

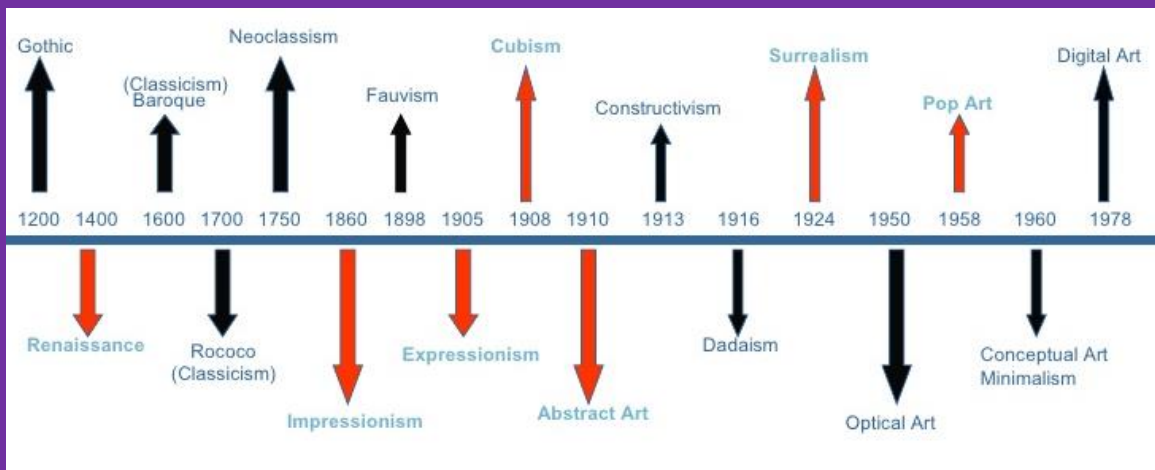
Assessment Objectives

| | |
|--|---|
| A01 Contextual understanding | Understanding of historical and contemporary visual elements of Arts, Crafts and Design. Analyse and compare using the Formal Elements to demonstrate your understanding. |
| A02 Experiment | Using a range of materials, techniques and processes to explore and develop ideas and intentions as your work progresses. This may be in both 2D and 3D. |
| A03 Recording Ideas | Develop and record ideas through drawing and annotation towards a personalized outcome. Link all work to A01 and A02 as your project progresses. |
| A04 Presenting an Outcome | Create and present a personalized outcome, realizing your intentions. |
| Coursework Portfolio | Worth 60% of your overall grade. Contains project work evidencing the four assessment objectives above. |
| Exam Portfolio | Worth 40% of your overall grade. Contains exam work evidencing the four assessment objectives above. |

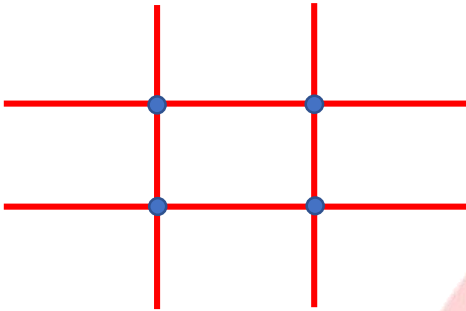
Key Terms

| | |
|-------------------|--|
| Abstract | Abstract art seeks to break away from traditional representation of physical objects. It explores the relationships of forms and colours |
| Aesthetics | Aesthetics is the branch of philosophy that is concerned with the nature of beauty and taste |
| Aperture | The opening through which light passes to expose sensitized material or a sensor. |
| Composition | Composition is the placement or arrangement of visual elements in a work of art. |
| Contemporary Art | Embraces late 20th century contemporary art movements in painting, sculpture and architecture, as well as new media such as installation art, (including sound), conceptualism and video art. |
| Contrast | Contrast is the scale of difference between dark and light areas in images. |
| Depth of Field | The distance in front of the point of focus and the distance beyond that is acceptably sharp. |
| Exposure | The amount of light that is allowed to reach the image sensor which is controlled by the shutter speed and aperture setting. |
| Form | Form is the aesthetics of recording in 2 and 3D |
| Line | Lines can be horizontal, vertical, or diagonal, straight or curved, thick or thin. |
| Macro Photography | Photography producing photographs of small items larger than life size |
| Modernism | Modernism is the term given to the succession of styles and movements in art and architecture which dominated Western culture from 19th Century up until the 1960's. |
| Photograph | A drawing with light |
| Primary source | Your own photographs/ drawings based on real objects |
| Sculpture | To make or represent (a form) by carving, casting, or other shaping techniques. |
| Secondary source | Images from the internet, books or magazines |
| Texture | Texture is the perceived surface quality of a work of art. |
| Tone | This could be a shade or how dark or light a colour appears |

Timeline of Art Movements

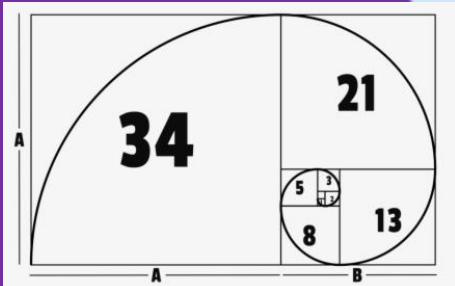


GCSE PHOTOGRAPHY



Key Terms

| | |
|----------------|--|
| Angle | The position from one point to another |
| Aperture | Used to determine how much light passes into the camera |
| Balance | An equal or symmetrical composition |
| Composition | The layout of an image, or placement of objects within a frame. |
| Contrast | The difference in tones from the lightest tone to the darkest tone |
| Depth of Field | The focus of objects based on distance |
| Detail | The part of an image that might have otherwise gone unnoticed. Often fine or small elements within an image. |
| Exposure | The amount of light in a picture. |
| Focus | The definition (or lack of) in an image. What the camera is aiming for. What your eye is drawn towards. |
| Light | The illumination of scenes or objects to be photographed |
| Negative Space | The space around the object. |
| Positive Space | The object that takes up physical space in the image |
| Rule of Thirds | a guideline that places the subject in the left or right third of an image, leaving the other two thirds more open. It divides a photo into nine equal parts, split by two equally spaced horizontal and vertical lines. |
| Saturation | The amount of colour in an image. |
| Shutter Speed | The length of time that the camera allows light into its lens. |
| Viewpoint | What the photographer sees from their position |



GCSE PHOTOGRAPHY

TECHNICAL

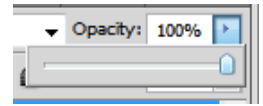


- Move Tool
- Marquee Tool
- Lasso Tool
- Quick selection tool
- Crop Tool
- Eyedropper Tool
- Healing Brush
- Paintbrush
- Stamp Tool
- History Brush
- Eraser
- Paint Bucket Tool
- Blur Tool
- Dodge Tool
- Pen Tool
- Text Tool
- Path Selection Tool
- Shape Tool



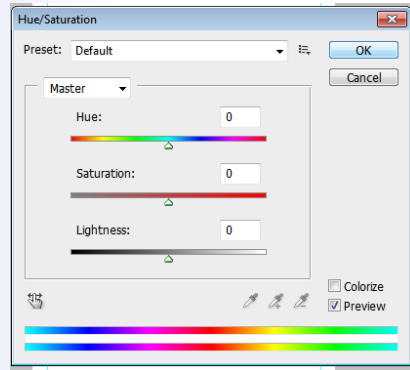
Create new layer

Work on separate layers simultaneously



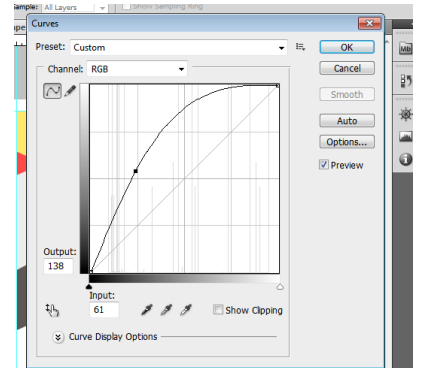
Change Opacity

Adjust how transparent your image is



Hue/Saturation

Adjust the colours in your image



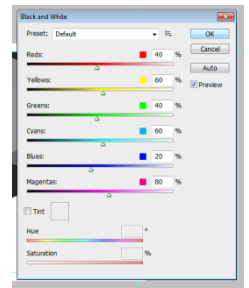
Curves

Adjust the tones in your image enhancing the light and dark areas and adding contrast and depth.

- Ctrl + T = Free Transform
- Ctrl + D = Deselect
- Holding Shift = Keep Proportions
- Ctrl + + = Zoom in
- Ctrl + - = Zoom out

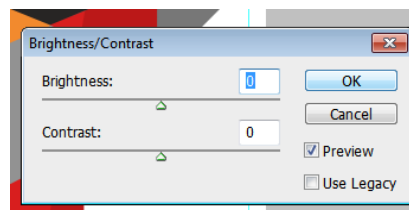
Black & White

Remove all colour from your image



Invert

Swap the colours in your image



Brightness & Contrast

Control how light your image is

Levels

Adjust your dark, medium and light tones separately

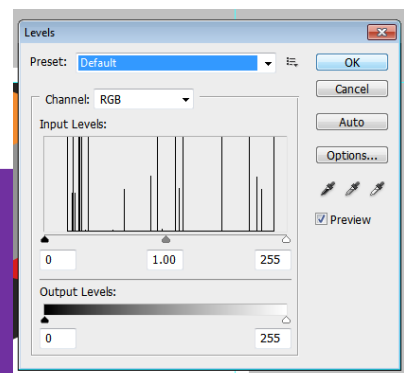
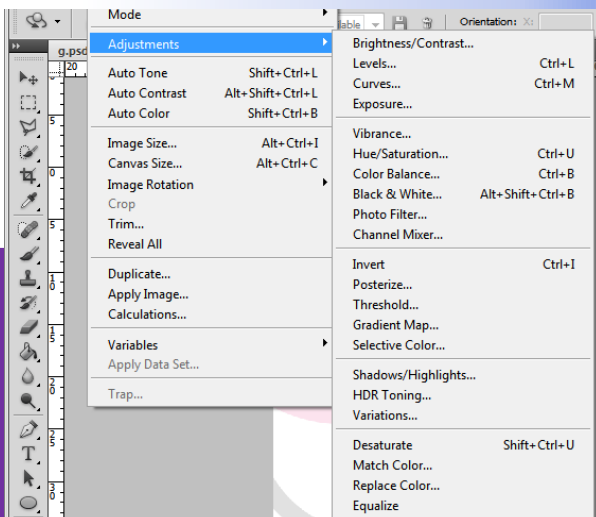


Image > Adjustments



What it means to be British



Understandings of Britishness should be as inclusive as possible. The term Britishness refers to the sense of nationhood held by many citizens of the United Kingdom, and the idea that the citizens of the United Kingdom have a common culture.

It is estimated by 2037 that the UK population will be 73million, with the number of elderly people increasing.

UK citizens have rights and responsibilities. Rights are often, though not always written into law.

Responsibilities can be legal (for example, to pay taxes) or they can be moral. A moral responsibility is the correct thing to do, moral responsibilities are not always enforced by law.

British Values

- Democracy
- The rule of law
- Individual liberty
- Mutual respect

Population

| | |
|-------|-------|
| UK | 64.6m |
| Eng | 54.3m |
| Wales | 3.1m |
| Scot | 5.3m |
| N.Ire | 1.8m |

Identity

Being British has come to mean a "layered" multi-identity where citizens can be simultaneously British, Scottish, English or Welsh.

Citizens might relate to their nationality, country or region when stating their identity.

Individuals gain their identity in numerous ways. Some people say identity is something you are born with (British by birth) whereas others say it can be adopted (British citizenship gained). This is known as a nature vs. nurture debate.

Britishness is evolving and re-forming with every moment due to factors such as immigration.

An identity is not fixed and can change depending upon situation.

Diversity in Britain

To become a British citizen people from other countries have to pass a citizenship test. The UK is a diverse country and has a long tradition of immigration and emigration. 1.8million UK citizens live and work in the EU.

The makeup of the UK could be grouped by: age, gender, ethnic background, religious belief of wealth distribution. The census records this data – The Office for National Statistics (ONS) provides reliable source data.

Many immigrants come to the UK for economic (work) and family (join those already residing in the UK). The medical and technology workforces are the most likely to be pursued by migrants.

The need for mutual respect and tolerance

- ✓ Recognise and utilise talents and contributions of others, regardless of diverse cultural or physical characteristics.
- ✓ Without respect among people, the incidence of conflict may increase.
- ✓ Britain has been drawn into a single global economic system due to the cross-border nature of today's world (communication, travel, trade etc.)
- ✓ Morally right to respect and tolerate each-other.

Increasingly Western countries are becoming concerned about how citizens are influenced and then take part in military actions abroad or within the UK, then pose a threat to national security. This concern has resulted in heated debates in society relating to immigration and diversity.

The UK's role on the world stage

The UK is a member of a number of major international organisations. This membership plays a role in shaping foreign, defense and economic policy in the UK, as well as having an impact upon its national sovereignty. The UK played a major role in the establishment of many of the key international organisations. The UK now holds more soft power than hard power in international affairs, despite this the UK's defence budget is the 5th largest in the world.

United Nations: The UN is one of the most important international bodies in the world with 193 members. The UN has legislated key declarations such as the Universal Declaration of Human Rights. The UK is one of the five permanent members of the United Nations (UN) Security Council, which means it has a veto over UN action.

NATO (North Atlantic Treaty Organisation): NATO is an intergovernmental military defence alliance. Nato is important in shaping UK defence policy as Article 5 states that an attack on one member is an attack on all. The UK was one of the founding members in 1949. There are currently 28 member states of NATO.

The WTO: The UK joined the WTO in 1955 which consists of 161 member countries working together to deal with trading rules between nations.

European Union: Winston Churchill first suggested the idea of a European community in 1946. The union was finally founded in 1957 and there were six member countries (France, West Germany, Belgium, Netherlands, Luxemburg, Italy). The UK did not join until 1973 when they voted in a referendum to join the Union. In 2016 the UK then voted to leave, again by referendum. Despite this vote Britain is still a member of the EU as the leaving process has not completed. The Union has its own directly elected parliament, the UK has 73 MEPs out of 751.

Council of Europe: The Council is Europe's leading human rights organisation – the UK was a founder member of the Council which is not part of the EU. 47 countries are members, all of which agree to follow the European Convention of Human Rights. The European Court of Human Rights oversees the implementation of the Convention.

Citizenship GCSE

Key Words

- Citizenship
- Values
- Principles
- Democracy
- Individual Liberty
- Tolerance
- Multi-cultural
- Multi-identity
- Discrimination
- Identity
- Patriotism
- Nationalism
- Immigration
- Emigration
- Refugees
- Hate crime
- Freedom of Press
- Investigative
- Accountability
- Regulation
- Census
- United Nations
- NATO
- European Union
- Council of Europe
- Commonwealth
- World Trade Organisation
- World Power / Super Power



Key Words

| |
|------------------------------------|
| Anarchy |
| Dictatorship |
| One-Party State |
| Theocracy |
| Liberal Democracy |
| Representative Democracy |
| Direct Democracy |
| Constitution |
| Bicameral |
| Civil Service |
| Legislature |
| Manifesto |
| The Monarchy |
| Prime Minister |
| Bicameral |
| Civil Service |
| Legislature |
| Manifesto |
| Cabinet |
| Devolution |
| West Lothian Question |
| Ultra Vires |
| General & Local Election |
| Apathy |
| Budget |
| Economy |
| Mixed, Market, and Command Economy |

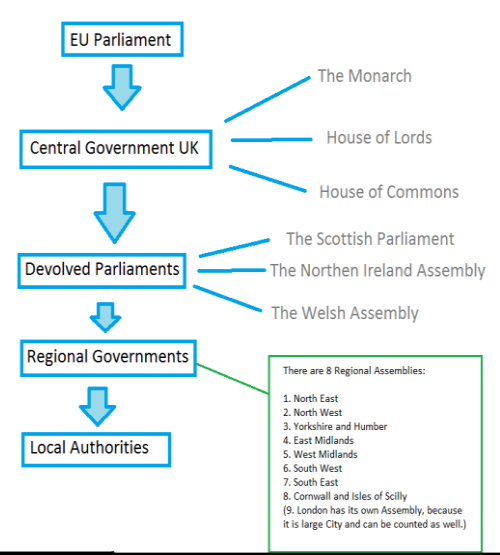
Constitutions

- A constitution is a set of rules that; Seek to establish the duties, powers and functions of the various institutions of government; regulate the relationship between and among the institutions; define the relationship between the state (government) and the individual (citizens); i.e. the extent of civil liberty.
- Without a constitution the government could simply do whatever it wants – oppressing minorities, violating freedom, tyrannising the mass of the people.
- The UK constitution is classified as unwritten and is a flexible document influenced by many documents. However the USA is a written constitution which clearly lays out the rights of citizens but it is not easy to change.

Main features of the UK Constitution:

| | |
|------------------|---------------------------|
| Fusion of powers | Parliamentary Sovereignty |
| Flexible | Uncodified |
| Uncodified | Unitary |

Citizenship GCSE – Politics and Participation



What is democracy

- A system of government by the whole population or all the eligible members of a state, typically through elected representatives.
- Direct democracy - a system of government where all citizens take part in decision making. A modern form of direct democracy is referendums.
- Representative democracy - a system of government where citizens are elected to represent others in an assembly.
- Liberal Democracy - a system of government based upon representative democracy and linked to the rights and freedoms for citizens. The UK is a liberal democracy. Liberal democracy became the predominant political system in the world. is characterised by fair, free, and competitive elections between multiple distinct political parties, a separation of powers into different branches of government, rule of law, and the protection of human rights for all.
- Values underpinning democracy: Rights, responsibilities, freedoms, the rule of law.
- Democracy in the UK is across multi-tiers of governance.

Central Government / Parliament

Three main parts: **House of Commons** - All of the MPs elected by UK citizens in the general election. Each represents their own constituency. **House of Lords** - All of the Peers. They are unelected. They are nominated experts in their fields. The Prime Minister has a large say in who becomes a Peer. **The Monarch** - The King or Queen at the time. They've less power now but still have final sign-off on laws.

House of Commons:

- Make laws
- Examine the work of the Government by asking questions and having debates.
- Keep a check on government spending.
- Represent their constituencies and the interests of their people.

House of Lords:

- Check on the House of Commons and make sure laws are not rushed.
- Criticise the government if it thinks that it has become too powerful.
- Hold debates on important issues.

Who can stand?

All candidates must be 18yrs + and either: A British, Ireland or Commonwealth citizen and not be subject to any legal incapacity. You cannot stand if you: Are a member of the police or armed forces, judges or those politically employed outside of the UK; subject to bankruptcy restrictions; sentenced to a term of imprisonment of 3+ months, including a suspended sentence within the last 5 years; been disqualified for any reason under the Representation of People Act 1983

Devolution

Devolution is 'the transfer of central government powers to lower levels (e.g. Scottish Parliament), these powers being exercised with some degree of independence though with ultimate power remaining with central government (e.g. Westminster).

Devolved parliaments do not have a say over:

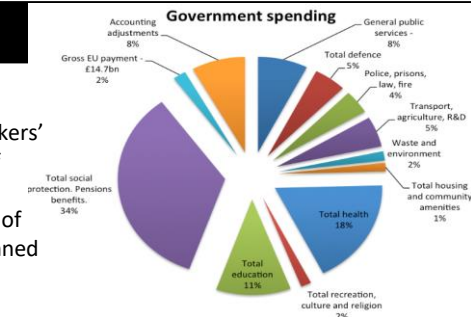
- | | |
|------------------------------|---------------------|
| ✓The Crown | ✓National insurance |
| ✓Parliament | ✓Elections |
| ✓International relations | ✓Currency |
| ✓Defence | ✓National security |
| ✓Immigration and Nationality | ✓Nuclear energy |
| ✓Taxation | ✓Outer space |

Tax

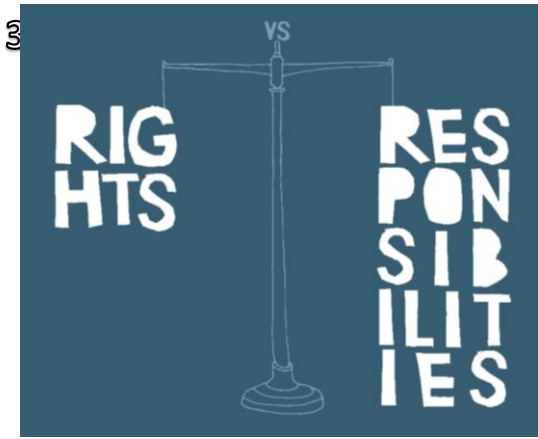
The government can either raise income through borrowing or forms of taxation - a mandatory or compulsory payment to the government from a workers' income, profits of a business, or added to the cost of some goods, services and transactions (VAT). The UK economy is known as a mixed economy (mix of private and public sector services). Government planned spending is announced annually in the Autumn Statement delivered by the Chancellor.

Regional / Local Council

Responsible for well-being of citizens resident in the local area. They have to make sure that roads are safe to drive, develop plans such as leisure centres, inspect companies and make sure that environment is protected from excessive toxic waste, observe and monitor crime rate, building and renovating of schools, hospitals and other social care buildings to meet required standards set by the Central Government. Local authorities get a certain amount of budget from the Central government and they need to spend it wisely.



Rights and Responsibilities GCSE Citizenship



1. The role and powers of the police.

- Role:**
- Protecting life and property
 - Preserving order
 - Preventing offences
 - Bringing offenders to justice.

Day to day job of the police:

- Work in the community
- Visible presence to deter crime
- Patrol
- Develop community knowledge
- Respond to calls
- Keep the peace
- Conduct initial investigations

Power

- Stop & Search
- Power of arrest
- Entry, search and seizure

4. How do the legal systems differ within the UK?

Scotland:

- Justices of the peace
- Sheriff and summary
- Sheriff and jury
- The High Court

Northern Ireland

- UK Supreme Court
- The Court of Appeal
- The High Court
- County Courts
- The Crown Court
- Magistrates Court
- Coroner's Court
- The Enforcement of Judgments Office

5. How does civil law differ from criminal law?

Civil Law:

- Deals with disputes between individuals such as debt or divorce
- Damages are awarded to the claimant if the case is found in their favour.

Criminal Law:

- Deals with individuals and groups who are accused of breaking the law.
- Requires the state to prove beyond reasonable doubt that the person committed the offence.
- If the person is found guilty they can receive a non-custodial or a custodial sentence.

2. The role and powers of the judiciary.

Role:

- Preside over court proceedings
- Interpret and apply the law
- Create case law
- Decide sentencing
- Chair public inquiries and commissions
- Protect the citizen from an overbearing state

Power

- Follow the decision of a jury
- Determine the sentencing
- Influence debate and discussion on specific topics
- Decide the outcome of a civil case

6. Differing types of crimes

Violent crime: murder, manslaughter or knife attack

Hate Crime: an attack motivated by prejudice based on race, religion, sexual orientation, disability or gender

Sexual offences: Rape, other sexual offences

Robbery: force or the threat of force is used either during or immediately prior to theft or attempted theft

Theft Offences: burglary of vehicles, from the person, bicycle theft, shoplifting and all other theft offences.

Criminal damage & arson: intentional or malicious damage to the damage to the home, property or vehicles

Fraud: Deception intended for personal gain or cause a loss to another party

Anti-social behaviour: nuisance, rowdy or inconsiderate neighbours, vandalism, graffiti and fly posting. Street drinking

9. Universal Human Rights:

Human rights are fundamental rights that everyone is entitled to have, to be or to do. The UNDHR was agreed in 1948 and was based on what had happened in WWII. There are 30 articles of the UNDHR

10. The European Convention on Human Rights:

After WWII, the ECHR was an international agreement to protect human rights and the rule of law and help promote democracy. Countries that sign up to it make a legal agreement to protect the basic rights of all people within their country. There are 14 articles.

7. Alternate Dispute Resolution (ADR)

Refers to the methods of resolving a dispute that can be lodged with a court:

Negotiation: Parties involved discuss issues and compromise or make a decision about how the issues can be resolved

Mediation: Parties discuss their dispute with a neutral third party known as a mediator. They act as a facilitator to help the parties reach their own agreement.

Conciliation: Plays a more active role than a mediator and may suggest grounds for a possible compromise

Arbitration: Process where parties agree to have their dispute heard by a private arbitrator who will make a binding decision.

8. The purposes of sentencing:

- Punishing-** the offender
- Deterrence-** trying to reduce crime
- Rehabilitation-** trying to reform the offenders behaviour
- Protection-** for the community
- Reparation-** by the offender- making compensations to those affected by their offending.

11. The United Nations Convention on the Rights of the Child:

This came into force in Sep 1990 and by 2009, 194 countries had agreed to abide by the convention. The Convention places a duty on governments in regard to areas relating to children. In total there are 54 articles.

12. The International Humanitarian Law (IHL)

An internationally binding agreement regarding humanitarian law and conflict.

- Protect people who are not involved e.g. the sick, wounded, children
- Set out the rights and obligations of those involved in the armed conflict.

Keywords:

- Judiciary-** responsible for the legal system, including judges in courts of law.
- Criminal Law-** Charged by the state and punished by the state
- Civil Law-** disputes between individuals where damages are awarded
- Common Law-** law based upon judges rulings in court
- Metropolitan Police Force-** sometimes referred to as "The Met" are responsible for the London area.
- Police & community support officers-** they do not have police powers and are uniformed, employed staff who help the police in the local community
- Legal executives-** legally qualified specialists employed largely by solicitors
- Solicitors-** Cover a range of civil and criminal legal work and have to be formally qualified
- Barristers-** Specialists in a narrow aspect of the law and employed by solicitors on behalf of their clients to represent them in higher courts.
- Citizens Advice-** Community-based charity that provides help and advice, including free legal advice.
- Queen's counsel-** barristers may apply. This is recognition that they have become experts in their own field
- Non-custodial-** a criminal sentence that does not involve imprisonment
- Custodial-** a sentence that involves imprisonment
- Supreme Court-** the final court of appeal in the UK. It hears cases of great public or constitutional importance that affects the whole population.
- Employer's Association-** industry or regionally based bodies that seek to represent the interests of groups of employers
- Strike-** the withdrawal of one's labour: refusing to work
- Secondary action-** when a worker takes action to support other workers
- Recorded crime-** crimes that are reported and recorded by the police
- Deterrence-** use of sentencing to prevent the offender and others committing the offence
- Rehabilitation-** an aim of sentencing seeking to change the behaviour of the offender
- Reparations-** where an offender has to pay towards the damage they have caused
- Youth Offending Teams (YOTs)-** a partnership of organisations with a legal responsibility to prevent offending and reduce reoffending, and to work and help develop skills to engage with young people.
- United Nations Declaration of Human Rights-** established in 1948 it is an agreed statement of the rights to which all human beings are entitled.
- UN Convention on the Rights of the Child-** In 1989, the convention stated the basic rights in regards to children.
- International humanitarian law-** a body of law associated with international disputes and the conduct of war.
- Geneva Conventions-** A convention relating to how civilians and others should be treated during a time of war
- Hague conventions-** deal with the rules of governing the conduct of war
- International Criminal Court-** Set up in 1998 to try persons indicted for crimes against humanity or war crimes.

Rights & Responsibilities

Civil law is concerned with the rights and duties of citizens in dealings with other citizens.
Criminal offences are regarded as offences against society.

Between ages 10 and 25 your rights and responsibilities change, and you can do different things at different ages.

14 +
You can get a part time job, for a maximum of two hours on a school day.
If convicted of a serious criminal offence (in a Youth Court), You can be held in secure accommodation for no more than 24 months. You could also get a fine for a maximum of £1,000.

16+
You have the right to give consent to medical, dental and surgical treatment. This includes contraceptive advice and treatment.
You can have sex, gay or straight, so long as your partner is also 16+ (17+ in Northern Ireland).
You can claim benefit and obtain a National Insurance number.
You can join the armed forces (so long as that's OK with your parent/s or carer).
If convicted of a criminal offence, but not given a custodial sentence, you can receive a youth rehabilitation order.
You can get married (with parental consent).

17+
You can drive most types of vehicles
You can be interviewed by the police without an adult present, given a reprimand or a warning. Should you be charged with an offence (without being granted bail) then you could be sent to a remand centre or prison.

18+
You can vote in local and general elections.
You can stand for election as a Member of Parliament, local councillor or Mayor.
You can serve on a jury, or be tried in a magistrates court and go to jail if you're found guilty of a criminal offence.

Key Dates:

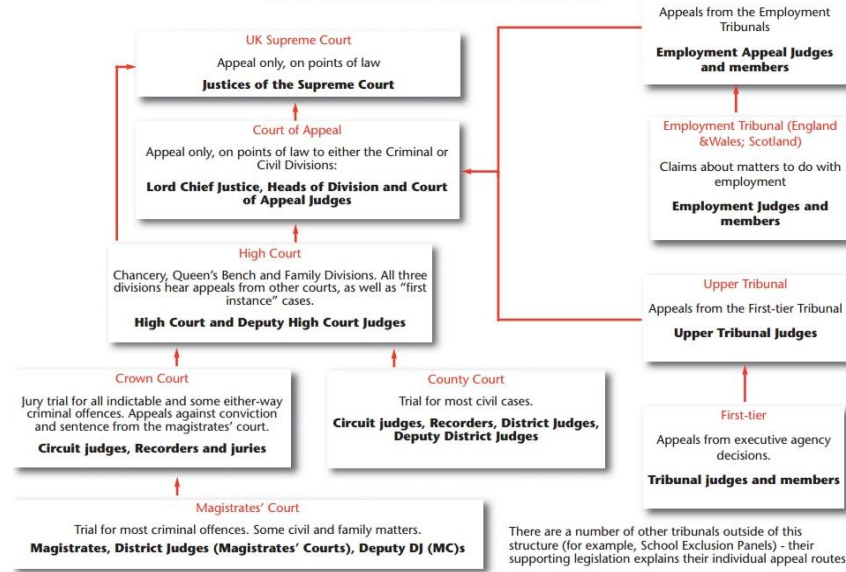
- 1215 – Magna Carta.
- 1791 – United States Bill of Rights.
- 1836 – Defendants have the right to legal representation in British courts.
- 1948 – The United Nations Declaration of Human Rights.
- 1949 – Signing of the North Atlantic Treaty.
- 1950 - European Convention on Human Rights.
- 1961 – Amnesty International was founded.
- 1990 – United Nations Convention on the Rights of the Child.
- 1998 – UK Human Rights Act.
- 2010 – UK Equalities Act.

Trade Unions

A labor or trade union is an organization of workers dedicated to protecting members' interests and improving wages, hours and working conditions for all. No matter what you do for a living, there's a union with members who do the same thing. Unions are important because they help set the standards for education, skill levels, wages, working conditions, and quality of life for workers. A trade union is an organisation made up of members (a membership-based organisation) and its membership must be made up mainly of workers.

Trade unions: Negotiate agreements with employers on pay and conditions, discuss major changes to the workplace such as large scale redundancy, discuss members' concerns with employers, accompany members in disciplinary and grievance meetings, provide members with legal and financial advice, provide education facilities and certain consumer benefits such as discounted insurance.

The structure of the courts



Young Offenders Process

Informal warning

This is basically a telling off from the police and only for 1st or minor offences

Reprimand

If the offence is more serious they will be given a reprimand at the police station in the presence of your parents.

Final Warning

If the offence is more serious they will be given a final warning and be referred to the YOT

Youth Offending Team

A team made up of police, social services education and probation will work with the young offender and offer counselling and help to improve their behaviour. They will be encouraged to apologise to any victims.

Youth Court

Serious or 3 + offenses. Possibility of custodial sentence or fine

International Organisations

The **United Nations** is an international organization founded in 1945. It is currently made up of 193 Member States. The mission and work of the United Nations are guided by the purposes and principles contained in its founding Charter.



The fundamental purposes of the **European Union** are to promote greater social, political and economic harmony among the nations of Western Europe..



The **World Trade Organization** (WTO) is the only global international organization dealing with the rules of trade between nations. The goal is to ensure that trade flows as smoothly, predictably and freely as possible.



GCSE ART CONNECTIVES

Theme & Artist research | Experimentation & Refinement | Drawing & Recording | Journey & Outcome

EMPHASISING IDEAS

Emphasising an idea that you've sketched.



Example:

"Clearly this is the best idea out of the four designs **therefore** I will look to develop this idea further by..."

| | |
|---------------|---------------|
| obviously | significantly |
| surely | especially |
| clearly | undoubtedly |
| above all | therefore |
| least of all | it would |
| in particular | moreover |
| indeed | as well as |
| notably | too |

LINKING IDEAS

Example:

"I started by looking at two artists, **then** I combined both their styles."

| | |
|-------------|-------------|
| in addition | in spite of |
| furthermore | besides |
| also | because |
| and | then |
| next | it would |
| previously | moreover |
| so that | as well as |
| this meant | too |



COMPARE AND CONTRAST IDEAS

Being able to compare and contrast design ideas in a sentence or paragraph.

Example:

"My first idea featured lots of colour and looks really effective. **However**, my second idea links more to my artist's style."

By **comparison**, my third design incorporates ideas from my artist but in my own style."

| | | |
|---------------|-------------------|---------------|
| although | likewise | however |
| yet | whereas | by comparison |
| in spite of | despite this | similarly |
| while | in contrast | otherwise |
| nevertheless | as long as | but |
| instead | in the same way | unless |
| even so | on the other hand | except |
| alternatively | apart from | equally |
| unlike | just like | compared to |

TIME CONNECTIVES

Linking time in a paragraph

Example:

"At **first** I used a pen to draw out my design. **Next** I added a wash over the top."

| | |
|------------------|-----------|
| at first/firstly | at length |
| until | after |
| from that point | meanwhile |
| lastly | finally |
| eventually | later |
| next | soon |
| ultimately | earlier |
| secondly | before |

INTRODUCING EVIDENCE

Introducing evidence in a paragraph

Example:

"This series of work shows refinement, **for instance** I have used a range of mediums to determine the most suitable."

It's my opinion this artist uses a controversial style that not everyone will like. This can be **supported** in this quote from his website:"

| | |
|---------------------------------|----------------|
| for example | illustrated by |
| such as | because |
| for instance | meanwhile |
| as shown by | in the case of |
| this can be backed up by | |
| the evidence to support this is | |

WRITING ABOUT YOUR FINAL DESIGN

Being able to write about your own ideas and sources

Example:

I am really pleased with my final outcome. I **like it because** it **reflects** the artists I've shown in my research. **Whilst I think that** my choice of colour is good **I feel that** I could have refined my choice of medium further by combining the techniques".

| | | |
|------------------------------------|----------------------|--------------------------------|
| I think that | reflects | another idea would be to |
| reminds me of | I like...because | makes me feel |
| portrays | signifies | gives the impression that |
| suggests that | reinforces | it could be that |
| next time | it could be that | gives the impression that |
| it's almost as if | this particular idea | what I like about this idea is |
| of all the ideas that I have drawn | | it satisfies the specification |



Ks4- Creative Studies

Tips to improve writing skills/Formal Elements/Drawing/Analysing a Brief

BBC Bitesize guide to Formal Elements

<https://www.bbc.co.uk/bitesize/topics/z9kmhyc>

Do's and Don'ts for Realistic Drawings

<https://www.youtube.com/watch?v=NC3HukT9ZMA>

Important factors when analysing a brief....

Requirements

What are the specific things that the brief asks for?

Constraints

What are the restrictions of the brief? e.g. budget

Opportunities

Who will see this work? What are the benefits of making this work?

Format

Does the brief ask for the artwork to be made and/or presented in a certain way?

Scale

Does the brief ask for the artwork to be a certain size?

Location

Does the brief ask for the artwork to be in a certain place?

Theme

Does the brief ask for the artwork to be based on a particular theme?

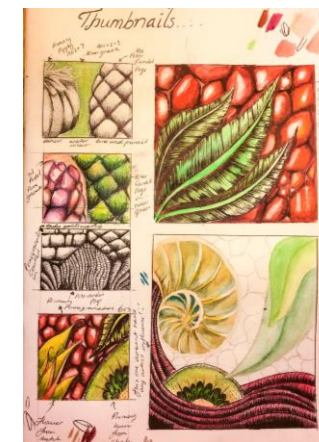
Ks4- Creative Studies

Developing Creativity – Design Process

| Key Terms | |
|-----------------------|--|
| Creativity | The use of imagination or original ideas to create something; inventiveness. |
| Idea Generation | A creative process that encompasses the generation, development and communication of new thoughts and concepts. |
| Design | A plan, sketch, or preliminary drawing. the arrangement or pattern of elements or features of an artistic or decorative work. |
| Annotation | A note added to a text, book, drawing, etc., as a comment or explanation. |
| Composition | Composition is the placement or arrangement of visual elements in a work of art. |
| Contemporary | Term loosely used to refer to art of the present day and of the relatively recent past. |
| Secondary source | Images from the internet, books or magazines |
| Primary source | Your own photographs/ drawings based on real objects |
| Observational drawing | Observational art is to draw or paint a subject as accurately as possible. The subject may be a still life, figure model, portrait or landscape and the image must be created from real life rather than a photograph or the artist's imagination. |

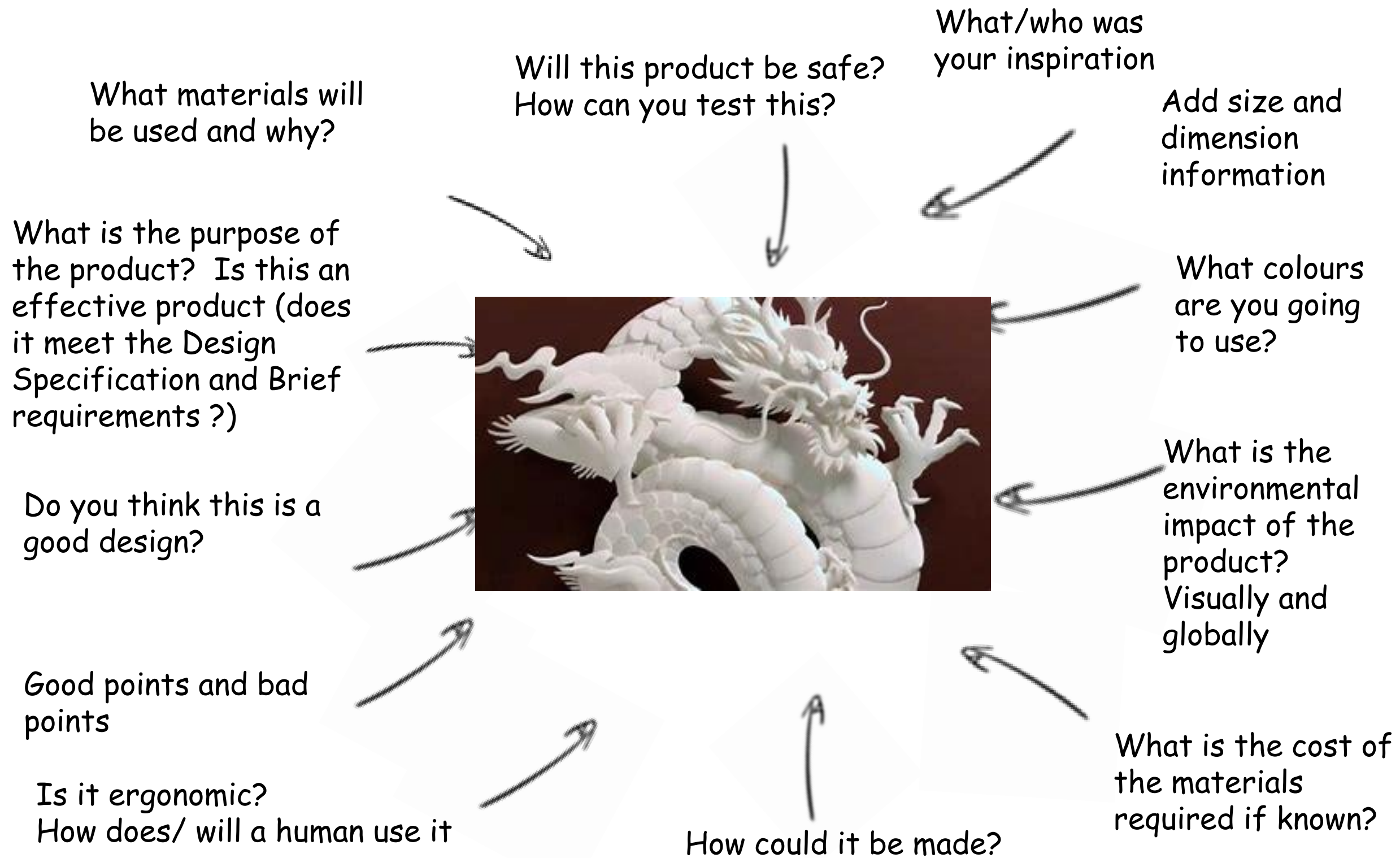
THE DESIGN PROCESS

Action Verbs



How to annotate a design idea

Your design idea drawings do not always give the reader all the details you have thought about, by adding annotation you can share your whole idea and give details about areas you cant see.



Ks4- Creative Studies – Terminology and Tips to improve writing skills

| | |
|---------------------------------|---|
| Contextual understanding | Understanding of Historical and contemporary visual elements of Arts, Crafts and Design. |
| Recording | Using suitable materials, methods and techniques in 2 and 3D to convey your ideas. |
| Refining ideas | Evaluating and adapting ideas through the investigation of a wide range of processes |
| Formal Elements | Line, tone, form, composition, colour, texture, pattern |
| Portfolio | A body of work based on investigation of contextual study, exploration of materials and techniques and development and refinement of ideas. |
| Abstract | Abstract art seeks to break away from traditional representation of physical objects. It explores the relationships of forms and colours |
| Aesthetics | Aesthetics is the branch of philosophy that is concerned with the nature of beauty and taste |
| Composition | Composition is the placement or arrangement of visual elements in a work of art. |
| Contemporary Art | Embraces late 20th century contemporary art movements in painting, sculpture and architecture, as well as new media such as installation art , (including sound), conceptualism and video art . |
| Contrast | Contrast is the scale of difference between dark and light areas in images. |
| Form | Form is the aesthetics of recording in 2 and 3D |
| Line | Lines can be horizontal, vertical, or diagonal, straight or curved, thick or thin. |
| Modernism | Modernism is the term given to the succession of styles and movements in art and architecture which dominated Western culture from 19th Century up until the 1960's. |
| Primary source | Your own photographs/ drawings based on real objects |
| Sculpture | To make or represent (a form) by carving, casting, or other shaping techniques. |
| Secondary source | Images from the internet, books or magazines |
| Texture | Texture is the perceived surface quality of a work of art. |
| Tone | This could be a shade or how dark or light a colour appears |

Examples

The contextual factors include:

Artists / designers and their artwork used within the art movement

Art and design disciplines used within the art movement

How contextual factors influenced the creation of their art and design work:

- belief system context – art created in response to belief system/events or for the purpose of belief systems
- political, social and economic context – art created in response to political, social or economic beliefs/events or for political purposes
- geographical context – art created in response to, or to represent, places.

Art for Social Change Art is often a vehicle for social change. It can give voice to the politically or socially disenfranchised. A song, film or novel can rouse emotions in those who encounter it, inspiring them to rally for change. The impact that art has on society is threefold, it comes from the individual's reaction to the work, the power inherent in the work and the environmental factors surrounding the work.

Another example of art and how it affects society is with Australian Aboriginal art. These works date back over multiple generations, and it was used to transmit information from generation to generation. It has sacred meaning. Although many Aboriginals were displaced from their land and languages have been lost, the art remains as a strong reminder of the history of Australia. Even today, the Aboriginal art influences contemporary art in concept and style.

Geographical Context

An artist's relationship with a particular place is a constant in art; Cézanne's paintings of Mont St. Victoire, which established a great precedent in modern art, are among the most significant. The concept of the artist as traveller and diarist also belongs to a long tradition.



The Monument Of An Anonymous Passerby, Wroclaw, Poland



Spider, Tate Modern, London, UK



Mustangs By Robert Glen, Las Colinas, Texas, USA



Kelpies, Grangemouth, UK



KO 11 - Analysing the work of artists

Name of artist :
 Theme of artist work:
 Date work was created
 Art Movement:.....
 What materials and techniques have been used:.....

Describe the work
 Is the work realistic or abstract? Why?.....
 How has the artist used colour? Why?.....
 How has the artist used line? Why?.....
 How has the artist created Form? Why?.....
 Describe the composition and why it has been made this way.....

- Similar tones
- Similar variety of textures and mark making
- The same media and techniques
- The same mood and atmosphere
- Similar dramatic focal point
- Similar composition and scale of objects
- Similar realistic OR abstract style
- Similar subject matter in my final piece

AO1: Artist Research & Analysis

Something I like about the artist's work is...

I think the artist has made the work by using...

I think the artist made their work this way because...

I think the artist's ideas are about...

I will use the artist's ideas in my own work by...

I think the artist's work is relevant to my ideas because...

Stanley Spencer

Skin Tones

The worksheet includes a central image of a portrait with various skin tones circled and labeled. To the left, there are color swatches for 'Tint', 'Shade', and 'Tone'. To the right, there are two smaller images labeled 'Pencil Study' and 'Paint Study'.

AO 1 – Recall knowledge and understanding
 The emphasis here is for learners to recall and communicate the fundamental elements of knowledge and understanding.

The work of
 will influence/inspire/help me to develop my own ideas because I will use

- Form
- Tone
- Shadow
- Contrast
- Light areas
- Dark areas
- Curved lines
- Geometric
- Texture
- Monochrome
- Tints
- Shades

You can refer to the artist by their full name or surname NOT their first name!

Remember to use as many key terms as you can and to check your spelling.

AO 3 – Analyse and evaluate knowledge and understanding
 The emphasis here is for learners to develop analytical thinking skills to make reasoned judgements and reach conclusions.

MAUKIZU ANZEKI | ORIGIN AND IDENTITY

The diagram features a central portrait of a man with a face made of threads. Surrounding the portrait are various text boxes and arrows pointing to different parts of the artwork. The text boxes contain detailed analysis of the artist's techniques, such as the use of threads to create a sense of movement and depth, and the choice of colors to evoke specific emotions. The diagram also includes labels for 'subject matter' and 'function/purpose'.

If you have difficulty with neat handwriting then type up your analysis.

The questions below will help you **analyse** an artist and their work:

Look at the questions below and choose to answer any that are relevant to the work you are looking at.

Context

This refers to how the work relates to a particular time, place, culture and society in which it was produced.

- When was it made? Where was it made? Who made it?
- What do you know about the artist?
- Can you link it to other arts of the period, such as film, music or literature?

Content

The content is the subject of a piece of work.

- What is it? What is it about? What is happening?
- The title - what does the artist call the work?
- Is it realistic or have any parts been exaggerated or distorted? If so, why?

Process

Looking at process means studying how the work was made and what techniques were used.

- What materials and tools were used to make the piece?
- Why did the artist use these tools/materials?

Mood

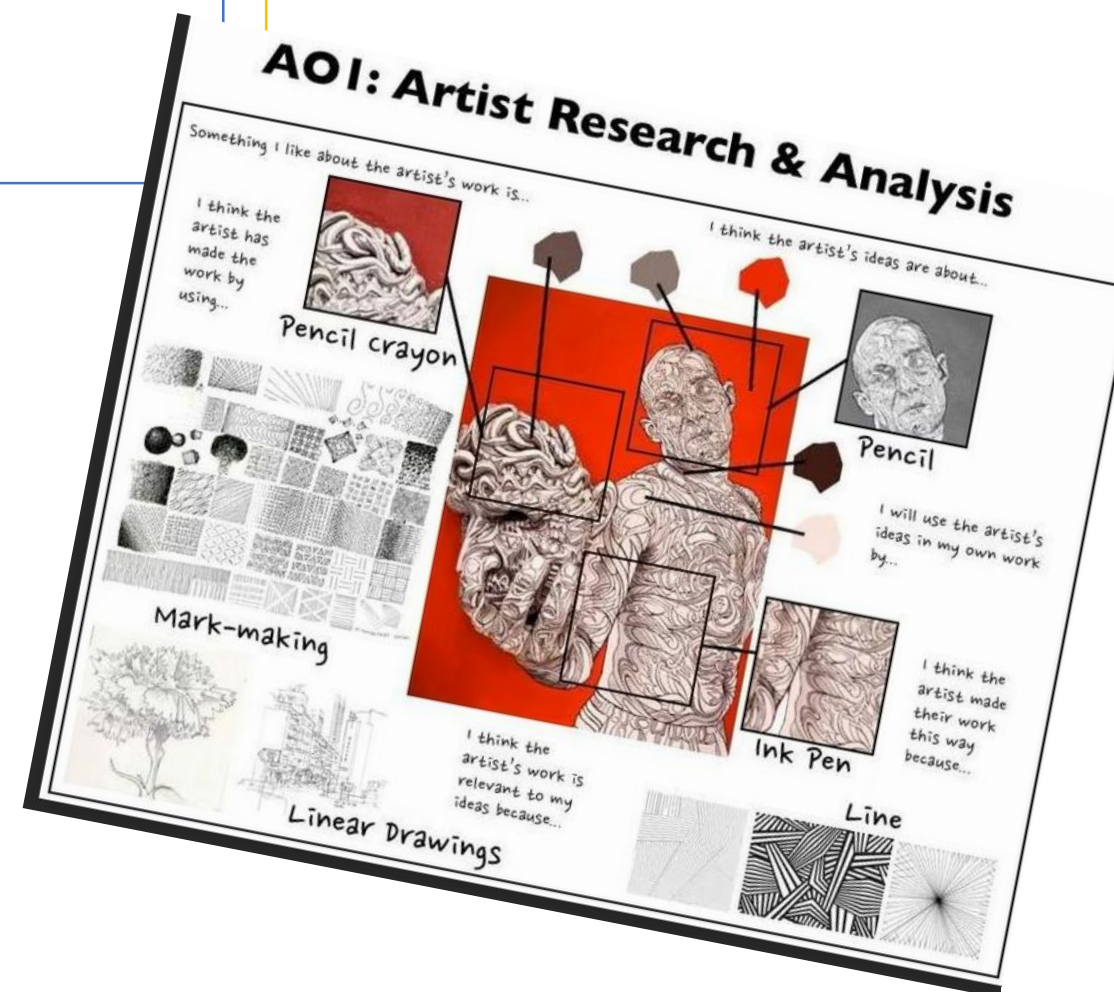
Mood means looking at how the artist has created a certain atmosphere or feeling.

- How does the work make you feel? Why?
- Does the work create an atmosphere?

Form

This means looking at the formal elements of an artwork.

- What colours are used? Why?
- What kind of shapes or forms can you find?
- What kind of marks or techniques does the artist use?
- What kinds of textures can you see?

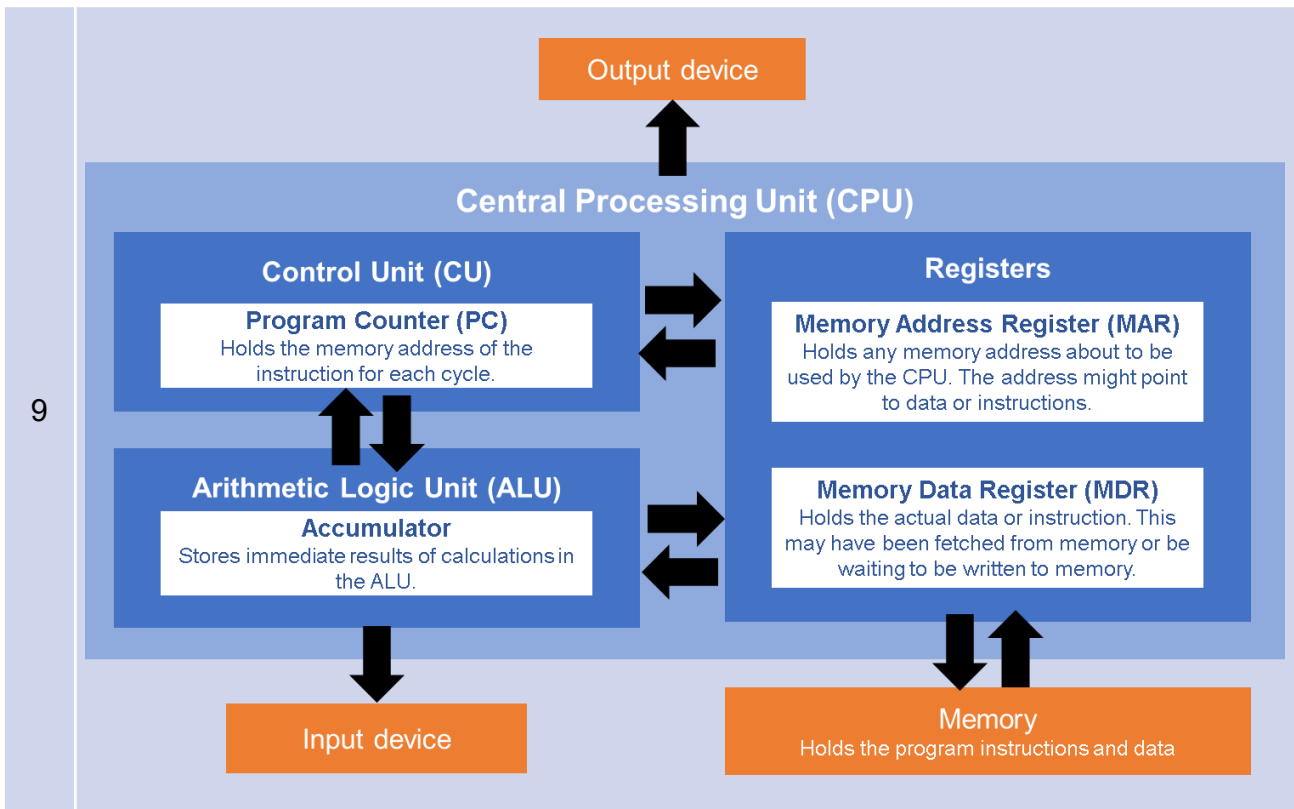


KS4 Computer Science - 1.1.1 ARCHITECTURE OF THE CPU

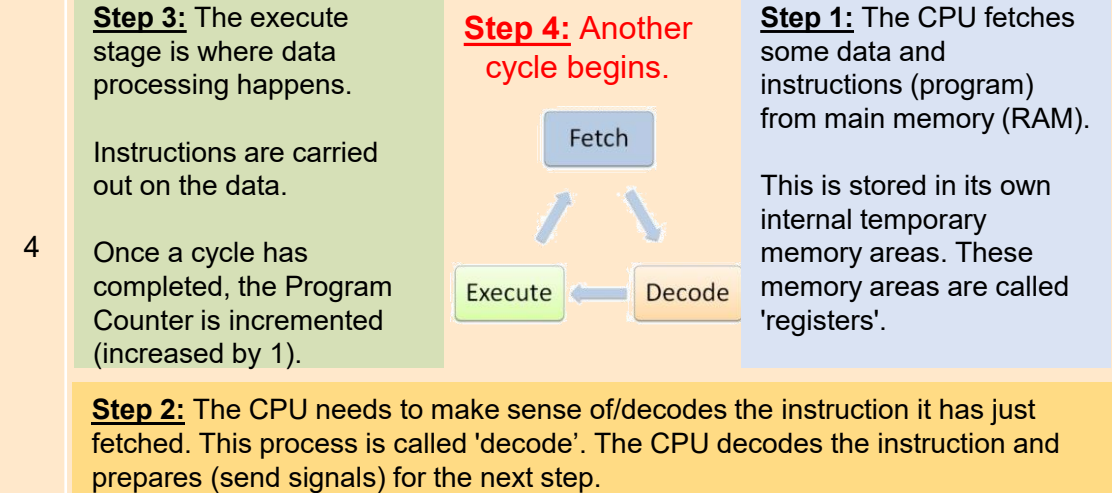
KEYWORDS

| | | |
|---|--------------------------------------|---|
| 1 | Central processing unit (CPU) | The CPU is a piece of hardware in a device that carries out the instructions of a computer program. |
| 2 | Von Neuman architecture | The design that many general purpose computers are based. Based on a 1945 description by the mathematician and physicist John von Neumann. See diagram in the blue box below. |
| 3 | Fetch-decode – execute | When a program is being executed, the CPU performs the fetch-decode-execute cycle , which repeats until reaching the STOP instruction. |

VON NEUMAN ARCHITECTURE (CPU STRUCTURE)



The FETCH -> DECODE -> EXECUTE CYCLE



MAIN COMPONENTS OF THE CPU




| | | |
|---|------------------------------------|--|
| 5 | Control unit (CU) | <ul style="list-style-type: none"> Has <u>overall control</u> of the CPU. Main job to <u>execute program instructions</u> by following the <u>fetch-decode-execute cycle</u>. Controls the flow of data inside the CPU (e.g cache) and outside the CPU (e.g main memory). |
| 6 | Arithmetic Logic Unit (ALU) | <ul style="list-style-type: none"> The ALU does all the <u>calculations</u> such as addition, subtraction, multiplication and division. It <u>performs logic operations</u> such as AND, OR and NOT and binary shifts. |
| 7 | Cache memory | <ul style="list-style-type: none"> The cache is very fast memory. Faster than RAM. It stores regularly used data so it can be accessed quickly next time it is needed. Three levels of cache memory. L1 is the fastest and smallest and L3 is the slowest but largest. |
| 8 | Registers | <ul style="list-style-type: none"> Another type of memory in CPU that temporarily holds tiny bits of data. Quickest of all memory. |

KS4 Computer Science - 1.1.2 CPU PERFORMANCE & 1.1.3 EMBEDDED SYSTEMS

KEYWORDS

| | | |
|---|-------------------------------|--|
| 1 | Central processing unit (CPU) | The CPU is a piece of hardware in a device that carries out the instructions of a computer program. |
| 2 | Characteristics | Feature/quality of the CPU that affects performance. |
| 3 | Performance | How quickly a CPU can process data/instructions. This can have an impact on a devices responsiveness and ability to multitask. |
| 4 | Embedded systems | A computer System that is made up of both Hardware and Software (Often known as Firmware), usually for very specialised tasks and doesn't usually contain an Operating System. For example: washing machine, Sat Nav, Microwave, cars (parking sensors) etc. |
| 5 | General Purpose Computer | A computer that is designed to be able to carry out many different tasks. Desktop computers and laptops are examples of general purpose computers. |

THINGS THAT AFFECT CPU PERFORMANCE

| | | |
|---|---|--|
| 6 | Clock speed  | <ul style="list-style-type: none"> The is the number of instructions a single processor can carry out per second - measured in Hertz A standard computer would be about 3.5Hz – this is <u>3.5 billion instructions per second!!</u> The higher the clock speed, the greater the number of instructions can be carried out per second. Increasing the clock speed is called overclocking, however, overclocking increases the temperature, so improved cooling may be required. |
| 7 | Number of Cores  | <ul style="list-style-type: none"> Each core in the CPU can process data independently. The more cores, the more instructions it can carry out at once, <u>this doesn't mean increased speed!</u> Most PCs have four or more cores now. |
| 8 | Amount of Cache  | <ul style="list-style-type: none"> Cache is memory inside the CPU. It is much <u>faster than RAM.</u> A larger cache gives the CPU more capacity for the most frequently used instructions, meaning it can access more instruction in its fastest memory. |

DOES ONE CHARACTERISTIC IMPROVEMENT MEAN BETTER PERFORMANCE?

- 9 **NO!** - Each characteristic can have some impact upon the performance of a device, an improvement in one alone will not necessarily improve the devices overall performance.
- For example:** An increase in the number of cores will allow a device to perform multitask or parallel, BUT if the clock speed is slow, then the cores only perform as fast as the clock speed, therefore impacting performance.

PARALLEL PROCESSING & MULTI-TASK PROCESSING

| | | |
|----|-----------------------|--|
| 10 | Parallel Processing | The same program can have two instructions processed at the same time. |
| 11 | Multi-Task Processing | Each core can each process two different programs' instructions at the same time. |
| 12 | Coding of Software | Some programs do not allow more than one instruction to be processed at once, not necessarily mean better performance! |

EMBEDDED SYSTEMS

- An embedded system is designed with a specific task in mind. All parts and components are usually built on a single printed circuit board. This board is then built into the larger piece of equipment.
- An embedded system is a single microprocessor that includes RAM, ROM and a CPU. Without them a digital device would not be able to perform specific functions. **For example:** a dishwasher wouldn't know how to heat the water, or a satnav wouldn't know how to communicate with a satellite.

13

Embedded Systems:

- Have no operating system
- Purpose and function is limited to a few dedicated tasks
- Program is held in ROM
- RAM is used to accept user input
- Built into the object or device that it controls




KS4 Computer Science - 1.2.1 PRIMARY STORAGE (MEMORY)

KEYWORDS

| | | |
|---|-----------------------------------|---|
| 1 | Random Access Memory (RAM) | RAM holds the loaded operating system as well as all the running applications and data. Stores data as electricity in transistors etched into a circuit in the device. Charge needs to be refreshed every few milliseconds otherwise it leaks away. <u>Needed as too slow for CPU to access data from hard disk.</u> |
| 2 | Read Only Memory (ROM) | ROM is used to store start up routines in a computer. The contents of ROM can't be changed. ROM is a type of Flash memory. |
| 3 | Virtual Memory | Virtual memory is located in the Hard Disk Drive (HDD) and used when the RAM is full. |
| 4 | Flash Memory | Doesn't need constant power to hold data. Sends large electric current to force electrons through a barrier and trap them. The arrangement of them is data. |
| 5 | Primary storage | RAM and ROM that directly interacts with the CPU – NOT storage for files created by user. |
| 6 | Volatile | Volatile means data will be lost when power is lost. |

ROM (Read Only Memory)

When you switch off your computer the data that the CPU can access (the RAM) loses its data. 

This is a problem because, when you restart your computer, data must be in the RAM for the computer to work.

This is where ROM comes in, ROM is:


- a memory chip that can store data even without power: **non-volatile**.
- Can only be read, not easily written to.
- Stores computer boot-up sequence called the BIOS (Basic Input Output System). Everything the computer needs to start and load the operating system.
- Built into the motherboard.
- Used a lot in embedded systems to store the software to control the hardware.

MEMORY - This is why computers store data as binary!


- Made from semi-conductor switches / transistors.
- Position of the switch can only be in one of two states, open or closed / on or off, which is used to represent binary 0 (closed/off) or 1 (open/on).
- Single unit of memory = BIT = 0 or 1.

- 8 **Memory access:** Memory linked to CPU by 2 busses (a BUS is a set of very thin parallel wires that transmit binary data).
- **ADDRESS BUS** identifies the location of the data (a bit like a house number/postcode does).
 - **DATA BUS** is used to transfer the contents of the memory address (the data) between the memory location and the CPU (and visa-versa with RAM).

RAM (Random Access Memory)

- Volatile.
- Data constantly changing (when a program is opened data and instructions needed for it are loaded into RAM). 
- Stores currently running programs/data.
- More RAM =
 - more currently in use programs and data can be stored and accessed by CU for processing
 - Better responsiveness & ability to have several programs open at once (multitask) or memory intensive ones like high end games.

VIRTUAL MEMORY

- 11 When RAM is full, part of secondary storage (hard drive) acts as RAM. This ensures your computer does not simply crash. 
- At any one time only some blocks of data in RAM are actively being used by the CPU, the operating system copies blocks of inactive data from RAM to the hard drive and copies active blocks of data into RAM to be accessed by the CPU, once space available OS copies data back to RAM.
- Hard disk has a slower read/write access speed, swapping inactive & active data blocks causes a delay as the computer switches tasks. Accessing VM slows down as too much time is spent swapping blocks of data between real and virtual memory (disk thrashing). Area of hard disk acting as VM = "page file". Size can set using OS (usually twice size of RAM).

KS4 Computer Science - 1.2.2 SECONDARY STORAGE

KEYWORDS

| | | |
|---|-----------------------------------|---|
| 1 | Secondary storage | Allows for permanent, long term of storage of data (files and software), even when there is no power. Non-volatile , e.g. HDD, USB etc. |
| 2 | Characteristics | Feature/quality of the storage type that affects it's ideal use. |
| 3 | Optical | A laser light creates marks in a pattern on the disk. A laser light detects where the marks are and translates this into a readable format. |
| 4 | Magnetic | Read/write needle moves across a disk and changes how magnetised that part is. E.g. one level of magnetism is a 1, a second is a 0. |
| 5 | Solid State (Flash Memory) | Made of microchips (switches). The state of the switches(open/on or closed/off) determine if a 1, or 0 is stored. |
| 6 | Cloud | Storing data at a remote location online. When files and data are sent to the cloud, they are being sent to a server that is connected to the internet. Files can be uploaded and downloaded as required. |

WHY SECONDARY STORAGE IS NEEDED. NOT BACKUP STORAGE!

In everyday computer use, we need a way to write data, rewrite data, store data when the computer is switched off and retrieve data the next time we switch our computer back on.

RAM allows us to write data and store it...but the data is lost when it is switched off (volatile).





ROM allows us to store data when it has no power (non-volatile)...but we cannot write to it.

We therefore need another device/medium by which we can re-write data when we want AND store the data when the computer has no power.

This is where SECONDARY STORAGE comes in!

Without secondary storage software would need to be installed each time we use it and you couldn't save any files, data, images, videos etc.

TYPES OF STORAGE AND THEIR CHARACTERISTICS


| | | |
|----|--|--|
| 8 |  Optical E.g. DVD, CD, BluRay. | <ul style="list-style-type: none"> Use: Storage of small media files and documents Capacity: 650MB (Small) Speed: Moderate read/write speeds Portability: Very portable and light Durability: Fair durability, can survive knocks but scratches can damage the data. Reliability: CD-Rs are write once but can be read indefinitely. CD-RW can be reused. Cost: Very cheap |
| 9 |  Magnetic E.g. Hard Disc Drives (HDD), magnetic tapes. | <ul style="list-style-type: none"> Use: Desktop computers to store large files, programs and operating systems Capacity: 750GB – 3TB (3000GB) (Large) Speed: High read/write speeds Portability: Heavy / poor portability (even external are clunky!) Durability: Dropping could cause damage, especially to 'read head' as is a moving part Reliability: Can be used again and again but does have a limited life (a good few years) Cost: Low cost (quite cheap) |
| 10 |  Solid state / Flash E.g. Solid State Drives (SSD) and USB sticks/pens. | <ul style="list-style-type: none"> Use: Desktop computers, laptops and tablets to store large files, programs and operating systems / Phones, Cameras (portable devices), no moving parts, function whilst moving. Capacity: 64GB - 480GB (Moderate) Speed: Super Fast (Read/Write) Portability: Very portable (small and lightweight) Durability: No moving parts so can survive knocks and scrapes Reliability: Can be re-used many times (up to 100,00 times) Cost: Very Expensive (per Gb) |
| 11 |  Cloud E.g. iCloud, GoogleDrive, DropBox etc. | <ul style="list-style-type: none"> Use: Used to store documents and media files online. This means that you can go to another computer and access your files (providing you have internet access). Capacity: Unlimited (providing you can pay for it). Speed: Depends on network / bandwidth speeds. Poor bandwidth can cause uploading and downloading of large files to take a long time. Portability: It is virtual so you don't have anything physical to move around. Durability & Reliability: Providing you keep up payments and the company looks after their storage devices - very durable and reliable. This is often because they back up storage devices in many places. There can be issues with the law as a company's data may be stored in a country which doesn't follow the same data protection laws. The hosting company could also be attached by hackers who could steal your data. Cost: Can be expensive depending on the service – but often it is free for a few GBs. |

KS4 Computer Science - 1.2.3 UNITS & DATA CAPACITY





KEYWORDS

| | | |
|----|-------------------------------|--|
| 1 | Binary | <ul style="list-style-type: none"> All data must be converted into binary in order to be processed by a computer. This includes images, sound, characters etc. Binary is a base 2 number system that only uses 1s and 0s. |
| 2 | Capacity | Describes how much disk space or data storage is used. |
| 3 | Bit | A 'bit' is a binary digit. A binary digit is the smallest unit of data a computer can store. Each 'bit' is represented using either a 1 (true) or 0 (false). |
| 4 | Nibble | A nibble It describes a group of 4 bits. A nibble is really useful when converting between binary and hexadecimal. A nibble will only cover decimal numbers between 0 and 15. |
| 5 | Byte | A 'byte' is a collection of 8 bits. It is the 'building block' for every other measurement. Keyboard characters generally take up 1 byte (8 bits) of storage. Every other storage measurement is made up from multiples of bytes. |
| 6 | Kilobyte (KB or Kb) | A kilobyte can be thought of as 1,000 bytes but because we are counting in binary, it is actually 1024 bytes. You may use either in an exam! Kilobytes are often used when talking about document file sizes. |
| 7 | Megabyte (MB or mbyte) | Like a byte, a megabyte can be thought of as either 1,000 or 1,024 kilobytes. We also use megabytes to measure transmission speeds on the web and also storage space on a CD. |
| 8 | Gigabyte (GB or gbyte) | <p>You must be careful NOT to use Gb - this used for gigabit.</p> <p>Like a byte, a gigabyte can be thought of as either 1,000 or 1,024 megabytes. We often use GB to refer to hard drive sizes. To give you an idea of storage sizes, 1 Gigabyte could hold: over 3,000 books, 25% of a typical movie.</p> |
| 9 | Terabyte (TB) | Like a byte, a terabyte can be thought of as either 1,000 or 1,024 gigabytes. More and more hard disks are now measured in Terabytes. A Terabyte can store: over 300 hours of video, 1,000 copies of the Encyclopaedia Britannica. |
| 10 | Petabyte (PB) | Like a byte, a petabyte can be thought of as either 1,000 or 1,024 terabytes. A Petabyte is a massive amount of storage. It could hold: Over 2,000 years worth of songs, back to back 315 million photos (3MB each). |

UNITS OF DATA STORAGE

| | | |
|----|--|--|
| 11 | <ul style="list-style-type: none"> 1 Bit (1 bit) 1 Nibble (4 bits) 1 Byte (8 bits) 1 Kilobyte or KB (1,000/1024 bytes) 1 Megabyte or MB (1,000/1024 KB) 1 Gigabyte or GB (1,000/1024 MB) 1 Terabyte or TB (1,000/1024 GB) 1 Petabyte or PB (1,000/1024 TB) | <p>Mnemonic to remember this:</p>  |
|----|--|--|

DATA CAPACITY

| 12 | Traditionally 1 KB = 1,024 bytes. In exams, we can use 1KB = 1,000 bytes, this makes the maths easier! You will be expected to calculate file sizes and storage space needs. | | | | | | | | | | | | | |
|-----------|---|--|-----------|-----------|------|----------------------|---------|-----------|------|-----------|---------|--------|------|---------|
| 13 | <p>Sizes of text files</p>  | <ul style="list-style-type: none"> 1 byte per character, + 10% for any overheads (e.g. file type). A text file with 1000 characters will have approximately? <ul style="list-style-type: none"> 1000 bytes * 1.1 = 1100bytes How many KB? 1100/1000 = 1.07 KB | | | | | | | | | | | | |
| 14 | <p>Size of Database files</p>  | <ul style="list-style-type: none"> Step 1: How many bytes in 1 record. <ul style="list-style-type: none"> FirstName = 10 bytes, Surname = 10 bytes, DateOfBirth = 8 bytes, NumberOfChildren = 4 bytes ... Total = 32 bytes Step 2: Multiply by the number of records <ul style="list-style-type: none"> 32 * 100 = 3200 bytes Step 3: Add 10% for overheads <ul style="list-style-type: none"> 3200 * 1.1 = 3520 bytes or 3.52 KB <table border="1"> <thead> <tr> <th>Data Type</th> <th>No. Bytes</th> </tr> </thead> <tbody> <tr> <td>Text</td> <td>1 byte per character</td> </tr> <tr> <td>Integer</td> <td>4/8 bytes</td> </tr> <tr> <td>Real</td> <td>4/8 bytes</td> </tr> <tr> <td>Boolean</td> <td>1 byte</td> </tr> <tr> <td>Date</td> <td>8 bytes</td> </tr> </tbody> </table> | Data Type | No. Bytes | Text | 1 byte per character | Integer | 4/8 bytes | Real | 4/8 bytes | Boolean | 1 byte | Date | 8 bytes |
| Data Type | No. Bytes | | | | | | | | | | | | | |
| Text | 1 byte per character | | | | | | | | | | | | | |
| Integer | 4/8 bytes | | | | | | | | | | | | | |
| Real | 4/8 bytes | | | | | | | | | | | | | |
| Boolean | 1 byte | | | | | | | | | | | | | |
| Date | 8 bytes | | | | | | | | | | | | | |
| 15 | <p>Size of image files</p>  | <p>(Number of pixels * number of bytes per pixel) + 10% for overheads</p> <p>E.g. an image is 1024 x 720 pixels. It has 256 different colours.</p> <ul style="list-style-type: none"> 256 colours = 8 bits per pixel (1 byte), because with 8 bits you can have 256 different combinations Number of pixels = 1024 * 720 = 737280 pixels 737280 * 1.1 = 811008 bytes or ... 811008/1024 = 792KB | | | | | | | | | | | | |
| | <p>Size of sound files</p>  | <p>bytesPerSample * samplesPerSecond * channels * duration</p> <p>E.g. a sound file has 2 bytes per sample, it takes 10 samples per second, over 2 channels and is 30 seconds long.</p> <ul style="list-style-type: none"> 2 * 10 * 2 * 30 = 1200 bytes or ... 1200/1024 = 1.17 KB. | | | | | | | | | | | | |

KS4 Computer Science - 1.2.4 DATA STORAGE CHARACTER

KEYWORDS

| | | |
|---|--|--|
| 1 | Metadata | Data, which is stored about a file. Examples include the type of file, date and time created, file size and geolocation |
| 2 | Character | A single letter, number or symbol. (e.g., A, 1, !) |
| 3 | Character set | The term Character set is used to describe the possible characters that can be represented in a computer system. |
| 4 | ASCII | A character set which uses 7 bits to store a maximum of 128 characters. This uses the binary numbers 0 to 127. |
| 5 | Extended ASCII | The same as ASCII, though uses 8 bits (1 byte) to represent 256 characters using the numbers 0 to 255. |
| 6 | Unicode | The modern standard for representing characters in a computer system. Uses 16 bits to allow 65,536 characters to be represented. |
| 7 | Formula to calculate text file size | (Number of pixels * number of bytes per pixel) + 10% for overheads |

CALCULATIONS

| | | |
|---|----------------|--|
| 8 | Text file size | <p>(Number of pixels * number of bytes per pixel) + 10% for overheads</p> <p>E.g. an image is 1024 x 720 pixels. It has 256 different colours. 256 colours = 8 bits per pixel (1 byte), because with 8 bits you can have 256 different combinations</p> <p>Number of pixels = 1024 * 720 = 737280 pixels</p> <p>737280 * 1.1 = 811008 bytes or ... 811008/1024 = 792KB</p> |
|---|----------------|--|

DATA STORAGE CHARACTERS

| 9 | File Types | <p>.PDF .DOCX</p> <p>(* means lossy compression used)</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----------------------|---|--------------------------------------|-----|--------------------------------------|---------|---------------------|--------|----------------------------------|-----|---|---------|-----|----------------|---|--------------------|-----|--------------|----|--------|-----|-----|--------|-----|-----|--------|---|---|------------------|-----|----|--------|-----|-----|--------|-----|-----|--------|---|---|---------------|-----|----|--------|-----|-----|--------|-----|-----|--------|---|---|-------------|-----|----|--------|-----|-----|--------|-----|-----|--------|---|---|-----------|-----|----|--------|-----|-----|--------|-----|-----|--------|---|---|-----------|-----|----|--------|-----|-----|--------|-----|-----|--------|---|---|----------------------|-----|----|--------|-----|-----|--------|-----|-----|--------|---|---|------|-----|----|--------|-----|-----|--------|-----|-----|--------|---|---|-----------|-----|----|--------|-----|-----|--------|-----|-----|--------|---|---|----|-----|----|--------|-----|-----|--------|-----|-----|--------|----|---|----|-----|----|--------|-----|-----|--------|-----|-----|--------|----|---|----|-----|----|--------|-----|-----|--------|-----|-----|--------|----|---|----|-----|----|--------|-----|-----|--------|-----|-----|--------|----|---|----|-----|----|--------|-----|-----|--------|-----|-----|--------|----|---|----|-----|----|--------|-----|-----|--------|-----|-----|--------|----|---|----|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|-----|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|-----|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|------------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|----|----|--------|-----|----|--------|-----|-----|--------|-----|-----|--------|
| 10 | ASCII | <p>So that all computer systems behave in a similar way it is important that there is an agreed set of codes for characters.</p> <p>In 1960, the American Standard Association agreed on a set of codes to represent the main characters in the English language.</p> <p>The ASCII system requires 127 different codes. In binary, 127 is 1111111, so the ASCII system uses 7 bits.</p> <table border="1"> <tr><td>Letters of the alphabet (lower case)</td><td>26</td></tr> <tr><td>Letters of the alphabet (upper case)</td><td>26</td></tr> <tr><td>All numeric symbols</td><td>10</td></tr> <tr><td>Punctuation, symbols and 'space'</td><td>33</td></tr> <tr><td>32 codes reserved for non-printable control codes</td><td>32</td></tr> <tr><td></td><td>95 (printable)</td></tr> <tr><td></td><td>32 (non printable)</td></tr> <tr><td></td><td>127 in total</td></tr> </table> <p>What is the problem with this?</p> <p>The issue is that some languages (such as Chinese and Japanese) use thousands of different characters – which cannot fit into a byte.</p> | Letters of the alphabet (lower case) | 26 | Letters of the alphabet (upper case) | 26 | All numeric symbols | 10 | Punctuation, symbols and 'space' | 33 | 32 codes reserved for non-printable control codes | 32 | | 95 (printable) | | 32 (non printable) | | 127 in total | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Letters of the alphabet (lower case) | 26 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Letters of the alphabet (upper case) | 26 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| All numeric symbols | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Punctuation, symbols and 'space' | 33 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 32 codes reserved for non-printable control codes | 32 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 95 (printable) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 32 (non printable) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 127 in total | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | Extended ASCII | <p>As 8 bit machines became standard, the ASCII character set made use of the extra bit (providing a further 128 characters).</p> <table border="1"> <thead> <tr> <th>Decimal</th> <th>Hex</th> <th>Char</th> <th>Decimal</th> <th>Hex</th> <th>Char</th> <th>Decimal</th> <th>Hex</th> <th>Char</th> <th>Decimal</th> <th>Hex</th> <th>Char</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>NUL</td><td>128</td><td>80</td><td>MEMBER</td><td>256</td><td>100</td><td>MEMBER</td><td>384</td><td>180</td><td>MEMBER</td></tr> <tr><td>1</td><td>1</td><td>START OF HEADING</td><td>129</td><td>81</td><td>MEMBER</td><td>257</td><td>101</td><td>MEMBER</td><td>385</td><td>181</td><td>MEMBER</td></tr> <tr><td>2</td><td>2</td><td>START OF TEXT</td><td>130</td><td>82</td><td>MEMBER</td><td>258</td><td>102</td><td>MEMBER</td><td>386</td><td>182</td><td>MEMBER</td></tr> <tr><td>3</td><td>3</td><td>END OF TEXT</td><td>131</td><td>83</td><td>MEMBER</td><td>259</td><td>103</td><td>MEMBER</td><td>387</td><td>183</td><td>MEMBER</td></tr> <tr><td>4</td><td>4</td><td>FORM FEED</td><td>132</td><td>84</td><td>MEMBER</td><td>260</td><td>104</td><td>MEMBER</td><td>388</td><td>184</td><td>MEMBER</td></tr> <tr><td>5</td><td>5</td><td>LINE FEED</td><td>133</td><td>85</td><td>MEMBER</td><td>261</td><td>105</td><td>MEMBER</td><td>389</td><td>185</td><td>MEMBER</td></tr> <tr><td>6</td><td>6</td><td>CHARACTER TABULATION</td><td>134</td><td>86</td><td>MEMBER</td><td>262</td><td>106</td><td>MEMBER</td><td>390</td><td>186</td><td>MEMBER</td></tr> <tr><td>7</td><td>7</td><td>BELL</td><td>135</td><td>87</td><td>MEMBER</td><td>263</td><td>107</td><td>MEMBER</td><td>391</td><td>187</td><td>MEMBER</td></tr> <tr><td>8</td><td>8</td><td>BACKSPACE</td><td>136</td><td>88</td><td>MEMBER</td><td>264</td><td>108</td><td>MEMBER</td><td>392</td><td>188</td><td>MEMBER</td></tr> <tr><td>9</td><td>9</td><td>HT</td><td>137</td><td>89</td><td>MEMBER</td><td>265</td><td>109</td><td>MEMBER</td><td>393</td><td>189</td><td>MEMBER</td></tr> <tr><td>10</td><td>A</td><td>LF</td><td>138</td><td>8A</td><td>MEMBER</td><td>266</td><td>10A</td><td>MEMBER</td><td>394</td><td>18A</td><td>MEMBER</td></tr> <tr><td>11</td><td>B</td><td>VT</td><td>139</td><td>8B</td><td>MEMBER</td><td>267</td><td>10B</td><td>MEMBER</td><td>395</td><td>18B</td><td>MEMBER</td></tr> <tr><td>12</td><td>C</td><td>FF</td><td>140</td><td>8C</td><td>MEMBER</td><td>268</td><td>10C</td><td>MEMBER</td><td>396</td><td>18C</td><td>MEMBER</td></tr> <tr><td>13</td><td>D</td><td>SH</td><td>141</td><td>8D</td><td>MEMBER</td><td>269</td><td>10D</td><td>MEMBER</td><td>397</td><td>18D</td><td>MEMBER</td></tr> <tr><td>14</td><td>E</td><td>SO</td><td>142</td><td>8E</td><td>MEMBER</td><td>270</td><td>10E</td><td>MEMBER</td><td>398</td><td>18E</td><td>MEMBER</td></tr> <tr><td>15</td><td>F</td><td>SI</td><td>143</td><td>8F</td><td>MEMBER</td><td>271</td><td>10F</td><td>MEMBER</td><td>399</td><td>18F</td><td>MEMBER</td></tr> <tr><td>16</td><td>10</td><td>DEL</td><td>144</td><td>90</td><td>MEMBER</td><td>272</td><td>110</td><td>MEMBER</td><td>400</td><td>190</td><td>MEMBER</td></tr> <tr><td>17</td><td>11</td><td>ESC</td><td>145</td><td>91</td><td>MEMBER</td><td>273</td><td>111</td><td>MEMBER</td><td>401</td><td>191</td><td>MEMBER</td></tr> <tr><td>18</td><td>12</td><td>CTRL SPACE</td><td>146</td><td>92</td><td>MEMBER</td><td>274</td><td>112</td><td>MEMBER</td><td>402</td><td>192</td><td>MEMBER</td></tr> <tr><td>19</td><td>13</td><td>CTRL A</td><td>147</td><td>93</td><td>MEMBER</td><td>275</td><td>113</td><td>MEMBER</td><td>403</td><td>193</td><td>MEMBER</td></tr> <tr><td>20</td><td>14</td><td>CTRL B</td><td>148</td><td>94</td><td>MEMBER</td><td>276</td><td>114</td><td>MEMBER</td><td>404</td><td>194</td><td>MEMBER</td></tr> <tr><td>21</td><td>15</td><td>CTRL C</td><td>149</td><td>95</td><td>MEMBER</td><td>277</td><td>115</td><td>MEMBER</td><td>405</td><td>195</td><td>MEMBER</td></tr> <tr><td>22</td><td>16</td><td>CTRL D</td><td>150</td><td>96</td><td>MEMBER</td><td>278</td><td>116</td><td>MEMBER</td><td>406</td><td>196</td><td>MEMBER</td></tr> <tr><td>23</td><td>17</td><td>CTRL E</td><td>151</td><td>97</td><td>MEMBER</td><td>279</td><td>117</td><td>MEMBER</td><td>407</td><td>197</td><td>MEMBER</td></tr> <tr><td>24</td><td>18</td><td>CTRL F</td><td>152</td><td>98</td><td>MEMBER</td><td>280</td><td>118</td><td>MEMBER</td><td>408</td><td>198</td><td>MEMBER</td></tr> <tr><td>25</td><td>19</td><td>CTRL G</td><td>153</td><td>99</td><td>MEMBER</td><td>281</td><td>119</td><td>MEMBER</td><td>409</td><td>199</td><td>MEMBER</td></tr> <tr><td>26</td><td>1A</td><td>CTRL H</td><td>154</td><td>9A</td><td>MEMBER</td><td>282</td><td>11A</td><td>MEMBER</td><td>410</td><td>19A</td><td>MEMBER</td></tr> <tr><td>27</td><td>1B</td><td>CTRL I</td><td>155</td><td>9B</td><td>MEMBER</td><td>283</td><td>11B</td><td>MEMBER</td><td>411</td><td>19B</td><td>MEMBER</td></tr> <tr><td>28</td><td>1C</td><td>CTRL J</td><td>156</td><td>9C</td><td>MEMBER</td><td>284</td><td>11C</td><td>MEMBER</td><td>412</td><td>19C</td><td>MEMBER</td></tr> <tr><td>29</td><td>1D</td><td>CTRL K</td><td>157</td><td>9D</td><td>MEMBER</td><td>285</td><td>11D</td><td>MEMBER</td><td>413</td><td>19D</td><td>MEMBER</td></tr> <tr><td>30</td><td>1E</td><td>CTRL L</td><td>158</td><td>9E</td><td>MEMBER</td><td>286</td><td>11E</td><td>MEMBER</td><td>414</td><td>19E</td><td>MEMBER</td></tr> <tr><td>31</td><td>1F</td><td>CTRL M</td><td>159</td><td>9F</td><td>MEMBER</td><td>287</td><td>11F</td><td>MEMBER</td><td>415</td><td>19F</td><td>MEMBER</td></tr> </tbody> </table> <p>So conveniently a byte is used to represents all characters for the English language.</p> | Decimal | Hex | Char | Decimal | Hex | Char | Decimal | Hex | Char | Decimal | Hex | Char | 0 | 0 | NUL | 128 | 80 | MEMBER | 256 | 100 | MEMBER | 384 | 180 | MEMBER | 1 | 1 | START OF HEADING | 129 | 81 | MEMBER | 257 | 101 | MEMBER | 385 | 181 | MEMBER | 2 | 2 | START OF TEXT | 130 | 82 | MEMBER | 258 | 102 | MEMBER | 386 | 182 | MEMBER | 3 | 3 | END OF TEXT | 131 | 83 | MEMBER | 259 | 103 | MEMBER | 387 | 183 | MEMBER | 4 | 4 | FORM FEED | 132 | 84 | MEMBER | 260 | 104 | MEMBER | 388 | 184 | MEMBER | 5 | 5 | LINE FEED | 133 | 85 | MEMBER | 261 | 105 | MEMBER | 389 | 185 | MEMBER | 6 | 6 | CHARACTER TABULATION | 134 | 86 | MEMBER | 262 | 106 | MEMBER | 390 | 186 | MEMBER | 7 | 7 | BELL | 135 | 87 | MEMBER | 263 | 107 | MEMBER | 391 | 187 | MEMBER | 8 | 8 | BACKSPACE | 136 | 88 | MEMBER | 264 | 108 | MEMBER | 392 | 188 | MEMBER | 9 | 9 | HT | 137 | 89 | MEMBER | 265 | 109 | MEMBER | 393 | 189 | MEMBER | 10 | A | LF | 138 | 8A | MEMBER | 266 | 10A | MEMBER | 394 | 18A | MEMBER | 11 | B | VT | 139 | 8B | MEMBER | 267 | 10B | MEMBER | 395 | 18B | MEMBER | 12 | C | FF | 140 | 8C | MEMBER | 268 | 10C | MEMBER | 396 | 18C | MEMBER | 13 | D | SH | 141 | 8D | MEMBER | 269 | 10D | MEMBER | 397 | 18D | MEMBER | 14 | E | SO | 142 | 8E | MEMBER | 270 | 10E | MEMBER | 398 | 18E | MEMBER | 15 | F | SI | 143 | 8F | MEMBER | 271 | 10F | MEMBER | 399 | 18F | MEMBER | 16 | 10 | DEL | 144 | 90 | MEMBER | 272 | 110 | MEMBER | 400 | 190 | MEMBER | 17 | 11 | ESC | 145 | 91 | MEMBER | 273 | 111 | MEMBER | 401 | 191 | MEMBER | 18 | 12 | CTRL SPACE | 146 | 92 | MEMBER | 274 | 112 | MEMBER | 402 | 192 | MEMBER | 19 | 13 | CTRL A | 147 | 93 | MEMBER | 275 | 113 | MEMBER | 403 | 193 | MEMBER | 20 | 14 | CTRL B | 148 | 94 | MEMBER | 276 | 114 | MEMBER | 404 | 194 | MEMBER | 21 | 15 | CTRL C | 149 | 95 | MEMBER | 277 | 115 | MEMBER | 405 | 195 | MEMBER | 22 | 16 | CTRL D | 150 | 96 | MEMBER | 278 | 116 | MEMBER | 406 | 196 | MEMBER | 23 | 17 | CTRL E | 151 | 97 | MEMBER | 279 | 117 | MEMBER | 407 | 197 | MEMBER | 24 | 18 | CTRL F | 152 | 98 | MEMBER | 280 | 118 | MEMBER | 408 | 198 | MEMBER | 25 | 19 | CTRL G | 153 | 99 | MEMBER | 281 | 119 | MEMBER | 409 | 199 | MEMBER | 26 | 1A | CTRL H | 154 | 9A | MEMBER | 282 | 11A | MEMBER | 410 | 19A | MEMBER | 27 | 1B | CTRL I | 155 | 9B | MEMBER | 283 | 11B | MEMBER | 411 | 19B | MEMBER | 28 | 1C | CTRL J | 156 | 9C | MEMBER | 284 | 11C | MEMBER | 412 | 19C | MEMBER | 29 | 1D | CTRL K | 157 | 9D | MEMBER | 285 | 11D | MEMBER | 413 | 19D | MEMBER | 30 | 1E | CTRL L | 158 | 9E | MEMBER | 286 | 11E | MEMBER | 414 | 19E | MEMBER | 31 | 1F | CTRL M | 159 | 9F | MEMBER | 287 | 11F | MEMBER | 415 | 19F | MEMBER |
| Decimal | Hex | Char | Decimal | Hex | Char | Decimal | Hex | Char | Decimal | Hex | Char | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | NUL | 128 | 80 | MEMBER | 256 | 100 | MEMBER | 384 | 180 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | START OF HEADING | 129 | 81 | MEMBER | 257 | 101 | MEMBER | 385 | 181 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 2 | START OF TEXT | 130 | 82 | MEMBER | 258 | 102 | MEMBER | 386 | 182 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 3 | END OF TEXT | 131 | 83 | MEMBER | 259 | 103 | MEMBER | 387 | 183 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 4 | FORM FEED | 132 | 84 | MEMBER | 260 | 104 | MEMBER | 388 | 184 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 5 | LINE FEED | 133 | 85 | MEMBER | 261 | 105 | MEMBER | 389 | 185 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 6 | CHARACTER TABULATION | 134 | 86 | MEMBER | 262 | 106 | MEMBER | 390 | 186 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 7 | BELL | 135 | 87 | MEMBER | 263 | 107 | MEMBER | 391 | 187 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 8 | BACKSPACE | 136 | 88 | MEMBER | 264 | 108 | MEMBER | 392 | 188 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 9 | HT | 137 | 89 | MEMBER | 265 | 109 | MEMBER | 393 | 189 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | A | LF | 138 | 8A | MEMBER | 266 | 10A | MEMBER | 394 | 18A | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | B | VT | 139 | 8B | MEMBER | 267 | 10B | MEMBER | 395 | 18B | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | C | FF | 140 | 8C | MEMBER | 268 | 10C | MEMBER | 396 | 18C | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | D | SH | 141 | 8D | MEMBER | 269 | 10D | MEMBER | 397 | 18D | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | E | SO | 142 | 8E | MEMBER | 270 | 10E | MEMBER | 398 | 18E | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | F | SI | 143 | 8F | MEMBER | 271 | 10F | MEMBER | 399 | 18F | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | 10 | DEL | 144 | 90 | MEMBER | 272 | 110 | MEMBER | 400 | 190 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | 11 | ESC | 145 | 91 | MEMBER | 273 | 111 | MEMBER | 401 | 191 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | 12 | CTRL SPACE | 146 | 92 | MEMBER | 274 | 112 | MEMBER | 402 | 192 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | 13 | CTRL A | 147 | 93 | MEMBER | 275 | 113 | MEMBER | 403 | 193 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | 14 | CTRL B | 148 | 94 | MEMBER | 276 | 114 | MEMBER | 404 | 194 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | 15 | CTRL C | 149 | 95 | MEMBER | 277 | 115 | MEMBER | 405 | 195 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | 16 | CTRL D | 150 | 96 | MEMBER | 278 | 116 | MEMBER | 406 | 196 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | 17 | CTRL E | 151 | 97 | MEMBER | 279 | 117 | MEMBER | 407 | 197 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | 18 | CTRL F | 152 | 98 | MEMBER | 280 | 118 | MEMBER | 408 | 198 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | 19 | CTRL G | 153 | 99 | MEMBER | 281 | 119 | MEMBER | 409 | 199 | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 | 1A | CTRL H | 154 | 9A | MEMBER | 282 | 11A | MEMBER | 410 | 19A | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 27 | 1B | CTRL I | 155 | 9B | MEMBER | 283 | 11B | MEMBER | 411 | 19B | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28 | 1C | CTRL J | 156 | 9C | MEMBER | 284 | 11C | MEMBER | 412 | 19C | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | 1D | CTRL K | 157 | 9D | MEMBER | 285 | 11D | MEMBER | 413 | 19D | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30 | 1E | CTRL L | 158 | 9E | MEMBER | 286 | 11E | MEMBER | 414 | 19E | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 1F | CTRL M | 159 | 9F | MEMBER | 287 | 11F | MEMBER | 415 | 19F | MEMBER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | UNICODE | <p>As computers developed and 16 bit computers were introduced, a new character set was developed to accommodate the various other languages of the world.</p> <p>This new character set is known as UNICODE.</p> <p>UNICODE uses 32 bits (2 sets of 16 bits) to represent every character in various languages around the world.</p> <p>Within the UNICODE system, the original 127 ASCII characters still have the same code values, others have just been added on.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

KS4 Computer Science - 1.2.4 DATA STORAGE IMAGE

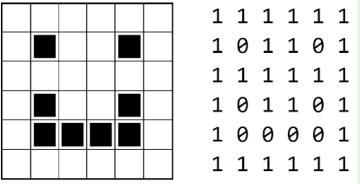
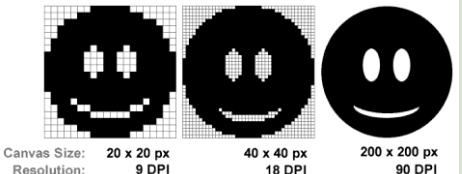
KEYWORDS

| | | |
|---|---|---|
| 1 | Metadata | Data, which is stored about a file. Examples include the type of file, date and time created, file size and geolocation. |
| 2 | Image | A picture that has been created or copied and stored in electronic form. |
| 3 | Bitmap / Raster | A map of bits, whereby the image is made of a set number of pixels. |
| 4 | Vector | An image represented using lines and shapes with specific properties such as line and fill colour. Data about each shape is stored in binary. |
| 5 | Pixels | The individual units (dots) that make up an image. Each has a unique binary number associated with it. |
| 6 | Colour Depth | The number of bits, which are used to represent each pixel in an image. Increased numbers of colours means more bits are needed. |
| 7 | Resolution | The level of detail in an image, measured in dots per inch (dpi). If the size of an image is increased then the quality will reduce. |
| 8 | Formula to calculate image file size | (Number of pixels * number of bytes per pixel) + 10% for overheads. OR (width * height * colour depth) / 8 |

CALCULATIONS

| | | |
|---|-----------------|---|
| 9 | Image file size | <p>Calculate the file size of an image of height 200, width 400, colour depth 16 bits.</p> <p>(width * height * colour depth) / 8</p> <p>200 × 400 = 80,000, 80,000 × 16 = 1,280,000 bits</p> <p>1,280,000 bits ÷ 8 = 160,000 bytes</p> <p>160,000 ÷ 1000 = 160 kilobytes</p> <p>Result: 160KB</p> |
|---|-----------------|---|

DATA STORAGE IMAGES

| | | | | | | | | | | | | | | |
|---|---|--|---------------------------------|---------------------------|---------------------------------|---------------------|---------------------------------|---------------------|-----|-----|-----------------------------------|-----------------------|---|-----------------------------|
| 10 | File Types | .BMP* .JPG* .GIF* .PNG (* means lossy compression used) | | | | | | | | | | | | |
| 11 | Images | <p>Images are stored as a series of pixels. The colour of each pixel is represented by a binary code. The number of colours available is related to the number of bits. For example: black and white images only use 1 bit. 1 for white and 0 for black.</p>  | | | | | | | | | | | | |
| 12 | Types of Images (2 Main types) | <p>BITMAP - The page is divided into an invisible grid and each pixel is assigned a colour.</p> <p>VECTOR - Drawn by following a set of mathematical instructions. i.e. Draw a circle radius: 6 pixels, centre: 10, 10, line thickness: 1 pixel.</p> | | | | | | | | | | | | |
| 13 | Resolution & Colour Depth | <p>The number of pixels we use is known as the resolution. Colour depth is how many bits will be used to store the colour for each pixel in the grid.</p> <table border="1"> <tr> <td>1 bit allows 2 different values</td> <td>2 different colours (b&w)</td> </tr> <tr> <td>2 bit allows 4 different values</td> <td>4 different colours</td> </tr> <tr> <td>3 bit allows 8 different values</td> <td>8 different colours</td> </tr> <tr> <td>...</td> <td>...</td> </tr> <tr> <td>8 bit allows 256 different values</td> <td>256 different colours</td> </tr> <tr> <td>24 bit allows 16,777,216 different values</td> <td>6,777,216 different colours</td> </tr> </table> <p>How can we improve the quality of the image in terms of 'colour depth'? - have more colours to choose from for each pixel. The greater range of colours makes the image look more 'real'.</p> | 1 bit allows 2 different values | 2 different colours (b&w) | 2 bit allows 4 different values | 4 different colours | 3 bit allows 8 different values | 8 different colours | ... | ... | 8 bit allows 256 different values | 256 different colours | 24 bit allows 16,777,216 different values | 6,777,216 different colours |
| 1 bit allows 2 different values | 2 different colours (b&w) | | | | | | | | | | | | | |
| 2 bit allows 4 different values | 4 different colours | | | | | | | | | | | | | |
| 3 bit allows 8 different values | 8 different colours | | | | | | | | | | | | | |
| ... | ... | | | | | | | | | | | | | |
| 8 bit allows 256 different values | 256 different colours | | | | | | | | | | | | | |
| 24 bit allows 16,777,216 different values | 6,777,216 different colours | | | | | | | | | | | | | |
| 14 | DPI (Dots per inch) / Resolution | <p>How can we improve the quality of the image in terms of 'how defined' the image is? - Pack more pixels into the same space.</p>  <p>Higher DPI means higher resolution which in turn means a more defined image! ...but also more data and therefore a bigger file size!</p> | | | | | | | | | | | | |

KS4 Computer Science - 1.2.4 DATA STORAGE - BINARY

KEYWORDS

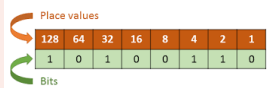
| | | |
|---|-------------------------|---|
| 1 | Data Types | All computer systems use and process data, data can come in the form of... Text (Characters), Sound, Moving image (video), Images(Pictures), Numbers. |
| 2 | Binary | All data must be converted/encoded into binary in order to be processed by a computer, binary is all a computer understands. Computers are made of transistors/switches that use electricity, they are open/on (1) or closed/off (0). <ul style="list-style-type: none"> The only number system a computer can understand. Base 2. Uses only 1s and 0s. 0s represent off and 1s represent on. |
| 3 | Denary / decimal | <ul style="list-style-type: none"> Our usual number system. E.g. 1, 17, 29, 138. Base 10. Uses 10 different numbers, 0 through 9. |

BINARY TO DENARY (DECIMAL)

4 You need to know how to convert binary to denary numbers up to 8 bits. The column values go up by x2 each time. See below.

| | | | | | | | | |
|---|-----------------------|----------------------|----------------------|----------------------|---------------------|---------------------|---------------------|---------------------|
| 5 | 128 (2 ⁷) | 64 (2 ⁶) | 32 (2 ⁵) | 16 (2 ⁴) | 8 (2 ³) | 4 (2 ²) | 2 (2 ¹) | 1 (2 ⁰) |
| 6 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 |

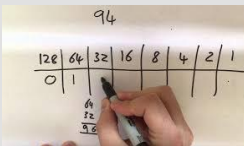
7 When calculating the value, you only add up the columns with a '1' in them. The example above would be:
128 + 32 + 16 + 4 + 2 = 182



DENARY (DECIMAL) TO BINARY

8 Use the same columns and start from the left. Example 201.

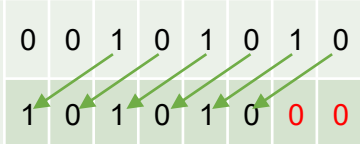
- First check to see if the number fits into 128. If it does add a '1' to that column.
- 201 - 128 = 73 left
- Then we check the next column 64 and we can see that 64 fits into 73 so we put a '1' in that column too.
- 73 - 64 = 9 left
- Because we only have 9 left, the next column our '1' will go into is the 8 column because all the other numbers wouldn't fit.
- 9 - 8 = 1 left
- Our final '1' will go into the first column.
- The rest of the columns will be zero.
- Our number is: 11001001

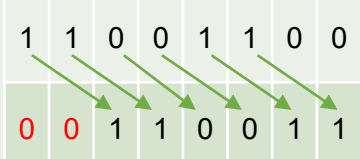


BINARY SHIFTS

9 **Binary shifts**
A binary shift is when we move all the digits in a binary number either left or right a certain number of places.

- Left shifts **multiply** a binary number (makes it bigger)
- Right shifts **divide** a binary number (makes it smaller)

10 **Left shift example (<<)**

 A left shift by 2 places has been performed here. The number 42 becomes 168 (42*4). Always add 0s for the missing digits (in red).

11 **Right shift example (>>)**

 A right shift by 2 places has been performed here. The number 204 becomes 51. Always add 0s for the missing digits (in red).

BINARY ADDITION

12 **The four rules**
 0 + 0 = 0
 0 + 1 = 1
 1 + 1 = 10 (because this is 2 in binary)
 1 + 1 + 1 = 11 (because this is 3 in binary)

13 **Examples**

| | |
|--|--|
| $\begin{array}{r} 10001101 \\ + 01001000 \\ \hline 11010101 \end{array}$ | $\begin{array}{r} 10100101 \\ + 01011010 \\ \hline 11111111 \end{array}$ |
|--|--|

14 **Exam tip**
To check your answer, convert the binary numbers to denary and add them up.

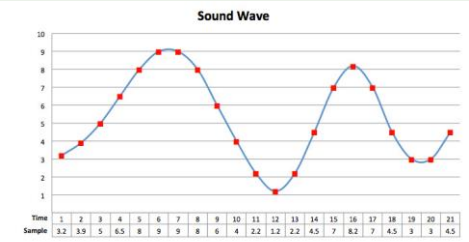
15 **Overflow errors**
Sometimes, an 8 bit binary number will become a 9bit binary number when you have added two numbers together (if the number is bigger than 11111111 (255). This is called an **overflow error**.
When you need more bits than a byte to store the number.

KS4 Computer Science - 1.2.4 DATA STORAGE SOUND

KEYWORDS

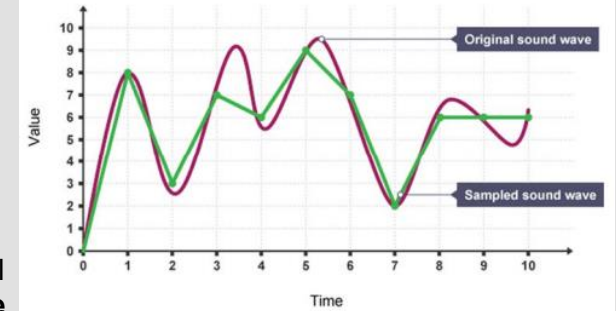
| | | |
|---|---|---|
| 1 | Metadata | Data, which is stored about a file. Examples include the type of file, date and time created, file size and geolocation |
| 2 | Sampling | Method of converting an analogue sound signal into a digital file containing binary numbers. |
| 3 | Sample rate | The frequency at which you record the amplitude of a sound. Measured in Hertz. |
| 4 | Sample resolution | The number of bits used to store each sample. |
| 5 | Sample size | The number of seconds over which the sample was taken. |
| 6 | Formula to calculate bit rate | Bit rate = Frequency × bit depth × channels |
| 7 | Formula to calculate sound file size | File size (bits) = sampling rate × resolution × length of sample (secs) |

DATA STORAGE SOUND

| 8 | File Types | .MP3* .WAV* .WMV* (* means lossy compression used) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|-------------------|--|------|-----|---|---|---|---|---|----|-----|-----|-----|-----|----|-----|----|-----|----|----|-----|----|----|----|----|----|--------|-----|-----|---|-----|---|---|---|---|---|---|-----|-----|-----|-----|---|-----|---|-----|---|---|-----|--|--|
| 9 | Sounds | <p>Sound is recorded as an analogue signal. This is converted to digital Data so computers can read it. This process is called sampling.</p>  <table border="1"> <thead> <tr> <th>Time</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>11</th> <th>12</th> <th>13</th> <th>14</th> <th>15</th> <th>16</th> <th>17</th> <th>18</th> <th>19</th> <th>20</th> <th>21</th> <th>22</th> <th>23</th> </tr> </thead> <tbody> <tr> <td>Sample</td> <td>3.2</td> <td>3.9</td> <td>5</td> <td>6.5</td> <td>8</td> <td>9</td> <td>9</td> <td>8</td> <td>6</td> <td>4</td> <td>2.2</td> <td>1.2</td> <td>2.2</td> <td>4.5</td> <td>7</td> <td>8.2</td> <td>7</td> <td>4.5</td> <td>3</td> <td>3</td> <td>4.5</td> <td></td> <td></td> </tr> </tbody> </table> <p><small>(c) leachwithict.weebly.com</small></p> | Time | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | Sample | 3.2 | 3.9 | 5 | 6.5 | 8 | 9 | 9 | 8 | 6 | 4 | 2.2 | 1.2 | 2.2 | 4.5 | 7 | 8.2 | 7 | 4.5 | 3 | 3 | 4.5 | | |
| Time | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sample | 3.2 | 3.9 | 5 | 6.5 | 8 | 9 | 9 | 8 | 6 | 4 | 2.2 | 1.2 | 2.2 | 4.5 | 7 | 8.2 | 7 | 4.5 | 3 | 3 | 4.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

ANOLOGUE VS DIGITAL SOUND

Computers work in **binary**. All data must be **converted** into binary in order for a computer to process it. Sound is no exception. To do this, sound is captured - usually by a **microphone** - and then converted into a **digital signal**.



10

An **analogue-to-digital converter** will capture a sound wave **at regular time intervals (the amplitude)**. This recording is known as a **sample**.

The sound recorded at each sample point is converted to its nearest numeric equivalent. **The more samples taken, the better the quality (closer the digitised version is to the original analogue one), however the bigger the file size.**

CALCULATIONS


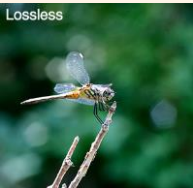
| | | |
|----|------------------------|---|
| 11 | Bit rate | <p>Bit rate = Frequency × bit depth × channels</p> <p>A typical, uncompressed high-quality audio file has a sample rate of 44,100 samples per second, a bit depth (the number of bits available for each sample) of 16 bits per sample and 2 channels of stereo audio. The bit rate for this file would be:</p> <p>44,100 samples per second × 16 bits per sample × 2 channels = 1,411,200 bits per second (or 1,411.2 kbps)</p> <p>A four-minute (240 second) song at this bit rate would create a file size of: 14,411,200 × 240 = 338,688,000 bits (or 40.37 megabytes)</p> |
| 12 | Sound file size | <p>A sound engineer is recording a 30 second mono sound clip of some birds singing outside the studio. Her recording equipment samples at 10 kHz and she is using 8-bit sampling.</p> <p>How big will the sound file be in bytes? & How big in kilobytes?</p> <p>File size (bits) = sampling rate × resolution × length of sample (secs)</p> <p>10000 × 8 × 30 = 2,400,000 bits, = 300,000 bytes, = 300 kB</p> |

KS4 Computer Science - 1.2.4 DATA STORAGE COMPRESSION & DATA VALIDATION

KEYWORDS

| | | |
|---|--------------------|---|
| 1 | Compression | The re-encoding of data so that less bits are used to store it. Usually done to increase speed of transmission. |
| 2 | Lossy | Removes data completely to reduce the size of a file (eg. JPG). |
| 3 | Lossless | Organises data to reduce the size of a file without removing any information (eg. ZIP). |

COMPRESSION

| | | |
|---|----------------------------------|--|
| 4 | Why compression? | <p>Helps reduce the consumption of expensive resources, such as hard disk space or transmission bandwidth over the internet.</p> <p>File sizes can be very large so we sometimes need to compress them to make them smaller. This may be because:</p> <ul style="list-style-type: none"> Storage capacity is limited Downloads may take too long Email file size restrictions |
| 5 | Problem with compression. | <ul style="list-style-type: none"> Compressed data must be decompressed/uncompressed to be used, and this extra processing may be detrimental to some applications. |
| 6 | Lossy compression | <ul style="list-style-type: none"> Permanently removes data from the file. Data is not restored when the file is uncompressed. Used when loss of quality does not have impact (may not be visible/audible) such as image, video and sound files. Makes file smaller than using lossless compression. Not good if 100% accuracy required when data uncompressed e.g. text files. For example: MP3, JPEG.  |
| 7 | Lossless compression | <ul style="list-style-type: none"> Uses an algorithm to rearrange data. Temporarily removes data from the file and restores it when the file is uncompressed. Used when data integrity essential such as text files (data would not make sense if lost). Can't make files as small as lossy compression. For example FLAC (audio), PNG.  |

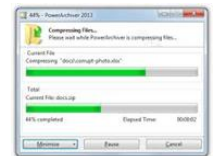
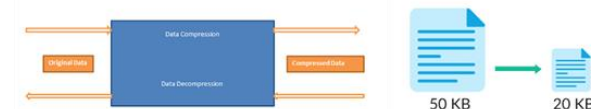
DATA VALIDATION AND VERIFICATION

| | | |
|----|------------------------|--|
| 10 | Data Validation | <p>Checking carried out by a computer system to make sure that only data that follow rules set by a user or programmer are accepted.</p> <p>Validation aims to make sure that data is sensible, reasonable, complete and within acceptable boundaries.</p> |
|----|------------------------|--|

| Validation type | How it works | Example usage |
|-----------------|--|--|
| Format check | Checks the data is in the right format. | A National Insurance number is in the form LL 99 99 9 L where L is any letter and 9 is any number. |
| Length check | Checks the data isn't too short or too long. | A password which needs to be six letters long. |
| Presence check | Checks that data has been entered into a field. | In most databases a key field cannot be left blank. |
| Range check | Checks that a value falls within the specified range. | Number of hours worked must be less than 50 and more than 0. |
| Spell check | Looks up words in a dictionary. | When word processing. |
| Type check | Checks that the data only contains certain data types eg integers. | Entering a price for a product. |
| Limit check | Similar to range but only includes one limit eg greater than 0. | Date must be greater than today's date. |
| Character check | Checks that the string does not contain invalid characters or symbols. | (Entering a bank account number M for Male, F for Female. |

| | | |
|----|--------------------------|--|
| 12 | Data Verification | <p>Verification means to check that the data on the original source document is identical to the data you have entered.</p> <p>Visual check – an operator may read through whole records comparing each item with the original source to check for and correct any errors</p> <p>Double entry – same person enters data twice, or two operators enter the same data.</p> |
|----|--------------------------|--|

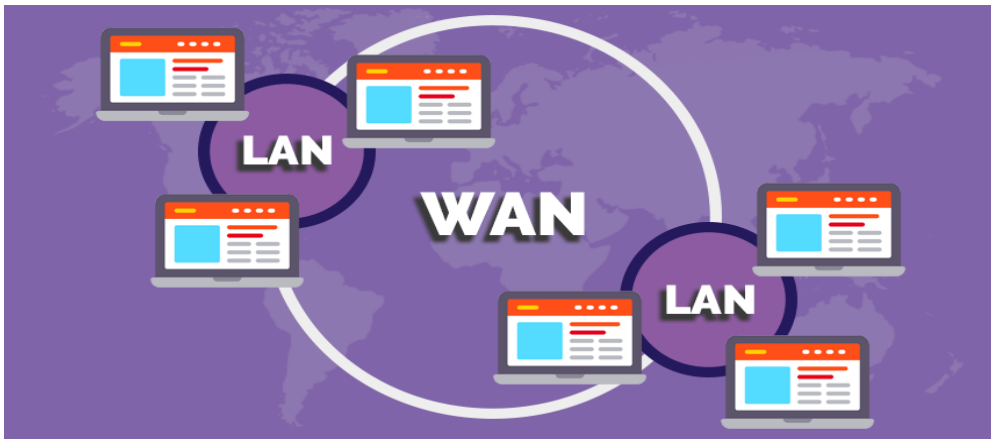
| | | |
|----|--------------------------------------|---|
| 13 | Why validate and verify data? | <ul style="list-style-type: none"> Saves time correcting errors later GIGO – garbage in, garbage out Ensures completeness Ensures consistency. Queries difficult if criteria inconsistent. Security. Certain strings can present security concerns. Prevent runtime errors e.g. when text is entered instead of a number Correctness - Email wrong customers - costly, embarrassing. |
|----|--------------------------------------|---|



KS4 Computer Science - 1.3 COMPUTER NETWORKS CONNECTIONS AND PROTOCOLS

NETWORKS

| | | |
|---|---------------------------------|---|
| 1 | Local Area Network (LAN) | A LAN covers a small area located on a single site. For example a school or a business. |
| 2 | Wide Area Network (WAN) | A WAN connects LANs that are in different geographical locations. For example the internet. |



HARDWARE

| | | |
|---|---|--|
| 3 | Wireless access points (WAP). | Uses a radio transceiver to allow wireless connections to a network. |
| 4 | Routers | Transmits data between networks. Used to connect the LAN to the internet. |
| 5 | Switches | Connect devices on a LAN. Switches receive data from one device and transmit this data to another device on the network. |
| 6 | Network Interface Controller (NIC) | An internal piece of hardware that allows devices to connect to the internet. |
| 7 | Transmission media | Carries data signals from one computer to another. Either wired or wireless. |

FACTORS THAT AFFECT NETWORK PERFORMANCE

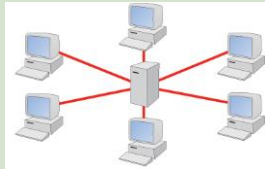
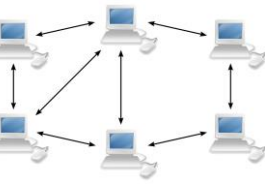
| | | |
|----|--------------------------|--|
| 8 | Bandwidth | The amount of data that can be transferred in a given time. The greater the bandwidth, the better. |
| 9 | Number of users | Available bandwidth is shared between users. Too many users may slow the network. |
| 10 | Wired vs wireless | Wired connections are faster and more reliable. Wireless can encounter interference e.g thick walls. |
| 11 | Other | Choice of hardware and choice of network topology (see below) can also affect network performance. |

TOPOLOGIES

| | | |
|----|--|--|
| 12 | <p>Star network – all devices are connected to a central hub/switch.</p> <p>Advantages: reliable- if one cable or device fails, the rest will still work. High performing as no data collisions can occur.</p> <p>Disadvantages: Expensive as uses a lot of cable and extra hardware is required. If hub or switch fails, all devices will lose connection.</p> | |
| 13 | <p>Mesh network – each device is directly connected to all other devices.</p> <p>Advantages: Data can be sent quickly as multiple routes to use. Can send and receive at the same time. New devices added easily.</p> <p>Disadvantages: Difficult to set up due to high number of connections. Need a lot of maintenance.</p> | |

KS4 Computer Science - 1.3 COMPUTER NETWORKS CONNECTIONS AND PROTOCOLS

CLIENT SERVER AND PEER TO PEER NETWORKS

- | | | |
|---|---|--|
| 1 | <p>Client server. A network managed by a server. Computers are the clients. Pros - Files and software stored centrally so easier to keep track of and install updates. Easier to back up and manage security. Cons – expensive to set up. If server goes down, so do all devices. Can become overloaded if too many devices connect to it.</p> |  |
| 2 | <p>Peer to peer. All computers are equal – no computer has control over the network. Pros – easy to maintain and cheap to set up. No dependence on server. Cons - Files stored on individual devices so could be lost/duplicated. Updates and security installed individually. Backups take longer. Less reliable and slow.</p> |  |

THE INTERNET

- | | | |
|---|--|---|
| 3 | DNS | Domain Name Server. Used to match website addresses (bbc.co.uk) to IP addresses. |
| 4 | Hosting | When a business uses its servers to store files of another organisation (e.g Dropbox). |
| 5 | The Cloud | Technology that allows you to store files on remote servers. |
| 6 | IP addressing <i>(layer 2)</i> | IP addresses aren't linked to hardware. They are assigned before a device connects to the internet. Different IP address each time you connect. |
| 7 | MAC addressing | Each device has it's own unique binary identifier so they can be identified on the network. |
| 8 | Wired connection | More expensive to set up but faster speeds. E.g Ethernet. |
| 9 | Wireless connection | Cheaper but more likely to be unreliable. For example if obscured by thick walls etc. E.g WiFi, Bluetooth |

COMMON PROTOCOLS

- | | | |
|----|-----------------------------------|---|
| 10 | TCP/IP <i>(layer 3)</i> | Transmission Control Protocol/Internet Protocol. Sets the rules for how devices connect on the network. |
| 11 | HTTP <i>(layer 4)</i> | Hyper Text Transfer Protocol. Used by web browsers to access websites and communicate with web servers. |
| 12 | HTTPS <i>(layer 4)</i> | Hyper Text Transfer Protocol Secure. A secure version of HTTP. Encrypts information. |
| 13 | FTP <i>(layer 4)</i> | File Transfer Protocol. Used to access, edit and move files between devices on a network. |
| 14 | POP | Post Office Protocol. Used to retrieve emails from a server. The server holds the email until you download it. |
| 15 | IMAP | Internet Message Access Protocol. Used to retrieve emails from a server. Holds the email until you delete it. |
| 16 | SMTP <i>(layer 4)</i> | Simple Mail Transfer Protocol. Used to send emails. |

LAYERS – a group of protocols with similar functions

- | | | |
|----|-------------------------------------|--|
| 17 | Layer 1 Link Layer | Link layer. Passes data over a physical network. Responsible for how bits are sent. E.g Ethernet. |
| 18 | Layer 2 Internet Layer | Makes connections between networks, directing data packets and handling traffic. E.g IP. |
| 19 | Layer 3 Transport Layer | Controls data flow by splitting data into packets and checking they are sent / delivered. E.g TCP. |
| 20 | Layer 4 Application Layer | Turns data into websites and other applications and vice versa. E.g HTTP, FTP, SMTP. |

KS4 Computer Science - 1.4 NETWORK SECURITY









NETWORK SECURITY THREATS

| | | |
|---|-----------------------------|--|
| 1 | Malware | Malicious software installed without knowledge or consent. |
| 2 | Phishing | A fraudulent email sent from what looks like a real company that aims to get personal information. |
| 3 | Social engineering | Weak passwords, giving personal information over the phone or email (falling for phishing scams). |
| 4 | Brute force | Automated software used to generate multiple password guesses in order to gain access. |
| 5 | Denial of service | Hackers flood the network with useless traffic, making it slow or inaccessible. |
| 6 | Data inception/theft | Hackers monitor data travelling on a network to intercept personal information. |
| 7 | SQL injection | Using SQL code in the login box to access users' personal information. |

WHAT MALWARE DOES TO YOUR COMPUTER






| | | |
|----|-------------------|---|
| 9 | Scareware | Tells the user their computer is infected so that they follow links and pay to 'fix it' |
| 10 | Ransomware | Encrypts (locks) files on computer. User must pay money to unlock the files. |
| 11 | Spyware | Secretly monitors users actions (e.g key presses). |
| 12 | Rootkits | Alter permissions – allowing hackers admin access to devices. |
| 13 | Backdoors | Creates holes in security ready for future attacks. |

HOW TO PREVENT NETWORK SECURITY THREATS


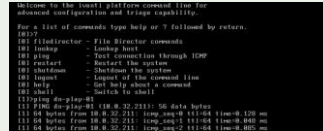

| | | | |
|----|------------------------------|---|--|
| 14 | Good network policy |  | Regularly test to find weaknesses in security, passwords, user access levels, use anti malware and firewalls and encrypt sensitive data. |
| 15 | Penetration testing |  | Companies employ specialists to try and hack the network to highlight weaknesses. |
| 15 | Network forensics |  | Used to find the cause of an attack on a network. |
| 17 | Strong passwords |  | To prevent unauthorised access. Passwords should be long, use a mix of numbers, letters and characters and should be changed regularly. |
| 18 | User access levels |  | Control which parts of the network different users can access. |
| 19 | Anti malware/firewall |  | Designed to stop malware from damaging an organisations network. Firewalls block unauthorised access. |
| 20 | Encryption |  | Essential for sending data over a network. Only people with the correct key can access the data. |
| 21 | Physical security |  | Security guards/cameras to stop unauthorised access to buildings where secure data is kept. |

KS4 Computer Science - 1.5 SYSTEMS SOFTWARE





OPERATING SYSTEMS (OS)

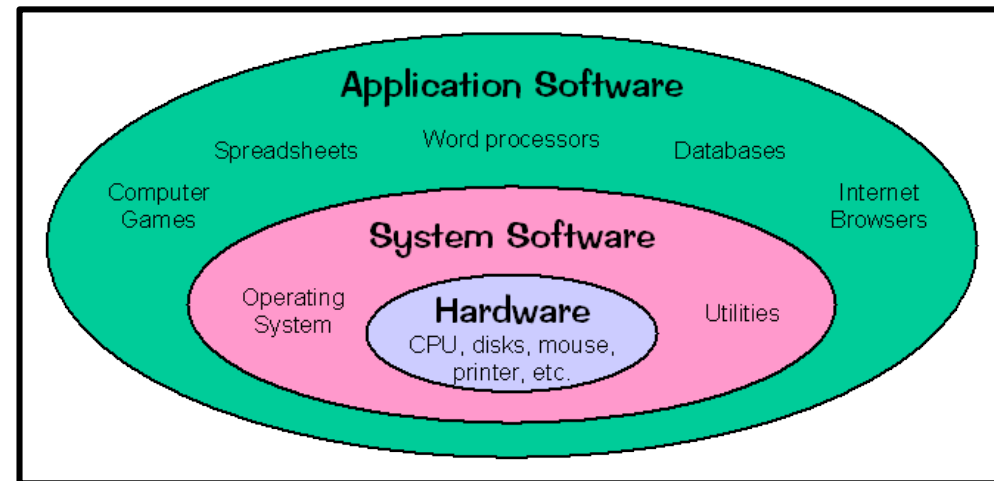
| | | |
|---|---|--|
| 1 | An operating system is the part of the system software that manages computer hardware and software resources. It is made up of the following five things: | |
| 2 | User interface  | The visual part of an application that determines how a user interacts with it. |
| 3 | Memory management & multi-tasking  | Allows the user to have multiple programs running at the same time. Also manages data in the RAM and Virtual Memory. |
| 4 | Peripheral management & drivers  | Manages all hardware connected to a computer using a device driver – a translator between the OS and hardware. |
| 5 | User management  | Allows for different user accounts to be created. Each user can have their own settings. |
| 6 | File management  | Allows the user to create, move, delete and copy files. |

EXAMPLES OF USER INTERFACES

| | | |
|---|-------------------------------|--|
| 7 | Graphic User Interface | Made up of Windows, Icons, Menus and Pointers (WIMP). The type of interface we are used to.  |
| 8 | Command line interface | A text-based interface user to view and manage computer files.  |
| 9 | Voice input | A speech recognition application. Becoming more and more popular.  |

UTILITY SOFTWARE

| | | |
|----|--|---|
| 10 | The utility software is another part of the systems software that helps to maintain or configure a computer. | |
| 11 | Encryption software  | Software scrambles data to stop third parties from accessing it. Must be decrypted using a key. |
| 12 | Defrag-Mentation  | Files aren't always stored neatly together on a hard disk. They are spread out. Defragging reorganises files so they are together. This makes them faster to access. |
| 13 | Data compression  | Compression software reduces the size of files so they take up less space or to make them easier to send/download. You need to know about lossy and lossless compression (see KO for 1.2). |
| 14 | Backups  | A backup is a copy of a computer's file and settings stored externally for security. A backup can be full – backs up everything on the computer or incremental – only backs up data that has changed/added since the last backup. |








KS4 Computer Science - 1.6 IMPACTS OF DIGITAL TECHNOLOGY

KEYWORDS

| | | |
|---|--------------------|---|
| 1 | Stakeholder | Individuals or groups who take an interest in a product. They may be shop owners, employees, customers, suppliers or the local community. |
| 2 | Software | A collection of data or computer instructions that tell the computer how to work. E.g Microsoft Word, Photoshop, an Operating system etc. |

IMPACTS OF DIGITAL TECHNOLOGY WITH EXAMPLES

| | | |
|---|--|--|
| 3 | Ethical issues  | What is considered right or wrong by society. Examples: Technology can impact our well-being (cyber-bullying). Face-to-face interactions neglected. Can also cause health problems like eye strain. |
| 4 | Legal Issues  | What is actually right or wrong in the eyes of the law. Examples: phishing/hacking etc is illegal. Companies cannot share personal data with anyone. See legislation section. |
| 5 | Cultural issues  | How groups of people with certain beliefs/practices or language could be affected by technology. Examples: Digital divide – people who have access to tech have an advantage – e.g they can apply for jobs online. Robots stealing jobs. |
| 6 | Environmental issues  | How using technology impacts the natural world. Examples: Electronic devices made from precious metals. Technology uses a lot of energy. E-Waste causes a massive problem in their world countries where poisonous gases leak and cause harm. |
| 7 | Privacy issues  | How our privacy is affected by using technology. Examples: Social media requires personal information to sign up. Also encouraged to post even more information like pictures. Cookies track our moves online. Company data could be hacked. |

LEGISLATION

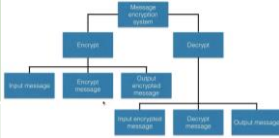
| | | |
|----|--|---|
| 8 | The Data Protection Act 2018 | Gives rights to people whose personal data is stored on a computer system. The act has eight principles. |
| 9 | Computer Misuse Act 1990 | Introduced to stop hacking and cyber crime. The three offences include: gaining unauthorised access to a private network or device, gaining unauthorised access in order to commit a crime or modifying computer material without permission. |
| 10 | Copyright Design and Patents Act 1988 | Introduced to protect intellectual property - anything someone has created e.g a book, a song, a piece of software etc. |
| 11 | Software licences | Legally binding guidelines for the use and distribution of software. Software can be open source or proprietary. See information below. |

OPEN SOURCE VS PROPRIETARY SOFTWARE

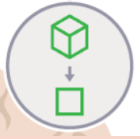

| | | |
|----|--|---|
| 12 | Open source software  | Allows user access to the software's source code so they can edit/change it. Pros – users can edit and make it right for what they need. Usually free. Strong support forums. Cons – relies on other user support. Need to have good knowledge of coding. De-bugging can be hard. May not have regular updates. |
| 13 | Proprietary software  | Licensed software that cannot be changed. Pros – free customer support. Good security and bugs fixed quickly. Built by professionals. Cons – Expensive. Reliant on one company. May not fully meet needs of customer. |

KS4 Computer Science - 2.1 ALGORITHMS




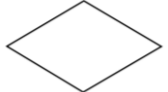


KEYWORDS

| 1 | Algorithm | A set of step-by-step instructions needed to solve a problem. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|--|--|---------|---------|------|--------|--------|---|---|---|----|----|---|---|---|---|---|---|---|---|----|----|---|---|---|---|--|---|---|---|-----|--|
| 2 | Trace tables | A table used to test different conditions in a program to make sure the result is correct. <table border="1"> <thead> <tr> <th>Number1</th> <th>Number2</th> <th>Sign</th> <th>Answer</th> <th>OUTPUT</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>7</td> <td>+</td> <td>12</td> <td>12</td> </tr> <tr> <td>6</td> <td>2</td> <td>-</td> <td>4</td> <td>4</td> </tr> <tr> <td>4</td> <td>3</td> <td>*</td> <td>12</td> <td>12</td> </tr> <tr> <td>7</td> <td>8</td> <td>?</td> <td>0</td> <td></td> </tr> <tr> <td>0</td> <td>0</td> <td>/</td> <td>(0)</td> <td></td> </tr> </tbody> </table> | Number1 | Number2 | Sign | Answer | OUTPUT | 5 | 7 | + | 12 | 12 | 6 | 2 | - | 4 | 4 | 4 | 3 | * | 12 | 12 | 7 | 8 | ? | 0 | | 0 | 0 | / | (0) | |
| Number1 | Number2 | Sign | Answer | OUTPUT | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 7 | + | 12 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 2 | - | 4 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 3 | * | 12 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 8 | ? | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | / | (0) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Structure diagrams | A graphical way to represent a problem.  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Pseudocode | A simplified programming language used in program design. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | High-level programming language | A programming language that allows humans to write programs as it is closer to human language than machine languages e.g python, HTML, C+. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Flowcharts | A diagram that represents the flow of a program. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Computational or algorithmic thinking | Taking a complex problem, understanding it and developing solutions. Broken down in abstraction and decomposition (see below). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

COMPUTATIONAL THINKING

| | | |
|---|---|---|
| 8 | Abstraction  | Filtering out unnecessary parts of the problem so that you can make the solution. <i>For example if you were building a quiz program, you don't need to know the age of the users taking part.</i> |
| 9 | Decomposition  | Breaking down one big problem into a number of smaller problems. <i>For example if you were building a quiz program, you could start by generating the questions and checking the answers, then creating users and calculating scores.</i> |

FLOWCHART SYMBOLS

| | | |
|----|--|---|
| 10 | Line/ arrow Shows the direction of the flow of the program. |  |
| 11 | Input/ Output An input is received from user or an output is given. E.g print score. |  |
| 12 | Process An instruction or command. |  |
| 13 | Decision A decision of either yes or no will decide which route you will follow. |  |
| 14 | Sub program Links one program to another. Like a function. |  |
| 15 | Terminal(Start / Stop) Marks the start and end of a flowchart. |  |

COMMON ERRORS

| | | |
|----|---|---|
| 16 | Syntax errors Program will not run and errors messages will be returned. | <ul style="list-style-type: none"> • Missing an opening or closing bracket • Missing a quotation mark • Spelling a keyword incorrectly (print) • Using capitals instead of lowercase • Using = instead of == when comparing values • Missing a colon at the end of a line • Inconsistent indentation |
| 17 | Logic errors Program will run but it will not return the expected result. | <ul style="list-style-type: none"> • Using the wrong comparison operators (> instead of < or <=) • Doing the wrong sum * 100 instead of 10. • Printing information in the wrong order. |

KS4 Computer Science - 2.1 Pseudocode

DATA Types

| | | | |
|---|------------------|--|-----------|
| 1 | Character (Char) | 1 single character | "M" |
| 2 | Real (Float) | Decimal numbers | 20.5 |
| 3 | Integer (Int) | Whole numbers | 13 |
| 4 | Boolean (Bool) | True/False | True |
| 5 | String (Str) | Any character including letters, numbers, space and symbols. | "JK21 &!" |

MATHEMATICAL OPERATORS

| | | | |
|----|---------|---|-----------------|
| 6 | + | Addition | 5+5 Output 10 |
| 7 | - | Subtraction | 6-5 Output 1 |
| 8 | / | Division | 6/3 Output 2 |
| 9 | * | Multiplication | 6*2 Output 12 |
| 10 | MOD | Returns remainder after division | 16 % 3 Output 1 |
| 11 | DIV | Returns floor division integer value quotient (integer number before the decimal places). | 13//2 Output 6 |
| 12 | ** or ^ | Exponentiation (Power of) | 2 ** 3 Output 8 |

CALCULATIONS

| | | |
|----|---|--|
| 13 | Simple calculations | Calculate with DIV and MOD |
| | <pre>num1 = input("Input first number: ") total = num1 * 10 print("Total: " + str(total))</pre> | <pre>time = input("Please input minutes: ") hours = time DIV 60 minutes = time MOD 60 print(str(hours) + "hours and " + str(minutes) + " minutes")</pre> |

Comparison Operators

| | | | |
|----|----|--------------------------|-----------------------|
| 14 | == | Equal to | IF x == "Hello": |
| 15 | != | Not equal to | While name != "Jane": |
| 16 | > | Greater than | IF age > 18: |
| 17 | < | Less than | While age < 21: |
| 18 | >= | Greater than or equal to | IF age >= 21: |
| 19 | <= | Less than or equal to | IF age <= 18: |

LOGICAL OPERATORS

| | | | |
|----|------------|---|-----------------------------|
| 20 | AND | All criteria must be met | IF x == "Hello" AND y == 2: |
| 21 | OR | At least 1 part of the criteria must be met | IF x == "Hello" OR y == 2: |
| 22 | NOT | The criteria must not be met | IF x NOT "Hello": |

OTHER

| | | |
|----|--|---|
| 23 | Random number | random(1, 50) |
| 24 | Random selection from an array colours = ["Red", "Blue", "Yellow"] | chosenColour = random (colours) |
| 25 | Incrementing (increasing) | score = score + 1 |
| 26 | Decrementing | score = score - 1 |
| 27 | Storing data , assigning to a variable from an input | Friend = input ("Please enter your friends name: ") |
| 28 | Outputting a message | Print ("meessage must be in speech marks") |
| 29 | Outputting data assigned to a variable | print (name) |

KS4 Computer Science - 2.1 Pseudocode

SELECTION (IF, ELIF, ELSE)

30 **Definition:**
A programming construct, where code is selected to be executed based upon a condition being met, such as an IF statement.

```
print("Component Facts")
peripheral = input("Please enter a peripheral")
if peripheral == "Keyboard" OR peripheral == "Mouse":
    print ("This is an input device!")
elif peripheral == "Monitor" OR peripheral == "Speakers":
    print ("This is an output device!")
else:
    print ("I'm not sure what type of device this is")
```

32

```
print("Grade calculator")
score=input("Enter score out of 100: ")
if score >= 80:
    print ("Distinction Grade!")
    print("Top grade – well done!")
elif score >= 65:
    print ("Merit Grade!")
elif score >= 50:
    print ("Pass Grade!")
else:
    print ("Fail")
```

33

```
print("Component Facts")
component = input("Please enter a component")
if component == "CPU":
    print ("Processes data and instructions.")
elif component == "RAM":
    print ("Stores programs and data being used.")
elif component == "Hard drive":
    print ("Stores all of the files and programs.")
else:
    print ("Definition not available.")
```

ITERATION

34 Definition
A programming construct, where code is be executed a set number of times (count controlled) such as a FOR loop or until a condition is met (condition controlled) such as a WHILE loop.

Count controlled iteration - Iterate 10 times (0-9), FOR loop

```
for i = 0 to 9
    print("Code goes here!")
    print("Code goes here!")
    print("Code goes here!")
next i
```

Condition controlled iteration - WHILE loop

```
reply = input ("Please input Yes or No: ")
36 while reply != "Yes" AND reply != "No":
    print ("Invalid response! Please try again")
    reply = input ("Please input Yes or No: ")
print ("Thank you!")
```

Condition controlled iteration - DO loop

```
37 Do
    reply = input("Yes or no?")
until reply == "yes" OR reply == "no"
```

OTHER DEFINITIONS

38 **Sequence** A programming construct where statements are executed one after another in order.

39 **Variable** A named location in memory that stores a value. The value CAN CHANGE as the program is running.

40 **Constant** A named location in memory that stores a value. The value NEVER CHANGES as the program is running.

KS4 Computer Science - 2.1 SEARCHING & SORTING ALGORITHMS

SEARCH ALGORITHMS

1 Computers need to use search algorithms to **find** items in a list.

BINARY SEARCH

2 A binary search is used to look for items in an **ordered** list.

3 **How it works**

1. Find the middle item in the ordered list.
2. If this is your item – stop the search!
3. If not, compare the item you are looking for to the middle item, if it comes before, get rid of the second half of the list and if it comes after get rid of the first half of the list.
4. Repeat steps 1-3 until the item is found.

4 **Example**



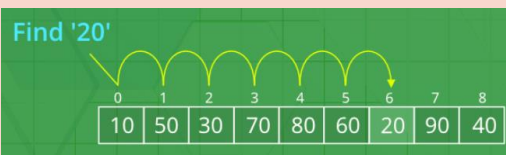
LINEAR SEARCH

5 A linear search is used to look for items in an **unordered** list.

6 **How it works**

1. Look at the first item in the list. If this is your item stop!
2. If not, look at the next item in the list, if this is your item – stop the search!
3. Repeat steps 1 and 2 until you find the item or reach the end of the list.

7 **Example**



SORTING ALGORITHMS

8 Computers use sorting algorithms to **order** items in a list.

BUBBLE SORT

9 Used to sort unordered lists. Simple algorithm but takes a long time to sort a list. Works by comparing a pair of items each step.

10

How it works

1. Look at the first two items in the list.
2. If they are in the right order, don't do anything. If they are not, swap them around.
3. Move onto the next pair and repeat step 2.
4. Repeat step 3 until you get to the end of the list. This is called the first pass.
5. Repeat steps 1-4 until there is no swaps in a pass.

MERGE SORT

11 An example of a divide and conquer algorithm. Quicker sort for larger lists than the bubble sort.

12

How it works

1. Split the list in half.
2. Repeat step 1 until you have only 1 item in each list.
3. Merge pairs of lists back together and sort them into the right order as you go.

INSERTATION SORT

13




The simplest sorting algorithm. Very quick with short lists. Quick at checking to make sure a list is ordered.

14

How it works

1. Look at the second item in the list.
2. Compare it to all items before it and insert it into the right place in the list.
3. Repeat step 2 for the 3rd, 4th 5th etc items in the list.

KS4 Computer Science - 2.2 PROGRAMMING FUNDAMENTALS

| KEYWORDS | | |
|----------|--|---|
| 1 | Python | A high level programming used to write programs. Similar to the English language so easier to read, write and understand by humans. Difficult to understand by computers, so needs compiling or interpreting into low level language or machine code once written. |
| 2 | Programming | A 'bit' is a binary digit. A binary digit is the smallest unit of data a computer can store. Each 'bit' is represented using either a 1 (true) or 0 (false). |
| 3 | Code | The instructions that a program uses. |
| 4 | Sequence  | A programming construct where code is executed in the order it is written. |
| 5 | Selection  | A programming construct where more than one block of code is available and code is selected to be executed based upon a condition being met, such as an IF statement. |
| 6 | Iteration  | A programming construct where code is repeated either until a conditions is met (condition controlled i.e. while loop) or a set number of times (count controlled i.e. FOR loop). |
| 7 | Variable | A name for a location in memory, that stores a value and can be changed when the program is running. It can be local or global. |
| 8 | Local Variable | A variable which can only be used within the code they are declared in. |
| 9 | Global Variable | A variable which can only be used in any part of the code after they are declared. |
| 10 | Constant | A name for a location in memory, that stores a value and never changes when the program is running. |
| 11 | Function | A collection of code that works outside the main program. These are created to speed up programming and reduce chance of errors. They can be called from a single line of code at any time. |
| 12 | Comparative Operator | A symbol used to compare multiple values. |
| 13 | Arithmetic Operator | A symbol used to manipulate numerical values. |

| Syntax | Syntax Error | Logic Error | |
|--------|---|--|--|
| 14 | The grammar associated with a programming language. The way the code is written so that a computer can understand it. | An error that will stop a program as the computer doesn't understand the code. | An error that will not stop the program as it has used the correct syntax, but will give an unexpected output. |

| PYTHON TO ENGLISH | |
|--|--|
| <code>print("hello!")</code> | Prints a value on screen (in this case, hello!) |
| <code>input("")</code> | Inputs a value into the computer. |
| <code>x = input("")</code> | Inputs a value and stores it into the variable x. |
| <code>x = int(input(""))</code> | Inputs a value into x, whilst also making it into an integer. |
| <code>answer = x + y</code> | Saves the result of x and y added together in a variable named answer. |
| <code>print(str(x))</code> | Prints the variable x, but converts it into a string first. |
| <code>print("Hello", "World")</code> | Prints the two strings concatenated with a space between. This code would output "Hello World". |
| <code>age = 12</code> <code>print("Age: " + str(age))</code> | The + joins together two variables when printing. Str has to be used to cast age to be a string. This code will output "Age: 12". |
| <code>if name == "Fred":</code> | Decides whether the variable 'name' has a value which is equal to 'Fred'. |
| <code>else:</code> | The other option if the conditions for an if statement are not met (eg. name = 'Bob' when it should be Fred) |
| <code>elif name == "Tim":</code> | elif (short for else if) is for when the first if condition is not met, but you want to specify another option. |
| <code># COMMENT</code> | # is used to make comments in code – any line which starts with a # will be ignored when the program runs. They are used to describe the code to a programmer. |
| <code>for i in range(0,10):</code> <code> # WRITE CODE HERE</code> | Repeats any code indented after this line a set number of times, in this case, 10. |
| <code>while x < 10:</code> <code> # WRITE CODE HERE</code> | Repeats any code indented after this line until a condition is met, in this case x becoming equal to or greater than 10. |
| <code>list = ["", ""]</code> | Creates a variable and makes it an array – a list which can store many values. |

KS4 Computer Science - 2.2 PROGRAMMING FUNDAMENTALS

DATA TYPES

| | | |
|---|------------|--|
| 1 | String | Any character on the keyboard, including spaces, symbols and numbers – Alphanumeric e.g. "Hello !" |
| 2 | Integer | Whole number e.g. 32 |
| 3 | Float/Real | Decimal number e.g. 1.2 |
| 4 | Boolean | Two values e.g. true or false |
| 5 | Character | A single character e.g. b |

Casting

- 6 Sometimes a programmer needs to change the data type of the contents of a variable. For example, an integer may need to be converted to a string in order to be displayed as part of a message.
- This process is known as casting.
- The following examples in Python convert a string to an integer:

```
number = input("Please enter a number")
int_number = int(number)
result = int_number * 2
print(result)
```

```
num1 = int(input("First number: "))
num2 = int(input("Second number: "))
total = num1 + num2
print("Result " + str(total))
```

Comparative Operators

| | | |
|----|----|-------------------------------|
| 7 | == | Equal to |
| 8 | != | No equal to (or different to) |
| 9 | > | Greater than |
| 10 | < | Less than |
| 11 | >= | Greater than or equal to |
| 12 | <= | Less than or equal to |



```
litter = int(input("How many puppies were born?"))
if litter <= 5:
    print("good size")
elif litter == 6:
    print("just right")
elif litter == 7:
    print("large litter")
else:
    print("goodness me")
```

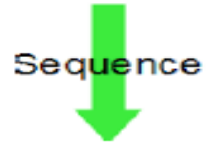
```
number=0
while number != 8:
    number = number + 1
    print ("the number is", number)
```

Arithmetic Operators

| | Operation | Symbol | Example | Output |
|----|-------------------------------|--------|---------|--------|
| 13 | Addition | + | 2 + 10 | 12 |
| 14 | Subtraction | - | 9 - 6 | 3 |
| 15 | Multiplication | * | 5 * 4 | 20 |
| 16 | Division | / | 5 / 2 | 2.5 |
| 17 | DIV (Floor Division) | // | 7 // 2 | 3 |
| 18 | MOD (Modulus – Remainder) | % | 7 % 3 | 1 |
| 19 | Exponentiation (to the power) | ^ | 2 ^ 5 | 32 |

KS4 Computer Science - 2.2.3 ADDITIONAL PROGRAMMING

PROGRAMMING CONSTRUCTS



Sequence

A Sequence is when there are programming steps that are carried out one after another.



Selection

Selection is where there are different paths in your code
eg: IF, ELIF, ELSE



Iteration

Iteration is when there is repetition (loops) in code. This could be a WHILE loop (do something WHILE a condition is met) or a FOR loop (do something for a set number of times)

This count-controlled loop would print "Hello World" 8 times.:

```
for i=0 to 7
    print ("Hello")
next i
```

These condition controlled loops would check if a password's correct:

```
while answer != "letmein123"
    answer=input("Enter password")
endwhile
```

```
do
    answer=input("Enter password")
until answer=="letmein123"
```

Finding errors – follow these steps

1. Have you checked that you have closed all brackets correctly?
2. Have you checked that you have closed all quotes correctly?
3. Are your variable names spelt in the same way consistently? Remember that Python is case sensitive
4. Have you remembered to use commas to separate the variables inside print?
5. Have you used quotes around strings which you want to print out word for word?
6. Have you used int or float on number inputs?

STRING MANIPULATION

0 1 2 3 The characters in a string are numbered starting with position 0.
W o r d

| Function | Purpose |
|------------------|--|
| x.length | Gives the length of the string |
| x.upper | Changes the characters in the string to upper case |
| x.lower | Changes the characters in the string to lower case |
| x[i] | Gives the character in position i. Eg: x[2] = "r" |
| x.substring(a,b) | Gives the characters from position a with length b. Eg: x.subString(1,2) = or |
| + | Joins (concatenates) two strings together |

IF/ELSE AND SWITCH/CASE FOR SELECTION

| IF ELSE | SWITCH/CASE |
|--|---|
| If choice == "a" then print("You chose A") elseif choice=="b" then print("You chose B") else print("Unrecognised choice") | Switch entry: case "A": print("You chose A") case "B": print("You chose B") default: print("Unrecognised choice") |

KS4 Computer Science - 2.2.3 ADDITIONAL PROGRAMMING

SUB PROGRAMS

Procedures are a set of instructions stored under a name so that you can call the procedure to run the whole set of instructions.

A **function** is like a procedure but always returns a value.

Parameters are variables used to pass values into a function or procedure.

| A procedure with parameters | A procedure without parameters |
|------------------------------------|---------------------------------------|
| procedure intro (name) | procedure intro () |
| print("Hello " +name) | print("Hello") |
| print("Welcome to the game") | print("welcome to the game") |
| endprocedure | endprocedure |

SQL (Structured Query Language)

SQL is the language used to manage and search databases.

| Commands | Example | What it does |
|----------------|---|--|
| SELECT FROM | SELECT name, age FROM students | Displays the name and age of everyone in the students table |
| WHERE | SELECT name FROM students WHERE gender=male | Displays the name of everyone in the students table who's gender is male |
| LIKE | SELECT name FROM students WHERE name LIKE "% Smith" | Displays the students' names that end with Smith. |
| AND | SELECT name FROM students WHERE gender=male AND attendance > 90 | Displays the students who are male and have an attendance of more than 90. |
| * | SELECT * from students | Selects all of the fields from the students table |

ARRAYS

One-Dimensional Arrays- this is like a list. In this example an array has been created called students. The list can hold 3 items (as shown).

```
array students [3]
students [0] = "Bob"
students [1] = "Dave"
students [2] = "Bob"
```

This command would print the second item (1) from the array. It would print "Dave".

```
print(students[1])
```

Two-Dimensional Arrays - these are lists within lists (like a table)

```
Grades=[[ "Bob", "22%", "44%"], [ "Dave", "85%", "100%"]]
```

| | 0 | 1 | 2 |
|---|------|-----|------|
| 0 | Bob | 22% | 44% |
| 1 | Dave | 85% | 100% |

The code above creates the 2D array. The code below would output:

"Bob's first test score was 22%"

```
print("Bob's first test score was " + Grades [0, 1])
```

FILE HANDLING

| | |
|---------------------------------|-------------------------------------|
| Myfile=openRead("myfile.text") | Opens the file in read mode |
| Myfile=openWrite("myfile.text") | Opens the file in write mode |
| Myfile.writeLine ("Hello") | Writes a line to the file |
| Line1=myfile.readLine() | Reads one line of the file |
| Myfile.close() | Closes the file |
| endOfFile() | Used to determine the end of a file |

KS4 Computer Science - 2.3 PRODUCING ROBUST PROGRAMS

KEYWORDS

| | | |
|---|----------------------------|--|
| 1 | Defensive design | The purpose of defensive design is to ensure that a program runs correctly and continues to run no matter what actions a user takes. |
| 2 | Anticipating misuse | Protection against user inputs or actions such as a user entering a letter instead of a number. |
| 3 | Authentication | Used to confirm the identity of the users before they can access certain pieces of data or parts of the program. Usually done using passwords. |
| 4 | Input validation | The testing of any data input by user. |
| 5 | Syntax errors | Error in the code (wrong grammar). Program will not run and errors messages will be returned. |
| 6 | Logic errors | Error in the logic. Program will run but it will not return the expected result. |

TESTING

| | | |
|---|---------------------------|---|
| 7 | Purpose of testing | <ul style="list-style-type: none"> To check it performs as expected To check it meets the users' requirements To check that there are no errors To check the user understands how to use it To check for any security loopholes |
| 8 | Types of testing | <ul style="list-style-type: none"> Iterative testing – carried out while the program is being developed. Final/terminal – carried out when the whole program is complete to ensure it functions as it should. |
| 9 | Suitable test data | <ul style="list-style-type: none"> Normal - Sensible, normal data that the computer should be able to process. Boundary - Data that is at the upper or lower limits of what is accepted. Invalid - Data that the program does not accept. Erroneous - Data that is the wrong data type. |

MAINTAINABILITY

| | | |
|----|----------------------------|--|
| 10 | | A well maintained program makes it easier for other programmers to understand. The following features can improve maintainability of a program: |
| 11 | Use of sub-programs | Sub-programs can be called upon as many time as needed so the code is not repeated again and again. |
| 12 | Naming conventions | Variables and sub-programs should be appropriately named so they can be used and recognised throughout the program. |
| 13 | Indentation | Used to separate different statements which allows other programmers to see the flow of the program easier. |
| 14 | Comments | Notes added to code that used to show explain the code and are ignored when the program is compiled. Written using a # followed by the comment. Useful for explaining the key features of a program so other programmers can understand. |

EXAMPLE OF WELL MAINTAINED CODE

Sub-program 'greet' allows us to use this line of code multiple times in the program.

Comments explain what the line of code is doing.

```
def greet(name) :
    #This function greets the person passed in as a parameter
    print("Hello, " + name + ". Good morning!")

greet('Paul')
```

Indentation allows us to see which parts of the code are in the sub-program 'greet'.

Naming conventions – the name 'greet' for the function is appropriate because this is what it does.

KS4 Computer Science - 2.4 BOOLEAN LOGIC

KEYWORDS

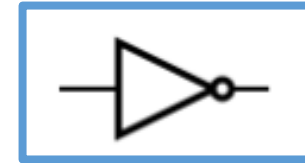
| | | |
|---|--------------------|--|
| 1 | Logic Gate | A logic gate is an building block of a digital circuit. Most logic gates have two inputs and one output. At any given moment, every terminal is in one of the two binary conditions 0 or 1 |
| 2 | Truth Table | A table which shows outputs from a logic gate or circuit given certain inputs. The three you need to know are below. |



∧



∨



¬

3. AND LOGIC GATE & TRUTH TABLE

An AND logic gate take two inputs and returns on output. Both inputs have to be 1 in order to output a 1.

| Input 1 | Input 2 | Output |
|---------|---------|--------|
| 1 | 1 | 1 |
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 0 | 0 | 0 |

A good way to remember:

AND – if I went to the shop to get bread AND milk and only came back with one or the other – I have failed (0).



4. OR LOGIC GATE & TRUTH TABLE

An OR logic gate take two inputs and returns on output. At least one input has to be 1 in order for the output to be 1.

| Input 1 | Input 2 | Output |
|---------|---------|--------|
| 1 | 1 | 1 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 0 | 0 | 0 |

A good way to remember:

OR – if I went to the shop to get bread OR milk and came back with at least one – I have succeeded (1)



5. NOT LOGIC GATE & TRUTH TABLE

A NOT logic gate takes one input and returns one output. The output of a NOT gate is always the opposite of the input.

| Input | Output |
|-------|--------|
| 1 | 0 |
| 0 | 1 |

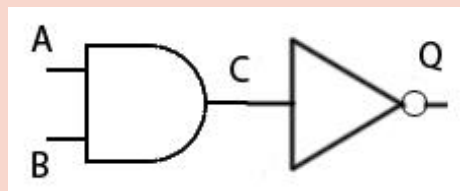
A good way to remember:

NOT – the easy one to remember as it is always just the opposite.

EXAMPLE

6

Logic gates can also be **combined** to make a larger representation of different electrical systems. Your example will likely include a combined gate. The following diagram combines a AND and a NOT gate and the truth table shows the different results.

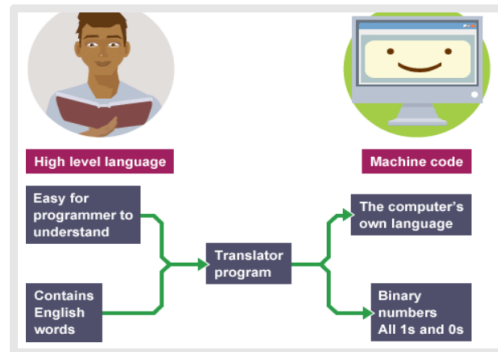
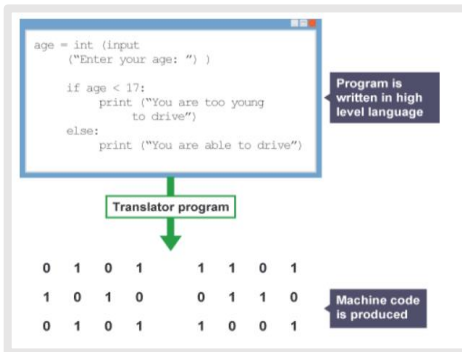


| A | B | C | Q |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 |

KS4 Computer Science - 2.5 PROGRAMMING LANGUAGES AND IDE

KEYWORDS

| | | |
|---|--|--|
| 1 | Programming languages | Programming languages are used to write algorithms to make programs (software). |
| 2 | High level programming language | Human-readable instructions that are created so that humans can use and understand them e.g Python. |
| 3 | Low level programming language | Machine code. Machine-readable instructions are in a language that computers understand e.g binary code. |
| 4 | Translators | Converts high-level code into machine code. Translators are interpreters or compilers. |



HIGH-LEVEL VS LOW-LEVEL PROGRAMMING LANGUAGES

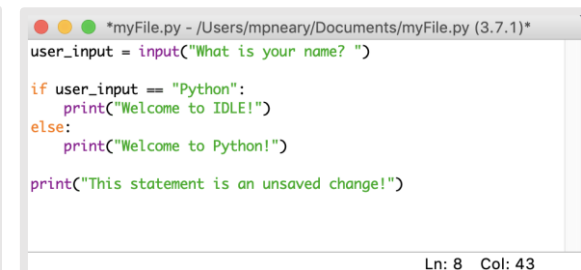
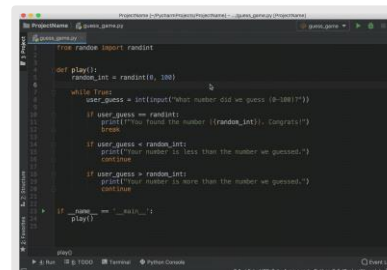
| | | |
|---|-------------------|--|
| 7 | High-level | <ul style="list-style-type: none"> Close to human language so easier to read and write. Slower to process as need to be translated to computer language first. Logic operators and functions built in (e.g arithmetic). |
| 8 | Low-level | <ul style="list-style-type: none"> Can be processed quicker as it does not need to be translated. More difficult for people to read and write. Developers of major web applications and games need to know how to code in low-level in order to maximise speed and efficiency of a program. |

INTEGRATED DEVELOPMENT ENVIRONMENT (IDE) TOOLS

| | | |
|----|-----------------------------|--|
| 9 | | An IDE is an application used to create software in different programming languages. It has different tools and functions that can assist in the development of software, for example: |
| 10 | Editors | The main section where the code is typed into. The IDE will use auto-colour coding for strings, loops etc and auto-correct, auto-indent and auto-complete (such as closing brackets). |
| 11 | Error diagnostics | Helps to find and fix errors in a program by showing the location of the bug and suggesting how to fix it. |
| 12 | Run-time environment | Will run the code even if it is not designed to be run on that machine. |
| 13 | Translators | Converts the code into machine code. |

COMPILER VS INTERPRETER

| | | |
|---|--------------------|--|
| 5 | Compiler | <p>Translates the whole program into machine code before the program is run.</p> <p>Returns a list of errors for the entire program once compiling is complete. Once compiled, the program runs quickly, however can take a while to compile.</p> |
| 6 | Interpreter | <p>Translates code into machine code, instruction by instruction.</p> <p>Returns the first error it finds and stops. Useful for debugging. Will run slower because code is being translated as the program is running.</p> |





Remember:

The Component is externally assessed by an Examiner. It counts for 20% (60 marks in total).

Important Things!

Remember: Read your text, decide on your interpretation of the character and artistic intention. Be confident – full marks can be achieved in the Component.

YOUR DRAMA:

After deciding on the play you want to perform:

Remember: Read the whole play in order to understand the style, the playwright's intention, the period involved before analysing and interpreting your role.

Style: The style of the play - Naturalistic, Realistic, Absurd, Symbolic, Brechtian, Physical Theatre.

The Playwright's Intention: Discuss contemporary themes, e.g. mental health, family problem, anorexia, drugs. Discuss a historical theme, e.g. War and its impact on society?

Period: Historical, Political, Cultural

Research: Go online, look at Youtube clips and write rough notes.

ACTING ELEMENT:

Remember: Groups of 2 to 4

Time:

- groups of 2 actors – 5 to 10 minutes
- groups of 3 actors – 7 to 12 minutes
- groups of 4 actors – 9 to 14 minutes

You must: Perform two sections 10 minutes long that are key parts of the text.

You must: Perform a text that contrasts with the play you're studying for Component 3.

The play must: Be written by a different playwright, in different historical period and with different themes to the text in Component 3.

Why? To give you new experiences, and to be able to enjoy and challenge yourselves to learn and interpret different texts.

CHARACTERISATION:

Remember the criteria:

You will be marked on your physical skills, vocal skills, interaction, interpretation, communication with the audience and individual contribution.

Also remember:

Your artistic intention must be written and submitted to the examiner before or on the day of the examination.

Once you know your text, you will need to focus on your character. Remember to use a range of practice techniques that will help you develop your role and create the rounded character: The Red Chair, Role on the Wall, Improvisation, Mime Work, The Missing Scene, Emotional Memory, The Magic If.

During the rehearsal periods, develop your vocal and physical skills:

VOICE: pronunciation, emphasis, pauses, tone and tempo, accent, pitch, constructiveness, highlights.

MOVEMENT: gesture, body posture, walk, position on the stage, characters' territories.

INTERACTION: distance, proximity, back turned, eye-rolling, facial response, moving away, approaching, physical gestures.

Discuss with your group what your stage shape will be, what type of set will be needed, stage equipment and props. It is also a good idea to use sound to create a mood and atmosphere either at the beginning, between scenes or at the end. You will need to carefully consider the costume, hair and make-up suitable for your role. Remember that you need consistent rehearsals and a full dress rehearsal before your final performance.

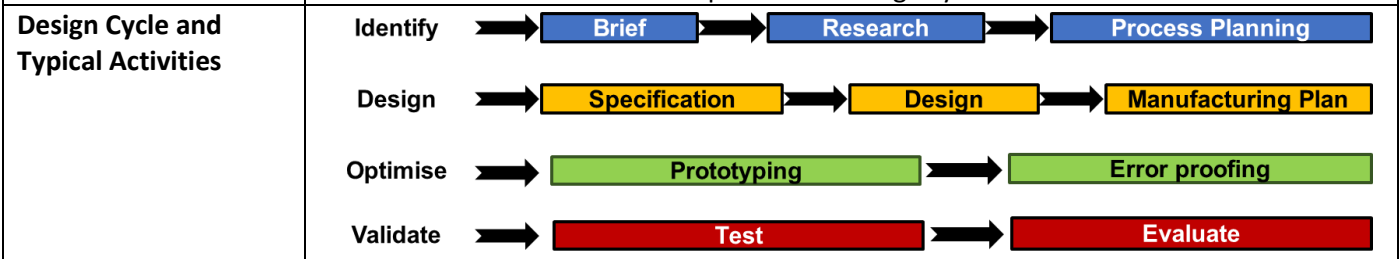
| | |
|-------|--|
| 1.1 | 1.1 The stages involved in design strategies |
| 1.2 | 1.2 Stages of the iterative design process, and the activities carried out within each stage of this cyclic approach |
| 1.2.2 | 1.2.2 Make and evaluate |

Design Cycle Phases

The design cycle:
Identify, Design, Optimize, Validate

- **Identify** = conduct research to explore the design problem, create a design brief, and project planning.
- **Design** = create a design specification (product success criteria) and then create solutions to answer the design brief and design specification.
- **Optimize** = create models (prototypes) to test ideas and make improvements.
- **Validate** = test and evaluate a prototype against the design brief and design specification. A designer or team of designers will go through the design cycle to complete a project.

Designers may **repeat** the design cycle to create an **optimal solution** (best idea). James Dyson made over 5,127 prototypes (tests) over 15 years to perfect his first bagless vacuum cleaner. Each time he repeated the design cycle.



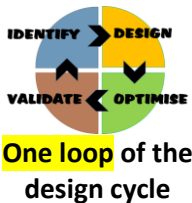
Designers will undertake the above activities throughout the design cycle. If they repeat the design cycle some may not be repeated.

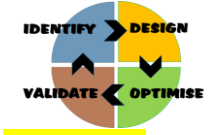
| | |
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| Identify | Identify = conduct research to explore the design problem, create a design brief, and project planning. |
| • Brief | A statement about the design problem supplied by the client and developed by the designer. |
| • Research | Exploring the design problem. Finding solutions to the design problem. |
| • Process Planning | Project planning. Deciding what tasks need to be completed, who will undertake them and how long they should take. Gantt charts are generally used. Budget should be considered in relation to both time and money. |
| Design | Design = create a design specification (product success criteria) and then create solutions to answer the design brief and design specification. |
| • Specification | A success criteria for a yet to be designed product. |
| • Design | Creating solutions to answer the clients brief and design specification. |
| • Manufacturing Plan | A step by step guide (plan) of how to manufacture the product or prototype. |
| Optimise | Optimize = create models (prototypes) to test ideas and make improvements. |
| • Prototyping | Manufacturing prototypes (models) to test design ideas. They can be either virtual (CAD) or physical. They could be the whole product or a scale model or |

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| | | even just a small section of the overall product (sub-assembly). |
| | <ul style="list-style-type: none"> Error Proofing | <p>Testing the product to make sure the user and or customer uses the product correctly, making alterations if needed e.g flatpack furniture – did the users construct it correctly in a focus group test? If not what needs to be changed to increase user satisfaction?</p> <p>To make sure the product is assembled and manufactured correctly and safely in the factory or production line. Do design changes need to be made to make sure staff maintain production quality, reduce manufacturing mistakes and decrease the risk of worker injury?</p> |
| | Validate | Validate = test and evaluate a prototype against the design brief and design specification. A designer or team or designers will go through the design cycle to complete a project. |
| | <ul style="list-style-type: none"> Test | Testing the prototype to identify potential issues. |
| | <ul style="list-style-type: none"> Evaluate | Assess the test data and make a plan of action to correct design flaws. |

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| Design Process Overview | <pre> graph TD A[Design problem] --> B[Design brief] B --> C[Design ideas] C --> D[Development] D --> E[Working drawings] E --> F[Manufacture] F --> G[Evaluation] </pre> | <p>Design Problem - The client will provide the design team with a design problem (design brief).</p> <p>Client = company/person employing your design services The designer will interview the client and develop the client's basic design brief by conducting research: Examples of research to develop the clients design brief:</p> <ul style="list-style-type: none"> Market Research – may be conducted to find out what the competition is up to, identify strengths and weaknesses in the market place and to find out if the market place is too saturated (i.e. is there a need for the product). Existing product analysis – designers will analyse the existing product range of the client or competing companies to identify strengths and weaknesses to identify design opportunities. Product disassembly – designers may disassembly and analyses similar products to identify strengths and weaknesses either of the competition or the client's own product range. They may examine what manufacturing methods, materials, technologies, and components have been used. Customer survey – the target market could be surveyed to identify if there is a need for the product or to see if the idea needs changing. |
| | | <p>Design Brief - A design brief is a statement about the design problem and the client's needs. The designer will interview the client and then conduct research to develop the clients design problem into a design brief.</p> <p>It may contain specific information, such as:</p> <ul style="list-style-type: none"> A statement about the design problem Basic features and functions |

| | | |
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| | | <ul style="list-style-type: none"> • Target market – age, gender, lifestyle of the user and customer. • Scale of production – how many products will be manufactured and over what time frame. • Branding – company identity – logos, company colours, fonts. • Budget – time and money – how much time and money the client can afford to spend on the project. <p>Further research will be conducted and then analysed to create a success criterion for the product – Design Specification.</p> <p>Design ideas – the designer will create solutions to the design brief and design specification.</p> <p>Development – ideas are tested and developed to create an optimal (best) solution that answers the design brief and specification. This could be a range of sketches, models (prototypes), and CAD work.</p> <p>Working drawing – a detailed 2D drawing that gives manufactures the information they need to construct a prototype or final product. The following will be detailed: sizes (dimensions), tolerances (acceptable manufacturing error of margin), materials, surface finish and manufacturing processes.</p> <p>Evaluation – the success of the product is reviewed against the design brief and design specification by analysing test and feedback data. Modifications may be made.</p> |
| Design Brief | <p>Design Brief - A design brief is a statement about the design problem and the client's needs.</p> <p>See above what a design brief should contain.</p> | |
| Design Specification | <p>Design Specification – A success criteria for a yet to be designed product.</p> <ul style="list-style-type: none"> • It is a statement about what the product should be or do often with a reason why. • A Design Specification should always be based on accurate research. • Design Specifications are often based on ACCESSFM (see table below) • The specification should be a mixture of quantitative and qualitative points. <ul style="list-style-type: none"> ○ Quantitative = quantities, facts, figures, dimensions, weights ○ “The product should weigh no more than 500 grams. This was the amount the user could carry with ease for 1 hour.” ○ Qualitative = statements, properties ○ “The product should be light weight to make it easy to carry.” • It is a very important planning document that allows the designer to evaluate and review designs, to make sure they have answered the original problem and the client’s needs (Design Brief). • It allows large organisations to work efficiently (save time/money) and reduce design mistakes e.g. Dyson employs over 3,500 designers, engineers, and scientists in the development of new products. They need to know what each team should be doing or there would be chaos leading to product failure. | |
| <p>ACCESSFM is a design tool used by designers to help analyse products and write specifications.</p> | <p>Aesthetics</p> | <ul style="list-style-type: none"> • Appearance - size, shape, colour, texture of a product. Branding is also an important factor. • How will you make the product appealing to the target audience? How will you make the product easy to understand and use? |
| | <p>Cost</p> | <ul style="list-style-type: none"> • What price should the product be? – link to materials, manufacturing, transport, retail (shop) price. |

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| | Customer | <ul style="list-style-type: none"> • Target audience. Who is the customer (buyer)? Who is the user? • Target market – what is their gender, age range, lifestyle? • What do they want/need? |
| | Environment | <ul style="list-style-type: none"> • How will you make the product environmentally friendly? • How will you reduce the impact a product has on the environment? • Location – where will it be used? How will this affect its design? • Design for disassembly (DFD) – how can you make the product easier to service or repair? |
| | Size | <ul style="list-style-type: none"> • What size should the product be? - link to anthropometric data (sizes of the human body) and ergonomics (how to make products safer, easier, and more comfortable) and where it will be used (location). • Size of materials and components. |
| | Safety | <ul style="list-style-type: none"> • How will you make the product safe? • What are the safety requirements of the user and or customer? • Safety of the final user – link to materials, design features and ergonomics. • Manufacture (DFMA – design for manufacturing assembly) – how to make it safer and easier for workers on the production line? |
| | Function | <ul style="list-style-type: none"> • What does the product need to do? – this will be based on many factors. |
| | Materials Manufacture | <ul style="list-style-type: none"> • What type of material properties are required to answer the brief or specification? E.g. do they need to be lightweight, impact resistant or malleable (can be bent into shape without cracking). • Production and material costs – this is linked to the maximum price the product can be sold for whilst maintaining a healthy profit margin. • Scale of production (how many products should be made) – this lets you choose manufacturing methods and then suitable materials that are in budget. |
| Types of Research | <ul style="list-style-type: none"> • Primary research – first-hand information. Surveys, questionnaires, interviews, focus groups, observations (photographs, videos), tests and experiments. You have physically undertaken the research yourself and gathered the information/data first hand. This method will give you accurate high-quality information but is more time consuming than secondary research and therefore more expensive to undertake. • Secondary research – second hand information. Someone else has created the information or data for you. Types include internet research, books, magazines. Secondary research is quicker than primary but may not provide the exact information you need or may not be 100% accurate. | |
| Linear Design  <p>One loop of the design cycle</p> | <ul style="list-style-type: none"> • A design strategy that completes the design cycle only once. • After each design phase is complete the designer moves onto the next without moving back. • Linear design is often used for simple products that require little testing or development work. • Linear design is often quicker and more cost effective (cheaper) than iterative design because of the lack of development. • Linear design is perfect for simple products and clients with limited budgets (time/money) | |

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| <p>Iterative Design</p>  <p>Many loops of the design cycle</p> | <ul style="list-style-type: none"> • A design strategy that completes the design cycle multiple times to create the best solution. James Dyson completed over 5,000 cycles to create his first bagless vacuum cleaner. • Iterative design is often used for complex products that require lots of development work and testing. • Iterative design is more expensive than linear design because of increased development work. • Iterative design is perfect for complex products and clients with large budgets (time/money). |
| <p>Inclusive Design</p> | <ul style="list-style-type: none"> • Inclusive design is a design process where the needs of specific groups of people are considered who may be traditionally excluded. • A good example is a pedestrian crossing: the lowered/drop curb for wheelchair or pram users. The rumble/textured tiles for the blind with canes. Buzzer for blind people to tell them when to cross. Flashing light for the deaf. Lowered button for wheelchair users. • Inclusive design leads to a happier and more fulfilled society. • Inclusive design can add increased design complexity, increasing manufacturing costs and potentially the amount of space required for the product. |
| <p>User Centred Design</p> | <ul style="list-style-type: none"> • User centred design is a design process where the needs of the user are used to develop a product. • A product is tested and developed using the feedback of the user/s feedback. Focus groups and product testing are especially important. • It is a type of iterative design and requires lots of development and testing work. Therefore, it is time consuming and expensive to do. |
| <p>Sustainable Design</p> <ul style="list-style-type: none"> • Finite: will run out e.g., coal, oil, gas. Crude oil is used to produce most of the plastics we need. • Non-finite: will not run out – timber, paper, cotton, bamboo etc. • Renewable: can be replaced. • Biodegradable: can break down/rot naturally. | <ul style="list-style-type: none"> • Sustainable design is a design process that aims to make a product as environmentally friendly as possible by reducing the negative impact it has on the environment over its lifetime. • Designers should consider the complete lifecycle of a product from its manufacture, including material sourcing, transportation, use (energy usage) and end of life (can it be recycled with ease?). • Designers often apply the 6 Rs of sustainability to reduce the environmental impact of a new product: <ol style="list-style-type: none"> 1. Recycle – can the product be designed in a way to make it easier to take apart and recycle? Can the materials be recycled? 2. Repair – can the product be designed in a way that makes it easier to fix and extend its life? 3. Reuse – can the product be reused at the end of its life (extend its life)? 4. Refuse – should we refuse to use certain materials that are damaging to the environment? Are they difficult to recycle or damaging when they are refined or extracted? 5. Rethink – can we change the design to reduce its impact? 6. Reduce – can we reduce the number of materials and energy required to manufacture the product? <p>Other factors environmental factors include:</p> <p>CO2 Emissions</p> <ul style="list-style-type: none"> • Extraction of raw materials and manufacturing processes require energy. This energy normally causes some level of CO2 emissions. <p>Working conditions</p> <ul style="list-style-type: none"> • Fair trade and workers' rights and conditions is an important factor when thinking about sustainability. <p>Resource scarcity</p> <ul style="list-style-type: none"> • Scarce materials or materials that are difficult to obtain can cause sustainability issues. High demand for scarce materials causes environmental damage e.g. such as mining rare metals to produce mobile phones. <p>Transportation</p> |

- All manufacturers and retailers must transport goods and materials. Many modern corporations transport components over vast distances. Transportation can add to the CO2 emissions of a product.

Harvesting and Deforestation

- Harvesting and deforestation can have a negative impact on wildlife. If replanting does not take place, then future harvests are affected. Deforestation can also cause flooding to occur.

Mining Raw Materials

- Mining for raw materials can have an impact on the environment. This should be considered when thinking about the sustainability of the product.

Ergonomic design

- Ergonomic design is a design process that aims to make a product more comfortable, easier, and safer to use.
- It is an iterative design process that requires a lot of development work.
 - Ergonomic factors include:
 - Size
 - Shape
 - Texture
 - Weight
 - Colour

Designers apply **anthropometric data** (sizes of the human body) to create safe and comfortable products.

Physical and Virtual Prototypes

- Prototype** = test, model.

Designers create prototypes to test design ideas. Models are tested against the design brief and specification to make sure the needs and expectations of the client and product are met.

Physical models can be created to test part of a design or the whole. Test data is then analysed, and the idea developed after further research and design.

Physical scale models can also be produced to economically test ideas.

- Aesthetical prototype – test the appearance.
- Functional prototype – test its function.
- Electrical prototype – test electrical components, circuits, coding.
- Virtual prototype (computer based) – CAD simulation of design.
- Physical prototype – real life model

| Virtual prototype | Virtual prototype | Physical prototype | Physical prototype |
|--|---|--|---|
| Advantages | Disadvantages | Advantages | Disadvantages |
| Cheaper than a physical model. | Test data may be inaccurate, compared to a physical model. | A real sense of the product can be achieved. Missing elements from virtual model/testing can be identified. | Expensive – requires highly skilled people to make. |
| Quicker to create than a physical model. | Virtual models do not give a true/real sense of the product being designed and developed. | More accurate testing data can be gathered from a physical model rather than the predictions of a virtual model. | Time consuming – delays development time. |

CAD

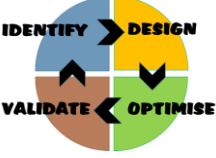
Computer aided design

Designers use CAD programs to create accurate 2D and 3D models with speed. Models can be edited quickly and tested virtually (simulations). Online CAD packages (**cloud-based computing**) now allow designers to work on CAD models together at the same time over the internet to speed up the design process.

| Advantages | Disadvantages |
|--|---|
| Changes (edits/modifications) can be made quickly compared to traditional hand drawn techniques. | Expensive to set up. |
| Ideas can be tested virtually to reduce prototyping costs and reduce design time and material wastage. | Expensive to train staff. |
| Accurate – compared to hand drawings. | Data can become corrupted, and work lost. |
| Improved communication - designers can work together on the same CAD drawing to reduce design time. | CAD drawings can be copied, and ideas stolen. |

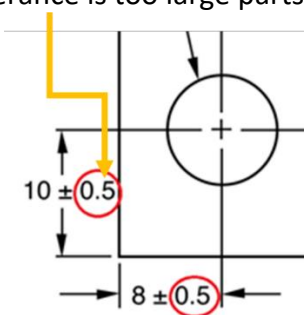
Computer aided manufacture (**CAM**) – CAD drawings can be used to control items of CAM machinery e.g., laser cutters and 3d printers.

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| 2.1 | Types of Criteria Included in a Design Specification |
| 2.2 | How Manufacturing Consideration Affect Design |
| 2.3 | Influences on Engineering Product Design |

| Design Cycle/Process Recap | | | |
|---|--|-------------------|---|
| <p>Design Cycle and phases:</p>  | <p>Identify → Brief → Research → Process Planning</p> <p>Design → Specification → Design → Manufacturing Plan</p> <p>Optimise → Prototyping → Error proofing</p> <p>Validate → Test → Evaluate</p> | | |
| Recap of keywords: | | | |
| Client | <ul style="list-style-type: none"> Company or person employing your design/engineering services. | | |
| User | <ul style="list-style-type: none"> The user of the product. | | |
| Customer | <ul style="list-style-type: none"> The person buying the product. | | |
| New keywords: | 2.1 Types of Criteria Included in a Design Specification | | |
| Needs | <ul style="list-style-type: none"> Critical aspects of a product that must be included to make sure it answers the needs of the client, user, or customer. | | |
| Wants | <ul style="list-style-type: none"> Desirable aspects of a product that are not critical. They could be left out if there isn't enough budget for them to be included. | | |
| Qualitative criteria | <ul style="list-style-type: none"> Factual and measurable criteria/data e.g. sizes, weights, cost. This should be generated from analysed data. "The handle should be no wider than 35mm to make sure the average adult hand can comfortably grip the bar." | | |
| Quantitative | <ul style="list-style-type: none"> Non-factual and non-numerical criteria. They are descriptive statements e.g., "The product should light weight" | | |
| Situation | <ul style="list-style-type: none"> Situation is the location of where the product will be used e.g. the bathroom or garage. It can be more specific such as the garage work bench drawer. | | |
| Context | <ul style="list-style-type: none"> The reason behind the problem being solved. Why is there a need for the product being designed? | | |
| 2.1 | Types of Criteria Included in a Design Specification | | |
| Design Specification | <p>Design Specification – a success criteria for a yet to be designed product or service. It is a set of criteria about what the product should do or be. Specification points should always be backed by solid research.</p> | | |
| ACCESSFM criteria | <p>It is a very important planning document that allows the designer to evaluate and review designs to make sure the needs of the client, user, customer, and product have been met.</p> <p>Design specifications within larger organisations such as Apple, allow teams to work independently with precision and confidence, reducing collective mistakes. This in turn saves time and money during the design and development of a new product.</p> <table border="1"> <tr> <td>Aesthetics</td> <td> <ul style="list-style-type: none"> Appearance - Size, shape, colour, texture of a product. How will you make the product appealing to the user and customer? What do they expect the product to look like? What surface finish will be used and why? How will you incorporate the clients branding? – company logo, colours, style etc. </td> </tr> </table> | Aesthetics | <ul style="list-style-type: none"> Appearance - Size, shape, colour, texture of a product. How will you make the product appealing to the user and customer? What do they expect the product to look like? What surface finish will be used and why? How will you incorporate the clients branding? – company logo, colours, style etc. |
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| | | <ul style="list-style-type: none"> • Aesthetics also plays an important part in ergonomics. How can colour be used to make the product safer and easier to use? • Fashion and trends – are they relevant to the product you are creating if so, what are they? <ul style="list-style-type: none"> • “The product should be a gender-neutral colour to increase sales”. • “The logo should be displayed on top of the product to be visible when it is placed on the floor” |
| | <p>Cost</p> | <ul style="list-style-type: none"> • What should the retail price be? This will be set by what the market is willing to pay. This will affect material, manufacturing, and transportation costs. • Development costs should also be factored in: what should be the maximum cost of the design project? This will be linked to your client’s budget. Costs include: <ul style="list-style-type: none"> ▪ Market research ▪ Staffing ▪ Prototyping ▪ Testing ▪ Manufacture setup • Breakeven point – how much would you need to charge to break even and start making a profit? |
| | <p>Customer</p> | <ul style="list-style-type: none"> • Who is the customer? • Who is the user? • Demographic - Target market – gender, age range, lifestyle, geography, buying habits. • What do they want/need? Surveys, questionnaires, focus groups can be used. |
| | <p>Environment</p> | <ul style="list-style-type: none"> • Situation (location): where will the product be used and how will this affect its design? Are there size restrictions? For example, will it go in a drawer or on a shelf? • How will you make the product environmentally friendly? <ul style="list-style-type: none"> ▪ How could you make the product more sustainable? Think about the 6 Rs of sustainability. ▪ How could you reduce the negative impact the product has on the environment? ▪ Design for disassembly (DFD). How can you make the product easier to repair or service? ▪ Lifecycle of the product (LCA). How will you make the product easier to dispose of? How will the negative impact of the products manufacture be reduced? For example, energy usage during manufacture and waste. ▪ Sourcing materials and components. Supply chains and the distance materials must travel should be considered to reduce the environmental impact of a product. |
| | <p>Size</p> | <ul style="list-style-type: none"> • What size should the product be? - link to anthropometric data, ergonomics, and locational factors. • Size of materials and components. Will you use standard components or material stock forms? If so, what are their sizes? |

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| | | <ul style="list-style-type: none"> • <i>"The handle should be no wider than 35mm so it can fit into the average adult hand making it easier to carry"</i> |
| | <p>Safety</p> | <ul style="list-style-type: none"> • How will you make the product safe? • What are the safety requirements of the user/customer? – link to materials, design features and ergonomics. • British Standards and Conformity European. Adherence to safety laws and regulations. What are the rules and regulations associated with the type of product you wish to manufacture? • Manufacturing safety - design for manufacturing assembly (DFMA). What requirements are needed to make it safer and easier for the workers to manufacture and assemble? <ul style="list-style-type: none"> • <i>"The product should have rounded edges and corners and used flame resistant materials to comply with British Standards rules and regulations."</i> |
| | <p>Function</p> | <ul style="list-style-type: none"> • What does the product need to do? • What features should the product have? • Are there any servicing, repair, or cleaning requirements for the product? How will they be added to the design? • What functions and features can be incorporated within the budget or cost constraints of the product? <ul style="list-style-type: none"> • <i>"The product should be easy to stack and clean".</i> • <i>"The product should use a display that can be seen with ease at 10 meters."</i> |
| | <p>Materials/ Manufacture</p> | <ul style="list-style-type: none"> • What material properties are required to answer the brief or specification? For example, does the product need to be lightweight or water resistant? • What scale of production should be used? This will determine suitable manufacturing methods and materials. • What materials are suitable for the budget/cost of the product? • What components will be used? <ul style="list-style-type: none"> • <i>"The product should be made from lightweight and impact resistant materials that should be suitable for mass production and injection moulding."</i> |
| <p>Material Selection</p> | <p>The following factors play an important role in material selection:</p> <ul style="list-style-type: none"> • Scale of production – this will affect the manufacturing techniques you will use, and in turn affect the materials you can use. • Ease of manufacture. • Aesthetics • Material working properties – how easy it is to form or shape. • Mechanical properties – how suitable is it for its intended function? • Electrical properties – does it need to be an insulator or conductor? • Thermal properties – does it need to transfer or trap heat? • Cost • Sacristy - how easy is it to get? • Processing - how easy is it to process the raw materials into a usable material? Energy and time. • Stock form – is the material available in the stock form you require for the manufacturing processes you wish to use in your design? • Quantity – can you get enough of the material for the production run? | |


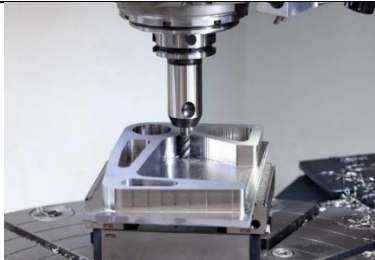


| | <ul style="list-style-type: none"> • Environmental impact. | | | | |
|-----------------------------------|---|-------------------------|---|----------|---|
| Material properties | <p>The following factors are important criteria for selecting suitable materials:</p> <ul style="list-style-type: none"> • Weight • Strength Resistant to corrosion • Water resistance • Operating temperature • Fatigue – how many times can it operate before failure • Durability • Flammability <p>Tensile strength Strength of a material when it is stretched or pulled.</p> <p>Compressive strength Strength of a material under load (when the load is 'compressing' the object).</p> <p>Resistance to corrosion Ability of a material to resist deterioration caused by reactions to its surrounding environment.</p> <p>Composite materials Materials made up of two or more different materials, combining their properties to create a new, improved product.</p> <p>Low carbon steel A low carbon ferrous material (contains iron) that consists of less than 0.3 per cent carbon; also known as mild steel.</p> <p>Ductility The ability of a material to be stretched under load without breaking.</p> <p>Toughness The ability of a material to resist impact or shock loads (such as press-forming a car body panel).</p> <p>Malleability The ability of a material to be shaped or deformed by compressive forces (such as hammering or pressing).</p> | | | | |
| Manufacturing Tolerances | <p>A manufacturing tolerance is an acceptable range in manufacturing accuracy.</p> <p>It is impossible to manufacture a part with 100% accuracy.</p> <p>Zero tolerance would mean a 100% failure rate during quality control (QC) – parts would not pass inspection. There would be a 100% wastage of parts.</p> <p>If the tolerance is too large parts would be unsafe.</p>  <p>It is impossible for a machine to make a part with 100% accuracy.</p> <p>The +- symbol indicates the acceptable manufacturing size range e.g., 10mm +- 0.5mm = 9.5mm to 10.5mm to pass inspection.</p> <p>Designers must make sure parts fit together safely and with ease during assembly.</p> | | | | |
| Bioplastics | Polymers (plastics) made from plant-based materials such as starch such as PLA. The materials are biodegradable (will rot down) and are non-finite. | | | | |
| Eco materials | Designers maximising the use of renewable and biodegradable materials in their designs such as timber or bamboo. | | | | |
| Recycled materials | Recycled materials are materials that have been extracted from a product at the end of its life and repurposed. It takes less energy to recycle a material than to create it from raw materials (extraction/refining/processing). | | | | |
| New and emerging materials | <table border="1"> <tr> <th>Modern materials</th> <th>Modern materials are generally created by the scientific world and are relatively new.</th> </tr> <tr> <td>Graphene</td> <td>A single layer of carbon atoms. It has excellent electrical conductivity, and weight for weight is 200 times stronger than steel. It is flexible and light weight and is often used as a coating or in lightweight and flexible circuits.</td> </tr> </table> | Modern materials | Modern materials are generally created by the scientific world and are relatively new. | Graphene | A single layer of carbon atoms. It has excellent electrical conductivity, and weight for weight is 200 times stronger than steel. It is flexible and light weight and is often used as a coating or in lightweight and flexible circuits. |
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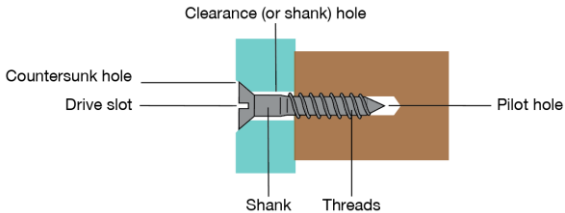
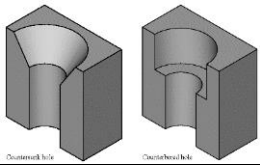
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| | Nanomaterials | Nanomaterials are used as coating on materials. They are very thin and are often used as antibacterial coatings. |
| | Titanium | A light weight, heat resistant material (compared to steel and aluminium) that is often used in fighter jets and some sports cars to save weight and fuel. |
| | Smart materials | Materials that react to external stimulus – examples include light, heat, pressure/mechanical force, electric and magnetic fields |
| | SMA | Shape memory alloys can return to their original shape if they are deformed by applying heat. Nitinol is a good example of an SMA and is often used in small quantities in products such as glass frames and spring mechanisms within fire sprinklers and car engines. |
| | Thermochromic pigments | Pigments that change colour with heat. Often used in flexible thermometers, battery indicators or colour changing paints. |
| | Photochromic dyes | Dyes or coatings that change colour with light. Often used in sunglasses. |
| | Composite materials | Two or more materials bonded together (in a matrix) – the properties of each material are combined to create an enhanced material. |
| | MDF | Wood fibres are bonded with a resin (glue) and compressed into a sheet. MDF comes in large sheets sizes, is easy to paint and doesn't warp (expand) like most natural timbers such as pine. |
| | Concrete | Sand, cement, and gravel are bonded together with steel reinforcing rods to create a material that can withstand both tension and compressive forces. The concrete can be poured and moulded to form structural elements in buildings. |
| | Carbon fibre | Carbon fibre is bonded with a resin (glue) and formed in a mould. It is cured in a vacuum bag that is heated in an autoclave (pressurised oven). Carbon fibre is light weight, rigid and very strong. Race cars and now modern aeroplanes are starting to use more and more carbon fibre to save weight and fuel. |
| | GRP – Glass reinforced plastic | Glass fibre matting bonded with resin (glue) and formed in a mould. GRP is a very strong material and less expensive than carbon fibre but not as light weight. |

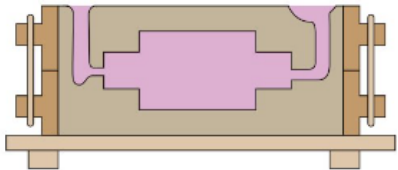

2.2 How Manufacturing Consideration Affect Design


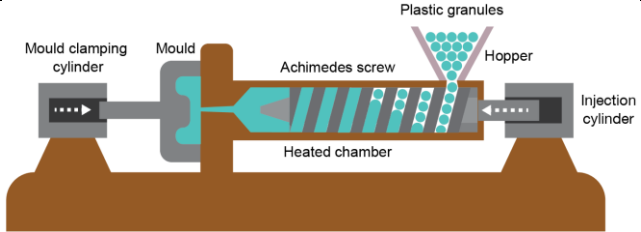

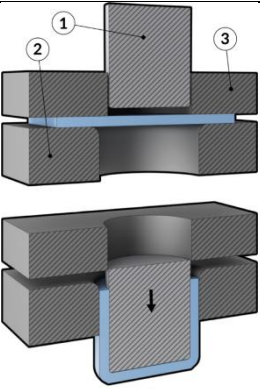
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| Scales of Production | Scale of production | | Typical products | Advantages/disadvantages |
| | One-off | Unique or bespoke products. | One-of-a-kind watch, building or | <ul style="list-style-type: none"> • Unique products are created – one-off a kind. • Custom • Tailor made. • Client design changes can be made with relative ease by the designer/maker compared to batch or mass production which have a high set up cost. |
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| | | piece of clothing such as a suit. | <ul style="list-style-type: none"> • One-off production uses a highly skilled work force which creates a high wage cost. This in turn will increase the price of the final product. • Generally, one off production has longer production times due to a lack of expensive tooling and machinery that is associated with other scales of production such as mass. • Low set up cost compared to batch and mass production. • Uses hand tools and basic machinery (compared to batch or mass) |
| | Batch | Furniture, newspapers, seasonal clothing | <ul style="list-style-type: none"> • Products are manufactured in batches (100's, 1000's or even more) in a specific time frame. Parts of the product are made in set quantities. Once each part/stage/process has been completed they move onto the next stage until the final product is complete. • Production may stop and start to suit demand. • Batch production has a higher set up cost compared to one-off production. Templates, manufacturing jigs and tooling need to be designed and set up. Set up costs are recouped over the larger number of products being made and lower wage costs due to the use of semi-skilled labour. • Jig = a device to make a job easier or safer to do. • Consistent high-quality products are made because of the investment in tooling, machinery, and jigs. Machines are less likely to make mistakes. • Investment in tooling and more advanced machinery means a semi-skilled work force can be used reducing wage costs. • Design changes are difficult to make. Tooling and machinery would need to be changed and paid for. |
| | Mass | Mobile phones, games consoles, toothbrushes | <ul style="list-style-type: none"> • Large production volumes – fast rate of production. • Efficient, overall lower production costs. • High quality consistent products produced. • Extremely high set up costs. Production lines, automation, tooling, and large-scale machinery need to be set up. Set up costs are recouped over the larger number of products being made. • Investment in tooling and more advanced machinery means a low-skilled work force can be used reducing wage costs. |

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| | | | <ul style="list-style-type: none"> Automation and investment in tooling/machinery reduces the work force and lowering manufacturing costs further. Automation and manufacturing jigs also mean that a semi-skilled or low-skilled work force can be used reducing salaries and training time. Design changes are very difficult to make. Tooling, machinery, and production lines would need to be modified and paid for. |
| Automation | Reducing human intervention in manufacturing using computer-controlled machinery. | | |
| Stock forms | <p>Most materials come in stock forms:</p> <ul style="list-style-type: none"> Granules Ingots Bar Sheet Tube <p>The benefit of stock forms is that they come in set sizes or weights. This enables designers to make design decisions and in turn speed up the design process.</p> | | |
| CNC | Computer numerical control. | | |
| CAD | Computer aided design. | | |
| CAM | Computer aided manufacture. | | |
| Manufacturing can be split into the following categories: wasting (cutting), shaping, forming, joining, finishing and assembly | | | |
| Wasting | Turning |  | <p>A lathe is used to make round metal objects.</p> <p>A sharp stationary tool removes material as the metal part rotates in the chuck of the lathe.</p> <p>Knurling = adding a textured diamond pattern to the part</p> |
| | Milling |  | <p>A miller can be used to create complex metal parts from blocks of metal or used to refine cast metal parts.</p> <p>The cutting tool rotates to shave away material. The machining is done in stages to create the desired shape, specification, and surface finish.</p> |
| | Cordless Drill |  | <p>Pillar drill</p> <p>Used to drill holes with accuracy.</p> |
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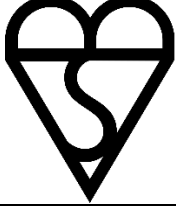

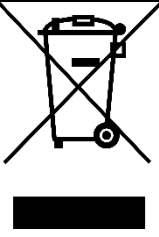
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| | drill but isn't as accurate. | | A machine vice should be used to hold the workpiece. | |
| Counter sink  | Twist drill bit  | Stepped drill  | | |
| Pilot hole Stops the materials from splitting and guides the screw/bolt. Clearance hole A hole slightly larger than the bolt or screw.  | Counter sunk hole. V shaped hole (chamfered edge) that allows the screw/bolt head to sit flush (flat). Counterbore Flat shaped hole  | | | |

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| Shaping | Sand casting  | <ol style="list-style-type: none"> 1. Liquid molten metal is poured into a two-part mould made from sand. 2. The sand is often mixed with oil to help bind it together. Hot molten metal is poured down the sprue which connects to the mould. 3. The riser allows the expanded gases and excess metal to be released the other side. 4. When the part has cooled it will be machined. |
| Investment casting  | Casting <ol style="list-style-type: none"> 1. Often referred to as the lost wax method of casting. 2. This process can create accurate complex metal parts. 3. Liquid wax is injection moulded and then joined to a feeder system made from wax. 4. The wax is coated in a ceramic slurry and fine ceramic particles. 5. Multiple coats are applied and then fired in a kiln to set the mould and burn the wax away. 6. Hot molten metal is then cast into the mould. | |

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| | <p>Die casting.</p> <p>Injection moulding</p> | <p><u>Investment casting using wax</u></p> <ol style="list-style-type: none"> 1. Liquid molten metal is injected under pressure into a metal mould. 2. The moulded part is removed once cooled down and trimmed/machined. <p><u>Die casting</u></p> <ul style="list-style-type: none"> • Complex plastic parts with internal structures can be created at speed using injection moulding. • The process is suitable for mass production. • Parts are accurate due to the low shrinkage rate. • The plastic requires very little finishing, reducing production costs. • Set up costs are high but recouped over time through large production volumes. • Hot liquid plastic is forced under pressure (injected) into a liquid cooled mould. |
| <p>Additive manufacturing</p> | <p>Manufacturing methods that add material e.g., 3D printing, injection moulding, casting</p> | |
| <p>Subtractive manufacturing</p> | <p>Manufacturing methods that remove material e.g., milling, turning, laser cutter</p> | |
| <p>Forming</p> | <p>Shaping a material either through pressing, bending, or moulding.</p> <p>Examples:</p> <div> <p>Press Brake</p> <p>A press brake is used to fold sheet metal. It is often used to make metal casings after holes have been cut for fastenings and hardware.</p> <p>Steel panels are often laser, plasma or die cut and then shaped.</p> </div> <div> <p>Deep Drawing</p> <p>Sheet metal is pressed/stretched into a shape. Often used for drinks cans, cylinders, sinks and saucepans.</p> <ul style="list-style-type: none"> • A die is forced into a metal sheet using a hydraulic press. • The press applies tons of force to stretch the metal sheet. </div> | |
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| | <ul style="list-style-type: none"> The die pushes the metal sheet into the mould and completes the forming process. | |
| | <p>Stamping/Piercing</p> <p>A hydraulic press applies a large amount of force to a die to punch out shapes in sheet metal.</p> |  |
| <p>Joining</p> | <p>Design for manufacturing assembly (DFMA)</p> | <p>Developing designs to make assembly safer and more efficient. Worker safety is paramount – e.g., sharp edges should be reduced, and hand sizes considered to allow workers access to assemble parts. If robotic manufacturing is being used designers should consider the limitations of the robot and simplify the design.</p> |
| | <p>Design for disassembly</p> | <p>Designing products so they can be cleaned, serviced, or repaired to extend their life.</p> |
| | <p>Standard components</p>  | <p>Components that are a standard size and are often manufactured by multiple suppliers.</p> <p>Examples include bolts, nuts, washers, rivets, screws.</p> <p>Using standard components speeds up the design process because sizes and specification are already known. They are often mass produced.</p> |
| | <p>Premanufactured components</p> | <p>Components or subassemblies manufactured separately, often made by external specialists, that are assembled on the production line into the final product.</p> |
| | <p>Subassemblies</p> | <p>Components assembled separately to form a unit which is then joined to the main assembly/product e.g., a car seat joining the interior of a car on the production line.</p> |
| | <p>Robotic manufacturing and assembly</p> | <p>Robots are often used on mass production lines. The aim is to reduce human error, improve efficiency and productivity and in turn reduce labour costs.</p> <p>The high set up costs are spread over the large number of products being manufactured.</p> <p>AI is now being incorporated to help machines make human like decisions to speed up quality control and complete basic problem-solving tasks.</p> |
| | <p>Temporary fixings Mechanical fastenings</p> | <p>Bolts, push fasteners and screws can be used to create temporary fixings that can be taken</p> |

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| | | apart using basic tools. Temporary fixings are not as strong as permanent fixings but allow the user to take apart the product and repair it. |
| | Permanent fixing | Welding, soldering, brazing, adhesives (glues) are examples of permanent fixings. They are generally stronger than temporary fixings but cannot be taken apart. |
| Finishing | Heat treating | Metal parts can be heat treated to harden the surface of a material or to reduce the risk of the part cracking. |
| | Deburring | Burrs are sharp edges on machined or cast parts. They are removed using a deburring tool. A small amount of metal is shaved from the edge. |
| | Grinding/linishing | Surface welds and scratches can be removed using an abrasive wheel or belt. |
| Assembly | Joining parts together to create a more complex product. | |
| Production costs | <ul style="list-style-type: none"> • Production costs are affected by many factors: materials, tooling, machinery, labour, overheads (heating, lighting, insurance, transport etc). • Production costs must be factored into the overall cost of the final product. • Production costs are split across the predicted number of products that will be manufactured. | |
| Materials Selection | <p>The following factors affect material selection:</p> <ul style="list-style-type: none"> • Cost • Aesthetics • Mechanical properties • Electrical properties • Thermal conductivity • Scarcity – how rare a material is. • Processing – the energy and time required to turn the raw material into a usable form. • Ease of manufacture • Environmental impact | |
| 2.3 Influences on Engineering Product Design | | |
| Market Pull | Designers create products in response to the needs of the marketplace (surveys, questionnaires – market research). Market pull will generate predictable sales, but products are open to copyright issues from other companies. | |
| Technology Push | <p>Revolutionary ideas (brand new) are pushed onto the marketplace. It could be a new material, manufacturing method or technology. Technology push requires lots of R&D (research and development) which is time consuming and costly.</p> <p>Generally, companies will patent new ideas and capture the market for at least 20 years or sell the manufacturing rights to other companies. Technology push can be risky but financially rewarding because companies cannot guarantee if consumers will adopt the new idea.</p> | |
| Cultural and fashion trends | <ul style="list-style-type: none"> • Understanding the cultural needs of the intended marketplace is essential to make sure the product is a success and doesn't cause offense within the intended country or region. • Understanding fashion trends can increase sales by making the product more appealing to its target market. | |
| Safety Standards and Legislation | Kitemark – British Standards | Conformity European |

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| |  |  | <ul style="list-style-type: none"> • The symbol signifies that the product has been tested and is safe to use. • Both organisations are independent bodies free from bias. • The organisations set out the minimum safety requirements that a product should meet. Companies must meet criteria if they wish to sell the product within the UK or European Union. • Now the UK has left the EU the UKCA (United Kingdom Conformity Assessment) has replaced it. |
| Legislation | Law | | |
| Standard | An agreed way of doing something | | |
| Prosecuted | Officially accused of breaking the law in court e.g., if a safety regulation has not been adhered to and the product causes an accident. | | |
| WEEE |  | <p>Waste electrical and electronic equipment directive</p> <p>Legislation encouraging the recovery of electrical waste at specialist centres.</p> | |
| Right to Repair | EU and UK law requires companies to sell spare parts for ten years after its manufacture date and be designed in a way that it can be repaired by a non-specialist technician. | | |
| Planned Obsolescence | <ul style="list-style-type: none"> • A product that is designed to last for a limited time. Products are designed to fail on purpose to either increase sales or for safety reasons. This can have a negative impact on the environment, wasting unnecessary materials and energy. • Some products are designed to fail of purpose for safety reasons such as food (sell by dates), smoke alarms and fire extinguishers. <p>Perceived Obsolescence – marketing (advertising) that encourages users to upgrade to a newer model to increase sales.</p> | | |
| <p>Sustainable Design</p> <ul style="list-style-type: none"> • Finite: will run out • Non-finite: will not run out – timber, paper, cotton, bamboo etc. • Renewable: the source material can be replaced | <p>A design process that aims to make a product as environmentally friendly as possible by reducing the negative impact it has on the environment.</p> <p>Materials (source and type) and manufacturing methods should be chosen very carefully. Other factors that should be considered are material extraction/refining and transportation.</p> <p>6 Rs of sustainability should be considered, to help reduce the environmental impact of a new product:</p> <ol style="list-style-type: none"> 1. Recycle – can the product be designed in a way to make it easier to take apart and recycle? Can the materials be recycled? 2. Repair – can the product be designed in a way that makes it easier to fix and extend its life? 3. Reuse – can the product be reused at the end of its life (extend its life)? | | |

| <ul style="list-style-type: none"> • Biodegradable: can break down/rot naturally | <ol style="list-style-type: none"> 4. Refuse – should we refuse to use certain materials that are damaging to the environment? Are they difficult to recycle or damaging when they are refined or extracted? 5. Rethink – can we change the design to reduce its impact on the environment? 6. Reduce – can we reduce the amount, number of materials and energy required to manufacture the product? | | | | | | | | | | |
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| Recycling | <p>Products are processed and repurposed to create new materials or objects.</p> <table border="1"> <thead> <tr> <th>Advantages</th> <th>Disadvantages</th> </tr> </thead> <tbody> <tr> <td>Raw materials are saved from going to landfill.</td> <td>Collection and transportation cause pollution. Emissions are produced by lorries.</td> </tr> <tr> <td>Less energy is used recycling materials compared to creating the material from resources either harvested or mined. It also avoids unnecessary transportation of raw materials from abroad.</td> <td>Recycling plants require energy to process the waste materials. Energy that could have been created by burning fossil fuels in power stations. This in turn creates CO2 emissions increasing the greenhouse effect and adding to potential global warming.</td> </tr> <tr> <td>Energy is saved not having to source raw materials.</td> <td>Recycling is labour intensive. Not all materials can be separated and will ultimately be incinerated or end up in landfill.</td> </tr> <tr> <td>Creates jobs.</td> <td></td> </tr> </tbody> </table> | Advantages | Disadvantages | Raw materials are saved from going to landfill. | Collection and transportation cause pollution. Emissions are produced by lorries. | Less energy is used recycling materials compared to creating the material from resources either harvested or mined. It also avoids unnecessary transportation of raw materials from abroad. | Recycling plants require energy to process the waste materials. Energy that could have been created by burning fossil fuels in power stations. This in turn creates CO2 emissions increasing the greenhouse effect and adding to potential global warming. | Energy is saved not having to source raw materials. | Recycling is labour intensive. Not all materials can be separated and will ultimately be incinerated or end up in landfill. | Creates jobs. | |
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| Creates jobs. | | | | | | | | | | | |
| Upcycling | <p>Finding creative uses for old products to prevent them going to landfill e.g., turning car tyres into play equipment.</p> | | | | | | | | | | |
| Circular Economy | <p>Designing products that avoid the use of finite resources and can be repurposed or recycled at the end of their life.</p> | | | | | | | | | | |
| Linear Economy | <p>Designing products that mainly use finite resources that are not repurposed or recycled at the end of the products life and end up as waste in landfill.</p> | | | | | | | | | | |

Characters of Macbeth

Year 11 – Macbeth – English KO

Plot

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| Macbeth | Eponymous protagonist, ambitious and ruthless. | Act 1 | M and Banquo meet witches, Cawdor executed, Lady M reads letter, taunts M, Duncan arrives. |
| Lady Macbeth | Defies expectations, strong and ambitious, but goes mad. | Act 2 | M kills Duncan, Malcolm flees, M crowned. |
| Witches | Supernatural beings, prophesy, could represent conscience. | Act 3 | Banquo suspects M, murder of B, Fleance escapes, M haunted by B's ghost at a banquet |
| Banquo | Macbeth's friend, sons prophesied to rule, killed and returns as ghost. | Act 4 | Witches show M future kings – sons of Banquo, Macduff's family murdered, Malcolm says he is dishonest to test Macduff's loyalty. |
| Duncan | Good king, praises Macbeth at start, murdered in Act 2. | Act 5 | Lady M sleepwalks, dies, Macduff kills Macbeth, Malcolm restored as King. |
| Macduff | Wife and children killed; kills Macbeth; born by caesarian | Dramatic/Stylistic Devices | |
| Malcolm | Heir to throne, good man, flees to England, finally crowned. | Soliloquy | One character speaking to audience; M uses to make audience complicit |
| Fleance | Banquo's son, represent innocence and justice. | Dramatic irony | Audience knows more than characters; audience knows D will die |
| Key quotes | | Hamartia | Tragic flaw; M's could be easily influenced/ambition |
| Appearance/reality | Witches: Fair is foul and foul is fair (1.1) | Hubris | Pride; M could be said to have this or Lady M |
| M plots his crime | Macbeth: Stars, hide your fires/Let not light see my black and deep desires (1.4) | Catharsis | Purgation of pity and fear; happens at the end |
| Unnatural | Lady M: Come, you spirits... Unsex me here (1.5) | Anagnorisis | Recognition or the tragedy to come |
| Hallucination | Macbeth: Is this a dagger I see before me? (2.1) | Peripeteia | Sudden reversal of fortune |
| Lady M is braver | Lady M: My hands are of your colour but I shame to wear a heart so white (2.2) | Rhyme | Used by the witches to create chant-like, supernatural atmosphere |
| Paranoid | Macbeth: To be thus is nothing but to be safely thus (3.1) | Motifs | |
| Guilt | Macbeth: Full of scorpions is my mind dear wife (3.2) | Nature | 'Against the use of nature' (1.3); 'Tis unnatural,/ Even like the deed that's done' (3.4); 'And his gash'd stabs looked like a breach in nature' (3.1); 'Boundless intemperance/ In nature is a tyranny' (4.3) |
| M hides info | Macbeth: Be innocent of the knowledge, dearest chuck (3.2) | Light and dark | 'Stars, hid your fires; Let not light see my black and deep desires' (1.4); 'that darkness does the face of earth entomb,/When living light should kiss it?' (4.2); 'Come, seeling night,/ Scarf up the tender eye of pitiful day' (3.2) |
| Cyclical | Macbeth: Blood will have blood (3.4) | Children | 'Your children shall be kings' (1.3); 'And pity, like a naked new-born babe,' (1.7); 'I have given suck, and know / How tender 'tis to love the babe that milks me' (1.7); 'He has no children. All my pretty ones?' (4.3) |
| Tragic hero | Malcolm: This tyrant whose sole name blisters our tongue was once thought honest (4.3) | Blood | 'Make thick my blood' (1.5); 'And on thy blood and dungeon gouts of blood.../It is the bloody business which informs thus to mine eyes' (2.1); 'Will all great Neptune's ocean wash this blood clean from my hand?' (2.1); 'Here's the smell of blood still.' (5.1) |
| Guilt/anxiety | Lady M: All the perfumes of Arabia will not sweeten this little hand (5.1) | Sleep | 'Nature seems dead, and wicked dreams abuse / The curtain'd sleep' (2.1); 'There's one did laugh in's sleep, and one cried 'Murder!'' (2.2); 'Macbeth does murder sleep' (2.2); 'A great perturbation in nature, to receive at once the benefit of sleep and do the effects of watching!' (5.1) |
| Existential crisis | Macbeth: Life's but a walking shadow, a poor player (5.5) | Dreams | 'Art thou not, fatal vision, sensible / To feeling as to sight? (2.1); 'Hence, horrible shadow! Unreal mockery, hence!' (3.4); 'Wash your hands; put on your nightgown; look not so pale! I tell you yet again, Banquo's buried.' (5.1); 'My wife and children's ghosts will haunt me still' (5.7) |
| Betrayal of prophecy | Macbeth: I bear a charmed life (5.8) | | |
| Key themes | | | |
| Fate and free will | Is the action pre-decided? | | |
| Ambition | The Macbeths' ambition drives the play. | | |
| Appearance and reality | People and events are not always as they seem. | | |

Plot

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| Act 1 | M and Banquo meet witches, Cawdor executed, Lady M reads letter, taunts M, Duncan arrives. |
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| Act 5 | Lady M sleepwalks, dies, Macduff kills Macbeth, Malcolm restored as King. |

| Chapter | Plot <u>Jekyll and Hyde</u> | <u>YEAR 11 – JEKYLL AND HYDE LITERATURE– ENGLISH KO</u> | | Vocabulary | Context |
|------------------------------------|---|---|---|--------------|---|
| 1 The Story of the Door | <i>Passing a strange-looking door whilst out for a walk, Enfield tells Utterson about incident involving a man (Hyde) trampling on a young girl. The man paid the girl compensation. Enfield says the man had a key to the door (which leads to Dr Jekyll's laboratory)</i> | Character | | Jaded | <i>Fin-de-siècle fears</i> – at the end of the 19 th century, there were growing fears about: migration and the threats of disease; sexuality and promiscuity; moral degeneration and decadence. |
| 2 Search for Hyde | <i>Utterson looks at Dr Jekyll's will and discovers that he has left his possessions to Mr Hyde in the event of his disappearance. Utterson watches the door and sees Hyde unlock it, then goes to warn Jekyll. Jekyll isn't in, but Poole tells him that the servants have been told to obey Hyde.</i> | Dr Henry Jekyll | <i>A doctor and experimental scientist who is both wealthy and respectable.</i> | Ethics | |
| 3 Dr Jekyll was Quite at Ease | <i>Two weeks later, Utterson goes to a dinner party at Jekyll's house and tells him about his concerns. Jekyll laughs off his worries.</i> | Mr Edward Hyde | <i>A small, violent and unpleasant-looking man; an unrepentant criminal.</i> | Knaveish | <i>Victorian values</i> – from the 1850s to the turn of the century, British society outwardly displayed values of sexual restraint, low tolerance of crime, religious morality and a strict social code of conduct. |
| 4 The Carew Murder Case | <i>Nearly a year later, an elderly gentleman is murdered in the street by Hyde. A letter to Utterson is found on the body. Utterson recognises the murder weapon has a broken walking cane of Jekyll's. He takes the police to Jekyll's house to find Hyde, but are told he hasn't been there for two months. They find the other half of the cane and signs of a quick exit.</i> | Gabriel Utterson | <i>A calm and rational lawyer and friend of Jekyll.</i> | Yield | |
| 5 Incident of the Letter | <i>Utterson goes to Jekyll's house and finds him 'looking deadly sick'. He asks about Hyde but Jekyll shows him a letter that says he won't be back. Utterson believes the letter has been forged by Jekyll to cover for Hyde.</i> | Dr Hastie Lanyon | <i>A conventional and respectable doctor and former friend of Jekyll.</i> | Lamentable | The implications of <i>Darwinism and evolution</i> haunted Victorian society. The idea that humans evolved from apes and amphibians led to worries about our lineage and about humanity's reversion to these primitive states. |
| 6 Remarkable Incident of Dr Lanyon | <i>Hyde has disappeared and Jekyll seems more happy and sociable until a sudden depression strikes him. Utterson visits Dr Lanyon on his death-bed, who hints that Jekyll is the cause of his illness. Utterson writes to Jekyll and receives a reply that suggests he is has fallen 'under a dark influence'. Lanyon dies and leaves a note for Utterson to open after the death or disappearance of Jekyll. Utterson tries to revisit Jekyll but is told by Poole that he is living in isolation.</i> | Richard Enfield | <i>A distant relative of Utterson and well-known man about town.</i> | Laced | |
| 7 Incident at the Window | <i>Utterson and Enfield are out for walk and pass Jekyll's window, where they see him confined like a prisoner. Utterson calls out and Jekyll's face has a look of 'abject terror and despair'. Shocked, Utterson and Enfield leave.</i> | Poole | <i>Jekyll's manservant.</i> | Atavism | <i>Physiognomy</i> – Italian criminologist Cesare Lombroso (1835-1909) theorised that the 'born criminal' could be recognised by physical characteristics, such as asymmetrical facial features, long arms or a sloping forehead. |
| 8 The Last Night | <i>Poole visits Utterson and asks him to come to Jekyll's house. The door to the laboratory is locked and the voice inside sounds like Hyde. Poole says that the voice has been asking for days for a chemical to be brought, but has rejected it each time as it is not pure. They break down the door and find a twitching body with a vial in its hands. There is also a will which leaves everything to Utterson and a package containing Jekyll's confession and a letter asking Utterson to read Lanyon's letter.</i> | Sir Danvers Carew | <i>A distinguished gentlemen who is beaten to death by Hyde.</i> | Narcissistic | |
| 9 Dr Lanyon's Narrative | <i>The contents of Lanyon's letter tells of how he received a letter from Jekyll asking him to collect chemicals, a vial and notebook from Jekyll's laboratory and give it to a man who would call at midnight. A grotesque man arrives and drinks the potion which transforms him into Jekyll, causing Lanyon to fall ill.</i> | Mr Guest | <i>Utterson's secretary and handwriting expert.</i> | Debauched | <i>Victorian London</i> – the population of 1 million in 1800 to 6.7 million in 1900, with a huge numbers migrating from Europe. It became the biggest city in the world and a global capital for politics, finance and trade. The city grew wealthy. |
| 10 Henry Jekyll's Full Statement | <i>Jekyll tells the story of how he turned into Hyde. It began as a scientific investigation into the duality of human nature and an attempt to destroy his 'darker self'. Eventually he became addicted to being Hyde, who increasingly took over and destroyed him.</i> | Themes | | Hypocrisy | |
| | | The duality of human nature | | Yearn | <i>Urban terror</i> – as London grew wealthy, so poverty in the city also grew. The overcrowded city became rife with crime. The crowd as something that could hide sinister individuals became a trope of Gothic and detective literature. |
| | | Science and the unexplained | | Debased | |
| | | The supernatural | | Existential | <i>Robert Louis Stevenson</i> was born and raised in Edinburgh, giving him the dual identity of being both Scottish and British. Edinburgh was a city of two sides - he was raised in the wealthy New Town area, but spent his youth exploring the darker, more sinister side of town. |
| | | Reputation | | animalistic | |
| | | Rationality | | evolution | <i>Deacon Brodie</i> – a respectable member of Edinburgh's society and town councilor, William Brodie lead a secret life as a burglar, womaniser and gambler. He was hanged in 1788 for his crimes. As a youth, Stevenson wrote a play about him. |
| | | Urban terror | | duality | |
| | | Secrecy and silence | | degenerate | |
| | | | | morality | |
| | | | | reputation | |
| | | | | Suppression | |
| | | | | savage | |
| | | | | civilised | |

| Chapter | Plot |
|---------|---|
| 1 | <i>Passing a strange-looking door whilst out for a walk, Enfield tells Utterson about incident involving a man (Hyde) trampling on a young girl. The man paid the girl compensation. Enfield says the man had a key to the door (which leads to Dr Jekyll's laboratory)</i> |
| 2 | <i>Utterson looks at Dr Jekyll's will and discovers that he has left his possessions to Mr Hyde in the event of his disappearance. Utterson watches the door and sees Hyde unlock it, then goes to warn Jekyll. Jekyll isn't in, but Poole tells him that the servants have been told to obey Hyde.</i> |
| 3 | <i>Two weeks later, Utterson goes to a dinner party at Jekyll's house and tells him about his concerns. Jekyll laughs off his worries.</i> |
| 4 | <i>Nearly a year later, an elderly gentleman is murdered in the street by Hyde. A letter to Utterson is found on the body. Utterson recognises the murder weapon has a broken walking cane of Jekyll's. He takes the police to Jekyll's house to find Hyde, but are told he hasn't been there for two months. They find the other half of the cane and signs of a quick exit.</i> |
| 5 | <i>Utterson goes to Jekyll's house and finds him 'looking deadly sick'. He asks about Hyde but Jekyll shows him a letter that says he won't be back. Utterson believes the letter has been forged by Jekyll to cover for Hyde.</i> |
| 6 | <i>Hyde has disappeared and Jekyll seems more happy and sociable until a sudden depression strikes him. Utterson visits Dr Lanyon on his death-bed, who hints that Jekyll is the cause of his illness. Utterson writes to Jekyll and receives a reply that suggests he is has fallen 'under a dark influence'. Lanyon dies and leaves a note for Utterson to open after the death or disappearance of Jekyll. Utterson tries to revisit Jekyll but is told by Poole that he is living in isolation.</i> |
| 7 | <i>Utterson and Enfield are out for walk and pass Jekyll's window, where they see him confined like a prisoner. Utterson calls out and Jekyll's face has a look of 'abject terror and despair'. Shocked, Utterson and Enfield leave.</i> |
| 8 | <i>Poole visits Utterson and asks him to come to Jekyll's house. The door to the laboratory is locked and the voice inside sounds like Hyde. Poole says that the voice has been asking for days for a chemical to be brought, but has rejected it each time as it is not pure. They break down the door and find a twitching body with a vial in its hands. There is also a will which leaves everything to Utterson and a package containing Jekyll's confession and a letter asking Utterson to read Lanyon's letter.</i> |
| 9 | <i>The contents of Lanyon's letter tells of how he received a letter from Jekyll asking him to collect chemicals, a vial and notebook from Jekyll's laboratory and give it to a man who would call at midnight. A grotesque man arrives and drinks the potion which transforms him into Jekyll, causing Lanyon to fall ill.</i> |
| 10 | <i>Jekyll tells the story of how he turned into Hyde. It began as a scientific investigation into the duality of human nature and an attempt to destroy his 'darker self'. Eventually he became addicted to being Hyde, who increasingly took over and destroyed him.</i> |

Character

| | |
|--|---|
| | <i>A doctor and experimental scientist who is both wealthy and respectable.</i> |
| | <i>A small, violent and unpleasant-looking man; an unrepentant criminal.</i> |
| | <i>A calm and rational lawyer and friend of Jekyll.</i> |
| | <i>A conventional and respectable doctor and former friend of Jekyll.</i> |
| | <i>A distant relative of Utterson and well-known man about town.</i> |
| | <i>Jekyll's manservant.</i> |
| | <i>A distinguished gentlemen who is beaten to death by Hyde.</i> |
| | <i>Utterson's secretary and handwriting expert.</i> |

Character

Dr Henry Jekyll

Mr Edward Hyde

Gabriel Utterson

Dr Hastie Lanyon

Richard Enfield

Poole

Sir Danvers Carew

Mr Guest

Character

| | |
|-------------------|---|
| Richard Enfield | <i>A doctor and experimental scientist who is both wealthy and respectable.</i> |
| Dr Henry Jekyll | <i>A small, violent and unpleasant-looking man; an unrepentant criminal.</i> |
| Sir Danvers Carew | <i>A calm and rational lawyer and friend of Jekyll.</i> |
| Dr Hastie Lanyon | <i>A conventional and respectable doctor and former friend of Jekyll.</i> |
| Gabriel Utterson | <i>A distant relative of Utterson and well-known man about town.</i> |
| Mr Guest | <i>Jekyll's manservant.</i> |
| Mr Edward Hyde | <i>A distinguished gentlemen who is beaten to death by Hyde.</i> |
| Poole | <i>Utterson's secretary and handwriting expert.</i> |

Match up
the
character to
their
description

Vocabulary

suppression

feral

duplicity

atavism

allegory

metamorphosis

savage

Victorian

anxiety

professional

Genre

respectability

consciousness

restraint

Unorthodox

Allusion

degenerate

subconscious

depraved

Aberration

Supernatural

duality

Abhorrent

debased

Ethics

perversion

epistolary

eugenics

- Put in alphabetical order
- Define words

Context

1

_____ – at the end of the 19th century, there were growing fears about: migration and the threats of disease; sexuality and promiscuity; moral degeneration and decadence.

2

_____ – from the 1850s to the turn of the century, British society outwardly displayed values of sexual restraint, low tolerance of crime, religious morality and a strict social code of conduct.

3

The implications of _____ haunted Victorian society. The idea that humans evolved from apes and amphibians led to worries about our lineage and about humanity's reversion to these primitive states.

4

_____ – Italian criminologist Cesare Lombroso (1835-1909) theorised that the 'born criminal' could be recognised by physical characteristics, such as asymmetrical facial features, long arms or a sloping forehead.

5

_____ – the population of 1 million in 1800 to 6.7 million in 1900, with a huge numbers migrating from Europe. It became the biggest city in the world and a global capital for politics, finance and trade. The city grew wealthy.

6

_____ – as London grew wealthy, so poverty in the city also grew. The overcrowded city became rife with crime. The crowd as something that could hide sinister individuals became a trope of Gothic and detective literature.

7

_____ was born and raised in Edinburgh, giving him the dual identity of being both Scottish and British. Edinburgh was a city of two sides - he was raised in the wealthy New Town area, but spent his youth exploring the darker, more sinister side of town.

8

_____ – a respectable member of Edinburgh's society and town councilor, William Brodie lead a secret life as a burglar, womaniser and gambler. He was hanged in 1788 for his crimes. As a youth, Stevenson wrote a play about him.

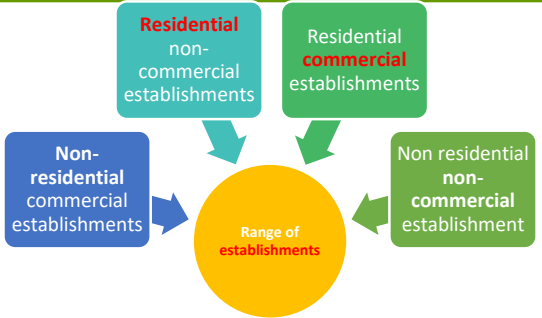
| Themes | |
|-----------------------------|--|
| The duality of human nature | |
| Science and the unexplained | |
| The supernatural | |
| Reputation | |
| Rationality | |
| Urban terror | |
| Secrecy and silence | |

Provide 1 quotation for each theme

AC 1.1

The structure of the hospitality and catering industry

1. Types of Provider



| Establishment | Service provided | Examples |
|--------------------------------|--|--|
| Commercial residential | Accommodation, house keeping, food, beverages, conference or training facilities | Hotels, guest houses, campsites, bed and breakfasts, holiday parks, farmhouses |
| Commercial non-residential | Food and beverage to eat in or take away, areas to sit to eat and drink | Restaurants, cafes, tea rooms, coffee shops, fast food outlets, pubs and bars, street food and pop up restaurants, mobile vans |
| Non-commercial residential | Accommodation, food and beverages | Hospitals, care homes, prisons, armed forces, boarding schools, colleges, universities. |
| Non-commercial non-residential | Food and beverages | Canteens in offices, day-care centres, schools and nurseries, charity food suppliers, for example soup kitchen |

2. Suppliers



Types of service

| Food Service | Description |
|---------------------------|---|
| Formal food | Food is usually served to customers by waiting staff <ul style="list-style-type: none"> Plate: the meal is plated up and brought to the customers table by waiting staff Waiting service: the food is served to the customers at the table by waiting staff Guerridon (trolley or movable service): the customer's food is cooked at the table, usually for dramatic effect, for example flambéed Steaks and crepes. |
| Street food | Ready-to-eat food or drink sold on the street or in a public place, such as a market or festival. |
| Self Service | Customers help themselves to food, for example a canteen, in a canteen the meal is on display and carved by a chef, and a customer can help themselves to vegetables, sauces and gravy. |
| Fast food | Food is made to order very quickly and can be taken away from the restaurant or stall to eat, seats and tables are often provided. |
| Cafeteria | Small and inexpensive restaurant or coffee bar, serving light meals and refreshments. |
| Takeaway | Takeaway restaurants (for example Chinese, Indian, pizza) take an order and deliver the food to the customer's home; customers can also order at the restaurant and then take the food away to eat it. |
| Buffet | A selection of dishes is laid out for customers to help themselves, different buffet styles include: <ul style="list-style-type: none"> Sit-down buffet: once the customer has chosen their food from the buffet, they can sit down at a table to eat it. Stand-up or fork buffet: once the customer has chosen their food, they stand to eat it, this allows guests to circulate and meet other guests Finger buffet: all the food is prepared to be eaten with fingers (without the need for a knife and fork); foods are normally bite-size and easy to eat. |
| Automatic vending | Drinks and snacks are stored in a machine with a glass front and items are selected by the customer, they are often coin operated and placed in establishments where it may not always be possible to get access to food, for examples colleges and hospitals |
| Transport catering | A variety of food service options are available on trains, planes and ships. |
| Hotel | Provides overnight accommodation and food and drink options. Many hotels offer breakfast, evening meals, bar snacks, lunch, room service (food ordered and delivered to your room), budget hotels usually have a simpler offering |
| Bed and breakfast | Offers overnight accommodation and breakfast, often these are private family homes where rooms are made available to guests, breakfast is usually served in a dining room or the owners kitchen |

Hospitality at non-catering venues
Contract Caterers provide:

- food for functions such as weddings, banquets and parties in private houses.
- prepare and cook food and deliver it to the venue, or cook it on site.
- They may also provide staff to serve the food, if required.
- Complete catering solutions for works canteens etc

Unit 1 The Hospitality and Catering Industry
L01 Understanding the environment in which hospitality and catering providers operate
 AC 1.1 The structure of the hospitality and catering industry

3. Standards and ratings

Hotel and Guest house standards
 Hotels and guest houses are often given a star rating. Star ratings help customers to know what services and facilities they can expect at a hotel or guest house. The quality of the service provided is rated on a scale of one to five stars

ONE STAR All of the above, plus:
 At least 5 bedrooms with en-suite or private facilities
 Open 7 days a week
 Guests have access to all facilities
 Clearly defined reception area
 Reception opening/booking 7 days a week & evening meals 3 days a week
 Linen/cleaner

TWO STARS All of the above, plus:
 Higher standards of cleanliness, hospitality & responsiveness
 Access without a key 10pm - 11pm, & within 10m of all other areas
 Dinner served & evening meals, snacks on the bar
 Room service for drinks & snacks during daytime & evening
 All bedrooms en-suite
 Personal telephone system
 WiFi public areas

THREE STARS All of the above, plus:
 24-hour room service with full breakfast and dinner
 Reception open to residents & non-residents for breakfast & dinner every day of the week
 Higher staffing levels
 24-hour access facilitated by on-duty staff
 Reception open to residents with 24-hour concierge
 Enhanced services such as afternoon tea, luggage assistance or in-room functions
 WiFi in bedrooms

FOUR STARS All of the above, plus:
 Open all year round
 Provision service & customer care
 Additional receptionists
 Additional facilities such as a second dining area, business centre, spa & permanent laundry suite
 Enhanced services such as online booking, concierge & access to bedrooms
 Restaurant opens every day for all meals
 WiFi in at least 80% of bedrooms

FIVE STARS All of the above, plus:
 Open all year round
 Provision service & customer care
 Additional receptionists
 Additional facilities such as a second dining area, business centre, spa & permanent laundry suite

3. Standards and ratings

Food hygiene standards
 The Food standards agency runs a scheme with local authorities where they score businesses on a scale from zero to five to help customers make an informed choice about where to eat. The rating is usually displayed as a sticker in the window of the premises. The scores mean:



Keywords

Extended reading

Exam question

Video links

Revision Techniques

Restaurant standards
 The three main restaurant rating systems used in the UK are Michelin stars, AA Rosette Awards and The Good Food Guide reviews: **Michelin stars** are a rating system used to grade restaurants for their quality: One star is a very good restaurant Two star is excellent cooking Three stars is exceptional cuisine



AA Rosette Awards score restaurants from one (a good restaurant that stands out from the local competition) to five (cooking that compares with the best in the world)

The Good Food Guide gives restaurants a score from one (capable cooking but some inconsistencies) to ten (perfection)

Environmental standards

The Sustainable Restaurant Association awards restaurants a one-two-three star rating in environmental standards. To achieve this the restaurant has to complete an online survey about sourcing, society and the environment. It is then given an overall percentage for environmental standards:
 One star: 50-59%
 Two star: 60-69%
 Three stars: more than 70%

OUR 14 KEY FOCUS AREAS

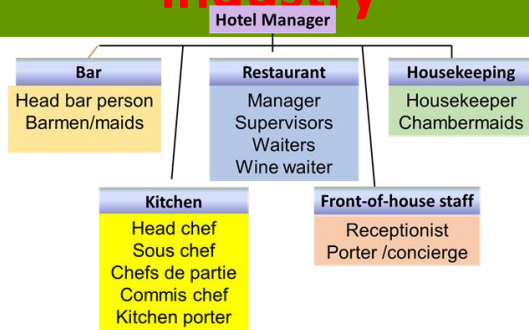
sourcing
 Local & Seasonal, Ethical Meat & Dairy, Pasture Farming, Sustainable Fish, Fair Trade

society
 Treating People Fairly, Healthy Eats, Community Engagement, Responsible Marketing

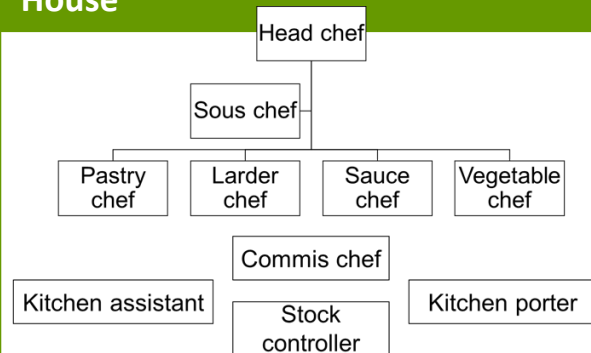
environment
 Supply Chain, Waste Management, Water/Resource, Energy Efficiency, Water Saving

4. Job roles in the

Staff structure in a hotel



5. The Kitchen brigade- Back of House



Most large establishments could have **chefs de partie** in the following areas:

- **Sauce chef**- Le Saucier
- **Pastry chef**- Le Pâtissier- baked goods and dessert
- **Fish chef**- Le Poissonnier
- **Vegetable chef**- L'entremetier
- **Soup chef**- Le Potager
- **Larder chef**- Le garde manger- cold starters and salads
- The **commis chef** or assistant chef is a chef in training
- The **kitchen porter** washes up and may do basic vegetable preparation
- The **stock controller** is in charge of all aspects of store keeping and stock control.

6. Front of House roles

Reception

Receptionist: meet customers and direct them to the correct person or place; they manage visitor lists and booking systems
Porter/ Concierge; assist hotel guests by making reservations, booking taxis and booking tickets for local attractions and events.

Restaurant and bar

Restaurant manager (Maître d'Hôte): The restaurant manager is in overall charge of the restaurant; they take bookings, relay information to the head chef, complete staff rotas, ensure the smooth running of the restaurant

Head waiter (ess): Second in charge of the restaurant. Greets and seats customers, relays information to the staff, Deals with complaints and issues referred by the waiting staff.

Waiting staff Serve customers, clear and lay tables, check the customers are satisfied with the food and service. May give advice on choices from the menu and special order foods

Wine waiter- Le sommelier: Specialises in all areas of wine and matching food, advises customers on their choices of wine, Wine waiters serve the wine to the customer and can advise customers on their choices as well

Bar staff serve drinks and take food orders, wash up, clear tables, change barrels and fill shelves.

Baristas make and serve hot and cold beverages, in particular different types of coffee such as espresso, cappuccino and latte.

wjec cbac Unit 1 The Hospitality and Catering Industry
 LO1 Understanding the environment in which hospitality and catering providers operate
 AC 1.1 The structure of the hospitality and catering industry



7. Average salaries in the hospitality and catering industry

| Role | Average Salary |
|-----------------------|----------------|
| Hotel Management | £37,310 |
| Head executive chef | £36,613 |
| Pastry chef | £30,530 |
| Housekeeper | £24,055 |
| Receptionist | £21,596 |
| Porter | £17,718 |
| Waiting and bar staff | £16,735 |
| Kitchen staff | £16,556 |

8. Training

| Level | Types of training |
|----------------------------|---|
| Key stage 4 school courses | Level ½ Vocational award in Hospitality and Catering |
| Post 16-19 | Colleges offer many courses for those leaving school after Year 11, for example: <ul style="list-style-type: none"> • Certificate in Hospitality and Catering Level 1 • Certificate in Introduction to Culinary Skills Level 1 • Diploma in Introduction to Professional Cookery Level 1 • Diploma in Hospitality and Catering Level 2 • Diploma in Professional Cookery Level 2 |
| Universities | Universities offer degree, HND and HNC courses in subjects such as: <ul style="list-style-type: none"> • Catering • Hospitality • Culinary Arts • Hotel management • Food and beverage service |
| Apprenticeships | These provide both work experience and training |
| In-house training | On-the-job training provided by the organisation you work for |

9. Personal attributes



| Job Role | Desirable Attributes |
|-----------------|---|
| Waiter/waitress | <u>Attentive</u> listener, good memory, clear <u>communicator</u> , diplomatic, calm and <u>assured</u> , high level of focus and attention, multitasker, can work in a team, <u>physical stamina</u> , <u>courteous</u> and polite, hardworking. |
| Receptionist | Professional, positive attitude and behaviour, clear communicator, helpful, an work in a team, courteous and polite, can learn skills quickly, calm, <u>composed</u> , approachable. |
| Housekeeper | Physical stamina, tactful, diplomatic, calm, courteous and polite, good memory, can work in a team. |
| Head Chef | Organised, able to accept criticism, physical stamina, creative, attention to detail, can handle highly stressful situations, passion for food and cooking. |
| Commis chef | Attentive listener, clear communicator, can work in a team, passion for food and cooking, physical stamina, creative. |

Keywords



Extended reading



Exam question



Video links



Revision Techniques

1.3 Working conditions across the hospitality and catering industry

1.3 Working conditions across the hospitality and catering industry

Employers want to employ most workers when they have busy times

Busy times of year: **Days of the week** **Time of day**

- Christmas
- Tourist season
- School holidays
- Mothers day
- Valentines
- Friday
- Saturday
- Sunday
- Pay day
- Lunchtime
- Afternoon
- Dinner time
- (breakfast)



10. Working hours

- Hospitality and Catering jobs tend to be long hours, early starts for breakfast in a hotel to late nights for dinner in a restaurant.
- Staff will still get 2 days off a week but it will be quieter days instead of the weekend
- Shifts could be 6-3. 11-6. 3-11 or other hours.
- Monthly salaried staff may not have set hours eg Head Chef who might work from early morning to late night every day

11. The national Minimum Wage

New minimum wage rates



Source: Department for Work and Pensions



12. Contracts of employment

Full-time and part-time employees must have



1. a written statement of employment or **contract** setting out their duties, rights and responsibilities
2. the statutory minimum level of paid holiday 28 days for full time workers
3. a pay slip showing all deductions, eg National insurance, tax . Earning above £166 a week
4. the **statutory** minimum length of rest breaks- one 20 min break for 6 hrs worked
5. Statutory Sick Pay (SSP) £94.25 pw for 28 weeks (some may get full wages for a limited amount of time)
6. Maternity, paternity and adoption pay and leave-90% of earnings for 6 weeks then ££148.68 for next 33 weeks

Casual staff / Agency staff

- work for specific functions and can be employed through an agency.
- They do not have a contract or set hours of work.
- They are needed at busier times of the year e.g. at Christmas or for weddings, New years eve

Temporary staff

- Employed for a specific length of time such as the summer tourist season or the month of December.
- Temporary staff have the same rights as permanent staff for the duration of their contract.
- Temporary staff employed for longer than 2 years become permanent by law

Zero Hours Contract

This type of contract is between the employer and a worker, where the worker may sign an agreement to be available to work when they are needed, but no specific number of hours or times to start or end work are given. The employer is not required to offer the person any work and the worker is not required to accept the work.

13. Remuneration

Remuneration is a term used for the reward that people receive from working somewhere. It includes their basic pay, plus extra money t top u their income from:

- **Tips and gratuities-** money given to someone by a customer as a way of saying 'thank you' for good service
- **Service charge-** a percentage added to the customers bill to reward the employees who have provided the customer with a service
- **Bonus payments and rewards-** given by some employers as a way of rewarding hard work throughout the year and helping make the business successful.

It is quite common for all he tips, gratuities and service charges to be divided equally amongst all the workers in, e.g. restaurant. This is known as a tronc arrangement, and the person who works out and distributes the extra money is known as a 'troncmaster'.

14. Paid annual leave

- All workers are entitled to 28 days paid leave annually
- **no** legal right for employees to be given Bank and Public Holidays. Most hospitality staff would work these days

To calculate holiday entitlement,
Multiply the full-time entitlement (28 days) by the number of days worked and divide by the number of days full-time staff work

Entitlement for 3 days a week: $28 \times 3/5 = 16.8$ days

15. Compulsory Rest Breaks

Adult workers are entitled to 24 hours off in each 7 day period and young workers (15-18) are entitled to 2 days in 7.

Adult workers are entitled to at least 20 minutes uninterrupted rest if their working day is longer than 6 hours.

Young workers are entitled to 30 minutes rest if their working day is over 4.5 hours long.

Keywords



Extended reading



Exam question



Video links



Revision Techniques



Unit 1 The Hospitality and Catering Industry
LO1 Understanding the environment in which hospitality and catering providers operate
AC 1.1 The structure of the hospitality and catering industry

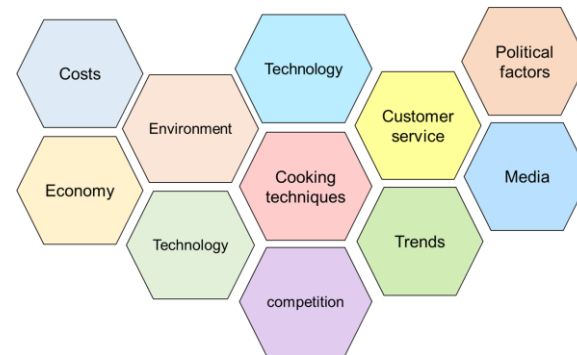


1.4 Factors that affect the **success** of Hospitality and catering providers

16. Reasons for **failure**

1. **A saturated market** – there is a fine line between competition & too many for the number of customers
2. **General business incompetence** – 46% of business fail due to lack of business knowledge
3. Lack of **capital** – not enough money to get through the first few months
4. **Location** – either not enough people walk past (foot-fall) live & work nearby
5. **Quality of life** - most restaurateurs work 60 hours a week – not the glamorous life they thought
6. **Lack of industry experience** – most successful restaurateurs tend to have previous industry experience
7. **Failure to create a good enough brand** – They did not incorporate the 12 Ps of restaurant branding, (Place, Product, Price, People, Promotion, Promise, Principles, Props, Production, Performance, Positioning and Press)
8. **Name of the restaurant is too long-** A restaurant with a name that is brief, descriptive and attractive is more likely to succeed.
9. **Lack of differentiation** -the brand is not different enough
10. **Poor financial controls** – Main costs – labour and food exceeded 60% of sales

17. Factors affecting success



Costs - need to make a profit. Consider cost of everything you buy and selling price.

- Material - Anything involved in making product
- Labour - Costs of staff
- **Overheads** - Anything not connected with making products

Economy - when the economy slows down, business have lower sales as consumers eat out less because they have less disposable income

Environment – 3 R's, packaging, food waste, global warming, carbon footprint, clean eating

Technology - Using technology to improve service, delivery and stock control – touch screen customer ordering, EPOS systems, stock management, apps for delivery services

Emerging and innovative cooking techniques – sous vide, clean eating, steaming, new restaurants,

Customer demographics and lifestyle

– delivery services Facebook Twitter

Customer service–customer satisfaction – free WiFi, order online

Competition - Low cost food (£1 menu, coffee McDs espresso v Starbucks)

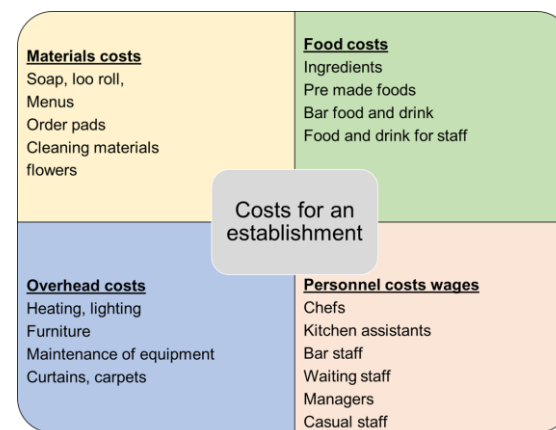
Trends healthy food options, pop-up bars, cafes and restaurants, cronut, clean eating, low carb, good fats,

Political factors - Increasing regulations – from government due to health issues, Brexit, use of migrant labour, migrants – ethnic foods

Media - Strong global brand, Good community reputation – children's charities / Ronald McDonald House, celebrity chefs, celebrity endorsements, Masterchef,



18. Costs for an establishment



19. Costing a recipe

Costing recipes

In order to calculate selling price and profit for dishes you need to calculate the recipe cost

$$\text{Ingredient cost} = \frac{\text{Pack cost}}{\text{Pack weight}} \times \text{weight used}$$

Divide by the number of portions made for the portion cost

Selling price

$$\text{Selling price} = \frac{\text{Portion cost}}{30} \times 100$$

20. What is portion control?

- Portion control is the amount of each menu item that is served to the customer.
- It depends on the type of customer, the type of food served,
- some foods are served in very small portions due to the high cost of the item eg caviar is served by the teaspoon



Keywords



Extended reading



Exam question



Video links



Revision Techniques

LO3 Understand how hospitality and catering provision meets health and safety requirements

3.1 Personal safety responsibilities in the workplace

It is both the employer's and employee's responsibility to make sure they follow health and safety rules at work because:

- They help prevent accidents
- They ensure the business is a safe place to work
- They ensure food is safe to eat

| Abbreviation | Full name |
|--------------|--|
| HASAWA | Health and safety at work act 1974 |
| RIDDOR | Reporting of injuries diseases and dangerous occurrences regulations 2013 |
| COSHH | Control of substances hazardous to health regulations 2002 |
| PPER | Personal protective equipment at work regulations 1992 http://www.hse.gov.uk/pubns/indg174.pdf |
| MHR | Manual handling operations regulations 1993 |

HASAWA 1974



Employers must ensure that:

- Equipment is tested for safety and correctly maintained
- Chemicals are stored and used correctly by trained staff
- **Risk assessments** are completed
- A **health and safety policy statement** is given to employees
- Safety equipment and clothing are provided
- Health and safety training is given and updated regularly

Employees must ensure that they:

- Work in a safe way so they do not put others in danger
- Follow the health and safety rules set by the employer
- Wear safety clothing and equipment provided by the employer
- Report anything that poses a health and safety risk, or something that could be a risk.

Risk assessments : a way of identifying things that could cause harm to people in the workplace

Health and safety policy statement : a written statement by an employer of its commitment to health and safety for employees and the public

RIDDOR 2013

This regulation require employers to report certain workplace incidents to the Health and Safety Executive (HSE) such as:

- Death and serious injury (for example serious burns)
- Dangerous occurrences (for example near-miss events such as the collapse of equipment)
- Work-related diseases (for example occupational dermatitis)
- Flammable gas incidents (for example leaking gas)
- Dangerous gas fitting (for example faulty gas cooker)

Employers must also keep a record of any injury, disease or dangerous accident.
An employee must ensure that:

- They tell their line manager or union representative if they see any health and safety issue that concerns them
- Any injury at work are recorded in an accident book

If nothing is done about a health and safety concern that an employee has reported, it can be reported to the HSE.

Unit 1 The Hospitality and Catering Industry
LO1 Understanding the environment in which hospitality and catering providers operate
 AC 1.1 The structure of the hospitality and catering industry

COSHH 2002



The control of Substances Hazardous to Health (COSHH) Regulations covers substances that are hazardous to health, for example:

- Chemicals, for example cleaning materials
- Fumes, from machinery and cooking processes
- Dusts, for example from icing sugar and flour
- Vapours from cleaning chemicals, for example oven cleaner
- Gases from cookers

Any substances hazardous to health must be:

- Stored, handled and disposed of according to COSHH Regulations
- Identified on the package or container
- Shown in writing and given a risk rating
- Labelled as toxic, harmful, irritant, corrosive, explosive or oxidising.

An employer should ensure that employee use of and exposure to these substances is kept to a minimum.
An employee should ensure that they are trained in the use of these substances. They should take note of the intentional symbols that are used to identify the different types of substances and how they can cause harm

PPER



Personal Protective Equipment (PPE) is clothing or equipment designed to protect the wearer from injury. It is sometimes necessary when cleaning as the chemicals used in the workplace are often stronger than those we may use at home. These regulations require employers to provide suitable high-quality protective clothing and equipment to employees who may be exposed to a risk to their health and safety while at work. This can include:

- **Gloves** to protect hands from cleaning materials and metallic-style gloves to be used when cutting meat
- **Goggles** to prevent eyes being splashed with chemicals
- **Facemasks** to prevent inhalation of any chemicals or powder
- **Long sleeves** to prevent contact with skin on arms
- Waterproof aprons to be worn on top of clothing

Signs to remind employees what PPE to wear and when should also be visible.
Employees are expected to attend training sessions on how to wear PPE and to wear it in the workplace as instructed by the employer

MHR



The manual Handling Operations Regulations protect employees from injury or accident when they are lifting or moving heavy or awkward shaped boxes. Items that are hot, frozen or sharp may also need to be carried in the hospitality industry-this is also covered by these regulations.
Employers must complete a risk assessment whenever items need to be moved, and provide adequate training.
Employees must be trained in correct manual handling techniques and lifting; moving equipment should be provided when appropriate.

Lifting

When handling boxes, cartons and trays, there is a correct way to lift:

- Always keep your back straight when lifting
- Bend your knees and use the strength in your arms
- Never reach forward
- Keep the item close to your body and make sure you hold the item firmly
- Use protective clothing if there are sharp edges to boxes or cartons
- Never attempt to carry items that are too heavy-always get help.

Keywords

Extended reading

Exam question

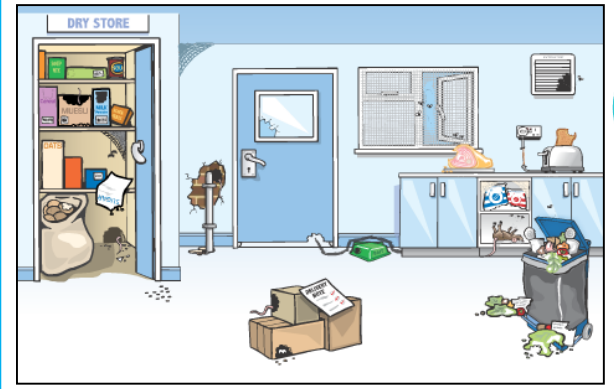
Video links

Revision Techniques

LO3 Understand how hospitality and catering provision meets health and safety requirements

3.2 Risks to personal safety in hospitality and catering

Can you spot the 17 hazards in the image below. Write them down in your book



Potential risks to employees, suppliers and customers

- Risk to employees**
Stress, fatigue, Using equipment, Trip hazards, Food and drink spillages, Using hazardous chemicals, Inadequate clothing worn, Using electrical appliances, Moving and lifting objects, Fire and explosion, Bullying and harassment, Injuries, Inadequate lighting, Inadequate ventilation, Inadequate signage, Theft, Assault, Undesirable people on the premises
- Risk to suppliers**
Using equipment, Trip hazards, Food and drink spillages, Inadequate clothing worn, Moving and lifting objects, Fire and explosion, Injuries, Inadequate lighting, Inadequate signage
- Risk to customers**
Food poisoning, Food allergies, Trip hazards, Food and drink spillages, Fire and explosion, Theft, Assault, Undesirable people on premises.

Risks to health and personal safety



Risks to security



Levels of risks

A risk assessment should be carried out to identify risks. It is a way of identifying things that could cause harm to people in the workplace. All workplaces must have the necessary risk assessments in place. In business there are five steps to risk assessment:

1. Identify the hazard
2. Decide who might be hard and how
3. Evaluate the risk and decide on **controls** (precautions)
4. Record the findings and implement them.
5. Review the assessment and update if necessary.

Calculating Risk

It is possible to calculate whether the level of **risk** is high, medium, or low. To do this, the **hazard** severity and the likelihood of it happening are given a score on a scale of one to five. They can then be multiplied together to give a level of risk. The overall aim is to reduce the risk to an acceptable level (as close to 1 as possible)

Scales used to calculate the level of risk:

| Hazard severity | Likelihood of occurrence | Scale |
|-----------------|--------------------------|-------|
| Trivial | Remote(almost never) | 1 |
| Minor | Unlikely (occurs rarely) | 2 |
| Moderate | Possible (uncommon) | 3 |
| Serious | Likely (not frequent) | 4 |
| Fatal | Very likely (frequently) | 5 |

Level of risk = hazard severity X likelihood of occurrence

| Low risk 1-8 | Medium risk 9-12 | High risk 15-25 |
|--|---|---|
| Continue to review regularly to ensure controls remain effective | Continue but implement additional controls where possible and monitor regularly | Stop the activity]Identify new controls Activity must not proceed until risks are reduced to a low or medium level |

Keywords

Extended reading

Exam question

Video links

Revision Techniques

LO3 Understand how hospitality and catering provision meets health and safety requirements

3.3 Personal safety control measures for hospitality and catering provision

Control measures for employees

The control measures outlined in the table can be put in place to help protect employee's personal safety

| Hazard | Control |
|-----------------------------|--|
| Stress, fatigue | Employees need to be monitored closely and adequate rest breaks should be allocated |
| Using equipment | The instruction manual needs to be followed, with training given if needed |
| Trip hazards | Floors need to be clutter free; exits and entrances need to be clear |
| Food and drink spillages | Clear up spillages immediately and use warning signs |
| Using hazardous chemicals | Wear protective clothing where necessary; training should be given on use of chemical; chemicals should be stored correctly; COSHH regulations need to be followed |
| Inadequate clothing worn | The correct PPE should be worn at all times; wear aprons that are done up correctly; shoe laces should be tied up. |
| Using electrical appliances | The equipment should be maintained and cleaned regularly; training should be given if necessary; it should be given if necessary; it should be PAT tested regularly by a qualified electrician |
| Moving and lifting objects | Wear correct PPE; training on safe lifting techniques should be given |

Control measures for employees cont.

| Hazard | Control |
|--------------------------------|---|
| Fire and explosion | Under the Fire Safety Order 2005, employers must ensure there is a low risk of fire and explosion by: <ul style="list-style-type: none"> Having fire alarms and making sure they are tested regularly Making sure escape routes are clear and adequately signed Having suitable equipment such as fire extinguishers available |
| Bullying and harassment | Protocols and policies should be in place to ensure that this does not happen; there should be an open culture if anyone needs to report it. |
| Injuries | Kitchens and restaurants can be dangerous places- there should be a first aid kit and a trained first aider |
| Inadequate lighting | Lighting must be bright enough to work safely in; if a light is broken it should be fixed |
| Inadequate ventilation | Good ventilation is needed in a catering kitchen; this is normally provided by extractor fans, which remove steam, heat and smells; the kitchen may be hot so drinking water should be available |
| Inadequate signage | Signs need to be clear and visible; staff need to be made aware of what the signs mean |
| Theft | A secure area should be available for staff to leave personal belongings |
| Assault | Train staff on how to deal with aggressive customers and diffuse volatile situations |
| Undesirable people on premises | Have a security system to monitor who is entering the premises; any suspicious person should be reported; effective signage in and out procedures are required. |

Control measures for customers

| Hazard | Control |
|--------------------------------|---|
| Food poisoning | Hazard Analysis and Critical Control Point (HACCP) systems put in place to ensure food prepared, cooked and served is safe to eat |
| Food allergies | Detailed information must be given to customers on any allergens in the dishes |
| Trip hazards | Make sure areas where customers go are well lit and that there are no trailing wires or clutter on the floor |
| Food and drink spillages | Spillages must be cleared up straight away and appropriate signage used |
| Fire and explosions | Emergency exits must be well lit and signposted; fire extinguishers should be in place and staff should be trained in how to use them |
| Assault | Staff should ensure the safety of customers if another person is aggressive |
| Theft/fraud | Ensure that card transactions are done in front of the customer; provide a secure place for their belongings |
| Undesirable people on premises | Any suspicious person should be challenged and not allowed to mix with customers |

Keywords


Extended reading


Exam question

Video links

Revision Techniques



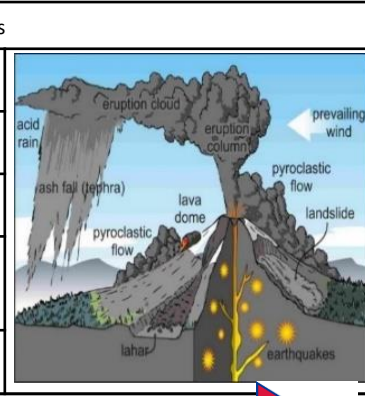

Unit 1 The Hospitality and Catering Industry
LO1 Understanding the environment in which hospitality and catering providers operate
 AC 1.1 The structure of the hospitality and catering industry





| The structure of the Earth | |
|----------------------------|---|
| The Crust | Varies in thickness (5-10km) beneath the ocean. Made up of several large plates. |
| The Mantle | Widest layer (2900km thick). The heat and pressure means the rock is in a liquid state that is in a state of convection. |
| The Inner and outer Core | Hottest section (5000 degrees). Mostly made of iron and nickel and is 4x denser than the crust. Inner section is solid whereas outer layer is liquid. |

| Volcanic Hazards | |
|------------------|--|
| Ash cloud | Small pieces of pulverised rock and glass which are thrown into the atmosphere. |
| Gas | Sulphur dioxide, water vapour and carbon dioxide come out of the volcano. |
| Lahar | A volcanic mudflow which usually runs down a valley side on the volcano. |
| Pyroclastic flow | A fast moving current of super-heated gas and ash (1000°C). They travel at 450mph. |
| Volcanic bomb | A thick (viscous) lava fragment that is ejected from the volcano. |



| Managing Volcanic Eruptions | |
|---|--|
| Warning signs | Monitoring techniques |
| Small earthquakes are caused as magma rises up. | Seismometers are used to detect earthquakes. |
| Temperatures around the volcano rise as activity increases. | Thermal imaging and satellite cameras can be used to detect heat around a volcano. |
| When a volcano is close to erupting it starts to release gases. | Gas samples may be taken and chemical sensors used to measure sulphur levels. |
| Preparation | |
| Creating an exclusion zone around the volcano. | Being ready and able to evacuate residents. |
| Having an emergency supply of basic provisions, such as food | Trained emergency services and a good communication system. |

| Convection Currents | |
|--|--|
| The crust is divided into tectonic plates which are moving due to convection currents in the mantle. | |
| 1 | Radioactive decay of some of the elements in the core and mantle generate a lot of heat. |
| 2 | When lower parts of the mantle molten rock (Magma) heat up they become less dense and slowly rise. |
| 3 | As they move towards the top they cool down, become more dense and slowly sink. |
| 4 | These circular movements of semi-molten rock are convection currents |
| 5 | Convection currents create drag on the base of the tectonic plates and this causes them to move. |

LIC -CS: Nepal 2015

Causes – 25th April 2015, a 7.9 earthquake occurred. The epicentre was 50 miles from the capital Kathmandu. This occurred on the destructive plate margin (collision) between the Indo-Australian Plate and Eurasian Plate. The earthquake was very shallow, just 15km under the surface.

| | |
|--|--|
| Effects P – 9000 people died, 20 000 injured, 3 million left homeless, 50% shops destroyed, amount of damage cost \$5 billion. S – Avalanches on Mt Everest killed 19 people, landslide blocked the Kali Gandaki River. | Responses I – Search and rescue teams came from India, UK, helicopters rescued people from Mt Everest. 500 000 tents set up for homeless. L – Stricter building controls, over 7000 schools rebuilt, June 2015 International conference held. |
|--|--|

Unit 1a

Earthquake Management

PREDICTING

Methods include:

- Satellite surveying (tracks changes in the earth's surface)
- Laser reflector (surveys movement across fault lines)
- Radon gas sensor (radon gas is released when plates move so this finds that)
- Seismometer
- Water table level (water levels fluctuate before an earthquake).
- Scientists also use seismic records to predict when the next event will occur.

| Types of Plate Margins | |
|--|--|
| Destructive Plate Margin | |
| When the denser plate subducts beneath the other, friction causes it to melt and become molten magma. The magma forces its way up to the surface to form a volcano. This margin is also responsible for devastating earthquakes. | |
| Constructive Plate Margin | |
| Here two plates are moving apart causing new magma to reach the surface through the gap. Volcanoes formed along this crack cause a submarine mountain range such as those in the Mid Atlantic Ridge. | |
| Conservative Plate Margin | |
| A conservative plate boundary occurs where plates slide past each other in opposite directions, or in the same direction but at different speeds. This is responsible for earthquakes such as the ones happening along the San Andreas Fault, USA. | |

The Challenges of Natural Hazards

What is a Natural Hazard

A natural hazard is a natural process which could cause death, injury or disruption to humans, property and possessions.

| | |
|--|--|
| Geological Hazard | Meteorological Hazard |
| These are hazards caused by land and tectonic processes. | These are hazards caused by weather and climate. |

Causes of Earthquakes

Earthquakes are caused when two plates become locked causing friction to build up. From this stress, the pressure will eventually be released, triggering the plates to move into a new position. This movement causes energy in the form of seismic waves, to travel from the focus towards the epicentre. As a result, the crust vibrates triggering an earthquake.

| | |
|---|--|
| The point directly above the focus, where the seismic waves reach first, is called the EPICENTRE . | |
| SEISMIC WAVES (energy waves) travel out from the focus. | |
| The point at which pressure is released is called the FOCUS . | |

PROTECTION

You can't stop earthquakes, so earthquake-prone regions follow these three methods to reduce potential damage:

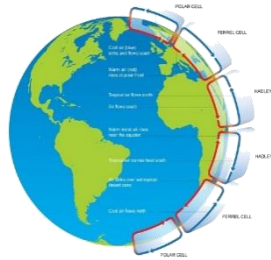
- Building earthquake-resistant buildings
- Raising public awareness
- Improving earthquake prediction

NEE – Chile 2010

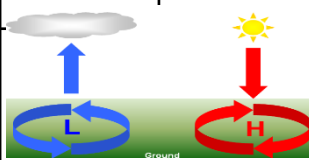
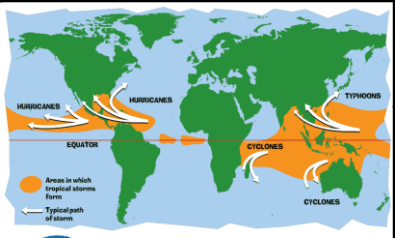
Causes – On 27th February 2010, an 8.8 earthquake hit Chile, the epicentre was just off the coast. It occurred on a subduction destructive plate margin, between the Nazca and South American plate.

| | |
|--|--|
| Effects P – 500 people died, 12 000 injured, 220 00 homes destroyed. \$30 billions cost in damages. S – 1500 km of roads destroyed, tsunamis, a fire at a chemical plant. | Management I – Power and water restored at 90% in 10 days, a national appeal raised \$60 million in aid. L – The president announced it would take 4 years to recover, a month after a housing reconstruction occurred. |
|--|--|

| Global pattern of air circulation | |
|--|--|
| Atmospheric circulation is the large-scale movement of air by which heat is distributed on the surface of the Earth. | |
| Hadley cell | Largest cell which extends from the Equator to between 30° to 40° north & south. |
| Ferrel cell | Middle cell where air flows poleward between 60° & 70° latitude. |
| Polar cell | Smallest & weakest cell that occurs from the poles to the Ferrel cell. |



| Distribution of Tropical Storms. | High and Low Pressure |
|---|-----------------------|
| They are known by many names, including hurricanes (North America), cyclones (India) and typhoons (Japan and East Asia). They all occur in a band that lies roughly 5-15° either side of the Equator. | Low Pressure |
| | High Pressure |



| Formation of Tropical Storms | |
|------------------------------|--|
| 1 | The sun's rays heats large areas of ocean in the summer and autumn. This causes warm, moist air to rise over the particular spots |
| 2 | Once the temperature is 27°, the rising warm moist air leads to a low pressure. This eventually turns into a thunderstorm. This causes air to be sucked in from the trade winds. |
| 3 | With trade winds blowing in the opposite direction and the rotation of earth involved (Coriolis effect), the thunderstorm will eventually start to spin. |
| 4 | When the storm begins to spin faster than 74mph, a tropical storm (such as a hurricane) is officially born. |
| 5 | With the tropical storm growing in power, more cool air sinks in the centre of the storm, creating calm, clear condition called the eye of the storm. |
| 6 | When the tropical storm hits land, it loses its energy source (the warm ocean) and it begins to lose strength. Eventually it will 'blow itself out'. |

Changing pattern of Tropical Storms

Scientist believe that global warming is having an impact on the frequency and strength of tropical storms. This may be due to an increase in ocean temperatures.

| Management of Tropical Storms | |
|---|--|
| Protection Preparing for a tropical storm may involve construction projects that will improve protection. | Aid Aid involves assisting after the storm, commonly in LIDS. |
| Development The scale of the impacts depends on the whether the country has the resources cope with the storm. | Planning Involves getting people and the emergency services ready to deal with the impacts. |
| Prediction Constant monitoring can help to give advanced warning of a tropical storm | Education Teaching people about what to do in a tropical storm. |



| Primary Effects of Tropical Storms |
|--|
| <ul style="list-style-type: none"> The intense winds of tropical storms can destroy whole communities, buildings and communication networks. As well as their own destructive energy, the winds can generate abnormally high waves called storm surges. Sometimes the most destructive elements of a storm are these subsequent high seas and flooding they cause to coastal areas. |



| Secondary Effects of Tropical Storms |
|--|
| <ul style="list-style-type: none"> People are left homeless, which can cause distress, poverty and ill health due to lack of shelter. Shortage of clean water and lack of proper sanitation makes it easier for diseases to spread. Businesses are damaged or destroyed causing employment. Shortage of food as crops are damaged. |

Case Study: Typhoon Haiyan 2013

Causes
Started as a tropical depression on 2nd November 2013 and gained strength. Became a Category 5 "super typhoon" and made landfall on the Pacific islands of the Philippines.



| Effects | Management |
|--|---|
| <ul style="list-style-type: none"> Approx 6,300 deaths. 130,000 homes destroyed. Water and sewage systems destroyed had caused diseases. Emotional grief for dead. | <ul style="list-style-type: none"> The UN raised £190m in aid. USA & UK sent helicopter carrier ships deliver aid remote areas. Education on typhoon preparedness. |

Case Study: Somerset Levels 13/14

Causes – Jan 2014 wettest Jan on record, 350mm of rainfall. The rivers had not been dredged in 20 years. It is a tidal river, strong storm surges from Bristol Channel added to river capacity.



| Effect | Responses |
|---|---|
| <p>S – 600 homes flooded, 16 farms evacuated,, power supply lost.</p> <p>Ec – Cost £10 million in damages, 16 farms evacuated.</p> <p>En – River water contaminated, debris had to be removed from the river.</p> | <p>I – People recued from their homes by boat, sandbags given to protect homes.</p> <p>L – river dredged, river banks raised,, £20 million action group set up.</p> |



What is Climate Change?

Climate change is a large-scale, long-term shift in the planet's weather patterns or average temperatures. Earth has had tropical climates and ice ages many times in its 4.5 billion years.

| Recent Evidence for climate change. | |
|-------------------------------------|---|
| Global temperature | Average global temperatures have increased by more than 0.6°C since 1950. |
| Ice sheets & glaciers | Many of the world's glaciers and ice sheets are melting. E.g. the Arctic sea ice has declined by 10% in 30 years. |
| Sea Level Change | Average global sea level has risen by 10-20cms in the past 100 years. This is due to the additional water from ice and thermal expansion. |



Enhanced Greenhouse Effect

Recently there has been an increase in humans burning fossil fuels for energy. These fuels (gas, coal and oil) emit greenhouse gases. This is making the Earth's atmosphere thicker, therefore trapping more solar radiation and causing less to be reflected. As a result, the Earth is becoming warmer.

| Evidence of natural change | |
|----------------------------|---|
| Orbital Changes | Some argue that climate change is linked to how the Earth orbits the Sun, and the way it wobbles and tilts as it does it. |
| Sun Spots | Dark spots on the Sun are called Sun spots. They increase the amount of energy Earth receives from the Sun. |
| Volcanic Eruptions | Volcanoes release large amounts of dust containing gases. These can block sunlight and results in cooler temperatures. |

| Managing Climate Change | |
|---|---|
| Carbon Capture This involves new technology designed to reduce climate change. | Planting Trees Planting trees increase the amount of carbon is absorbed from atmosphere. |
| International Agreements Countries aim to cut emissions by signing international deals and by setting targets. | Renewable Energy Replacing fossil fuels based energy with clean/natural sources of energy. |



1.1 Types of care settings

| Healthcare | Social care | 1. |
|-----------------|----------------------------|----|
| Dental practice | Retirement home | |
| GP surgery | Day centre | |
| Optician | Residential home | |
| Nursing home | Homeless shelter | |
| Health centre | Foodbank | |
| Pharmacy | Community centre | |
| Walk-in centre | Support group | |
| Hospital | Social services department | |

1.2 The rights of service users

- Choice
- Consultation
- Confidentiality
- Protection from abuse and harm
- Equal and fair treatment

2.

Choice- giving individuals options

3.

Social care examples

- Offering a range of activities so that residents can choose whether or not to take part
- Ensuring that residents have access to both a television lounge and quiet room
- What to eat
- What clothes to wear
- When to go to bed/get up
- Whether they have a bath or a shower

Health care examples

- Where to receive care e.g. support at home or in a residential home
- Choice of male or female doctor to meet cultural requirements
- Whether or not to receive treatment
- Choosing the GP we want to see

Consultation- involves discussing an issue with another person to get their thoughts and opinions so that a decision can be made that is acceptable for all involved

4.

- This means discussing things with people whatever their age
- People should be asked about the care they want
- Discuss wants and needs
- Clarify likes and dislikes
- Ask for preferences and options
- Peoples opinions and thoughts about different situations should be found out

Confidentiality- keeping limited access and restrictions on personal sensitive information

5.

- Examples include: Having personal notes stored securely, e.g. in a filing cabinet that is locked or passwords on computers only for those that need access to information
- Passing on information on a "**need to know**" basis
- Not gossiping about service users
- Shredding unwanted written information
- Having conversations in an enclosed room

Need to know basis

- Information is only shared with those directly involved with the care and support of the individual.
- Access to information is restricted to those who have a clear reason to access it when providing care and support for an individual.
- Telling a practitioner the facts they need to be aware of, to provide care for the individual, at the time they need to know them and nothing more.
- If something is said on a need to know basis you can only tell it to the relevant people. For example if someone had a problem at school they would tell the head of year, not all the teachers .

2

1.2 The rights of service users(continued)

Protection from abuse and harm

Some settings provide care for those who are more at risk of abuse and harm , such as:

- Service users with dementia
- Service users with a learning disability
- Children

These service users might not know what abuse is or understand their rights. They may not realise they are being abused or receiving poor treatment and may not remember what has happened or know how to tell anyone clearly. So, it is essential that staff are aware and follow **safeguarding** procedures.

- Staff having CRB (Criminal Records Bureau) checks
- Staff to be trained in first aid, manual handling, safeguarding
- CCTV on entrance and exit
- Another person being there when an examination takes place, e.g. GP and nurse

6.

Equal and fair treatment- being given the same opportunities and choices as everyone else.

- People should be treated/be able to use services for the needs they have
- e.g. children should all have the same chances in school despite their ability
- elderly people should get the same medical treatment as younger people

A child who has a special educational need or disability should be enabled to take part in the same lessons as the rest of the class. This may mean that they need:

- Extra support such as simpler worksheets or tasks
- One to one support from the teacher or teaching assistant

Staff at a residential home have arranged a trip to the coast. The coach that is taking them must have a wheelchair ramp, otherwise those residents that are wheelchair users will be unable to go.

7.

1.3 The benefits to service users' health and well-being when their rights are maintained

Benefits to service users if rights are maintained:

- To make people feel valued
- To raise self-esteem
- To **empower** individuals
- To instil confidence
- To instil trust
- To make individuals feel safe
- To give equality of access to services
- To meet individual needs

8.

High self-esteem

A person with high self-esteem feels valued and respected. If someone is treated fairly and receives appropriate care that meets their needs , and which enables them to live a better life, they will benefit emotionally and feel more positive. Having high self-esteem improves mental health and leads to feeling:

- Valued
- Respected
- confident

9.

Empowerment

Having choices and being consulted about care preferences gives service users control over their lives and promotes their independence. This increases their self-esteem and makes them feel valued.

Empowerment :

- Encourages independence and being self reliant
- Makes service users feel in control of their lives
- Gives service users choice, control and independence
- Ensures equality of access to care services

10.

1.3 continued

Service users' needs are met

Service users who receive appropriate care and treatment will be helped to recover from injury or illness, or learn to manage a disability or health condition, and still enjoy and achieve in life.

Meeting a service users' needs:

- Means giving appropriate care and treatment so that service user's requirements are met
- Results in good and improving physical health
- Results in good and improving mental health

11.

Trust

12.

It is important that service users' receiving care feel able to trust their care providers. They must feel that service providers are trustworthy, that they will not harm them and that they have their best interests at heart.

Service users' who can trust their care providers will feel:

- Reassured that service providers will not harm them
- Confident that service providers have their best interests in mind
- Confident in the care they receive
- Confident that staff will be able to provide a safe environment for care, following health and safety policies and procedures

RO32: PRINCIPLES OF CARE IN HEALTH AND SOCIAL CARE SETTINGS

TOPIC AREA 1: The rights of service users in H&S Care settings

RO32: PRINCIPLES OF CARE IN HEALTH AND SOCIAL CARE SETTINGS

TOPIC AREA 2: Person- centred values

2.1 Person-centred values and how they are applied by service providers

Person-centred values of care are key principles that underpin the work of those providing care and support in health and social care.

- They are a set of guidelines that provide ways of working for care settings and their staff
- Person-centred practice enables service users to receive person centred care that meets their own unique needs.

Person-centred values:

- Individuality
- Choice
- Rights
- Independence
- Privacy
- Dignity
- Respect
- Partnership
- Encouraging decision making of the service user

13.

Individuality

14.

This means recognising that each person has their own identity, needs, wishes, beliefs and values. These individual differences must be considered and taken account of when providing care.

Choice

All service users are entitled to make their own choices. Choice is empowering and this is a feature of person-centred care. For example service users should be offered a range of different care options and given enough information about them to make an informed choice.

15.

Independence

16.

Having independence means that a service user :

Does not have to rely on others

Has the opportunity and freedom to make their own decisions

A service provider should support service users' to have as much control over their lives as possible , as this enables person-centred care

Rights

17.

Everyone is entitled to rights (see Topic area 1)

Service providers who support service users rights will be working within the law and providing a high standard of personalised care.

2.1 (continued)

Privacy

Many procedures in healthcare and social care require privacy, such as showering and dressing someone. It is vital to respect and protect the service users' privacy. An example of good practice is to knock on the service users' door before entering. 18.

Dignity

This involves having regard for the feelings, opinions and wishes of others. By respecting and valuing the service users' rights, views and needs, the service provider supports their self-esteem and makes them feel valued. 19.

Respect

Having respect means treating someone in a way that shows they have importance as an individual, and their opinions and feelings have value. Service providers should respect service users'

Diversity
Sexuality
Faith, cultural needs and preferences
Rights
Confidentiality

The people using health and social care will be from a range of different backgrounds. The Equality Act 2010 identifies 9 protected characteristics, and is illegal to discriminate against any of these characteristics:

Age
Disability
Gender reassignment
Marriage and civil partnership
Pregnancy and maternity
Race
Religion
Sex
Sexual Orientation

Any unfair treatment, exclusion or discrimination against service users is against the law.

20.

Partnership

This involves different professionals, service and agencies working together to provide the most effective care for a service user requiring treatment or support. This could involve, for example, the hospital, a social worker and a care home working together to provide care to meet needs of an older adult being discharged from hospital after a fall. 21.

Encouraging decision making of service user

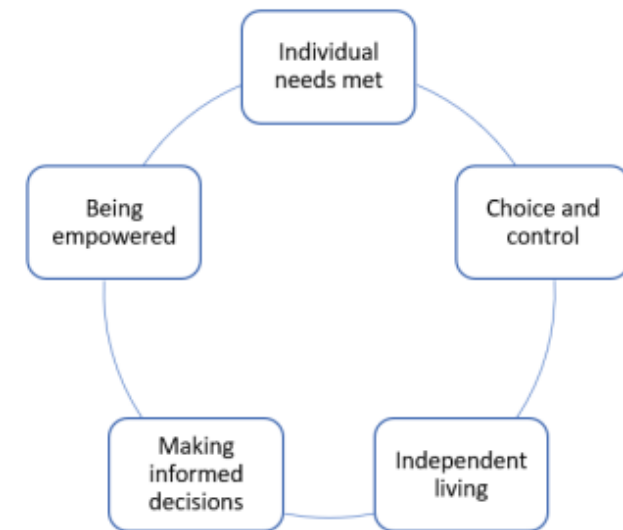
22.

A service user may be recommended to use a walking aid to help with mobility:

- The suggestion is to use a walking frame rather than a stick to help the service user walk short distances, but they do not want to use a frame
- The service user should be encouraged to make their own decision by discussing advantages and disadvantages of each aid.
- The service user is more likely to use a walking aid if it has been their own choice..

Person centred care means..

23.



Qualities of a service provider: The 6 Cs.

24.

1. **Care**
2. **Compassion**
3. **Competence**
4. **Communication**
5. **Courage**
6. **Commitment**

Care- means a service provider will do all they can to provide appropriate treatment or support that will maintain or improve a service users' health and well-being

Compassion – is being able to provide care and support with kindness, consideration, respect and empathy. It is also having consideration for the service user receiving care or treatment, as well as being able to put yourself in the patient's situation and show understanding .

Competence – refers to the ability of a service provider to provide high-quality, effective care through applying their knowledge , skills, understanding and expertise to meet a service user's care needs.

Communication- is essential to developing good relationships with service users , their families and also with colleagues. It is important to be able to listen carefully and speak in a way that service users can understand.

Courage – is being brave: being able to speak up when having concerns, doing the right thing and also trying something new such as a new way of working.

Commitment – is when a service provider is dedicated to providing care and support to meet the service user's needs

Partnership, individuality making and rights.

Producing a plan for an individual should be done in partnership with them and the health and social care services; other family members may be involved if appropriate.. The service user's needs, strengths and wishes should be the focus.

- Everyone should meet together
- The service user should be fully involved in any discussions
- They should be given a copy of the plan that has been decided.

25 .

Examples of how person-centred values can be applied in health and social care settings 26.

Individuality, rights, choice and decision making

Hospitals and care homes could provide access to a prayer room or transport to a place of worship , to support service users' religious beliefs.

The right for a pregnant woman to choose the type of birth she would like e.g. home or hospital birth.

Providing a menu with vegetarian, vegan, halal and kosher options to provide choice and meet individual needs.

Respect

Service providers should always use non discriminatory language and avoid patronising the service user they are caring for.

They should challenge discrimination if they see or hear it happening . The discrimination can be challenged by:

Explaining how they are being discriminatory to raise awareness
Reporting it to senior staff

Privacy and dignity

When someone is receiving help to get dressed/showered it is important that a curtain/screen is used or the bathroom door is closed.

Staff should not gossip about the service users

Independence

An important way to promote independence is to meet a service user's specific needs . For example:

If a theatre trip is arranged in a care home , it should be somewhere that has wheelchair access and a hearing loop system for those that need it.

2.2 Benefits of applying person-centred values

Benefits for service providers of applying person-centred care

| Benefit | Explanation ^{27.} |
|---|--|
| Provides clear guidelines of the standards of care that should be given | Service providers will know how to do their job effectively. Service users will receive appropriate care, attention and treatment to meet their individual needs. All of the staff in a care setting will be working to the same high standards |
| Improves job satisfaction | The service provider's role is clearly defined and they are aware of how to apply "best practice"; this provides job satisfaction for service providers. |
| Maintains or improves quality of life | People who use services will have their individual needs met. For example , by: <ul style="list-style-type: none"> • Providing hospital patients with appropriate nutritional meals • Providing help to eat and drink • Discussing their treatment with them • Consulting with them about alternative types of treatment available |
| Supports rights to choice and consultation | Choice is empowering and this is a feature of person-centred care as service providers will be involved in helping to construct a plan of care with a service user that fully takes account of their care needs and preferences. |
| Supports service providers to develop their skills; enables the sharing of good practice. | Partnership working enables collaboration between colleagues to develop best practice which will lead to the best possible outcomes as individual needs will be met. |

Benefits for service users of applying person-centred care

| Benefit | Explanation ^{28.} |
|--|--|
| Ensures standardisation of care given; improves the quality of care being given to the service user. | Provides clear guidelines of the standards of care that should be given, and this maintains quality of care. When service providers apply the person-centred values of care in their day-to-day work , they ensure that service users: <ul style="list-style-type: none"> • Always receive appropriate care that meets their needs • Do not experience discriminatory attitudes • Have their diversity valued and rights supported |
| Maintains or improves quality of life for service user | Service users rights, beliefs and preferences will be respected and their individual needs will be met. This ensures that the care they receive is beneficial in every way for example, an occupational therapist carries out a home assessment of an older person with arthritis. As a result of the visit, various kitchen aids such as an easy grip knife and a special bottle and jar opener are provided. These will enable the service user to continue preparing their own meals independently. |
| Supports service users to develop their strengths | Person centred care ensures the service user is involved in decision-making by discussing their care needs and then being given, for example information about the different options that will meet their needs. The service user can then choose the care that they prefer. This is enabling and empowering, ensuring the service user is at the centre of their care and has choice and control |

2.3 Effects on service users' health and well-being if person-centred values are not applied

Effects on service users can be :

Physical
Intellectual
Emotional
Social

29.

This can be remembered as PIES.

Physical effects

Effects on your body.

30.

A nursing home resident suffers with coeliac disease this causes unpleasant symptoms if gluten is consumed. If they are not given gluten free food, it will lead to a deterioration of their digestive health.

If a hospital patient is not given regular drinks, they will become dehydrated and their condition will get worse.

Intellectual effects

These relate to your thought processes such as thinking skills, understanding, learning, reasoning, comprehension and knowledge.^{31.}

If a young adult who has learning difficulties is not given support and learning activities matched to their needs, that learning will not progress and they will not reach their potential.

If staff at a retirement home expect residents to sit and watch television for most of the day and do not provide a range of activities to engage their interests, the residents will lack mental stimulation and suffer loss in concentration. This can have negative effects on their mental health and well being.

Physical

- Pain
- Existing illness gets worse
- Bruising
- Cuts and grazes
- Broken bones
- Dehydration
- Malnutrition
- injury

Intellectual

34.

- Lack of skills development
- Lack of knowledge
- Lack of progress
- Loss of concentration
- Losing interest
- Lack of stimulation
- Will not achieve potential

Emotional

- Low self esteem
- Low self confidence
- Disempowered
- Upset
- Loss of trust
- Angry
- depressed
- stress
- Frustrated
- humiliated
- self harm frightened feeling unsafe

Social

- Withdrawn
- isolated
- Lonely
- Excluded
- Become anti social
- Uncooperative
- Lack of friends
- Develop behaviour problems
- Refusal to use the service

Emotional effects

32.

These relates to a service users feelings.

An elderly woman attends a day centre. She's a vegetarian but at lunch is expected to eat the same meal as the others, just without the meat. This is unfair treatment, and is likely to upset her as she is not being treated as well as the others. She might develop low self esteem she feels she is not important enough to be given a proper vegetarian meal. She could also feel embarrassed that she's being a nuisance, expecting a "special "meal.

An expectant mum would be upset, angry and frustrated if her midwife told her that she cannot have a home birth, without explaining the reasons why or giving her the chance to ask questions.

Social effects

33.

These relate to service users relationships with others. If Stafford a centre do nothing about other young adults laughing at a girl who has a birthmark on her face, the girl may lack friends, become isolated and withdrawn, and refused to attend. An elderly resident at a retirement home has an undiagnosed hearing problem. The staff do not bother to talk to him much because they think he just doesn't like socialising and prefers to be by himself. He avoids spending time with other residents, he can't hear properly and has to keep asking for things to be repeated. He doesn't want to bother other people so he keeps to himself.



GWA HISTORY Knowledge Organiser - Topic : Nazi control and dictatorship, 1933-39

Timeline

| | | |
|----|---------------------------|--|
| 1 | 27 TH Feb 1933 | Reichstag fire. Parliament burns down. Hindenburg passes Reichstag Fire Decree. |
| 2 | 31 st Mar 1933 | Reichstag passes Enabling Act – Hitler can pass any law. |
| 3 | 2 nd May 1933 | Hitler bans trade unions. These are to be replaced by German Labour Front. |
| 4 | 20 th Jun 1933 | Concordat signed with Pope. Rome would not oppose Nazis if Catholic church was left alone. |
| 5 | 14 th Jul 1933 | Hitler bans all political parties apart from the Nazis. |
| 6 | 29 th Jun 1934 | Night of the Long Knives – Hitler eliminates threat from SA. |
| 7 | 2 nd Aug 1934 | Hindenburg dies. Hitler combines roles of President and Chancellor and takes the title Fuhrer (leader) of Germany. |
| 8 | Aug 1934 | German army swears allegiance to Hitler. |
| 9 | 1 st Aug 1936 | Berlin Olympics begins. |
| 10 | 1938 | Over course of the year, Hitler removes 16 army generals from their positions. |

Key Individuals

| | | |
|----|---------------------|---|
| 11 | Joseph Goebbels | Head of Nazi propaganda. Minister for Propaganda and Popular Enlightenment from 1933. |
| 12 | Ernst Rohm | Leader of the SA. Arrested and executed |
| 13 | Heinrich Himmler | Leader of the SS. Organised night of the Long Knives. Head of all police agencies in Germany from 1936. |
| 14 | Paul von Hindenburg | President of Germany, 1926-34 |

Key Words/Terms

| | | |
|----|------------------|---|
| 15 | Anti-Semitism | Hatred and persecution of the Jews |
| 16 | Fuhrerprinzip | The idea that the Nazi party and Germany should have one leader obeyed by all. |
| 17 | Reichstag | German Parliament |
| 18 | SA | Sturmabteilung – the paramilitary ‘storm troopers’ of the Nazi party. |
| 19 | SS | Schutzstaffel – Nazi paramilitary organization who acted as Hitler’s personal bodyguard. |
| 20 | SD | Nazi intelligence agency, ‘security service.’ |
| 21 | Gestapo | Official secret police of the Nazi regime. |
| 22 | General Election | Democratic process whereby the people cast their vote for who they want to represent them in the Reichstag. |
| 23 | Propaganda | Information, often misleading, spread with the intention of promoting a political cause or point of view. |
| 24 | Enabling Act | Law giving Hitler power to rule without consulting Reichstag for four years. |
| 25 | Fuhrer | Title taken by Hitler making him supreme leader of Germany. |
| 26 | Censorship | Controlling what is produced and suppressing anything considered to be against the state. |
| 27 | Concordat | Agreement with Pope that Nazi rule would not be opposed if Catholic church was left alone. |
| 28 | Gleichschaltung | Bringing people into identical way of thinking and behaving. |
| 29 | Indoctrination | Converting people to your ideas using education and propaganda |



GWA HISTORY Knowledge Organiser - Topic : Life in Nazi Germany, 1933-39

Timeline

| | | |
|----|------|--|
| 1 | 1933 | Boycott of Jewish shops and businesses |
| 2 | 1933 | Law for the Encouragement of Marriage passed. |
| 3 | 1933 | Sterilisation Law passed. |
| 4 | 1933 | First concentration camp for women opened at Moringen. |
| 5 | 1933 | First Napola schools set up. |
| 6 | 1935 | Nuremburg Laws passed [formalized racial laws such as removing citizenship from German Jews] |
| 7 | 1935 | Conscription introduced. |
| 8 | 1936 | Membership of the Hitler Youth made compulsory. |
| 9 | 1938 | Jewish children banned from German schools. |
| 10 | 1938 | Lebensborn programme introduced. |
| 11 | 1938 | Kristallnacht [night of broken glass] – waves of attacks on Jews. |
| 12 | 1939 | Euthanasia campaign began. |
| 13 | 1939 | Designated Jewish ghettos established. |

Key words / terms

| | |
|--------------------------|--|
| Volksgemeinschaft | The people's community. This was the Nazi idea of a community based upon the German race. |
| Herrenvolk | Master race. The idea that 'pure' Germans were superior to other races such as Jews. |
| Reich Labour Service | Scheme to provide young men with manual labour jobs. Compulsory for all men 18-25 to serve 6 months. |
| League of German Maidens | Organisation set up to prepare teenage girls for Nazi ideas of a woman's role. |

Key Words/Terms

| | |
|-------------------------------------|---|
| Anti-Semitism | Hatred and persecution of the Jews |
| Propaganda | Information, often misleading, spread with the intention of promoting a political cause or point of view. |
| Gleichschaltung | Bringing people into identical way of thinking and behaving. |
| Indoctrination | Converting people to your ideas using education and propaganda |
| Aryan | Nazi term for a non-Jewish German, someone of supposedly 'pure' German stock. |
| Concentration camp | Prison for political prisoners and enemies of the state who are placed there without trial. |
| Euthanasia | Bringing death to relieve suffering. The Nazis interpreted this as killing anyone who was of no further use to the state e.g. disabled. |
| Kinder, kuche, kirche | Children, kitchen, church. The three 'Ks' women were supposed to follow. |
| Ghetto | A densely populated area of a city inhabited by a particular ethnic group, such as Jews. |
| Gypsy | A race of people found across Europe who travel rather than living in one place. |
| German Labour Front (DAF) | Nazi replacement for Trade Unions with aim of controlling German workers. |
| Hitler Youth | Organisation set up to convert the young to Nazi ideas. |
| Nazi Teachers League | Organisation set up to control teachers and what they taught. |
| Strength through Joy movement (KdF) | Organisation set up to improve leisure time of German workers. |
| Napola Schools | Special schools to train future leaders of the state. |



GWA HISTORY Knowledge Organiser - Topic : Hitler's rise to power, 1919-33

Timeline

| | | |
|----|---------------------------|---|
| 1 | Sep 1919 | Hitler joins German Workers party (DAP) |
| 2 | Feb 1920 | The DAP is renamed the National Socialist German Workers party (NSDAP) – known as the Nazis. |
| 3 | Feb 1920 | The Nazis publish their 25 point programme |
| 4 | Jul 1921 | Hitler becomes leader of the Nazi party |
| 5 | Nov 1921 | The SA (also known as brownshirts or stormtroopers) are set up as the Nazis armed militia. |
| 6 | Nov 1923 | The Munich Putsch – The Nazis try to overthrow the Bavarian government and cause a revolution. They fail. 16 Nazis are killed and Hitler is arrested. |
| 7 | Feb 1924 | Hitler imprisoned in Landsberg but only serves 10 months. |
| 8 | Dec 1924 | Hitler releases 'Mein Kampf' and is released from prison. |
| 9 | May 1928 | The Nazis get 12 seats in the Reichstag. |
| 10 | Oct 1929 | Wall Street crash leads to the Great Depression. |
| 11 | Sep 1930 | Unemployment reaches 3m. Nazis get 106 seats in Reichstag. |
| 12 | Apr 1932 | Hitler comes runner up in Presidential election. 13.4m votes. |
| 13 | Jul 1932 | Unemployment reaches 6m, Nazis get 230 seats in Reichstag. |
| 14 | 30 th Jan 1933 | Hitler is appointed Chancellor of Germany |

Key Individuals

| | | |
|----|---------------------|---|
| 15 | Anton Drexler | Founder of the DAP (later the Nazi party) |
| 16 | Joseph Goebbels | Head of Nazi propaganda |
| 17 | Ernst Rohm | Leader of the SA |
| 18 | Paul von Hindenburg | President of Germany, 1926-34 |
| 19 | Kurt von Schleicher | Chancellor of Germany; June-November 1932 |

Key Words/Terms

| | | |
|----|-------------------|--|
| 20 | Communism | Ideology violently opposed to the Nazis. They promised to destroy it if they came to power. The German communist party was known as the KPD. |
| 21 | Anti-Semitism | Hatred and persecution of the Jews |
| 22 | Fuhrerprinzip | The idea that the Nazi party and Germany should have one leader obeyed by all. |
| 23 | Great Depression | Slump in the economy in the 1930s which led to high unemployment. |
| 24 | Manifesto | A public declaration of a political party's policies. |
| 25 | Reich | German Empire |
| 26 | Reichstag | German Parliament |
| 27 | SA | Sturmabteilung – the paramilitary 'storm troopers' of the Nazi party. |
| 28 | SS | Schutzstaffel – Nazi paramilitary organization who acted as Hitler's personal bodyguard. |
| 29 | Swastika | Emblem of the Nazi Party. |
| 30 | Third Reich | Nazi name for Germany. Means 'Third Empire.' |
| 31 | Wall Street Crash | Panic selling of more than 16 million shares in October 1929. Led to world economic crisis. |
| 32 | Mein Kampf | Book written by Hitler in prison setting out his beliefs and vision for Germany. |
| 33 | Putsch | Attempted takeover of the Government. |
| 34 | General Election | Democratic process whereby the people cast their vote for who they want to represent them in the Reichstag. |
| 35 | Propaganda | Information, often misleading, spread with the intention of promoting a political cause or point of view. |



GWA HISTORY Knowledge Organiser - Topic : Weimar Germany, 1919-29

Timeline

| | | |
|----|---------------------------|---|
| 1 | 9 th Nov 1918 | Kaiser abdicates (leaves throne) and flees Germany. |
| 2 | 9 th Nov 1918 | Weimar Republic is set up. |
| 3 | 11 th Nov 1918 | WWI ends. Armistice agreed after German surrender. |
| 4 | Jan 1919 | Spartacist Uprising (left wing) in Berlin and other cities. Crushed by army and the Freikorps. |
| 5 | 26 th Jun 1919 | Treaty of Versailles is signed. |
| 6 | 3 rd Mar 1920 | Kapp Putsch – attempted takeover by Freikorps led by Wolfgang Kapp. Failed due to lack of support. |
| 7 | Jan 1923 | Ruhr Crisis – France invades the Ruhr over reparations leading to huge problems in Germany. |
| 8 | Jun 1923 | Hyperinflation causes huge social and economic problems. |
| 9 | Aug 1923 | Gustav Stresemann becomes Chancellor (but only for 3 months!) |
| 10 | Nov 1923 | The Munich Putsch – The Nazis try to overthrow the Bavarian government and cause a revolution. They fail. 16 Nazis are killed and Hitler is arrested. |
| 10 | Sep 1924 | Stresemann signs the Dawes plan which ends hyperinflation. |
| 11 | Dec 1925 | Germany signs Locarno Pact with France, Britain, Belgium and Italy |
| 12 | June 1929 | Young plan agreed. |
| 13 | Oct 1929 | Wall Street crash leads to the Great Depression. |

Key Individuals

| | | |
|----|-------------------|--|
| 14 | Friedrich Ebert | First Chancellor of Germany and later President. |
| 15 | Gustav Stresemann | Chancellor (Aug-Nov 23) and Foreign minister (1923 - 1929). Solved hyperinflation and Ruhr crisis. Brought period of stability to Germany. |
| 16 | Kaiser Wilhelm II | King of Germany, who fled Nov 1918. |

Key Words/Terms

| | | |
|--|------------------------------|---|
| | Armistice | Agreement to stop fighting. Germany asked for it in 1918. |
| | November Criminals | Name given to the Weimar politicians who accepted the armistice which ended WWI. |
| | Constitution | The system of laws and rules in a country. |
| | Reichstag | The German Parliament. |
| | Article 48 | Gave President emergency powers in times of crisis. |
| | Proportional Representation. | The number of votes won in an election, determined the number of seats in the Reichstag. |
| | Chancellor | Head of Government, chosen by the President. |
| | President | Head of state and military, voted by people, could use Article 48 and had power to dismiss government. |
| | Coalition | A government of two or more political parties. |
| | Extremist | Groups that believe in violent or radical ideas. |
| | Communism | Left wing groups who believe everybody should be equal in the country and it should be run for the workers. |
| | Fascism | Right wing groups who believe in a strong ruling leader. |
| | Freikorps | WWI veterans who formed private armies. |
| | Spartacists | Revolutionary communists who wanted Germany to be run by the working classes. Led by Rosa Luxemburg. |
| | Putsch | A violent attempt to overthrow the government. |
| | Reparations | £6.6 bn fine placed on Germany following Versailles Treaty. |
| | Demilitarised | No military forces are allowed in the area. |
| | Article 231 | The Versailles 'War guilt clause' blaming Germany for WWI. |
| | Hyperinflation | Extremely high inflation, where prices rise and the value of money plummets and it becomes worthless. |
| | Rentenmark | Temporary currency introduced by Stresemann to end hyperinflation. |



GWA HISTORY Knowledge Organiser - Topic : Weimar Germany, 1919-29

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| | Rentenmark | Temporary currency introduced by Stresemann to end hyperinflation. |

CM1: Media products

Description:

A media product is a platform used to communicate information to a specific audience. There are different formats that can be used for this purpose.

Digital imaging and graphics

Definition/Meaning:

A product that uses technology to create images in digital form. This may involve the use of graphic tablets, cameras or specific software such as Photoshop.

Digital games

Definition/Meaning:

A product that uses games consoles as well as personal computers to entertain the audience. In particular, online gaming.

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Video

Definition/Meaning

A product that includes moving images and in most cases an auditory element. It's also referred to as an audio-visual product.

Animation

Definition/Meaning:

A product that converts still images into moving elements to illustrate a sequence of events.

Visual effects (VFX)

Definition/Meaning:

Technology is used to incorporate effects that may be too dangerous or impossible to add any other way. For example, a spaceship flying across the screen.

Audio

Definition/Meaning

A product that is recorded or transmitted in the form of sound. For example, sound effects.

Music

Definition/Meaning:

A product that records audio as a way to express emotion.

Special effects (SFX)

Definition/Meaning:

Special effects that can be created on set. This includes physical character creation, puppetry, animatronics or humans wearing prosthetic make-up and costumes.

CM1: Media products

Description:

A media product is a platform used to communicate information to a specific audience. There are different formats that can be used for this purpose.

Social media

Definition/Meaning:

Websites and applications that enable users to create and share content or to participate in social networking.

Apps

Definition/Meaning:

A mobile application or app is a computer program or software application designed to run on a mobile device such as a phone, tablet, or watch.

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Comics and graphic novels

Definition/Meaning

A product that is designed to tell stories in a more visual way through illustrations and speech bubbles for dialogue.

Multimedia

Definition/Meaning:

A product that combines a range of assets such as text, images, video, animation and sound.

Virtual reality (VR)

Definition/Meaning:

Virtual reality is a computer-generated simulation in which a person can interact within an artificial three-dimensional environment.

Websites

Definition/Meaning

A product that combines a range of multimedia elements to create a webpage that can be accessed with an internet connection.

eBooks

Definition/Meaning:

A product that is available in electronic form and accessible via apps or e-readers (e.g. Kindle)

Augmented reality (AR)

Definition/Meaning:

Augmented reality allows the user experience the real world, which has been digitally augmented or enhanced in some way.

CM1: Media sectors

Description:

The main means of mass communication (broadcasting, publishing, and the internet) regarded collectively. The industry itself branches out in 'traditional' media and 'new' media.

How has the traditional media industry evolved?

Examples:

- Special effects (SFX, VFX)
- Digital imaging and graphics
- Social media platforms/apps
- Digital games
- Websites
- Multimedia
- eBooks
- Augmented Reality (AR)
- Virtual Reality (VR)
- 3D technology
- Digital Audio Broadcasting (DAB)

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Traditional media

Definition/Meaning

Traditional media refers to non-digital methods of communication. These methods have been long used to create awareness of a product and existed before the internet.

Sectors

- TV (Television)
- Radio
- Film
- Print publishing

Interactive media examples:

Examples include:

Website, apps, e-learning products, information points and digital maps

New media

Definition/Meaning

On-demand content accessed via the internet through digital devices, such as personal computers and smartphones. New media can involve interactive elements such as audience engagement and feedback.

Sectors

- Interactive Media
- Video games
- Internet
- Digital publishing

Key terms:

Media
Distribution
Multimedia
Streaming
Downloading

CM2: Symbolic codes

Description:

Symbolic codes are those elements that contain deeper, connotative meanings.

The acronym **SCAM**, can be useful to help remember these:
Setting, Colour, Acting, Mise-en-scene (SCAM)

Setting

Description:

- Time – this is used to establish when this was taking place.
- Location – the physical location of where the scene is taking place can help support the narrative. Social structures/Economy – Does the story reflect a certain social status. For example, does it suggest the characters are wealthy or poor?
- Moral attitudes – The narrative can help to determine the actions taken by the characters.

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Colour

Description:

- The colour palette used in a film can help tell a story. This helps the viewer feel certain emotions, such as the use of red blood in a horror movie, or a shade of green for jealousy.
- Colour in film also helps draw the attention of the user to a specific detail, like a red handle on a white door.
- Colour can help the film identify character traits, such as having a greedy businessman wear green or a sad character wearing yellow.

Mise en scene

Description:

- Set/location
- Props (Items that would be used in the scene)
- Costumes (What they wear)
- Make-up (How they look – think back to the previous example of the Joker where makeup is quite prominent)
- Motif - a repeated narrative element that supports the theme of a story. (e.g. James Bond theme)
- Composition - The placement or arrangement of visual elements.

Actors

Description:

- Body language
- Gestures
- Facial expressions
- Vocal intonation which means the way someone's voice rises and falls as they're speaking.
- Personality actor (Their personality fits the role)
- Star actor (An actor who can adapt. For example, equally adept at playing a hero or villain.)

CM3: Technical codes

Description:

Technical codes are created using technology or skills.

The acronym **SCALE**, can be useful to help remember these:

Special effects, Camerawork, Audio, Lighting, Editing.

Camera shots

Description:

- This is can also be referred to as 'framing', it's what you can see in the frame.

Examples:

- Establishing shot
- Long shot
- Crowd shot
- One shot
- Medium shot
- Medium close-up
- Close-up
- Extreme close-up
- Over the shoulder shot
- Wide shot

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Camera angles

Description:

- This is determined by the position of the camera and the direction it is pointing to.

Examples:

- Eye-level shot
- Low angle
- High angle
- Dutch angle
- Shoulder level
- Hip level
- Ground level

Camera operator

Description of the role:

- assembling and setting up equipment.
- planning, preparing & rehearsing scenes
- following camera scripts.
- creatively framing and capturing action
- responding quickly to directions.

Camera movements

Description:

- This also determines the position of the camera but may also use additional equipment to allow them to position the cameras where humans can't.

Examples:

- Dolly and Track
- Pan
- Zoom
- Crane
- Handheld
- Pedestal

Director

Description of the role:

- read scripts and work with writers and provide feedback.
- working with casting directors and producers during this selection process.
- agree the budget and schedule of the film with the producer.

CM3: Technical codes

Description:

Technical codes are created using technology or skills.

The acronym **SCALE**, can be useful to help remember these:

Special effects, Camerawork, Audio, Lighting, Editing.

Editing

Description:

- An editor, under close guidance from the director, makes choices about when to cut a shot/sound, when to end a particular shot/sound and move on to another.

Examples:

- Continuity editing: Cutaway shot, Shot reverse shot, Eyeline match, Cross cutting,
- Non-continuity editing: Flashback, flash forward, montage.
- Transitions: Wipe, Dissolve, Fade and Cut

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Audio

Description:

- Audio plays a significant role in conveying meaning to a media product.

Examples:

- Diegetic and non-diegetic sounds
- Foley (artificial audio recording)
- Soundtrack
- Silence
- Dialogue
- Sound effects

Sound editor

Description of the role:

- create, update, maintain and add to sample and sound libraries.
- develop the sound concept for a project and a sound map or storyboard from a script or project description.

Lighting

Description:

- Lighting helps to create an atmosphere and helps to convey meaning within the narrative and this could be to emphasise the characters emotions

Examples:

- High-key lighting
- Low-key lighting
- Back lighting
- Fill lighting

Audio technician

Description of the role:

- preparing and operating sound equipment.
- running audio equipment so everything is properly connected.
- testing audio equipment for volume, tone, and clarity.

CM4: Interactivity

Description:

Interactivity is a two-way flow of information between a computer and a computer-user; responding to a user's input.

Animation

Description:

- Taking still images and creating a sequence of moving images that follow a timeline.

Examples:

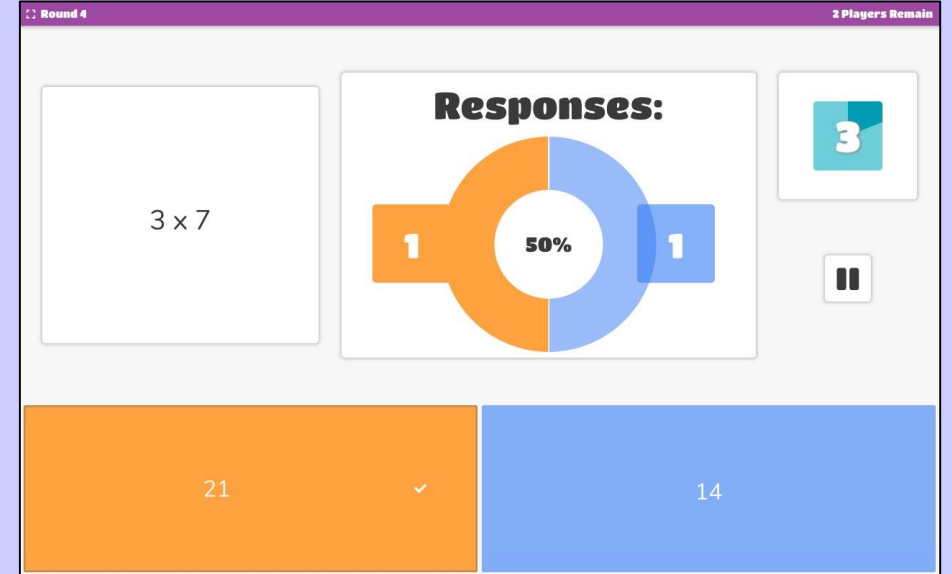
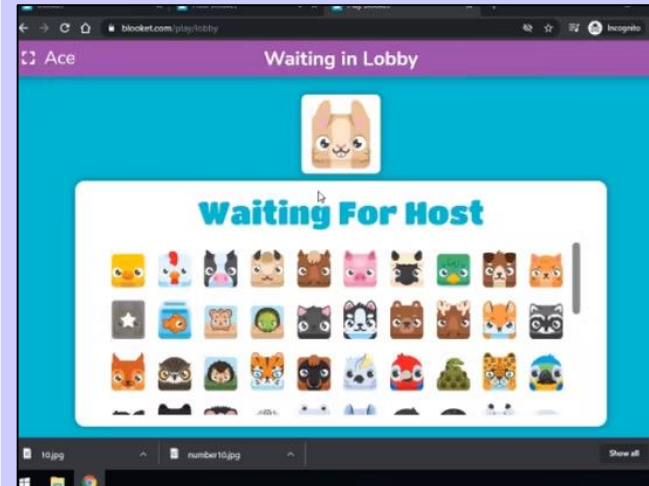
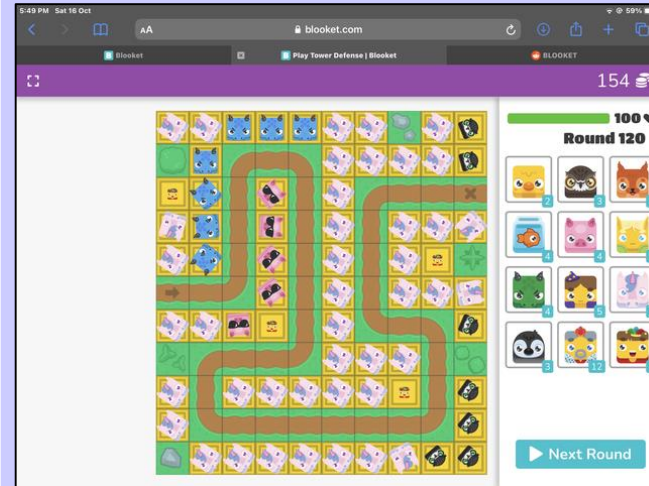
- 3D Animation – this can include the use of Computer Generated Imagery (CGI)
- 2D Animation – hand drawn characters frame by frame.
- Vector 2D Animation – a rigged character.
- Animated graphics/text
- Motion capture – Claymation, puppet, silhouette.

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Apps & Websites

Worked example: Blooket



Examples:

- Icons
- Graphics
- Animations
- Audio
- Video
- Music
- Navigation – buttons, icons, hyperlinks, rollovers, hotspots.

CM5: Purpose

Description:

Every media product is created for reason and this is known as purpose.

Inform

Description:

- To display information normally in a formal language because it's important.

Examples:

- Maps
- Books
- Leaflets

Influence

Description:

- To persuade consumers to change their behaviour.

Examples:

- Health advertisements
- Educational advertisements
- Political advertisements

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Entertain

Description:

- This is to provide a narrative/plot/storyline that entices the user to consume the content.

Examples:

- Films
- TV shows
- Books
- Apps
- Video games

Educate

Description:

- This is to provide consumers with information that enables them to learn/gather new information

Examples

- Text books
- YouTube videos
- Online learning platforms

Advertise/Promote

Description:

- This is to persuade the consumer into committing to a product or service.

Examples:

- Posters
- Billboards
- TV advertisements
- Radio advertisements
- Banners on webpages
- Social media posts

Job roles:

Content creator
Copywriter
Campaign manager
Photographer
Web developer
Web designer
Animator
Games developer



CM5: Purpose

Description:

The style, content and layout has to be adapted meet a particular type of purpose such as: colour, conventions of genre, formal/informal language, tone of language, positioning of elements, audio representation and visual representation.

Colour

Definition/Meaning:

The colour can help to create a particular mood as they can represent certain feelings. For example red can represent danger, love and blood whereas blue can represent calm, peace or trust.

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Conventions of genre

Definition/Meaning

Conventions are a commonly accepted way of doing things. Advertisements will share a common set of characteristics.

Tone of language

Definition/Meaning:

The tone can help to identify how serious the message may be. This depends on the type of media product.

Audio representation

Definition/Meaning:

A media product that can be represented in the form sound such as the use of music, dialogue and sound effects.

Visual representation

Definition/Meaning

The content used in the media product that helps the consumer to make a connection with that and the product that is being advertised.

Positioning of elements

Definition/Meaning:

Content will be placed at certain parts of product because that is where consumers may naturally be drawn to.

Formal/Informal language

Definition/Meaning:

The purpose of the product can affect the nature of the language used. For example, informal language is used for adverts where formal language may be used for educational purposes.

CM6: Audience segmentation

Description:

Target audience is made up of different characteristics known as demographics which are split into segments to help clearly define who the target audience is.

Benefits of audience segmentation

- Clearly defined target audience
- Increased chance of sales
- Personalised approach to marketing/advertising.
- Increased level of interest.

Lifestyles/Interests

Definition/Meaning:

This is linked to hobbies and what people actually enjoy. For example, a person who loves horror films will be more interested in products of this genre.

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Location

Definition/Meaning

This is how accessible the product is. It might be available within a certain radius, in a city/town, a country or it may have a wider reach if it's an online service.

Age

Definition/Meaning:

This can be an age range such as 18-25 or broader categories such as teenagers, adults, retired people.

Occupation/Income

Definition/Meaning:

The type of job can determine the level of disposable income that person has and therefore shapes their consumer behaviour depending on what they can afford.

Ethnicity

Definition/Meaning

This focuses on cultures, country, religion or language. For example, some software used in the UK is designed using US English language instead.

Gender

Definition/Meaning:

Some products may be aimed at one gender more than the other.

Education

Definition/Meaning:

The population have different levels of education such as: degree level, A-level or GCSE and this can define the sort of language used in media products.

Client requirements

Description

A client brief is a written document or verbal discussion that outlines the key requirements of a project.

Client brief

Types:

- **Formal** - A scheduled meeting that will take place between the client and the producer.
- **Informal** - Client will discuss requirements during a telephone call, no do documentation provided. More of a verbal agreement.
- **Negotiated** - The client and the producer work together to develop a brief for a media product.
- **Commissioned** - A client will hire a separate independent company to create the media product for them.

How are client briefs communicated?

A client brief can be **written** and discussed in a **meeting**.

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Interpreting client brief

Description:

A client brief would typically consist of the following components.

Type of product

The product that is being created.

Timescales

Key dates and deadlines for the project.

Audience

The segment of people this product is aimed at.

Purpose

The objective of the product

Client ethos

Ensuring the product meets the brands values.

Content

What needs to be included in the media product?

For example, a digital product then further consideration would need to be made into the use of other assets such as: sound, animation, video etc..

Genre, style and theme

The brand and their values will influence the design.

The type of product will follow a particular theme.

Client brief constraints

- Conflict of interest when it comes to design choices.
- A client brief can restrict what the production company can do.

CM8: Primary research

Description:

Primary data is any original information that you collect for the purposes of answering your research question (e.g. through focus groups, interviews, online surveys and questionnaires).

Focus groups

Description:

- A group of people assembled to participate in a discussion about a product before it is launched.

Pros

Valid set of results
Less time-consuming than a survey.
Additional feedback can be gathered in the session.

Cons

Sample size too small.
Small samples can lack validity.
Moderator might not record all responses.

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Interview

Description:

- A meeting of people face to face or online.

Pros

Allow for more in-depth data collection and comprehensive understanding.
Can be used for quantitative research

Cons

Interviews are more time consuming to recruit and conduct.
Expensive form of research.
Limited scope: you might miss out on interesting data

Online surveys

Description:

- A structured form that is completed over the internet.

Pros

Cost-effective and can capture a large sample very quickly.
Quick to gather large sample sizes.

Cons

Need an internet connection to participate in a survey.
Some respondents might lack technical skills to complete survey.

Questionnaires

Description:

- A list of questions or items used to gather data from respondents about their attitudes, experiences, or opinions

Pros

No technological constraints as it's paper-based so it's easy for everyone to access.
Can include open and closed questions.

Cons

Paper can easily be misplaced/lost
Time consuming
Expensive to employ surveyors.

CM9: Secondary research

Description:

Secondary data are information that has already been collected by other researchers.

Primary v Secondary research

Primary research:

| Pros | Cons |
|---|--|
| Can answer specific questions You control the sampling methods and size. | Time consuming to collect data. Staff might need training on collecting data. |

Secondary research:

| Pros | Cons |
|---|---|
| Easier and faster to access Collect data from a wider geographical location. | Time consuming, regularly need to check sources. No control over the data as it's already there. |

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Books

| Pros | Cons |
|--|---|
| Indicate areas of professional interest Up to date coverage of news and opinion | Can become outdated quickly. Can include subjective content. |

Television

| Pros | Cons |
|---|--|
| Present information in different formats. Can include facts and opinions. Can be an up-to-date source of information. | Can be biased May not give further references to follow up. May not always give a fair representation of a subject. Often created for entertainment purposes. |

Websites

| Pros | Cons |
|--|---|
| Quick access to information Can be kept up to date easily | Not quality checked – anyone can create a website Not always reliable or of an academic standard |

Questionnaires

| Pros | Cons |
|---|--|
| Present information in different formats. Can include facts and opinions. Can be an up-to-date source of information. | Can be biased May not give further references to follow up. May not always give a fair representation of a subject. Often created for entertainment purposes. |

Collecting data

Description:

Data can be collected in two formats: Quantitative and Qualitative data.

Quantitative v Qualitative

Quantitative:

Pros

Generates data that can be reproduced. Can describe large sets of data.

Cons

Requires statistical training to analyse data. Requires a larger sample.

Qualitative:

Pros

Flexible as you can easily adjust methods used. Can be conducted with small samples.

Cons

Difficult to moderate the research conducted. Cannot be analysed statistically.

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Quantitative data

Definition/Meaning

Data that is measured numerically. Commonly made up closed questions that restrict the respondents to a fixed set of options.

Examples

| | | |
|--|--------------------------|--------------------------|
| Do you have a dog as a pet? | Yes | No |
| Mark your answer in the appropriate box: | | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Do you have a driver's license? | Yes | No |
| Mark your answer in the appropriate box: | | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Do you collect social security benefits? | Yes | No |
| Mark your answer in the appropriate box: | | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| What is your gender? | Male | Female |
| Mark your answer in the appropriate box: | | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Binary answer (Yes/No)

Likert scale

Other examples include: Questions with one answer and ones with multiple answers.

Qualitative data

Definition/Meaning

This provides a more detailed description of data. Commonly made up of open questions that allows respondents to elaborate further.

Examples

Examples of Open-Ended Questions

- What were the challenges you faced with us?
- What did you like the most about us?
- Is there anything else we should know?
- How would you describe your experience with us?
- What can we do better to improve your experience with us?
- What is the primary reason for your score?
- Would you recommend us to others? Please share the reason.
- What was missing in the experience you had with us?
- What are the factors that usually influence your purchase?
- What are one or more things that may stop you from making a purchase with us?

CM10: Work plan

Description:

A work plan is used to plan out all the tasks that need to be completed within a project.

Benefits of a work plan

- It can provide clear timescales for each task.
- To better understand the hardware, software and people required for each activity.
- To factor in unexpected events and putting contingencies in place.
- Increased the chance of the production meeting the deadline.

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Work plan example

| | | | | | | Jan | | | | Feb | | | |
|--|----------------------------|------------------------|-----------------------------|--|-------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | | | | | | Week 1 | Week 2 | Week 3 | Week 4 | Week 1 | Week 2 | Week 3 | Week 4 |
| Pre-production | | | | | | | | | | | | | |
| Task | Activity | Hardware | Software | People | Contingencies | | | | | | | | |
| 1 | Read client brief | Monitor, Laptop | Word Processing Software | Production manager | Print out a hard copy | | | | | | | | |
| 2 | Generating ideas | Laptop | Desktop publishing software | Creative director, Production manager. | Draw mind map on flipchart paper | | | | | | | | |
| 3 | Visualisation diagram | Laptop | Desktop publishing software | Illustrator, Graphics artist | Draw visualisation diagram on paper | | | | | | | | |
| 4 | Source assets | Laptop | Web browser software | Content creator | Books, Magazines, Television | | | | | | | | |
| Milestone: Pre-production phase complete | | | | | | | | | | | | | |
| Production | | | | | | | | | | | | | |
| 5 | Repurpose assets | Laptop/Graphics tablet | Graphics software | Graphics designer | Use web-based graphics software | | | | | | | | |
| 6 | Create the digital graphic | Laptop/Graphics tablet | Graphics software | Graphics designer | Use web-based graphics software | | | | | | | | |
| Milestone: Production complete | | | | | | | | | | | | | |
| Post-production | | | | | | | | | | | | | |
| 7 | Export digital graphic | Laptop/Graphics tablet | Graphics software | Graphics designer | Use web-based graphics software | | | | | | | | |
| Milestone: Project complete | | | | | | | | | | | | | |

Components of a work plan

Activity

A task within a task – known as a sub-tasks.

Resources

The hardware, software and people required to complete the task.

Contingencies

A plan put in place to deal with any unexpected events.

Milestone

A significant achievement within the project.

Tasks

The main parts of the project that need to be completed.

Timescales

The time given to each activity/task to be completed.

Workflow

The sequence/order in which the activities are carried out.

Creative Job roles

Description:

When putting together a work plan, one of the key components is the identification of resources meaning what hardware, software and people are required to complete each activity.

Three phases of production:

Pre-production

The pre-production stage of the production process is where you create a vision for your product. (i.e. design)

Production

The production stage is when all the development of the product happens.

Post-production

Post-production is where all of the pieces of your product come together. (i.e. editing)

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Illustrator/graphics artist

Responsibilities:

- combining hand-drawing and painting with digital media to create complete illustrations.
- refining designs.
- using various colours, graphics and effects to better convey each concept.

Phase of production

- Pre-production

Web designer

Responsibilities:

- creating website designs.
- producing sample sites.
- meeting with clients to discuss requirements and/or project progress.
- digital retouching and image editing.

Phase of production

- Pre-production, Production

Scriptwriter

Responsibilities:

- developing believable plots and character.
- preparing short summaries of your ideas and selling (known as 'pitching') them to producers or development executives.

Phase of production

- Pre-production

Animator

Responsibilities:

- creating a series of images known as frames, to simulate movement.
- develop timing and pacing of motion.
- work with the story editors to merge various layers of animation.

Phase of production

- Production

Creative Job roles

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Graphics designer

Responsibilities:

- design graphics for use in media products such as magazines, labels, advertising etc..
- developing concepts, graphics and layouts for product illustrations, company logos and websites.

Phase of production

- Pre-production, Production

Copywriter

Responsibilities:

- creates text for advertising/marketing purposes.
- writing content used in print media, radio advertising, product descriptions and social media posts.

Phase of production

- Production

Content creator

Responsibilities:

- create content for websites including social media.
- using assets such as text, video and audio designed for a particular audience.
- aiming to generate interest/raise awareness for a brand.

Phase of production

- Production

Photographer

Responsibilities:

- captures high-quality images.
- collaborate with client to ensure right content is captured.
- sell their content in stock image libraries for others to purchase.

Phase of production

- Production, Post-production

Technical Job roles

Description:

When putting together a work plan, one of the key components is the identification of resources meaning what hardware, software and people are required to complete each activity.

Video editor

Responsibilities:

- assembling raw footage and transferring or uploading to a computer.
- following a script, screenplay or outline
- inputting sound to enhance footage.

Phase of production:

- Post-production

Web developer

Description:

- write code for how the website looks and how it works.

Phase of production

- Production

1.2

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Camera operator

Responsibilities:

- assembling and setting up equipment.
- planning, preparing and rehearsing scenes
- following camera scripts.
- creatively framing and capturing action
- responding quickly to directions.

Phase of production

- Production

Audio technician

Responsibilities:

- preparing and operating sound equipment.
- running audio equipment so everything is properly connected.
- testing audio equipment for volume, tone, and clarity.

Phase of production

- Post-production

Sound editor

Responsibilities:

- create, update, maintain and add to sample and sound libraries.
- develop the sound concept for a project and a sound map or storyboard from a script or project description.

Phase of production

- Post-production

Games programmer

Responsibilities:

- writing/testing code for new programs.
- updating existing programs.
- identifying/correcting coding errors.
- secure programs against cybersecurity threats.

Phase of production

- Production

Senior Job roles

Description:

When putting together a work plan, one of the key components is the identification of resources meaning what hardware, software and people are required to complete each activity.

Campaign manager

Responsibilities:

- track campaign performance by compiling regular reports.
- organise trade shows, exhibitions and promotional events.
- recruit and train talent so they can be allocated roles.
- meet with all new clients to identify campaign strategies.

Phase of production:

- Post-production

1.2

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Creative director

Responsibilities:

- developing concepts for advertising or promotional campaigns.
- pitching ideas to clients if working for an agency or present to directors.
- steering or writing scripts.
- overseeing photo or TV shoots.

Phase of production

- Pre-production, Production

Director

Responsibilities:

- read scripts and work with writers and provide feedback on the further development of scripts.
- select actors - working with casting directors and producers during this selection process.
- agree the budget and schedule of the film with the producer.

Phase of production

- Pre-production, Production and Post-production.

Sound editor

Responsibilities:

- planning and organising production schedules.
- assessing project and resource requirements.
- estimating, negotiating and agreeing budgets and timescales with clients and managers.

Phase of production

- Pre-production

Editor

Responsibilities:

- coordinate online or print publishing cycle and manage content areas.
- suggest stories and generate headline ideas.
- comply with media law and ethical guidelines.

Phase of production

- Production

Hardware

Description:

Hardware is an item you can physically touch. There is computer hardware in the form of internal components such as the CPU, RAM and Hard Drive. In addition to this, is external computer hardware known as peripheral devices. These are accessories that support the functionality of a computer system.

Multi-functional devices

Description:

There are some devices that can receive and send data (both input and output)

| Device | Purpose |
|-----------------|--|
| Touch screen | A display device that allows the user to interact with a computer by using their finger or stylus. |
| Graphics tablet | A device that enables a user to hand-draw images, animations and graphics, with a special pen-like stylus. |

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Input and Output devices

Description:

Input devices allows the computer to receive data.

| Device | Purpose |
|----------|---|
| Mouse | It moves a pointer on the screen, allowing the user to select icons, buttons and menus. |
| Keyboard | Used to enter characters and functions into the computer system by pressing buttons, or keys. |
| Scanner | Captures images from photographic prints to be stored electronically. |

Description:

Output devices that allows the computer to send data.

| Device | Purpose |
|----------|---|
| Monitor | Displays the computer's user interface and open programs. |
| Printer | A device that accepts text/graphic output from a computer and transfers the information to paper. |
| Speakers | To produce audio output that can be heard by the listener. |

Additional hardware

Microphone, Headphones, Computer/Laptop, Headsets.

Software

Description:

Software is a program that can be ran on the computer. Application software is a program designed for users to perform specific tasks. Each type of application software will be able to perform more specialised tasks. However, some can be a little more versatile.

Software used in the three phases:

Pre-production

- Word processing software
- Spreadsheet software
- Desktop publishing software

Production

- Graphic software
- Web authoring software
- Animation software

Post-production

- Audio editing software
- Video editing software

*This list is not exhaustive.

1.2

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Different types of Software:

| | | | |
|-----------------------------|---|---------------------------|--|
| Word processing software | Allows the user to create, edit, format, and print written documents. | Database software | Used for storing, manipulating, and managing data. |
| Spreadsheet software | Displays data in a grid format and allows the user to enter and manipulate data using formulas. | Diary management software | Used to manage emails, calendars and set up appointments. |
| Presentation software | Used to show information, normally in the form of a slide show. | Graphics editing software | Used to manipulate or enhance digital images. |
| Desktop publishing software | Designed for creating visual communications in print form. (e.g. posters) | Audio editing software | Allows editing and generating of audio data. |
| Video-editing software | Involves putting together raw footage of various shots to create a sequence or scene. | Web browser software | Allows users to open and display web pages. |
| Web-authoring software | A type of desktop publishing tool that allows users to create websites. | Animation software | Allows for the creation of motion on a frame-by-frame basis. |

CM11: Mind maps

Description:

Mind Maps are used to organise thoughts into a more formalised structure by having a main idea which branches off into different ideas that link to the central theme. It's a common pre-production document used in the first meeting because it's a quick way to generate new ideas.

Hardware & Software used:

Hardware:

- Mouse
- Keyboard
- Monitor
- Touch screen
- Graphics tablet
- Laptop/Computer

Software:

- Mind map software
- Desktop publishing software

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Components of a mind map

Central idea

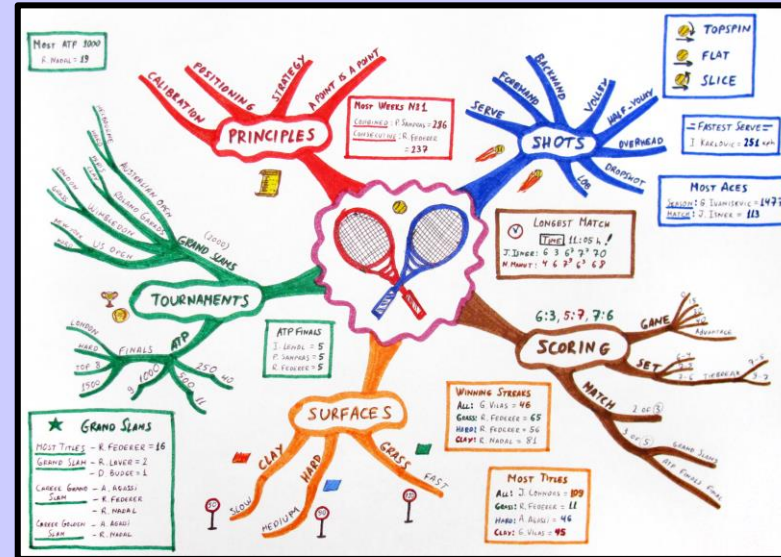
The central idea is what the project is about or what the theme is.

Nodes

Nodes are points connected to the central idea using branches which illustrated how the ideas are related to each other.

Sub-nodes

These are connected to nodes to organise ideas more clearly and provide more detail.



Keywords

Specific words may be used to help express the idea.

Colours

Colours can be used to differentiate between the ideas. Each node is in different colour in this example.

Who would use the mind map?

Creative director, Production manager, Illustrator, Graphics artist, Web designer, Director

CM11: Moodboard

Description:

A moodboard is a collection of sample materials which can be in paper or digital form. It's a way of generating ideas/setting a theme for the product.

Hardware & Software used:

Hardware:

- Mouse
- Keyboard
- Monitor
- Touch screen
- Graphics tablet
- Laptop/Computer
- Microphone
- Headphones
- Speakers
- Headset

Software:

- Desktop publishing software
- Graphics software
- Video editing software
- Presentation software

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Components of a mind map

Colours

This can be represented with the inclusion of a colour swatch or colour palette.

Fabrics

A physical moodboard may include actual cut-outs of material that are stuck to the paper.

Multimedia assets

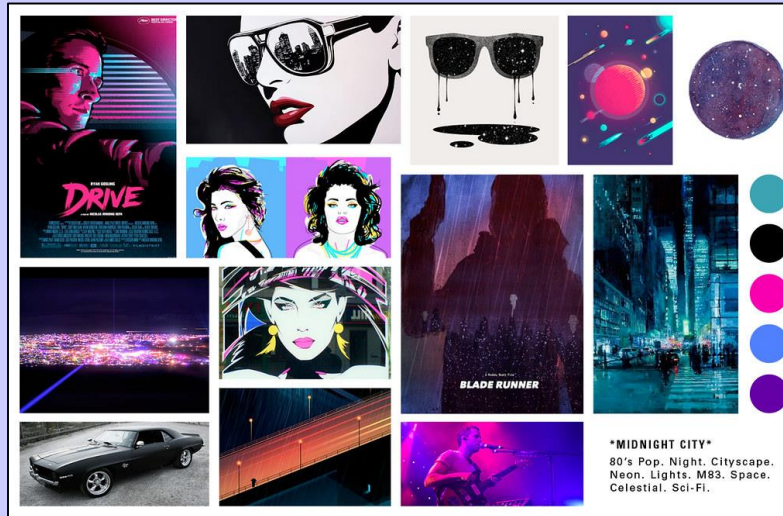
A digital moodboard may use videos, audio and animation to express an idea.

Images

Images are a key feature of a moodboard because of the visual representation it provides for the idea.

Text

Text may be used in the form of keywords that represent the theme or to provide information typography and colour schemes that could be used.



Who would use the mind map?

Creative director, Production manager, Illustrator, Graphics artist, Web designer, Director

CM12: Visualisation diagram

Description:

A draft version to plan out a product in a visual way. It can be used to show the client what the final product could look like. This can be a good opportunity for the client to provide useful feedback to the designer.

Hardware & Software used:

Hardware:

- Mouse
- Keyboard
- Monitor
- Touch screen
- Graphics tablet
- Laptop/Computer

Software:

- Desktop publishing software
- Graphics software

People:

Illustrator, Graphics artist, Graphics designer, Content creator, Copywriter and Photographer

3.3

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Components of a visualisation diagram

Title

This is because it tells you what the graphic is about. In this example, the title has been used to promote a festival, it's name and when it takes place.

Font

This refers to typography choice such as font colour, size and style. This is helpful as it can help to determine the sizes of headings, sub-headings and the main body of text.

Text

This refers to information that needs to be on the graphic.

Logo

The most recognisable part which should be easily visible to the viewer.



Colour

This is important because if it's left out then the graphics designer may not know what the colour scheme will be.

Images

This provides a more visual representation of what the product will look. Using clear images make it easier for the graphics designer to understand what assets need to be added.

Annotation

Another term used for labelling and this is important when doing a sketch design because it's not always easy to provide a complete visual representation of the final product. The more annotation, the more information the graphics has to work with.

CM13: Storyboard

Description:

A timeline that is designed to illustrate a sequence of events for content that requires movement. It allows changes to be seen over time, narrative to be included, storylines to be developed through dialogue and allows the ideas to be planned and linked together.

Hardware & Software used:

Hardware:

- Mouse
- Keyboard
- Monitor
- Touch screen
- Graphics tablet
- Laptop/Computer
- Microphone
- Headphones/Headset
- Speakers

Software:

- Desktop publishing software
- Graphics software
- Video editing software

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Components of a storyboard

Scene content

This can be inferred from the drawings found in each panel.

Timings

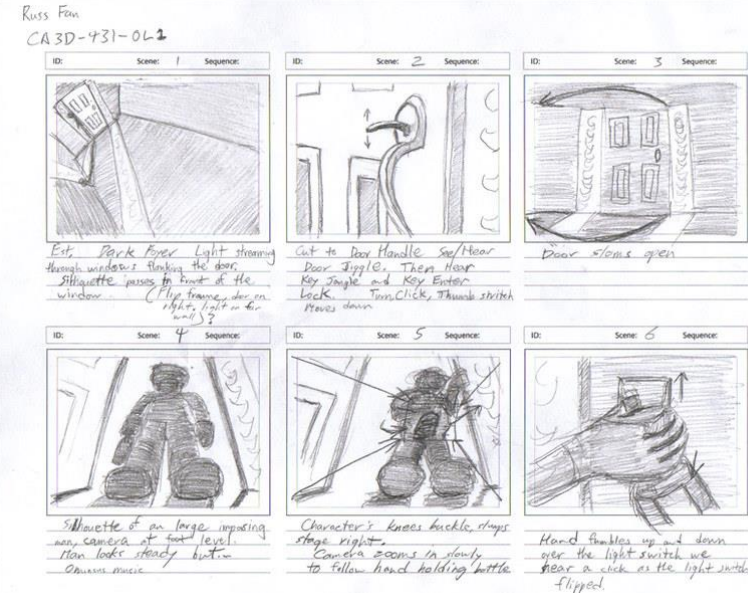
How long each scene will last.

Scene numbers

Each panel will have clearly defined scene number which makes it easier to film these in isolation and use editing techniques to put them together.

Location

The scene is filmed outside (EXT) or inside (INT)



Order of panels

The storyboard should follow a logical structure to make it easier to put together.

Camera

This can be used to identify camera shots, movements and angles. It can also identify camera type such as a virtual camera.

Sound

Background music, dialogue or sound effects could be expressed

Lighting

Specify use of lighting techniques in scenes.

Who would use the storyboard?

Creative director, Camera operator, Audio technician, Illustrator, Graphics artist, Director

Description:

A script is a pre-production document that is used as part of a narrative for an audio-visual product. It provides lines for the characters so they know what to say and provides direction for the camera crew to know what will be used within each scene.

Hardware & Software used:

Hardware:

- Mouse
- Keyboard
- Monitor
- Touch screen
- Graphics tablet
- Laptop/Computer

Software:

- Word processing software
- Script writing software

Components of a script

Location

The scene is filmed outside (EXT) or inside (INT)

Camera

This can be used to identify camera shots, movements and angles. It can also identify camera type such as a virtual camera.

Dialogue

He speaking parts of the product. But this can also include: Intonation, loudness, emotion.

Sound

Background music, dialogue or sound effects could be expressed.

It's peaceful, the two fisherman have left and we see their aluminium chairs left behind at the edge of the lake.

JOHN

Not many left fishing the lake now.
There was a time you'd see lamps
all around, floating.

John rows out as Eamon sorts the bait.

JOHN

Ah it's hard to get the licence now. We impoverish the
fishing for the tourists.
Impoverish!

Eamon pauses for a moment and looks up at him. John continues to row.

JOHN

A thousand. I told him you were
well able to count to a thousand.
That's what I told Ben Moran.

(Getting more irate)

That he's the one helping them
clear the lake!

EAMON

(Interrupting him quickly)

That's his job.

JOHN

His job! To clear us off the lake!
His job.

Eamon pauses, hesitating and then decides to speak.

EAMON

I saw Una Moran today.

John looks at him keenly and stops rowing.

JOHN

What business did you have with
her?

EAMON

(embarrassed)

None. None. I just saw her walking
down the road.

JOHN

It's a free country I suppose.

John starts rowing again and looks away.

Direction

This refers to what happens in the scene, this might be something as simple as a character movement.

Characters

It's important the character names are included as it helps to clearly define the dialogue for each character.

Who would use the script?

Creative director, Camera operator, Audio technician, Illustrator, Graphics artist, Director

CM14: Wireframe

Description:

A planning document that illustrates how a product will look. It will show how pages/screens are linked together and is used commonly for websites and apps. Wireframe focuses more on how the website will look and will be used by a front-end web developer.

Hardware & Software used:

Hardware:

- Mouse
- Keyboard
- Monitor
- Touch screen
- Graphics tablet
- Laptop/Computer

Software:

- Word processing software
- Desktop publishing software

3.3

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Components of a wireframe

Images

These are usually displayed as a box with a cross which represents an image.

Video

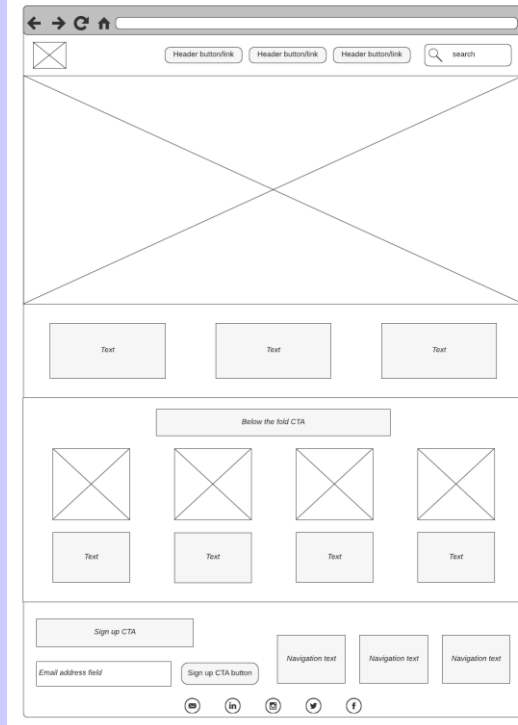
The word video is displayed inside the box.

Text

These are usually displayed as a box with straight lines, the actual copy or by a placeholder text such as Lorem ipsum.

Annotation

This allows the designer to explain how different elements are linked together.



Hierarchy

The importance of a page is created by using headings, most often bold or heavier weighted text, of different sizes and location.

Links

Links are represented most often as blue, underlined text. Links may also be a different colour, keeping in line with a particular visual design direction.

Who would use the wireframe?

Photographer, Web designer, Illustrator, Graphics artist, Web developer

CM14: Flow chart

Description:

A diagram that represents the entire process from start to finish. It's illustrated in a logical step by step sequence using shapes that each have their own function. Flow charts focus more on how the website will work and will be used by a back-end web developer.

Hardware & Software used:

Hardware:

- Mouse
- Keyboard
- Monitor
- Touch screen
- Graphics tablet
- Laptop/Computer


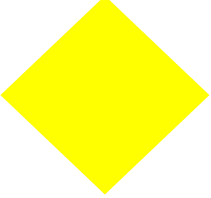

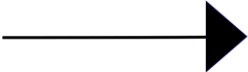

Software:

- Word processing software
- Desktop publishing software
- Flow chart software

3.3

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Flow chart symbols

| | | | |
|--|--|---|--|
|  | Start/Stop: This signals the beginning and the end of a flow chart. |  | Decision: This is used to represent selection and the outcomes when a certain condition is met. |
|  | Input/Output: Used if data is being inputted into the system. If any data needs to be displayed then output could be used. |  | Arrow: This is used to connect the symbols together and to show the direction the flow chart is going. |
|  | Process: This is used to process instructions. It could be used to process calculations or run events. | Why use flow charts? <ul style="list-style-type: none">• Easy to show the layout each page.• Show how all the pages/screens link together.• It can show how functional the website is. | |

Who would use the flow chart?

Games programmer, Web designer, Web developer.

CM15: Legislation for individuals

Description:

Legislation is the process of enacting laws so if they're breached then it can become a criminal offence. Some laws are in place to protect individuals when they make a contribution to the creation of a media product.

Permissions when filming

Key facts:

- It's not against the law to film in a place that may include general members of the public.
- You may need to request permission of anyone who has been filmed if it was for commercial purposes.
- If filming takes place on private property then you must ask the land owner for permission.
- Photographers can capture images and sell them on image libraries.

3.4

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Key term:

Defamation the action of damaging the good reputation of someone; slander or libel. Slander is a verbal statement and Libel is a written statement.

Slander

Description:

The action or crime of making a false spoken statement damaging to a person's reputation.

Libel

Description:

A published false statement that is damaging to a person's reputation; a written defamation.

Data protection

Description:

A piece of legislation that aims to protect a person's personal data.

Principles:

- Used for a specific purpose (as shown above)
- Relevant and not more than needed (as shown above)
- Accurate and kept up to date.
- Not kept longer than necessary (e.g. user closes account)
- Stored securely

CM16: Legislation for assets

Description:

Intellectual property is legislation designed stop your work from being copied and distributed without your permission and there are three types of intellectual property: Copyright, Trademarks and Patents which aim to protect ideas.

3.4

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Trademarks

Description:

A sign or logo that identifies a brand or company as a unique entity. This is represented by the TM symbol. The R symbol protects words and phrases.

Using copyrighted materials

Examples:

- Ask permission from the copyright holder.
- Creative commons licensing
- Royalty free – pay a fee to gain a licence to use the image and remove the watermark.
- Stock libraries – assets that are free to use.

Copyright

Description:

- Copyright is the legal right to protect the original work of the people whom it may belong to.
- Copyright can protect....

Books

Music

Art

Images

Sound

Software

Fair use

This is when copyrighted material may be used for news reporting, commentary or educational purposes.

Creative commons licence

Description:

This license allows copyrighted material to be more freely distributed.



Attribution: Material can be copied, modified and used. However, the original creator must be given credit.



Non-commercial: Material can be copied, modified and used as long as there is no intention to make money from it.



Share-a-like: Material can be modified and used but must be covered by a similar license.



No derivative works: Material can be copied and used, but it cannot be modified.

CM16: Asset log

Description:

A pre-production document that is used to record all the assets that are potentially used when creating a media product and understand any legislative constraints there may be.

Hardware & Software used:

Hardware:

- Mouse
- Keyboard
- Monitor
- Touch screen
- Laptop/Computer

Software:

- Word processing software
- Spreadsheet software

Key term:



Assets: in the context of digital media, refers to the different components that can be used in a product such as: text, images, videos, animation and audio.

3.3

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Components of an asset log

No/Asset ID

A count of how many assets are recorded or to give an asset a unique ID which is useful if the log contains a large volume of assets.

Filename

So the user knows what the file is called if they need to use it.

Description

To provide a description of what the asset is so the user knows what it is before they open it.

Properties

The resolution and dimensions if it's a digital graphic in case it needs repurposing.

Source

Where the asset has come from by recording the URL.

Legal issues

To record any legal considerations such as whether they need to ask permission to use the asset.

Use

What it will and what it could be used for.

| No. | Filename | Description | Properties | Source | Legal issues | Use |
|-----|---------------------|---|-----------------------|---|--|--|
| 1 | Pizza.jpg | Image of a pizza. | 800 x 1022 96 DPI | https://clipart.world/pizza-clipart/simple-pizza/ | Should only be for personal use. | To be used in the YePizza logo. |
| 2 | Pizza paddle.jpg | Pizza paddle | 450 x 450 | https://www.123rf.com/photo_134983275_pizza-cooking-shovel-icon-isometric-style.html?vti=nbubvpyvtl89e1e66y-1-2 | Subscription required to download which will remove the watermark. | To be used in the YePizza logo. |
| 3 | Phone icon.png | Image of a phone | 320 x 431 | Client image | Not applicable | To be used to represent contact details on a poster. |
| 4 | Wood_fire_pizza.jpg | Image of a pizza that has been in a wood fire oven. | 6016 x 4016 96 DPI | https://www.pexels.com/photo/baked-pizza-on-pizza-peel-in-oven-905847/ | Free to use | To be included in the promotional poster. |
| 5 | Tomatoes.jpg | Image of fresh tomatoes | 640 x 320 | I took the image myself | Free to use as I'm the original owner. | To be included in the promotional poster to promote how fresh the ingredients are. |

Who would use the asset log?

Graphic artist, Web designer, Games programmer, Animator

CM17: Regulation, Classification and Certification

Description

The control or guidance of media content by governments and other bodies. This means media production and consumption are monitored.

Example:



Background:

- The ASA banned this Ryanair newspaper campaign featuring scantily-clad flight attendants, ruling that it linked female cabin crew with sexual behaviour.

3.4

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BBFC

Description:

- The British Board of Film Classification who regulate media content and classify films that are distributed in the UK.

ASA

Description:

- The Advertising Standards Agency regulate all broadcast and non-broadcast content across the UK.

Key terms:

Certification

This is the award given to a media product as a result of the classification process which is displayed on the product. For example, a film might have an 18 certificate placed on the front cover.

Ofcom

Description:

- The Office of Communications regulate all broadcasted content across UK television channels.

PEGI

Description

- Pan European Game Information have classified all video game content in the UK. It used to be the role of the BBFC.

Key terms:

Classification

The process of giving age ratings and content advice to films and other audio-visual content to help children and families choose what's right for them and avoid what's not..

CM18: Health and safety

Description:

Health and safety is about stopping you getting hurt at work or ill through work. Your employer is responsible for health and safety and they have a legal obligation to follow this through.

Healthy and safety in production:

Camera risks

- In some cases, camera operator may need to walk backwards? Or if they're suspended from a harness?

Lifting hazards

- May need to move equipment or props so manual handling training might be required.

Trip hazards

- Lots of cameras and other equipment will lead to more cables.

Electrocution

- If devices fail or are not connected correctly so people may need training.

3.4

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Healthy and safety in pre and post-production

Regular breaks

Suitable lighting

Tiltable screens

Desk needs to be about 70cm high

Foot rest

Eyes must be level with the top of the screen.

Anti-glare filters

Clear working space

Wrist support

Chair needs to be adjustable for tilt and height.



Key term:

Mitigate: make (something bad) less severe, serious, or painful. In the context of health and safety, mitigating risks is all about reducing the risk of an accident happening.



CM18: Location recces

Description:

A location recce involves members of a production company visiting a potential location for filming and use a set of measures to assess it's suitability.

Risk assessment

Components of a risk assessment.

- Activity
- Hazard – what might cause danger or injury?
- Risk – what are the consequences of the hazard? Normally an injury.
- Prevention – what measure can be put in place to reduce the risk.

Key term:



Risk assessment: This is a document that identifies the hazards, the risks they pose and what can be put in place to mitigate these risks.

3.4

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Location recce checklist

Safety

They can check for an potential trip hazards, potential obstructions when carrying equipment around, risk of electrocution.

Sound

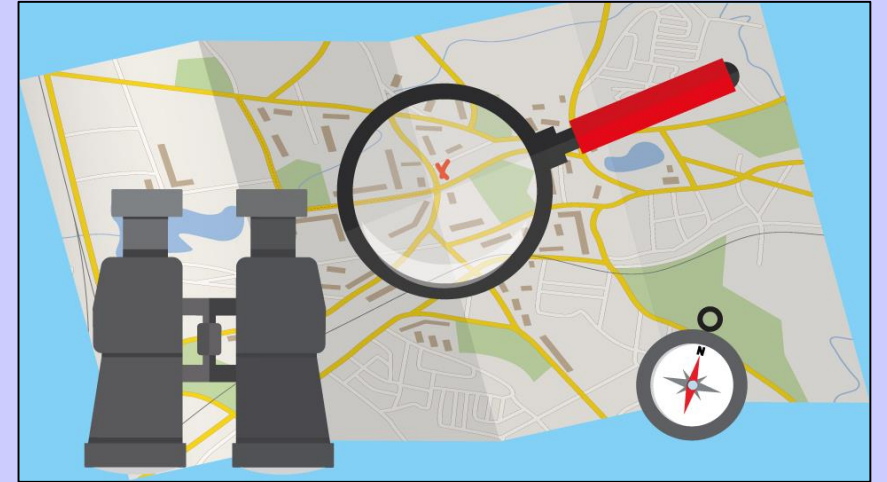
Checking for any background noise that might affect the recording such as road traffic, trains, planes etc..

Lighting

Does the location have lots of natural lighting? Will there be a problem when it gets dark? What sort of lighting can the camera crew use?

Facilities

Toilets, areas for employees to have breaks, place for catering facilities, can people park? Is there parking that allows heavy equipment to be transferred?



Power outlets

Are there enough sockets to plug them in? Is there enough distance between the outlet and where the equipment needs to go? Will the unit cope with the watts generated by the equipment?

Who would be involved in the location recce?

Director, Camera operator, Audio technician, Photographer

CM19: Distribution considerations

Description:

Distribution is the methods by which media products are delivered to audiences, including the marketing campaign.

Online platforms

Apps

- One of the most popular forms of distribution is they can be accessed via mobile devices
- They can be more responsive than website.
- However, some apps require an internet connection to use, even if they're downloaded onto the device.

Websites

- A popular method of distribution because of it's wider audience reach.
- It's ability to distribute content in different ways such as: videos, audio and images.
- Less favoured to apps as some websites aren't as responsive.
- Some website aren't user friendly especially when using mobile devices to access them.

4.1

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Physical media

Examples:

- CD/DVD – Portable and cheap method of distribution but can be easily damaged.
- Memory stick – Portable method distribution but expensive and easy to misplace/lose.
- Paper-based media – A physical method of distribution, no device needed to access but can be expensive to print and transport.

Physical platforms

Computers

- Lots of people have access to a laptop or desktop computer which makes it a good choice to distribute content.
- Not very portable and may need to be constantly plugged in.

Mobile devices

- A small, lightweight and portable platform that allows users to access content on the go.
- Limited battery life and would need to be charged.

Interactive TV

- Provides users with more flexibility and not tied down to a schedule.
- Have to be physically plugged in to access.

Kiosks

- Automated system that provides users with real-time information.
- Fixed in one position and cannot be moved around.

CM20: Static image files

Description:

Static images are images that have no moving elements.

File formats:

JPG:

- This is a bitmap image file format.
- Uses lossy compression.
- Commonly used to store photographs.

PNG:

- This is a bitmap image file format.
- Uses lossless compression.
- Supports transparency
- Commonly used for web graphics.

SVG

- This is a vector image file format.
- Uses lossless compression.
- Small in file size.
- Commonly used for web graphics.

TIFF

- This is a bitmap image file format.
- Uses lossless compression.
- Large in file size.
- Commonly used for print graphics.

4.2

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Vector graphics



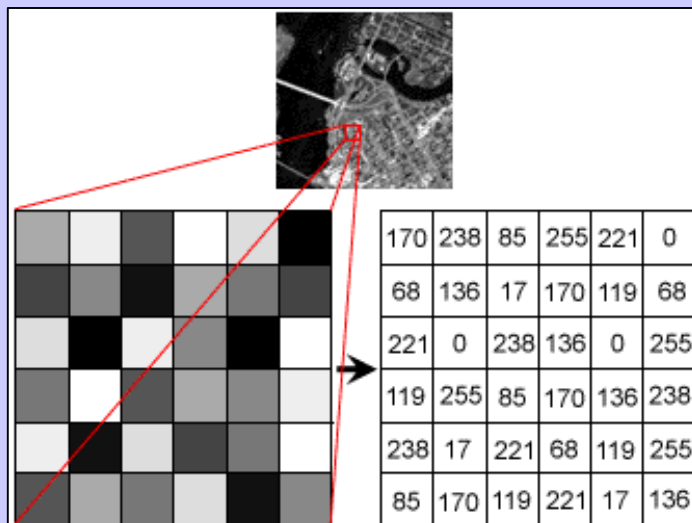
Examples:

- Made up of lines of curves using mathematical equations to determine the scale of the graphic.
- It doesn't use pixels and is not dependent on resolution.
- Commonly used to create logos.

Bitmap images

Description:

Made up of pixels which help to determine the dimensions of an image which is measured by the number of pixels in height x number of pixels in length.



Resolution:

- The number of pixels stored in an image.
- Measured in PPI (Pixels per inch)/DPI (Dots per inch)
- Higher the resolution, the much sharper the quality of the image will be.
- Recommended resolution for a print graphic is 300 DPI.
- Recommended resolution for a web graphic is 72 DPI.

CM20: Compression

Description:

Compression is an algorithm designed to reduce the size of a file. There are two types of compression: Lossy and Lossless.



Lossy and Lossless Compression:

| Lossy Compression | Lossless Compression |
|---|---|
| It reconstructs all the original data but this means data is lost during the compression process. | Data is reconstructed and doesn't remove any data. |
| Once data is removed, it's permanent and cannot be restored. It's irreversible. | Because data is retained, it's reversible so changes can continue to be made. |
| This can impact the overall quality of the graphic. | The overall quality of the graphic is retained. |
| It does significantly reduce the overall size of the file. | The size of these files tend to be large. |
| JPG is a common file format that uses lossy compression. | PNG are common file formats that use lossless compression. |

4.2

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Impact on size:

| | | | |
|--|------------------|--------------------|----------|
|  cafe_wonderland_teachparty | 08/09/2020 12:38 | JPG File | 84 KB |
|  cafe_wonderland_teachparty | 10/05/2019 10:51 | Adobe Photoshop... | 2,449 KB |

Example:

The top file has been compressed using lossy and this will:

- Save space on the device it's being stored.
- Use less bandwidth if file is transferred over a network (i.e. e-mail)

Impact on quality:

Example:

As you can see above, the image at the top has been saved in a lossless format whereas the image below, has been saved in a lossy format. You can see that the quality of the image below has reduced because data has been permanently removed.



Remember:

- Lossy and Lossless can impact audio and moving images.

CM21: Audio files

Description:

Audio can be in the form of music, dialogue and sound effects.

File formats:

MP3:

- This is a lossy file format.
- Small file size
- Stored on portable devices.

WAV:

- This is a lossless file format.
- No quality is lost.
- Used for studio recordings.

AAC:

- This is a lossy file format.
- Maintains a high quality of sound.
- The format for standard music for iTunes, Android etc...

FLAC:

- This is a lossless file format.
- Maintains all the data so quality retained.
- Can reduce file size.

4.2

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Bit depth

Uncompressed audio formats

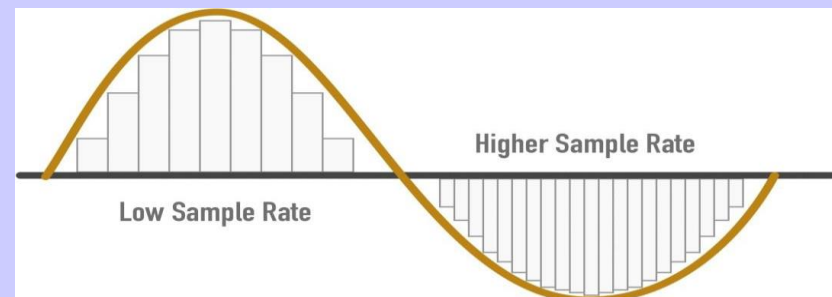
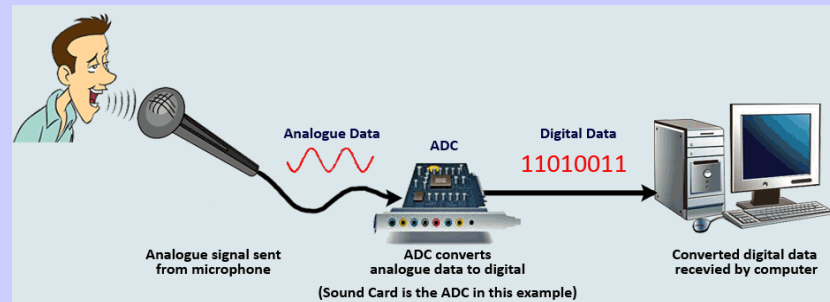
| Bit Depth | Sample Rate | Application |
|-----------|-------------|-------------------------------|
| 16 bit | 44.1 kHz | CD quality audio |
| 24 bit | 48 kHz | High quality music production |
| 24 bit | 96 kHz | Archival quality audio |

BLOG.LANDR.COM

Description

Bit depth is the number of bits available for each sample. If the bit depth increases it can increase the dynamic range of volume (this affects how loud the sound will be). This will also contribute to the quality of the sound file improving.

How sound becomes digitised



Analogue to Digital

During the conversion process, samples are taken that are then converted from analogue into a digital recording.

Sampling

When sound is recorded, samples are taken at regular intervals as you can see in the diagram on the right. The sample rate is measured in Hz (Hertz). The more samples taken improves the playback quality.

CM22: Moving image files

Description:

Moving images can be in the form of a video or animation.

File formats:

MP4:

- This is a lossy file format.
- Small file size
- Used for streaming videos and films.

AVI:

- This is a lossless file format.
- No quality is lost.
- Used for editing raw footage.

MPEG:

- This is a lossy file format.
- Maintains a high quality of sound.
- Used to be broadcasted on TV and released on DVD's

MOV:

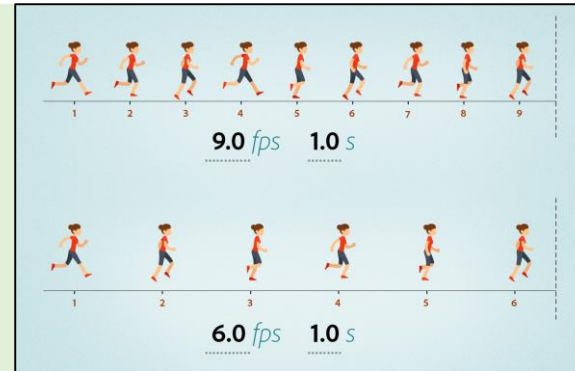
- This is a lossy file format.
- Only compatible on Apple devices such as iPhone, iPad etc..

GIF and SVG

4.2

KS4 OCR Cambridge National in Creative iMedia R093: Creative iMedia in the media industry

Frame rate



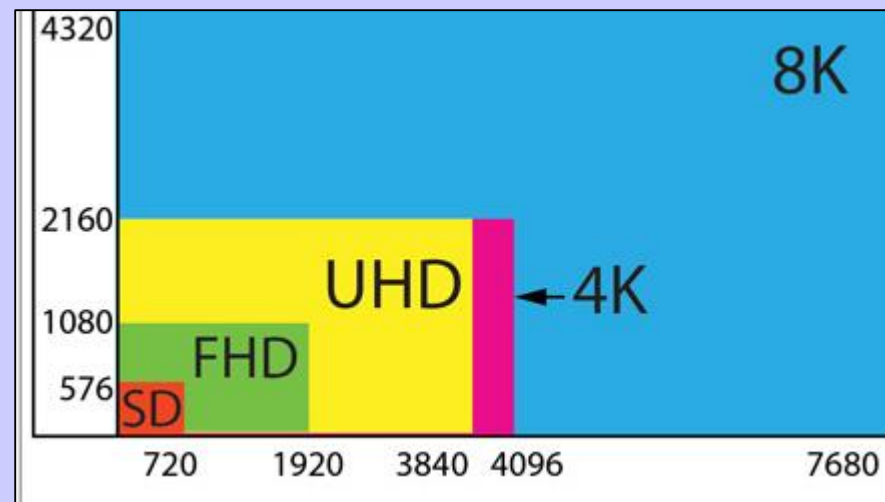
Description

Frame rate (frames per second or fps) is the speed at which individual still photo (frames) are projected onto a screen.

Impact

- A higher frame rate leads to a smoother motion.
- If the frame rate is too fast it will blur the details of the animation.
- If the frame rate is too slow will have a start/stop and jittery non-fluid effect.

Resolution



Description

Video resolution determines the amount of detail in your video, or how realistic and clear the video appears and is measured by the number of pixels. Examples include:

- SD (Standard)
- HD (High Definition)
- 4K UHD (4K Ultra High Definition)
- 8K UHD (8K Ultra High Definition)

Year 11 Foundation Topic 1 – Vectors - Student Knowledge Organiser

Key words and definitions

Magnitude – the length of a vector

Vector – a quantity that is described by a magnitude and a direction.

Scalar – a quantity that is described by a magnitude (or numerical value) alone.

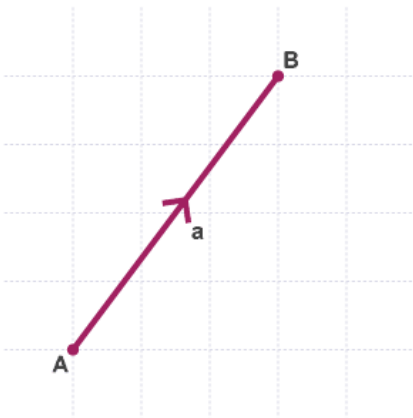
Direction – the direction along which it acts.

Scalar Multiple – the amount by which a vector's magnitude is changed.

Parallel – Vectors acting in the same direction will be parallel (side-by-side).

Column Vectors

A vector between two points A and B is described as: \overrightarrow{AB} , a or \underline{a} .



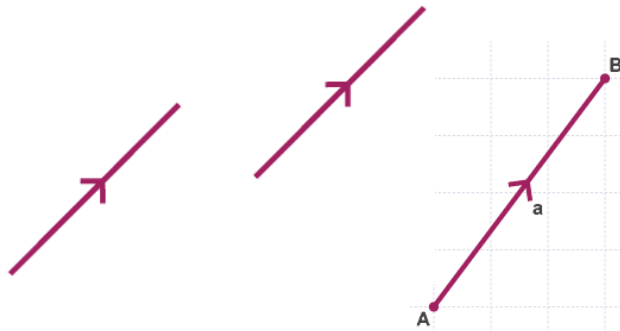
The vector can also be represented by the **column vector** $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$.

The top number tells you how many spaces or units to move in the positive x -direction and the bottom number is how many to move in the positive y -direction.

Vectors are equal if they have the same magnitude and direction regardless of where they are.

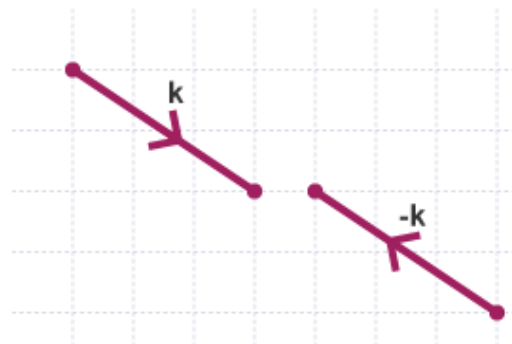
Drawing Vectors

A vector can be represented by a **line segment** labelled with an arrow.



A vector between two points A and B is described as: \overrightarrow{AB} , a or \underline{a} .

A negative vector has the same magnitude but the opposite direction.



Vectors can be multiplied by a **scalar** which changes the size of the vector but not the direction.

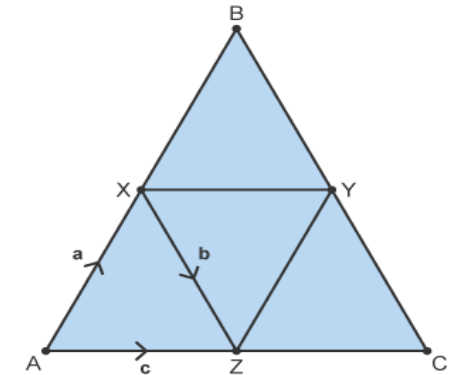
$$k = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$$

The vector $2k$ is twice as long as the vector k . Double each number in k to get $2k$.

Vectors around a Shape

Example

Write, in terms of a , b and c , the vectors \overrightarrow{ZY} , \overrightarrow{YC} , \overrightarrow{ZA} and \overrightarrow{BX} .



$$\overrightarrow{ZY} = a$$

\overrightarrow{ZY} and \overrightarrow{AX} are equal vectors, they have the same magnitude and direction.

$$\overrightarrow{YC} = b$$

\overrightarrow{YC} and \overrightarrow{XZ} are equal vectors, they have the same magnitude and direction.

$$\overrightarrow{ZA} = -c$$

\overrightarrow{ZA} has the same magnitude as \overrightarrow{AZ} but the opposite direction.

$$\overrightarrow{BX} = -a$$

\overrightarrow{BX} has the same magnitude as \overrightarrow{AX} but the opposite direction.

Hegarty Maths Links

622-Vectors & Scalars

623-Column Vectors

624-Negative Vectors

625-Combining Vectors

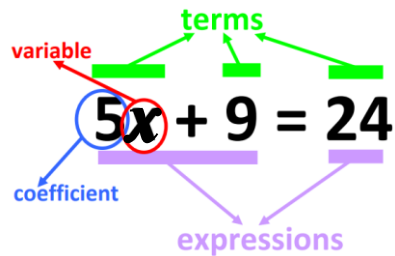
626-Multiplying by Scalars

627-Magnitude of a Vector

628-Geometry 1

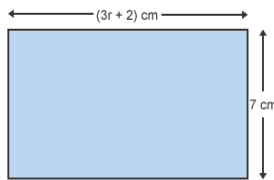
Key words and definitions

| Word | Definition |
|--------------------|--|
| Variable | A symbol for an unknown value. Usually a letter, such as a , x or y , is the symbol used for a variable. |
| Constant | A number on its own |
| Coefficient | A number that is multiplied by a variable. Example: $8y$ means 8 times y ; 8 is the coefficient, and y is the variable. |
| Operator | A symbol (+, \times , $-$, or \div) representing a mathematical operation |
| Term | Either a single number, a variable, or numbers and/or variables multiplied together Examples: 4 45 x abc $5w$ $20mn$ |
| Expression | A term or a combination of terms and operators Examples: 2 $2x$ $2x+7$ y $y-3$ $7w+3$ $8ab+9$ $5xyz$ |
| Equation | A mathematical sentence stating that two expressions are equal |



Forming and Solving Equations

The area of this rectangle is 56 cm^2 . Find the value of r .



Area of a rectangle = $\text{base} \times \text{height}$. This means $3r + 2$ will all be multiplied by 7. To show this in algebra, use a bracket for $3r + 2$ to show that both terms are being multiplied by 7.

7 multiplied by $(3r + 2)$ can be written as $7(3r + 2)$ as multiplication signs are not used in algebra.

Area = $\text{base} \times \text{height}$

$$\text{Area} = 7(3r + 2)$$

The area of the rectangle has been given in the question as 56 cm^2 :

$$56 = 7(3r + 2)$$

Expand the bracket:

$$56 = 7 \times 3r + 7 \times 2$$

$$56 = 21r + 14$$

Isolate $21r$ by subtracting 14 from both sides:

$$56 - 14 = 21r + 14 - 14$$

$$42 = 21r$$

Isolate r by dividing both sides by 21:

$$42 \div 21 = 21r \div 21$$

$$2 = r$$

Rearranging Formulae

The **subject** of a formula is the variable that is being worked out. It can be recognised as the letter on its own on one side of the equals sign.

For example, in the formula for the area of a rectangle $A = bh$ ($\text{area} = \text{base} \times \text{height}$), the subject of the formula is A .

Rearrange the formula $v = u + at$ to make t the subject of the formula.

$$v = u + at$$

$$-u \quad -u$$

$$v - u = at$$

$$\div a \quad \div a$$

$$\frac{v - u}{a} = t$$

The letter t is now isolated, so t is now the subject of the formula.

Rearrange the formula $T = 2\pi\sqrt{\frac{L}{G}}$ to make L the subject.

Firstly, isolate the root: Now 'square' both sides: Lastly, multiply by G :

$$\frac{T}{2\pi} = 2\pi\sqrt{\frac{L}{G}}$$

$$\left(\frac{T}{2\pi}\right)^2 = \left(\sqrt{\frac{L}{G}}\right)^2$$

$$\frac{T^2}{4\pi^2} = \frac{L}{G}$$

$$\frac{T^2}{2\pi} = \sqrt{\frac{L}{G}}$$

$$G\left(\frac{T^2}{2\pi}\right) = L$$

Solving Simultaneous Equations

Solve the following simultaneous equations:

$$3x + y = 11$$

$$2x + y = 8$$

First, identify which unknown has the same coefficient. In this example this is the letter y , which has a coefficient of 1 in each equation.

Either add or subtract the two equations from each other to eliminate the letter y . In this example the equations will need to be subtracted from each other as $y - y = 0$.

$$3x + y = 11$$

$$- \quad - \quad -$$

$$2x + y = 8$$

$$= \quad = \quad =$$

$$x = 3$$

The value of x can now be **substituted** into either equation to find the value of y .

Substitute $x = 3$ into either $3x + y = 11$ or $2x + y = 8$.

$$3x + y = 11 \text{ when } x = 3$$

Substitute $x = 3$:

$$3 \times 3 + y = 11$$

$$9 + y = 11$$

Find the value of y using **inverse operations** to **solve equations**.

The inverse of adding 9 is subtracting 9, so subtract 9 from each side:

$$9 + y - 9 = 11 - 9$$

$$y = 2$$

Check the answers by substituting both values into the other original equation. If the equation balances, then the answers are correct:

$$2x + y = 8 \text{ when } x = 3 \text{ and } y = 2.$$

$$2x + y = 2 \times 3 + 2 = 6 + 2 = 8.$$

In examples like this, one or both equations must be multiplied to create a common coefficient.

$$3a + 2b = 17$$

$$4a - b = 30$$

Multiply the bottom equation to create a common coefficient of $2b$.

$$3a + 2b = 17$$

$$8a - 2b = 60$$

These equations can now be used to find the values of a and b .

The signs in front of the common coefficients are different, so the equations should be added together:

$$3a + 2b = 17$$

$$+ \quad + \quad +$$

$$8a - 2b = 60$$

$$= \quad = \quad =$$

$$11a = 77$$

$$\div 11 \quad \div 11$$

$$a = 7$$

Substitute the value of a into one of the original equations to find the value of b .

$$3a + 2b = 17 \text{ (when } a = 7)$$

Substitute $a = 7$:

$$3 \times 7 + 2b = 17$$

$$21 + 2b = 17$$

Solve the equation by using **inverse operations**. The opposite of $+21$ is -21 . Subtract 21 from both sides of the equation:

$$2b = -4$$

$$b = -2$$

Check the answers:

$$4a - b = 30 \text{ when } a = 7 \text{ and } b = -2.$$

$$4 \times 7 - -2 = 30$$

Solving Linear Equations

Solve the equation $4y + 5 = -3$.

$$4y + 5 = -3$$

Subtract 5 from each side:

$$4y + 5 - 5 = -3 - 5$$

Simplify:

$$4y = -8$$

Get y by itself by dividing both sides by 4:

$$4y \div 4 = -8 \div 4$$

$$y = -2$$

Solve the equation $5(2c - 3) = 19$.

Expand the bracket:

$$5 \times 2c - 5 \times 3 = 19$$

$$10c - 15 = 19$$

Isolate $10c$ by adding 15 to each side:

$$10c - 15 + 15 = 19 + 15$$

$$10c = 34$$

Isolate c by dividing by 10:

$$10c \div 10 = 34 \div 10$$

$$c = \frac{34}{10} = \frac{17}{5} \text{ or } 3.4$$

Hegarty Maths Links

Solving equations 177,178,179,180,181,182,183,184,185,186,187

Forming and solving equations 176,188

Rearranging Formulae 280,281, 282, 283, 284,285,286,287

Simultaneous Equations 190,191,192,193,194,195

Key

Formula

$$a^2 + b^2 = c^2$$

a = side of right triangle

b = side of right triangle

c = hypotenuse

The **hypotenuse** (h) is the longest side. It is opposite the right angle.

The **opposite side** (o) is opposite the angle in question (x).

The **adjacent side** (a) is next to the angle in question (x).

Trigonometric Formula

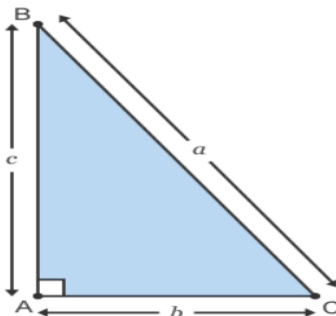
What are the formulas for sin cos and tan?

- $\sin x = \frac{\text{opposite}}{\text{hypotenuse}}$
- $\cos x = \frac{\text{adjacent}}{\text{hypotenuse}}$
- $\tan x = \frac{\text{opposite}}{\text{adjacent}}$

Pythagoras

Right-angled triangles

Pythagoras' theorem states that for all right-angled triangles, **'The square on the hypotenuse is equal to the sum of the squares on the other two sides'**. The hypotenuse is the longest side and it's always opposite the right angle.

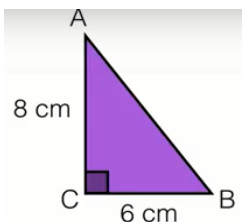


In this triangle $a^2 = b^2 + c^2$ and angle A is a right angle.

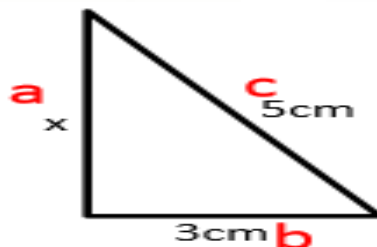
Pythagoras' theorem only works for right-angled triangles, so you can use it to test whether a triangle has a right angle or not.

In the triangle above, if $a^2 < b^2 + c^2$ the angle A is acute.

In the triangle above, if $a^2 > b^2 + c^2$ the angle A is obtuse.

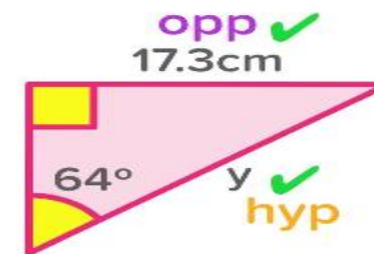
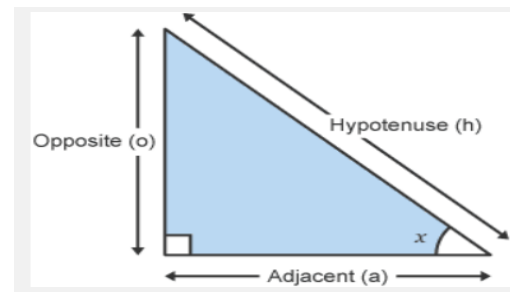


$$\begin{aligned} AB^2 &= BC^2 + AC^2 \\ AB^2 &= 6^2 + 8^2 \\ AB^2 &= 36 + 64 \\ AB^2 &= 100 \\ AB &= \sqrt{100} \\ AB &= 10 \text{ cm} \end{aligned}$$

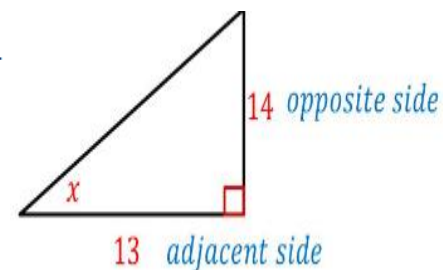


$$\begin{aligned} a^2 + b^2 &= c^2 \\ x^2 + 3^2 &= 5^2 \\ x^2 + 9 &= 25 \\ x^2 &= 25 - 9 \\ x^2 &= 16 \\ x &= \sqrt{16} \\ x &= 4 \text{ cm} \end{aligned}$$

Trigonometry



$$\begin{aligned} \sin \theta &= \frac{\text{opp}}{\text{hyp}} \\ \sin(64) &= \frac{17.3}{y} \\ y &= \frac{17.3}{\sin(64)} \\ y &= 19.24801... \end{aligned}$$



Use tangent ratio $\tan x = \frac{O}{A}$

Use inverse tangent $x = \tan^{-1}\left(\frac{14}{13}\right)$

Solve for x using calculator $x = 47.1^\circ$

Hegarty Maths Links

Pythagoras: Videos 497-507

Right Angled Trigonometry: Videos 508-515

Year 11 Foundation Topic 4 – Shapes and Angles- Student Knowledge Organiser

Key words and definitions

Polygon – a plane figure with at least three straight sides and angles, and typically five or more.

Quadrilateral – 4 sided shape.

Pentagon – 5 sided shape.

Hexagon - 6 sided shape.

Heptagon – 7 sided shape.

Octagon – 8 sided shape.

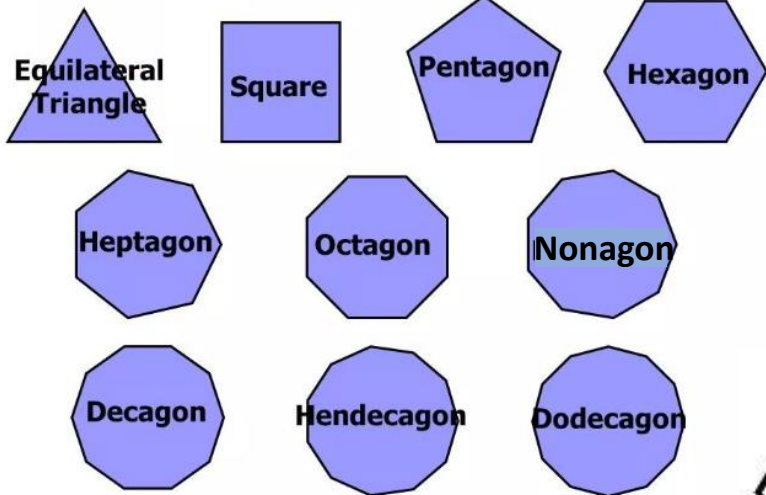
Nonagon – 9 sided shape.

Decagon - 10 sided shape.

Hendecagon – 11 sided shape.

Dodecagon – 12 sided shape.

Polygons

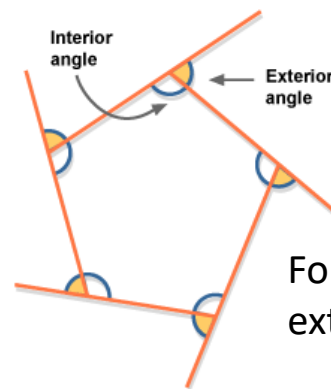


Prior Knowledge

Angles on straight lines/internal angle sums in polygons
Angles in parallel lines

Interior and exterior angles of polygons

Sum of interior angles = $180^\circ \times (n - 2)$
 $n = \text{number of sides}$

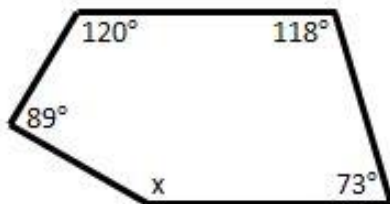


For all polygons the exterior angles total 360°

A regular polygon has an exterior angle of 20° .

How many sides does it have?

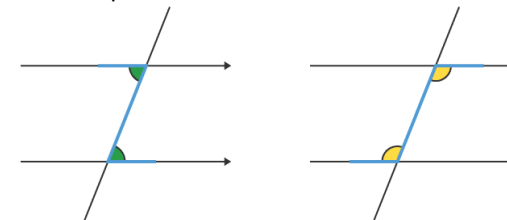
$$\begin{aligned} \text{Number of sides} &= 360^\circ \div 20^\circ \\ &= 18 \text{ sides} \end{aligned}$$



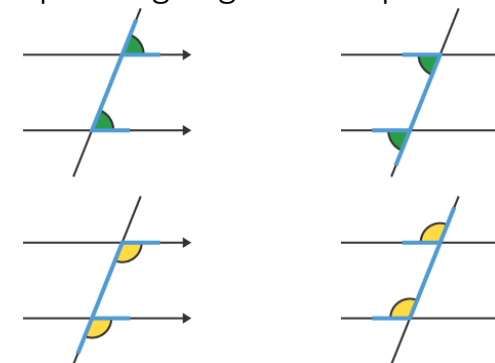
$$\begin{aligned} \text{Sum of angles} &= 89^\circ + 120^\circ + 118^\circ + 73^\circ \\ &= 400^\circ \\ \text{Sum of interior angles} &= 180^\circ \times (5-2) \\ &= 540^\circ \\ x &= 540^\circ - 400^\circ \\ &= 140^\circ \end{aligned}$$

Angles in parallel lines

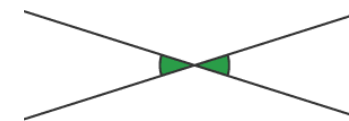
Alternate angles are equal



Corresponding angles are equal



Vertically opposite angles are equal



Hegarty Maths Links

| | |
|----------------------------|-------------------------|
| Angles in polygons | 561, 562, 563, 564, 565 |
| Vertically opposite angles | 480 |
| Alternate angles | 481 |
| Corresponding angles | 483 |

Further Trigonometry Student Knowledge Organiser

Key words and definitions

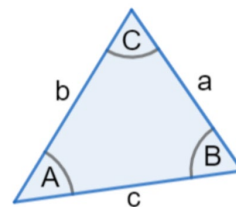
- Adjacent – the side next to the given angle in a right angled triangle
- Opposite – the side opposite to the given angle in a right angled triangle
- Hypotenuse – longest side of a right angled triangle
- Tangent (tan) - the trigonometric ratio using Opposite and Adjacent
- Cosine (cos) - the trigonometric ratio using Adjacent and Hypotenuse
- Sine (sin) – the trigonometric ratio using Opposite and Hypotenuse
- Perpendicular – Making a right angle
- Inverse function – is a function that "reverses" another function
- 2D – 2 Dimensional
- 3D – 3 Dimensional

Sine and Cosine Rule

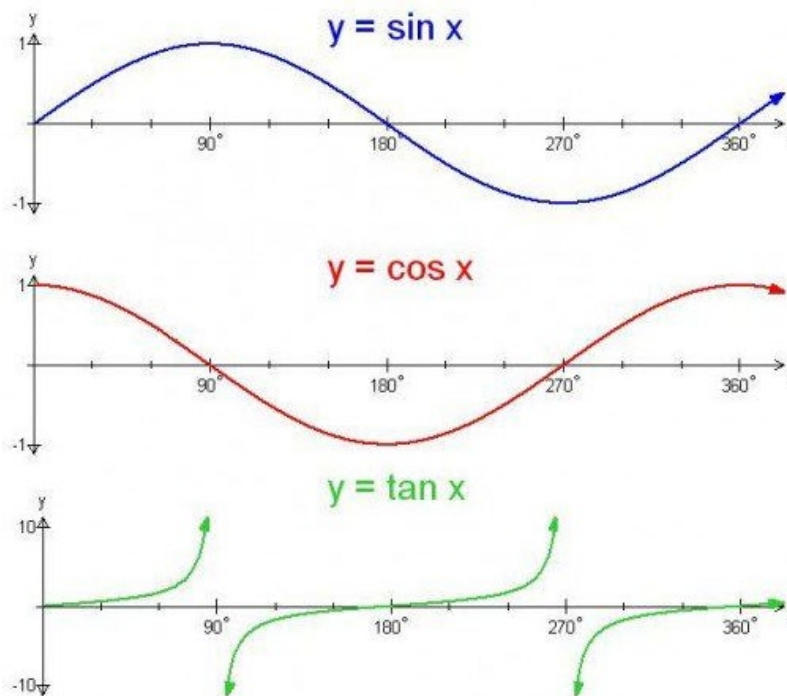
$$\text{Sine Rule } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{Cosine Rule } a^2 = b^2 + c^2 - 2bccosA$$

$$\text{Area of a triangle} = \frac{1}{2}ab \sin C$$



Trigonometric Graphs



Transforming Graphs

- Transform graph of $y = \sin(x)$:
- $y = -\sin(x)$,
 - $y = \sin(-x)$,
 - $y = \sin(x) + a$,
 - $y = \sin(x + a)$
- Transform graph of $y = \cos(x)$:
- $y = -\cos(x)$,
 - $y = \cos(-x)$,
 - $y = \cos(x) + a$,
 - $y = \cos(x + a)$

Transform graph of $y = \tan(x)$:

- $y = -\tan(x)$,
- $y = \tan(-x)$,
- $y = \tan(x) + a$,
- $y = \tan(x + a)$

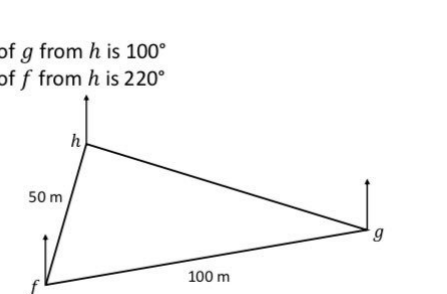
Exact Values

| Angle (θ) | $\sin(\theta)$ | $\cos(\theta)$ | $\tan(\theta)$ |
|--------------------|----------------------|----------------------|----------------------|
| 0° | 0 | 1 | 0 |
| 30° | $\frac{1}{2}$ | $\frac{\sqrt{3}}{2}$ | $\frac{1}{\sqrt{3}}$ |
| 45° | $\frac{1}{\sqrt{2}}$ | $\frac{1}{\sqrt{2}}$ | 1 |
| 60° | $\frac{\sqrt{3}}{2}$ | $\frac{1}{2}$ | $\sqrt{3}$ |
| 90° | 1 | 0 | Not Defined |

Bearings

Higher

- The bearing of g from h is 100°
- The bearing of f from h is 220°



Hegarty Maths Links

- Area of a Triangle 516 – 519
- Sine Rule 520 – 525
- Cosine Rule 526 – 530
- Bearings 492 – 496

Key words and definitions

Substitution – putting values into a function to replace the variable x

Function notation – written as $F(x) =$

Variables – the letters involved in the expression usually x or y

Domain – the numbers that are substituted into the function (input)

Range – the values that are obtained from substituting (output)

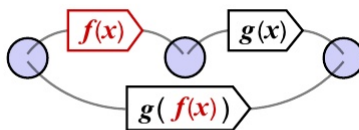
Inverse function – is a function that "reverses" another

Composite Functions

NOTE

Composite Functions

It is possible to combine functions by substituting one function into another.



$g(f(x))$ is a composite function and is read 'g of f of x'.

Important

In general
 $g(f(x)) \neq f(g(x))$

Example

Given the functions

$$f(x) = 2x$$

and $g(x) = x + 3$

find $f(g(x))$ and $g(f(x))$.

$$\begin{aligned} f(g(x)) &= 2(x + 3) \\ &= \underline{2x + 6} \end{aligned}$$

$$\begin{aligned} g(f(x)) &= (2x) + 3 \\ &= \underline{2x + 3} \end{aligned}$$

Composite Functions

A composite function is created when one function is substituted into another function.

Example:

Given $f(x) = 3x + 2$ and $g(x) = x + 5$

$$\begin{aligned} f(g(x)) &= f(x+5) \\ &= 3(x+5) + 2 \\ &= 3x + 15 + 2 \\ &= 3x + 17 \end{aligned}$$

$$\begin{aligned} g(f(x)) &= g(3x+2) \\ &= (3x + 2) + 5 \\ &= 3x + 7 \end{aligned}$$

Inverse Functions

1. Write as an equation: $y =$
2. Swap x and y
3. Change the subject
4. Write as $f^{-1}(x) =$

Functions

Evaluate/simplify terms like:

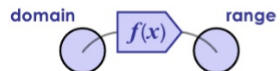
$$f(3x) \quad f(2) \quad g(2x - 3)$$

NOTE

Function Domain and Range

Any function can be thought of as having an input and an output.

The 'input' is sometimes also known as the **domain** of the function, with the output referred to as the **range**.



Important

Each number in the domain has a **unique** output number in the range.

Example

The function $f(x) = x^2 + 3x$ has the domain

$$\{-2, -1, 0, 1, 2, 3\}$$

Find the range.

$$f(-2) = 4 - 6 = -2$$

$$f(-1) = 1 - 3 = -2$$

$$f(0) = 0 + 0 = 0$$

$$f(1) = 1 + 3 = 4$$

$$f(2) = 4 + 6 = 10$$

$$\text{Range} = \underline{\underline{\{-2, 0, 4, 10\}}}$$

Hegarty Maths Links

| | |
|---------------------|----------|
| Function Notation | 288, 289 |
| Domain and Range | 290, 291 |
| Composite Functions | 293, 294 |
| Inverse Functions | 295, 296 |

Key words and definitions

Rationalise – to change to a rational number
 Numerator - the top part of a fraction
 Denominator – the bottom part of a fraction
 Surd – the root of a prime number or multiple of
 Rearrange – to change around using the rule of algebra

Proof

Expressions and forming expressions including
 Integers - n
 consecutive numbers - $n, n+1, n+2$
 Even numbers - $2n$
 Odd numbers - $2n+1$
 Consecutive even numbers - $2n, 2n+2, 2n+4$
 Consecutive odd numbers - $2n+1, 2n+3, 2n+5$

Change the subject of the formula

Rearranging Formulae

Make c the subject of the formula $y = mx + c$.

$$\begin{aligned} y &= mx + c \\ -mx & \quad -mx \\ \hline y - mx &= c \end{aligned}$$

Make m the subject of the formula $y = mx + c$.

$$\begin{aligned} y &= mx + c \\ -c & \quad -c \\ \hline y - c &= mx \\ \div x & \quad \div x \\ \hline \frac{y - c}{x} &= m \end{aligned}$$

Algebraic Fractions

Simplify fractions like:

$$\frac{x^2 + 3x - 4}{2x^2 - 5x + 3}$$

Add, subtract, multiply and divide algebraic fractions like:

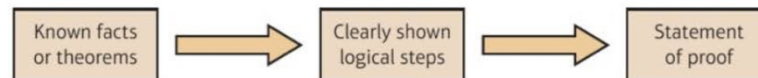
$$\frac{4}{x+2} + \frac{3}{x-2}$$

Direct Proof

A proof is a logical and structured argument to show that a mathematical statement (or **conjecture**) is always true. A mathematical proof usually starts with previously established mathematical facts (or **theorems**) and then works through a series of logical steps. The final step in a proof is a **statement** of what has been proven.

Nota

beer
A sta
prov



- In a mathematical proof you must
 - State any information or assumptions you are using
 - Show every step of your proof clearly
 - Make sure that every step follows logically from the previous step
 - Make sure you have covered all possible cases
 - Write a statement of proof at the end of your working

Direct Proof

Model expressions that could be a multiple of 7 ($7n$) or a multiple of 8 ($8n$) or 2 more than multiple of 3 ($3n+2$)

Algebraic Proof

Prove the sum of four consecutive numbers is always even.

$$\begin{aligned} x + (x + 1) + (x + 2) + x + 3 \\ 4x + 6 \\ 2(2x + 3) \end{aligned}$$

Prove $(n + 6)^2 - (n + 2)^2$ is always a multiple of 8

$$\begin{aligned} (n + 6)(n + 6) - [(n + 2)(n + 2)] \\ n^2 + 6n + 6n + 36 - [n^2 + 2n + 2n + 4] \\ n^2 + 12n + 36 - [n^2 + 4n + 4] \\ n^2 + 12n + 36 - n^2 - 4n - 4 \\ 8n + 32 \\ 8(n + 4) \end{aligned}$$

Hegarty Maths Links

| | |
|---------------------------------|---------------|
| Direct Proof | 325, 326 |
| Change the subject of a formula | 280 – 287 |
| Algebraic Fractions | 172, 229, 244 |

Vectors Student Knowledge Organiser

Key words and definitions

Scalar: a number (measure) with magnitude only

Vector: an illustrative measure which has both magnitude and direction

Magnitude the length of a vector (found using Pythagoras' theorem)

Pythagoras - $a^2 + b^2 = c^2$

Direction: the angle of the vector (often found using trigonometry)

Column: 2 or 3 dimensional matrix isolating dimensional movement

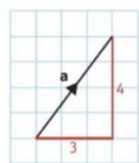
Multiple - many of the same type

Parallel: vectors which are scalar multiples of one another

-

Vectors

A vector can be described by its change in position or **displacement** relative to the x - and y -axes.

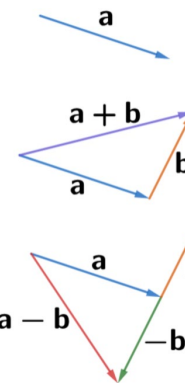


$\mathbf{a} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ where 3 is the change in the x -direction and 4 is the change in the y -direction. This is called **column vector** form.

Notation The top number is the x -component and the bottom number is the y -component.

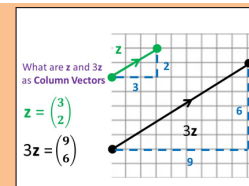
- To multiply a column vector by a scalar, multiply each component by the scalar: $\lambda \begin{pmatrix} p \\ q \end{pmatrix} = \begin{pmatrix} \lambda p \\ \lambda q \end{pmatrix}$
- To add two column vectors, add the x -components and the y -components: $\begin{pmatrix} p \\ q \end{pmatrix} + \begin{pmatrix} r \\ s \end{pmatrix} = \begin{pmatrix} p+r \\ q+s \end{pmatrix}$

Vector addition and multiples of vectors



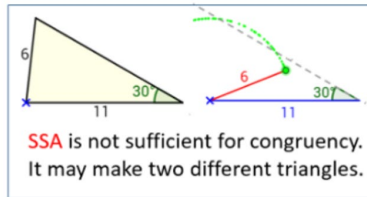
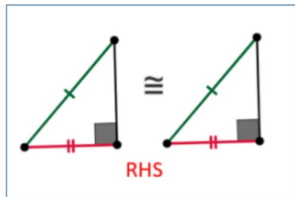
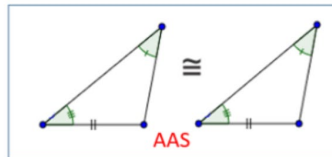
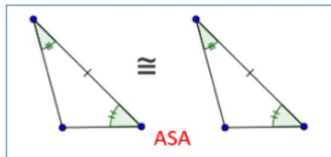
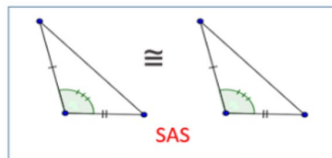
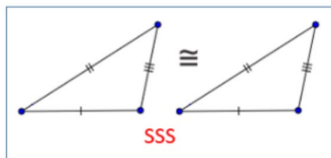
$$\mathbf{z} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

$$3\mathbf{z} = \begin{pmatrix} 9 \\ 6 \end{pmatrix}$$



$$3\mathbf{z} = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \times 3 = \begin{pmatrix} 9 \\ 6 \end{pmatrix}$$

Congruent Triangles



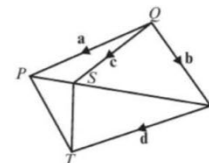
SSA is not sufficient for congruency. It may make two different triangles.

Use of vectors

In the diagram, $\vec{QP} = \mathbf{a}$, $\vec{QR} = \mathbf{b}$, $\vec{QS} = \mathbf{c}$ and $\vec{RT} = \mathbf{d}$.

Find in terms of \mathbf{a} , \mathbf{b} , \mathbf{c} and \mathbf{d} :

- \mathbf{a} \vec{PS} \mathbf{b} \vec{RP}
 \mathbf{c} \vec{PT} \mathbf{d} \vec{TS}



$$\mathbf{a} \vec{PS} = \vec{PQ} + \vec{QS} = -\mathbf{a} + \mathbf{c}$$

$$= \mathbf{c} - \mathbf{a}$$

Add vectors using $\triangle PQS$.

$$\mathbf{b} \vec{RP} = \vec{RQ} + \vec{QP} = -\mathbf{b} + \mathbf{a}$$

$$= \mathbf{a} - \mathbf{b}$$

Add vectors using $\triangle RQP$.

$$\mathbf{c} \vec{PT} = \vec{PR} + \vec{RT} = (\mathbf{b} - \mathbf{a}) + \mathbf{d}$$

$$= \mathbf{b} + \mathbf{d} - \mathbf{a}$$

Add vectors using $\triangle PRT$.

Use $\vec{PR} = -\vec{RP} = -(\mathbf{a} - \mathbf{b}) = \mathbf{b} - \mathbf{a}$.

$$\mathbf{d} \vec{TS} = \vec{TR} + \vec{RS} = -\mathbf{d} + (\vec{RQ} + \vec{QS})$$

$$= -\mathbf{d} + (-\mathbf{b} + \mathbf{c})$$

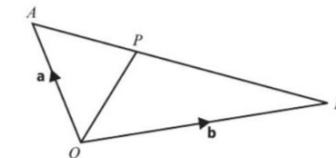
$$= \mathbf{c} - \mathbf{b} - \mathbf{d}$$

Add vectors using $\triangle TRS$ and $\triangle RQS$.

Geometric Problems - Vectors

In the diagram the points A and B have position vectors \mathbf{a} and \mathbf{b} respectively (referred to the origin O). The point P divides AB in the ratio 1:2.

Find the position vector of P .



$$\vec{OP} = \vec{OA} + \frac{1}{3}\vec{AB}$$

$$= \vec{OA} + \frac{1}{3}(\vec{OB} - \vec{OA})$$

$$= \frac{2}{3}\vec{OA} + \frac{1}{3}\vec{OB}$$

$$= \frac{2}{3}\mathbf{a} + \frac{1}{3}\mathbf{b}$$

There are 3 parts in the ratio in total, so P is $\frac{1}{3}$ of the way along the line segment AB .

Rewrite \vec{AB} in terms of the position vectors for A and B .

Give your final answer in terms of \mathbf{a} and \mathbf{b} .

Hegarty Maths Links

Vectors
 Congruent Triangles

622 – 636
 682 – 690



1.1 - Quality Street: context

Historical:

- Made by chocolate makers Mackintosh in the 50s - post-war era of rationing ending and people spending money on luxury items again.
- Comparative to the Regency period with significant cultural focus development - indicated by Major Quality and Miss Sweetly looking on over the other characters from a gold frame in Regency costume.

Social and Cultural Context

- 'High culture', i.e. theatre and art was being made more accessible to the masses rather than just the upper classes.
- Advert was designed for working class families with an aspirational messages through the construction of **mise-en-scene**.
- Gender roles in the 1950s were different to the present day.

1.2 - Media Language

How the advert communicates with the audience

Layout and Design

- Man is positioned in the middle of the image surrounded by women - shows dominance
- **Anchorage** of the frame provides a halo effect for the man - their eye line guides audience down towards the product.
- Hierarchy of class demonstrated through positioning - chocolate brings them all together

Images - Visual Codes

- Hand drawn design and rich colour palette of **reds, golds** and **purples** indicate *richness*
- Costume suggests formality and wealth, perhaps placing the characters in a higher class - reinforced by the gold frame
- Women dressed in the same colours as the chocolates - connotations of them being 'consumable' and objectified.
- Women kissing the man suggests affection towards him as a distraction - so they can get the chocolate? OR is he offering them out and they are thanking him?

Language - Verbal codes

- **Typography** is bold - takes up the bottom third of the advert suggesting it has importance.
- Use of **alliteration** and **persuasive language** 'delicious dilemma' and 'delightfully different' to encourage the audience to remember the phrasing
- Emotive language and superlatives are indicative of a well-read educated audience;
- Bold, serif font styles connote luxury and wealth

What a delicious dilemma!

18 delightfully different toffees and chocolates in

Mackintosh's
Quality Street

1.3 - Representations

STEREOTYPES

= **MAN** as **DOMINANT + PROVIDER**

- The man's **CHOICE** suggests a male dominated (**patriarchal**) society
- Women flank (on either side of) him placing him in the centre and as the main focus for the advert.
- He holds the product in his lap which has possible phallic connotations and links to his 'manhood'
- Costume positions the man as a **provider** in his business suit - connotes that he is the one who earns money
- Major Quality is in army uniform suggesting a position of authority
- One reading of the 'dilemma' is the man's choice between which woman he will choose - connotes that the women have no say in it!



STEREOTYPES

= **WOMEN** as **SUBMISSIVE**
(+ **NEEDING CHOCOLATE**)

- The women are shown distracting and manipulating the man to get to the chocolate - a common stereotype of women that is still used today.
- **POLYSEMIC** reading - the women could be seen to be controlling the situation with their feminine appeal - possibly taking control of their position to get what they want.
- Submissive body language compared to the man - both sat behind him.

1.4 - Narrative - Propp's theory

Hero

Male protagonist, centralised and in control of the narrative - he holds the item the women want.

Princess/Damsel

Women either side of the man, suggesting a patriarchal narrative of him in control.

1.5 - Key Terminology

Anchorage

When a piece of media uses another piece of media to guide the audience to the preferred meaning

Slogan

A memorable phrase that signifies something about the brand or product

Alliteration

Occurrence of the same letter or sound at the beginning of adjacent or closely connected words

Persuasive Language

Use of words to convince the reader to do or agree with something

Patriarchal Society

A male dominated society where men are in control and women are seen to be less important

Mise-en-scene

Everything in the scene or shot, i.e. costume, props, setting, lighting, makeup/hair; colour palette and performance

Nostalgia

An enjoyable yearning of some past period of time

Mode of address

Tone of voice adopted by a product, i.e. direct/indirect, formal/informal

Typography

The style of font used, i.e. serif/sans serif

Polysemic

Multiple meanings or interpretations of meaning in a product

Intertextuality

The referencing of one media product in another

Superlatives

an adjective or adverb that expresses that the thing or person being described has more of the quality being described than anything or anyone of the same type.



2.2 Media Language

How the advert communicates with the audience

Layout and Design

- Striking central image of confident woman
- **Mantra** over-layed, anchoring the image
- TGC Logo positioned below and smaller but centrally, to be noticed but not to overpower the other elements
- Sport England and Lottery logos are small and positioned out of main view so as not to distract attention
- Simple layout and limited text to prioritise the image

Images - Visual Codes

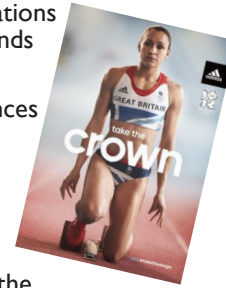
- Lack of celebrity encourages audience identification - women feel she is normal and are inspired
- Costume = mismatched and baggy gym clothes with messy hair tied back - relatable for women
- Sweating, eyes closed and slight smile on face suggest she is enjoying herself without fear of judgement
- Body language and facial expression suggest she is lost in the moment
- Blurred background - shallow depth of field, focuses audience on the protagonist.

Language - Verbal codes

- **Mantra** = "sweating like a pig, feeling like a fox" has connotations of transformation from an undesirable animal to a more desirable one
- sweating = unladylike
- fox = young beautiful lady
- Brand logo = **THIS GIRL CAN** - positive statement with connotations of determination and resilience.
- **#thisgirlcan** = **enigma** codes and link to social media to encourage engagement. Raises questions for the audience. Also encourages community through use of social media where women can communicate and encourage like-minded people.

2.3 Representations

- **Dominant ideology** about women in sport is directly challenged by the advert through a positive representation of a woman enjoying herself/
- Positive representation of women through media language construction
- Independent, confident and happy
- Image has been constructed and selected to show its 'rawness', focusing on 'real' women
- Challenges the representations of women in sporting brands that seem unachievable
- The ad encourages audiences to consider whether the fear of judgement is appropriate when you see how much fun these women are having
- Use of the word GIRL in the branding is all-encompassing, thereby representing and targeting the whole of the female population no matter age, ethnicity or religion, etc.
 - challenges the negative **stereotypes** of its use in sport, i.e. 'throw/run like a girl', etc
 - Arguably some older women may feel disconnected from the younger female connotations.



2.4 Narrative - Propp's theory

Hero = the dominant, central female is clearly the **protagonist** in the advert and according to Propp also the hero.

She is embracing sport and doesn't appear to care what anyone thinks - inspiring other women.

2.5 Key Terminology

- **Simile**
comparison of one thing with another thing of a different kind
- **Stereotype**
a widely held but fixed and oversimplified image or idea of a particular type of person or thing.
- **Narrative**
elements of storytelling or an account of events. Including how the story is told using characters and events.
- **Protagonist**
The main character in a narrative; also the hero in many narratives
- **Hashtag**
a word or phrase preceded by a hash sign (#), used on social media websites to identify messages on a specific topic.
- **Enigma Codes**
A mystery or puzzle, through withholding information, thereby raising questions for the audience.
- **Connotation**
the underlying meanings or associations constructed through the media language
- **Dominant ideology**
values, beliefs, and morals shared by the social majority, which frames how most people think
- **Mantra**
A word or phrase used to positively reinforce ideas for an individual or group of people.
- **Call to action**
A device used in advertising to encourage an immediate response, i.e. *call now, visit the store today, etc.*
- **Imperatives**
A verb used to communicate a suggestion or command persuading someone to do something.

2.1 This Girl Can: Context

Campaign context:

- Part of a national campaign by **Sport England** to break down barriers that are holding women back from sport.
- Campaign seeks to celebrate 'active women who are doing their thing, whatever that may be...'
- Non-commercial, lottery funded.

Social and Cultural Context

- **Sport England** found that 2 million fewer 14-40 year old women than men participate in sport regularly
- Fear of being judged was the No.1 thing stopping women getting involved
- 1.6m women have started exercising as a result of the campaign and the number of active women is increasing faster than the number of men.



Key Terms

- **Masthead:** The title of the magazine
- **Coverline:** hints at the biggest articles in magazine.
- **Spornosexual:** a muscular representation of men
- **Metrosexual:** a fashion-centric representation of men

Target audience

- GQ is aimed at ABC1 men
- aged between 20 and 44
- Has now broadened to appeal to, inspire and empower younger readers too.
- Consumerist culture of men that frequently purchase products they see in the magazine.

VALs

- Promotes the idea of the “all-round man” (men must excel in all areas).
- “The greatest magazine around. The men’s magazine with an IQ. Whether it’s fashion, sport, health, humour, politics or music, GQ covers it all with intelligence and imagination.”

Media Language

Image

- There is a long shot of footballer and celebrity Raheem Sterling, ensuring the magazine has star appeal for the audience.
- The black wings strongly establish him as a Proppian hero and BAME icon defending against racism in football.

Written Language

- GQ calls Sterling a “Guardian Angel”, which connotes a sense of guidance and protection, suggesting he is looking after players and the values of the game by rooting out racism.
- “Why it’s finally OK to own a belt bag” reinforces a metrosexual representation that focuses heavily on aesthetics.

Layout and Design

- The choice of gold font, connoting luxury and exclusivity – traits that the brand associates with.
- The coverlines frame his expose muscular abs and chest, reinforcing his role as the epitome as a spornosexual male icon.

Contexts

- Launched in 1931, GQ began its life as a quarterly publication called Gentleman’s Quarterly, aimed specifically at fashion industry insiders.
- Rebranded in 1967 to GQ.
- GQ is a multiplatform brand. Each issue is published in print and digitally; it has its own acclaimed website and apps.
- 212,000 monthly print readership
- over 2 million monthly unique online users, and more than 2 million social media followers.
- Historically, British black men have been underrepresented on magazine front covers due to systemic racism within the industry.
- In December 2018, Raheem Sterling took to social media to highlight racism in the British press.
- Gary Lineker has called him “perhaps the most influential player in the game” off-field.

Representation

Race

- Raheem Sterling challenges Alvarado’s threatening, aggressive and “dangerous” stereotype of black males.
- He strongly acts as a successful role model for a BAME audience.
- Creates an inclusive attitude to race to challenge Hall’s idea of “Otherness”.
- Epitome of British success as a key player and icon for the England football team.

Gender

- Raheem Sterling is a powerful role model for a young male audience.
- The choice to represent Sterling topless with his tattoos on show reinforces the stereotype of men as having to be hyper masculine, strong and muscular.
- Tattoos represent his nurturing role as a father (modern

Other Key Ideas

- His thick silver jewellery reinforces the capitalist ideology that for a man to be thought of as successful you must be wealthy and make a lot of money.
- Conspicuous consumption: His jewellery is a prop used to highlight his wealth to others.




Year 11 French – Knowledge Organiser – homelessness

| | | | | | |
|------------------------|---------------|-------------------|-----------------------------|------------------|---------------------|
| aider | to help | habiter | to live | SDF | homeless person |
| aliments | food | ils n'ont pas de | they don't have | seul | alone |
| apporter | to bring | inégalité | inequality | soutien | support |
| association caritative | charity | le monde | the world | tout le monde | everyone, everybody |
| avoir lieu | to take place | logement | accommodation | travail | work |
| bénévolat | voluntary | loyer | rent | travail bénévole | voluntary work |
| boîte en carton | cardboard box | malade | sick, ill, unwell | travailler | to work |
| boulot | job | maladie | sickness, illness | triste | sad |
| chômage | unemployment | une manifestation | a protest | trottoir | pavement |
| combattre | to combat | médicaments | medication | un tiers | a third, 1/3 |
| défavorisé | disadvantaged | nourriture | food | vivre | to live |
| déprimé | depressed | pauvre | poor | volontaire | voluntary |
| distribuer | to give out | pauvreté | poverty | vouloir | to want |
| donner | to give | pays | country | | |
| dormir | to sleep | publicité | advert, publicity | | |
| dur | hard | quartier | area, estate (in a town) | | |
| emploi | job | rue | street | | |
| faim | hungry | sac de couchage | sleeping bag | | |
| gens | people | sans | without | | |
| grave | serious | sans abri | homeless person | | |

Year 11 French – Knowledge Organiser – homelessness

| | | | |
|------------------------|---------------|------------------|---------------------|
| aider | to help | trottoir | pavement |
| association caritative | charity | vivre | to live |
| bénévolat | voluntary | volontaire | voluntary |
| boîte en carton | cardboard box | logement | accommodation |
| boulot | job | nourriture | food |
| chômage | unemployment | pauvre | poor |
| combattre | to combat | pauvreté | poverty |
| défavorisé | disadvantaged | pays | country |
| déprimé | depressed | rue | street |
| distribuer | to give out | sans abri | homeless person |
| donner | to give | SDF | |
| dormir | to sleep | tout le monde | everyone, everybody |
| dur | hard | travail | work |
| emploi | job | travail bénévole | voluntary work |
| gens | people | travailler | to work |
| grave | serious | triste | sad |
| habiter | to live | | |
| inégalité | inequality | | |
| le monde | the world | | |

Texture

| | |
|---------------------------------|---|
| MONOPHONIC | A single melodic line.  |
| HOMOPHONIC | A chordal style or melody and accompaniment: moving together.  |
| POLYPHONIC | A more complex (contrapuntal) texture with a number of different lines.  |
| Melody and accompaniment | A tune with accompaniment (e.g. chords). |
| Unison | All parts play/sing the same music at the same time. |
| Chordal | The music moves in chords (e.g. like a hymn/chorale). |
| Descant | A decorative, higher pitched line. |
| Countermelody | A new melody, combined with the theme. |
| Round | A short (vocal) canon. |
| Canon | The melody is repeated exactly in different parts but starting at different times, with parts overlapping. |
| Drone | Long held notes. |
| 2-3-4 part texture | Textures which have 2/3/4 different lines. |

Jazz and blues

Scat: vocal improvisation using wordless/nonsense syllables.
Improvised: music made up on the spot.
Blue notes: flattened 3rd, 5^{ths}, 7^{ths}.
Syncopation: off-beat accents.
Call and response: a phrase played/sung by a leader and repeated by others.
Walking bass: bass line that 'walks' up and down the notes of a scale/arpeggio.
Swing style: 'jazzy' rhythm with a triplet/dotted feeling.

A jazz ensemble may contain:

Rhythm section

- Drums
- Bass (guitar or double bass)
- Piano/guitar

'Horn section'

- Trumpet
- Trombone
- Saxophone

Some groups use a wider range of instruments e.g. clarinet, violin.

12 bar blues

Chords

| | | | |
|----|----|---|-----|
| I | I | I | I |
| IV | IV | I | I |
| V | IV | I | I/V |

Example in C major

| | | | |
|---|---|---|-----|
| C | C | C | C |
| F | F | C | C |
| G | F | C | C/G |

Chamber music

Chamber music was music for a small ensemble, originally played in a small room in someone's home.
Baroque: The **trio sonata** featured one or two soloists, plus **basso continuo** (which consisted of a low-pitched instrument such as a cello playing a bassline, with an instrument playing chords e.g. harpsichord).
Classical: String quartets (two violins, a viola and a cello) were popular. They had **four** movements, with the 1st movement usually in sonata form.

Romantic: Chamber music groups were more varied in the Romantic era, using a wider range of instruments (e.g. piano quintet, horn trio). Performances happened in larger concert halls as well as in small 'chambers'.

A piece of music for:

| | |
|----------------|--------------|
| DUET | 2 performers |
| TRIO | 3 performers |
| QUARTET | 4 performers |
| QUINTET | 5 performers |
| SEXTET | 6 performers |
| SEPTET | 7 performers |
| OCTET | 8 performers |

Musical theatre

Musical numbers may include:
Solo: a song for one singer.
Duet: a song for two singers.
Trio: a song for three singers.
Ensemble: a song sung by a small group.
Chorus: a large group (usually the full company/cast).
Recitative: a vocal style that imitates the rhythms and accents of speech.
Overture: an orchestral introduction to the show, which usually uses tunes from the show.
 The orchestra/band is used to **accompany** the voices and to **underscore**.

Voices

Soprano
Alto
Tenor
Bass

The band/orchestra (sometimes called the 'pit' orchestra), may use **strings**, **woodwind** (sometimes called 'reeds'), **brass** and **percussion** and/or a rock/pop band, depending on the style. Most shows also use keyboards or synths.

Musical forms and devices

Area of study 1 - Eduqas GCSE Music

Baroque era (1600-1750)

- Harpsichord
- Ornaments
- Terraced dynamics
- Basso continuo
- Small orchestra (mostly strings, plus some wind)
- Suite, sonata, oratorio, chorales, trio sonata
- **Bach, Handel, Vivaldi**

Classical era (1750-1810)

- Slightly larger orchestra
- Piano introduced
- Alberti bass
- String quartets
- Symphony, solo sonata, solo concerto
- Balanced, regular phrases
- **Haydn, Mozart, Beethoven**

Romantic era (1810-1910)

- Lyrical, expressive melodies
- Large orchestra
- Wider range of dynamics
- Richer harmonies and use of chromatic chords
- Programme music
- Opera symphony
- **Tchaikovsky, Grieg, Schumann, Dvorak, Brahms, Verdi, Wagner**

Form and structure

BINARY

A B

Two sections: A usually ends in a related key (e.g. dominant or relative minor), but B returns to the tonic. B will contain with some change/contrast.

TERNARY

A B A

Three sections: section B provides a contrast (e.g. new tune key change). A may return exactly or with some slight changes.

RONDO

A B A C A

A longer form: A returns throughout the piece, with contrasting sections called 'episodes', containing new ideas and using different keys.

MINUET AND TRIO

II: AB: II II:CD :II AB

The minuet was a type of graceful dance from the 17-18th century, and was often used as the 3rd movement in symphonies in the Classical era. The minuet had two repeated sections, the trio had two new repeated sections, with a return to the minuet at the end (no repeat).

VARIATIONS

A a A A *f*

The main theme (tune) is repeated and developed a number of times in a variety of different ways.

STROPHIC

A A A

A simple form where the song uses the same melody over and over.

Devices

| | |
|-----------------------------------|--|
| Repetition | A musical idea is repeated exactly. |
| Imitation | An idea is copied in another part. |
| Sequence | Repetition of an idea in the same part at a higher/lower pitch. |
| Ostinato | A short, repeated pattern or phrase. |
| Drone | A long held or constantly repeated note(s). |
| Arpeggio/ broken chord | The notes of a chord played individually. |
| Alberti bass | A broken chord accompaniment (I,V,iii,V) common in the Classical era. |
| Anacrusis | An 'up-beat' or pick-up before the first strong beat. |
| Dotted rhythms | A rhythm using dotted notes (gives a 'jagged' or 'bouncy' type of effect). |
| Syncopation | Off beat accents. |
| Conjunct | Notes that move in steps. |
| Disjunct | Notes that move in leaps/ intervals. |
| Regular phrasing | Balanced parts of a melody (like the phrases in a sentence) e.g. four bar phrases. |

Scales and chords

A **CHORD** is a group of two or more notes played at the same time. A **TRIAD** has three notes. A **CHORD SEQUENCE/PATTERN** is a series of chords. **DIATONIC HARMONY** is based on the chords of major/minor scales.

Primary chords I, IV, V
Secondary chords ii, iii, vi, vii

C Major Scale

C Major Triads

Cadences

The two chords at the end of a phrase

| | | |
|--------------------|------------------------|---|
| Perfect | V-I | Strong ending – sounds 'finished'; a musical full stop. |
| Plagal | IV-I | Sounds finished but 'softer'; Amen. |
| Imperfect | I-V, ii-V, vi-V | Sounds unfinished. |
| Interrupted | V-vi | Moves to an unexpected chord; 'surprise'. |

Film Music

Area of study 3 - Eduqas GCSE Music



Some film **SOUNDTRACKS** include specially composed **SCORES**, either for orchestra (e.g. composers like John Williams, Ennio Morricone) or songs written especially for the film (e.g. Disney films). Other films use pre-existing music e.g. popular songs from the era/place in which the film is set.

STRINGS

- Violin
- Cello
- Viola
- Double bass
- Harp

WOODWIND

- Flute
- Clarinet
- Oboe
- Bassoon
- Saxophone

BRASS

- Trumpet
- Trombone
- French horn
- Tuba

KEYBOARDS

- Piano
- Electronic keyboard
- Harpsichord
- Organ
- Synthesizer

PERCUSSION

- Bass drum
- Snare drum
- Triangle
- Cymbal
- Drum kit (untuned)
- Timpani
- Glockenspiel
- Xylophone (tuned)

OTHER

- Electric guitar
- Bass guitar
- Spanish/classical guitar
- Traditional world instruments

Musical elements

Film composers use the **MUSICAL ELEMENTS** (tempo, texture, dynamics, timbre, tonality, rhythm, melody, harmony) to create mood and atmosphere to help to tell the story and enhance the action.

For example:

In a **sad, reflective scene**, a composer might use slow tempo, minor tonality, soft dynamics, legato, homophonic texture, long sustained notes, and a conjunct melody.

An **exciting car chase scene** in a thriller might have a fast tempo, busy, polyphonic texture, dissonant chords, loud dynamics, syncopated rhythms, a disjunct melody and short riffs.

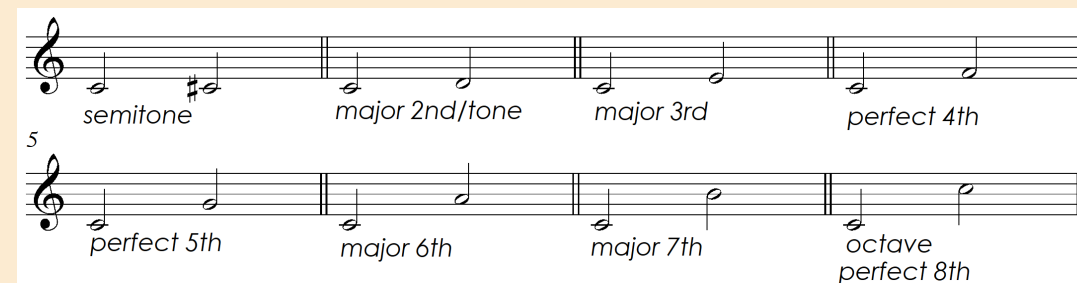
A scene where the **superhero 'saves the day'** might use a major tonality, brass fanfares, loud dynamics, accents, 4^{ths} and 5^{ths} (intervals).

Composers will often use **CONTRASTS** to create effect (e.g. using a wide range of pitch from very high to very low).

Intervals

Film composers often use intervals to create a particular effect (e.g. a rising perfect 4th sounds 'heroic', and a semitone can sound 'menacing').

An **interval** is the distance between two notes.



Rising interval: moving upwards (ascending)

Falling interval: moving downwards (descending)

Specific instrumental terms

| | |
|------------------------|--|
| Pizzicato | Plucking the strings. |
| Divisi | Two parts sharing the same musical line. |
| Double stopping | Playing two strings at the same time. |
| Arco | Using a bow to play a stringed instrument. |
| Tremolo | A 'trembling' effect, moving rapidly on the same note or between two chords (e.g. using the bow rapidly back and forth). |
| Tongued | A technique to make the notes sound separated (woodwind/brass). |
| Slurred | Notes are played smoothly. |
| Muted | Using a mute to change/dampen the sound (brass/strings). |
| Drum roll | Notes/beats in rapid succession. |
| Glissando | A rapid glide over the notes. |
| Trill | Alternating rapidly between two notes. |
| Vibrato | Making the notes 'wobble' up and down for expression. |

Composers also use:

| | |
|--------------------------|---|
| Theme | The main tune/melody. |
| Motif | A short musical idea (melodic or rhythmic). |
| Leitmotif | A recurring musical idea linked to a character/object or place (e.g. Darth Vader's motif in Star Wars). |
| Underscoring | Music playing underneath the dialogue. |
| Scalic | Melody follows the notes of a scale. |
| Triadic | Melody moves around the notes of a triad. |
| Fanfare | Short tune often played by brass instruments, to announce someone/something important; based on the pitches of a chord. |
| Pedal note | A long, sustained note, usually in the bass/lower notes. |
| Ostinato/riff | A short, repeated pattern. |
| Conjunct | The melody moves by step. |
| Disjunct | The melody moves with leaps/intervals. |
| Consonant harmony | Sounds 'good' together. |
| Dissonant harmony | Sounds 'clashy'. |
| Chromatic harmony | Uses lots of semitones/accidentals that's not in the home key. |
| Minimalism | A style of music using repetition of short phrases which change gradually over time. |

Popular music includes:

- **POP**
- **ROCK**
- **RAP**
- **HIP HOP**
- **REGGAE**

Plus many other genres, e.g. soul, ska, heavy metal, R&B, country, rock'n'roll.

FUSION: when two different styles are mixed together. This can be two styles of popular music e.g. 'rap metal', or could combine a popular music genre with other styles, folk-rock, gospel, world music, classical to create a new and interesting sound. **Jazz fusion** (jazz and pop) is a popular genre.

Instruments

ELECTRIC GUITAR:

- **Lead guitar:** plays the melody/ solos/riffs
- **Rhythm guitar:** plays the chords/ accompaniment.

BASS GUITAR: plays the bass line.

DRUM KIT: provides the beat.

LEAD SINGER: the main vocalist.

BACKING VOCALS: singers who provide harmony.

Pop/rock groups may also include **acoustic** (not electric) instruments e.g. trumpet, trombone, saxophone and/or electronic keyboards/synthesizers.

Features and techniques found in popular music

| | |
|---------------------|---|
| Riff | A short, repeated pattern. |
| Hammer on | Finger brought sharply down onto the string. |
| Pitch bend | Altering (bending) the pitch slightly. |
| Power chords | A guitar chord using the root and 5 th note (no 3 rd). |
| Distortion | An effect which distorts the sound (creates a 'grungy' sound). |
| Slap bass | A percussive sound on the bass guitar made by bouncing the strings on the fret board. |
| Fill | A short, improvised drum solo. |
| Rim shot | Rim and head of drum hit at same time. |
| Belt | A bright, powerful vocal sound, high in the chest voice. |
| Falsetto | Male voice in a higher than usual range. |
| Syllabic | One note sung per syllable. |
| Melismatic | Each syllable sung to a number of different notes. |
| A cappella | Voices singing without instrumental accompaniment. |

The structure of a pop/rock song may include:

INTRO: short opening section, usually instrumental.

VERSE: same music but different lyrics each time.

CHORUS: repeated with the same lyrics each time (refrain).

MIDDLE EIGHT: a link section, often eight bars, with different musical ideas.

BRIDGE: a link/transition between two sections.

OUTRO: an ending to finish the song (coda).

*You may also hear a pre-chorus, instrumental interlude or instrumental solo.

*Strophic songs, 32 bar songs (AABA) and 12 bar blues are also found in popular music.

A typical rock ballad in verse-chorus form could follow the pattern:

- Intro
- Verse 1
- Chorus
- Verse 2
- Chorus
- MiddleEight
- Chorus
- Outro

Technology

| | |
|--------------------|---|
| Amplified | Made louder (with an amplifier). |
| Synthesized | Sounds created electronically. |
| Panning | Moving the sound between left and right speakers. |
| Phasing | A delay effect. |
| Sample | A short section of music that is reused (e.g. looped, layered). |
| Reverb | An electronic echo effect. |

DESCRIBING MUSIC

When we describe the music that we hear, we have to use a lot of musical words. Music is another language, so we have to put a number of these words together to create a complete sentence.

DYNAMICS

Pianissimo – Very Quiet
Piano – Quiet
MezzoPiano – Kinda Quiet
MezzoForte – Kinda Loud
Forte – Loud
Fortissimo – Very Loud
Crescendo – Getting Louder
Diminuendo – Getting Quieter

RHYTHM

Long notes
Short notes
Repetitive rhythm
Jazzy Rhythm

SONORITY

Strings
Brass
Woodwind
Percussion
Male singer
Female singer
What instruments/sounds can you hear?

The **FLUTE** plays the **MELODY** which is **SMOOTH** and in a **HAPPY, MAJOR KEY**. The **MELODY** starts off **PIANO** and gradually **CRESCENDO'S** to **FORTE**. The **KEYBOARD** then joins in accompanying the **FLUTE** playing the **HARMONY**. The **KEYBOARD** plays **CHORDS** underneath which makes the **TEXTURE HOMOPHONIC**. The **TEMPO** of the piece is **FAIRLY SLOW (ADAGIO)** and has lots of **LONG NOTES**.

HARMONY

Major – happy/peaceful
Minor – sad/uneasy
Uses chords
Long/short notes

MOOD

| | |
|----------|-----------|
| Happy | Uneasy |
| Sad | Sorrowful |
| Cheerful | Tense |
| Playful | Angry |
| Cheeky | |

TEXTURE

Monophonic – only 1 sound
Homophonic – more than 1 sound but all playing together
Polyphonic – more than 1 sound all playing differently
Melody – the tune
Harmony – the backing

MELODY

Smooth
Spikey
Wide range of ...
Fragments
Mood

TEMPO

Largo – very slow
Adagio – Slow
Andante – Walking pace
Allegro – Fast
Presto – very fast
Accelerando – Speeding up
Rallentando – Slowing down

Paper 2: Commercialisation

Commercialisation

Sponsorship



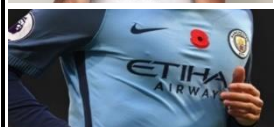
A sponsor is an individual or group that provides support in the form of sponsorship in return it is seen by millions, via advertising, sponsorship and endorsement

It can be for:

- An individual (Ronaldo sponsored by Nike)
- A team (Man City sponsored by Etihad)
- An event (Olympics sponsored by MacDonald's)

Different types of sponsorship include:

- Money
- Clothing and equipment
- Facilities



Media

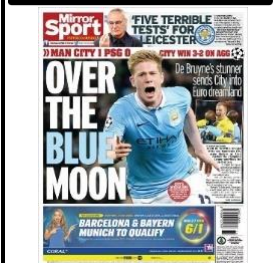


The media are a broad range of technologies that act as the main means of communication. They include:

- Printed media (newspapers and magazines)
- Broadcast media (TV and radio)
- Internet and social media

Sponsorship and the media

- Sponsors want to promote their products via the media as they can reach millions of potential customers
- Media companies need high viewing figures to make them more attractive to sponsors
- Media companies therefore pay sports clubs to allow them to televise matches as this attracts lots of viewers, making it more likely that they will get funding from sponsors



Sport



The player/performer and the sport need funding for:

- Facilities
- Equipment
- Competitions

Both the media and commercialisation can help promote sports. The media can also provide opportunities for the spectator

The Advantages of Commercialisation

| | | |
|---------------------------|---|--|
| Sponsor or company | <p>Excellent and relatively inexpensive advertising of their products as:</p> <ul style="list-style-type: none"> • Media can show products during breaks in play • Brand names can be seen around venues and on clothing • Raised awareness of brands increase sales • Products associated with high quality performance give it a high status • Media hype gets more viewers which means more exposure of the brand | |
| Sport | <ul style="list-style-type: none"> • Raised awareness = increase participation • Higher profile = commercial interest • Increases funding from sponsors • Funding means that you can run events, develop the sport and facilities | |
| player performer | <ul style="list-style-type: none"> • Paid millions to endorse products • Train full time and focus on being the best in their sport • Receive top quality products to use to improve performance | |
| Spectator | <ul style="list-style-type: none"> • More coverage and top event • Red button/Replays • Player cam • Buy the same clothes and equipment to their role models | |
| Official | <ul style="list-style-type: none"> • Sponsors can provide kit • Media can support correct decisions • More likely to become role models | |

The Disadvantages of Commercialisation

| | | |
|---------------------------|---|--|
| Sponsor or company | <ul style="list-style-type: none"> • The media may not get a high number of viewers • The company doesn't get the amount of exposure they wanted • The player/team doesn't perform well • The player who becomes a bad role model due to cheating, violence, infidelity, racism etc.... affects popularity and sales | |
| Sport | <ul style="list-style-type: none"> • Fixtures can be changed to maximise viewing opportunities • Breaks in play for advertising purposes • Minority sports not shown on TV which decreases sponsorship • Negative reporting can give a sport a bad name • Clothing and rule changes are more appealing to viewers | |
| player performer | <ul style="list-style-type: none"> • Event times make it less favourable for performers • Withdrawal of sponsorship could cause financial difficulties • Required appearances take time away from training • Pressure to win at all costs to keep a sponsor • No privacy and negative reporting can lose sponsorship | |
| Spectator | <ul style="list-style-type: none"> • High costs for subscription fees to sports channels • Pay per view for certain events • High cost of merchandise • Minority sports not shown • Sponsors keep best tickets for hospitality | |
| Official | <ul style="list-style-type: none"> • Under the spotlight for all decisions as they can be replayed, so poor decisions are highlighted undermining the official • They have to wear the sponsors logo | |

Paper 2: Performance enhancing drugs

Performance enhancing drugs

Advantages to the performer from taking PED's

Level playing field
If every athlete were to take them it would make things equal when competing

Fame
The more successful you are the more famous you can become owing to more publicity

Wealth
If you are successful you are more likely to win more prize money and attract sponsorship deals

Increase chance of success
An archer taking beta blockers to reduce anxiety may be more accurate and have a greater chance of winning

Disadvantages to the performer from taking PED's

Cheating/immoral
If caught everyone will know you cheated

Fines
If caught you may have to pay an expensive fine

Damage to reputation
If caught you will not be able to compete, when the ban is over you may be past your peak fitness

Associated health risks
Many performance enhancing drugs have health risks. Taking diuretics can cause kidney damage

Bans
If caught you will not be able to compete, when the ban is over you may be past your peak fitness

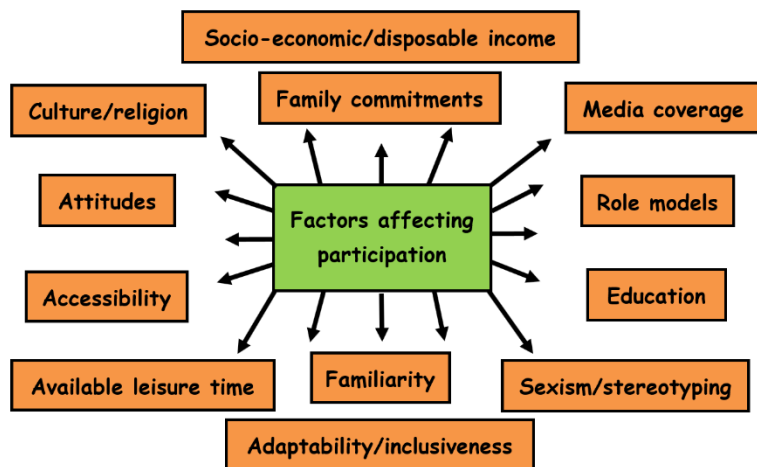
Disadvantages to the Sport when performers take PED's

A Bad reputation
If a performer takes drugs the sport may not get the respect it deserves

Poor credibility
If a performer takes drugs the sport may be seen as untrustworthy or unreliable

| Drug | Effect on Performance | Health Risks | Which Sports |
|----------------------------|--|---|--|
| Anabolic Agents | allows performers to train longer and harder It increases protein synthesis helping develop lean muscle mass and speeds up recovery time | <ul style="list-style-type: none"> Liver damage/CHD Testicular atrophy Infertility Skin problems Mood swings Aggression Baldness | Activities that require power: <ul style="list-style-type: none"> Sprinters Rugby players Weightlifting Boxers Baseball |
| Beta Blockers | Beta blockers improve fine motor control by slowing heart rate and reducing anxiety which allow the performer to remain calm and controlled | <ul style="list-style-type: none"> Nausea Sleep disturbance Tiredness/weakness Lower blood pressure Slow heart rate | Activities that require precision: <ul style="list-style-type: none"> Archery/shooting Snooker Gymnastics |
| Diuretics | Diuretics achieve quick weight loss (fluids). They also mask other drugs making them harder to detect | <ul style="list-style-type: none"> Dehydration Nausea headaches Heart/kidney failure | Drug cheats and sports with weight categories: <ul style="list-style-type: none"> Boxing Jockey |
| Narcotic Analgesics | Narcotic analgesics increases the performers pain threshold so can mask injuries, also give a feeling of invincibility | <ul style="list-style-type: none"> Nausea/vomiting Anxiety/depression Kidney/liver damage Addiction Risk further injury | Any sport that a performer is injured: <ul style="list-style-type: none"> Boxers Sprinters Football |
| Peptide Hormones | EPO Erythropoietin (EPO) Can increase red blood cell production increasing O ₂ delivery | <ul style="list-style-type: none"> Thickening of blood Blood clots Strokes Heart attack | Aerobic events e.g. long distance: <ul style="list-style-type: none"> Running Cycling |
| | HGH Human Growth Hormone Helps muscle mass and burns fat | <ul style="list-style-type: none"> Arthritis Heart failure Abnormal feet/hands | Strength events: <ul style="list-style-type: none"> Weightlifting Sprinting Rugby |
| Stimulants | Stimulants increase alertness, reduce tiredness and increase heart rate (therefore oxygen delivery) | <ul style="list-style-type: none"> Insomnia Anxiety Aggression Irregular heart rate | Alert/aggressive sports: <ul style="list-style-type: none"> Rugby Boxing Ice hockey |
| Blood Doping | Blood doping involves the removal of blood a few weeks prior to competition. The blood is frozen and re-injected just before competition. (increase red blood cells) | <ul style="list-style-type: none"> Infection Thickening of blood (viscosity) Heart attack Embolism (blockage of vessel) | Aerobic events e.g. long distance: <ul style="list-style-type: none"> Running/cycling Cycling Swimming Games players |

Paper 2: Engagement patterns of different social groups



Family/friends/peers

| | |
|--|--|
| Explanation | You can be grouped by those you spend time with: <ul style="list-style-type: none"> • Parents/guardians • Relations • Friends • Siblings • Classmates |
| Factors affecting participation | <p>Familiarity: You may play the same sport as your family. E.g. you play table tennis because your dad plays table tennis</p> <p>Attitudes: You may not play badminton because your friends don't play</p> <p>Family commitments: You may not play sport because you have to look after younger siblings</p> |
| Age | |
| Explanation | People are split into groups based on their age: <ul style="list-style-type: none"> • Children • Teenagers • Adults • Retirees |
| Factors affecting participation | <p>Accessibility: Many clubs have specific times in which they train/play. If you have other commitments, they cannot play</p> <p>Disposable income: Money may be needed to pay bills rather than play sport</p> <p>Available leisure time: Some people have little spare time due to work commitments</p> <p>Stereotyping: Some people think you are too old to play sport if you are retired</p> |

Gender

| | |
|--|--|
| Explanation | Gender groups are determined by a person's sex they are either: <ul style="list-style-type: none"> • Male • Female |
| Factors affecting participation | <p>Role models: There are a lack of female role models in many sports</p> <p>Media Coverage: Lack of TV coverage of female sports</p> <p>Sexism: Some girls do not want to play rugby as they think others will think they are masculine</p> <p>Stereotyping: Some males do not want to play netball as they think it is a sport for females</p> |

Race/religion/culture

| | |
|--|---|
| Explanation | People are grouped based on their: <ul style="list-style-type: none"> • Culture • specific origin |
| Factors affecting participation | <p>Cultural influences: Family or peers influence whether someone does an activity or not</p> <p>Disposable income: Due to economic grouping some people from minority groups may have less money. Someone without a permanent job would not have the money needed to access many sports</p> <p>Stereotyping: People from different backgrounds are steered towards or away from certain activities. E.g. people from African origin may be encouraged to participate in athletics rather than activities such as swimming</p> |

Disability

| | |
|--|---|
| Explanation | People are split into groups dependent on their disability |
| Factors affecting participation | <p>Adaptability: There are many adapted activities available to people with disabilities such as wheel chair tennis and rugby Adapting sports for the disabled can be expensive and venues are limited</p> <p>Inclusiveness: Sports sessions may not run for people with disabilities. This means it is not inclusive. They are unable to take part in mainstream activities</p> <p>Accessibility: Lack of clubs and facilities in the local area for disabled groups as well as Physical barriers such as lack of ramps or pool hoists</p> <p>Disposable income: Specialist equipment may be expensive</p> <p>Stereotyping: Someone with a disability think they are unable to participate or others assuming those with disabilities are unable to take part</p> <p>Media coverage: Although there has been an increase in media coverage it is limited</p> <p>Role models: Due to the limited media coverage there is a lack of disabled role models to aspire to</p> |

Paper 2: Conduct of performers

Sportsmanship and gamesmanship

Sportsmanship

Sportsmanship is the sporting behaviour you would like to see in sport. Performers display good conduct and do not try to win by unfair means.

Sportsmanship examples:

- Shows respect to their opponents and officials
- Shakes hands with opponents
- Kicking the ball out of play if an opponent is injured
- Being honest if the ball is out or if they break a rule

Sportsmanship creates:

- Good role models
- Positive image for the sport
- Satisfaction to know you have won honestly



Gamesmanship

Gamesmanship is the type of behaviour that you should not see from performers in sport. It is bending the rules (not breaking them) to gain an unfair advantage

Gamesmanship examples:

- Playing for time if winning
- Entering a weaker team if the following match is more important
- Sledging in cricket

Gamesmanship creates:

- Bad role models
- negative image for the sport
- Dissatisfaction to know you have won due to an unfair advantage



Spectator behaviour

Advantages of spectators

Creation of atmosphere:

- A large crowd creates excitement interest and enjoyment
- Player can be more motivated
- Interaction for the fans
- Positive experience leads to more fans who want to attend
- Raises income and raises the profile of the sport, increasing participation

Home-field advantage:

- Teams and individual performers can gain an advantage from being in familiar surroundings, with fan support and referee bias.
- You feel lifted with the majority of spectators cheering for you and so you play better

Disadvantages of spectators

Increasing pressure:

- With spectators wanting you to win can lead to an increase in anxiety causing performance to drop

Safety costs/concerns:

- It is expensive to employ security staff and repair damage caused by spectator behaviour

Negative effect on participation numbers among young people:

- The reputation of a sport due to spectator behaviour can cause a drop in the number of young people interested and therefore a loss of potential elite performers

Potential for crowd trouble/hooliganism:

- Hooliganism can lead to fans not attending matches leading to a loss in ticket sales, support and sponsorship

Reasons for hooliganism

- Rivalries (local derby)
- Hype (from media)
- Fuelled by drugs/alcohol
- Gang culture
- Frustration (official's decision)
- Displays of masculinity

Strategies to prevent hooliganism

- Bans, fines, prison
- Increased security
- Segregation
- Early kick-offs
- All seater stadiums
- Alcohol restrictions
- Education



Hooliganism can often be fuelled by drinking excessive alcohol







CCTV at stadiums help prevent unwanted Hooliganism







The intense rivalry between Celtic and rangers leads to fans being segregated

Paper 2: Technology

The Advantages of Technology






| | | |
|--|---|--|
| <p>To the sponsor</p> | <ul style="list-style-type: none"> Easier to see logos due to enhanced viewing quality More coverage of sports provides more opportunities to see products Advertising opportunities during breaks on TV Better standard of play using improved equipment encourages more sales |  |
| <p>To the performer and sport</p> | <ul style="list-style-type: none"> Improved equipment, clothing and footwear to improve performance such as running blades for disabled athletes Improved equipment, clothing and footwear to improve safety such as ski helmets and head guards in boxing Improved security at venues such as cameras and metal detectors Better facilities such as velodromes for cycling Better decisions by officials due to technology support such as VAR Better drug testing to prevent cheating |  |
| <p>To the spectator</p> | <ul style="list-style-type: none"> Multiple viewing platforms such as TV, tablet, mobile phone Better picture and sound creating a better viewing experience Interactive options such as player cam Increases enjoyment as a result of better performances due to technology Increased interaction at live games for decisions VAR and Hawkeye |  |
| <p>To the official</p> | <ul style="list-style-type: none"> Technology support means less chance of errors as it provides additional help to reach the right decision (VAR, Hawkeye, Hot spot) Improved timing devices mean more accurate results Wifi allows for improved communication with officials and technicians |  |

The Disadvantages of Technology

| | | |
|--|--|---|
| <p>To the sponsor</p> | <ul style="list-style-type: none"> They need to provide more funding to buy equipment for performers so they stay at the top of their game and give access to the best medical support to keep them fit such as ice baths and hypoxic tents Sponsored players may be found cheating which reflects badly on the sponsor |  |
| <p>To the performer and sport</p> | <ul style="list-style-type: none"> The cost of equipment increases State of the art facilities cost more Technology can go wrong Repairs are expensive Technology can be inaccurate The human part of lucky decisions is lost People can watch at home rather than attend live games Players/performers unable to afford modern technology are at a disadvantage |  |
| <p>To the spectator</p> | <ul style="list-style-type: none"> Breaks in play waiting for decisions is boring Technology changes the nature of the sport They have to pay to view some sports They have to pay for specialist sports channels Technology is expensive 3D and ultra HD TV's They don't experience the excitement of watching the match live |  |
| <p>To the official</p> | <ul style="list-style-type: none"> They become reliant on the technology Technology can go wrong Technology highlights the official's errors Decisions are challenged more owing to loss of respect for officials and judgement |  |






AQA Religious Studies A – Christian Beliefs

| Key Words | | | |
|-------------|---|--------------|---|
| Ascension | Jesus returning to be with God in heaven after the crucifixion | Omnipotent | God's nature as all-powerful |
| Atonement | Making things better after sinning, asking for forgiveness from God | Original Sin | The built-in tendency to do wrong which comes from Eve's disobedience |
| Benevolent | God's nature as all-loving | Resurrection | Jesus returning from the dead after he was crucified |
| Crucifixion | Jesus' execution by the Romans on the cross | Salvation | Being saved from sin and given eternal life in heaven by God |
| Incarnation | God becoming flesh in the form of Jesus Christ | Sin | Any thought or action which goes against God's will |
| Just | God's nature as fair | Trinity | God's nature as three-parts-in-one, the Father, Son and Holy Spirit |

| Key Ideas | | | |
|--|---|--|--|
| <p style="text-align: center;">Nature of God</p>  | <ul style="list-style-type: none"> - Christians believe in one God who is the creator and the sustainer of all that exists - God is omnipotent which means they are almighty and have unlimited power - God is benevolent which means they are all-loving and all-good - God is just which means they are a perfect and fair judge - The Problem of Suffering asks: if God is all these things why do they allow bad things to happen to good and innocent people? | | |
| <p style="text-align: center;">The Trinity</p>  | <ul style="list-style-type: none"> - Christians believe God is three persons in one. This idea is called the Trinity. - Each person of the Trinity is fully God but the three persons of the Trinity are not the same. - The Father is the creator of all life - The Son is Jesus Christ who is both fully human and fully God - The Holy Spirit is the unseen power of God at work in the world, especially answering prayers <i>"We believe in one God, Father, Son and Holy Spirit"</i> – The Nicene Creed | | |
| <p style="text-align: center;">Incarnation and Crucifixion</p>  | <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p><u>Crucifixion</u></p> <ul style="list-style-type: none"> - Jesus travelled to Jerusalem to preach and he was sentenced to death by Pontius Pilate - Jesus was then nailed to a cross where he died. - In his last moments Jesus was able to forgive those who were killing him showing Christians how important forgiveness is - This event is remembered on Good Friday <i>"Forgive them father, they know not what they do"</i> – Luke 23:34 </td> <td style="width: 50%; vertical-align: top;"> <p><u>Incarnation</u></p> <ul style="list-style-type: none"> - Christians believe that God was incarnated (born) in human form as Jesus Christ - Mary was impregnated by the Holy Spirit and gave birth as a virgin – for Christians this is proof of Jesus' status as the son of God - Christmas is the festival that celebrates the incarnation <i>"The word became flesh"</i> – John 1:14 </td> </tr> </table> | <p><u>Crucifixion</u></p> <ul style="list-style-type: none"> - Jesus travelled to Jerusalem to preach and he was sentenced to death by Pontius Pilate - Jesus was then nailed to a cross where he died. - In his last moments Jesus was able to forgive those who were killing him showing Christians how important forgiveness is - This event is remembered on Good Friday <i>"Forgive them father, they know not what they do"</i> – Luke 23:34 | <p><u>Incarnation</u></p> <ul style="list-style-type: none"> - Christians believe that God was incarnated (born) in human form as Jesus Christ - Mary was impregnated by the Holy Spirit and gave birth as a virgin – for Christians this is proof of Jesus' status as the son of God - Christmas is the festival that celebrates the incarnation <i>"The word became flesh"</i> – John 1:14 |
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| <p style="text-align: center;">Sin and Salvation</p>  | <ul style="list-style-type: none"> - Christians believe you are judged after you die (see Religion and Life) and how well or badly you have lived and treated others decides if you go to heaven or hell - Sin is any action or thought that goes against God's will, Christians can look in the Bible for advice on what is a sin e.g. murder (you shall not kill) and adultery (cheating, you shall not commit adultery) - God gave humans free will but they should use that freedom to make good choices and not sin - Salvation is the idea that Jesus's crucifixion saves human beings from eternal damnation - The death of Jesus made up for original sin – the idea that we were all damned by Eve's choice to disobey God – it allows us to atone for sins and reach eternal life in heaven | | |







AQA Religious Studies A – Christian Practices

| Key Words | | | |
|--------------------|--|------------------------|--|
| Believer's Baptism | Service where those old enough to decide for themselves are welcomed into the church | Liturgical Worship | Formal worship with set prayers, hymns and Bible readings |
| Christmas | Christian festival which celebrates the incarnation (birth) of Christ | Mission | The calling to spread the word of God and evangelise |
| Consecration | When a priest blesses bread and wine in order to use it for Eucharist | Non-liturgical worship | Worship with no set pattern, may have modern music and sermons |
| Easter | Christian festival which celebrates the resurrection of Christ | Persecution | Hostility and ill-treatment of a group of people |
| Eucharist | Service where bread and wine is received by Christians to remember Jesus' sacrifice | Pilgrimage | Going on a journey to visit a holy site |
| Evangelism | Spreading the word of God through action or speech | Prayer | A communication with God, can be private or during worship |
| Infant Baptism | Service where babies are welcomed into the church with holy water | Reconciliation | Restoring friendly relations after a conflict or falling out |

| Key Ideas | | |
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| <p>Worship + Prayer</p>  | <p>Liturgical Worship</p> <ul style="list-style-type: none"> - This form of worship takes place in a church and is led by a priest - Formal, set prayers are read out - A more traditional, and formal form of worship <hr/> <p>Non-liturgical Worship</p> <ul style="list-style-type: none"> - Also takes place in a church but less formal - No set prayers, instead people take turns to preach and read from the Bible - Can be modern and appealing to young people | <p>Prayer</p> <ul style="list-style-type: none"> - Prayer means communicating with God, either silently or out loud, sometimes through song - It is one of the most important parts of the spiritual life of a Christian and enables them to have a personal relationship with God - Intercessions are prayers made on behalf of others - Thanksgiving is when people pray to say thank you to God - Set prayers are written down and used in liturgical worship - Informal prayer is off-the-cuff and often used in non-liturgical worship |
| <p>Eucharist + Baptism</p>  | <p>Eucharist</p> <ul style="list-style-type: none"> - Eucharist and baptism are both sacraments meaning special occasions in a Christian's life - In Eucharist a priest consecrates (blesses) bread and wine and the congregation then receives these - Catholics believe the Holy Spirit transforms the bread and wine into Jesus' body and blood - Anglicans believe the bread and wine are symbolic - Christians take part in this ritual in order to remember the sacrifice Jesus Christ made for them by being crucified on the cross - <i>"For whenever you eat this bread and drink this cup, you proclaim the Lord's death until he comes"</i> – 1 Corinthians 11:26 | <p>Infant Baptism</p> <ul style="list-style-type: none"> - This is a formal service welcoming a new child into the Christian church - Holy water is sprinkled over the baby's head - All Catholics baptise their children close to birth in order to ensure they go to heaven <hr/> <p>Believer's Baptism</p> <ul style="list-style-type: none"> - A believer's baptism welcomes someone into the church who is old enough to decide themselves - They are submerged in a pool of holy water - They make promises to stay away from evil - Baptists only practice this type of baptism |
| <p>Pilgrimage + Festivals</p>  | <p>Pilgrimage</p> <ul style="list-style-type: none"> - A pilgrimage is a journey made by a Christian to a holy site - Catholics go on pilgrimage to Lourdes where a vision of Mary was once seen, they believe the water there has healing effects | <p>Christmas</p> <ul style="list-style-type: none"> - Christmas celebrates the incarnation (birth) of Jesus Christ - Christians give gifts to commemorate the gift of God sending his own son to the world <hr/> <p>Easter</p> <ul style="list-style-type: none"> - Easter celebrates the resurrection of Jesus Christ - Christians celebrate by saying "<i>he is risen</i>" and by eating chocolate eggs that represent new life |
| <p>Evangelism + Church in the Community</p>  | <p>Christians have a duty to evangelise (tell others of the word of God). An example is the Alpha Course which is an educational course that tells people more about the life of Jesus.</p> | <p>Christians also have a duty to help others in the local community. Two examples of this are Street Pastors who help drunk people at night and Food Banks that provide food to people in poverty.</p> |
| <p>Reconciliation</p>  | <ul style="list-style-type: none"> - Christians across the world play an important role in reconciliation (seeking to restore friendly relations after a conflict or falling out) - An example is Coventry Cathedral which was bombed during World War II but now seeks to create peace and reconciliation elsewhere in the world. The World Council of Churches also works to help after conflict. - In some places Christians face persecution where they are treated badly for their faith. Churches around the world work together to try and overcome this. | |


AQA Religious Studies A - Theme E: Religion, Crime and Punishment


| Key Words | | | |
|---------------------|--|-------------|--|
| Community Service | Working in the community to pay back for a criminal act | Hate Crime | A crime motivated by hatred e.g. racism, homophobia |
| Corporal Punishment | Using physical pain as a punishment | Poverty | Not having enough money to be able to live a comfortable life |
| Crime | An action which is against the law and incurs a punishment | Prison | A place where criminals are sent to withdraw their freedom as punishment |
| Death Penalty | A form of punishment where the offender is killed for their crime | Punishment | Something negative done to criminals by the state |
| Deterrence | An aim of punishment – preventing future criminals by harsh treatment of offenders | Reformation | An aim of punishment – to try and reform criminals |
| Forgiveness | To show mercy and pardon someone for what they've done wrong | Retribution | An aim of punishment – seeking a form of revenge on criminals |

| Key Ideas | | | |
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| <p>Christian Attitudes to Crime</p>  | <p>Good and Evil Intentions The Bible warns Christians against having evil thoughts which lead to evil actions. Avoiding sin and temptation steers Christians away from crime. Christians would be more willing to treat an offender who had good intentions with more mercy than one who acted out of evil intentions.</p> | <p>Attitudes to Lawbreakers Christians do not believe that people are evil but that people can be tempted to do wrong and break the law. Christians are taught to “love the sinner, hate the sin” which means they should forgive and show mercy to people who have done wrong but admitted their mistakes and sought atonement.</p> | |
| <p>Reasons for Crime</p>  | <p>People are tempted to commit crime for a wide range of reasons including poverty (not having enough money or food), upbringing (where people are not taught right from wrong), addiction (some people commit crimes to feed an addiction), greed (committing crimes out of a desire for things they cannot afford), hatred or out of opposition to unjust law (breaking the law to oppose hateful or unjust laws)</p> | | |
| <p>Three Aims of Punishment</p>  | <p>Deterrence This aim of punishment seeks to use punishment as a message to others considering committing crime. By giving one criminal a harsh punishment others may be put off committing a similar crime.</p> | <p>Reformation This aim of punishment seeks to help criminals change their behaviour for the better. It may involve therapy, education or training. Many Christians support this as a form of ‘love your neighbour’ mercy.</p> | <p>Retribution This aim of punishment is society getting its own back on the offender. The Old Testament says ‘an eye for an eye’ so some Christians would argue that this form of punishment is just according to the Bible.</p> |
| <p>Forgiveness</p>  | <p>Forgiveness is at the heart of Jesus’ teaching. It means to show mercy and pardon someone for what they have done wrong but showing someone forgiveness does not mean they should be justly punished for their crimes. When Jesus was crucified, he forgave those who sentenced him to death and crucified him saying: ‘Father forgive them, for they know not what they do’. Forgiveness leads Christians to support reformation as an aim of punishment as it allows the criminal to be forgiven and to ask for forgiveness. They also use forgiveness as an argument against the death penalty.</p> | | |
| <p>Christian Attitudes to Punishment</p>  | <p>Prisons Many Christians believe prisoners should be treated well when in prison as even though they have done wrong they do not believe in evil people as much as evil actions. Some Christians campaign for better prison conditions out of mercy.</p> | <p>Corporal Punishment Most Christians do not support using physical pain as a form of punishment as it is harmful and negative. It is currently illegal in the UK and many Christians would rather seek to reform a criminal than punish them in this way.</p> | <p>Community Service Many Christians argue in favour of community service where criminals work to repay their community as a punishment. It allows criminals to make up for what they have done and does not harm the offender in the process.</p> |
| <p>Death Penalty</p>  | <p>The death penalty means the state killing criminals who have committed the worst crimes. It has not been used in the UK since 1969 but is still a common punishment elsewhere in the world.</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Some Christians argue that the death penalty is a just punishment for murder as the Bible says both ‘you shall not kill’ and ‘an eye for an eye’. <input checked="" type="checkbox"/> They may also argue that it deters criminals from committing the worst crimes and keeps people safe. <input checked="" type="checkbox"/> Other Christians argue that the death penalty goes against sanctity of life. Life is sacred and holy and only God can give and take life. <input checked="" type="checkbox"/> They might also argue that the death penalty goes against the aim of reformation as a dead criminal cannot be reformed, forgiven or shown mercy to. | | |

AQA Religious Studies A – Islam Beliefs

| Key Words | | | |
|--------------------|---|--------------------------------------|---|
| Akhirah | Life after death | Tawhid | Oneness of God |
| Al- Qadr | Shi'a | Shi'a | Muslims who believe in the Imamate, successorship of Ali |
| Kutub | Holy books | Six articles of faith | The foundations of the faith in Sunni Islam; six key beliefs: Tawhid (the Oneness of God), Angels, Holy Books, Prophethood, Akhirah, Predestination |
| Malaikah | Angels | Sunni | Muslims who believe in the successorship of Abu Bakr, Umar, Uthman and Ali |
| Omnipotence | All-powerful; belief about the nature of God and one of the 99 Beautiful Names of Allah | The five roots of Usul ad-Din | The foundations of the faith in Shi'a Islam; five key beliefs: Tawhid (the Oneness of God), Adalat (justice), prophethood, imamate, resurrection |
| Risalah | Prophets | The imamate | One of the Five Roots of Usul-ad-Din, 'Leadership.' Shia belief in the twelve imams who succeeded Muhammad as the leaders of Islam |

| Key Ideas | | | |
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| The six articles of faith in Sunni Islam and the five roots of Usual ad-Din in Shi'a Islam | TAWHID – Belief that there is only one God. ANGELS – Belief in angels, who passed on God's message to the prophets THE HOLY BOOKS - Respect for the Holy Books and particularly the Qur'an, the highest authority in Islam. THE PROPHETS - Respect for the prophets (rasul) and particularly Muhammad, who received the final revelation of Islam from God. THE DAY OF JUDGEMENT – The belief that at the end of the world, every person will be judged by God and sent to paradise or hell THE SUPREMACY OF GOD'S WILL – Belief that nothing happens unless God wants it to happen | | TAWHID – There is only one God (who is not divided into parts) RISALAH – Prophets are an important channel of communication between God and humans. IMAMATE – Divinely appointed leaders, from the descendants of Muhammad. ADALAT (divine justice) – God is just and fair. When he judges humans, he will base it on how they have behaved. MI'AD (day of resurrection and judgement) – Muslims believe they will be resurrected from the dead on the Day of resurrection and then judged by God on the Day of Judgment. This is the start of the afterlife (Akhirah). |
| | The nature of God | Tawhid – the oneness of God 'He is God the One' - there is only one God 'God the eternal' – God has always existed 'He begot no one not was He begotten' - God was not born or came out of something else | 'The supremacy of God's will Muslims believe God's will is supreme (most powerful). Nothing happens unless God allows it to happen. This helps to give Muslims confidence when something goes wrong – part of God's plan. |
| The role of angels (Malaikah) | Angels are God's messengers, often speak with prophets to give God's revelation, do not have free will and are made from light, with wings. | Isra'il – angel of death Jibril – angel of revelation. He brings good news and revealed the words of the Qur'an starting on the night of Power. Mika'il – angel of mercy. He asks God to forgive humans' sins. He rewards humans for good deeds and is in charge of rain, thunder and lightning. | |
| Predestination and Akhirah  | Predestination God already knows the future and what will happen in each human being's life. This is balanced with the belief humans have free will and make their own decisions. 'Only what god has decreed will happen to us'. Human Freedom God knows everything that is going to happen because he is omniscient. Some Muslims think he doesn't decide what will happen as humans have free will, but God already knows what decisions and actions they will take. | Day of Judgment God will hold humans accountable for their actions. Life is a test which humans will be rewarded for good actions by going to heaven and punished for bad actions by going to hell. 'Every soul will taste death and you will be paid in full on the Day of Resurrection'. | Akhirah A person's soul is taken by the angel Isra'il to barzakh where it waits until judgement. When the Day of judgement arrives the angel Israfil blows a trumpet, and all humans will be resurrected. They will face God and be judged according to their deeds. Humans will be responsible for their intentions (niyyah). If a person's deeds are good, they will be rewarded with heaven (Jannah) and bad punished in hell (Jahannam). |

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| <p>Prophets (Risalah)</p> | <p>Prophets are chosen by God to give out the message of Islam. The first prophet was Adam and the final prophet was Muhammad. They are important because they are role models, they are a method of communication between God and humanity, and they are sinless.</p> | <p>Adam First steward on Earth and first prophet. He was made from clay and God breathed life into him. Whilst he disobeyed God by eating the forbidden fruit he asked for forgiveness: 'Adam disobeyed his Lord and was led astray'.</p> | <p>Ibrahim (Abraham) Showed his faith to God by standing up to idol worshippers. He followed God's instructions and showed commitment by being prepared to sacrifice his son: 'Abraham was truly an example: devoutly obedient to God and true in faith' Showed his faith to God by standing up to idol worshippers. He followed God's instructions and showed commitment by being prepared to sacrifice his son: 'Abraham was truly an example: devoutly obedient to God and true in faith'</p> | | | <p>Muhammad Also known as the seal of the prophets. He restored the Ka'aba to the worship of one God. He defended Islam by performing the Lesser Jihad. He received the Qur'an. His first revelation of the Qur'an by the angel Jibril was on the Night of Power.</p> |
| <p>Holy Books</p>  | <p>Qur'an Only surviving book that is complete revelation in its original language that has not been changed. It is the final revelation to the final prophet, Muhammad. The angel Jibril started to reveal the words of the Qur'an during the night of Power and these revelations have continued over approximately 23 years It includes stories, history and teachings which act as a guide.</p> | <p>Torah (Tawrat) Contains teachings and laws on how people should live, including the Ten Commandments. It is referred to as 'guidance and light'.</p> | <p>Pslams (Zabur) Are prayers and poems used for the worship of God.</p> | <p>Gospel (Injil) The revelation to Jesus predicted the coming of the prophet Muhammad.</p> | <p>Scrolls of Abraham (Sahifah/Suhuf) Are known as the first holy book in Islam revealed to Ibrahim (Moses).</p> | |
| <p>The Imamate</p> | <p>When Muhammad died it wasn't clear who should succeed him and so Muslims split into two groups: Sunni and Shi'a. Sunni Muslims believe Abu Bakr was elected as their first leader (Caliph). Shi'a Muslims believe Muhammad named his cousin and son-in-law Ali as his successor. He was the first Imam. When Ali died his son became the Imam. Each Imam that followed was the son of the previous Imam. The Imamate is the name given to the divine appointment of the Imams. 'I am putting a successor on Earth'.</p> | | | <p>The Twelver branch of Shi'a Islam teaches there have been 12 Imams in total. The twelfth Imam has been kept alive by God, hidden on Earth and will return in the future.</p> <p>The Imamate are infallible – free from error and sin, receive divine inspiration, are role models and are the representatives of Allah on Earth.</p> | | |

AQA Religious Studies A – Islam Practices







| Key Words | | | |
|-----------------|---|------------------|---|
| Ablution (wudu) | Ritual washing before prayer | Khums | One of the Ten Obligatory Acts in Shi'a Islam; practice of alms giving |
| Ashura | Important festival in Shi'a Islam, to commemorate the martyrdom of Hussein (Muhammad's grandson). Sunni Muslims observe Ashura as a day of repentance for sins in the belief that they will be forgiven | Salah | Prayer |
| Hajj | Pilgrimage | Sawm | Fasting |
| Id-ul-Adha | Festival; celebration of the Prophet Ibrahim's willingness to sacrifice his son for Allah | Shahadah | Declaration of faith |
| Id-ul-Fitr | Festival; celebration that comes at the end of Ramadan and marks the end of fasting. | The Five Pillars | Important duties for Sunni Muslims which support the main principles of Islam. Shahadah, salah, zakah, sawm and hajj. |
| Jihad | The struggle for Islam/God. | Zakah | Almsgiving |

| Key Ideas | | | | |
|---|---|---|--|--|
| The five pillars of Sunni Islam and ten obligatory acts of Shi'a Islam | The Five Pillars Shahadah – declaration of faith. Believing and at certain times saying "There is no God but Allah and Muhammad is his prophet". Salah – prayer. Muslims pray 5 times a day. Sawm – Fasting in the month of Ramadan. No food, drink or sex during daylight hours. Zakah – Almsgiving. Muslims give 2.5% of their wealth to charity. Hajj – Pilgrimage to Makkah. Perform at least once in their lifetime. | | The Ten Obligatory Acts Salah Sawm Zakah Hajj Jihad – Lesser Jihad (struggle to defend Islam) and Greater Jihad (personal struggle to be a good Muslim) Khums – Giving 20% of surplus income or profits on; war gains, minerals, treasure, precious items, land Amr-bil-Maruf – Following the straight path by doing what is right (halal) Nahy Anil Munkar – Prohibiting what is bad Tawallah – Following the Prophet Muhammad and his family. Avoiding that which is not allowed (haram) Tabarra – Staying away from those that are against God. Dissociate with enemies. | |
| | Shahadah Declaration of faith. It is said at key moments in a Muslim's life: when someone becomes a Muslim, when a Muslim wakes up and goes to bed, whispered into the ear of a new-born baby, the last thing a person says before they die and when they are buried. Sunni – There is no God but Allah and Muhammad is his prophet Shi'a – There is no God but Allah, Muhammad is his prophet and Ali is the representative of God | | | |
| Salah | Brings Muslims closer to God. Muhammad told Muslims to pray 5 times a day. It's one of the 5 pillars of Sunni Islam and the ten obligatory acts of Shi'a Islam. It unites the Muslim community (Ummah). | Wudu – Before prayer Muslims should find a clean place and perform. This prepares them physically and spiritually. Each part of the body is cleaned 3 times.: 'Allah loves those who turn to him and who care for cleanliness' Rak'ahs – set way of performing salah involves prostration and movements. | Muslims pray facing the direction of Makkah. Sunni Muslims pray 5 times a day and Shi'a Muslims pray 3 times a day. Friday prayer – Jummah. All men are expected to attend, women may do so. Cannot be performed individually - it develops the concept of brotherhood as it gives opportunity for people to meet and socialise. | |
| Sawm | It's one of the 5 pillars of Sunni Islam and the ten obligatory acts of Shi'a Islam. Muslims fast during the month of Ramadan. Both the Qur'an and the hadith make it clear that Muslims should fast: 'You who believe, fasting is prescribed for you'. Exempt from fasting: pregnant women, people that are ill, young children and the elderly. | Muslims believe that they are rewarded by God for fasting. It reminds them to be thankful to God for the food they are able to eat. It gives them a greater awareness of those who may not have enough food to eat. | Ramadan is the month in which Muhammad first started to receive the revelations of the Qur'an. The Night of Power was the first time Jibril appeared to Muhammad in a cave to reveal the Qur'an. Some Muslims may stay awake on the odd nights in the last ten nights and focus on worship. They may read the Qur'an and reflect on its meaning or offer voluntary prayers and pray for forgiveness of sin. | |
| Zakah | It's one of the 5 pillars of Sunni Islam and the ten obligatory acts of Shi'a Islam. Muslims fast during the month of Ramadan. It is 2.5% of a Muslim's savings over a certain amount, given as alms each year to help others: 'pay the prescribed alms'. | Muhammad said in his final sermon to "pay your wealth in zakah'. The Qur'an says to pay in alms. It purifies the rest of a Muslim's money. It creates equality in society to help reduce poverty. Some Muslims pay zakah monthly, and others annually. Some give it directly to the mosque and others give it to a charity. | Some Shi'a Muslims don't end up paying zakah because they believe that it only applies to gold and silver coins, cattle and crops. So it may only be paid by farmers and those with gold/silver. They follow the instruction to give a fifth (20%) of year surplus income or profits to those in need, known as khums. | |

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| <p>Hajj</p> | <p>Is the pilgrimage to Makkah. It's one of the 5 pillars of Sunni Islam and the ten obligatory acts of Shi'a Islam. 'Perform Hajj if you can afford it'. Muslims complete set rituals during pilgrimage. Many of the actions performed on Hajj link to the life of Ibrahim or Muhammad.</p> | <p>Ka'aba – Muslims walk around 7 times in an anti-clockwise direction (tawaf). Some Muslims believe that Ibrahim rebuilt the Ka'aba with his son. Muhammad performed tawaf. Muzdalifah – Muslims collect stones Mina – Muslims throw stones at the Jamarat. This reminds them when Ibrahim threw stones at the devil that tried to tempt him not to complete the sacrifice of his son. Today it represents getting rid of temptation and rejecting evil. Arafat – Muslims stand before God and pray and ask for forgiveness. This reminds them of the Day of Judgement where they will stand before God.</p> | <p>Hajj brings Muslims closer to God. It shows self-discipline and strength in belief. It means sins are forgiven and gives a fresh start to life as a Muslim. Promotes importance of the Ummah.</p> |
| <p>Jihad</p> | <p>Greater Jihad Personal, daily struggle to be a good Muslim. It means completing religious duties and resisting evil.</p> | <p>Lesser Jihad Holy War. Means physically defending Islam/God. 'Fight in God's cause against those who fight you'. Conditions: Must be declared by a religious leader, must be in response to a threat to the faith and must be a last resort.</p> | |
| <p>Festivals</p> | <p>Id-Ui-Adha (festival of sacrifice) Celebrates when Ibrahim was prepared to sacrifice his son Ishmael. It is celebrated by sacrificing a lamb to remember God giving Ibrahim a ram to sacrifice instead of Ishmael, prayers at the mosque, visiting family and friends, listening to the Imam's sermon at the mosque.</p> | <p>Id-ul-Fitr (festival of the breaking the fast) Celebrates the end of Ramadan. Celebrated by giving alms to the poor, prayers in the mosque, sharing food with family and friends, wearing best or new clothes and remembering and praying for loved ones who are deceased.</p> | <p>Ashura – Sunni festival (Day of Atonement) Celebrates Moses rescuing the Israelites from slavery in Egypt and Noah leaving the ark for the first time following the flood. It is celebrated by completing a voluntary fast, going to the mosque, praying and giving to charity.</p> <p>Ashura – Shi'a commemoration It commemorates the death of Imam Husayn (third in the imamate) as a martyr in the Battle of Karbala. It is a day of great sorrow and mourning. Shi'a Muslims go on a march and join as a community, Some wail and beat their chests, whilst others give blood to save lives.</p> |


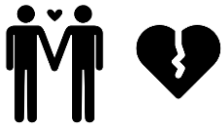


AQA Religious Studies A – Theme D: Religion, Peace and Conflict

| Key Words | | | |
|----------------|--|----------------|--|
| Forgiveness | Pardoning someone for wrongdoing | Peace-making | Working toward bringing about an end to war and a state of peace |
| Greed | Going to war to gain land or natural resources such as oil | Protest | A public expression of disapproval, often in a big group, can be peaceful or violent |
| Holy War | A war that is fought for religious reasons, usually backed by a religious leader | Quakers | A Christians denomination who worship in silence and are well known pacifists |
| Just War | A Christian theory that asks whether a war is fought justly | Reconciliation | Restoring friendly relationships after a war or conflict |
| Justice | Bringing about what is right and fair, according to the law or God’s will | Retaliation | Deliberately harming someone as a response to them harming you |
| Nuclear Weapon | A weapon using a nuclear reaction to cause massive damage | Self-Defence | Protecting yourself or others from harm |
| Pacifism | A belief that all forms of violence are wrong, commonly held by Quakers | Terrorism | Using violence in order to further a political or religious message |
| Peace | A state of happiness and harmony, an absence of war | WMD | Weapons of mass destruction: chemical, nuclear or biological weapons |

| Key Ideas | | | |
|---|--|---|--|
| Protests and Terrorism  | <p style="text-align: center;">Protests</p> <p>The right to gather together and protest is a fundamental democratic freedom. UK law allows for peaceful public protest but sometimes protests can turn violent and become a riot. Christians often protest unjust laws or for other forms of justice but would rarely advocate the use of violence in protest.</p> | | <p style="text-align: center;">Terrorism</p> <p>Examples of terrorism include suicide bombing, mass shootings or using vehicles to injure pedestrians. The aim of terrorism is to make society aware of a cause or issue and to make people frightened to go about their business. Christians don’t promote political violence + believe terrorism is wrong as it targets innocent people</p> |
| Reasons for War  | <p>Greed To gain more land or to control important resources such as oil or gas. e.g. The UK and US invading Iraq in order to control oil resources</p> | <p>Self-Defence To defend one’s country against invasion or attack or to protect allies who are under attack e.g. UK threatened by Nazi invasion in WWII</p> | <p>Retaliation To fight against a country that has done something very wrong or to fight against a country that has attacked you e.g. US invading Afghanistan in retaliation for 9/11</p> |
| Nuclear War and WMD  | <p>Nuclear weapons work by a nuclear reaction and devastate huge areas and kill large numbers of people. They are a type of WMD (weapons of mass destruction) which also includes chemical and biological weapons. All these weapons are not allowed under the Christian Just War Theory and would therefore be rejected by most Christians. Nuclear weapons were used at the end of WWII in Japan to force the Japanese to surrender. Some people say their use was justified as it prevented more suffering even though 140,000 people died. Although some Christians justify war with ‘an eye for an eye’, this cannot be used to justify the use of weapons of mass destruction as they are not a proportionate response.</p> | | |
| Holy War  | <p>A Holy War is a war which is fought for religious reasons, often with the backing of religious leaders. An example of this was the Crusades fought from the 11th-14th Century by Christians, backed by the Pope. Religion can still be a cause for war today such as in Northern Ireland where Protestant and Catholic Christians fought a civil war between 1968-98.</p> | | |
| Just War Theory  | <p>Just War Theory is a Christian moral theory for working out if a war meets internationally accepted criteria for fairness. These are some of the conditions that must be met in order for a war to be just:</p> <ul style="list-style-type: none"> • Just Cause – fought in self-defence or to protect others • Just Intention – fought to promote good and defeat wrongdoing • Last Resort – only going to war if all other methods have been tried first • Proportional – excessive force should not be used and innocent civilians must not be killed | | |
| Pacifism and Christian Responses to War  | <p>Pacifism is the idea that all forms of violence are wrong. Pacifists such as Quakers refuse to take part in war and often choose to be a conscientious objector (someone who doesn’t go to war for moral reasons) or to assist in medical tasks like ambulance driving. Christians try to follow Jesus’ teaching that “blessed are the peacemakers”</p> | | <p>Christians try to show mercy and agape to victims of war and provide them with assistance. This can be through charity or through welcoming them into their churches. It can be victims in their own country or refugees such as people fleeing from Syria or Yemen. This is an example of ‘love your neighbour’ in action.</p> |






AQA Religious Studies A – Theme A: Relationships and Families

| Key Words | | | |
|--------------------------|--|------------------|--|
| Adultery | Having sex with someone who is not your husband or wife, outside of marriage | Gender Prejudice | Holding biased opinions about people based on their gender |
| Artificial Contraception | Methods of preventing pregnancy e.g. condoms, the pill, the coil | Heterosexual | Sexual attraction to the opposite gender |
| Cohabitation | Living and starting a family with someone who you are not married to | Homosexual | Sexual attraction to the same gender |
| Divorce | The legal ending of a marriage | Marriage | A legal and religious ceremony joining two people together in love |
| Family Planning | Using a woman's natural cycle of fertility to try and avoid pregnancy | Procreation | Bringing babies into the world |
| Gender Discrimination | Acting against people based on their gender | Remarriage | Marrying someone else after divorce |

| Key Ideas | | |
|--|--|---|
| <p>Religious Views on Sexuality</p>  | <p style="text-align: center;"><u>Sexual Orientation</u></p> <ul style="list-style-type: none"> - The Roman Catholic church teaches that sex between people of the same gender is 'disordered' - They argue that homosexual relationships are banned by the Bible - Liberal Christians teach that Jesus wanted people to love each other and show mercy and that we should be accepting of homosexuals - Gay marriage is banned in the Catholic Church and Church of England - <i>"Do not have sexual relations with a man as one does with a woman" – Leviticus 18:22</i> | <p style="text-align: center;"><u>Adultery and Sex Outside Marriage</u></p> <ul style="list-style-type: none"> - Roman Catholics argue that all sex before marriage and after a divorce is unacceptable. Sex should only take place inside a marriage which is a lifelong, loving relationship. - Adultery means the act of having sex with someone who is not your husband or wife. - It is prohibited by the Bible and Christians argue it is wrong as it undermines marriage involves lies and secrecy. - <i>"You shall not commit adultery" – Exodus 20:14</i> |
| <p>Artificial Contraception</p>  | <ul style="list-style-type: none"> - Artificial contraception means using something to stop yourself from getting pregnant. This could be a condom, the pill or a device like the coil. - Family planning means using the natural cycle of fertility which women go through to predict when a woman would be least fertile. It is much less effective than artificial contraception. - God tells Adam and Eve (the first couple) to <i>"be fruitful and multiply"</i> (Genesis 1:2) which encourages them to have children. <input checked="" type="checkbox"/> The Catholic Church argues that all sexual acts inside marriage must be open to procreation (having babies) and that a baby is a gift from God. They may use family planning as it is a natural method. <input checked="" type="checkbox"/> The Church of England argues that contraception should be allowed so that couples can take time and consider if they want to have children. | |
| <p>Marriage and Divorce</p>  | <ul style="list-style-type: none"> - Marriage is a religious and legal ceremony in which two people make vows (promises) in front of their friends and family and (if in a church) in front of God - During the ceremony you agree to be together for life saying <i>"til death do us part"</i> (Marriage Ceremony) - Divorce is the legal break-up of a marriage. It is legal in the UK and many marriages currently end in divorce. - Many Christians do not like it as it is seen to break the promises made in a marriage. <input checked="" type="checkbox"/> The Catholic Church do not support divorce. They believe that sex after divorce is a form of adultery and you cannot get remarried in a Catholic Church once you have been divorced. Jesus says <i>"if a man divorces his wife [...] he involves her in adultery"</i> (Matthew 5:32) <input checked="" type="checkbox"/> The Church of England accepts divorce, especially if it is for reasons of abuse but you have to receive special permission to get remarried in a church. They might see it as a merciful option. | |
| <p>Family</p>  | <p style="text-align: center;"><u>Types of Family</u></p> <ul style="list-style-type: none"> - Nuclear Family is a family with a mother, father and children – some Christians argue this is the ideal - Extended Family is a family where grandparents and other relatives are involved - Single Parent Family this is a family where one parent brings up the child | <p style="text-align: center;"><u>Purpose of the Family</u></p> <ul style="list-style-type: none"> - Procreation – the family should be for the purpose of having and bringing up children - Stability – the family should be for providing a secure, stable environment for children - Faith – the family should be a way of bringing children up as good Christians |
| <p>Gender</p>  | <ul style="list-style-type: none"> - Gender equality means that men and women should be equal and given the same rights and opportunities as each other - In the UK women can face gender prejudice and discrimination where they are not treated equality - The Catholic Church argues that women have a special role as mothers and they do not allow women to be priests - The Church of England has allowed women priests since 1994 | |

AQA Religious Studies A – Theme B: Religion and Life

| Key Words | | | |
|-----------------|---|-------------------|--|
| Abortion | The ending of a pregnancy | Liberal | A type of Christian who reads the Bible as stories, myths and metaphors |
| Big Bang Theory | Scientific theory of the creation of the universe through a large explosion | Literalist | A type of Christian who believes the Bible is literally true + the word of God |
| Dominion | The power humans have over God's creation | Natural Resources | Materials found in nature (e.g. coal, oil) which are exploited by humans |
| Euthanasia | The painless killing of a terminally ill patient | Purgatory | Where Catholics believe souls are purified after death + before heaven |
| Evolution | Scientific theory of the development of humans from apes | Quality of Life | How easy or difficult someone's life is – e.g. cancer causes a low quality of life |
| Heaven | Paradise where those judged good go after death to be forever with God | Sanctity of Life | The belief that all life is sacred as man is made in God's image |
| Hell | Damnation where those judged bad go after death to be forever without God | Stewardship | The responsibility God gave humans to look after the world |
| Judgement | After death Christians believe you are judged by God | Vegetarian | The choice not to eat animals |

| Key Ideas | | |
|--|---|---|
| <p>Ideas about Creation</p>  | <p style="text-align: center;"><u>Christian Ideas</u></p> <ul style="list-style-type: none"> - Christians believe the universe was designed and made by God - The creation story in Genesis 1 says that God made the world in six days - Literalist Christians believe this is true and that God created Adam + Eve from whom all humans come - Liberal Christians say the creation story in the Bible is just a story and may agree with scientific ideas about creation <p><i>"In the beginning God created the heavens and the earth" – Genesis 1:1</i></p> | <p style="text-align: center;"><u>Scientific Ideas</u></p> <ul style="list-style-type: none"> - The Big Bang Theory argues that the universe started as a dense collection of mass which massively expanded creating stars, galaxies and planets - The Theory of Evolution comes from Charles Darwin who observed that animals change over time and argued that humans were not designed by God but evolved from apes - These theories do not fit with a literalist Christian's view but could fit with a liberal view |
| <p>Stewardship + Dominion</p>  | <p style="text-align: center;"><u>Stewardship</u></p> <ul style="list-style-type: none"> - Stewardship means Christians have a duty to look after the environment on behalf of God and for future generations - This can be seen where Christians campaign for environmental charities or choose to reduce waste and recycle <p><i>"Rule over [...] every living creature" - Genesis 1:28</i></p> | <p style="text-align: center;"><u>Dominion</u></p> <ul style="list-style-type: none"> - Dominion is the idea that God gave humans power and authority over the world - Some Christians believe this allows them to use natural resources (e.g. oil and coal) and animals to make their lives better - In Genesis God gives Adam and Eve the power to name the animals and rule over them |
| <p>Abortion</p>  | <ul style="list-style-type: none"> - Abortion is the removal of a foetus from the womb in order to end a pregnancy. - In the UK (except Northern Ireland) it is legal during the first 24 weeks of pregnancy unless the mother's life is in danger or the foetus is severely deformed. <p><input checked="" type="checkbox"/> The Catholic Church is strongly against abortion. They believe in sanctity of life, the idea that life is a sacred gift from God which only God can take away. They see the foetus as a living thing.</p> <p><input checked="" type="checkbox"/> The Church of England think abortion is sometimes acceptable as a pregnancy as a result of rape or where the child would be very ill would lead to a very poor quality of life</p> | |
| <p>Euthanasia</p>  | <ul style="list-style-type: none"> - Euthanasia is the painless killing of a patient with a terminal illness. - Voluntary euthanasia is where the patient asks for their life to be ended. - Non-voluntary euthanasia is where the patient is not capable of asking to die, perhaps in a coma. - All forms of euthanasia are currently illegal in the UK. <p><input checked="" type="checkbox"/> The Catholic Church is strongly against euthanasia. They believe that only God can give and take life and that life is sacred (sanctity of life)</p> <p><input checked="" type="checkbox"/> Some liberal Christians think euthanasia can be an act of mercy which Jesus tells them is a good thing to do, this is especially the case when someone's quality of life is very poor.</p> | |
| <p>The Afterlife</p>  | <ul style="list-style-type: none"> - Christians believe that when you die you will be judged and that those who are found to be good will go to heaven but those who have sinned and gone against God's wishes will go to hell. <p>Roman Catholics believe that there is a middle stage called purgatory where souls go to be purified of sin before they go to heaven</p> | <p>Some Christians believe that Jesus will return on a future Day of Judgement when all souls will be judged</p> |

Chemical analysis

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Pure and impure

Pure substances contain a single element, or compound that is not mixed with another substance. They have specific melting and boiling temperatures.

Impure substances contain more than one type of element or compound in a **mixture**. These have a range of melting and boiling temperatures.

Formulations are mixtures that have been designed as a useful product. They are made by mixing components in specific proportions. They include fuels, cleaning agents, paints, medicines, alloys, fertilisers and foods.

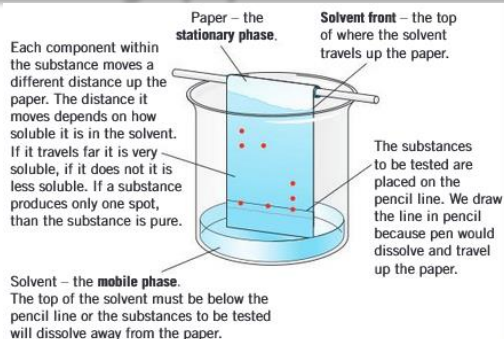
Chromatography

Chromatography can be used to separate different components in a mixture. Chromatography involves a stationary and a mobile phase. Separation depends on the distribution of substances between the phases.

The **R_f value** is a ratio of the distance moved by a compound to the distance moved by the solvent.

$$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$$

Different compounds have different R_f values in different solvents and at different temperatures. R_f values for particular substances can be used to identify a substance. R_f values are always between 0 and 1.



Testing for ions (Separates only)

Metal ions always have a positive charge. Sodium hydroxide solution can be used to identify some metal ions.

| Cation | What you do |
|-----------------------------|--|
| Aluminium Al ³⁺ | On slow addition of NaOH solution, white precipitate forms, that dissolves in excess NaOH |
| Calcium Ca ²⁺ | On addition of excess NaOH solution, white precipitate forms that does not dissolve |
| Magnesium Mg ²⁺ | On addition of excess NaOH solution, white precipitate forms that does not dissolve |
| Copper(II) Cu ²⁺ | Formation of a blue precipitate |
| Iron(II) Fe ²⁺ | Formation of a green precipitate |
| Iron(III) Fe ³⁺ | Formation of a brown precipitate |

| Anion | Test | Positive result |
|---|---|--|
| Carbonate CO ₃ ²⁻ | Add dilute acid | CO ₂ formed - milky limewater |
| Chloride Cl ⁻ | Add silver nitrate solution in presence of nitric acid | White precipitate formed |
| Bromide Br ⁻ | Add silver nitrate solution in presence of nitric acid | Cream precipitate formed |
| Iodide I ⁻ | Add silver nitrate solution in presence of nitric acid | Yellow precipitate formed |
| Sulfate SO ₄ ²⁻ | Add barium chloride solution in presence of hydrochloric acid | White precipitate formed |

Testing gases

Common gases can be identified using the following tests:

| Gas | Test | Observations |
|----------------|------------------------------------|-----------------------|
| Hydrogen | Hold a lit splint near gas | Squeaky pop sound |
| Oxygen | Hold a glowing splint near gas | Splint re-lights |
| Carbon dioxide | Bubble gas through limewater | Limewater turns milky |
| Chlorine | Hold piece of damp litmus near gas | Bleaches litmus white |

Flame tests

Flame tests can be used to identify some metal ions as they produce distinctive colours.

| Metal | Flame colour |
|-----------|--------------|
| Lithium | Crimson |
| Sodium | Yellow |
| Potassium | Lilac |
| Calcium | Orange-red |
| Copper | Green |

Instrumental methods

Elements and compounds can be detected and identified using instrumental methods. These are rapid, accurate and sensitive,

Flame emission spec

Flame emission spectroscopy is an instrumental method used to analyse metal ions in solutions. The sample is put into the flame, light is given out and passed through a spectroscope. The line spectrum produced can be analysed to identify metal ions and measure their concentrations.

Key terms

Chromatography
mobile phase

flame emission spectroscopy
precipitate pure R_f value

flame test
solvent

formulation
solvent front

impure instrumental analysis
stationary phase



Relationships in an Ecosystem

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Ecosystem organisation

Individual organisms

Population - the total number of organisms of the same species that live in one specific geographical area

Community - group of two or more populations of different species living in one specific geographical area

Ecosystem - the interaction of a community of living organisms with the non-living parts of their environment

A stable community is one where all the species and environmental factors are in balance so that population sizes remain fairly constant.

An example of this is the interaction between predator and prey populations, which rise and fall in a constant cycle so that each remains within a stable range

Abiotic Factors

Abiotic factors are non-living factors in the ecosystem that can affect a community. Too much or too little of the following abiotic factors can negatively affect the community in an ecosystem:

carbon dioxide level for plants, light intensity, moisture levels, oxygen levels for animals that live in water, soil pH and mineral content, temperature, wind intensity and direction

Competition

To survive and reproduce, organisms require a supply of resources from their surroundings and from the other living organisms there.

This can create competition, where organisms within a community compete for resources.

There are two types of competition - interspecific competition is between organisms of different species and intraspecific competition is between organisms of the same species.

Animals

- Food
- Mates
- Territory

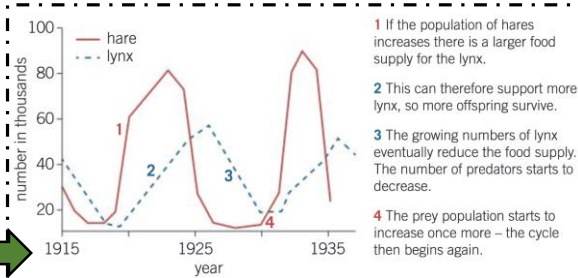
Plants

- Light
- Space
- Water and mineral ions

Interdependence

Within a community each species interacts with many others and may depend on other species for things like food, shelter, pollination, and seed dispersal.

If one species is removed it can affect the whole community - this is called interdependence.



Biotic Factors

Biotic factors are living factors in the ecosystem that can affect a community. For example, the following biotic factors would all negatively affect populations in a community:

decreased availability of food, new predators arriving, new pathogens, competition between species.

Adaptations of organisms

Organisms have features - adaptation - that enable them to survive in the condition in which they live. The adaptations of an organism may allow it to outcompete others, and provide it with an evolutionary advantage.

Structural

Physical features that allow an organism to successfully compete:

- sharp teeth to hunt prey
- colouring that may provide camouflage to hide from predators or to hunt prey
- a large or small body surface area-to-volume ratio.

Behavioural




The behaviour of an organism that gives it an advantage:

- making nests to shelter offspring or attract a mate
- courtship dances to attract a mate
- use of tools to obtain food
- working together in packs

Functional

Adaptations related to processes that allow an organism to survive:

- photosynthesis in plants
- production of poisons or venom to deter predators or kill prey
- changes in reproduction timings

| Organism | Example adaptations |
|--|---|
|  | <ul style="list-style-type: none"> - White fur for camouflage when hunting - Feet with large surface area to distribute weight on snow - Small ears to reduce heat loss - Thick fur for insulation |
|  | <ul style="list-style-type: none"> - Feet with large surface to distribute weight on sand - Hump stores fat to provide energy when food is scarce - Tough mouth and tongue to allow camel to eat cacti - Long eyelashes to keep sand out of eyes. |
|  | <ul style="list-style-type: none"> - Spines instead of leaves to reduce surface area and therefore water loss - Long roots to reach water underground - Large, fleshy stem to store water |

Some organisms are extremophiles, which means they live in environments that are very extreme where most other organisms could not survive. For example, areas with very high temperatures, extreme pressures, high salt concentrations, highly acidic or alkaline conditions, low levels of oxygen or water.

Key terms

abiotic factor adaptation biotic factor community ecosystem extremophile interaction interdependence interspecific intraspecific population

Ecology

Knowledge Organiser

Investigating Distribution

Aim: To measure the population size of a common species in a habitat and use sampling techniques to investigate the effect of a factor on the distribution of this species

- You will:**
- Use a quadrat to estimate the population size of a plant species in a survey area
 - Use a transect line and a quadrat to investigate the effect of a factor on the number of plants in a survey area

ESTIMATING POPULATION SIZE METHOD

- USE TWO TAPE MEASURES TO LAY OUT A SURVEY AREA (e.g. 10 m x 10 m) IN YOUR CHOSEN HABITAT, SUCH AS THE SCHOOL FIELD.
- USE A RANDOM NUMBER GENERATOR TO CREATE A SET OF COORDINATES TO PLACE YOUR FIRST QUADRAT. e.g. IF YOU GET A 4 AND A 5, PLACE YOUR QUADRAT 4 m ALONG THE x-Axis AND 5 m ALONG THE y-Axis.
- COUNT THE NUMBER OF YOUR CHOSEN PLANT SPECIES (e.g. DANDELIONS) THAT ARE FOUND WITHIN THIS QUADRAT.
- ESTIMATE THE POPULATION OF DANDELIONS IN YOUR SURVEY AREA USING THE EQUATION:

$$\text{ESTIMATED POPULATION SIZE} = \frac{\text{TOTAL AREA}}{\text{AREA SAMPLED}} \times \text{TOTAL NUMBER OF DANDELIONS COUNTED}$$

TOTAL SURVEY AREA WAS 10 m x 10 m

$$= \frac{100}{10} \times 21 = 210$$

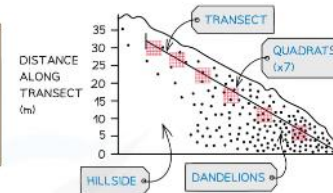
EACH QUADRAT IS 1 m x 1 m AND 10 QUADRATS WERE PLACED

4 RECORD THIS NUMBER IN A RESULTS TABLE AND REPEAT STEPS 1-3 UNTIL YOU HAVE RECORDED THE NUMBER OF YOUR CHOSEN PLANT SPECIES IN 10 QUADRATS.

| Quadrat | Number of dandelions |
|--------------|----------------------|
| 1 | 3 |
| 2 | 4 |
| 3 | 2 |
| 4 | 1 |
| 5 | 0 |
| 6 | 0 |
| 7 | 2 |
| 8 | 5 |
| 9 | 3 |
| 10 | 1 |
| Total | 21 |

INVESTIGATING THE EFFECT OF A FACTOR ON THE DISTRIBUTION OF A SPECIES METHOD

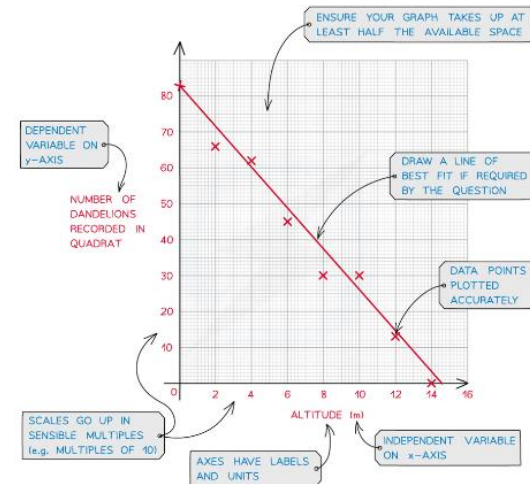
1 SET YOUR TRANSECT UP THROUGH THE AREA YOU ARE INVESTIGATING. IN THIS CASE, A 30 m TAPE MEASURE IS PLACED UP A HILLSIDE. PLACE A QUADRAT AT EQUAL INTERVALS (e.g. EVERY 5 m) ALONG THE TRANSECT.



| Distance along transect (m) | Number of dandelions | Attitude (m) |
|-----------------------------|----------------------|--------------|
| 0 | 84 | 2 |
| 5 | 66 | 4 |
| 10 | 62 | 6 |
| 15 | 45 | 8 |
| 20 | 30 | 10 |
| 25 | 30 | 12 |
| 30 | 13 | 14 |

2 RECORD THE NUMBER OF YOUR CHOSEN PLANT SPECIES INSIDE EACH QUADRAT. RECORD YOUR ABIOTIC FACTOR (e.g. ALTITUDE) AT EACH QUADRAT. RECORD YOUR RESULTS IN A TABLE.

3 PLOT YOUR DATA IN A GRAPH AND DESCRIBE ANY RELATIONSHIP THAT CAN BE OBSERVED.



RELATIONSHIP: 'AS THE ALTITUDE INCREASES, THE NUMBER OF DANDELIONS DECREASES.'

Key terms

biodiversity biofuel biomass deforestation
global warming peat bog pollution

Ecology

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Levels of organisation

Feeding relationships within a community can be represented by food chains.

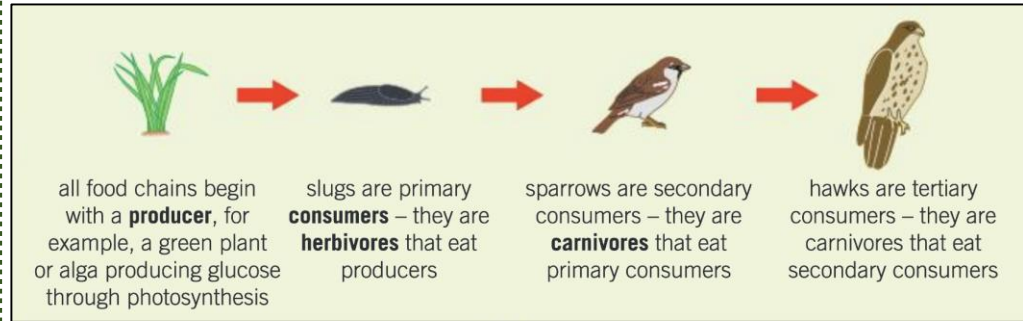
Photosynthetic organisms that synthesise molecules are the producers of all biomass for life on Earth, and so are the first step in all food chains.

A range of experimental methods using transects and quadrats are used by ecologists to determine the distributions and abundance of different species in an ecosystem.

Consumers that kill and eat other animals are predators, and those that are eaten are prey.

Apex predators are carnivores with no predators.

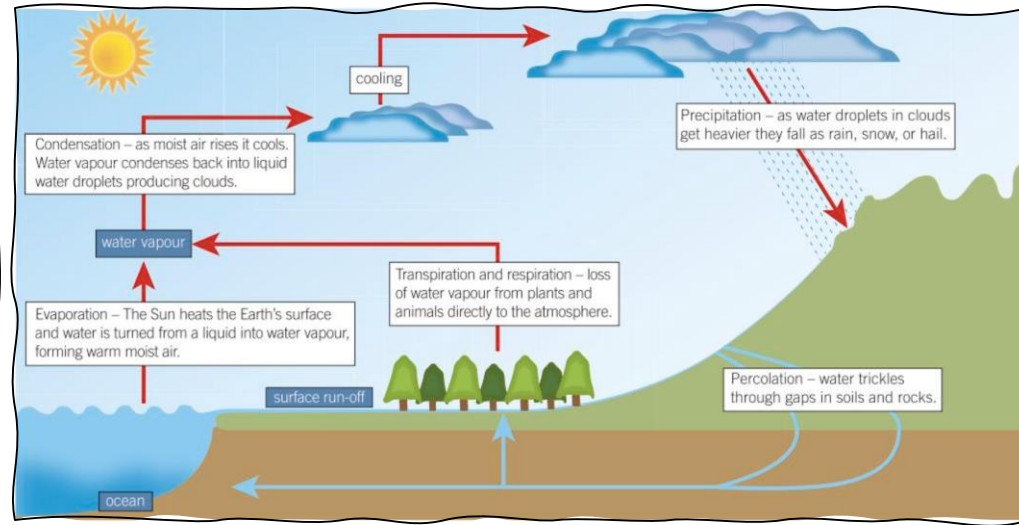
Organisms usually have more complex feeding relationships, with more than one predator or more than one source. These can be shown in a food web.



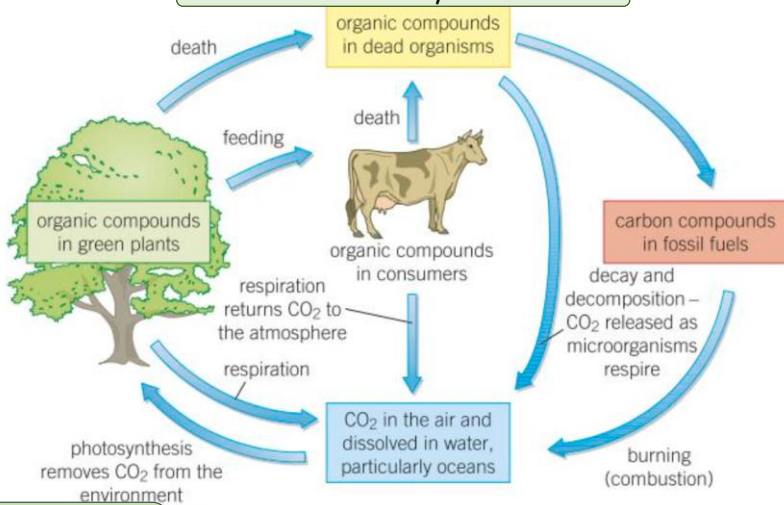
How materials are recycled

All materials in the living world are recycled, which provides the building materials for future organisms.

Water Cycle



Carbon Cycle



Key terms

biodiversity carbon cycle carnivore consumer deforestation evaporation
 food chain food web herbivore precipitation predator prey producer water cycle



Ecology

Knowledge Organiser

Biodiversity

Biodiversity is the variety of all the different species of organisms (plant, animal, and microorganism) on Earth, or within a specific ecosystem.

High biodiversity ensures the stability of an ecosystem because it reduces the dependence of one species on another for food or habitat maintenance.

The future of the human species depends on us maintaining a good level of biodiversity. Many human activities, such as deforestation, are reducing biodiversity, but only recently have measures been taken to try to prevent this.

Maintaining biodiversity

Many habitats are currently under threat due to human activities such as deforestation, climate change, and habitat destruction.

There are a number of ways in which scientists and concerned citizens are trying to maintain biodiversity and reduce the negative impact of humans on ecosystems, including

- breeding programmes in zoos for endangered species
- protection and regeneration of rare habitats (e.g., national parks)
- reintroduction of hedgerows in agricultural areas where single crop species are grown, as hedges provide habitat for many organisms
- government policies to reduce deforestation and carbon dioxide emissions
- recycling resources rather than dumping waste in landfill.

Waste Management

Rapid growth of the human population and increases in the standard of living mean that humans are using more resources and producing more waste.

Waste and chemical materials need to be properly handled in order to reduce the amount of pollution they cause. Pollution kills plants and animals, and can accumulate in food chains, reducing biodiversity. Pollution can occur

- in water, from sewage, fertiliser run-off, or toxic chemicals (e.g., from factories)
- in air, from smoke and acidic gases
- on land, from landfill and toxic chemicals.

Key terms

biodiversity biofuel biomass deforestation
global warming peat bog pollution

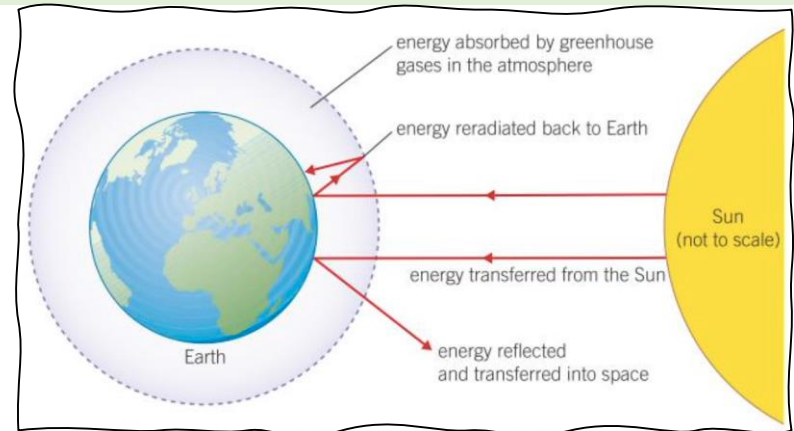


Global warming

Levels of carbon dioxide and methane in the atmosphere are increasing due to human activity, contributing to global warming and climate change. Global warming is the gradual increase in the average temperature of the Earth. This scientific consensus is based on systematic reviews of thousands of peer-reviewed publications.

Global warming has resulted in

- large-scale habitat change and reduction, causing a decrease in biodiversity
- extreme weather and sea-level changes
- migration of species to different parts of the world, affecting ecosystems
- threats to the security and availability of food.



Land use and deforestation

Rapid population growth has led to humans using much more land for building, quarrying, farming, and dumping waste. This reduces the area in which animals can live and can further destroy habitats through pollution.

For example, the destruction of peat bogs (areas of partially decayed vegetation) to produce garden compost has decreased the amount of this important habitat, and the biodiversity it supports. The decay or burning of peat for energy also releases carbon dioxide into the atmosphere, contributing to global warming.

Large-scale deforestation in tropical areas has been carried out to provide land for cattle and rice fields, and to grow crops for biofuels.

This has resulted in

- large amounts of carbon dioxide being released into the atmosphere due to burning of trees.
- extinctions and reductions in biodiversity as habitats are destroyed
- climate change, as trees absorb carbon dioxide and release water vapour.

Atomic Structure 01

Knowledge Organiser - Science - year 11

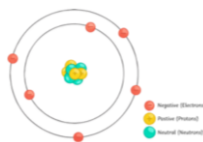
Atoms

All substances are made of atoms. An atom is the smallest part of an element that can exist.

Atoms are very small, having a radius of about 1×10^{-10} m. The radius of the nucleus is less than 1/10000 of that of the atom.

In an atom, the number of electrons is equal to the number of protons in the nucleus, Atoms have no overall electric charge.

| Particle | Relative Mass | Relative Charge |
|----------|---------------|-----------------|
| Proton | 1 | +1 |
| Neutron | 1 | 0 |
| Electron | Very small | -1 |



Atomic Number and Mass Number

The number of protons in an atom of an element is its **atomic number**. All atoms of a particular element have the same number of protons. The sum of the protons and neutrons in an atom is its **mass number**.

Electronic structure

The electrons in an atom occupy the lowest available energy level. The electronic structure can be represented by numbers or by a diagram. For example, the electronic structure of carbon (above) is 2,4.

Elements, compounds and mixtures

Elements are substances that only contain one type of atom. These are represented by chemical symbols, e.g. O represents oxygen. There are about 100 different elements on the periodic table.

Compounds are formed when two or more different elements chemically bond together, in fixed proportions. Compounds can only be separated by **chemical reactions**.

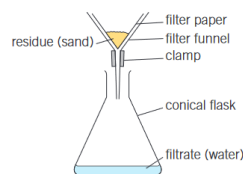
Mixtures consist of two or more elements or compounds **not** chemically combined together. **Mixtures** can be separated by **physical processes**.

Key terms

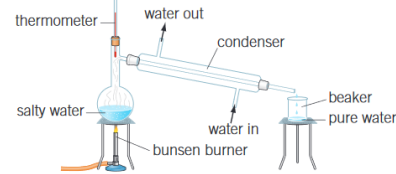
atom atomic number compound electron
mass number neutron nucleus proton

Separating techniques

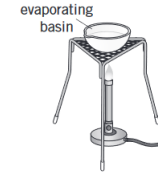
Filtration








Distillation



Evaporation



Development of the atomic model

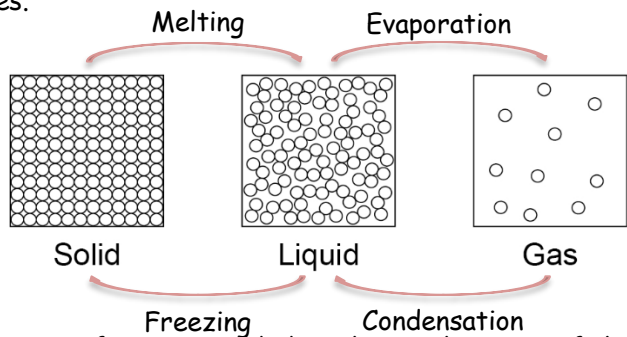
| Scientist | Period | Discovery | Model |
|-------------------|--------|--|---|
| John Dalton | 1808 | Atoms described as solid spheres |  |
| JJ Thomson | 1897 | Plum Pudding model - the atom is a ball of positive charge with scattered electrons |  |
| Ernest Rutherford | 1911 | Alpha Scattering - concentrated positive mass in the centre. Atoms are mostly empty space. |  |
| Niels Bohr | 1913 | Electrons are in shells orbiting the nucleus |  |
| James Chadwick | 1932 | Neutrons in the nucleus |  |

Structure and Bonding 03

Knowledge Organiser - Science - year 11

States of matter

The three states of matter are solid, liquid and gas. They can be represented using the particle model, by small solid spheres.



The amount of energy needed to change the state of the substance depends on the strength of the forces between the particles. The stronger the forces between the particles, the higher the melting and boiling point of the substance.

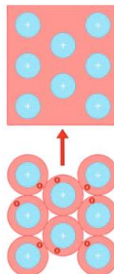
There are limitations to this model, due to the following assumptions:

- No forces between the particles
- Particles are all solid spheres

In chemical equations, the three states of matter are shown as (s), (l) and (g), with (aq) for aqueous solutions.

Metallic bonding

Metallic bonding occurs only in metals. Tightly packed rows of **positive ions** are surrounded by a **sea of delocalised electrons** which are free to move through the whole structure. There are strong **electrostatic** forces of attraction between the **positive** metal ions and **negative** electrons. They have **high** melting and boiling points. **Pure metals** are **malleable (soft)**, as the layers can slide over each other, so are mixed with other metals to make **alloys**.



Key
terms

Boiling point

Covalent bond

delocalised electrons

fullerene

giant covalent

graphene

diamond

small molecules

boiling point

conductor

electrostatic

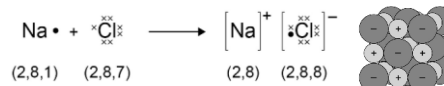
ionic bond

ion

lattice

Ionic bonds

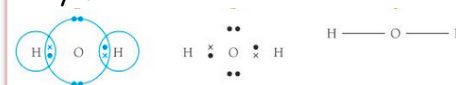
When a **metal** atom reacts with a **non-metal** atom, outer-shell electrons are transferred. Metal atoms **lose** electrons to become positively charged ions, whilst non-metal atoms **gain** electrons to become negatively charged ions.



Ionic compounds are giant structure of ions, held together by strong electrostatic forces of attraction between oppositely charged ions. These forces act in all directions in the **lattice**. These compounds have **high** melting and boiling points, as large amounts of energy is needed to break the strong bonds. When in liquid or aqueous form, they can conduct electricity as the ions are free to move.

Covalent bonds

A covalent bond forms when electrons are **shared** between **non-metal** atoms. The number of electrons shared depends on how many extra electrons are needed to fill the outer shell. Covalent bonds can be represented in a number of ways.



Atoms forming **covalent bonds** form different types of structures.

Giant structures consist of billions of atoms covalently bonded together. An example is diamond.

Small molecules contain only a few atoms. Different molecules are held together by weak **intermolecular forces**. An example is water.

Large molecules contain many repeat units joined covalently in a chain. Polymers are examples.

Carbon allotropes

There are numerous carbon structures. **Diamond** and **graphite** are **giant covalent structures** with **very high** melting and boiling points. **Graphite** contains layers of covalently bonded carbon atoms. Between the layers, there are no covalent bonds. This means the layers can **slide**, making graphite soft. Graphite can conduct electricity due to delocalised electrons. For **diamond**, the carbon atoms have a **rigid** structure, making it very hard. **Graphene** consists of a single layer of graphite. **Fullerenes** exist as **cage-like** structures and **tubes**, where molecules are held together by **weak** intermolecular forces. They typically **can** conduct electricity.



The Earth's Atmosphere

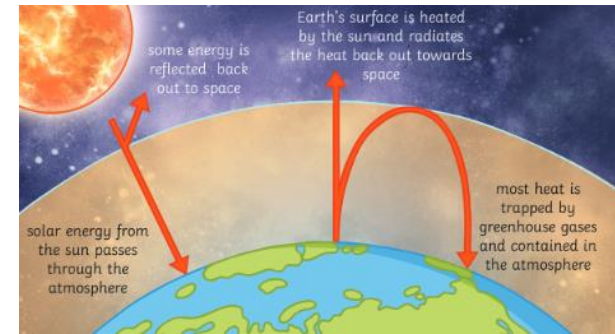
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The Earth's changing atmosphere

| Period | Proportions of gases | Evidence |
|---|--|--|
| ~ 4.6 billion years to 2.7 billion years ago | <p>CO_2 - Released by volcanoes. Biggest component of the atmosphere.</p> <p>O_2 - Very little oxygen present</p> <p>N_2 - Released by volcanoes</p> <p>H_2O - Released by volcanoes. Existed as vapour -Earth too hot.</p> <p>Ammonia and methane may also have been present.</p> | Very limited evidence. Comparisons made to other planets with an atmosphere rich in CO_2 |
| ~ 2.7 billion years to 200 million years ago | <p>CO_2 - Begins to reduce.</p> <ul style="list-style-type: none"> Water condenses to form oceans, which CO_2 dissolves in. Algae start to photosynthesise using CO_2. CO_2 precipitates in the oceans as carbonates to form rocks CO_2 taken in by plants and animals. Trapped as fossil fuels for millions of years <p>O_2 - Increases due to evolving plants releasing during photosynthesis</p> <p>N_2 - Continues to increase through volcanic release</p> <p>H_2O - Decreases as the Earth cools, condensing to form seas and oceans</p> | Still limited. Look at processes such as photosynthesis to make theories. |
| ~ 200 million years ago until the present day | <p>CO_2 - about 0.04%.</p> <p>O_2 - about 21%</p> <p>N_2 - about 78%</p> <p>H_2O - Very little overall. Collects in clouds.</p> <p>A small proportion of other gases</p> | Ice core evidence. Global measurements. |

Greenhouse effect

Greenhouse gases such as **carbon dioxide, methane** and **water vapour** absorb radiation from the sun and maintain the temperature on Earth. During the day, the Sun warms the earth's surface, whilst at night the earth cools and releases the heat back into the atmosphere. Some of the heat becomes trapped - this is the **Greenhouse effect**. In the last 200 years, human activities have led to an increase in the release of greenhouse gases through burning of fossil fuels, deforestation and cattle farming.



Global warming

A vast amount of peer-reviewed evidence demonstrates that an increase in the release of greenhouse gases causes an increase in the average global temperature.

Global climate change

Global warming leads to changes in the weather patterns across the globe. This is known as global climate change. Climate change has numerous effects on the planet: Rising sea levels, changes in the amount of rainfall, polar ice caps melting and extreme weather events.

Pollutants

| Pollutant | Origin | Effect |
|-----------------|----------------------------|-------------------------------------|
| CO | Incomplete combustion | Colour/odourless toxic gas |
| Particulates | Incomplete combustion | Global dimming |
| SO_2 | Sulfur impurities | Acid rain/respiratory issues |
| Nitrogen oxides | Heating of nitrogen in air | Acid rain/respiratory issues |

Key terms

Acid rain atmosphere
global warming

carbon footprint
particulate

global climate change
greenhouse gas

global dimming
pollutant



Health and Communicable Disease Knowledge Organiser - Year 10 - Science

Communicable disease

A communicable disease is one caused by pathogens that can be passed from organism to organism. A pathogen is a microorganism that causes a disease. Examples of pathogens are: bacteria, fungi, viruses and protists.

Viruses live and reproduce rapidly inside an organism's cells. This can damage or destroy the cells.

Bacteria reproduce rapidly inside organisms and may produce toxins that damage tissues and cause illness.

Pathogens can be spread in the air, water or by direct contact.

| Viruses | Spread by | Symptoms | Prevention and treatment |
|---------|-----------|----------|--------------------------|
|---------|-----------|----------|--------------------------|

| | | | |
|---------|---|--|---|
| measles | inhalation of droplets that are produced by infected people sneezing and coughing | <ul style="list-style-type: none"> fever red skin rash complications can be fatal | <ul style="list-style-type: none"> painkillers to treat the symptoms young children are vaccinated to immunise them against measles |
|---------|---|--|---|

| | | | |
|-----|--|---|--|
| HIV | Exchange of body fluids such as: <ul style="list-style-type: none"> sexual contact blood when drug users share needles | <ul style="list-style-type: none"> flu-like symptoms at first virus attacks the body's immune cells, which can lead to AIDS - when the immune system is so damaged that it cannot fight off infections. | <ul style="list-style-type: none"> antiretroviral drugs - are very damaging to the body barrier methods of contraception, such as condoms using clean needles |
|-----|--|---|--|

| | | | |
|-----|--|---|--|
| TMV | <ul style="list-style-type: none"> direct contact of plants with infected plant material animal and plant vectors soil: the pathogen can remain in soil for decades | <ul style="list-style-type: none"> mosaic pattern of discolouration on the leaves - where chlorophyll is destroyed reduces plant's ability to photosynthesise, affecting growth | <ul style="list-style-type: none"> removing infected plants |
|-----|--|---|--|

| Bacteria | Spread by | Symptoms | Prevention and treatment |
|----------|-----------|----------|--------------------------|
|----------|-----------|----------|--------------------------|

| | | | |
|------------|---------------------------------------|---|--|
| Salmonella | bacteria in or on food being ingested | Salmonella bacteria and the toxins they produce cause <ul style="list-style-type: none"> fever abdominal pains vomiting diarrhoea | <ul style="list-style-type: none"> poultry are vaccinated against Salmonella bacteria to control spread |
|------------|---------------------------------------|---|--|

| | | | |
|------------|--|---|--|
| Gonorrhoea | direct sexual contact - gonorrhoea is a sexually transmitted disease (STD) | <ul style="list-style-type: none"> thick yellow or green discharge from the vagina or penis pain when urinating | <ul style="list-style-type: none"> treatment with antibiotics (many antibiotic-resistant strains have appeared) barrier methods of contraception |
|------------|--|---|--|

Key terms

Bacterium communicable disease fungicide fungus herd immunity pathogen protist sexually transmitted disease (STD) toxin vaccination vector virus

| Fungi | Spread by | Symptoms | Prevention and treatment |
|-----------------|----------------|---|---|
| Rose black spot | Water and wind | <ul style="list-style-type: none"> purple or black spots on leaves, which turn yellow and drop early reduces plant's ability to photosynthesise, affecting growth | <ul style="list-style-type: none"> fungicides affected leaves removed and destroyed |

| Protists | Spread by | Symptoms | Prevention and treatment |
|----------|--|---|---|
| Malaria | Mosquitos feed on the blood of infected people and spread the protist pathogen when they feed on another person - organisms that spread disease by carrying pathogens are known as vectors | <ul style="list-style-type: none"> recurrent episodes of fever can be fatal | <ul style="list-style-type: none"> prevent mosquito vectors breeding mosquito nets to prevent bites anti-malarial medicine |

Controlling the spread of communicable disease

There are a number of ways to prevent the spread of communicable diseases from one organism to another.

Hygiene
Hand washing, disinfecting surfaces and machinery, keeping raw meat separate, covering mouth when coughing/sneezing.

Isolation
Isolation of infected individuals - people, animals, and plants can be isolated to stop the spread of disease.

Controlling Vectors
If a vector spreads a disease, destroying or controlling the population of the vector can limit the spread of disease.

Vaccination
Vaccination can protect large numbers of individuals against diseases. It cannot be used in plants as they don't have an immune system.

Herd immunity

If a large proportion of a population is vaccinated against a disease, the disease is less likely to spread even if there are some unvaccinated individuals.

Vaccination involves injecting small quantities of dead or inactive form of a pathogen into the body

This stimulates lymphocytes to produce the correct antibodies for that pathogen

If the same pathogen re-enters the body, the correct antibodies can be produced quickly to prevent infection.

Health and Communicable Disease

Knowledge Organiser - Year 10 - Science

Detection and identification of plant diseases

Signs that a plant is diseased:

- stunted growth
- spots on leaves
- areas of rot or decay
- growths
- malformed stems or leaves
- discolouration
- pest infestation

Ways of identifying plant diseases

- gardening manuals and websites
- laboratory testing of infected plants
- testing kits containing monoclonal antibodies

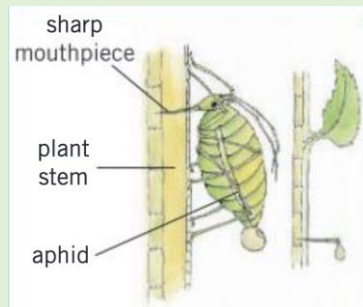
Plant diseases and insects

Plant diseases can also be directly caused by insects.

Aphids are insects that suck sap from the stems of plants. This results in

- reduced rate of growth
- wilting
- discolouration of leaves.

Ladybirds can be used to control aphid infestations as ladybirds larvae eat aphids.



Plant defences

Physical barriers

- cellulose cell walls - provide a barrier to infection
- tough waxy cuticle on leaves
- bark on trees - a layer of dead cells that can fall off

Chemical barriers

- many plants produce antibacterial chemicals
- poison production stops animals eating plants



Mechanical adaptations

- thorns and hairs stop animals eating plants



- leaves that droop curl when touched to scare herbivores or dislodge insects



- some plants mimic the appearance of unhealthy or poisonous plants to deter insects or herbivores



Health and Communicable Disease

Knowledge Organiser - Year 10 - Science

Non-specific defences

Non-specific defences of the human body against all pathogens include:

Skin

- physical barrier to infection
- produces antimicrobial secretions
- Microorganisms that normally live on the skin prevent pathogens growing

Nose

Cilia and mucus trap particles in the air, preventing them from entering the lungs. Trachea and bronchi produce mucus, which is moved away from the lungs to the back of the throat by the cilia, where it is expelled.

Stomach

Produces strong acid (pH 2) that destroys pathogens in mucus, food and drinks.

White blood cells

If a pathogen enters the body, the immune system tries to destroy the pathogen.

The function of white blood cells is to fight pathogens.

There are two main types of white blood cell - lymphocytes and phagocytes.

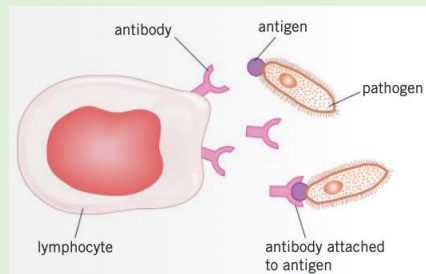
Lymphocytes fight pathogens in two ways:

Antitoxins

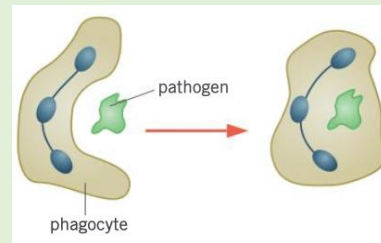
Lymphocytes produce **antitoxins** that bind to the toxins produced by some pathogen (usually bacteria). This *neutralises* the toxins.

Antibodies

Lymphocytes produce antibodies that target and help to destroy specific pathogens by binding to antigens (proteins) on the pathogen's surface's.



1. **Phagocytes** are attracted to areas of infection.
2. The phagocyte surrounds the pathogen and engulfs it.
3. Enzymes that digest and destroy the pathogen are released.



Key terms

Bacterium communicable disease fungicide fungus herd immunity pathogen protist sexually transmitted disease (STD) toxin vaccination vector virus

Health and Communicable Disease

Knowledge Organiser - Sep Only - Year 10 - Science

Producing monoclonal antibodies

Monoclonal antibodies are produced from a single clone of cells.

1 Mice are injected to stimulate the production of **lymphocytes** that make specific antibodies.

Lymphocytes make antibodies but **cannot divide to form clones**

2 Tumour cells are cultured. These cells can divide and grow endlessly.

Tumour cells **can divide to form clones**

3 The lymphocytes are fused with the tumour cells to create **hybridoma** cells.

A single hybridoma cell can divide to make a large number of identical cells called a clone.

All the cloned cells can make the antibody.

4 A large amount of the monoclonal antibody can then be produced, collected, and purified for use.

Use of monoclonal antibodies

Monoclonal antibodies are specific to a single binding site on a specific protein antigen.

This means they can be used to target specific chemicals or cells.

Research

Specific molecules can be located in cells and tissues by using monoclonal antibodies to bind them to a fluorescent dye.

Treatment

Monoclonal antibodies can deliver toxic chemicals and drugs specifically to cancer cells, limiting their harm to other cells in the body

Diagnostic testing

Monoclonal antibodies can be used to measure the levels of a particular chemical in the blood or to detect pathogens

Pregnancy tests

Pregnant women produce the hormone HCG, which is excreted in their urine. Monoclonal antibodies can be used to detect HCG in a pregnant woman's urine:

1) Urine is applied to the end of the stick

2) The test stick contains monoclonal antibodies that only bind HCG, attached to a dye.

3) If HCG is present in the urine, the monoclonal antibodies cause a line of dye to appear. This means the pregnancy test is positive.

4) A second line appears in the control zone to show the test is valid, even if the result is negative.

Treating diseases

Antibiotics

- **Antibiotics** are medicines that can kill *bacteria* in the body.
- Specific bacteria need to be treated by specific antibiotics
- Antibiotics have greatly reduced deaths from infectious bacterial diseases, but antibiotic-resistant strains of bacteria are emerging.

Treating viral diseases

- Antibiotics *do not* affect viruses.
- Drugs that kill viruses often damage the body's tissues.
- Painkillers treat the symptoms of viral diseases but do not kill pathogens.

Discovering and developing new drugs

New drugs are extensively tested and trailed for

- Toxicity - is it harmful?
- Efficacy - does it work?
- Dose - what amount is safe and effective to give

Stages of clinical trials

Pre-clinical trials

Drug is tested in cells, tissues, and live animals.

Clinical trials

1. Healthy volunteers receive vary low doses to test whether the drugs is safe and effective.
2. If safe, large numbers of healthy volunteers and patients receive the drugs to find the optimum dose.

Peer review

Before being published, the results of clinical trials will be tested and checked by independent researchers. This is called **peer review**.

Double-blind trials

Some clinical trials give some of their patients a placebo drug - one that is known to have no effect.

Double-blind trials are when neither the patients nor the doctors know who has been given the real drug and who has been given the placebo. This reduces biases in the trail.

terms

Bacterium communicable disease fungicide fungus herd immunity pathogen prot sexually transmitted disease (STD) toxin vaccination vector virus

Health and Infectious Disease

Knowledge Organiser

Health

Health is a state of physical and mental well-being.

The following factors can affect health:

- Communicable and non-communicable diseases
- Diet
- Stress
- Exercise
- Life situation

Different types of disease may interact, for example:

- Defects in the immune system make an individual more likely to suffer from infectious diseases
- Viral infection can trigger cancers
- Immune reactions initially caused by a pathogen can trigger allergies, for example skin rashes and asthma
- Severe physical ill health can lead to depression and other mental illnesses.

Cancer

Cancer is the result of changes in cells that lead to uncontrolled growth and division by mitosis.

Rapid division of abnormal cells can form a **tumour**.

Malignant tumours are cancerous tumours that invade neighbouring tissues and spread to other parts of the body in the blood, forming secondary tumours.

Benign tumours are non-cancerous tumours that do not spread in the body.

Risk factors and non-communicable diseases

| Risk Factor | Disease | Effects of risk factor |
|---|---------------------------------------|--|
| Diet (obesity) and amount of exercise | Type 2 diabetes | Body does not respond properly to the production of insulin, so blood glucose levels can not be controlled |
| | Cardiovascular disease | Increased blood cholesterol can lead to CHD |
| Alcohol | Impaired liver function | Long-term alcohol use causes liver cirrhosis (scarring), meaning the liver cannot remove toxins from the body or produce sufficient bile |
| | Impaired brain function | Damages the brain and can cause anxiety and depression |
| | Affected development of unborn babies | Alcohol can pass through the placenta, risking miscarriages, premature births and birth defects |
| Smoking | Lung disease and cancers | Cigarettes contain carcinogens, which can cause cancers |
| | Affected development of unborn babies | Chemicals can pass through the placenta, risking premature births and birth defects |
| Carcinogens , such as ionising radiation, and genetic risk factors | Cancers | For example, tar in cigarettes and ultraviolet rays from the Sun can cause cancers |
| | | Some genetic factors make an individual more likely to develop certain cancers |

Treatment of non-communicable diseases linked to lifestyle risk factors - such as poor diet, drinking alcohol, and smoking - can be very costly, both to individuals and to the Government.

A high incidence of these lifestyle risk factors can cause high rates of non-communicable diseases in a population.

Key terms

artificial heart benign carcinogen cholesterol coronary heart disease health malignant risk factor statin stent transplant

Health and Infectious Disease Knowledge Organiser

Communicable disease

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Bacteria reproduce rapidly inside organisms and may produce toxins that damage tissues and cause illness.

Pathogens can be spread in the air, water or by direct contact.

| Viruses | Spread by | Symptoms | Prevention and treatment |
|---------|-----------|----------|--------------------------|
|---------|-----------|----------|--------------------------|

| | | | |
|---------|---|--|---|
| measles | inhalation of droplets that are produced by infected people sneezing and coughing | <ul style="list-style-type: none"> fever red skin rash complications can be fatal | <ul style="list-style-type: none"> painkillers to treat the symptoms young children are vaccinated to immunise them against measles |
|---------|---|--|---|

| | | | |
|-----|--|---|--|
| HIV | Exchange of body fluids such as: <ul style="list-style-type: none"> sexual contact blood when drug users share needles | <ul style="list-style-type: none"> flu-like symptoms at first virus attacks the body's immune cells, which can lead to AIDS - when the immune system is so damaged that it cannot fight off infections. | <ul style="list-style-type: none"> antiretroviral drugs - are very damaging to the body barrier methods of contraception, such as condoms using clean needles |
|-----|--|---|--|

| | | | |
|-----|--|---|--|
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|-----|--|---|--|

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|----------|-----------|----------|--------------------------|
|----------|-----------|----------|--------------------------|

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|------------|---------------------------------------|---|--|

| | | | |
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|------------|--|---|--|

Key terms

Bacterium communicable disease fungicide fungus herd immunity pathogen protist sexually transmitted disease (STD) toxin vaccination vector virus

| Fungi | Spread by | Symptoms | Prevention and treatment |
|-----------------|----------------|---|---|
| Rose black spot | Water and wind | <ul style="list-style-type: none"> purple or black spots on leaves, which turn yellow and drop early reduces plant's ability to photosynthesise, affecting growth | <ul style="list-style-type: none"> fungicides affected leaves removed and destroyed |

| Protists | Spread by | Symptoms | Prevention and treatment |
|----------|--|---|---|
| Malaria | Mosquitos feed on the blood of infected people and spread the protist pathogen when they feed on another person - organisms that spread disease by carrying pathogens are known as vectors | <ul style="list-style-type: none"> recurrent episodes of fever can be fatal | <ul style="list-style-type: none"> prevent mosquito vectors breeding mosquito nets to prevent bites anti-malarial medicine |

Controlling the spread of communicable disease

There are a number of ways to prevent the spread of communicable diseases from one organism to another.

Hygiene
Hand washing, disinfecting surfaces and machinery, keeping raw meat separate, covering mouth when coughing/sneezing.

Isolation
Isolation of infected individuals - people, animals, and plants can be isolated to stop the spread of disease.

Controlling Vectors
If a vector spreads a disease, destroying or controlling the population of the vector can limit the spread of disease.

Vaccination
Vaccination can protect large numbers of individuals against diseases. It cannot be used in plants as they don't have an immune system.

Herd immunity

If a large proportion of a population is vaccinated against a disease, the disease is less likely to spread even if there are some unvaccinated individuals.

Vaccination involves injecting small quantities of dead or inactive form of a pathogen into the body

This stimulates lymphocytes to produce the correct antibodies for that pathogen

If the same pathogen re-enters the body, the correct antibodies can be produced quickly to prevent infection.

Health and Infectious Disease Knowledge Organiser

Non-specific defences

Non-specific defences of the human body against all pathogens include:

Skin

- physical barrier to infection
- produces antimicrobial secretions
- Microorganisms that normally live on the skin prevent pathogens growing

Nose

Cilia and mucus trap particles in the air, preventing them from entering the lungs. Trachea and bronchi produce mucus, which is moved away from the lungs to the back of the throat by the cilia, where it is expelled.

Stomach

Produces strong acid (pH2) that destroys pathogens in mucus, food and drinks.

White blood cells

If a pathogen enters the body, the immune system tries to destroy the pathogen.

The function of white blood cells is to fight pathogens.

There are two main types of white blood cell - lymphocytes and phagocytes.

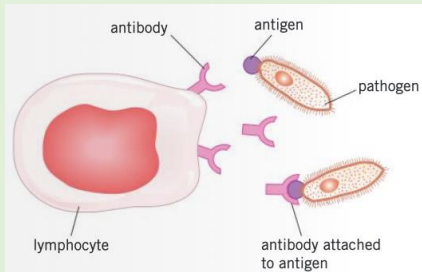
Lymphocytes fight pathogens in two ways:

Antitoxins

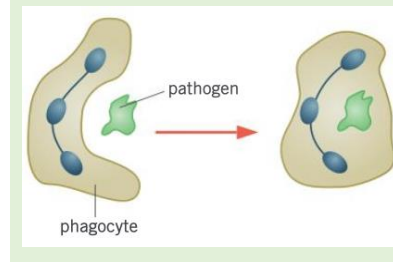
Lymphocytes produce **antitoxins** that bind to the toxins produced by some pathogens (usually bacteria). This *neutralises* the toxins.

Antibodies

Lymphocytes produce antibodies that target and help to destroy specific pathogens by binding to antigens (proteins) on the pathogen's surface's.



1. **Phagocytes** are attracted to areas of infection.
2. The phagocyte surrounds the pathogen and engulfs it.
3. Enzymes that digest and destroy the pathogen are released.



Treating diseases

Antibiotics

- **Antibiotics** are medicines that can kill *bacteria* in the body.
- Specific bacteria need to be treated by specific antibiotics
- Antibiotics have greatly reduced deaths from infectious bacterial diseases, but antibiotic-resistant strains of bacteria are emerging.

Treating viral diseases

- Antibiotics *do not* affect viruses.
- Drugs that kill viruses often damage the body's tissues.
- Painkillers treat the symptoms of viral diseases but do not kill pathogens.

Discovering and developing new drugs

Drugs were traditionally extracted from plants and microorganisms, for example

- The heart drug digitalis comes from foxglove plants
- The painkiller aspirin originates from willow trees
- Penicillin was discovered by Alexander Fleming from *Penicillium* mould.

Most modern are now synthesised by chemists in laboratories.

New drugs are extensively tested and trailed for

- Toxicity - is it harmful?
- Efficacy - does it work?
- Dose - what amount is safe and effective to give

Stages of clinical trials

Pre-clinical trials

Drug is tested in cells, tissues, and live animals.

Clinical trials

1. Healthy volunteers receive vary low doses to test whether the drugs is safe and effective.
2. If safe, large numbers of healthy volunteers and patients receive the drugs to find the optimum dose.

Peer review

Before being published, the results of clinical trials will be tested and checked by independent researchers. This is called **peer review**.

Double-blind trials

Some clinical trials give some of their patients a placebo drug - one that is known to have no effect.

Double-blind trials are when neither the patients nor the doctors know who has been given the real drug and who has been given the placebo. This reduces biases in the trail.

Key terms

Bacterium communicable disease fungicide fungus herd immunity pathogen protist sexually transmitted disease (STD) toxin vaccination vector virus

Rates and equilibrium

Knowledge Organiser



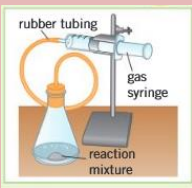

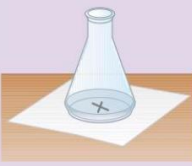
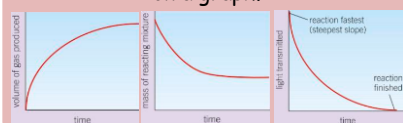
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Rates of reaction

The rate of reaction is how quickly the reactants become the products, The rate of reaction can be determined by:

$$\text{Mean rate of reaction} = \frac{\text{quantity of reactant used}}{\text{time taken}} \text{ OR } \frac{\text{quantity of product formed}}{\text{time taken}}$$

Practically this can be determined from measuring how the mass of the reaction changes, the volume of gas given off from the reaction or the changes in the colour or turbidity of a solution when a solid precipitate is produced

| Change in mass | Volume of gas produced |
|---|--|
|  <p>The reactants are placed in a conical flask, which is connected to a gas syringe of upside down measuring cylinder. As the reaction proceeds, the gas is collected.</p> |  <p>The reactants are placed in a conical flask on a balance. As the reaction proceeds the gaseous product is given off and the mass of the flask decreases.</p> |
| Change in colour or turbidity | Calculating rate from a graph |
|  <p>The reactants are placed in a conical flask, which is placed on top of a cross. As the reaction proceeds the solid precipitate is produced eliminating view of the cross.</p> | <p>The results from each can be plotted on a graph.</p>  <p>A steep gradient indicates a fast rate of reaction, whereas a shallow gradient indicates a slow rate of reaction. A plateau indicates the reaction has reached completion.</p> |

Collision theory

For a reaction to occur, the reactant particles need to collide with sufficient energy to react. This amount of energy is called the **activation energy**. The rate of a reaction can be increased by: increasing the **frequency of collisions** and increasing the **energy of particles** when they collide.

Key terms

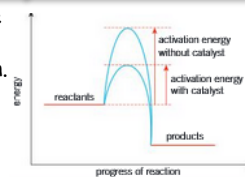
Activation energy catalyst collision theory frequency rate of reaction temperature
 equilibrium concentration pressure surface area closed system energy reversible

Factors affecting the rate of reaction

| Factor | Impact on rate of reaction |
|--|---|
| Increasing the temperature ... | Particles gain more kinetic energy, move faster and therefore collide more frequently, with more energy so more collisions result in a reaction. |
| Increasing the concentration of solution reactants ... | There are more reactant particles therefore more frequent collisions occur. |
| Increasing the pressure of gaseous reactants ... | There is less space between the particles, so more frequent collisions occur. |
| Increasing the surface area of solid reactants ... | Only reactant particles at the surface of a solid are able to interact and collide with another reactant, so a larger surface area leads to more frequent collisions occurring. |

Catalysts

Catalysts speed up the reaction without being used up in the reaction. They provide an alternative pathway that has a lower activation energy.



Reversible reactions

For some reactions, the products can react to produce the original reactants. This is a reversible reaction. We use this symbol: \rightleftharpoons . If carried out in a closed system, equilibrium can be reached where the forward and reverse reactions occur at the same rate.



Le Chatelier's principle (HT only)

To move from equilibrium, and to change the amount of reactant and product, the conditions of the reaction must be changed. Le Chatelier's principle states, that within a closed system, the system will work to oppose or counteract the change by favouring either the forward or the reverse reaction. Conditions that can be changed are: concentration of the reactants or products, temperature of the system or the pressure of the system.

Concentration - When the concentration of a substrate is altered, the system will oppose the change. For example, if the reactant concentration is increased, the forward reaction is favoured, less reactant is available and more product is made.

Temperature - When the temperature of the system is altered, the system will oppose the change. For example, if the temperature of the system is increased, the endothermic reaction is favoured, resulting in the surrounding temperature to decrease.

Pressure - When the pressure of the system is altered, the system will oppose the change. For example, if the pressure of the system is increased, the reaction will favour the direction with fewer molecules, resulting in a decrease in pressure.



Inheritance

Knowledge Organiser - Year 10 - Science

Types of reproduction

| Sexual | Asexual |
|--|--|
| Two parents | One parent |
| Cell division thorough meiosis | Cell division by mitosis |
| Joining of male and female sex cells (gametes) - sperm and egg in animals, pollen and ovule in plants | No fusion of gametes |
| Produces non-identical offspring that are genetically different to parents | Produces offspring that are genetically identical to parent (clones) |
| Results in wide variation within offspring and species | No mixing of genetic information |
| Advantages: <ul style="list-style-type: none"> • Produces variation in offspring • If the environment changes, the offspring may have a survival advantage by natural selection due to their genetic variation. | Advantages: <ul style="list-style-type: none"> • Only one parent needed • Time and energy efficient as do not need to find a mate • Faster than sexual reproduction • Many identical offspring can be produced when conditions are favourable • Successful traits passed on as offspring are identical |
| Disadvantages <ul style="list-style-type: none"> • Finding a mate and reproducing is time consuming and requires lots of energy • Much slower than asexual reproduction | Disadvantages <ul style="list-style-type: none"> • Reduced genetic variation - if the environment changes, the offspring may have a survival disadvantage • Harmful mutations in parent would be passed on to all offspring |

Depending on the circumstances, some organisms reproduce by both methods. For example:

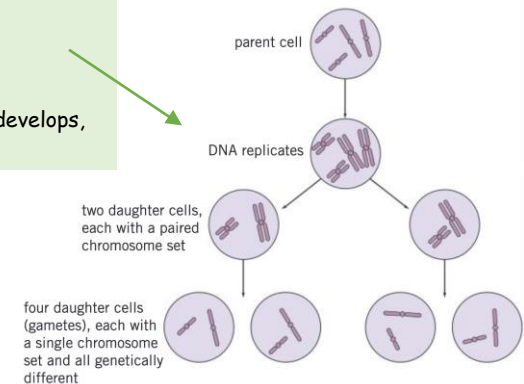
- malaria parasites reproduce asexually in human hosts, but sexually in mosquitoes
- many fungi reproduce asexually by spores, but also sexually to give variation.
- many plants produce seeds sexually, but also reproduce asexually by bulb division (daffodils) or runners (strawberry plants).

Meiosis

Meiosis is a type of cell division that makes gametes in the reproductive organs.

Meiosis halves the number of chromosomes in gametes, and fertilisation (joining of two gametes) restores the full number of chromosomes.

The fertilised cell divides by mitosis, producing more cells. As the embryo develops, the cells differentiate.



Genetic inheritance

You need to be able to explain these terms about genetic inheritance:

| | |
|--------------|--|
| gamete | Specialised sex cell formed by meiosis |
| chromosomes | Long molecule made from DNA found in the nucleus of cells |
| gene | Part of a chromosome that codes for a protein - some characteristics are controlled by a single gene (e.g. fur colour in mice and red-green colour blindness in humans), but most are controlled by multiple genes interacting |
| allele | Different forms of the same gene |
| dominant | Allele that only needs one copy present to be expressed |
| recessive | Allele that needs two copies to present to be expressed |
| homozygous | When an individual carries two copies of the same allele for a trait |
| heterozygous | When an individual carries two alleles for a trait |
| genotype | Combination of alleles an individual has |
| phenotype | Physical expression of the genotype - the characteristic shown |

Key terms

allele chromosomes clone DNA dominant double helix fertilisation gamete gene genetic cross genome
genotype homozygous heterozygous meiosis mitosis phenotype Punnett square recessive

Inheritance

Knowledge Organiser - Year 10 - Science

DNA and the genome

Genetic material in the nucleus of a cell is composed of DNA.

DNA is made up of two strands forming a double helix.

DNA is contained in structures called chromosomes.

A gene is a small section of DNA on a chromosome that codes for a specific sequence of amino acids, to produce a specific protein.

The genome of an organism is the entire genetic material of that organism.

The whole human genome has been studied, and this has allowed scientists to:

- Search for genes linked to different diseases
- Understand and treat inherited disorders
- Trace human migration patterns from the past.

Structure of DNA



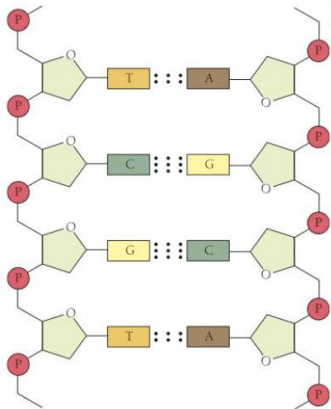
DNA is a polymer made from four different nucleotides.

A nucleotide is a molecule made of phosphate, a sugar, and one of four organic bases (A, C, G and T).

A sequence of three bases codes for a particular amino acid.

The order of the bases determines the order in which amino acids are assembled to produce a specific protein.

In complementary DNA strands, a C base is always linked to a G base on the opposite strand, and a T to an A.



Inherited disorders

Some disorders are due to the inheritance of certain alleles:

- Polydactyly (extra finger or toe) is caused by a dominant allele.
- Cystic fibrosis (a disorder of cell membranes) is caused by a recessive allele.

Embryo screening and gene therapy may alleviate suffering from these disorders, but there are ethical issues surrounding their use.

Protein Synthesis

Proteins are synthesised on the ribosomes using a template of DNA.

Carrier molecules bring amino acids to add to the protein chain in the correct order.

When the protein is complete it folds up to form a specific shape, and this shape allows proteins to do a specific job (as enzymes and hormones, or forming structures).

Non-coding parts of DNA can control the expression of genes by switching them on and off.

Mutations and genetic variability

Mutations occur continuously and change the base code of DNA. In coding DNA they may alter the activity of a protein:

- Most do not alter the appearance or function of the protein the DNA produces.
- A change in DNA structure may change the amino acid order, causing a gene to synthesise a different protein.
- Some mutations alter the shape of the protein, so the protein may no longer fit the substrate binding site, or lose its strength if it is structural.

In non coding DNA, mutations may alter how genes are expressed.

Genetic crosses

A genetic cross is when you consider the offspring that might result from two known parents. Punnett squares can be used to predict the outcome of a genetic cross, for both the genotypes the offspring might have and their phenotypes.

For example, the cross bb (brown fur) x BB (black fur) in mice:

| | | mother | |
|--------|---|--------|----|
| | | B | B |
| father | b | Bb | Bb |
| | b | Bb | Bb |

Offspring genotype: 100% Bb

Offspring phenotype: all black fur

Sex determination

Normal human body cells contain 23 pairs of chromosomes-one of these pairs determines the sex of the offspring. In human females the sex chromosomes are the same (XX) and in males there are different (XY).

A Punnett square can be used to determine the probability of offspring being male or female. The probability is always 50% in human as there are two XX and two XY outcomes.

| | | mother | |
|--------|---|--------|----|
| | | X | X |
| father | X | XX | XX |
| | Y | XY | XY |

Key terms

allele chromosomes clone DNA dominant double helix fertilisation gamete gene genetic cross genome genotype homozygous heterozygous meiosis mitosis phenotype Punnett square recessive

Evolution

Knowledge Organiser - Year 10 - Science

Theory of evolution

Evolution is the gradual change in the inherited characteristics of a population over time.

Evolution occurs through the process of natural selection and may result in the formation of new species.

Darwin's work

Charles Darwin proposed the theory of evolution by natural selection after gathering evidence from a round-the-world expedition, experimentation and discussion.

This states that all living species evolved from a common ancestor that first developed more than three billion years ago.

Darwin published this theory in *On the Origin of the Species* (1859). His ideas were considered controversial and only gradually accepted because

- They challenged the idea that God made all of the Earth's animals and plants
- There was insufficient evidence at the time the theory was published, although much more evidence has been gathered since
- Mechanisms of inheritance and variation were not known at the time.
- Other theories, such as that of Jean-Baptiste Lamarck, were based on the idea that the changes that occur in an organism over its lifetime could be passed on to its offspring. We now know that in the majority of cases this type of inheritance cannot occur.

Process of natural selection

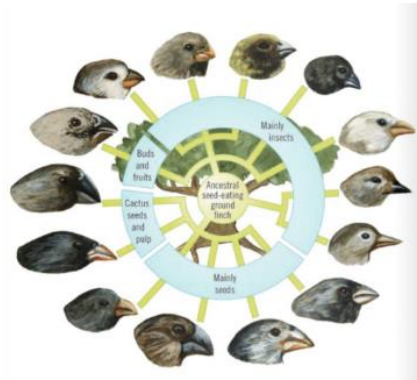
The theory of evolution by natural selection states that:

- Organisms within species show a wide variation in phenotype
- Individuals with characteristics most suited to the environment are more likely to survive and breed successfully
- These characteristics are then passed on to their offspring.

Evidence for evolution

The theory of evolution by natural selection is now widely accepted because there are lots of data to support it, such as

- It has been shown that characteristics are passed on to offspring in genes
- Evidence from the fossil record
- The evolution of antibiotic resistance in bacteria



Extinction

Extinction is when there are no remaining individuals of a species still alive.

Factors that may contribute to a species' extinction include:

- new predators
- new diseases
- new competitors
- catastrophic events
- changes to the environment

Speciation

Alfred Russel Wallace independently proposed the theory of evolution by natural selection.

He published joint writings with Darwin in 1858 on the subject, prompting Darwin to publish his book the next year.

Wallace worked worldwide gathering evidence for evolutionary theory.

He is best known for his work on warning colours in animals and for his pioneering work on the theory of speciation.

Speciation is the gradual formation of a new species as a result of evolution. More evidence and work from scientists over time have led to our current understanding of the theory of speciation.

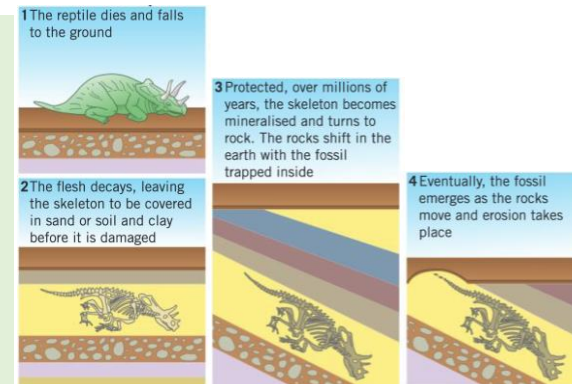
1. Two populations of one species are isolated.
2. Natural selection occurs so that the better-adapted individuals reproduce and pass on the genes for these different characteristics
3. The populations have an increasing number of genetic mutations as they adapt to their different environments
4. Eventually the two populations are so genetically different they cannot breed to produce fertile offspring.

Fossils

Fossils are the remains of organisms from millions of years ago, which are found in rocks.

Fossils can be formed from:

- Parts of the organism that do not decay because one or more of the conditions needed for decay are absent
- Hard parts of an organism (e.g. bones) when replaced by minerals
- Preservation of the traces of organisms (e.g. burrows, footprints, and rootlet traces).



Benefits of the fossil record

- Can tell scientists how individual species have changed over time
- Fossils allow us to understand how life developed over the Earth's history
- Fossils can be used to track the movement of a species or its ancestors across the world

Problems with the fossil record

- Many early organisms were soft-bodied, so most decayed before producing fossils
- There are gaps in the fossil record as not all fossils have been found and others have been destroyed by geological or human activity - this means scientists cannot be certain about how life began on Earth.

Key terms

Antibiotic resistance binomial system evolution evolutionary tree extinction fossil record natural selection three-domain system

Evolution

Knowledge Organiser - Year 10 - Science

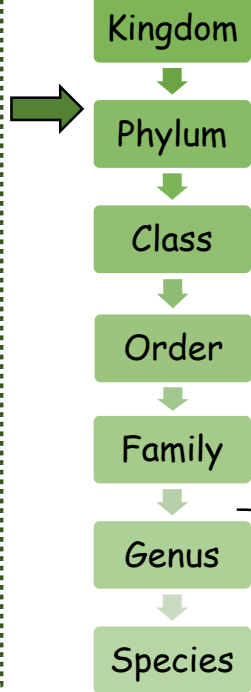
Classification of living organisms

Carl Linnaeus developed a system to classify living things into groups, based upon observable characteristics.

New models of classification were proposed as understanding of biochemical processes developed and improvements in microscopes led to discoveries of internal structures.

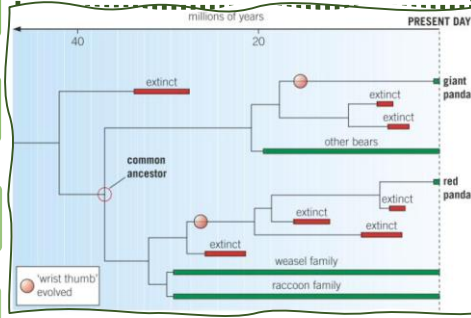
There is now a three-domain system developed by Carl Woese, dividing organisms into:

- Bacteria (true bacteria)
- Archea (primitive bacteria usually living in extreme conditions)
- Eukaryota (including protists, plants, fungi and animals).



Evolutionary Trees

Evolutionary trees use current classification data for living organisms and fossil data for extinct organisms to show how scientists believe organisms are related.



Organisms are named by the binomial system of genus and species e.g. **Homo Sapiens**

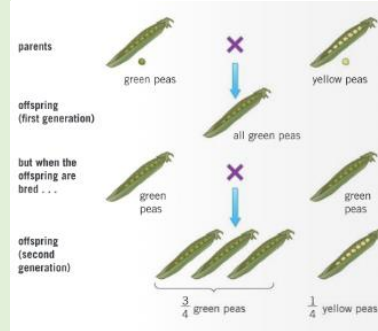
Homo is our **Genus**
Sapiens is our **Species**

Understanding of genetics

Gregor Mendel development our understanding of genetics by carrying out breeding experiments on plants in the mid-nineteenth century.

For example, he showed that crossing a plant that produces yellow peas and a plant that produces green peas always bred offspring with green peas. But when crossing these offspring, some offspring of later generations might have yellow peas again.

Through experiments like these, Mendel observed that the inheritance of each characteristic is determined by units - later called genes - that are passed on unchanged to offspring and that these genes can be dominant or recessive.



The significance of Mendel's work was not recognised until after his death, because

- Most scientists believed in blended inheritance (e.g. a white flower and a purple flower producing a lilac flower).
- He published his work in an obscure journal so not many people saw it.
- He was a monk and not a scientist.

Development of gene theory

Further work by many scientists led to the development of gene theory.

In the late nineteenth century the behaviour of chromosomes during cell division was observed.

In the early twentieth century genes and chromosomes were observed to behave similarly, leading to the idea that genes were located on chromosomes.

In the mid-twentieth century the structure of DNA and mechanism of gene function were determined.

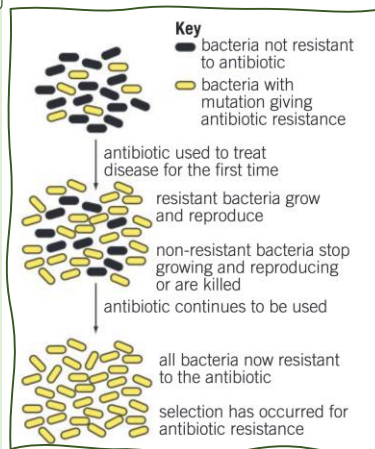
Resistant bacteria

Bacteria can evolve rapidly because they reproduce very quickly. This has led to many strains of bacteria developing antibiotic resistance, such as MRSA. The development of antibiotic resistance is evidence for the theory of evolution by natural selection.

The development of new antibiotics is expensive and slow, so is unlikely to keep up with the emergence of new antibiotic-resistant bacteria strains.

To reduce the rise of antibiotic-resistant strains

- doctors should only prescribe antibiotics for serious bacterial infections
 - patients should complete their courses of antibiotics so all bacteria are killed and non survive to form resistant strains.
- the use of antibiotics in farming and agriculture should be restricted.



Key terms

Antibiotic resistance binomial system evolution evolutionary tree extinction fossil record natural selection three-domain system

Variation

Knowledge Organiser - Year 10 - Science

Variation in populations

Differences in the characteristics of individuals in a population are called variation.

Variation may be due to differences in:

- the genes they have inherited, for example eye colour (genetic causes)
- the environment in which they have developed, for example, language (environmental causes)
- a combination of genes and the environment.



Mutation

There is usually a lot of genetic variation within a population of species - this variation arises from mutations.

A mutation is a change in a DNA sequence:

- mutations occur continuously
- very rarely a mutation will lead to a new phenotype
- some mutations may change an existing phenotype and most have no effect if a phenotype is suited to an environmental change, it can lead to a relatively rapid change in the species - this is the theory of evolution by natural selection.

Selective Breeding

Selective breeding (artificial selection) is the process by which humans breed plants and animals for particular genetic characteristics.

Humans have been using selective breeding for thousands of years, since breeding crops from wild plants and domesticating animals.

Process of selective breeding:

- choose parents with the desired characteristics from a mixed population
- breed them together
- choose offspring with the desired characteristic and breed them together
- continue over many generations until all offspring show the desired characteristic.



The characteristic targeted in selective breeding can be chosen for usefulness or appearance, for example

- disease resistance in food crops
- animals that produce more meat or milk
- domestic dogs with a gentle nature
- larger or unusual flowers.



Disadvantages of selective breeding:

- can lead to inbreeding, where some breeds are particularly prone to inherited defects or diseases
- reduces variation, meaning all members of a species could be susceptible to certain diseases.

Methods of Cloning

Tissues culture

Small groups of cells from part of a plant are used to grow identical new plants. This is important for preserving rare plant species and growing plants commercially in nurseries.

Cutting

An older, simple method used by gardeners to produce many identical plants from a parent plant.

Embryo transplant

Cells are split apart from developing animal embryo before they become specialised, then the identical embryos are transplanted into host mothers.



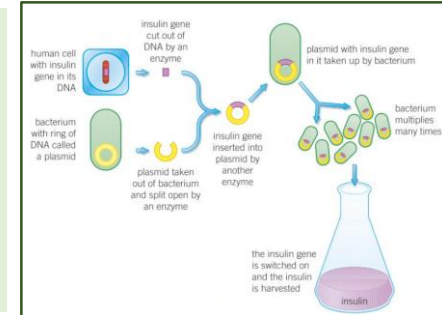
| Benefits | Risks |
|--|---|
| <ul style="list-style-type: none"> Large number of identical offspring produced Quick and economical Desired characteristics guaranteed | <ul style="list-style-type: none"> Limits variation and causes reduction in gene pool Clones may be vulnerable to diseases/changes in the environment Ethical considerations around cloning living organisms |

Genetic Engineering

Genetic engineering is a process that involves changing the genome of an organism by introducing a gene from another organism to produce a desired characteristic.

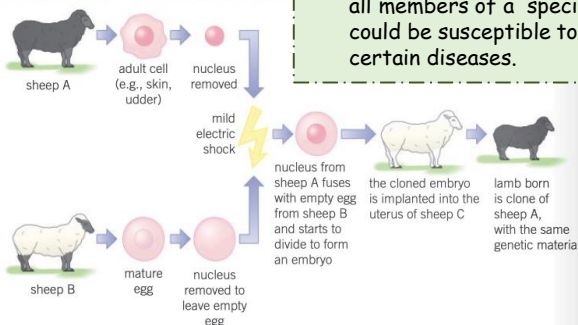
For example:

- Bacterial cells have been genetically engineered to produce useful substances, such as human insulin to treat diabetes.
- Plant crops have been genetically engineered to be resistant to diseases, insects, or herbicides, or to produce bigger and better fruits and higher crop yields. Crops that have undergone genetic engineering are called genetically modified (GM).



Cloning

A clone is an individual that has been produced asexually and is genetically identical to its parent. There are several methods for producing both plant and animal clones, but there are benefits and risks associated with cloning.



There are many benefits to genetic engineering in agriculture and medicine, but also some risks and moral objections.

| Benefits | Risks |
|--|--|
| <ul style="list-style-type: none"> Potential to overcome some inherited human diseases Can lead to higher value of crops as GM crops have bigger yields than normal Crops can be engineered to be resistant to herbicides, make their own pesticides, or be better adapted to environmental conditions. | <ul style="list-style-type: none"> Genes from GM plants and animals may spread to other wildlife, which could have devastating effects on ecosystems Potential negative impacts on populations of wild flowers and insects Ethical concerns, for example, in the future people could manipulate the genes of foetuses to ensure certain characteristics Some people believe the long-term effects on health of eating GM crops have not been fully explored. |

Key terms

genetically modified genetic engineering inbreeding mutation selective breeding variation



Inheritance

Knowledge Organiser

Types of reproduction

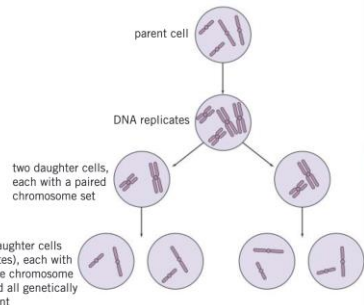
| Sexual | Asexual |
|---|--|
| Two parents | One parent |
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| Joining of male and female sex cells (gametes) - sperm and egg in animals, pollen and ovule in plants | No fusion of gametes |
| Produces non-identical offspring that are genetically different to parents | Produces offspring that are genetically identical to parent (clones) |
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Meiosis

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Meiosis halves the number of chromosomes in gametes, and fertilisation (joining of two gametes) restores the full number of chromosomes.

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DNA and the genome

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Inherited disorders

Some disorders are due to the inheritance of certain alleles:

- Polydactyly (extra finger or toe) is caused by a dominant allele.
- Cystic fibrosis (a disorder of cell membranes) is caused by a recessive allele.

Embryo screening and gene therapy may alleviate suffering from these disorders, but there are ethical issues surrounding their use.

Genetic inheritance

You need to be able to explain these terms about genetic inheritance:

| | |
|--------------|--|
| gamete | Specialised sex cell formed by meiosis |
| chromosomes | Long molecule made from DNA found in the nucleus of cells |
| gene | Part of a chromosome that codes for a protein - some characteristics are controlled by a single gene (e.g. fur colour in mice and red-green colour blindness in humans), but most are controlled by multiple genes interacting |
| allele | Different forms of the same gene |
| dominant | Allele that only needs one copy present to be expressed |
| recessive | Allele that needs two copies to present to be expressed |
| homozygous | When an individual carries two copies of the same allele for a trait |
| heterozygous | When an individual carries two alleles for a trait |
| genotype | Combination of alleles an individual has |
| phenotype | Physical expression of the genotype - the characteristic shown |

Genetic crosses

A genetic cross is when you consider the offspring that might result from two known parents. Punnett squares can be used to predict the outcome of a genetic cross, for both the genotypes the offspring might have and their phenotypes.

For example, the cross bb (brown fur) x BB (black fur) in mice:

| | | mother | |
|--------|---|--------|----|
| | | B | B |
| father | b | Bb | Bb |
| | b | Bb | Bb |

Offspring genotype: 100% Bb

Offspring phenotype: all black fur

Sex determination

Normal human body cells contain 23 pairs of chromosomes-one of these pairs determines the sex of the offspring. In human females the sex chromosomes are the same (XX) and in males there are different (XY).

A Punnett square can be used to determine the probability of offspring being male or female. The probability is always 50% in human as there are two XX and two XY outcomes.

| | | mother | |
|--------|---|--------|----|
| | | X | X |
| father | X | XX | XX |
| | Y | XY | XY |

Key terms

allele chromosomes clone DNA dominant double helix fertilisation gamete gene genetic cross genome genotype homozygous heterozygous meiosis mitosis phenotype Punnett square recessive

Inheritance

Knowledge Organiser

Variation in populations

Differences in the characteristics of individuals in a population are called variation.

Variation may be due to differences in:

- the genes they have inherited, for example eye colour (genetic causes)
- the environment in which they have developed, for example, language (environmental causes)
- a combination of genes and the environment.

Selective Breeding

Selective breeding (artificial selection) is the process by which humans breed plants and animals for particular genetic characteristics.

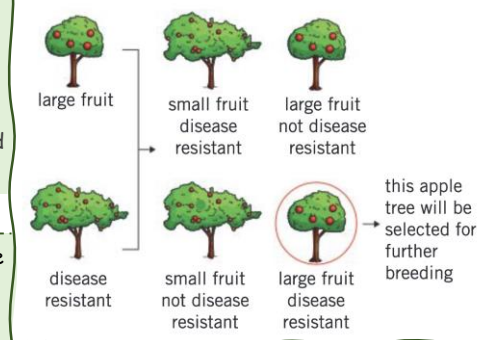
Humans have been using selective breeding for thousands of years, since breeding crops from wild plants and domesticating animals.

Process of selective breeding:

- choose parents with the desired characteristics from a mixed population
- breed them together
- choose offspring with the desired characteristic and breed them together
- continue over many generations until all offspring show the desired characteristic.

The characteristic targeted in selective breeding can be chosen for usefulness or appearance, for example

- disease resistance in food crops
- animals that produce more meat or milk
- domestic dogs with a gentle nature
- larger or unusual flowers.



Mutation

There is usually a lot of genetic variation within a population of species - this variation arises from mutations.

A mutation is a change in a DNA sequence:

- mutations occur continuously
- very rarely a mutation will lead to a new phenotype
- some mutations may change an existing phenotype and most have no effect if a phenotype is suited to an environmental change, it can lead to a relatively rapid change in the species - this is the theory of evolution by natural selection.

Disadvantages of selective breeding:

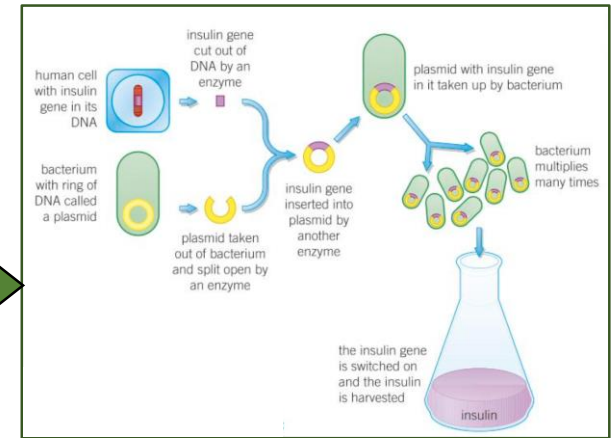
- can lead to inbreeding, where some breeds are particularly prone to inherited defects or diseases
- reduces variation, meaning all members of a species could be susceptible to certain diseases.

Genetic Engineering

Genetic engineering is a process that involves changing the genome of an organism by introducing a gene from another organism to produce a desired characteristic.

For example:

- Bacterial cells have been genetically engineered to produce useful substances, such as human insulin to treat diabetes.
- Plant crops have been genetically engineered to be resistant to diseases, insects, or herbicides, or to produce bigger and better fruits and higher crop yields. Crops that have undergone genetic engineering are called genetically modified (GM).



There are many benefits to genetic engineering in agriculture and medicine, but also some risks and moral objections.

| Benefits | Risks |
|--|--|
| <ul style="list-style-type: none"> Potential to overcome some inherited human diseases Can lead to higher value of crops as GM crops have bigger yields than normal Crops can be engineered to be resistant to herbicides, make their own pesticides, or be better adapted to environmental conditions. | <ul style="list-style-type: none"> Genes from GM plants and animals may spread to other wildlife, which could have devastating effects on ecosystems Potential negative impacts on populations of wild flowers and insects Ethical concerns, for example, in the future people could manipulate the genes of foetuses to ensure certain characteristics Some people believe the long-term effects on health of eating GM crops have not been fully explored. |

Key terms

genetically modified

genetic engineering

inbreeding

mutation

selective breeding

variation

Inheritance Knowledge Organiser

Theory of evolution

Evolution is the gradual change in the inherited characteristics of a population over time.

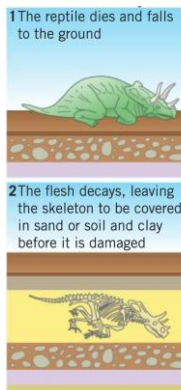
Evolution occurs through the process of natural selection and may result in the formation of new species.

Fossils

Fossils are the remains of organisms from millions of years ago, which are found in rocks.

Fossils can be formed from:

- Parts of the organism that do not decay because one or more of the conditions needed for decay are absent
- Hard parts of an organism (e.g. bones) when replaced by minerals
- Preservation of the traces of organisms (e.g. burrows, footprints, and rootlet traces).



Process of natural selection

The theory of evolution by natural selection states that:

- Organisms within species show a wide variation in phenotype
- Individuals with characteristics most suited to the environment are more likely to survive and breed successfully
- These characteristics are then passed on to their offspring.

Evidence for evolution

The theory of evolution by natural selection is now widely accepted because there are lots of data to support it, such as

- It has been shown that characteristics are passed on to offspring in genes
- Evidence from the fossil record
- The evolution of antibiotic resistance in bacteria

Benefits of the fossil record

- Can tell scientists how individual species have changed over time
- Fossils allow us to understand how life developed over the Earth's history
- Fossils can be used to track the movement of a species or its ancestors across the world

Problems with the fossil record

- Many early organisms were soft-bodied, so most decayed before producing fossils
- There are gaps in the fossil record as not all fossils have been found and others have been destroyed by geological or human activity - this means scientists cannot be certain about how life began on Earth.

Organisms are named by the binomial system of genus and species e.g. **Homo Sapiens**

Homo is our Genus
Sapiens is our Species

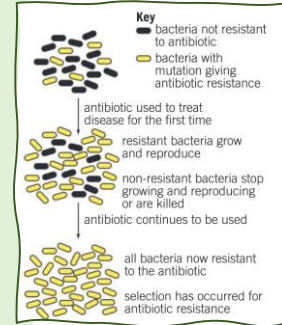
Resistant bacteria

Bacteria can evolve rapidly because they reproduce very quickly. This has led to many strains of bacteria developing antibiotic resistance, such as MRSA. The development of antibiotic resistance is evidence for the theory of evolution by natural selection.

The development of new antibiotics is expensive and slow, so is unlikely to keep up with the emergence of new antibiotic-resistant bacteria strains.

To reduce the rise of antibiotic-resistant strains

- doctors should only prescribe antibiotics for serious bacterial infections
- patients should complete their courses of antibiotics so all bacteria are killed and non survive to form resistant strains.
- the use of antibiotics in farming and agriculture should be restricted.



Classification of living organisms

Kingdom

Phylum

Class

Order

Family

Genus

Species

Carl Linnaeus developed a system to classify living things into groups, based upon observable characteristics.

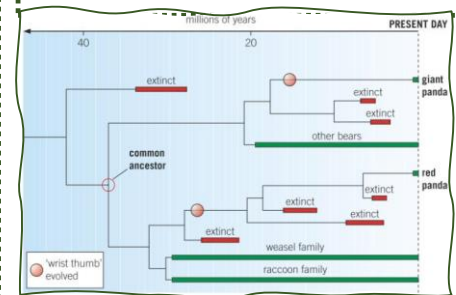
New models of classification were proposed as understanding of biochemical processes developed and improvements in microscopes led to discoveries of internal structures.

There is now a three-domain system developed by Carl Woese, dividing organisms into:

- Bacteria (true bacteria)
- Archea (primitive bacteria usually living in extreme conditions)
- Eukaryota (including protists, plants, fungi and animals).

Evolutionary Trees

Evolutionary trees use current classification data for living organisms and fossil data for extinct organisms to show how scientists believe organisms are related.



Extinction

Extinction is when there are no remaining individuals of a species still alive.

Factors that may contribute to a species' extinction include:

- new predators
- new diseases
- new competitors
- catastrophic events
- changes to the environment

Key terms

Antibiotic resistance binomial system evolution evolutionary tree extinction fossil record natural selection three-domain system

Quantitative Chemistry 01

Knowledge Organiser - Science - year 11



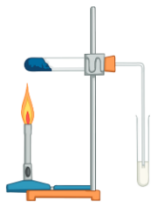
Conservation of mass

The conservation of mass states that atoms cannot be created or destroyed during a chemical reaction, so the mass of the reactants will equal the mass of the product. In other words, all the atoms you had in the reactants must be present in the products. For some reactions, the mass appears to **decrease**. This typically occurs when a gas is produced and lost to the surroundings. For other reactions, the mass appears to **increase**. This typically occurs when a gas is a reactant.

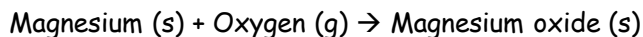
Decrease in mass



When sodium carbonate is thermally decomposed, carbon dioxide gas is produced and released into the surroundings.



Increase in mass



Oxygen from the air is added to the magnesium which will be heavier in mass.



Relative mass

The masses of atoms are compared by measuring them relative to atoms of carbon-12. You can work out the relative formula mass (M_r) of a compound by adding up the relative atomic masses (A_r) of the elements in it, in the ratio shown by its formula

Concentration

Concentration is the amount of solute in a volume of solvent. The more substance that is dissolved, then the more concentrated the solution is.

It is possible to calculate concentration using:

$$\text{Concentration} = \frac{\text{Mass}}{\text{Volume}}$$

With concentration measured in g/dm^3 , mass in g and volume in dm^3 .

Remember:

$$\text{Volume}(\text{dm}^3) = \frac{\text{Volume}(\text{cm}^3)}{1000}$$

Moles (HT)

The **Avogadro constant**, 6.02×10^{23} , is the number of molecules of a substance that make up one mole of that substance.

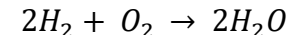
One mole of a substance has the same mass as the M_r of the substance. E.g. Oxygen (O_2) has an M_r of 32, so 1 mole of oxygen has a mass of 32g.

The number of moles can be determined using:

$$\text{Moles} = \frac{\text{Mass (g)}}{M_r}$$

Balanced equations (HT)

When writing symbol equations you need to ensure that the number of each atom on each side is equal.



There are 4 hydrogen and 2 oxygen atoms on each side.

You can deduce the balanced symbol equations from the masses (and hence the ratios of the numbers of moles) of substances involved in a chemical reaction. On the other hand, balanced symbol equations tell you the number of moles of substances, and thus the masses of reactants and products.

Excess and limiting reactants (HT)

In a chemical reaction between two or more reactants, often one reactant will run out before the others.

The reactant that is left over is in **excess**. The reactant that runs out is the **limiting reactant**.

Key terms

Avogadro constant
excess

balanced
limiting reactant

concentration
mass

conservation
mole

equation
ratio

formula mass
state



Quantitative Chemistry 02 - Separates only

Knowledge Organiser - Science - year 11

Titration

Titrations are used to experimentally determine the concentration of an unknown solution in a reaction.

Method

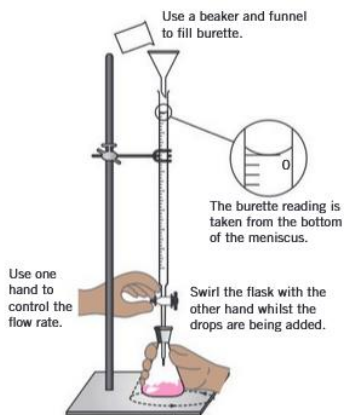
1. Measure 25 cm³ of sodium hydroxide solution into a conical flask.
2. Place flask on a white tile.
3. Clamp the burette vertically and close the burette tap.
4. Using a small funnel, fill the burette with sulfuric acid.
5. Put 5-10 drops of phenolphthalein indicator into the conical flask. Swirl the flask to ensure the indicator mixes with the sodium hydroxide.
6. Slowly open the burette tap so that the sulfuric acid slowly flows into the flask. Add acid drop by drop until you see a permanent colour change from pink to colourless in the flask. Close the burette tap.
7. Read the burette scale and record the volume of added acid.
8. Repeat steps 1-7 until you get 2 concordant titres. i.e are within 0.1 cm³ of each other.
9. Determine the mean:

$$\text{Mean} = \frac{\text{sum of the concordant results}}{\text{number of concordant results}}$$

To determine the concentration of the unknown:

1. Construct a balanced equation
2. Determine the number of moles from the known solution
3. Use the ratio from the equation to determine the moles of the unknown
4. Determine the concentration using:

$$\text{Concentration (mol/dm}^3\text{)} = \frac{\text{moles}}{\text{volume (dm}^3\text{)}}$$



Theoretical yield

The theoretical yield is the mass of a product that you expect to be produced. It is not always achievable because:

- Some product is lost when separated from reactant mixture
- Unexpected side reactions occur and produce other products
- The reaction may be reversible

The theoretical yield can be calculated as follows:

1. Balance the equation
2. Calculate moles of substance with known mass
3. Use the balanced equation to work out the ratio of moles.
4. Determine mass from mass = moles x Mr

Concentration in mol/dm³

Concentration can also be measured in mol/dm³.

$$\text{Concentration of solution (mol/dm}^3\text{)} = \frac{\text{number of moles of solute}}{\text{volume of solution (dm}^3\text{)}}$$

You can combine this formula with the moles equation to calculate the mass of solute dissolved in a solution.

Percentage yield

The percentage yield is the mass of a product that is actually produced.

Percentage yield can be calculated as follows:

$$\text{Percentage yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$

Atom economy

The atom economy gives an indication of the proportion of atoms that become part of the useful products.

The percentage atom economy is determined as follows:

$$\text{Atom economy} = \frac{M_r \text{ of useful products}}{M_r \text{ of all products}} \times 100$$

Moles of gas

At room temperature (25° C) and atmospheric pressure (1 atm), one mole of gas will occupy 24 dm³

To determine the number of moles of a gas:

$$\text{Moles of gas} = \frac{\text{volume of gas (dm}^3\text{)}}{24 \text{ dm}^3}$$

$$\text{Moles of gas} = \frac{\text{volume of gas (cm}^3\text{)}}{24000 \text{ cm}^3}$$

Key terms

Atom economy

room temperature and pressure

burette

concordant

theoretical yield

percentage yield

titration

pipette

titre

yield

useful



Using Resources 01

Knowledge Organiser

Earth's Resources

We use Earth's resources to provide us with warmth, fuel, shelter, food, and transport. These can be **natural** (timber, fuel) or **synthetic** resources made by scientists. When choosing resources, it is important to consider **sustainable development**.

Resources can also be categorised as **finite** or **renewable**. Finite resources such as fossil fuels will run out. Wood is a renewable resource, as trees can be grown to replace any that are cut down.

Water

| Type | What is in it? How is potable water made? |
|---------|--|
| Pure | Just water molecules. |
| Potable | Water molecules, low level of salts, safe levels of harmful microbes |
| Salty | Water molecules, high levels of salts, high levels of harmful microbes. Desalination is the process to turn salt water into potable water, either through distillation or reverse osmosis . |
| Fresh | Water molecules, low level of salts, often high levels of harmful microbes. To produce potable water, fresh water is passed through filters to remove larger objects before being sterilised to kill microbes with ozone, chlorine or UV light. |

Metal extraction (HT)

Metals can be extracted from their ores by reduction or electrolysis. **Phytomining** and **bioleaching** are two alternative methods to extract from low grade ores.

Phytomining: Grow plants near ore → burn plants → collect ash containing metal compound → process ash by electrolysis or displacement

Bioleaching: Grow plants near ore → bacteria produce leachate containing metal compound → process leachate by electrolysis or displacement

Key terms

Aerobic
Screening

Anaerobic
Sedimentation

Distillation
Sewage

Finite
Sustainable development

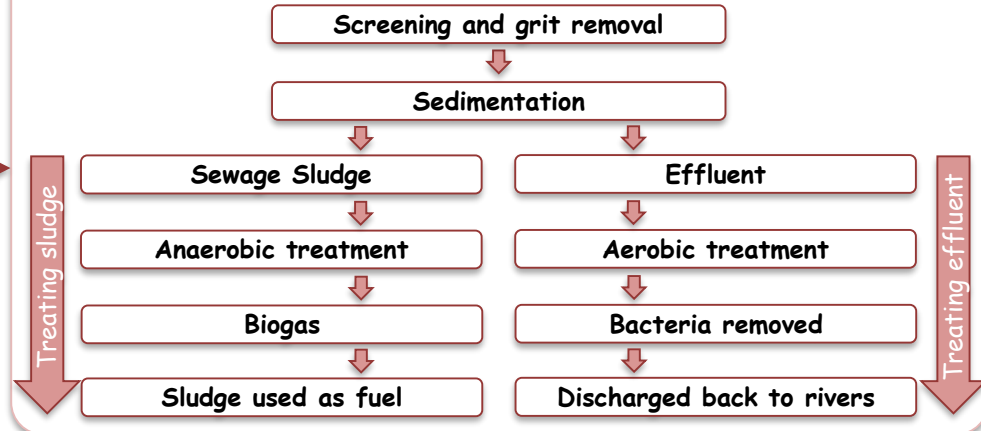
Potable
Renewable
LCA

Reverse osmosis
Phytomining

Effluent
Bioleaching

Waste water treatment

Human activities produce lots of waste water as **sewage**, agricultural and industrial waste



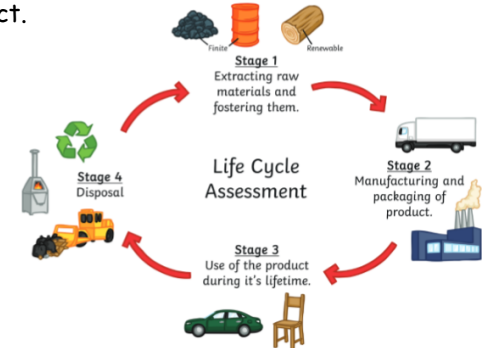
Recycling

Many materials are made from **natural resources** that have **limited supplies**. When finished with a product, it can be: added to landfill, incinerated, reused or recycled. Items can be **reused** (used again for a similar purpose) or **recycled** (conserves resources and requires less energy than creating new materials).



LCAs

A **Life cycle assessment (LCA)** is a way of looking at the whole life of a product and assessing its impact on the environment. It is broken down into four categories. Some parts are objective - the amount of water used or waste produced, whilst others are judgements - such as the polluting effect.



Using Resources 02 - Separates only

Knowledge Organiser

Corrosion

Corrosion occurs when materials react with other substances within the environment and wear away. **Rusting** is an example of corrosion, caused when iron reacts with oxygen and water.

Corrosion can be **prevented** using either **physical barriers** such as paint or grease, or through electroplating. **Sacrificial protection** is where a more reactive substance is introduced. This will react with the environment rather than the main material.

Alloys

| Alloy | Properties | Uses |
|----------------------------|--------------------------------------|---|
| Bronze - Cu/Sn | Resistant to corrosion | Statues, decorative items |
| Brass - Cu/Zn | Hard | Musical instruments, ornaments, home fittings |
| Stainless steel - Fe/Cr/Ni | Both resistant to corrosion and hard | Cutlery, pipes |

Ceramics

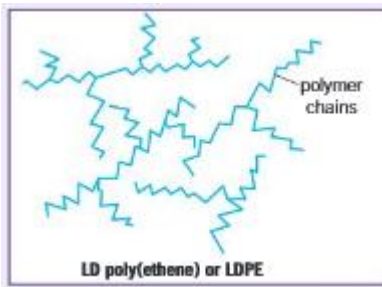
| Ceramic | Properties | Uses |
|--------------------|--|-----------------------------|
| Clay | Hard, brittle, resistant to corrosion, easy to shape | Pots, plumbing, crockery |
| Borosilicate glass | High melting point | Oven and lab glassware |
| Soda-lime glass | Transparent | Glass objects used everyday |

Polymers

There are many types of polymers. The properties depend on their monomer composition and the processing conditions.

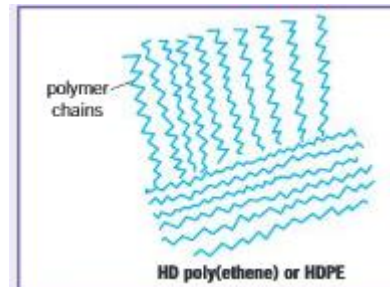
Low density poly(ethene)

These are formed from the addition polymerisation of ethene under high pressure. The polymer chains have many branches and prevent the polymers from packing, causing the low density.



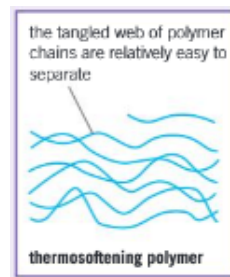
High density poly(ethene)

These are formed from the addition polymerisation of ethene utilising a catalyst at 50°C. The straight polymer chains pack together, causing the high density.



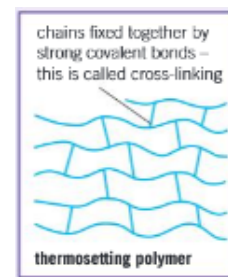
Thermosoftening polymers

The chains are not linked together, and soften when heat is applied.



Thermosetting polymers

The chains have strong links and do not soften/melt when heated.



Key terms

Alloy
reinforce

ceramic
rusting

composite
thermosetting

corrosion

galvanise
thermosoftening

matrix
polymer



Using Resources 03 - Separates only

Knowledge Organiser

Haber process

The **Haber Process** is used to produce ammonia which is a key component from the production of fertilisers.



The reaction is reversible

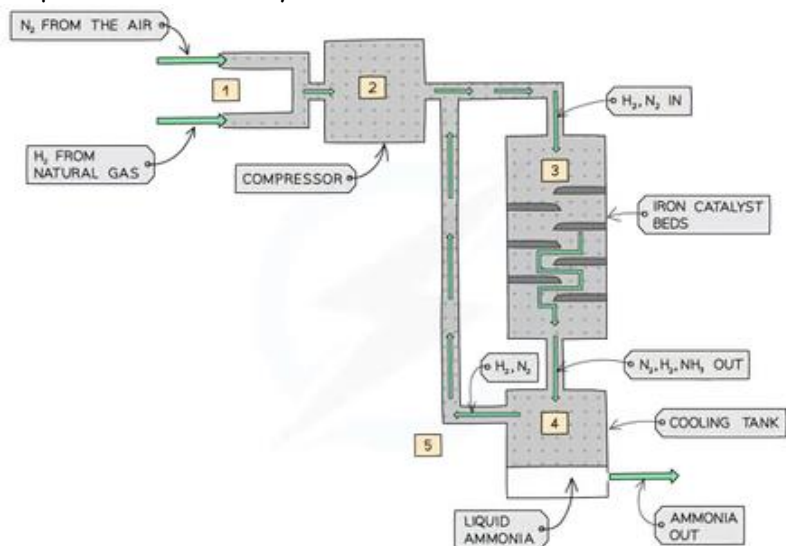
Stage 1: H₂ and N₂ gases are pumped into the compressor through pipes.

Stage 2: The gases are compressed to ~ atm.

Stage 3: The gases are pumped into a tank containing catalytic iron beads at 450 ° C. Some of the hydrogen and nitrogen react to form ammonia in the reversible reaction stated above.

Stage 4: Any unreacted hydrogen and nitrogen, alongside any ammonia pass into a cooling tank. The ammonia is liquified and extracted.

Stage 5: The unreacted hydrogen and nitrogen are recycled and pumped back into the system.



Conditions

The conditions used for the Haber process are deemed a compromise, balancing cost, yield and rate of reaction.

| Temperature | Pressure | Catalyst |
|---|---|--|
| Temperature of ~450°C The forward reaction is exothermic, hence a lower temperature would be favoured to increase the yield of ammonia, however the rate of reaction would be very slow. | Pressure of ~200 atm There are less product gas molecules than reactants, hence a higher pressure would be favoured to increase the yield and the rate of reaction, however it is expensive to stabilise high pressures. | An iron catalyst Catalysts have no impact on the yield of ammonia, however they will increase the rate of the forward reaction. Iron is a n effective catalyst for the Haber process. |

Fertilisers

Fertilisers are produced to increase the amount of food obtained from crop. NPK fertilisers are formulations consisting of nitrogen, phosphorus and potassium.

| | Laboratory | Industrial |
|------------------------|---|--|
| Equipment | Simple glassware needed | Large expensive and complex |
| Reactant concentration | Low concentration - less heat given off | High concentration - lots of heat given off. Highly exothermic. |
| Separation of product | Crystallisation - very slow process | Heat given off is used to evaporate water from the reactant mixture to produce concentrated ammonia nitrate. |

Key terms

Haber process

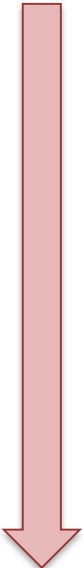
NPK fertiliser



Chemical Reactions 2

Knowledge Organiser Science - year 11

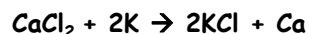
Reactivity series

| Reaction with water | Reaction with acid | Reactivity series | | Extraction method |
|--------------------------------|------------------------------|--------------------|---|--------------------------|
| | | Metal | Reactivity | |
| Fizzes, gives off hydrogen gas | Explodes | Potassium |  High reactivity | Electrolysis |
| | | Sodium | | |
| | | Lithium | | |
| Fizzes, gives off hydrogen gas | | Calcium | | |
| | | Magnesium | | |
| | | Aluminium (carbon) | | |
| | | Zinc | | |
| | | Iron | | |
| Reacts very slowly | | Tin | | Low reactivity |
| | | Lead (hydrogen) | | |
| | | Copper | | |
| | | Silver | | |
| No reaction | Reacts slowly with warm acid | Gold | | Mined from Earth's crust |
| | | | | |
| | | | | |

Displacement reactions

In a **displacement reaction**, the **more** reactive element takes the place of the **less** reactive element.

For example, **Potassium is more reactive than calcium**, so potassium displaces the calcium in calcium chloride



Key terms

Acid alkali base crystallisation displacement metal neutralisation ore oxidation pH reactivity

Acids and alkalis

Acids are compounds that release H^+ ions when in an aqueous form. The three acids are sulfuric acid, nitric acid and hydrochloric acid. They have a pH below 7.

Alkalis are compounds that release OH^- when in aqueous form. They have a pH above 7.

Neutral solutions have a pH of 7.

The pH scale is a measure of how acidic or alkaline a substance is. It is a scale from 1 to 14.

Indicators, such as **universal indicator** or a **pH probe** can be used to determine the pH of a solution.

When an acid and alkali react, **neutralisation can occur**.



Reactions of acids

Reactions of acids with metals

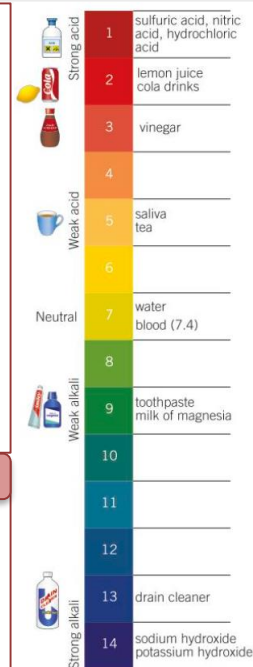
Acids react with **metals** to form metal salts and **hydrogen gas**

Reaction of acids with metal oxides and hydroxides

Acids react with **metal hydroxides/oxides** to form metal salts and **water**

Reaction of acids with metal carbonates

Acids react with **metal carbonates** to form metal salts, **water** and **carbon dioxide**



Salts

Hydrochloric acid forms a **chloride salt** e.g. Sodium chloride (NaCl)

Sulfuric acid forms a **sulfate salt** e.g. Sodium sulfate (Na_2SO_4)

Nitric acid forms a **nitrate salt** e.g. sodium nitrate (NaNO_3)

Metal extraction

Metals that are **more reactive** than carbon are extracted using a process called **electrolysis**.

Metals that are **less reactive** than carbon are extracted by reduction with carbon

Metals that are **unreactive** are found as pure metals and are mined from the Earth's crust.

Homeostasis and the nervous system

Knowledge Organiser

Homeostasis

Homeostasis is the regulation of internal conditions (of a cell or whole organism) in response to internal and external changes, to maintain optimum conditions for functioning.

This maintains optimum conditions for all cell functions and enzyme action.

In the human body, this includes control of

- blood glucose concentration
- body temperature
- water levels

The automatic control systems of homeostasis may involve nervous responses or chemical responses.

All control systems involve

- Receptor cells, which detect stimuli (changes in the environment)
- **Coordination centres** (such as the brain, spinal cord, or pancreas), which receive and process information from receptors
- Effectors (muscles or glands), which produce responses to restore optimum conditions.

The nervous system

Function

The nervous system enables humans to react to their surroundings and to coordinate their behaviour - this includes both voluntary and involuntary actions.

Structure

The nervous system is made up of the **central nervous system (CNS)** and a network of nerves. The CNS comprises the **brain** and the **spinal cord**.

Stimulus

A change in the environment (stimulus) is detected by receptors

Receptor

Information from receptors passes along cells (neurons) to the CNS as electrical impulses

Coordinator

The CNS coordinates the body's response to the stimulus

Effector

Effectors bring about a response, such as glands secreting hormones or muscles contracting

Response

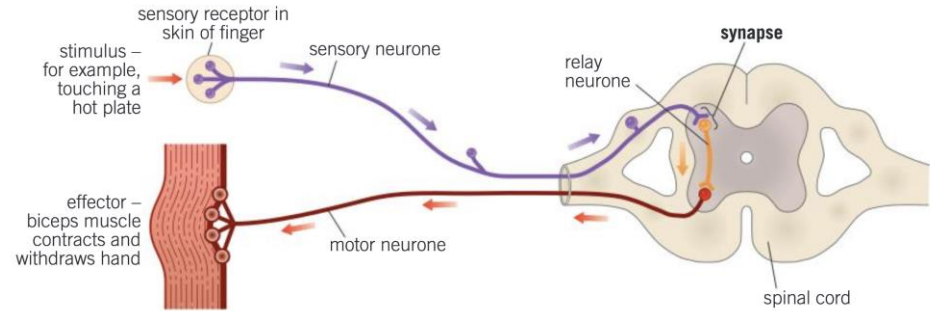
The body responds to the stimulus

Key terms

brain central nervous system coordination centre effectors homeostasis involuntary neurones receptors reflex action spinal cord stimulus synapse

Reflex arcs

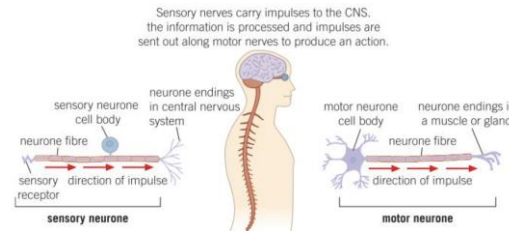
Reflex actions of the nervous system are automatic and rapid - they do not involve the conscious part of the brain. Reflex actions are important for survival because they help prevent damage to the body.



Reflex arc structures

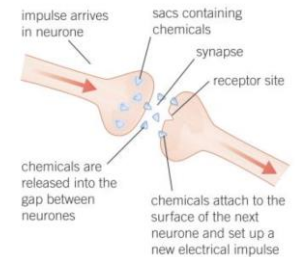
Neurons

Carry electrical impulses around the body - relay neurones connect sensory neurones to motor neurones



Synapses

Gaps between neurones, which allow electrical impulses in the nervous system to cross between neurones.



Factors affecting reaction time

- Tiredness
- Distractions
- Caffeine
- Alcohol

Hormonal Control

Knowledge Organiser

Human endocrine system

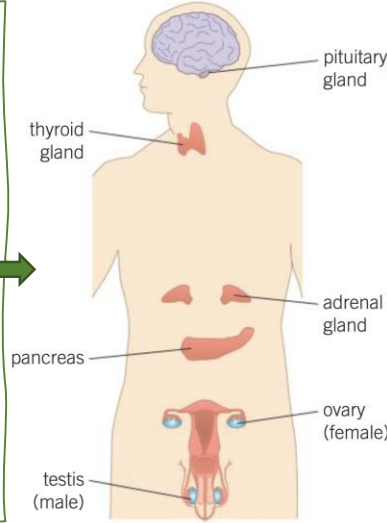
The **endocrine system** is composed of glands that secrete chemicals called **hormones** into the bloodstream.

The blood carries hormones to a target organ, where an effect is produced.

Compared to the nervous system, the effects caused by the endocrine system are slower but act for longer.

The **pituitary gland**, located in the brain, is known as a 'master gland', because it secretes several hormones into the blood.

These hormones then act on other glands to stimulate the release of other hormones, and bring about effects.

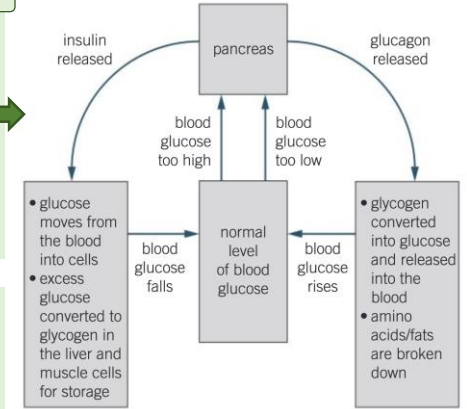


| Endocrine gland | Role of the hormone |
|-----------------|--|
| Pituitary | <ul style="list-style-type: none"> Controls growth in children Stimulates the thyroid gland to make thyroxine to control metabolic rate In females - stimulates the ovaries to make and release eggs In males - stimulate the testes to make sperm |
| Thyroid | <ul style="list-style-type: none"> Controls the rate of metabolism |
| Pancreas | <ul style="list-style-type: none"> Controls blood glucose levels |
| Adrenal | <ul style="list-style-type: none"> Prepares the body for stress Involved in the 'fight or flight' response |
| Ovaries | <ul style="list-style-type: none"> Controls the development of female secondary sexual characteristics Controls the menstrual cycle |
| Testes | <ul style="list-style-type: none"> Controls the development of male secondary sexual characteristics Involved in the production of sperm |

Control of blood glucose levels

Blood glucose (sugar) concentration is monitored and controlled by the **pancreas**.

This is an example of **negative feedback control**, as the pancreas switches production between the hormones **insulin** and **glucagon** to control blood glucose levels.



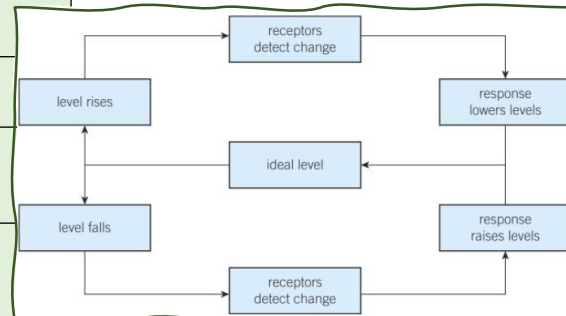
Diabetes

Diabetes is a non-communicable disease where the body either cannot produce or respond to insulin, leading to uncontrolled blood glucose concentrations.

| Type 1 diabetes | Type 2 diabetes |
|---|--|
| Early onset | Usually later onset, obesity is a risk factor |
| Pancreas stops producing sufficient insulin | Body doesn't respond to the insulin produced |
| Commonly treated through insulin injections, also diet control and exercise | Commonly treated through a carbohydrate controlled diet and exercise |

Negative feedback - HT Only

Negative feedback systems work to maintain a steady state. For example, blood glucose, water, and **thyroxine** levels are all controlled in the body by negative feedback.



Adrenaline

- produced by **adrenal glands** in time of fear or stress
- Increases heart rate
- Boosts delivery of oxygen and glucose to brain and muscles
- Prepares the body for 'fight or flight' response
- Does not involve negative feedback, as adrenal glands stop producing **adrenaline**

Thyroxine

- Produced by the **thyroid gland**
- Regulates how quickly your body uses energy and makes proteins (**metabolic rate**)
- Important for growth and development
- Levels controlled by **negative feedback**

Key terms

brain central nervous system coordination centre effectors homeostasis involuntary neurones receptors reflex action spinal cord stimulus synapse

Hormonal Control

Knowledge Organiser

Hormones in human reproduction

During puberty, reproductive hormones cause the secondary sex characteristics to develop:

Oestrogen

- Main female reproductive hormone
- Produced in the **ovary**
- At puberty, eggs begin to mature and one is released every 28 days

Testosterone

- Main male reproductive hormone
- Produced by the **testes**
- Stimulates sperm production

Several hormones are involved in the **menstrual cycle**. Their functions are given in the table, and their levels vary as shown in the figures

| Hormone | Released by | Function |
|---|-----------------|----------|
| Follicle stimulating hormone (FSH) | Pituitary gland | |
| Luteinising hormone (LH) | Pituitary gland | |
| Oestrogen | ovaries | |
| Progesterone | ovaries | |

Higher Tier Only: Treating infertility with hormones

Hormones are used in modern reproductive technologies to treating infertility.

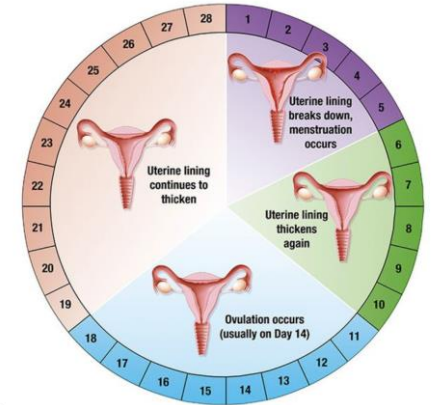
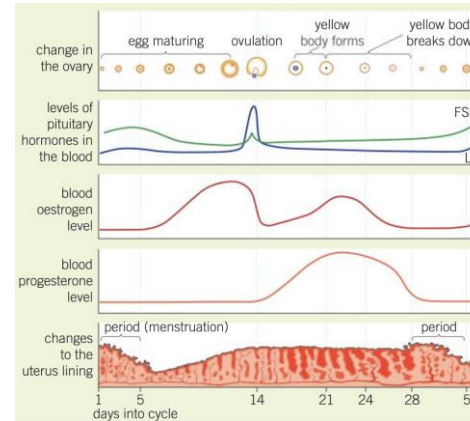
FSH and LH can be given as a drug to treat infertility, or in vitro fertilisation (IVF) treatment may be used.

IVF treatment

1. Mother given FSH and LH to stimulate the maturation of several eggs
2. Eggs collected from the mother and fertilised by sperm from the father in a laboratory
3. Fertilised eggs develop into embryos
4. One or two embryos are inserted into the mother's uterus (womb) when the embryos are still tiny balls of cells.

Fertility treatment has some disadvantages:

- It is emotionally and physically stressful
- It has a low success rate
- It can lead to multiple births, which are a high risk to both the babies and the mother.



Contraception

Fertility can be controlled by a variety of hormonal and non-hormonal methods of contraception.

Hormonal contraception

- Oral contraceptives - contain hormones to inhibit FSH production so no eggs mature
- Injection, implant, skin patch or intrauterine device (IUD) - slowly release progesterone to inhibit maturation and release of eggs; can last months or years

Non-hormonal contraception

- Barrier methods, for example, condoms and diaphragms - prevent sperm reaching the egg
- Copper IUD - prevents the implantation of an embryo
- Surgical methods of male and female sterilisation
- Spermicidal agents - kill or disable sperm
- Abstaining from intercourse when an egg may be in the oviduct

Key terms

contraception follicle stimulating hormone infertility in vitro fertilisation oestrogen ovary luteinising hormone menstrual cycle ovulation progesterone testes uterus



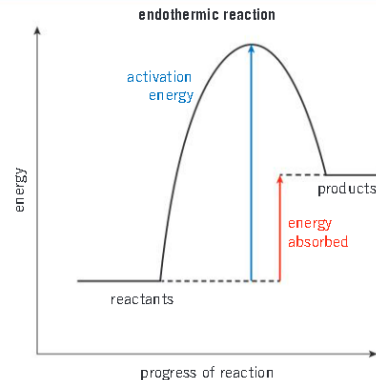
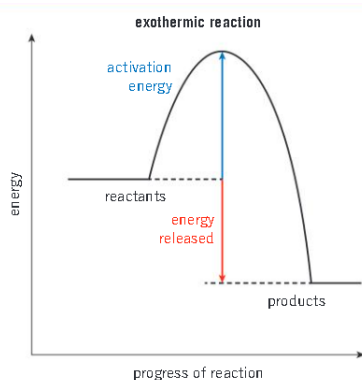
Chemical Changes

Knowledge Organiser - Science - year 11

Energy changes

During a chemical reaction, **energy** is transferred either:

- to the surroundings - **exothermic** - temperature of the surroundings **increases**
- from the surroundings - **endothermic** - temperature of the surroundings **decreases**



Bond energies

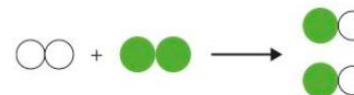
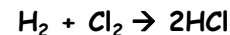
Chemical bonds occur between atoms. In order for a chemical reaction to occur, bonds are broken before new ones are made between different atoms.

- Breaking bonds - **endothermic** - energy is taken in
- Making bonds - **exothermic** - energy is released

Bond energy example calculation

Bond energy values can be used to predict whether a chemical reaction will be exothermic or endothermic.

Taking the following reaction as an example:



| Bond type | Bond energy (kJ/mol) |
|-----------|----------------------|
| H-H | 436 |
| Cl-Cl | 243 |
| H-Cl | 432 |

Overall energy transferred = energy required to break bonds - energy released when making bonds

The energy required to break bonds in H₂ and Cl₂ is 436 + 243 = 679 kJ/mol

The energy released on making bonds in HCl is (2 × 432) = 864 kJ/mol

Overall energy transferred = 679 - 864 = -185 kJ/mol → exothermic

Summary

| Reaction | Energy transfer | Temperature changes | Examples | Everyday uses | Bonds |
|-------------|-----------------------|--------------------------------------|--|--|--|
| Exothermic | To the surroundings | Increase of surroundings temperature | Combustion Neutralisation | Hand warmers | More energy released, than needed for bonds to break |
| Endothermic | From the surroundings | Decrease of surroundings temperature | Thermal decomposition Melting and boiling | Sports injury packs Freezing and condensing | Less energy released, than needed for bonds to break |

Key terms

activation energy bond energy endothermic exothermic reaction profile bond making bond breaking

Organic Chemistry 01

Knowledge Organiser

Crude oil

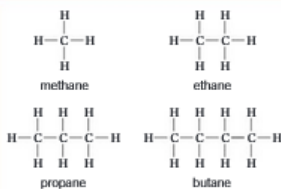
Crude oil formed from the remains of plants and animals millions of years ago. Crude oil is a mixture of **hydrocarbons** (molecules made of only carbon and hydrogen) of different sizes. As a raw product, crude oil is not particularly useful.

The properties of **hydrocarbons** depend heavily on the length of the molecule.

| Chain length | Flammability | Boiling point | Viscosity |
|--------------|--------------|---------------|-----------|
| Long chains | Low | High | High |
| Short chains | High | Low | low |

Alkanes

Alkanes are a family of hydrocarbons that have only single bonds. They are described as saturated. The general formula is C_nH_{2n+2} . The first four alkanes are:



Alkenes

Alkenes are also a family of hydrocarbons that have a double bond functional group between 2 carbon atoms. The general formula is C_nH_{2n} . Alkenes are used as fuels and to produce polymers.

Alkenes are more reactive than alkanes. They react with hydrogen, with the use of a nickel catalyst to form alkanes, with water (steam) under high temperatures and pressures to form alcohols and with halogens at room temperature to form haloalkanes.

Combustion

Hydrocarbons are used as fuels. When they react with oxygen, during the process of **combustion** they release a lot of energy.

Complete: Hydrocarbon + oxygen \rightarrow carbon dioxide + water

Incomplete: Hydrocarbon + oxygen \rightarrow carbon + carbon monoxide + water

Cracking

Not all **hydrocarbons** are useful. Longer chain hydrocarbons tend to be less useful than those shorter chains. A process called cracking is used to break up the longer hydrocarbons, to produce shorter **alkanes** and **alkenes**.

The two cracking techniques are:

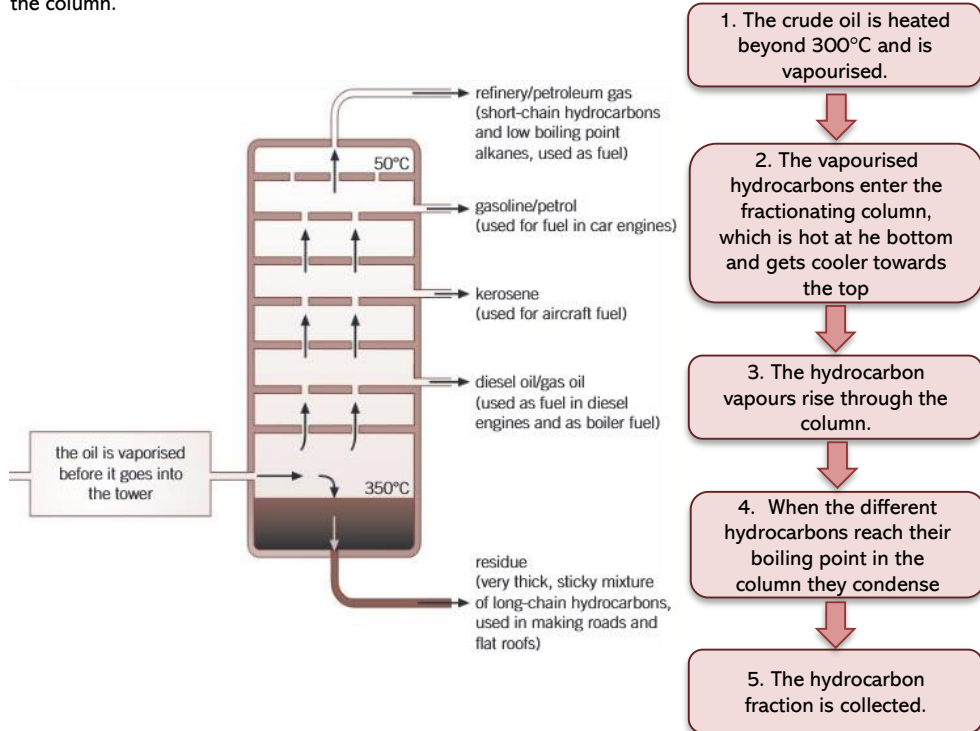
- Catalytic cracking** - hydrocarbons are heated to become a gas before being passed over a hot ceramic catalyst
- Steam cracking** - hydrocarbons are mixed with steam at very high temperatures to break the longer chains.

Fractional distillation

Crude oil can be separated into **fractions** based on the different boiling points of different length hydrocarbons through a process called **fractional distillation**.

Each **fraction** contains molecules of a similar number of carbon atoms.

To carry this process out a **fractionating column** is used, with a increasing temperature gradient moving up the column.



Products of fractional distillation

There are many useful products resulting from the separation of crude oil during fractional distillation

| Fuels | Raw materials | Other useful products |
|--|--|---|
| Petrol, diesel, kerosene, heavy fuel oil and petroleum gases | Fractions can be used as the raw materials for other processes | Solvents, lubricants, polymers and surfactants (detergents) |

Key terms

Alkanes
flammability

alkenes
boiling point
fractional distillation

combustion
fuel

cracking
hydrocarbon

crude oil
viscosity

raw products
volatility



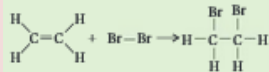
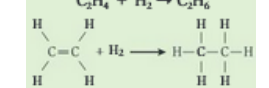
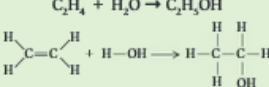
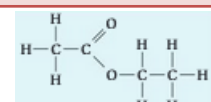
Organic reactions and Polymers 02 (SEPARATES ONLY)

Knowledge Organiser

Organic Reactions

There are numerous families of carbon based compounds. Each family is a homologous series, which has similar properties and reactions. Each homologous series is defined by the functional groups present.

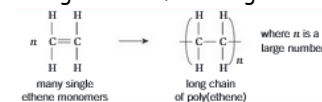
Alkenes, alcohols, carboxylic acids and esters

| Homologous series | Function -al group | Formation | Uses | Combustion | Reactions |
|-------------------|--------------------|---|--|--|--|
| Alkenes | C=C | Catalytic cracking or steam cracking | Formation of polymers Raw materials | Complete → carbon dioxide and water. Incomplete → carbon, carbon monoxide and water | Halogens: At room temperature, two halogen atoms are added across the double bond to form a haloalkane. $C_2H_4 + Br_2 \rightarrow C_2H_4Br_2$  |
| | | | | | Hydrogen: With a nickel catalyst, two hydrogen atoms are added across the double bond to form an alkane. $C_2H_4 + H_2 \rightarrow C_2H_6$  |
| | | | | | Water: Under high temperature and pressure, steam is added across the double bond to form an alcohol. $C_2H_4 + H_2O \rightarrow C_2H_5OH$  |
| Alcohols | -OH | Reaction of alkene and steam. Ethanol can be formed by fermentation | Ethanol - alcoholic drinks, biofuels Others - raw products and solvents | Complete → carbon dioxide and water | Sodium: Alcohols react with sodium to release hydrogen, similar to when alkali metals are added to water. The product is an alkoxide, which if added to water forms a strongly alkaline solution. |
| | | | | | Oxidation: Primary alcohols react with oxidising agents such as potassium dichromate (IV) to form carboxylic acids. |
| Carboxylic acids | -COOH | Oxidation of alcohols with potassium dichromate (IV) in the presence of dilute H ₂ SO ₄ | Food additives - vinegar, citric acid and malic acid | Not typically used as a fuel. | Bases/alkalis: Carboxylic acids react similarly to other acids |
| | | | | | Sodium carbonate: Formation of salts. For example carboxylic acids + metal carbonate → salt + carbon dioxide + water |
| | | | | | Alcohols: Carboxylic acids react with alcohols to make water and esters . For example, ethanol + ethanoic acid → ethyl ethanoate + water  |

Polymers

Polymers are long molecules made up of small repeating **monomers**. They are formed during **polymerisation**.

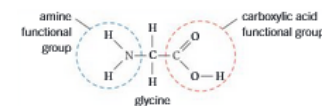
Addition polymerisation reacts small alkene monomers together to form large molecules.



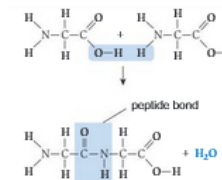
Condensation polymerisation involves monomers with **two** functional groups, such as diols or dicarboxylic acids. When these react they lose a small molecules such as water, and as such are called condensation reactions



Amino acids have **two** different functional groups - **amine** and **carboxylic acid** groups.



They react by condensation reactions to produce polypeptides. When lots of polypeptides come together they form proteins.



DNA (Deoxyribonucleic acid) is a large molecule which encodes genetic instructions for the development of living organisms. DNA is made of two long polymers that wind around each other in a double helix. The polymers are made of four different monomers called **nucleotides**. Other naturally occurring polymers important for life include **starch** and **cellulose**, which are made from **glucose** molecules joined together.

Key terms

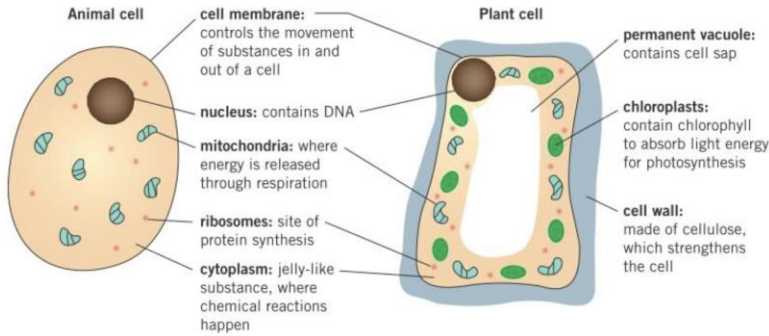
Addition alcohol alkene alkoxide amine amino acid carboxylic acid DNA ester fermentation
functional group homologous series monomer oxidation oxidising agent polymer polymerisation

Cells and Organisation 2A

Knowledge Organiser

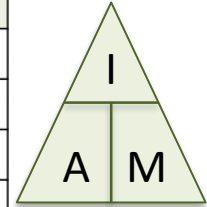
Animal and Plant Cells

Animal and plant cells are eukaryotic cells. They have genetic material (DNA) that forms chromosomes and is contained within a nucleus.



Microscopes

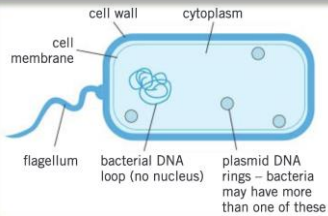
| Light microscope | Electron microscope |
|-----------------------------|---|
| Uses light to form images | Uses a beam of electrons to form images |
| Living samples can be views | Samples cannot be living |
| Relatively cheap | expensive |
| Low magnification | High magnification |
| Low resolution | High resolution |



Specialised cells

| Specialised cell | Function | Adaptations |
|------------------|---|--|
| sperm cell | Fertilise an ovum (egg) | <ul style="list-style-type: none"> - Tail to swim to the ovum and fertilise it - Lots of mitochondria to release energy from respiration, enabling the sperm to swim to the ovum |
| red blood cell | Transport oxygen around the body | <ul style="list-style-type: none"> - No nucleus so more room to carry oxygen - Contain a red pigment called hemoglobin that binds to oxygen molecules - Flat bi-concaved disc shape to increase surface area-to-volume ratio |
| muscle cell | Contract and relax to allow movement | <ul style="list-style-type: none"> - Contains protein fibres, which can contract to make the cells shorter - Contains lots of mitochondria to release energy from respiration, allowing the muscles to contract |
| nerve cell | Carry electrical impulses around the body | <ul style="list-style-type: none"> - Branched endings, called dendrites, to make connections with other neurones or effectors - Myelin sheath insulates the axon to increase the transmission speed of the electrical impulses. |
| root hair cell | Absorb mineral ions and water from the soil | <ul style="list-style-type: none"> - Long projection speeds up the absorption of water and mineral ions by increasing the surface area of the cell - Lots of mitochondria to release energy for the active transport of mineral ions from the soil |
| palisade cell | Enable photosynthesis in the leaf | <ul style="list-style-type: none"> - Lots of chloroplasts containing chlorophyll to absorb light energy - Located at the top surface of the leaf where it can absorb the most light energy |

Bacterial cells



Bacteria have the following characteristics:

- Single-celled
- No nucleus - have a single loop of DNA
- Have small rings of DNA called plasmids
- Smaller than eukaryotic cells

Comparing sub-cellular structures

| Structure | Animal | Plant | Bacteria |
|-----------------------|--------|-------|----------|
| cell membrane | / | / | / |
| cytoplasm | / | / | / |
| nucleus | / | / | - |
| cell wall | - | / | / |
| chloroplasts | - | / | - |
| permanent vacuole | - | / | - |
| DNA free in cytoplasm | - | - | / |
| plasmids | - | - | / |

Key terms

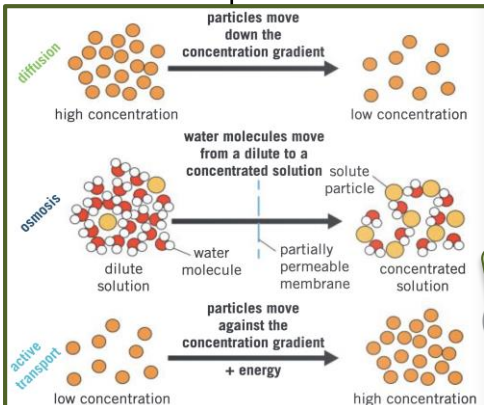
chloroplast chromosome cytoplasm
eukaryotic prokaryotic resolution ribosome



Cells and Organisation 2A

Knowledge Organiser

| | Diffusion | Osmosis | Active Transport |
|-----------------------|--|---|--|
| Definition | The spreading out of particles, resulting in a net movement from an area of higher concentration to an area of lower concentration. | The diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane. | The movement of particles from a more dilute solution to a more concentrated solution using energy from respiration. |
| Movement of particles | Particles move down the concentration gradient - from an area of high concentration to an area of low concentration. | Water moves from an area of lower solute concentration to an area of higher solute concentration. | Particles move against the concentration gradient - from an area of low concentration to an area of high concentration. |
| Energy required? | No - passive process | No - passive process | Yes - using energy released during respiration |
| Examples | <p>Humans:</p> <ul style="list-style-type: none"> Nutrients in the small intestine diffuse into the blood in the capillaries through the villi. Oxygen diffuses from the air in alveoli into the blood in the capillaries. Carbon dioxide diffuses from the blood in the capillaries into the air in the alveoli. Urea diffuses from cells into the blood for excretion by the kidney. <p>Fish:</p> <ul style="list-style-type: none"> Oxygen from water passing over the gills diffuses into the blood in the gill filaments. Carbon dioxide diffuses from the blood in the gill filaments into the water. <p>Plants:</p> <ul style="list-style-type: none"> Carbon dioxide used for photosynthesis diffuses into leaves through the stomata. Oxygen produced during photosynthesis diffuses out of the leaves through the stomata | <p>Plants:</p> <p>Water moves osmosis from a dilute solution in the soil to a concentrated solution in the root hair cell.</p> <p>Plants:</p> <p>Active transport is used to absorb mineral ions into the root hair cells from more dilute solutions in the soil.</p> | <p>Humans:</p> <p>Active transport allows sugar molecule to be absorbed from the small intestine when the sugar concentration is higher in the blood than in the small intestine.</p> <p>Plants:</p> <p>Active transport is used to absorb mineral ions into the root hair cells from more dilute solutions in the soil.</p> |



Factors that affect the rate of diffusion

1) Difference in concentration

The steeper the concentration gradient the faster the rate of diffusion.

2) Temperature

The higher the temperature, the faster the rate of diffusion.

3) Surface area of the membrane

The larger the membrane surface area the faster the rate of diffusion.

Adaptations for exchanging substances

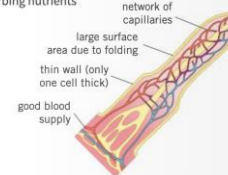
Single-celled organisms have a large surface area-to-volume ratio. This allows enough molecules to move across their cell membranes to meet their needs.

Multicellular organisms have a small surface area-to-volume ratio. This means they need specialized organs systems and cells to be transported into and out of their cells.

Exchange surfaces work most efficiently when they have a large surface area, a thin membrane, and a good blood supply.

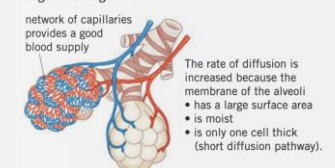
Villi in the small intestine

for absorbing nutrients



Alveoli in the lungs

for gas exchange

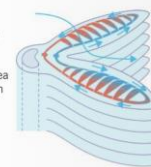


Fish gills

for gas exchange

Fish gills are made up of stacks of thin filaments with

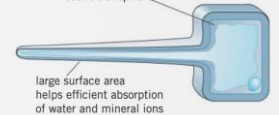
- a large surface area to increase diffusion
- a network of capillaries (good blood supply).



Root hair cells

for uptake of water and minerals

lots of mitochondria to take in mineral ions by active transport



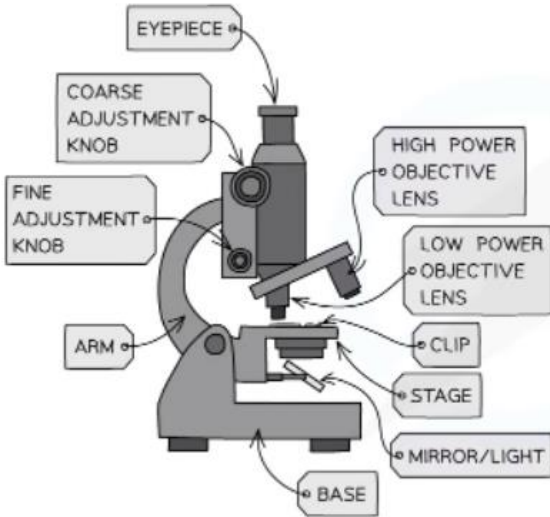
Key terms

concentration gradient partially permeable membrane diffusion active transport passive process stomata urea villi capillaries alveoli dilute

Using a microscope

Knowledge Organiser

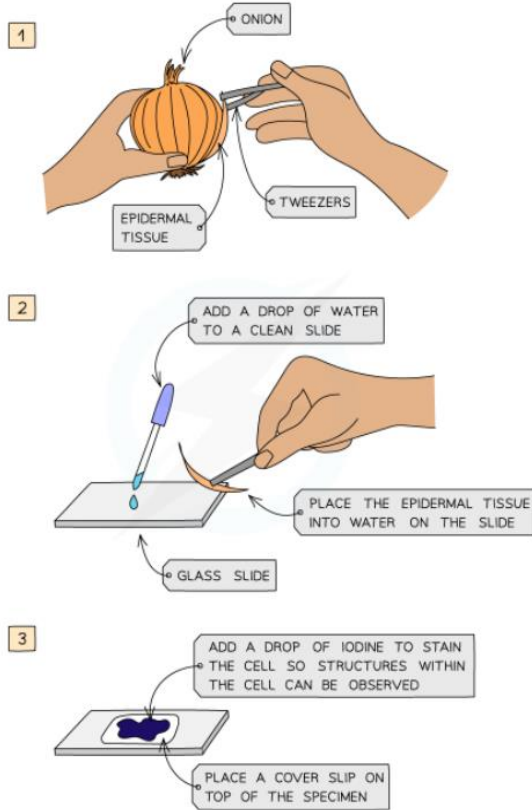
Parts of a microscope



Using a microscope

1. Clip slide onto the stage
2. Ensure the lowest powered objective lens is over the slide.
3. Use the coarse adjustment knob to bring the stage up just below the lens.
4. Look down the eye piece and gradually move the stage downwards using the coarse adjustment knob. Stop when the image is roughly in focus.
5. To bring the image into focus adjust the fine adjustment knob until a clear image is obtained.
6. To observe the image with a higher magnification, change the objective lens to a higher power and readjust the stage using the coarse and fine adjustment knobs.

Making an onion slide



Conversions

To convert micrometres into millimetres you should divide the measurement by 1000.

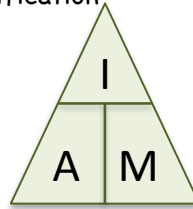
To convert millimetres into micrometres you should multiply the measurement by 1000.

Calculations

magnification = image size / actual size

actual size = image size / magnification

image size = actual size x magnification



total magnification = eye piece x objective

Microscopes

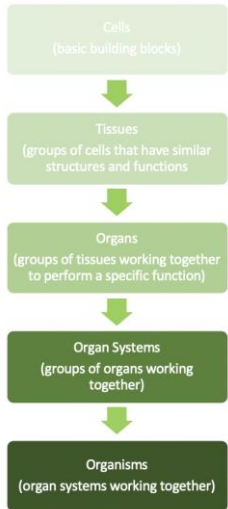
| Light microscope | Electron microscope |
|-----------------------------|---|
| Uses light to form images | Uses a beam of electrons to form images |
| Living samples can be views | Samples cannot be living |
| Relatively cheap | expensive |
| Low magnification | High magnification |
| Low resolution | High resolution |

Organisation

Knowledge Organiser - Science - year 11

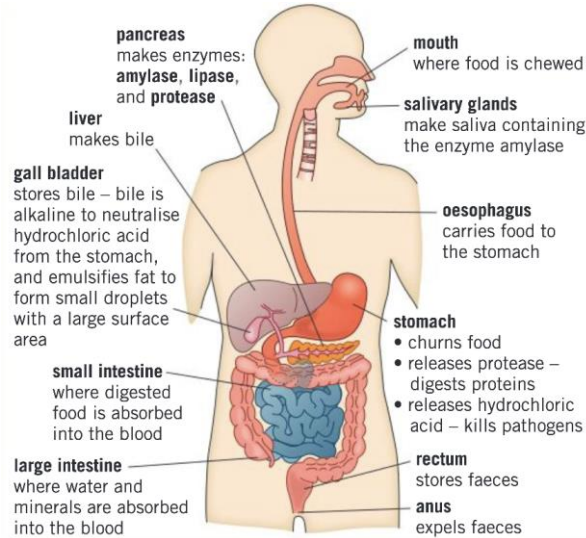
Organisation of living things

There are five levels of organisation in living organisms:



The Digestive System

The role of the digestive system is to break large insoluble molecules into smaller soluble molecules. Here are the organs that make up the digestive system and their roles in digestion.



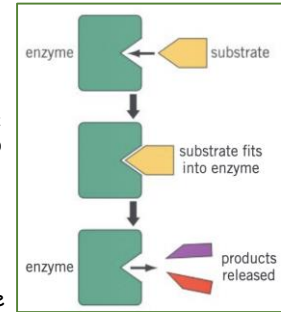
Enzymes

Enzymes are large proteins that catalyse (speed up) reactions. Enzymes are not changed in the reactions they catalyse.

Lock and Key Model

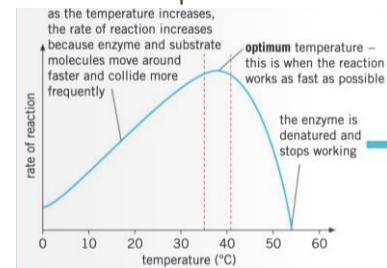
This is a simple model of how enzymes work:

- 1) The enzyme's active site (where the reaction occurs) is a specific shape.
- 2) The enzyme (the lock) will only catalyse a specific reaction because the substrate (the key) fits into its active site.
- 3) At the active site, enzymes can break molecules down into smaller ones or bind small molecules together to form larger ones.
- 4) When the products have been released, the enzyme's active site can accept another substrate molecule.

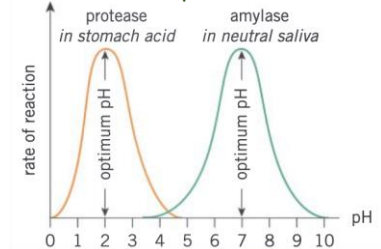


Factors affecting enzymes

Temperature



pH



Digestive Enzymes

| Enzyme | Sites of production | Reaction catalysed |
|-----------|--|-----------------------------------|
| Amylase | salivary glands pancreas small intestine | Starch → glucose (a simple sugar) |
| Proteases | stomach pancreas small intestine | Proteins → amino acids |
| Lipases | pancreas small intestine | Lipids → fatty acids and glycerol |

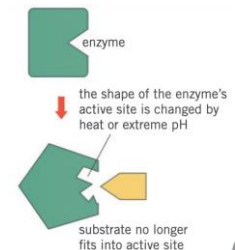
Key terms

active site amylase catalyse denatured enzyme lipase optimum protease substrate

Denaturation

At extremes of pH or at very high temperatures the shape of an enzyme's active site can change.

The substrate can no longer bind to the active site, so the enzyme cannot catalyse the reaction - the enzyme has been denatured.



Organisation

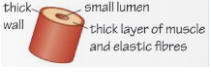

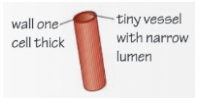
Knowledge Organiser - Science - Year 11

The blood

The blood is a tissue made up of four main components:

- Red blood cells** - bind to oxygen and transport it around the body.
- Plasma** - transports substances and blood cells around the body.
- Platelets** - form blood clots to create barriers to infections.
- White blood cells** - part of the immune system to defend the body against pathogens.

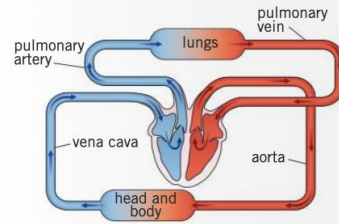
The blood vessels

| Vessel | Function | Structure | Diagram |
|-----------|--|--|---|
| artery | carries blood away from the heart under high pressure | - Thick, muscular and elastic walls - Walls that stretch to withstand high pressure - Small lumen |  |
| vein | carries blood to the heart under low pressure | - Have valves to stop blood flowing the wrong way - Thin walls - Large lumen |  |
| capillary | carries blood to tissues and cells and connects arteries and veins | One cell thick - short diffusion distance for substances to move between the blood and tissues (e.g., oxygen into cells and carbon dioxide out) - Very narrow lumen |  |

Double circulatory system

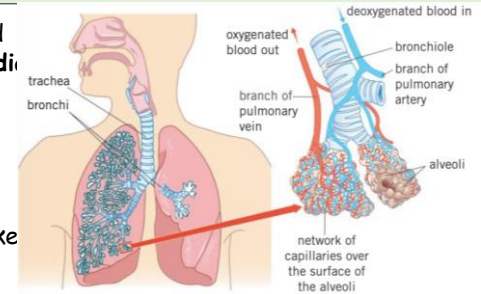
The human circulatory system is described as a double circulatory system because blood passes through the heart twice for every circuit around the body:

- The right ventricle pumps blood to the lungs where gas exchange takes place
- The left ventricle pumps blood around the rest of the body.



The heart

The heart is an organ that pumps blood around your body. It is made from **cardiac** muscle tissue, which is supplied with oxygen by the **coronary artery**.



Heart rate is controlled by a group of cells in the right **atrium** that generate electrical impulses, acting as a pacemaker. Artificial pacemakers can be used to control irregular heartbeats.

Coronary heart disease

Coronary heart disease (CHD) occurs when the coronary arteries become narrowed by the build-up of layers of fatty material within them. This reduces the flow of blood, resulting in less oxygen for the heart muscle, which can lead to heart attacks.

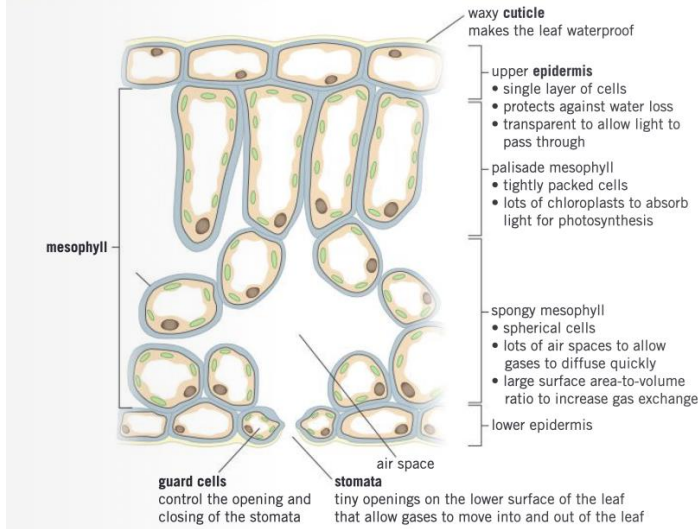
| | Description | Advantages | Disadvantages |
|--------------------------|---|---|--|
| Stent | Inserted into blocked coronary arteries to keep them open. | - Widens the artery - allows more blood to flow - Less serious surgery | - Can involve major surgery - risk of infection, blood loss and clot clots - Risks from anaesthetic |
| Statins | Drugs that reduce blood cholesterol levels, slowing down the deposit of fatty material in the arteries | - Effective - No need for surgery - Can prevent CHD from developing | - Possible side effects such as muscle pain, headaches and sickness - Cannot cure CHD, so patient will have to take tablets for many years. |
| Replacement heart valves | Heart valves that leak or do not open fully, preventing control of blood flow through the heart, can be replaced with biological or mechanical valves. | - Allows control of blood flow through the heart - Long-term cure for faulty heart valves | Risks related to surgery (as with stents) |
| Transplants | If the heart fails a donor heart, or heart and lungs, can be transplanted. Artificial hearts can be used to keep patients alive whilst waiting for a transplant, or to allow the heart to rest during recovery. | - Long-term cure for the most serious heart conditions - Treats problems that cannot be treated in other ways. | - Transplants may be rejected if the donor is not a match. - Lengthy process - Risks related to surgery (as with stents) |

Organisation

Knowledge Organiser - Science - year 11

Tissues in a leaf

Leaves are organs because they contain many tissues that work together to perform photosynthesis.



Stomata

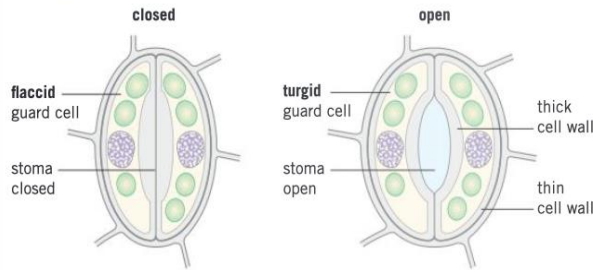
Stomata are tiny openings in the undersides of leaves - this placement reduces water loss through evaporation.

They control gas exchange and water loss from leaves by:

- Allowing diffusions of carbon dioxide into the plant for photosynthesis
- Allowing diffusion of oxygen out of the plant

Guard cells are used to open and close the stomata.

When a plant has plenty of water, the guard cells become turgid. The cell wall on the inner surface is very thick, so it cannot stretch as much as the outer surface. So as the guard cells swell up, they curve away from each other, opening the stoma.



Transportation in plants

| | Transpiration | Translocation |
|---------------------|---|---|
| Description | Water is lost through the stomata by evaporation. This pulls water up from the roots through the xylem and is called transpiration. The constant movement of water up the plant is called the transpiration stream. | The movement of dissolved sugars from the leaves to the rest of the plant through the phloem. |
| Importance | Provides water to cells to keep them turgid. Provides water to cells for photosynthesis. Transports mineral ions to leaves. | Moves dissolved sugars made during photosynthesis to other parts of the plant. This allows for respiration, growth and glucose storage. |
| Specialised Tissues | <p>one-way transport only water and minerals made of dead cells, joined together with no end walls between them thick walls stiffened with lignin xylem vessel</p> | <p>water and dissolved sugars cells have end walls with small holes to allow substances to flow through substances transported in both directions phloem vessel</p> |

Factors affecting the rate of transpiration

| Factor | Effect on transpiration | Because... |
|-----------------|--|--|
| temperature | higher temperatures increase the rate of transpiration | water evaporates faster at higher temperatures |
| humidity | lower humidity increases the rate of transpiration | the drier the air the steeper the concentration gradient of water molecules between the air and the leaf |
| wind speed | more wind increases the rate of transpiration | wind removes the water vapour quickly, maintaining a steeper concentration gradient |
| light intensity | Higher light intensity increases the rate of transpiration | stomata open wider to let more carbon dioxide into the leaf for photosynthesis |

Key terms

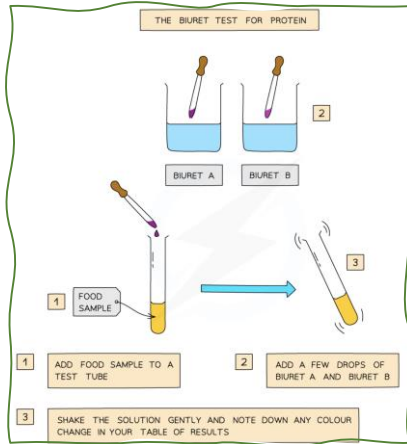
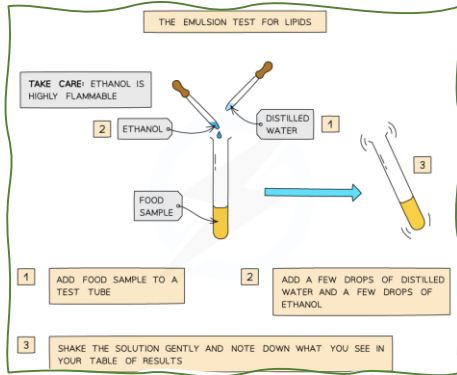
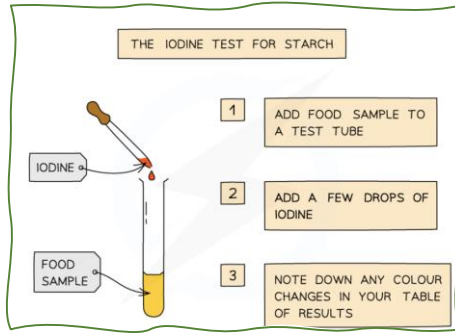
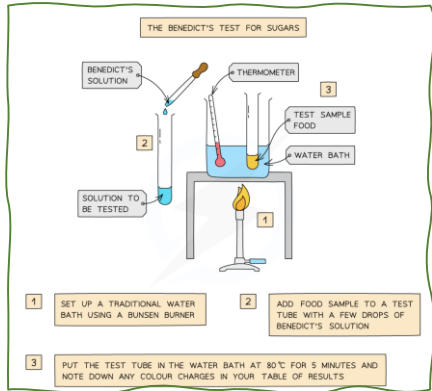
cuticle epidermis flaccid mesophyll stomata phloem xylem
turgid translocation transpiration guard cell



Organisation

Knowledge Organiser - Science Year 11

Testing Foods

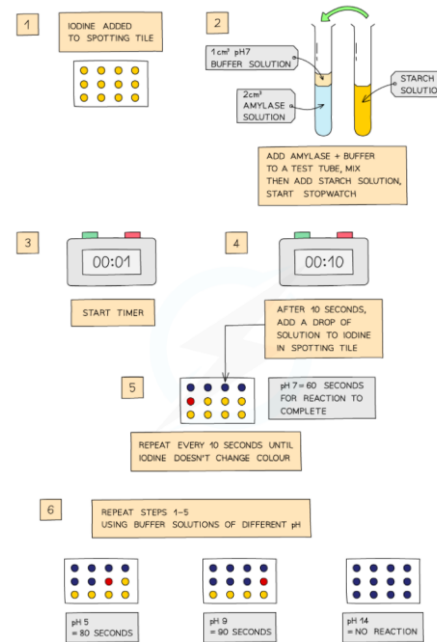


| Food Test | Colour of reagent | Positive test result | Negative test result |
|----------------------|-------------------|----------------------|--------------------------|
| Iodine for starch | orange-brown | blue-black | orange-brown (no change) |
| Benedict's for sugar | light blue | green to brick-red | light blue (no change) |
| Ethanol for lipid | colourless | cloudy emulsion | colourless (no change) |
| Biuret for protein | blue | lilac-purple | blue (no change) |

Investigating Enzymes

Method

- Place single drops of iodine solution in rows on the tile
- Label a test tube with the pH to be tested
- Use the syringe to place 2cm³ of amylase in the test tube
- Add 1cm³ of buffer solution to the test tube using a syringe
- Use another test tube to add 2cm³ of starch solution to the amylase and buffer solution, start the stopwatch whilst mixing using a pipette
- After 10 seconds, use a pipette to place one drop of the mixture on the first drop of iodine, which should turn blue-black
- Wait another 10 seconds and place another drop of the mixture on the second drop of iodine
- Repeat every 10 seconds until iodine solution remains orange-brown
- Repeat experiment at different pH values - the less time the iodine solution takes to remain orange-brown, the quicker all the starch has been digested and so the better the enzyme works at that pH



Key terms

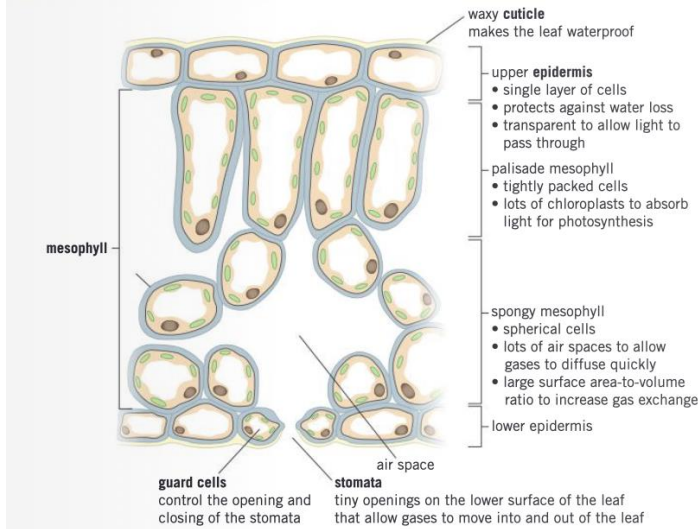
active site amylase catalyse denatured enzyme lipase optimum protease substrate

Plant Tissues

Knowledge Organiser - Science - year 11

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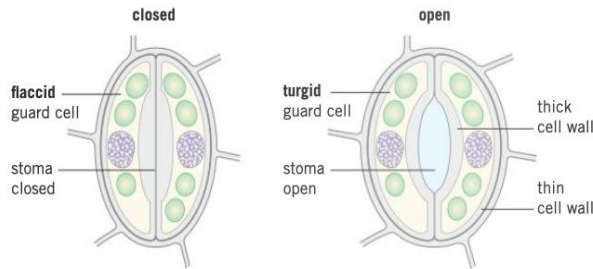
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Key terms

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turgid translocation transpiration guard cell

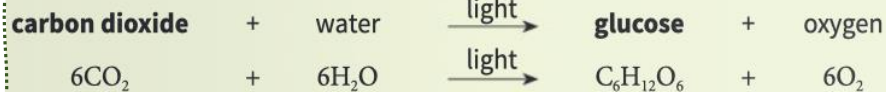
Photosynthesis

Knowledge Organiser - Science - year 11

Photosynthesis reaction

Photosynthesis is a chemical reaction in which energy is transferred from the environment as light from the Sun to the leaves of a plant. This is an **endothermic** reaction.

Chlorophyll, the green pigment in **chloroplasts** in the leaves, absorbs the light energy. Leaves are well adapted to increase the rate of photosynthesis when needed.



convert into insoluble starch for storage (in leaves, tubers, and bulbs)

Uses of glucose produced in photosynthesis

for respiration to release energy

Production of fat and oil (for storage)

Produce cellulose to strengthen cell walls

Produce amino acids for protein synthesis - plants also need nitrate ions from the soil for this

Inverse square law

As the distance of a light source from a plant increases, the light intensity decreases - this is called an inverse relationship. This relationship is not linear, as light intensity varies in inverse proportion to the square of the distance:

$$\text{light intensity} \propto \frac{1}{\text{distance}^2}$$

For example, if you double the distance between a light source and a plant, light intensity falls by three quarters.

Key terms

carbon dioxide chlorophyll chloroplast endothermic glucose inverse square law limiting factor photosynthesis

Rate of photosynthesis

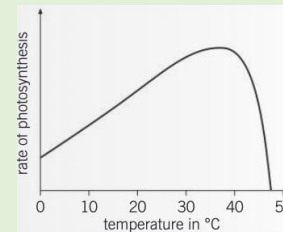
A limiting factor is anything that limits the rate of a reaction when it is in short supply.

The limiting factors for photosynthesis are

- Temperature
- Carbon dioxide concentration
- Light intensity
- Amount of chlorophyll

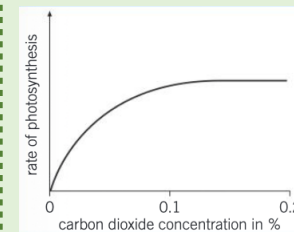
Less chlorophyll in the leaves reduces the rate of photosynthesis. More chlorophyll may be produced by plants in well-lit areas to increase the photosynthesis rate.

Limiting factors and photosynthesis rate



At low temperatures the rate of photosynthesis is low because the reactant molecules have less kinetic energy.

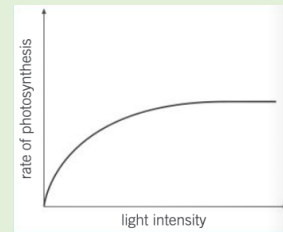
Photosynthesis is an enzyme-controlled reaction, so at high temperatures the enzymes are denatured and the rate quickly decreases.



Carbon dioxide is used up in photosynthesis, so increasing carbon dioxide concentration increases the rate of photosynthesis.

At a certain point, another factor becomes limiting.

Carbon dioxide is often the limiting factor for photosynthesis.



Light energy is needed for photosynthesis, so increasing light intensity increases the rate of photosynthesis.

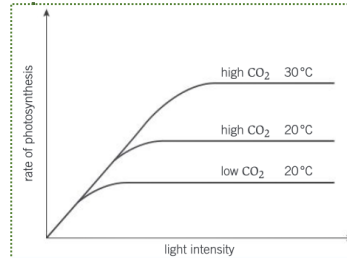
At a certain point, another factor becomes limiting.

Photosynthesis will stop if there is little or no light.

Interaction of limiting factors

Limiting factors often interact, and any one may be limiting photosynthesis.

For example, on the graph the lowest curve has both carbon dioxide and temperature limiting photosynthesis. Temperature is limiting for the middle curve, and the highest curve shows photosynthesis rate increases when both temperature and carbon dioxide are increased until another factor becomes limiting.



Greenhouse economics

Commercial greenhouses control limiting factors to get the highest possible rates of photosynthesis so they can grow plants as quickly as possible or produce the highest yields, whilst making a profit.



Respiration

Knowledge Organiser - Science - year 11

Cellular respiration

Cellular **respiration** is an **exothermic** reaction that occurs continuously in the **mitochondria** of living cells to supply the cells with energy.

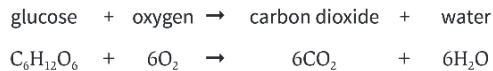
The energy released during respiration is needed for all living processes, including

- chemical reactions to build larger molecules, for example, making proteins from amino acids
- muscle contraction for movement
- keeping warm

Respiration in cells can take place aerobically (using oxygen) or anaerobically (without oxygen).

| Type of respiration | Oxygen required? | Relative amount of energy transferred |
|---------------------|------------------|---|
| aerobic | ✓ | Complete oxidation of glucose - large amount of energy is released |
| anaerobic | ✗ | Incomplete oxidation of glucose - much less energy is released per glucose molecule than in aerobic respiration |

Aerobic respiration



Anaerobic respiration in muscles



Fermentation

Anaerobic respiration in plant and yeast cells is represented by the equation:



Anaerobic respiration in yeast cells is called **fermentation**.

The products of fermentation are important in the manufacturing of bread and alcoholic drinks.

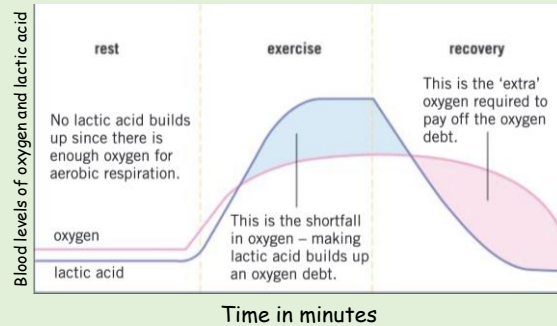
Response to exercise

During exercise the human body reacts to the increased demand for energy.

To supply the muscles with more oxygenated blood, heart rate, breathing rate, and breath volume all increase.

If insufficient oxygen is supplied, anaerobic respiration takes place instead, leading to the build up of **lactic acid**.

During long periods of vigorous exercise, muscles become fatigued and stop contracting efficiently.



After exercise, the lactic acid accumulated during anaerobic respiration needs to be removed. **Oxygen debt** is the amount of oxygen needed to react with the lactic acid to remove it from cells.

Removal of lactic acid

Lactic acid in the muscles

Transported to the liver in the blood

Lactic acid is converted back to glucose

Metabolism

Metabolism is the sum of all the reactions in the body.

The energy released by respiration in cells is used for the continual enzyme-controlled processes of metabolism that produce new molecules.

Metabolic processes include the synthesis and breakdown of:

Carbohydrates

- synthesis of larger carbohydrates from sugars (starch, glycogen and cellulose)
- breakdown of glucose in respiration to release energy

Proteins

- synthesis of amino acids from glucose and nitrate ions
- amino acids used to form proteins
- excess proteins broken down to form urea for excretion

Lipids

- synthesis of lipids from one molecule of glycerol and three molecules of fatty acid

Key terms

aerobic anaerobic exothermic fermentation lactic acid metabolism mitochondria oxidation oxygen debt respiration

Investigating Photosynthesis

Knowledge Organiser - Science - year 11

Aim

Investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed

Variables

Dependent - The number of bubbles / volume of oxygen produced
Independent - Distance between light source and plant / light intensity.

Control - Temperature (can be controlled using an LED bulb or a heat shield, carbon dioxide concentration, type of plant, length of plant, mass of plant.

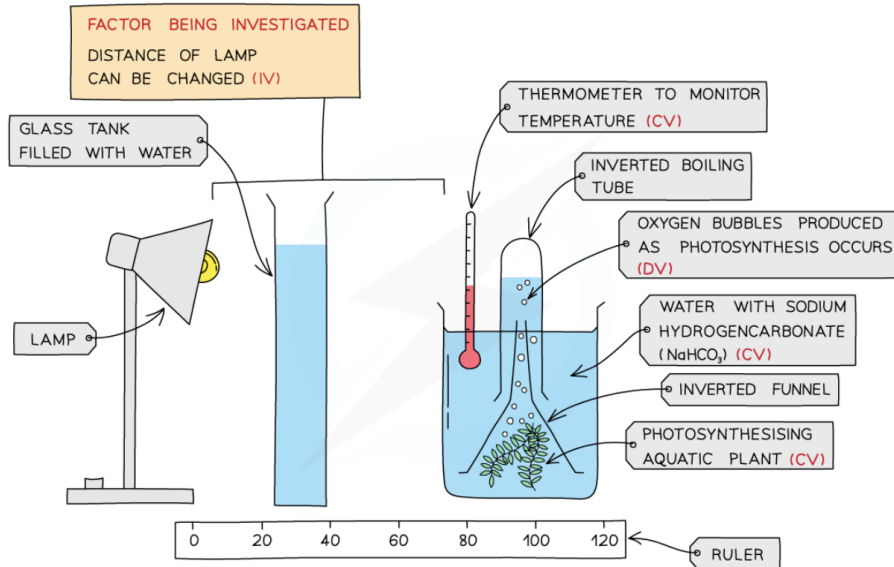
Method

Place a piece of pondweed (Elodea or Cabomba are often used), into a beaker of water

Use a light a set distance from the plant

Record the number of bubbles observed in three minutes

Repeat steps for different distances



Improvements

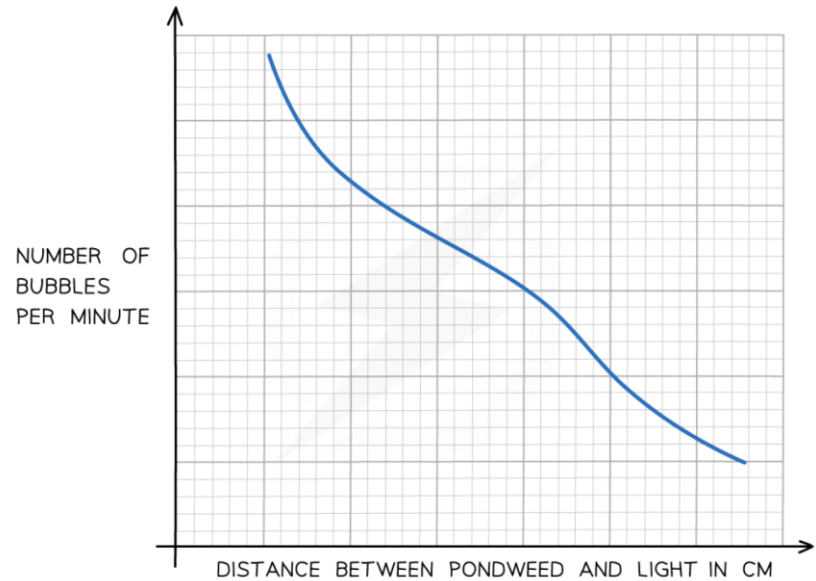
- Use a gas syringe to collect the volume of gas produced
- Repeat the experiment at least twice for each distance and calculate the mean number of bubbles
- Use of a glass tank between lamp and plant to prevent heating of the plant, or using an LED bulb that releases very little heat energy

Changing the Independent Variable

- To investigate the impact of carbon dioxide concentration the concentration of sodium hydrogen carbonate can be changed.
- Use different temperatures of sodium hydrogen carbonate solution.

Results

- As the distance between the plant and light source increases the number of bubbles decreases. This shows that the rate of photosynthesis decreases at lower light intensities.



Key terms

carbon dioxide chlorophyll chloroplast endothermic glucose inverse square law limiting factor photosynthesis

Relationships in an Ecosystem

Knowledge Organiser - Science - year 11

Ecosystem organisation

Individual organisms

Population - the total number of organisms of the same species that live in one specific geographical area

Community - group of two or more populations of different species living in one specific geographical area

Ecosystem - the interaction of a community of living organisms with the non-living parts of their environment

A stable community is one where all the species and environmental factors are in balance so that population sizes remain fairly constant.

An example of this is the interaction between predator and prey populations, which rise and fall in a constant cycle so that each remains within a stable range

Abiotic Factors

Abiotic factors are non-living factors in the ecosystem that can affect a community. Too much or too little of the following abiotic factors can negatively affect the community in an ecosystem:

carbon dioxide level for plants, light intensity, moisture levels, oxygen levels for animals that live in water, soil pH and mineral content, temperature, wind intensity and direction

Competition

To survive and reproduce, organisms require a supply of resources from their surroundings and from the other living organisms there.

This can create competition, where organisms within a community compete for resources.

There are two types of competition - interspecific competition is between organisms of different species and intraspecific competition is between organisms of the same species.

Animals

- Food
- Mates
- Territory

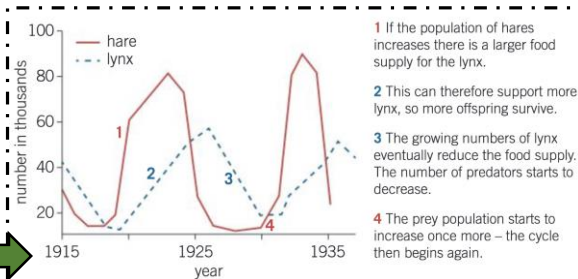
Plants

- Light
- Space
- Water and mineral ions

Interdependence

Within a community each species interacts with many others and may depend on other species for things like food, shelter, pollination, and seed dispersal.

If one species is removed it can affect the whole community - this is called interdependence.



Biotic Factors

Biotic factors are living factors in the ecosystem that can affect a community. For example, the following biotic factors would all negatively affect populations in a community:

decreased availability of food, new predators arriving, new pathogens, competition between species.

Adaptations of organisms

Organisms have features - adaptation - that enable them to survive in the condition in which they live. The adaptations of an organism may allow it to outcompete others, and provide it with an evolutionary advantage.

Structural

Physical features that allow an organism to successfully compete:

- sharp teeth to hunt prey
- colouring that may provide camouflage to hide from predators or to hunt prey
- a large or small body surface area-to-volume ratio.

Behavioural




The behaviour of an organism that gives it an advantage:

- making nests to shelter offspring or attract a mate
- courtship dances to attract a mate
- use of tools to obtain food
- working together in packs

Functional

Adaptations related to processes that allow an organism to survive:

- photosynthesis in plants
- production of poisons or venom to deter predators or kill prey
- changes in reproduction timings

| Organism | Example adaptations |
|--|---|
|  | <ul style="list-style-type: none"> - White fur for camouflage when hunting - Feet with large surface area to distribute weight on snow - Small ears to reduce heat loss - Thick fur for insulation |
|  | <ul style="list-style-type: none"> - Feet with large surface to distribute weight on sand - Hump stores fat to provide energy when food is scarce - Tough mouth and tongue to allow camel to eat cacti - Long eyelashes to keep sand out of eyes. |
|  | <ul style="list-style-type: none"> - Spines instead of leaves to reduce surface area and therefore water loss - Long roots to reach water underground - Large, fleshy stem to store water |

Some organisms are extremophiles, which means they live in environments that are very extreme where most other organisms could not survive. For example, areas with very high temperatures, extreme pressures, high salt concentrations, highly acidic or alkaline conditions, low levels of oxygen or water.

Key terms

abiotic factor adaptation biotic factor community ecosystem extremophile interaction interdependence interspecific intraspecific population

Key vocabulary:

Kinetic energy-Energy of a moving object due to its motion. Joules, J
Mass-The quantity of matter in an object. Kilograms, kg
Elastic potential energy-Energy stored in an elastic object when work is done to change its shape. Joules, J
Spring constant- The stiffer the spring the greater the spring constant. Newton per metre N/m
Extension- The increase in length from the original length. Metres, m
Gravitational potential energy-The energy of an object due to it's position in a gravitational field. Joules, J
Gravitational field strength -The force of gravity on an object-given in your question. Newton per kilogram N/kg
Power- Energy transferred every second. Watts, W
Work done- Energy transferred by a force. Joules, J
Specific heat capacity- Energy needed to increase the temperature of a material by 1°C when the mass is 1kg. J/kg°C
Efficiency- Useful energy transferred by a device/ total energy. There is no unit- answer should be a number less than 1. If you have multiplied your answer by 100 you have changed it into a percentage.
System- an object or group of objects.
An open system- energy is transferred between stores or to the surroundings.
A closed system -no energy can escape to or enter from the surroundings. The total energy in a closed system never changes.

Energy stores

| | |
|-------------------------|--|
| Kinetic | Energy an object has because it is moving |
| Gravitational potential | Energy an object has because of its height above the ground |
| Elastic potential | Energy an object has when it is stretched or compressed |
| Thermal (or internal) | Energy an object has because of its temperature (the total kinetic and potential energy of the particles in the object) |
| Chemical | Energy that can be transferred by chemical reactions involving foods, fuels and the chemicals in batteries |
| Nuclear | Energy stored in the nucleus of an atom |
| Magnetic | Energy a magnetic object has when it is near a magnet or in a magnetic field |
| Electrostatic | Energy a charged object has when it is near another charge object |

Kinetic energy:

The kinetic energy of a moving object can be calculated using the equation:

- kinetic energy = 0.5 × mass × speed²
- $E_k = 1/2 m v^2$

kinetic energy, E_k , in joules, J
 mass, m , in kilograms, kg
 speed, v , in metres per second, m/s



Energy transfers

Energy can be transferred to and from different stores by:

Heating

Energy is transferred from one object to another object with a lower temperature.

Waves

Waves (e.g. light and sound waves) can transfer energy by radiation.

Electricity

When an electric current flows it can transfer energy.

Forces

Energy is transferred when a force moves or changes the shape of an object.

Gravitational potential energy:

The amount of gravitational potential energy gained by an object raised above ground level can be calculated using the equation:

- $g.p.e. = \text{mass} \times \text{gravitational field strength} \times \text{height}$
- $E_p = m g h$

gravitational potential energy, E_p , in joules, J
 mass, m , in kilograms, kg
 gravitational field strength, g , in newtons per kilogram, N/kg
 (In any calculation the value of the gravitational field strength (g) will be given.) height, h , in metres, m



Power:

Power is defined as the rate at which energy is transferred or the rate at which work is done.

- power = energy transferred /time
- $P = E /t$
- power = work done /time
- $P = W /t$

power, P , in watts, W

energy transferred, E , in joules, J

time, t , in seconds, s

work done, W , in joules, J

An energy transfer of 1 joule per second is equal to a power of 1 watt.

Specific heat capacity:

The amount of energy stored in or released from a system as its temperature changes can be calculated using the equation:

- change in thermal energy = mass \times specific heat capacity \times temperature change
- $\Delta E = m \times c \times \Delta\theta$

change in thermal energy, ΔE , in joules, J

mass, m , in kilograms, kg

specific heat capacity, c , in joules per kilogram per degree Celsius, $J/kg\ ^\circ C$

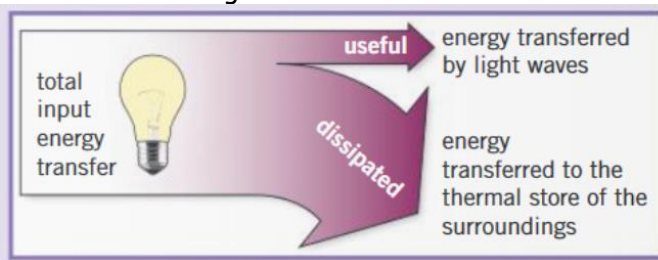
temperature change, $\Delta\theta$, in degrees Celsius, $^\circ C$

The specific heat capacity of a substance is the amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius.

Useful and dissipated energy:

Energy cannot be created, or destroyed-it can only be transferred usefully, stored or dissipated.

Dissipated energy means it transfers to the surroundings; this is often described as being wasted.



All energy eventually ends up transferred to the thermal stores of the surroundings.

Lubrication is a way of reducing unwanted energy transfer due to friction.

Streamlining is a way of reducing energy wasted due to air resistance or drag.

Insulation is a way of reducing thermal energy to surroundings.

Elastic energy:

The amount of elastic potential energy stored in a stretched spring can be calculated using the equation:

- elastic potential energy = $0.5 \times$ spring constant \times extension 2
- $E_e = 1/2 k e^2$

(assuming the limit of proportionality has not been exceeded)

elastic potential energy, E_e , in joules, J

spring constant, k , in newtons per metre, N/m

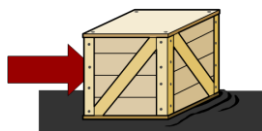
extension, e , in metres, m



Work done:

Work done= energy transferred

work done = force \times distance moved in the direction of the force



Efficiency:

Efficiency is a measure of how much energy is transferred usefully. You must know the equation to calculate efficiency as a decimal:

$$\text{efficiency} = \frac{\text{useful output energy transfer (J)}}{\text{total input energy transfer (J)}}$$

or

$$\text{efficiency} = \frac{\text{useful power output (W)}}{\text{total power input (W)}}$$

To give efficiency as a percentage you multiply your decimal by 100 and add the % sign.

NEVER add the % or J to your decimal!

Key vocabulary:

Conduction- The transmission of heat through a solid substance from a region of high temperature to lower temperature.

Infrared radiation- Electromagnetic waves in between visible light and microwaves in the electromagnetic spectrum.

Insulator- A substance that is a poor conductor of heat and electricity. This is due to a lack of mobile electrons.

Insulation- materials that are good insulators and are used to keep you warm (clothes) or thermal energy in your house.

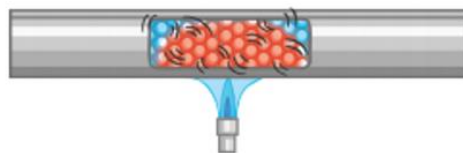
Specific heat capacity- the amount of energy required to increase the temperature of 1kg of a substance by 1°C.

Loft insulation- fibreglass in the loft to reduce energy transfer

Black body- is a theoretical object that absorbs 100% of the radiation that falls on it.

Energy transfers:

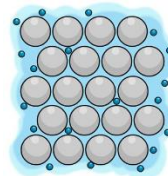
1. Conduction- when a solid is heated, the particles vibrate and collide more. Energy is transferred.



Conduction
Good conductors are metals

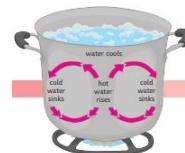
Metals

- Free / delocalised electrons
- Increase kinetic energy
- Collisions
- Heat/ thermal energy transferred



2. Convection- in a fluid (liquid or gas) You do not need to know about this in detail!

3. Radiation- Infrared radiation is part of the electromagnetic spectrum. You will learn about this in year 10.



Infrared radiation:

Infrared radiation (IR) is a part of the electromagnetic spectrum (EM).

All objects emit (give out) and absorb (take in) IR.

The higher the temperature of the object the more IR it emits.

A good absorber of IR is also a good emitter.

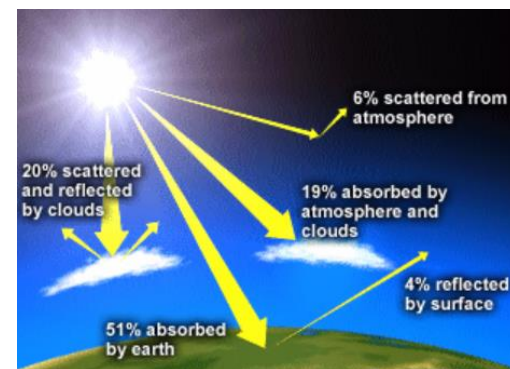
For an object at a constant temperature:

- IR emitted = IR absorbed
- IR radiation s emitted across a continuous range of wavelengths

A perfect black body would not reflect or transmit any radiation and would also be a perfect emitter of radiation.

Radiation and the Earth's temperature:

The temperature of the surface of the Earth depends on a lot of factors, including the rate at which visible light and IR are reflected, absorbed and emitted by the Earth's atmosphere and surface.

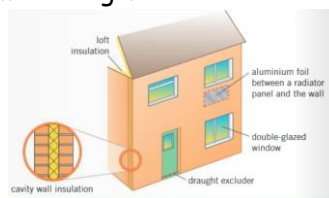


Insulating buildings:

Heating bills are expensive and so it is important to reduce heat loss from buildings.

Some factors that affect the rate of heat loss from a building are:

1. Th thickness of its walls and roof
2. The thermal conductivity of its walls and roof
3. Lower thermal conductivity = lower rate of heat loss



The thermal conductivity of the walls and roof can be reduced by using thermal insulators. A material with a low thermal conductivity. The rate of energy transfer through an insulator is low. The energy transfer per second through a material depends on:

1. The materials thermal conductivity
2. The temperature difference between the two sides of the material
3. The thickness of the material

Key vocabulary:

Renewable energy- energy from natural sources that is always being replenished so it never runs out.

Nuclear fuel- substance used in nuclear reactors that releases energy due to nuclear fission.

Solar heating panel designed to use sunlight to heat water running through it.

Biofuel- is any fuel taken from a living or recently living organism. Animal waste is an example.

Carbon neutral- A biofuel from a living organism that takes in as much carbon dioxide from the atmosphere as it released when the fuel is burnt.

Energy resources:

The main ways we use the Earth's energy resources are:

- Generating electricity
- Heating
- Transport

Most of our energy comes from fossil fuels- coal, oil and natural gas.



Some energy resources are more reliable than others. Reliable energy resources are ones that are available all the time (or they are predictable).

Both renewable and non-renewable energy resources have some kind of environmental impact when we use them.

| Non-renewable | Renewable |
|---|--|
| Are not replaced as quickly as they are used | Can be replaced at the same rate as they are used |
| Will eventually run out | Will not run out |
| Examples are fossil fuels and nuclear fission | Examples are solar, wave, wind, geothermal, biofuel and hydroelectric. |

| Non-renewable energy resources | Resource | Main uses | Source | Advantages | Disadvantages |
|--------------------------------|------------------------|--|---|---|---|
| | coal | generating electricity | extracted from underground | enough available to meet current energy demands | will eventually run out |
| | oil | generating electricity transport heating | | reliable – supply can be controlled to meet demand | release carbon dioxide when burned – one of the main causes of climate change |
| | natural gas | generating electricity heating | | relatively cheap to extract and use | release other polluting gases, such as sulfur dioxide (from coal and oil) which causes acid rain oil spills in the oceans kill marine life |
| nuclear fission | generating electricity | mining naturally occurring elements, such as uranium and plutonium | no polluting gases or greenhouse gases produced enough available to meet current energy demands large amount of energy transferred from a very small mass of fuel reliable – supply can be controlled to meet demand | produces nuclear waste, which is: <ul style="list-style-type: none"> • dangerous • difficult and expensive to dispose of • stored for centuries before it is safe to dispose of nuclear power plants are expensive to: <ul style="list-style-type: none"> • build and run • decommission (shut down) | |



| Resource | Main uses | Source | Advantages | Disadvantages |
|----------------------|-------------------------------------|--|--|--|
| solar energy | generating electricity | sunlight transfers energy to solar cells | can be used in remote places very cheap to run once installed | supply depends on weather expensive to buy and install |
| | heating | sunlight transfers energy to solar heating panels | no pollution/greenhouse gases produced | cannot supply large scale demand |
| hydroelectric energy | generating electricity | water flowing downhill turns generators | low running cost no fuel costs reliable and supply can be controlled to meet demand | expensive to build hydroelectric dams need to flood a large area behind the dam, destroying habitats and resulting in greenhouse gas production from rotting vegetation |
| tidal energy | generating electricity | turbines on tidal barrages turned by water as the tide comes in and out | predictable supply as there are always tides can produce large amounts of electricity no fuel costs no pollution/greenhouse gases produced | tidal barrages: <ul style="list-style-type: none"> change aquatic habitats and can harm animals restrict access and can be dangerous for boats are expensive to build and maintain cannot control supply supply varies depending on time of month |
| wave energy | generating electricity | floating generators powered by waves moving up and down | low running cost no fuel costs no pollution/greenhouse gases produced | floating generators: <ul style="list-style-type: none"> change aquatic habitats and can harm animals restrict access and can be dangerous for boats are expensive to build, install, and maintain dependent on weather cannot supply large scale demand |
| wind energy | generating electricity | turbines turned by the wind | low running cost no fuel costs no pollution/greenhouse gases produced | supply depends on weather large amounts of land needed to generate enough electricity for large scale demand can produce noise pollution for nearby residents |
| geothermal energy | generating electricity heating | radioactive substances deep within the Earth transfer heat energy to the surface | low running cost no fuel costs no pollution/greenhouse gases produced | expensive to set up only possible in a few suitable locations around the world |
| biofuels | generating electricity transport | fuel produced from living or recently living organisms, for example, plants and animal waste | can be carbon neutral – the amount of carbon dioxide released when the fuel is burnt is equal to the amount of carbon dioxide absorbed when the fuel is grown reliable and supply can be controlled to meet demand | expensive to produce biofuels growing biofuels requires a lot of land and water that could be used for food production can lead to deforestation – forests are cleared for growing biofuel crops |

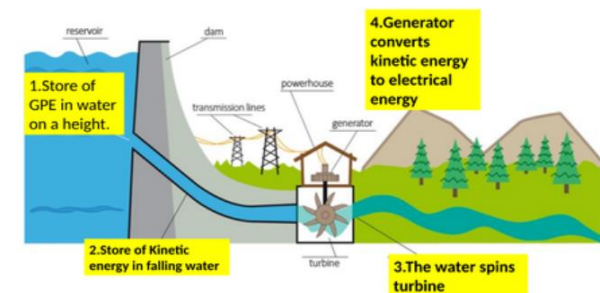


Hydroelectric power station:

Water is stored high off the surface of the earth. This has a large amount of gravitational potential energy.

The water falls which turns turbine. The turbine is attached to a generator which generates electricity. The water is then pumped back up.

Gravitational potential energy → kinetic energy → electrical energy



Key vocabulary:

Potential difference - the work done in moving one coulomb of charge from one point in the circuit to another.

Current - a flow of electrons.

Charge - the rate of flow of electrons.

Resistance - the opposing of a current.

Power - how much energy is transferred (work done) in a certain amount of time.

Series - all components in a circuit follow on directly from each other.

Parallel - the current has alternate pathways to possibly take in a circuit.

Free (or delocalised) electrons - electrons that are free to move through the conductor (eg metal).

Key equations:

$$Q = It \text{ (charge = current x time)}$$

$$V = IR \text{ (potential difference = current x resistance)}$$

$$\text{Total resistance} = R_1 + R_2$$

$$P = VI \text{ (power = potential difference x current)}$$

$$P = I \times I \times R \text{ (power = current squared x resistance)}$$

$$E = Pt \text{ (energy transferred = power x time)}$$

$$E = QV \text{ (energy transferred = charge flow x potential difference)}$$

Key Units:

Current - Amps (**A**)

Potential difference - volts (**V**)

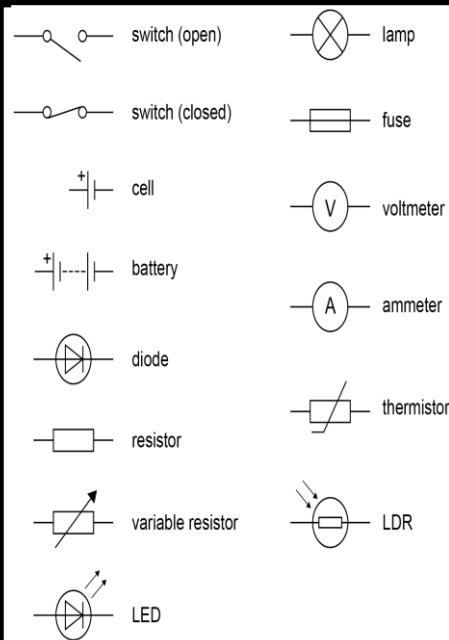
Charge - coulombs (**C**)

Resistance - ohms (Ω)

Power - watts (**W**)

Energy transferred - joules (**J**)

Energy transferred is the same as work done.



Series circuits - all components follow on directly from each other. The current only has one pathway to follow.

The current is the same all the way around a series circuit. The potential difference is shared between the components in the circuit.

Parallel circuit - the electricity has more than one pathway to take. The current will take the path of least resistance.

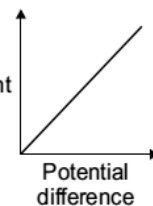
The current will be shared between the branches in the circuit. The potential difference will be the same across each component in the circuit.

Resistance - caused by the collision between free electrons and metal ions. The more collisions the greater the resistance.

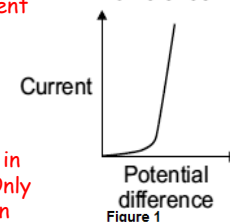
Factors that can affect resistance are:

- Length - double length, double resistance: directly proportional
- Temperature - increase temperature, increase resistance
- Diameter - bigger diameter, less resistance
- Material - number of free electrons

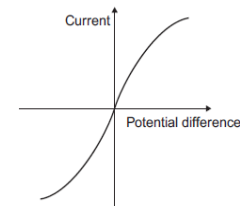
Fixed resistor at constant temperature - Ohm's Law. $R = V/I$. Directly proportional.



Diode - no current until certain potential difference. Current rapidly increases. Very high resistance in negative bias. Only allows current in one direction.



Filament bulb - bulb gets hotter, so line curves as resistance increases.

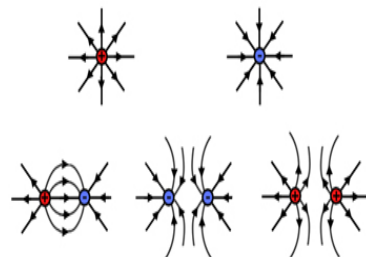


Electric fields. Separate physics only

Electric fields will always run from positive to negative - shown by arrows. The greater the number of arrows, the stronger the electric field.

Like charges - the field lines show a gap in the electric field.

Unlike charges - field lines move from + to -.



Static Separate physics only

Static is caused because of friction between two insulators resulting in the transfer of electrons.

Object gains electrons - object is negatively charged.

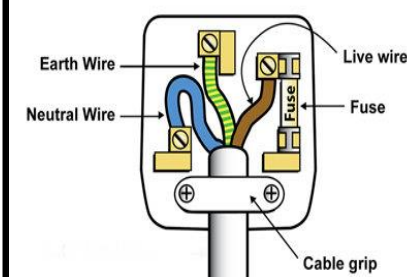
Object loses electrons - object is positively charged.

If there is a build-up of charge and the potential difference between two objects is great enough, a spark will 'jump' - this is a discharge of electricity.

The objects do not have to be touching - no contact needed for attraction / repulsion.

The National Grid: a system of transformers (step up and step down) and cables.

Cables can be overhead or underground. Electricity transmitted at high voltage, low current in order to reduce heat loss from the cables. Less energy is wasted therefore it makes the National Grid more efficient.



Plug case - plastic / rubber electrical insulators
 Pins - brass hard wearing conductor of electricity
 Wires - copper flexible conductor of electricity. Coated in coloured plastic (insulator of electricity) and identification.
 Earth wire (green Yellow) - safety (pd=0v)
 Live (brown) - carries current (pd=230V)
 Neutral (blue) - completes circuit (p.d. = 0V)



Key vocabulary:

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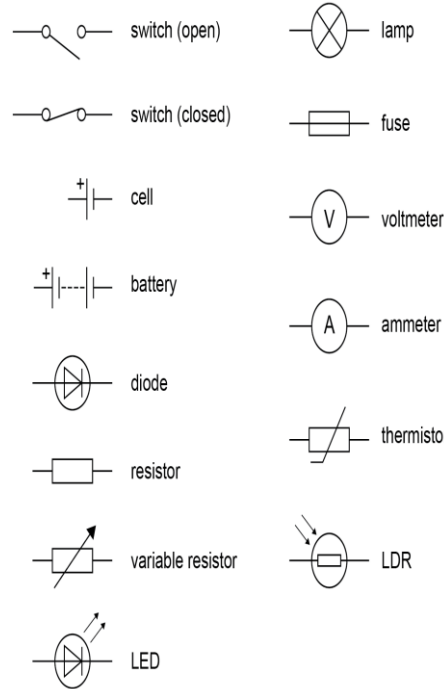
Resistance - ohms (**Ω**)

Power - watts (**W**)

Energy transferred - joules (**J**)

Energy transferred is the same as work done.

Circuit symbols to remember:

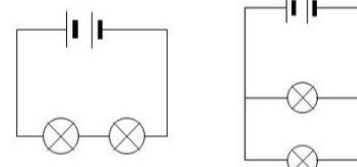


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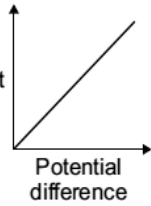
A series circuit

A parallel circuit

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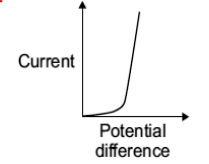
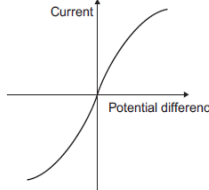


Figure 1

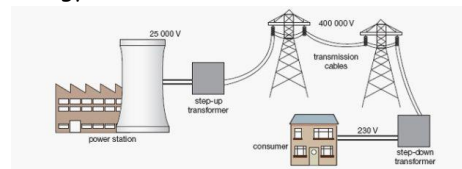
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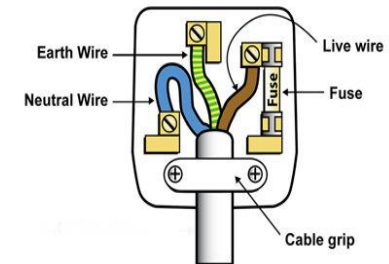
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The essential parts of the National Grid network



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| | Solid | Liquid | Gas |
|--------------------------|-----------------------------------|--------------------------------------|---------------------------------|
| Arrangement of particles | Close together Regular pattern | Close together Random arrangement | Far apart Random arrangement |
| Movement of particles | Vibrate on the spot | Move around each other | Move quickly in all directions |
| Diagram | | | |

States of matter – what form a substance can exist as.

Solid – regular arrangement of **vibrating** particles with strong forces of attraction. Fixed shape and volume.

Liquid – random arrangement of slowly moving particles which have weak forces of attraction. Takes the shape of the container. Fixed volume.

Gas – random arrangement of quickly moving particles which have negligible (no) forces of attraction. Volume can be changed (gases can be compressed). No fixed shape – fills container.

Melting – changing state from solid to liquid.

Evaporating / boiling / vaporisation – liquid to gas.

Condensation – gas to liquid.

Freezing / solidifying – liquid to solid.

Sublimation – solid to gas.

Melting point – the **temperature** at which a solid becomes a liquid.

Boiling point – the **temperature** at which a liquid becomes a gas.

Freezing point – the **temperature** at which a liquid becomes a solid.

Density – the amount of mass in a given volume.
Density = mass ÷ volume.

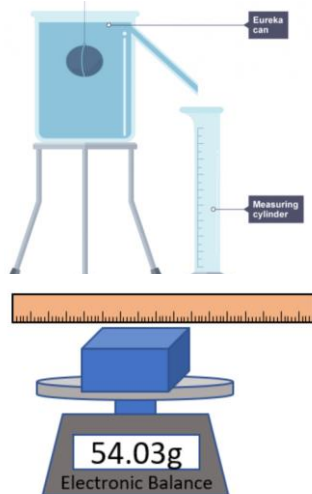
Latent heat – the energy transferred to or from a substance when it changes state.

Specific latent heat – the energy required to change the state of 1kg of a substance without an increase in temperature.

Specific Heat Capacity – the energy required to change the temperature of 1kg of a substance by 1°C.

Density required practical

Density is the mass per unit volume of any object. It is calculated by dividing the mass of an object by its volume.



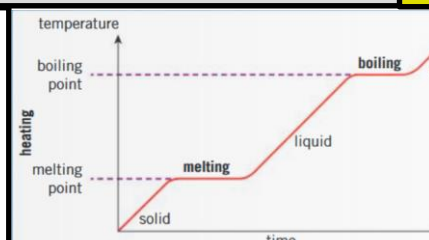
$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

(kg/m³) (kg) (m³)

Regular object (e.g. cube) – use a ruler to measure length, width, height. Multiply these 3 values together for volume. Use electronic scales to find mass. Use equation to calculate density.

Irregular object. – use electronic scales to find mass. Submerge object under water in a displacement can. The volume of the water displaced is the volume of the object (EUREKA!). Use equation to calculate density.

Liquid – Measure the volume of the liquid in a measuring cylinder. Use electronic scales to find the mass of the empty cylinder and then the cylinder and the liquid. Subtract to find the mass of the liquid. Use the density equation to calculate the density.



Changing state:

In the graph showing the change in temperature of a substance being heated or cooled, the flat horizontal section shows when the substance is changing state.

The energy transfers taking place during a change in state do not cause a change in temperature but do change the internal energy of the substance.

Specific Heat Capacity – the energy required to change the temperature of 1kg of a substance by 1°C.

Energy = mass X SHC X temperature change

| | |
|-------------|----------|
| Energy | (J) |
| Mass | (kg) |
| SHC | (J/kg°C) |
| Temperature | (°C) |

Specific latent heat – the energy required to change the state of 1kg of a substance without an increase in temperature.

Specific latent heat of fusion – solid to liquid

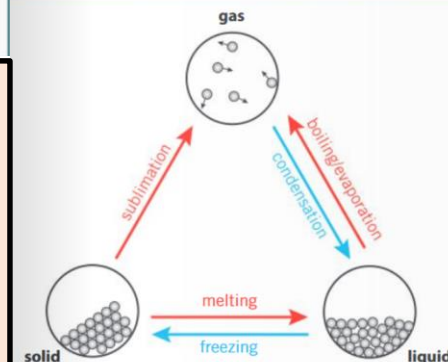
Specific latent heat of vaporisation – liquid to gas

Energy for change of state = mass x SLH

| | |
|--------|--------|
| Energy | (J) |
| Mass | (kg) |
| SLH | (J/kg) |

Changing state:

Red arrows – more energy (hotter).
Forces of attraction getting weaker.
Blue arrows – less energy (colder).
Forces of attraction getting stronger.



Gas Pressure – produces a force at right angles to the wall of the container. For a fixed mass of gas at a constant temperature:

pressure X volume = constant

Pressure (Pa; pascals)
Volume (m³)

Work is the transfer of energy by a force. Internal energy is the total kinetic and potential energy of all the particles in a system.

Doing work on a gas increases the internal energy of a gas, so temperature increases.

Particle motion in a gas is random (i.e. particles move in different directions at a range of speeds)

The temperature of a gas is related to the average kinetic energy of the molecules.

Keywords

Alpha particle– composed of two protons and two neutrons.

Atomic number- the number of protons (which equals the number of electrons) in an atom. It is sometimes called the proton number.

Electron- tiny negative charged particles that move around the nucleus of an atom.

Energy level- specific energy values of electrons in an atom.

Ionisation- a process in which atoms become charged.

Irradiated- an object that has been exposed to ionising radiation.

Isotope- atoms with the same number of protons and different numbers of neutrons.

Mass number- the number of proton and neutrons in a nucleus.

Neutron- uncharged particles of the same mass as protons. The nucleus of an atom consists of protons and neutrons.

Nuclear model- Rutherford's model of the atom where the mass is in the centrally located positively charged nucleus.

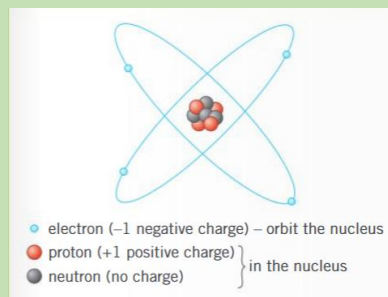
Orbit- moving around in a circular path.

Plum pudding model- J. J. Thomson's model of the atom that had a positively charged cloud with negatively charged electrons spread throughout. The model was called the plum pudding model because the positive medium was like a pudding and the electrons were like the plums or fruit.

Proton- positively charged particles with an equal and opposite charge to that of an electron.

Modern model of an atom

The model of the atom we have today was developed over time with the help of evidence from experiments.



Future experiments may change our understanding and lead us to change this model.

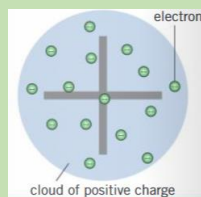
Dalton's model

John Dalton thought the atom as a solid sphere that could not be divided into smaller parts. His model did not include protons, neutrons and electrons.

Plum pudding model

Scientists' experiments resulted in the discovery of charged sub-atomic particle. The first to be discovered were electrons.

The discovery of electrons led to the plum pudding model. A cloud of positive charge with negative electrons embedded in it.

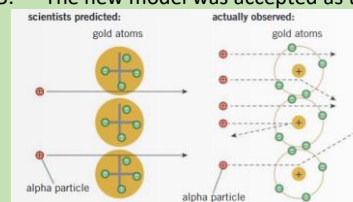


In the plum pudding model the electrons are the plums, and the positive charge is the rest of the cake.

The scattering experiment

Ernest Rutherford designed an experiment to test the plum pudding model.

1. Scientists fired small positively charged particles (alpha particles) at a piece of gold foil only a few atoms thick.
2. They expected the alpha particles to pass straight through the foil.
3. Instead a small number of alpha particles bounced back and some were deflected.
4. This was evidence suggested that the positive charge and the mass of the atom must be concentrated in a very small space at the centre called the nucleus.
5. The new model was accepted as the old model was not supported by the evidence.

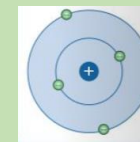


Nuclear model

Scientists replaced the plum pudding model with the nuclear model. They suggested that electrons orbit the nucleus, but not at set distances, and that the mass of the atom was concentrated in the charged nucleus.

Bohr's model

Niels Bohr improved the nuclear model and calculated that electrons must orbit the nucleus at fixed distances. The orbits are called shells or energy levels. These calculations agreed with experimental results.



Protons

Later experiments provided evidence that the positive charge of a nucleus could be split into smaller particles with the opposite charge to electrons. The positive charged particles are called **protons**.

Neutrons

James Chadwick carried out experiments that provided evidence for particles without a charge. This is the neutron and found in the nucleus.

Nucleus

- Has a radius about 10,000 times smaller than the radius of the atom.
- Contains protons and neutrons.
- Is where most of the mass of an atom is concentrated.

Electrons

- Orbit the nucleus at different fixed distances called energy levels.
- Can gain energy by absorbing electromagnetic radiation. This causes them to move into a higher energy level.
- Can lose energy by emitting electromagnetic radiation. This causes them to move to a lower energy level.

Element symbols

- Mass number**- number of protons and neutrons added together.
- Atomic number** – number of protons.

Ionisation
 Atoms can become charged when they lose or gain electrons. This process is called ionisation.

- A positive ion is formed if an uncharged atom loses one or more electrons.
- A negative ion is formed if an atom gains one or more electrons.

Radioactive decay
 Atoms with an unstable nucleus emit radiation. When nuclear radiation is given out the atomic nuclei become more stable. It is a random process. The radiation can knock electrons out of atoms in a process called ionisation.

Activity and count rate
 The activity of a radioactive source is the rate of decay of an unstable nucleus, measured in becquerel (Bq).
 1Bq= 1 decay per second
 Detectors, e.g a Geiger- Muller tube, record a count rate (number of decays detected per second).

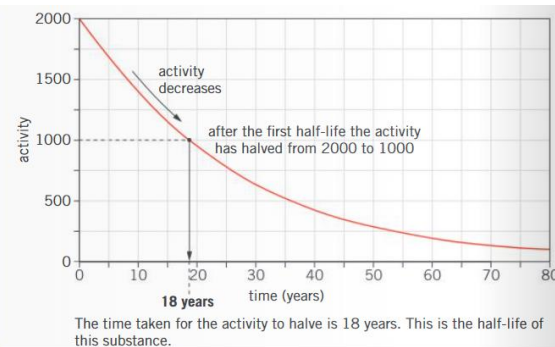
Half-life
 The half-life of a radioactive source is the time

- For half the number of unstable nuclei in a sample to decay

OR

- For the count rate or activity of a source to halve.

The half- life of a source can be found from a graph of its count rate or activity against time.




| Type of radiation | Change in the nucleus | Ionising power | Range in air | Stopped by |
|---|--|------------------------|----------------------------------|--|
| α alpha particle (two protons and two neutrons) | nucleus loses two protons and two neutrons | highest ionising power | travels a few centimetres in air | stopped by a sheet of paper |
| β beta particle (fast-moving electron) | a neutron changes into a proton and an electron | high ionising power | travels \approx 1 m in air | stopped by a few millimetres of aluminium |
| γ gamma radiation (short-wavelength, high-frequency electromagnetic radiation) | some energy is transferred away from the nucleus | low ionising power | virtually unlimited range in air | stopped by several centimetres of thick lead or metres of concrete |

Half-life
 To find the reduction in activity after a given number of half –lives:

1. Calculate the activity after each half life.
2. Subtract the final activity from the original activity.

Net decline as a ratio = reduction in activity/ original activity

Ionising radiation 
 Living cells can be damaged or killed by ionising radiation. The risk depends on the half life of the source.
 Inside the body alpha radiation is very dangerous, it is the most ionising. Outside the body it affects only the skin and eyes as it is the least penetrating.
 Background radiation- natural examples are rocks and cosmic rays. Man made examples are nuclear weapons and accidents.

Irradiation versus contamination
Irradiation- when an object is exposed to ionising radiation. Protect by shielding or moving away from the source.
Contamination- When atoms of a radioactive material are on an object. Object remains exposed to radiation as long as it is contaminated.

Nuclear equations
 Alpha emission. An alpha particle is made of two protons and two neutrons. So when an unstable atom emits an alpha particle the atomic number decreases by 2 and the mass number goes down by 4.

$${}_{90}^{228}\text{Th} \longrightarrow {}_{88}^{224}\text{Ra} + {}_2^4\alpha$$

Beta emission. A beta particle is a high energy electron from the nucleus. A neutron changes into a proton and electron, which is instantly emitted, this is the beta particle. The atomic number goes up by 1 and the mass number is unchanged. The charge of the nucleus is increased, and the mass of the nucleus is unchanged.

$${}_{19}^{40}\text{K} \longrightarrow {}_{20}^{40}\text{Ca} + {}_{-1}^0\beta$$

PHYSICS SEPARATES ONLY
Nuclear radiation in medicine
 Gamma emitting tracers are injected or swallowed by a patient. Gamma cameras can then create an image showing where the tracer has gone. The tracer must have a short half- life for safety, to limit the patients' dose.
 Control or destruction of unwanted tissue. Narrow beams of gamma radiation can be focused on tumours. Gamma is used as it can penetrate the body.

PHYSICS SEPARATES ONLY
Nuclear fission- when a large unstable nucleus absorbs an extra neutron and splits into smaller nuclei of roughly equal size.
 During fission gamma radiation and energy is released.
 Two or three fission neutrons are released and go on to cause a chain reaction. The reaction is controlled by control rods which can absorb neutrons.
 Spontaneous fission is rare and occurs when the nucleus splits without absorbing a neutron.
Two fissionable isotopes Uranium 235 (most common fuel in nuclear reactors) and plutonium 239.
Nuclear Fusion- when two light nuclei join together and make a heavier one. Energy is released. This takes place in stars/ the sun.

Keywords

- Attraction-** a force that pulling together
- Electromagnet-** an insulated wire wrapped around an iron bar that becomes magnetic when there is a current in the wire.
- Induced magnet-** magnetisation of an unmagnetised magnetic material by placing it in a magnetic field.
- Magnetic field-** The space around a magnet or current- carrying wire.
- Permanent-**
- Repulsion-** a force pushing apart
- Solenoid-** a long coil of wire that produces a magnetic field in and around the coil when there is a current in a coil.
- Transformer**
-Electrical device used to change an alternating voltage.
- Step down transformer**
Electrical device that is used to step down the size of an alternating potential difference.
- Step up transformer**
Electrical device that is used to step up the size of an alternating potential difference.

Magnets

Magnets have a north and a south pole. When two magnets are brought close together, they exert a non- contact force on each other. If the poles are the same (N and N or S and S) they will repel each other.

If the poles are different (N and S) they will attract each other.

There are four magnetic materials. They are iron, steel, nickel and cobalt.

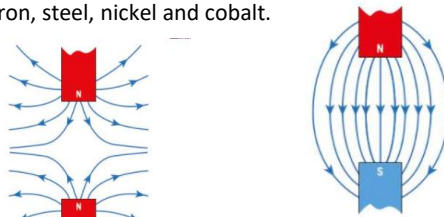
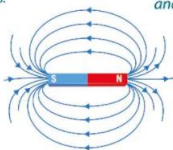


Figure 4 The shape of the magnetic field between two north poles.

Figure 3 The shape of the magnetic field between a north pole and a south pole.

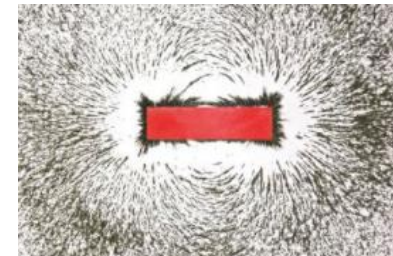
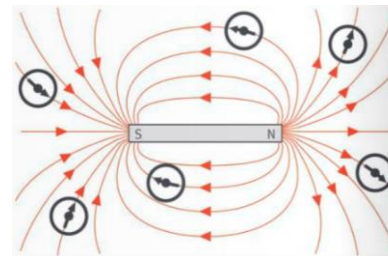


Magnetic fields

A magnetic field is the region around a magnet where another magnet or magnetic material will experience a force due to the magnet.

A magnetic field can be represented by magnetic field lines. They show the direction of the magnetic field. Field lines always point from the north pole into the south pole. The closer the field lines are together the stronger the magnetic field.

A plotting compass has a small bar magnet and can be used to plot the magnetic field lines around a magnet. When drawing field line ALWAYS include an arrow to show the direction of the magnetic field. Iron filings can also be used to find the magnetic field.



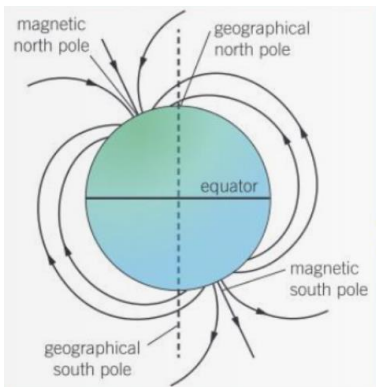
Induced and permanent magnets

A permanent magnet produces its own magnetic field which is always there. An induced magnet is an object that becomes magnetic when it is placed in a magnetic field. The force between an induced magnet is always attraction (even if you change ends it will still attract).

Magnetic fields continued

If a plotting compass is not near a magnet, a compass will line up with the Earth's magnetic field, providing evidence that the Earth's core is magnetic.

As a compass points towards a south pole, the magnetic pole near the Earth's geographical North pole is actually a south pole

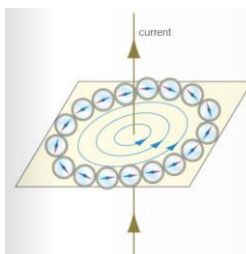


Electromagnets

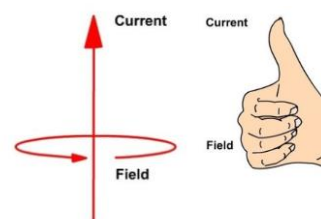
If an electric current flows through a wire (or other conductor), it will produce a magnetic field around the wire. The field strength increases:

- With a greater current
- Close to the wire.

Reversing the direction reverses the direction of the field.



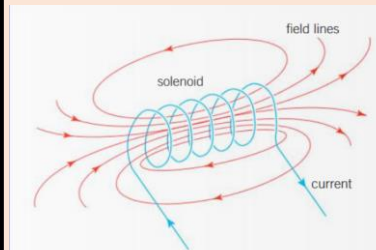
The Right Hand Grip Rule



Solenoids

A solenoid is a cylindrical coil of wire. Bending a current- carrying wire into a solenoid increases the strength of the magnetic field produced. The shape of the magnetic field around a solenoid is similar to that of a bar magnet. Inside the solenoid the magnetic field is strong and uniform.

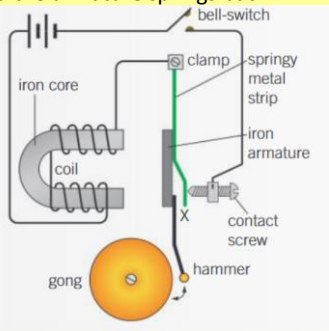
If you place an iron core inside a solenoid you increase the strength. This is now an electromagnet.



- ✓ Electromagnets can be turned on and off.
- ✓ The strength can be adjusted by adjusting the current

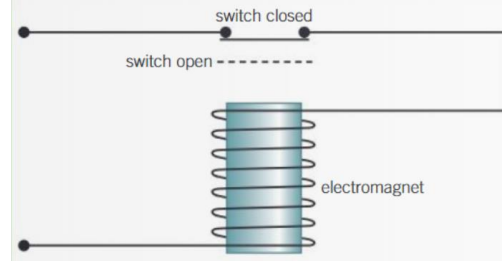
Physics separates only Uses of electromagnets

Scrap yard crane- heavy objects can be lifted.
 Electric bell- when the switch is pressed turning the electromagnet on. The iron armature is attracted to the electromagnet. Making the hammer strike the gong.
 The circuit is broken so the electromagnet stops working and the armature springs back.



Physics separates only A circuit breaker

A switch in series with an electromagnet.
 The switch is held closed by a spring, but if the current becomes too large the electromagnet becomes strong enough to pull the switch into the open position, turning the current off.



HT The motor effect

When a current carrying wire is placed in a magnetic field it experiences a force.

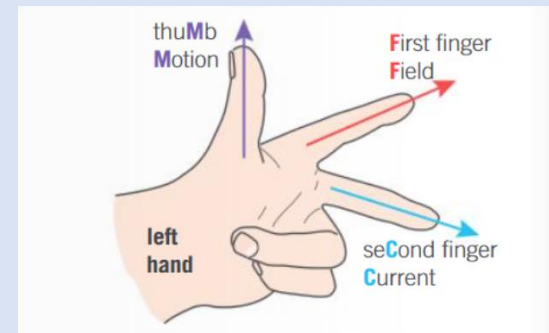
The force is due to the interaction between the field created by the current in the wire and the magnetic field in which the wire is placed.

The magnet producing the field will experience an equal-sized force in the opposite direction.

The direction of the force is reversed if the current is reversed or if the direction of the magnetic field is reversed.

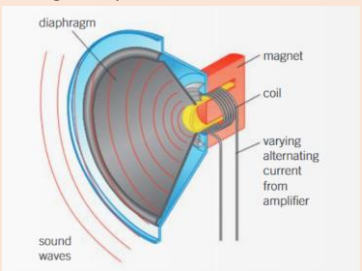
Flemings left- hand rule

The direction of the force/ motion of the wire is always at right angles to both the current and the magnetic field. It can be worked out using Flemings left hand rule:



HT Loudspeaker

Moving coil loudspeaker and headphones use the motor effect to convert changes in current in a coil of wire to changes of pressure in sound waves.

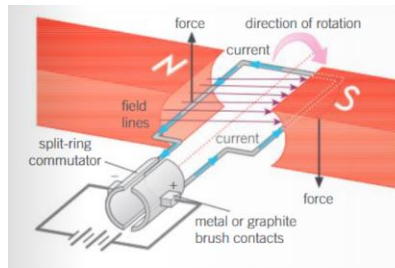


A coil of wire is placed inside a permanent magnet (so it is in a magnetic field) and is attached to a diaphragm.
 When a current flows through the coil, it experiences a force due to the motor effect.

This causes the diaphragm to move.
 When the current changes direction the force on the coil also changes direction, causing the diaphragm to move in the opposite direction.
 Variations in the current make the coil and diaphragm vibrate.
 These vibrations create variations of pressure in the air which form a sound wave.
 The frequency of the sound wave is the same as the frequency of the alternating current supplied to the coil.

HT Electric motors

A current carrying wire in a magnetic field will tend to rotate. This is the basis of an electric motor.
 The diagram shows a simple motor.



When the current in the wire is spins because:

- Each side of the coil experiences a force due to being a current carrying conductor in a magnetic field.
- The force on each side of the coil is in opposite directions.

The split ring commutator keeps the motor spinning in the same direction. The ends swap contacts with the power supply every half turn so the current always flows in the same direction.
 The motor can spin faster by increasing the current or the strength of the magnetic field.

Magnetic flux density:

The magnetic flux density of a field is a measure of the strength of the magnetic field.
 For a current carrying wire at right angles to a magnetic field, the size of the force on it is given by the equation:

$$F = B \times I \times L$$

Where:

F is the force in N

B is the magnetic flux density in T

I is the current in A

L is the length in m

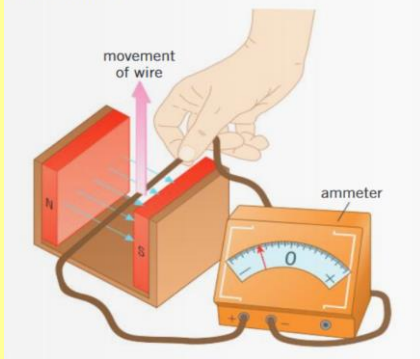
The generator effect

A potential difference is induced (created) across the ends of a conductor if:

- The conductor is moving relative to a magnetic field.
- The magnetic field around the conductor changes.

In a complete circuit there will be an induced current.

moving a wire in a magnet field so that it cuts across the field lines

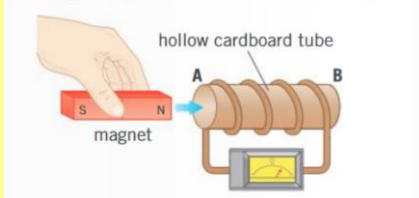


The direction of the induced potential differed and induced current reverses if:

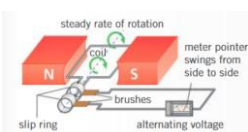
- The movement of the wire or magnet is reversed
- The polarity of the magnet is reversed.
- If the reversal happens repeatedly, an alternating current/ alternating potential difference is produced.
- The induced potential difference/ current will increase if the speed of the movement, strength of the magnetic field of the number of turns in the coil are increased.

An induced current will generate a magnetic field around the conductor that always opposes the original change producing it. This acts to slow down or stop any movement or change in magnetic field.

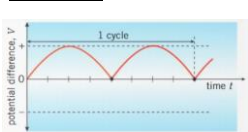
moving a magnet in and out of a coil of wire.



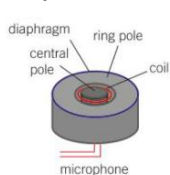
Alternator



Dynamos

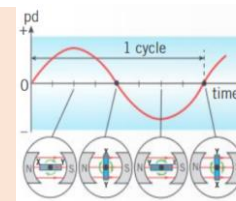


Microphones



Uses of the generator effect

Alternator- When the coil is made a turn in the magnetic field a current is induced in the coil. The ends of the coil are each connected to a slip ring. This keeps a continuous connection with the coil and lets the current flow out of the coil through the brushes and into the circuit.

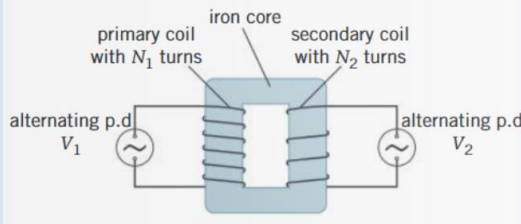


The current changes direction every half turn. Maximum induced p.d. – when the plane of the coil is parallel to the field lines. Induced p.d. is 0 when the coil is perpendicular to the magnetic field.

Dynamo- The split ring commutator makes the ends of the coil swap contacts with the circuit every half turn, so the current always flows in the same direction relative to the magnetic field. The induced p.d. in a dynamo varies from zero to a max. value twice each cycle but never goes in the opposite direction.

Microphone- A microphone uses the generator effect to convert variations in pressure in a sound wave into variations in electrical current. The coil is attached to a diaphragm. The coil is placed inside a permanent magnet. When a sound wave hits the diaphragm, it vibrates, making the coil vibrate inside the magnetic field of the magnet. This induces a current in the coil. The alternating p.d. induced in the coil has the same frequency as the sound waves which make the diaphragm vibrate.

Transformers



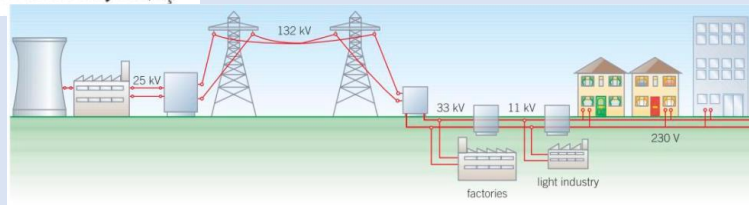
A transformer is a device that can change the size of an alternating potential difference. A transformer consists of two coils wound around an iron core. Iron is used because it is easily magnetised and demagnetised. As there are less turns/ coils on the secondary coil this is a step-down transformer.

AN alternating current passes through the primary coil producing an alternating magnetic field in the iron core. The alternating magnetic field in the iron core induces an alternating p.d. in the secondary coil.

Equations you will be given and expected to apply to questions:

$$\frac{\text{potential difference across primary coil, } V_p}{\text{potential difference across secondary coil, } V_s} = \frac{\text{number of turns on primary coil, } n_p}{\text{number of turns on secondary coil, } n_s}$$

$$\text{primary potential difference, } V_p \times \text{primary current, } I_p = \text{secondary potential difference, } V_s \times \text{secondary current, } I_s$$



Keywords

Alternating current- electric current in a circuit that repeatedly changes direction

Electromagnetic wave- Electric and magnetic disturbances that transfer energy from one place to another

Electromagnetic spectrum- the continuous spectrum of electromagnetic waves

Oscillation- a movement two and fro

Radiation dose- amount of radiation a person receives

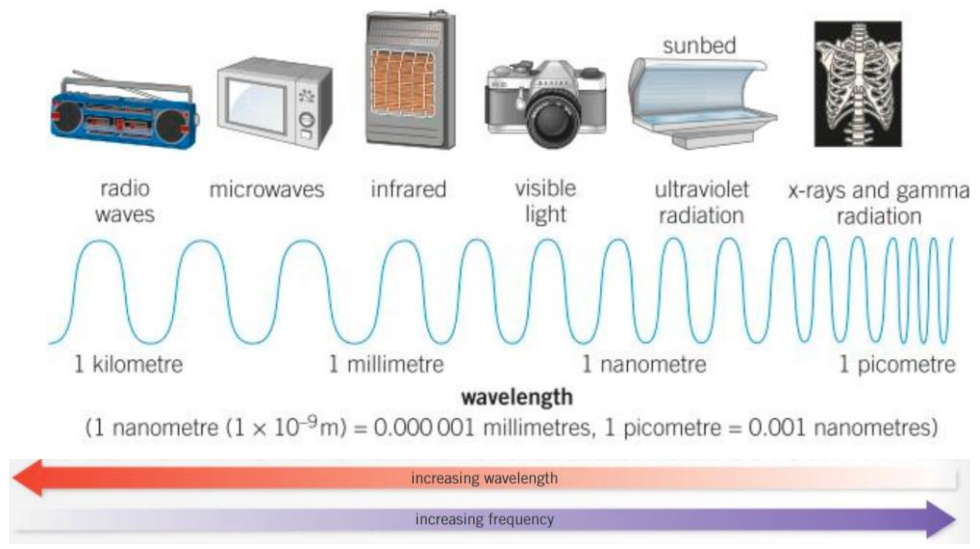
Reflection- the change of direction of a wave at a boundary when the ray of light or wave stay in the incident medium

Refraction- The change of direction of a wave when it passes across a boundary between two transparent substances

Transverse- A wave where the source of oscillation is perpendicular to the direction the energy transfer

Electromagnetic spectrum

Electromagnetic (EM) waves are transvers waves that transfer energy from their sources to an absorber. EM waves form a continuous spectrum and are grouped by their wavelengths and frequencies. All EM waves travel at the speed of light through air or a vacuum. $3 \times 10^8 \text{m/s}$ or $300.000.000 \text{m/s}$.



Visible light

Remember the order ROYGBIV. Red light has the longest wavelength and violet has the shortest wavelength.

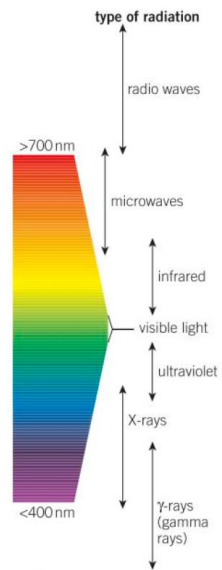
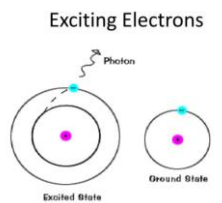


Figure 2 The electromagnetic spectrum with an expanded view of the visible range

Properties of EM waves

EM waves of a wide range of frequencies can be absorbed or produced by changes inside an atom or nucleus. For example gamma rays are produced by the changes in the nucleus of an atom.

When electrons in an atom move down between energy levels, they emit EM waves



Properties of radio waves HT

Radio waves can be produced by oscillations in an electrical circuit.

When radio waves are absorbed by a receiver aerial, they may create an alternating current with the same frequency as the radio waves.

Equation to remember

Wave speed, frequency and wavelength can be linked in the following equation:

$$v = f \times \lambda$$

Where:
 v = wave speed in m/s
 F = frequency in Hz
 λ = wavelength in m

Never have lower case h or a capital z!

Properties of EM waves

EM waves have many practical applications, but exposure to some EM waves (such as those that are forms of ionising radiation) can have hazardous effects.

Radiation dose (in sieverts) is the risk of harm from the exposure of the body to a particular radiation.

Dangers of EM waves

Gamma radiation is dangerous. It can kill cells or cause them to become cancerous as it is ionising radiation.

X-rays and ultraviolet radiation (UV) can also harm living cells. UV can damage eyes and cause **skin** cancer.

The level of danger depends on the frequency of the radiation and the size of the dose.

| Type of EM wave | Use | Why is it suitable for this use? | Hazards |
|------------------|--|---|--|
| radio waves | television and radio signals | <ul style="list-style-type: none"> can travel long distances through air longer wavelengths can bend around obstructions to allow detection of signals when not in line of sight | can penetrate the body and cause internal heating |
| microwaves | satellite communications and cooking food | <ul style="list-style-type: none"> can pass through Earth's atmosphere to reach satellites can penetrate into food and are absorbed by water molecules in food, heating it | |
| infrared | electrical heaters, cooking food, and infrared cameras | <ul style="list-style-type: none"> all hot objects emit infrared waves – sensors can detect these to turn them into an image can transfer energy quickly to heat rooms and food | can damage or kill skin cells due to heating |
| visible light | fibre optic communications | <ul style="list-style-type: none"> short wavelength means visible light carries more information | can damage the retina |
| ultraviolet (UV) | energy efficient lights and artificial sun tanning | <ul style="list-style-type: none"> carries more energy than visible light some chemicals used inside light bulbs can absorb UV and emit visible light | can damage skin cells, causing skin to age prematurely and increasing the risk of skin cancer, and can cause blindness |
| X-rays | medical imaging and treatments | <ul style="list-style-type: none"> pass easily through flesh, but not denser materials like bone high doses kill living cells, so can be used to kill cancer cells – gamma rays can also be used to kill harmful bacteria | form of ionising radiation – can damage or kill cells, cause mutation of genes, and lead to cancers |
| gamma rays | | | |

Keywords

Braking distance— the distance a car travels while under the braking force or while the brakes have been applied

Inertia- an objects tendency to reman in a steady state

Momentum- mass x velocity

Reaction time- the time for you to react to a stimuli. It varies from person to person but ranges from 0.2-0.9s

Stopping distance- braking distance + thinking distance

Thinking distance- the distance the car travels while the driver reacts

Inertial mass-Is a measure of the difficulty of changing the object's velocity

Recoil- rebound or movement backwards

Newton's First law
 Newton's first law says that the velocity, speed and or direction will only change if a resultant force is acting on it.

This means that if the **resultant force is zero**:

- An object at rest will remain at rest (stationary).
- A moving object will continue moving at the same velocity in a straight line.

If the resultant force is **not zero**, the objects speed and or direction will change. An object may accelerate or decelerate.

When a car is travelling at a constant speed the resistive forces are balances with the diving force (this is sometimes called thrust from the engine).


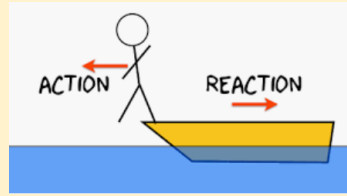


Figure 1 Constant velocity

Newton's Third law
 Newton's Third Law states that whenever two objects interact, they exert equal and opposite forces on each other.



Every action has an equal and opposite reaction.

Each pair of forces:

- Are the same size as each other
- Are in the opposite direction
- Are the same type as each other e.g. two gravitational forces or two electrostatic forces

Stopping distance
 The distance it takes for a car to stop is the stopping distance.

Stopping = thinking + braking distance

Thinking distance-the *distance* the car travels while the driver reacts.

Braking distance-the *distance* the car travels while the driver brakes.

Factors that affect:

| | |
|---|-----------------------------|
| Braking distance | Thinking distance |
| Speed | Tiredness |
| Road conditions (ice, snow rain-must state this!) | Drugs and alcohol |
| Condition of brakes or tyres. | Distractions such as phones |

Factors that reduce friction increase the braking distance. Less friction can increase skidding.

HT Inertia
 The tendency for an object to remain at rest or to continue in uniform motion is called inertia. The inertial mass of an object is the measure of the difficulty of changing the object's velocity.

Inertial mass= force/ acceleration

Newton's Second law
 Newton's Second Law states that:

- the acceleration of an object is proportional to the force on the object.

$$a \propto F$$

- Is inversely proportional to the mass of the object

$$a \propto \frac{1}{m}$$

Remember from previous topics:
 Velocity is *speed* in a given *direction*. It is a vector quantity.
 A change in velocity means an object:

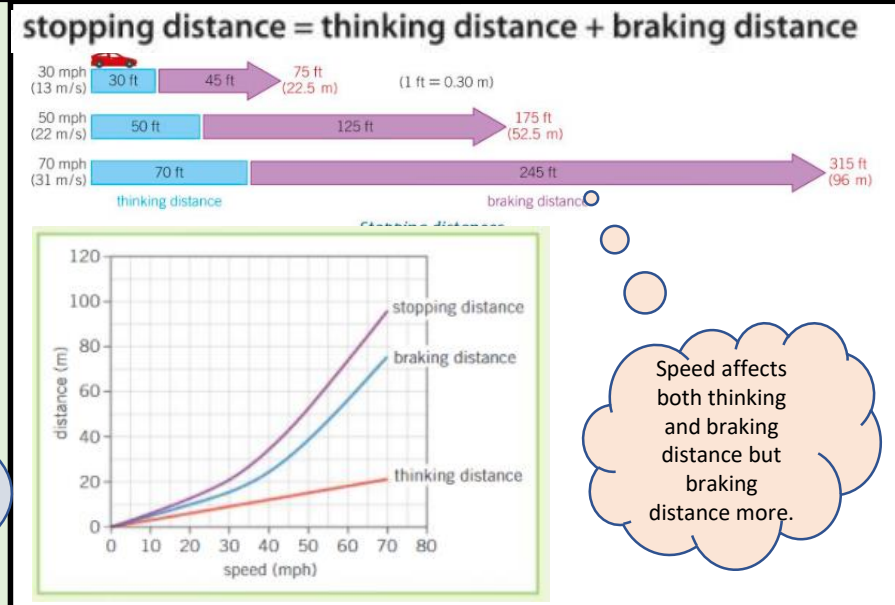
- Starts to move
- Stopes moving
- Speed up
- Slows down
- Changes direction

They are then linked in the equation:

$$F = m \times a$$

Where
 F= force in N
 m= mass in kg
 a= acceleration in m/s²

Use a mnemonic
 Fling my auntie



Forces and elasticity Required practical

| | |
|-----------|--|
| Equipment | Safety glasses Spring Slotted masses 1m ruler Clamp stand |
| Method | <ol style="list-style-type: none"> 1. Attach the spring to the clamp stand by hanging it off a clamp and let the spring hang freely over the side of the bench. 2. Use the two clamps to hold the ruler vertically, near but not touching the spring. You will use this to measure the length of the spring. 3. Measure the length of the spring with no force acting on it. 4. Hang the slotted masses from the spring and measure the new length of the spring. Record the length of the spring and the mass suspended from it. Work out the extension of the spring. 5. Continue adding slotted masses and record the new mass each time and work out the extension. 6. Plot the results on a graph. Extension v weight. |
| Safety | Safety glasses must be worn throughout Carefully place the slotted masses on the spring |

HT Momentum

Momentum is the property of all moving objects. It is a vector quantity
Momentum depends on the mass and velocity of the object.

$$p = m \times v$$

Where:

p= momentum in kg m/s

m= mass in kg

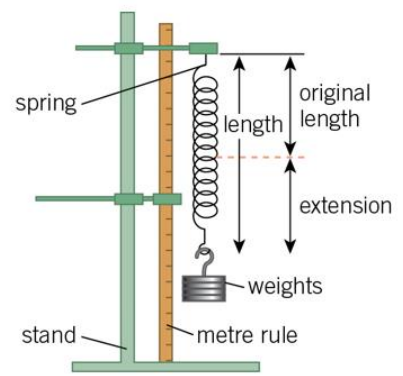
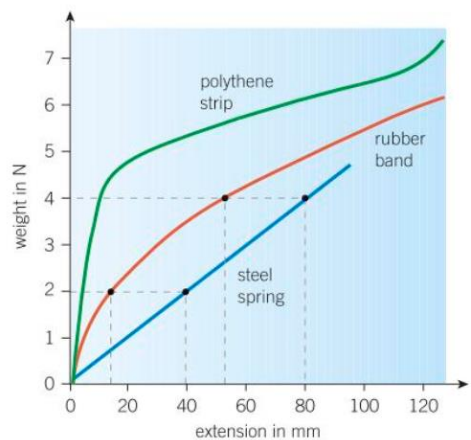
v= velocity on m/s

The Law of Conservation of Momentum says that:
In a closed system, the total momentum before an event (e.g., a collision or an explosion) is equal to the total momentum after the event.

If two moving objects collide the law of conservation can be written as:

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

m_1 = mass of object 1 m_2 = mass of object 2
 u_1 = initial velocity of object 1 u_2 = initial velocity of object 2
 v_1 = final velocity of object 1 v_2 = final velocity of object 2



F=k x e

Where:
 F= force in N
 k= spring constant in N/m
 e=extension in m

HT SUVAT

The deceleration of a vehicle can be calculated using the following equation:

$$v^2 = u^2 + 2as$$

You do not need to remember this equation it will be given to you. You will need to be able to re-arrange it, know units and know that the acceleration close to the surface of the Earth is 9.8ms²

PHYSICS SEPARATES ONLY

Momentum

If an object is moving an unbalanced force acting on it will change its momentum.

Since $F = ma$ and $a = \frac{\Delta v}{t}$, we can write:

$$F = \frac{m\Delta v}{t}$$

where $m\Delta v$ is the change in momentum of an object.

The greater the time for the change in the momentum:

- The smaller the rate of change of momentum
- The smaller the force experienced

Vehicle safety features increase the time take for the change in momentum:
 Aire bags, seat belts, crumple zones, cycle helmets and crash mats for gymnastics.



Key vocabulary:

- Vector- a quantity with direction and magnitude
- Scalar- a quantity with magnitude only
- Magnitude- size or amount of a physical quantity
- Displacement- distance in a given direction
- Velocity- speed in a given direction
- Speed- how fast something is moving
- Acceleration- change of velocity per second
- Deceleration- negative acceleration, used for any situation where an object slows down
- Gradient- (of a straight line graph) Change of the quantity plotted on the y-axis divide by the change of the quantity plotted on the x axis
- Tangent- a straight line drawn to touch a point on a curve, so it has the same gradient as the curve at that point
- Independent variable- the one you chose to vary in an investigation
- Dependent variable- used to judge the effect of varying the independent variable
- Continuous data- any numerical value
- Categorical data- one that is best described by a word or a label

Equations to remember:

$$v = \frac{s}{t}$$

$$a = \frac{v - u}{t}$$

Equation you will be given and expected to use:

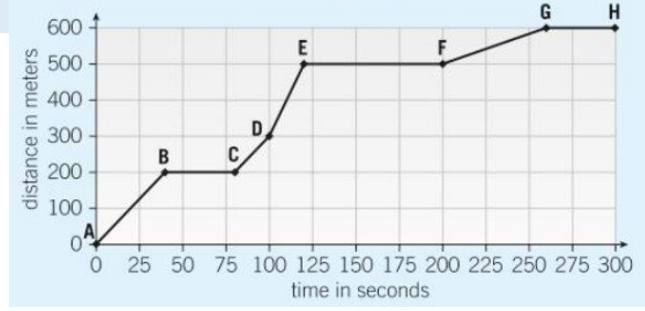
$$[v^2 - u^2 = 2as]$$

Speed, distance and time:

You can calculate the speed of an object by using the equation speed= distance/ time. If you have a distance time graph you can get the distance and the time for each section and therefore calculate the speed.

The gradient on a distance time graph represents the speed.

A-B shows constant speed as it is a straight line
 B-C shows the object is stationary as the distance is not changing
 C-D is also constant speed but as the gradient is steeper is a greater constant speed

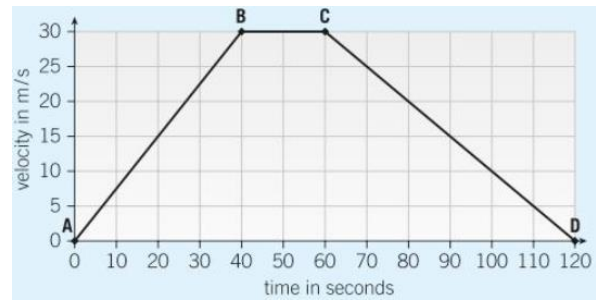


Acceleration, change in velocity and time:

You can calculate the acceleration of an object if you know the change in velocity and the time it takes for the change in velocity. These can be taken from a velocity- time graph.

The gradient of the line on a velocity- time graph represents the acceleration.

A-B shows constant acceleration
 B-C shows constant speed
 C-D shows deceleration
 A steeper gradient shows a greater constant acceleration



Higher tier
 The area under the velocity-time graph represents the distance travelled in a direction (displacement). Work out the area of regular shaped objects.

Key Information to remember:

Typical speeds of people:

- walking ~ 1.5 m/s
- running ~ 3 m/s
- cycling ~ 6 m/s

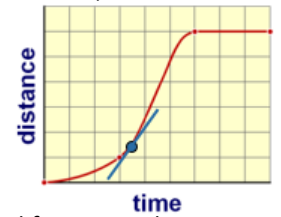


Near the Earth's surface any object falling freely under gravity has an acceleration of about 9.8 m/s².

HT An object moving in a circle has a direction of motion that changes continuously as it goes round. So its velocity is not constant even if its speed is constant, this is because the direction is continuously changing direction.

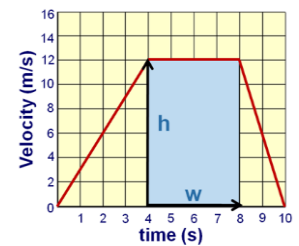
HT only

If the graph has curved sections, the motion is not uniform.



To find the speed for a curved part of the graph you need to draw a tangent. The would out the speed by doing $\Delta Y / \Delta X$

Work out the distance travelled, the area under the V-T graph. Calculate the area of the rectangles and the right-angled triangles.



Keywords

- Concave-** a lens that curves inwards.
- Converge-** where lines meet.
- Convex-** a lens that curves outwards.
- Diffuse-** spread out. Diffuse reflection scatters light.
- Diverge-** spread out or go in a different direction.
- Focal length-** the distance from the centre of a lens to the principal focus.
- Opaque-** An object that light cannot travel through.
- Real image-** An image from a lens that can be projected on a screen.
- Specular reflection-** reflection from a smooth surface.
- Translucent-** An object that allows light to travel through, but the light is scattered or refracted.
- Transparent-** An object that transmits all the incident light that enters the object.
- Virtual image-** An image seen in a lens or mirror, from which the light rays appear to be coming from after being refracted by a lens or reflected by a mirror.

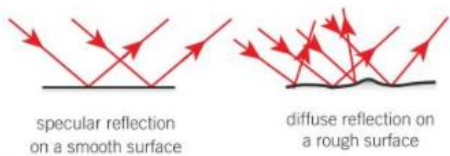
Visible light

Each colour within the visible light spectrum has its own narrow band of wavelength and frequency.

Reflection from:

- A smooth surface in a single direction is called specular reflection
- A rough surface causes scattering of light (diffuse reflection)

Transparent objects transmit visible light
 Translucent objects transmit visible light, but light rays are scattered or refracted inside them.
 Opaque objects do not transmit visible light but absorb and reflect it. The colour of an object depends on the wavelengths they transmit and reflect.



Reflection

The normal at a point on a mirror is a line drawn perpendicular to the mirror
 The law of reflection states that the angle of incidence = the angle of reflection.
 For a light ray reflected by a plane (flat) mirror:

- The angle of incidence is the angle between the incident ray and the normal.
- The angle of reflection is the angle between the reflected ray and the normal.

Real and virtual images

An image formed in a plane mirror is a **virtual image**. It is upright (the same way up) and laterally inverted (back to front). A virtual image is formed at a place where light appears to have come from. It cannot be projected on a screen. It appears to come from behind the lens.

An image that can be projected on a screen is a **real image** because it is formed by focusing light rays onto the screen.

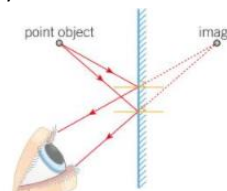
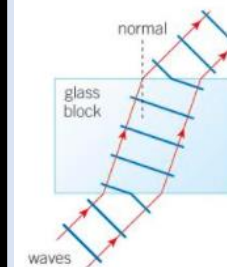


Figure 3 Image formation by a plane mirror

Refraction

Refraction is the change of direction of waves when they travel across a boundary from one medium to another, this is because the speed of light changes at the boundary.



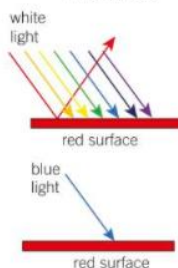
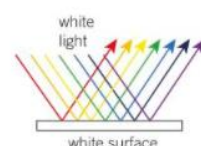
- The light ray moves towards the normal when light travels from air into glass.
- The light ray travels away from the normal when light travels from glass to air.

This is because light travels more slowly in glass than air.

If the ray of light travelled along the normal line it would pass straight through as the wave fronts would all slow down at the same time and would not experience a change in direction.

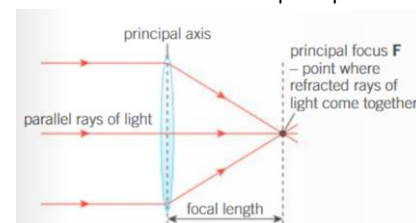
Colour

The wavelength of light increases from violet to red across the spectrum.
 The colour of the surface depends on the pigments of the surface materials and the wavelength of light the pigments absorb.

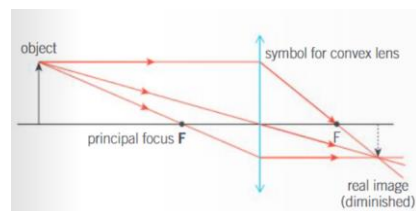


Convex lenses

Convex lenses curve outwards. They make parallel rays of light converge at a point. Focal length is the distance from the centre of the lenses to the principal focus.

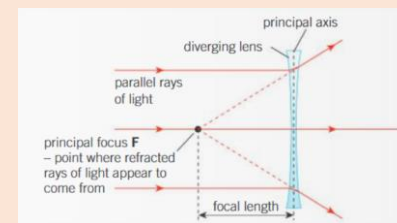


Images formed by convex lenses can be real or virtual.

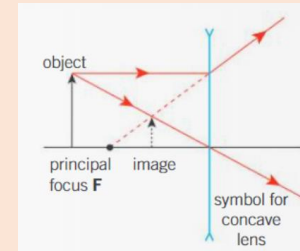


Concave lenses

Concave lenses curve inwards. They make parallel rays of light diverge (so they appear to have come from a point).



Images formed by concave lenses are always virtual.



Key vocabulary:

- Vector- magnitude and direction
- Scalar- direction only
- Magnitude- size
- Displacement- distance in a direction
- Newton- unit of force
- Friction
- Resultant force
- Balanced forces
- Unbalanced forces
- Weight a force in N
- Air resistance
- Stretching force (tension)
- Contact forces
- Non- contact forces
- Magnetic force
- Electrostatic force
- Gravity or gravitational field strength. On Earth 9.8N/kg

- Centre of mass
- Equilibrium
- Symmetrical objects
- Parallelogram of forces

$W = m \times g$

- W is weight, N
- M is mass, kg
- G is gravitational field strength is 9.8N/kg on Earth

Physics only

- Moments
- Load
- Effort
- Force multiplier
- Pivot

Forces between objects
Newton's third law of motion:
When two objects interact with each other, they exert equal and opposite forces on each other.



Vector quantity has magnitude (size) and direction
Scalar quantity has magnitude only

Resultant forces
Resultant force is a single force that has the same effect as all the forces acting on the object.

Balanced forces, resultant force is zero:

- objects at rest remains stationary
- object moving keeps moving at a constant speed

Unbalanced forces

- Depends on the size and direction of the resultant force

Centre of mass
 The centre of mass or the centre of gravity is if you think of the weight of an object as if it acts at a single point.

The centre of mass of an object is the point at which its mass can be thought of as being concentrated.

Figure 2 Suspension a In equilibrium b Non-equilibrium

Centre of mass
The centre of mass of a uniform ruler is at its midpoint.

When an object is freely suspended, it comes to rest with its centre of mass directly underneath the point of suspension.

For a flat object that is symmetrical, its centre of mass is along the axis of symmetry. If the objects has more than one axis of symmetry, its centre of mass is where the axes of symmetry meet.

Figure 3 Symmetrical objects

Balanced forces
Same size and opposite direction

Figure 2 Overcoming friction

When the crate is pushed across the floor at a constant speed without changing direction, the push force on it is equal in size and opposite direction to the friction of the floor on the crate.

Unbalanced forces
 The movement depends on the size and direction of the resultant force.

When a jet plane takes off the thrust from the engine is greater than the air resistance or drag on it. The plane is accelerating.

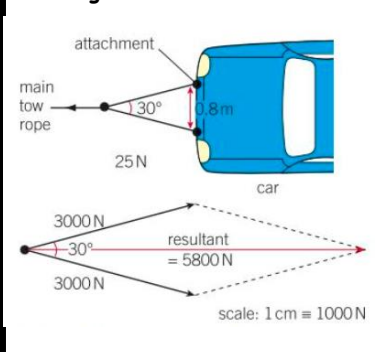
Figure 3 A passenger jet on take-off

A free body diagram show the forces acting on it.

Parallelogram of forces
HT
 The parallelogram of forces is a scale diagram of two force vectors

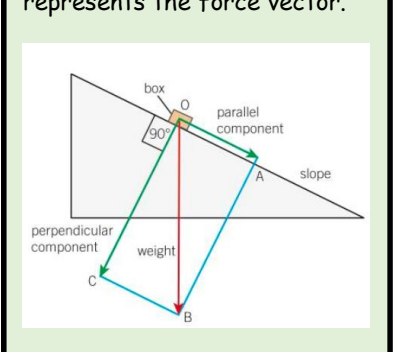
The parallelogram of forces is used to find the resultant of two forces that do not act along the same line

The resultant is the diagonal of the parallelogram that starts at the origin of the two forces



Resolution of forces HT
 Resolving forces means finding perpendicular components that have a resultant force that is equal to the force.

To resolve a force in two perpendicular directions, draw a rectangle with adjacent sides along the two directions so that the diagonal represents the force vector.



Keywords
Altitude- or height. It is the distance measured vertically up.
Atmosphere- layer of gases surrounding a planet.
Atmospheric pressure- the pressure exerted by the weight of the atmosphere. At sea level has a value of 101 kPa.
Density- mass per volume.
Displace- to move or take over the position of.
Fluid- a substance that can flow. A liquid or a gas.
Gravitational field strength- The strength of gravity. On Earth its value is 9.8N/kg
Pascal- Unit of pressure.
Pressure- the force acting per square metre.
Upthrust- the upward force that acts on a body submerged in a fluid.

Pressure in a liquid
 The pressure in a liquid increases with the depth of the liquid because:

- The pressure at any point in a liquid is due to the weight of the liquid above that point.
- The weight of the liquid depends on its density.

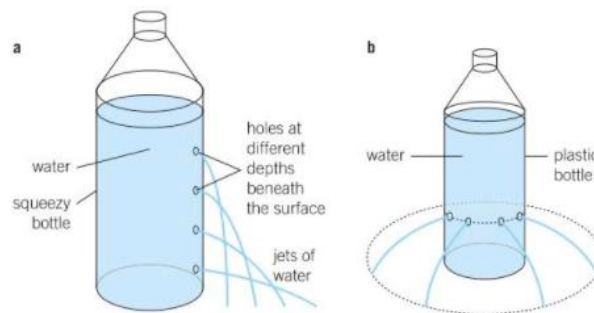


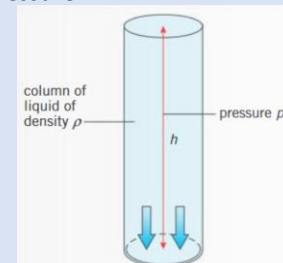
Figure 2 Pressure in a liquid at rest
a Pressure increases with depth **b** Same pressure at the same depth

Calculating pressure in a column of water
 The pressure cause by a column of liquid can be calculated using:

$$p = h \times \rho \times g$$

Where:
 p= pressure in Pa
 H= height in m
 ρ= is density in kg/m³
 g= gravitational field strength in N/kg

To calculate the difference in pressure at different depths in a liquid calculate the pressure at each depth (h) and subtract the smaller value from the larger.



Fluids
 A fluid is a substance that can flow (liquids or gases).
 When the particles of a fluid collide with a surface such as a container, they exert a force at right angles to the container. This causes pressure.
Pressure is the force acting per square metre on a surface.
 The unit of pressure is pascal, Pa.

Notice capital P and lower-case a.

You must remember the following equation:

$$\text{pressure, } p \text{ (pascals, Pa)} = \frac{\text{force, } F \text{ (newtons, N)}}{\text{area, } A \text{ (metres squared, m}^2\text{)}}$$

Upthrust
 An object that is partially or completely submerged in a fluid experiences a greater pressure on its bottom surface than its top surface.
 The difference in pressure creates an upwards resultant force called **upthrust**.

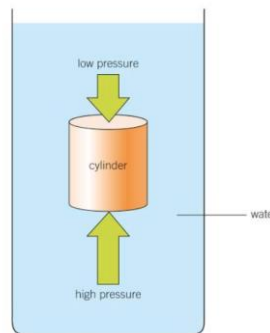


Figure 2 Explaining upthrust

Floating and sinking
 An object will sink if its weight is greater than upthrust.
 An object will float if its weight is equal to upthrust.
 Whether an object floats or sinks depends on its density because:

- The upthrust on an object is equal to the weight of the fluid it displaces (pushes out of the way).
- An object that is more dense than the fluid will sink because its weight is greater than the weight of the fluid it displaces (and so greater upthrust).
- An object that is less dense than the water will float because its weight is less than the weight of the fluid displaced (and so less than upthrust.)



Atmospheric pressure
 The Earth is surrounded by a thin layer of air known as the atmosphere. There is pressure in the atmosphere known as atmospheric pressure.
 Atmospheric pressure is caused by air molecules colliding with surfaces. This decreases as height increases because:

- There are fewer air molecules in total above the surface as height increases, so the weight of the air above decreases.
- Density of the atmosphere decreases with altitude, so there are fewer air molecules per cubic metre.

