Year 10 Cycle 1 Knowledge Organisers

Contents

LO: How to use a knowledge organiser so that you don't forget what you've learnt?

SUBHEADINGS

1. Look at the subheading.
2. Write down everything you know about that topic without looking at the KO.
3. Check what you've missed; add this to your notes in a different colour.
4. Do something else (e.g. revise something else).
5. Return to this and repeat from the beginning.

BIG IDEAS

1. Look at the list of ideas the writer is trying to convey.
2. For each idea, write down HOW the writer does this.

MINDMAP

1. Create a mindmap of what you know about the topic areas on the page *from memory*.
2. Check your mindmap against the KO.
3. Add 5 things that you've missed using a different colour pen.
4. Do something else (e.g. revise something else).
5. Repeat.

PICTURES

1. Look at just the pictures.
2. Explain how each of these pictures is relevant to the knowledge on the page.

VOCABULARY

1. Cover the vocabulary and definition columns. Try to work out what the missing word is in the example. Check. Move to the next word. Repeat until you can do this with all the words you've studied so far.
2. Try the same as above, but this time by looking at just the definition column.
3. Try the same as above, but this time just look at the vocabulary and try to explain what the definition is.

Questions

1. Cover the explanation.
2. Look at and write answers to the questions.
3. Check your answers; add anything you missed; correct anything you got wrong.
4. Do something else (e.g. revise something else).
5. Return to this and repeat from the beginning.

'Remains' – Knowledge Organiser

What happens in the poem? The speaker and two other soldiers are sent to tackle some looters who are robbing a bank. They open fire on a looter who is running away. The looter is seriously wounded He is carried away in the back of a lorry. The soldier has to walk past the blood stain left on the ground week after week. He returns home and is haunted by the memory of what he has done, reliving it again and again. He drinks and takes drugs in an attempt to forget what happened. However, he is unable to forget the looter and what he did. The memory remains stuck in his mind.

What is the context of the poem?

- Simon Armitage wrote 'Remains' (and other poems) for a Channel 4 programme called 'The Not Dead'.
- He has never been to war himself and has never been a soldier.
- To write the poems, he interviewed a number of soldiers who have survived war (in Iraq, Afghanistan, the Falklands etc.) i.e. the 'not dead'.
- The poems show the suffering soldiers experience long after wars have finished.
- 'Remains' is heavily based on the experience of Guardsman Tromans who fought in the Iraq war.
- Tromans shot a looter in Iraq and suffers from PTSD.

What is the significance of the title? The poem is about PTSD – in other words, how the traumatic experience of war REMAINS with the soldier. It could also refer to the human REMAINS – the image of the looter – that the soldier obsesses over so much as part of his PTSD.

What is a central idea in this poem? As is implied by the title, the poem explores the trauma experienced by soldiers and the terrible impact of PTSD on survivors long after the battle has ended.

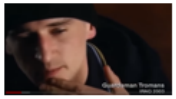
What other ideas are explored in the poem?

- War can cause suffering beyond the battlefield.
- War is damaging.
- Guilt is powerful and can overwhelm us.
- War can result in us dehumanising the enemy.
- War can cause us to act in ways we later regret.
- Memory can have a powerful effect on us.

Key Vocabulary	Definition	Example
Traumatic	Causing severe and lasting emotional shock or pain.	Being involved in war is deeply disturbing and a highly _____ experience.
PTSD (post-traumatic stress disorder)	This is an anxiety **disorder** caused by very stressful, frightening or distressing events. Someone with this often relives the **traumatic** event through nightmares and flashbacks, and may experience feelings of isolation, irritability and guilt.	The soldier in 'Remains' is suffering from _____.
Guilt	A feeling of worry or unhappiness that you have because you have done something wrong.	The soldier struggles to come to terms with the _____ he feels over shooting the looter.
Haunt	To revisit again and again.	The memory of the shooting _____ the soldier.
Dehumanisation	To treat people as less than human.	It can be argued that the soldiers in 'Remains' _____ the looter by treating him with so little respect.
Dramatic monologue	A poem made up of a single *character* speaking (i.e. the poet is very clearly writing as someone else).	'Remains' is a _____ because Armitage is writing as someone else and there is only one speaker in the poem.

Writer's Craft:	Example
Why is the poem written as a dramatic monologue?	To explore a traumatised soldier's thoughts and feelings; because the poem was produced following an interview with a soldier.
Why does Armitage use colloquial language?	To create a convincing voice – an ordinary person/soldier; to contribute to the almost matter-of-fact tone in the first half of the poem.
What does the first/second half focus on? What is the turning point?	First half: the shooting; second half: the emotional impact on the soldier. Turning point = 'End of story, except not really.'
Why is the shooting described with graphic imagery?	To convey the brutality; to show what has traumatised the soldier; because it's so vivid in the soldier's mind.
Why is the blood on the street described as a 'blood shadow'?	Shadow = dark imagery – connotations of death and misery; the shooting has cast a shadow over his life; a shadow follows you around
What does the imagery 'dug in behind enemy lines' suggest?	To the looter, the soldier is the enemy; the soldier's mind is enemy territory. The looter is in the soldier's mind, so this is 'behind enemy lines'. 'Dug in' means well defended and prepared for attack – this suggests that the memory of the looter is difficult to remove; 'dug in' is a military term, suggesting that the war/conflict is still going on for the soldier.
What impression does the final stanza leave us with and what is meant by 'bloody hands'?	It leaves us with the impression that the pain will be ongoing – there seems little hope of an end as the looter is still 'here and now'. 'Bloody' can suggest frustration (swearing), but 'to have blood on your hands' also means to be responsible for an act of violence against someone i.e. to be guilty of something.



AC1.1 entrepreneur and 1.2 Business aims and objectives

LO1: understand entrepreneurship, business organisation and the importance of stakeholders

Financial motivators
- To make a profit
- Make sure there's enough cash to pay the bills
- Access to sources of finance

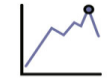
Personal motivators
- Control over working life
- Became bored at work
- To fulfil their potential

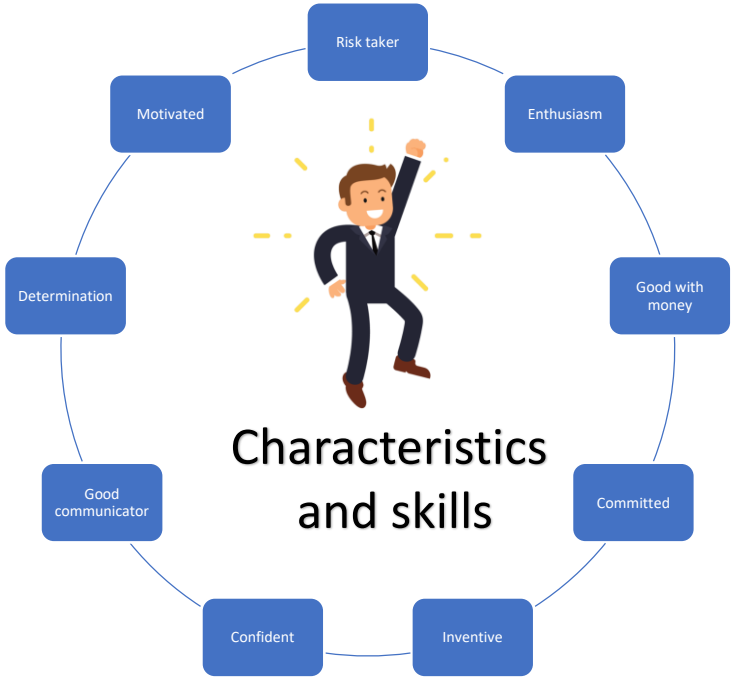
Social motivators
- Getting personal satisfaction
- Helping others

Break-Even Point Formula

$$\text{Break Even Point} = \frac{\text{Fixed Cost}}{\text{Sales Price Per Unit - Variable Cost Per Unit}}$$

$$\text{Break Even Point} = \frac{\text{Fixed Cost}}{\text{Contribution Margin Per Unit}}$$





	April	May	June	July	August	Sept
Total receipts (cash in flow)	15,000	12,000	5000	5000	16,000	16,000
Total payments (cash outflow)	12,000	12,000	10,000	10,000	12,000	12,000
Net cash flow	3000	0	-5000	-5000		
Opening balance	1,000	4000	4000			
Closing balance	4,000	4000				

Net Cash Flow Formula = Total Cash Inflows - Total Cash Outflows

Fixed costs	Costs that don't change in relation to output. For example rent, salaries and loan repayments
Variable costs	Costs that do change in relation to output. For example stock, wages and raw materials
Total costs	Fixed costs + variable costs
Revenue	Money that a business gets from selling goods or service
Total revenue	Selling price x number sold

Increasing revenue
- Raise prices
- Up sell products
- Cross sell
- Bundle offers
- Increase marketing
- 2 Discounts

Profit Formula

Profit = Total Sales - Total Expenses

Profit Per Unit = Selling Price - Cost Price

LO1: understand entrepreneurship, business organisation and the importance of stakeholders

Non financial aims and objectives

Customer satisfaction 	• Happy customers are likely to come back • Satisfied customers leave good reviews (TripAdvisor) • Spread recommendation by word of mouth
Expansion 	• Purchasing new premises • Employing new staff • Setting up an E-Commerce website
Employee satisfaction 	• Excellent customer service • Less days off (absenteeism) • Less mistakes • More motivated
Diversification 	• Expand what they sell • Target different market segments
Ethical/corporate responsibility 	• Being environmentally friendly • Being fair to stakeholders

Ownership	Definition	Examples	Advantages	Disadvantages
Sole trader	A business that is owned and controlled by one person	• Plumbers • Hairdressers • Carpenters	• Easy to set up • Low set up costs • Chose when they work	• Unlimited liability • Difficult to grow • No shared responsibility
Partnership	A business that is owned and controlled by 2-20 people	• Estate agents • Accountants • Dentists	• More capital to start up • Mix of skills • Risk shared among partners	• Slow decision making • Unlimited liability • Disagreement and conflict
Limited company	A business that is owned and run by shareholders. Examples are LTD and PLC	• BP • Manchester Utd • Tesco	• Greater capital investment • Investors don't have to actively run the company • Limited liability	• Complicated to set up • Accounts need to be published • Investors expect a return
Franchise	A business where the franchisor (owner) grants a license to others to trade under their name	• Pizza Hut • Starbucks • McDonalds	• Limited experience needed • Benefits from the businesses name • Customers recognise it	• Not cheap to start up • Can't make any of your own decisions or changes
Co-operative	Like minded people who work together to meet a common desire. They are owned by staff	• Consumer co-operatives • Workers co-operatives • Producer co-operatives	• Complete control by members • They exist to benefit members • Profits are shared	• Losses are shared among members

Public sector jobs

Jobs that are made up from central, local and business owned by the government

- Royal Mail
- NHS
- Politician

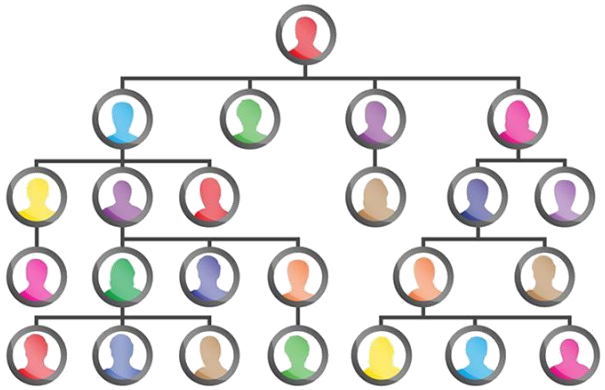
Private sector jobs

Businesses owned by private individuals

- Sole traders
- Private limited companies (Ltd)
- Partnerships
- Public Limited Companies (Plc)

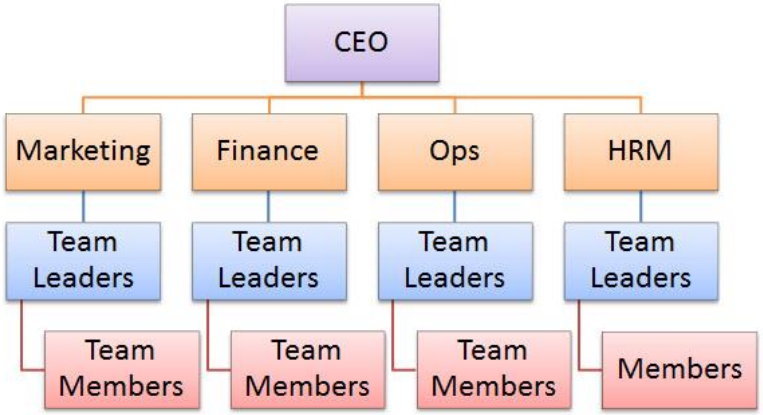
Types of business ownerships

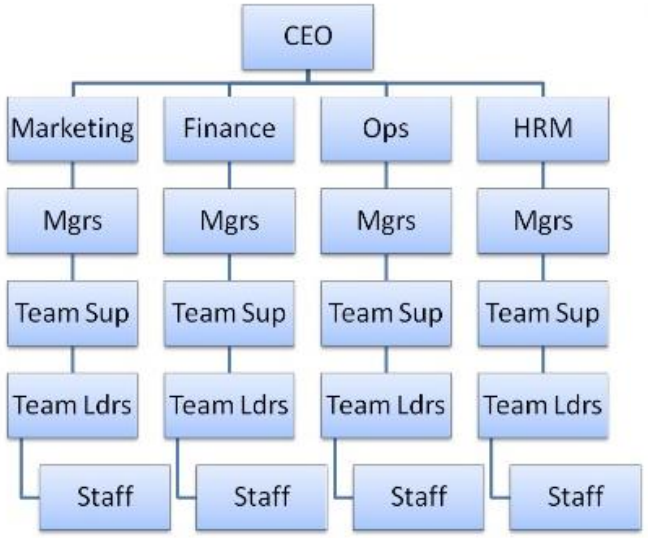
Organisational structures



The organisational structure of a business is important because it determines:

- **Authority and responsibility** – who is responsible for whom and who is in charge?
- Individual job roles and titles
- The people to whom others are **accountable**
- The formal routes through which **communication** flows in the business

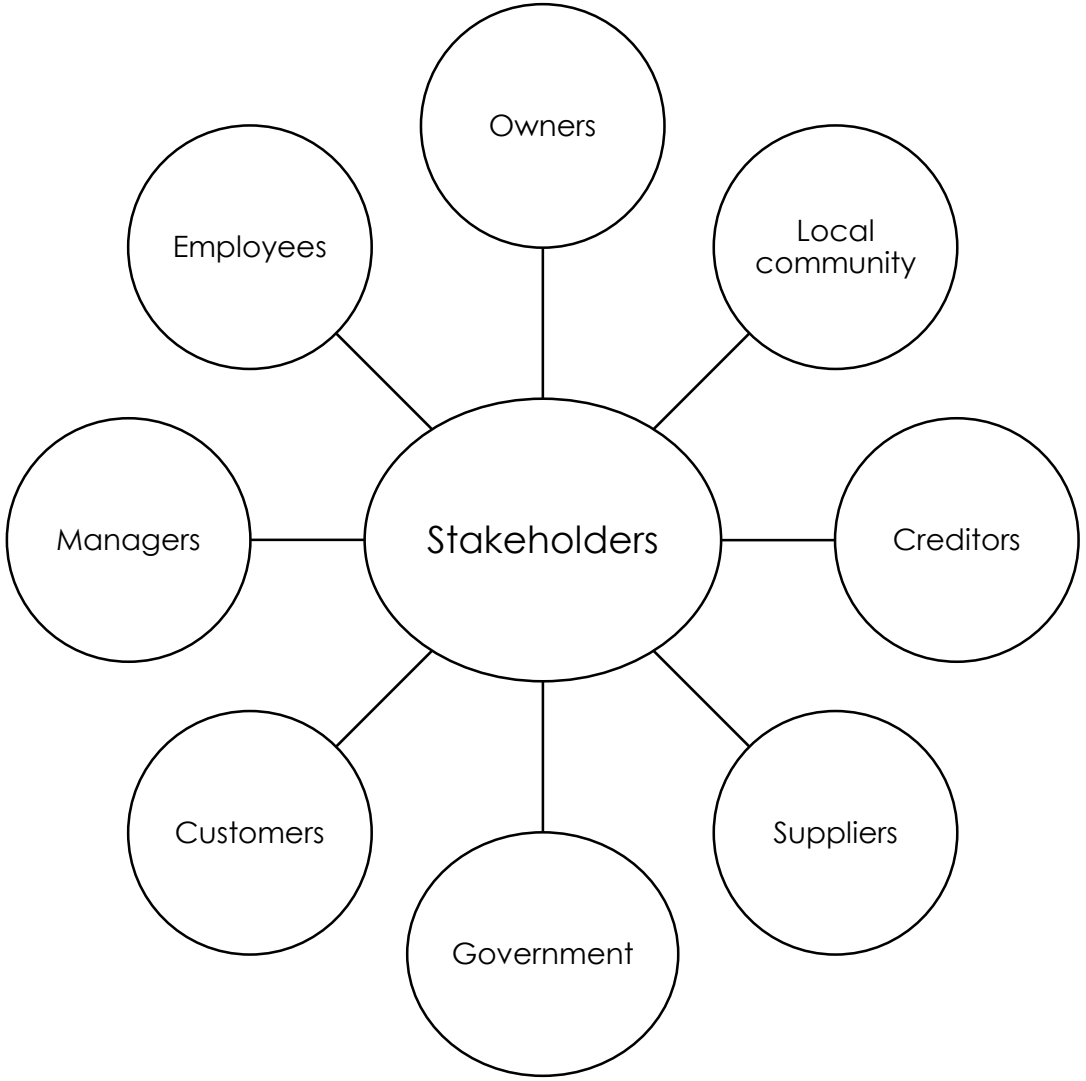




Removing layers is called delayering

- This is a flat organisational structure, this has a wide span of control.
- It has 4 levels of hierarchy

- This is a tall organisational structure, this has a narrow span of control.
- Tall organisation structures tend to have long chains of command.
- Chain of command is the line of communication and authority within a business



Stakeholders

Stakeholders	Engagement
Owners	Invested their own money in the business so are interested in the way it runs
Local community	They could provide the workforce needed. They could also be concerned about pollution
Creditors	They want the business to be successful so they can get their money back quickly
Suppliers	They will want to be paid by the business and want to be used again by them
Government	Want the business to comply to laws. Also get tax from a business
Customers	Customers want value for money, if they get that they may come back again
Managers	Managers need to plan for success so need as much information as they can get
Employees	Need to make sure that their job is secure and good working conditions

Internal stakeholder	External stakeholder
Owners	Local community
Managers	Creditors
Employees	Suppliers
	Government Customer

LO2: Understand the marketing mix, market research, mark types and orientation types

AC 2.1 Marketing Mix

Product How the product or service is designed or invented in order to make it something a customer wants	**Price** How the product of service is priced in order to make a profit
Place How the product gets to the customer	**Promotion** How customers are made aware of the product or service and are persuaded to buy it

Brand Image

McDonalds has a strong brand image. If you establish a brand image it can help make you stand out
An advantage would be people trust the business and will buy a product as its from that business (for example an iPhone)
Some disadvantages is that it takes a long time to establish a brand image and it's expensive

Tangible products are physical items that exist in the real world. For example a pint of milk, a teddy bear or some football boots

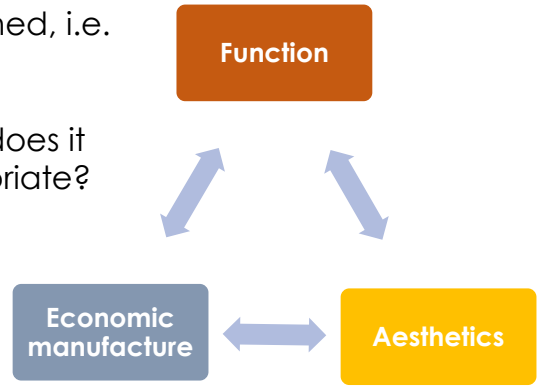
Intangible products are those that have no physical presence for examples, mobile phone networks, car insurance and broadband

Design Mix

Function = does it do the job it was designed, i.e. A lawnmower

Economic Manufacturing = how much does it cost to make?, are the materials appropriate?

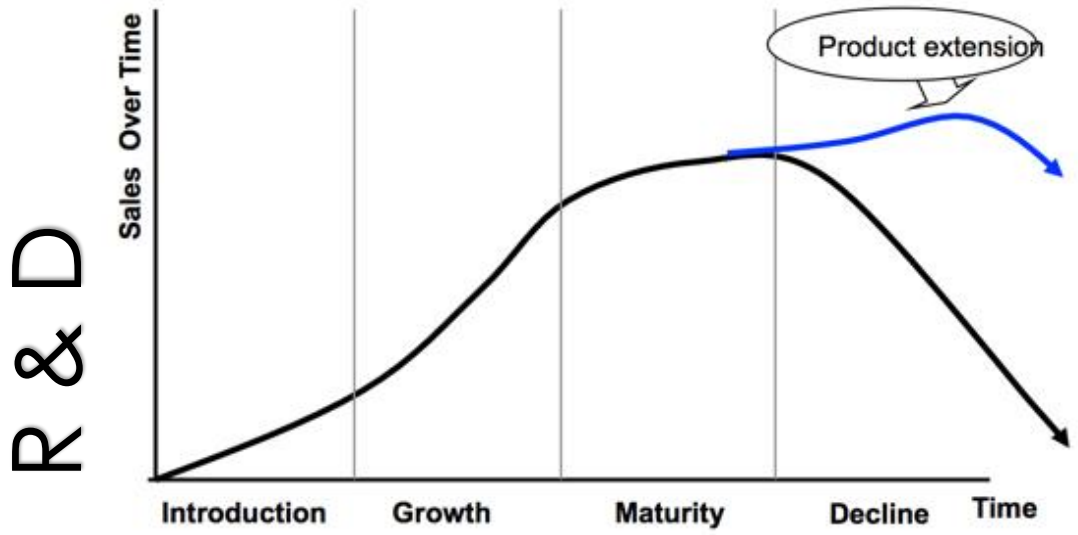
Aesthetics =how the product looks



This is a feature that sets a product apart from its competitors

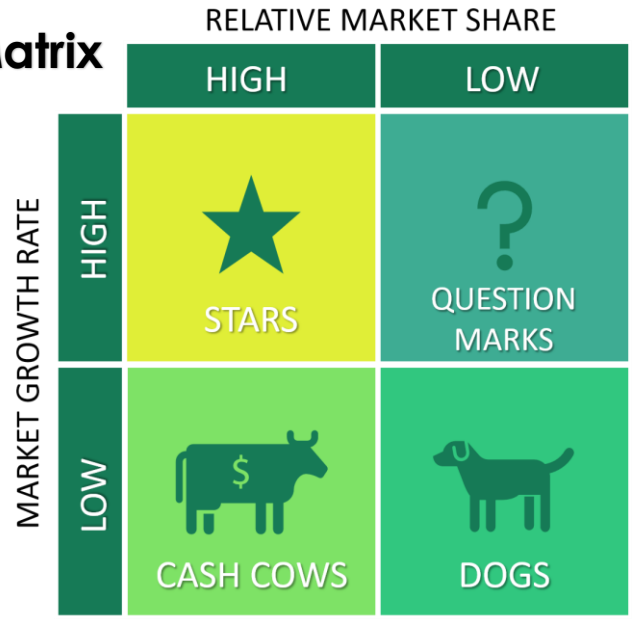
- BMW, Porsche = car performance
- Apple = Design
- Nike = Strong Brand

Product lifecycle

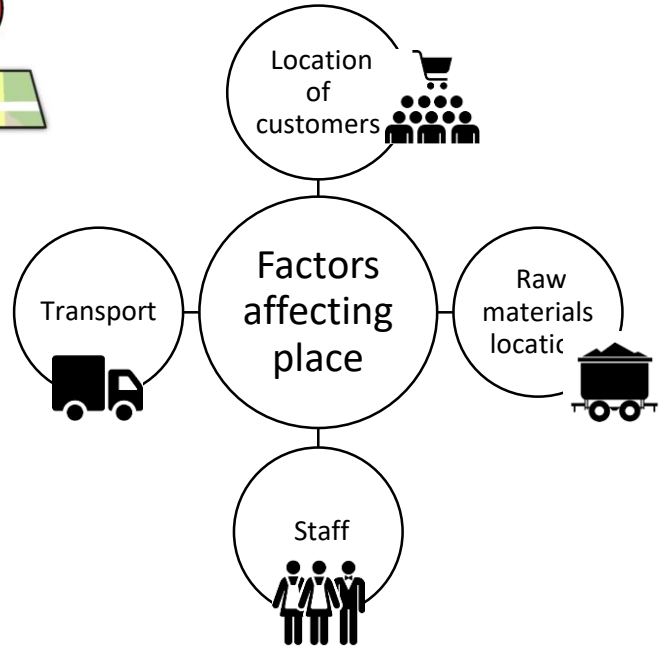


R & D	Product testing, research all done before a product is sold
Introduction	The "launch" of a product/service. Lots of advertising. Low profits at this stage and a low market share
Growth	Customers are familiar with the product and sales increase. Competitors may enter the market if your business is doing well
Maturity	Sales have reached their peak. New customers have reduced, profits have been made
Decline	Sales begin to fall, customers lose interest. Advertising stops
Product extension	New life is breathed into the product, for example a new price, new advertising campaign, new features and new packaging

Boston Matrix



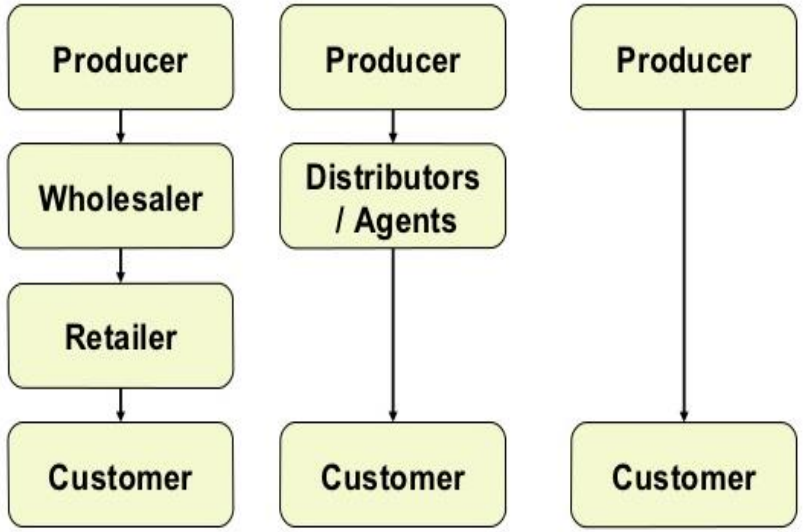
Dogs	Have a low market share in a low growth market. These products are often removed as they are no longer popular
Stars	These products have a high market share in fast growing markets
Cash cows	These products have a high market share in a slow growing market. They are very successful products that remain for years
Question marks	These are products that have a low market share in a fast growing market. These are a cause for concern and could be removed



Agent sell the product on behalf of the producers. Examples of agents are Estate agents and travel agents

Producers are the business that makes the product for example Walkers Crisp

Channels of distribution



Wholesalers buy in bulk from producers and sell the products in small numbers, for examples Makro

Retailers often by from wholesalers and sell the products in their shops. For example central stores

Ecommerce

Advantages	Open 24/7, can sell all over the world, no need to have a physical shop
Disadvantages	People can't see or try things, have to wait for delivery, credit card fraud

Factors influencing demand for a product

Income	If the wage of a buyer goes up it's likely increase for products will go up
The price of substitute goods	If the price of DVDs go up the demand for Netflix will increase
The price of complementary products	An increase in the price of cars will led to a decrease in petrol
Changes in taste and fashion	The decrease in demand for CD's
Changes population	An ageing population will have an impact on holidays to Ibiza
Advertising	A celebrity endorsing a product may lead to an increase in demand
Legislation	Changes in the law can impact demand

Factors influencing supply for a product

Cost of production	A fall in cost due to new technology
The weather	This can effect the supply of raw materials
Taxation	If firms are taxed highly on certain products they will produce less

Cost plus pricing	Product cost + profit = selling price	Bakeries, car manufacturing
Competitive pricing	Set a price that's similar to a competitor	McDonalds and Burger King
Loss leader	Willing to make a loss on a product	For example selling a disposable BBQ's cheaply when they are next to sausages and burgers
Promotional pricing	Temporarily reduces the price for a limited time	When there is a new flavour of Haribo or a new bar of chocolate
Price skimming	Starts with a high price and gradually lowers it over time	iPhone, games consoles, laptops
Psychological pricing	Sets a price that's attractive to a customer for example £999	99p shop
Penetration pricing	Starting with a low price and gradually increase it	New flavour of Pringles, new shower gel

LO2: Understand the marketing mix, market research, mark types and orientation types

AC 2.1 Marketing Mix

Sales promotion

- **Discount and BOGOF**
- **Competitions**
- **Free gifts, product trails, loyalty schemes**
- **Point of sale advertising**

- Discounts are a good way of getting the product noticed.
- Competitions are used to encourage purchases
- Point of sale advertising is often near the tills
- Free gifts could be a bowl for cereal, product trails could be free samples, loyalty schemes are where people collect points for examples Tesco Clubcard

Leaflets	
Advantages	Relatively cheap, targeted at a local area, easy to read and good visual impact
Disadvantages	Often thrown away after one read, can be seen as junk mail, no long term impact

Social media and websites	
Advantages	Relatively cheap, easy to update, access worldwide, customers call leave feedback
Disadvantages	Not good at targeting “older people”, needs to be monitored daily, can be hacked

Newspapers	
Advantages	Local newspapers can target a specific area, national papers have a broader reach
Disadvantages	Can be expensive (national), not targeted, less effective for younger people

Magazines	
Advantages	Magazines are targeted so can reach specific customers, people tend to keep magazines for a while
Disadvantages	Costs can vary, magazines have a lot of adverts so yours could get lot.

Radio	
Advantages	Sounds effects can be used, can be produced quickly, cheaper than TV
Disadvantages	Prime slots (morning/evening), can be background noise so the message can be lost

Personal Selling = when a person sells a product or service to you face to face for example a car salesman	**Direct selling = selling via mail order, phone or online for example double glazing**

Qualitative data involves getting more in depth answers and opinions from a customer

Quantitative data is factual information or yes/no answers. For example what is your gender, have you purchased this product before?

Primary Market Research		
Method	**ADV**	**DIS**
Observations	• Can see buyer behaviour (what time they shop, what aisle they avoid)	• Time consuming • Doesn't give any qualitative responses
Questionnaires	• Accurate and relevant info	• Expensive and time consuming
Telephone interviews	• Cover a wide geographical area • Can ask following on questions	• Time consuming • People don't answer or hang up
Focus groups	• High quality information • Focused on a specific group	• Costly • Time consuming
Consumer trials	• Honest and reliable feedback	• Expensive • Time consuming to collate results

Secondary market research		
Method	**ADV**	**DIS**
Government reports	• Readily available to download, often free • Accurate and trustworthy	• Can be out of date as a census is done every 10 years
News articles	• Can be digital or physical • Fairly cheap	• Can be out of date • Can be biased
Competitors data	• Will be published depending on the ownership	• Should only be compared for a like to like business (not a sole trader to a PLC)

Niche Markets

Where a business targets a smaller segment of a larger market, where customers have specific needs and wants

Advantages

- Less competition – the firm is a "big fish in a small pond"
- Clear focus - target particular customers (often easier to find and reach too)
- Builds up specialist skill and knowledge
- Can often charge a higher price
- Profit margins often higher
- Customers tend to be more loyal

Disadvantages

- Lack of "economies of scale"
- Risk of over dependence on a single product or market
- Likely to attract competition if successful
- all "eggs in one basket"

Examples

- Pet Spas
- Left handed products
- Exotic meats

Mass Markets

Where a business sells into the largest part of the market, where there are many similar products on offer

Advantages

- High number of sales
- A large number of customers
- Exploit economies of scale

Disadvantages

- Low profit margins
- More competitors
- Lots of people copying your ideas

Examples

- Cadbury
- Coca-Cola
- Nike

AC 2.1 Marketing Mix

A **marketing orientated** approach means a business reacts to what customers want. The decisions taken are based around information about customers' needs and wants, rather than what the business thinks is right for the customer.

A **product orientated** approach means the business develops products based on what it is good at making or doing, rather than what a customer wants.

LO3: understand operations management

When an organisation grows they are sometimes not able to complete all of the task themselves. Some examples are

- Website design
- Financial management
- Production
- IT operations

Advantages	Disadvantages
• Useful for siles traders who don't have some skills • Can take the pressure off knowing a specialist is doing a job for you	• Will have a cost involved • Can't guarantee the quality of work

Lean Production

Just in time (JIT)

This means that stock arrives just as you need it. This reduces the amount of storage you need.

Advantages	Disadvantages
• Improves cash flow as money isn't tied up in stock • Reduces waste • Requires less storage	• Need reliable suppliers • Difficult to manage if demand increases • If mistakes are made there is no replacement

Lean Production

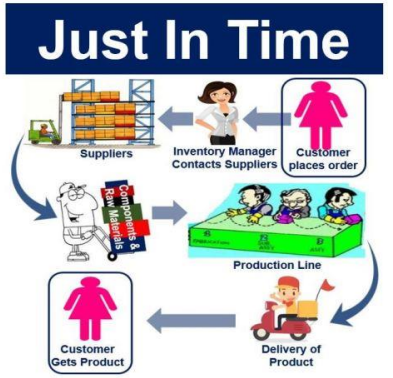
Kaizen

- The Japanese process of continual improvement
- It is important that everyone in the vision
- Some examples of Kaizen could be waste reduction, empowering staff and listening to customers needs

Lean Production

Cell production

- Cell production is divided into different stages that different teams complete.
- It ensures a team completes a whole piece of work instead of one task.
- It increase motivation
- Increase responsibly
- Can improve quality



LO3: understand operations management

This when a business checks that its product and services meets the required standard.

For example every Big Mac should have the same ingredients, in the correct quantity and order in every McDonalds

A definition of quality assurance is:

"The processes that ensure production quality meets the requirements of customers"

This is an approach that aims to achieve quality by organising every process to get the product 'right first time' and prevent mistakes ever happening.

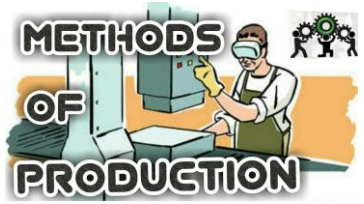
An attitude to quality where the aims are zero defects and total customer satisfaction.

The objective of benchmarking is to understand and evaluate the current position of a business in relation to best practice and to identify areas and means of improvement.

Business that benchmark measure their performance against other businesses

- The reliability of products
- Delivering items on time
- Send out correct payment requests (invoices)
- Time taken to produce a product

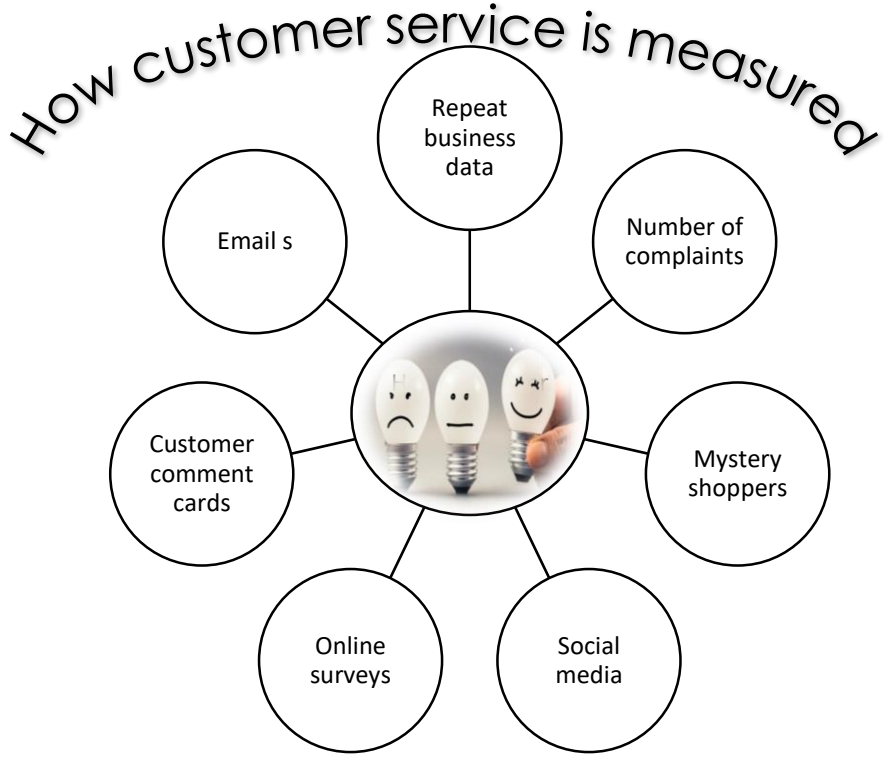
AC 3.1 Operations management



Production method	Description	Examples
Job production	• One product made at a time • Every product will be slightly different • Can be made by hand • They will be expensive and time consuming to make	• Paintings • Handmade clothes • Bespoke jewellery • Wedding cakes
Batch production	• Small quantities of identical products are made • Uses machinery	• Tins of paint • Frozen pizzas
Mass production	• Usually completed on a production line • Often completed by machines	• Cars • T shirts • Mobile phones
Continuous flow	• Similar to mass production except the production line is operated 24 hours a day, 7 days a week	• Canned baked beans • Mass produced biscuits

LO4: Understand internal influences on business

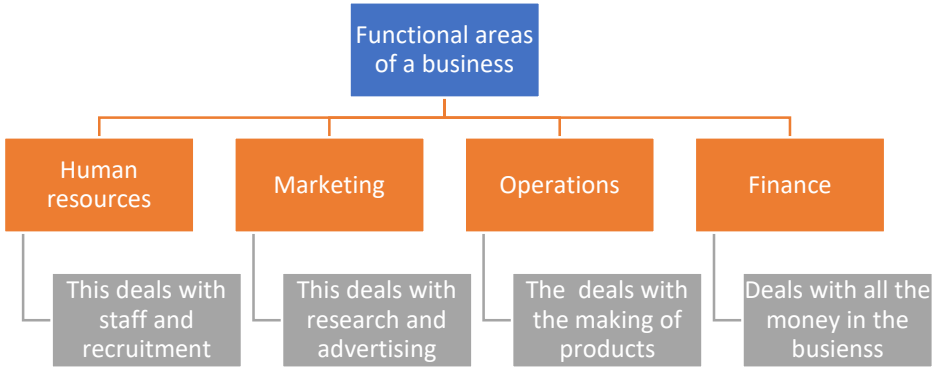
AC4.1 customer service and internal influences and challenges of growth



In order to give excellent customer service, employees will need
Good communication skills
Patience
Attention to detail
Good product knowledge

By measuring customer service a business can…
Make better decisions about products and service
Retain customers
Remain competitive
Identify areas of strength and weaknesses

LO4: Understand internal influences on business



Aims and objectives are used to target customers needs

The financial area of a business controls all monetary aspects of the business

- Allocates funds to departments
- Report performance
- Monitors cash flow

Herzberg

Key summary for Herzberg:

- Workers motivated to work harder by motivators e.g. more responsibility, more interesting work, more praise for good work
- Workers can become de-motivated if hygiene factors are not met e.g. pay, working conditions, relationships with colleagues

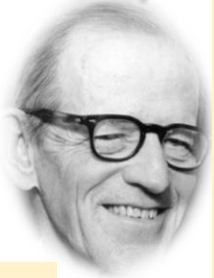
AC4.2 internal influences

A businesses success is often down to the quality of its staff. HR Dept is responsible for

- Recruitment
- Prepare paperwork –job adverts etc
- Determine wages
- Provide training
- Staff welfare
- Deal with dismissals and redundancies

Maslow

Mayo



Mayo believed that workers are not just concerned with money but could be better motivated by having their social needs met whilst at work

Mayo concluded that workers are best motivated by:

- Better communication between managers and workers
- Greater manager involvement in employees working lives
- Working in groups or teams

LO4: Understand internal influences on business

AC4.3 internal challenges of growth

As a business grows, it benefits from a reduction in average costs of production.

This reduction in costs is known as ***economies of scale*** and it gives larger firms a competitive advantage over smaller firms

Purchasing

- As a firm gets bigger they start to order more, this is called **bulk buying**
- A supplier will offer a firm a discount if they bulk buy.
- This makes buying in bulk cheaper for your business
- This reduces the average cost of production as raw materials are cheaper

Advertising

- As a firm grows they have a greater need for advertising.
- Each pound spent will have a great impact

Output	Fixed Costs	Total Variable Costs	Total Costs	Cost per Unit
Units	£	£	£	£
50	10,000	5,000	15,000	300
100	10,000	10,000	20,000	200
150	10,000	15,000	25,000	166
200	10,000	20,000	30,000	150
250	10,000	25,000	35,000	140

Technical

As a business grows they are able to afford and use the latest equipment and new methods of production.

This will reduce average costs

Financial

- As a firm grows they have access to a wider range capital (finance), which could reduce the cost of borrowing
- As a business grows they will be have more things to offer as security when borrowing

Managerial

As a firm grows they are able to employ specialist managers.

These managers will know how to get the best out of a team and the best value for money

Control

- As you grow bigger it is difficult to control the increasing number of staff

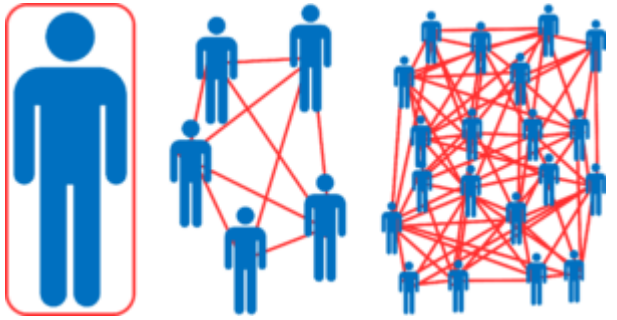
Coordination

- You may well have more than one location. It will be difficult to let everyone know what needs to be done

Cooperation

- Workers could feel less motivated as there are too many people and may feel worthless

When diseconomies of scale happen the average costs of production rise with output



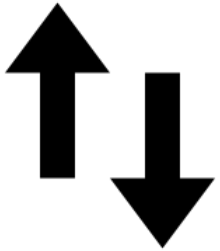
GDP is the value of all newly produced final goods and services produced in an economy within a given time period.

Interest rates

An interest rate is the reward for saving and the cost of borrowing expressed as a percentage of the money saved or borrowed.

Low interest rates encourage customers to buy more goods as there is little reward for saving money.

If borrowing rates are low then more people are likely to borrow if they need to.



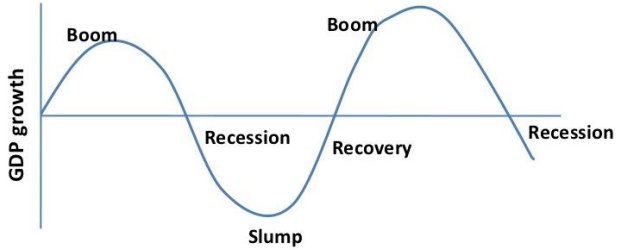
High interest rates result in less spending as repayments for loans are higher

It is more likely people will save more money if saving interest rates are higher

Changes in fashion and trends

Peoples wants and needs change over time, businesses need to keep up with this. Technology plays a big part in this

Business cycle



Boom	Spending is at the highest point
Recession	Little money to spend on luxury goods
Growth	Spending starts to increase
Decline	A decrease in spending

Wages

When wages go up businesses cost rise which means profits drop.
However people earn more so could spend or save more

Health and safety at work act 1974	Owners need to make sure that the employees are safe at work.
Race relations act 1976	It is illegal to discriminate against anyone based on the colour of their skin, race or ethnic group
Sex discrimination act 1975	Can't discriminate against a person because of their sex.

Sale and supply of goods act 1994	this states that goods must be of satisfactory quality
Consumer credit act 1974	this protects the consumer when borrowing money or buying on credit
Trade description act 1968	goods and services must perform in the way advertised by the business

Taxation		
VAT (value added tax	Income tax	Corporation tax

Design and Technology Vocabulary

Aesthetics	The study of the shape or form of every day products; as in … "That product is aesthetically pleasing"
Analysis	Looking in detail at the design problem, what the problem involves what needs to be looked at (researched), and who needs to be consulted for advice.
Anthropometrics	The measurements of humans, e.g. heights, arms / leg lengths, hand widths, head sizes, or similar.
Batch Production	The production of products in 'batches'. E.g. batches of different types of bread products …brown then white bread … large and then small loaves, etc. batches of red china mugs, then blue ones, etc. A batch of benches for a park, or a batch of children's seating for a McDonalds restaurant.
BSI	British Standards Institute has responsibility of devising standards that particular products must meet, for a variety of reasons. For example toys must be tested to BS EN 71, for safety reasons. The full definition is at http://www.bsieducation.org/Education/14-19/default.shtml
CAD	Computer software that helps the designer to create designs, plan, technical drawings and 3-D images of the design being explored.
CAM	Computer software programs and Computer Numeric Control (CNC) machinery, such as a milling machine lathe or vinyl cutter machine, that allows CAD produced designs to be made by the CAM machinery.
Compressive strength	The ability to resist a pressing force, e.g. concrete or cast iron.
Conductivity (Electricity)	The ability of a material to conduct electricity e.g. copper, aluminium, gold.
Conductivity (Heat)	The ability of a material to conduct / transmit heat, e.g. copper.
Corrosion	The tendency of a material to rust (iron/steel) or corrode (aluminium)
Corrosion Resistance	The ability for a material to resist corrosion / discolouring /rotting, e.g. copper, lead, gold, silver.

Design and Technology Vocabulary

DTP (Desk Top Publishing)	Computer software that is designed for producing leaflets, booklets and text-based documents.
Ductility	The ability of a material to be drawn / stretched pulled into thin strands, e.g., copper electrical cables.
Durability	The ability of a material or product to last a long time. The ability to do its job for a long period.
End User	A person who uses the product for its intended purpose, but may not have bought it.
Ergonomics	The study of 'Man in his Environment', e.g. work space, activity space, sitting, working heights or similar.
Flexibility	The ability of a material to bend and change shape, without cracking or breaking.
Gantt Chart	A method of planning that places tasks down the left hand side of the page and dates across the top, to enable you to see what needs to be done by when.
Malleability	The ability of a material to be bent, shaped, hollowed, etc. into a complex shape, e.g. steel sheets pressed into car body panels or copper sheet shaped into hot water cylinders.
Media	The general term for paper, card, paint, printer print-outs and other materials that are used in producing design work and products (mainly in Graphic Products).
Manufacturer	A person or company that will make the product.(See also One OFF production, Batch Production and Mass Production)
Market Research	The process of finding out what customers require from a product, e.g. questionnaires and interviews.
Mass Production	The continuous production on one product: e.g. motor cars, TVs, aluminium cans, plastic vending beakers, etc. The product may be produced around the clock and once it has commenced, the (sometimes automated?) machinery is made maximum use of.
Model	An attempt to build a version of your design to see if it works, if it is the right size or if it looks good. This could be done using CAD.

Design and Technology Vocabulary

One-off production	The design and manufacture of one product only, e.g. a sculpture for a shopping centre or a signboard for a shop front.
Patent	A form of Intellectual Property Protection that applies to the function of a newly invented product.
Pattern	(See Template)
PCB	Printed Circuit Board
Planning	The process of sorting out how the design work will be done, how the product will be made, which processes get done first and the time needed for all of these activities.
Plasticity	The ability to change shape, to deform or to mould. (Similar to malleability).
Product Designer	A person who designs the overall shape and appearance of a product and concerns themselves with the aesthetics of the product, shape size, form etc.
Product Life	The period of time that a product is designed to last. (Related to planned obsolescence).
Prototype	The first model made to decide if the design works, if it is the right size, comfortable, safe, attractive or suited to the user's needs. This allows changes to be made, before the final version is made.
Quality Assurance	The guarantee a company can give that their product will be reliable based upon the reliability of the tests carried out when the product was made.

Design and Technology Vocabulary

Quality Control	Individual tests carried out to check the product is being assembled correctly during production.
Questionnaire	A list of questions that are given to potential customers to find out their needs and preferences.
Recycle	Recycling involves processing used materials into new products in order to prevent waste.
Reduce	Reduce everything about the product. Reduce the size of the product making it less of an impact on the environment. Reduce the energy consumption when making the product. Reduce the number of batteries in the product.
Refuse	Refuse to use certain materials because they are not sustainable. Refuse to buy products that are not made ethically. Refuse to make products that are not sustainable.
Registered Design	A form of Intellectual Property Protection that applies to the outward appearance of a product. For example the glass coke bottle design was registered in 1937. Design registration lasts up to 25yrs.
Repair	Repair the product, don't throw it away. Graphics – facelift. Systems – fix it. Design for disassembly so parts are not thrown away.
Research	Gathering information to help with design work. The process of looking at existing ideas, designs and listing good and bad features. Gathering other information that will assist with design work.
Retailer	A person who sells products through shops directly to consumers.
Rethink	Designing products by "re-thinking" about the needs and wants for the product. Is the product REALLY needed? Is the product ONLY wanted, but not needed. Re-thinking the types of material to make the product.
Reuse	Reuse the product when it has come to end of its lifecycle. Reuse food. Rechargeable batteries. Reuse textiles. Reuse containers. Reuse the product in some way. Don't throw it away

Design and Technology Vocabulary

Rigidity	To make a product or structure stiff and resist deformation
Six Rs of Sustainability	Sustainability canbe refined down into 6 'R's those being 'Refuse', Rethink, Repair, Reduce, Reuse, Recyle.
Shelf life	The period of time a product remains safe to sell and / or safe to eat.
Smart Material	Smart materials are materials that have one or more property that can be significantly altered in a controlled fashion by external stimuli, such as stress, temperature, moisture, pH, electric or magnetic fields. E.g. Nitinol Wire, Thermochromic pigments, Thermochromic film.
Star diagram	A diagram that compares the good and bad features of a product.
Stiffness	(See Rigidity)
Strength	The ability of a material to resist pressure / loads.
Sustainable Design	Designing a product using the philosophy of RETHINK, REFUSE, REDUCE, REUSE, REPAIR, RECYCLE in order to reduce the use of energy and environmental impact of products. (each is defined in this glossary)
Target Group	When producing new products, the likely purchaser or user's needs and preferences are considered by the designer and manufacturer.
Template	A paper or card cut-out showing the shape of a product. Used to improve / finalise a shape and to transfer it to the chosen manufacturing material.
Tensile strength	The ability to resist a pulling force, e.g. a tow rope or lift cable.
Testing	The process of trying out a product to see if it does it's job or to see if it is strong enough or durable enough.
Toughness	Similar to durability. The ability to withstand repeated force, impact and rough use.

Trade description act 1968	Equality act 2010
Makes it illegal to mislead the customers by describing or making false statements about what you offer	Protects the rights of individuals . Promotes equal opportunities regardless of age, gender, race and sexual orientation
The consumer protection act 1987	**Consumers rights act 2015**
Stops the supply of unsafe products . Must have a health and safety message	Products bought must be • Satisfactory quality • Work as it should (fit for purpose) • Match the description given

Leisure requirements

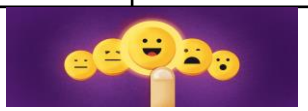
Local residents

Preventing noise levels	Prevent congestion by having ample parking	Employment
Have security and CCTV to make everyone feel safe	Offering discounts/good prices	Sponsor local events

Corporate Business use the industry for	
Conferences	Award ceremonies
Meetings	Staff training
Exhibitions	Team building events
Trade shows	Special events

Their needs are met by

Needs met by	
Food and drinks	Pop up cafes/restaurants
WIFI/internet	Parking
Accommodation	Entertainment



AC3.1 describe personal safety responsibilities in the workplace

Employers and employees responsibilities

Employers must:

- ✓ Provide the employee with a detailed job description and a contract of employment
- ✓ Adhere to laws relating to employment of staff, including health and safety and food safety.

Employees must:

- ✓ Work in the way that has been agreed to in the contract and job description
- ✓ Follow all the organisation's policies and practices.

Control of Substances Hazardous to Health Regulations 2002 (COSHH)

What to report

- Deaths and injuries
- Occupational Diseases
- Carcinogens, mutagens and biological agents
- Specified Injuries to Workers
- Dangerous Occurrences
- Gas Incidents

Health and safety at work act (HASAWA)

The act aims to:

- secure the health, safety and welfare of persons at work
- protect other people from health and safety risks caused by work activi…
- control the use and storage of explosive and dangerous substances

Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013. (RIDDOR)

What to report

- Deaths and injuries
- Occupational Diseases
- Carcinogens, mutagens and biological agents
- Specified Injuries to Workers
- Dangerous Occurrences
- Gas Incidents

Personal Protective Equipment (PPER)

Employers have duties concerning the provision and use of personal protective equipment (PPE) at work.
PPE is equipment that will protect the user against health or safety risks at work. It can include items such as safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses

Manual Handling Operations Regulations (MHOR)

"...any transporting or supporting of a load (including the lifting, putting down, pushing, pulling, carrying or moving thereof) by hand or bodily force".

LO4: food related causes of ill health

Bacteria name	Where is it found (food)	Symptoms
Campylobacter	Milk Raw meat Poultry	Stomach ache Vomiting
E.Coli	Milk Raw meat	Stomach ache Vomiting
Listeria	Diary Cheese/cream Pate	Flu
Salmonella	Egg Milk Chicken	Stomach ache Vomiting
Staphylococcus aureus	Humans Milk Soft cheese Cooked meats	Stomach ache Vomiting

Other sources of food related ill health

Red kidney beans	Raw red kidney beans contain a toxin called **haemagglutinin.** This can cause vomiting and diarrhoea.
Nuts and cereals	If they become damp they may develop a mould which produces **aflatoxin.** This can harm your liver
Rhubarb leaves	Contain **oxalic acid** which can cause illness, the stems are ok to eat
Poisonous wild mushrooms	Many are poisonous and cause organ failure
Poisonous berries	Many are poisonous and cause organ failure

PHYSICAL THEATRE KNOWLEDGE ORGANISER

What is Physical Theatre?

At its simplest, you could define Physical Theatre as a form of theatre that puts emphasis on movement rather than dialogue. There are a huge number of variations as the genre covers a broad range of work but essentially Physical theatre is anything that puts the human body at the centre of the storytelling process. As a result pieces are often abstract in style using movement in a stylised and representational way. ***(BBC Bitesize)***

Physical Theatre is a form of acting that tells a story through the way bodies are positioned and the way they move forming different shapes with little or no Dialogue. Physical Theatre uses our bodies for our effects rather than using props, scenery or even sound effects at times. Physical Theatre can include a wide variety of styles and approaches – it can include dance-theatre, movement theatre, clown, puppetry, mime, mask, and circus'
(WJEC/Eduqas – Devising Textbook)

Minimalistic Set & Props

Physical Theatre tends to use very little set or props to allow performers space and freedom to tell the story as physically as possible.

Body Props - In Physical Theatre performers often mime items of set or objects – or even become them – this can be done by a solo performer or as an ensemble/chorus and can be referred to as Body Props.

Bamboo Canes – Both **Complicité** and **Imaginary Body Theatre Companies** have used Bamboo Canes as their only set/props to create all manner of objects, locations and emotions In their plays.

Door Frames – Steven Berkoff's original production of **The Trial** used 10 free standing door frames/screens as the only set for the production. "Our set of ten screens became the story and as the story could move from moment to moment so could our set – no long waits for a scene change but as a flash with the magician's sleight of hand. We could be even quicker than the story. A room could become a trap, a prison, expand and contract and even spin around the protagonist Joseph K. This enabled us to recreate the environment – both physical and mental – of the book" ***(Steven Berkoff)***

Limiting Space – The Theatre Company **Off Balance** devised their version of **Robin Hood** on a 2m x 2m slab of wood. Their creative solutions to performing the story in such a small space are truly inspiring.

KEY TERMINOLOGY

***Mime –** Is when actors perform in silence with exaggerated facial expressions and body language. It can work with dialogue, but with actors miming any props or set required for the scene.
***Gesture & Body Language –** Gestures are non-verbal ways of communicating. A gesture is usually done with your hands but you can use other body parts. Gestures and Body language (the position of your body) are vital when communicating through movement.
Status* – The idea of who has the power in a scene can be explored through levels or by distance (proxemics) or strength of contact, or a combination of all of these with voice work.
Proxemics* – Comes from the word proximity. In drama it means how close or far you are from your co-performers. It can be very powerful - for example, the threatening gangster who speaks to his victim from a distance of perhaps a couple of inches.
Movement* - In any kind of Physical Theatre movement is the main way of communicating the story. The genre's power comes from how expressive and creative the movement is.
Stillness – If the stage is full of characters moving, immobility can have a powerful effect.
Mask Work - The impact of a mask is visual and without the facial features to show emotion, movement becomes an even more central performance instrument.
Dance Work – Don't be afraid to include dance in your work; you don't have to be an experienced dancer. 'Dad dancing' can work well in a comedy for instance!
Motif – This is the repeated use of a tableau, movement or patterns which have meaning and reminds us of the central theme of the work.
Music – Music is vital in Physical Theatre as it complements and reinforces the visual storytelling.
Ensemble/Chorus – An ensemble or chorus is a group of actors working together (often as one) physically and vocally.
Physicalising Emotional States – Body Language, Proxemics, Facial Expressions and Vocal Sound will immediately suggest particular emotions to the audience.
Sound Collage/Soundscape – The layering of sounds by performers.
Ritual – A movement sequence using precision, repetition, cannoning, Synchronicity, etc – to create an almost ceremonial feel.
Animalistic Behaviour – Using animalistic behaviour in your characterisations or chorus work can be very powerful. For example – two girls discussing another girl in a nasty way using cat or snake like vocal and physical skills.
Puppets –Puppetry involves the manipulation of puppets, often resembling a human or animal figure, that are animated by a human(s) called a puppeteer(s). The play **War Horse** used 3 actors to bring Joey the horse to life both vocally and physically. One of our lessons explores a similar process where the 'Paper Person' is controlled by 3 puppeteers using Focus, Breath and Weight to bring life to the inanimate object.

Frantic Assembly are an internationally renowned theatre company who use simple techniques they call 'Building Blocks' to devise their plays.

Push Hands

The person with their hand on top is in control, gently leading their partner around the space, trying to keep their hands flat and the pressure constant. You should take your partner on a journey exploring all levels.

Fluff

Partners sit opposite knee to knee. A choose three ways to adjust B's appearance. B choose three ways to adjust A's appearance. Continue to add more moves, and avoid a predictable rhythm

Chair Duets

Partners sit in chairs, both facing forward. Partners take turns placing their hand on to their partner or moving their partner's hand, swapping and adding to the sequence. Repeat until the moves are clear and memorised.

Round

The term ROUND is chosen to represent any move that involves passing closely ROUND the body of the partner

By

BY comes after the first two moves. The space between A & B is 'squeezed out'.

A or B 'slots in' to stand closer BY their partner

Through

THROUGH is the idea of passing through the upper body / arms of the partner

‘Bayonet Charge’ – Knowledge Organiser

What happens in the poem? The poem starts mid-action with a soldier charging towards the enemy with a bayonet attached to his rifle - it is exhausting, disorienting and overwhelming. In the heat of battle, the soldier realises he is no longer motivated by patriotism. The soldier is suddenly confused: if he’s not there for patriotism, why is he fighting? He reflects on how he is there because of the decisions of others: he’s a cog in a machine. He briefly pauses in his charge as he realises this. However, the soldier is shaken from his reflection by the danger to him: his instincts take over and charges towards the enemy because the only thing he cares about now is surviving (by killing).

What is the context of the poem?

- Ted Hughes was inspired to write the poem by World War 1 (his father fought in it and Hughes admired the poetry of WW1 poets such as Wilfred Owen.
- There were strong feelings of patriotism at the start of WW1: men queued up to fight. Many expected the war to be over in just a few months.
- However, the war lasted from 1914-18 and conditions were horrific.
- Nearly a million British personnel died in the war.

What is the significance of the title? The poem describes the experience of being in a bayonet charge (and considers the thoughts and feelings a soldier might have).

What are the central ideas in this poem?

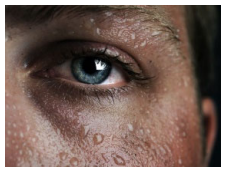
- The battlefield is a chaotic and overwhelming place.
- People might choose to fight because of patriotism or a sense of duty; however these are soon forgotten on the battlefield.
- On the battlefield, it is survival instinct that truly motivates people to fight.
- Soldiers on the battlefield are just pawns in the games of kings and governments.
- Even thoughtful, reflective individuals can become mindless killing machines when the survival instinct takes over.

Key Vocabulary	Definition	Example
Patriotic	Describing someone who loves or is proud of their country.	Many people _____ at the start of WW1: they were proud to fight for their country.
Overwhelmed	The feeling that there is much more than you can deal with.	If you let work pile up, it is easy to feel _____ because it becomes difficult to see how you will manage it all.
Disorientated	Confused about where you are or where you are going.	When walking through a maze, it is easy to become _____.
Bewilderment	Confusion.	If are confused about why we are doing something, we might experience _____.
Terror	Extreme fear.	If I saw a real ghost, I wouldn’t just experience fear, I’d experience _____.
Survival instinct	The instinct in humans and animals to do things in a dangerous situation that will prevent them from dying.	It’s amazing what we can do when we’re threatened – once the _____ kicks in, we become more like animals.
Imagery	The use of words or phrases to create mental images.	In ‘Bayonet Charge’, the phrase ‘his terror’s touchy dynamite’ is a very effective use of _____.

Key Quotes: ‘cold clockwork of the stars and the nations.’ ‘dropped like luxuries’ ‘his terror’s touchy dynamite’

Writer’s Craft:	Explanation
How does the poet convey the chaos of battle In the first stanza?	By using a list of sensory detail (e.g. the dazzling guns, the loud noises, the exhaustion) as a single sentence. The poem also starts in the middle of the action which adds to the sense of chaos.
Why describe the sweat as ‘like molten iron’?	Molten iron is incredibly hot; it suggests that his chest is burning (perhaps his lungs from the effort of charging); this sweat is what was once his ‘patriotic tear’.
What is meant by ‘the cold clockwork of the stars and the nations’?	Hughes presents the soldier as the second hand of a clock; a second hand has to move if the cog it is attached to moves: one cog turns another etc. The soldier is powerless: he’s ended up where he is because of governments making decisions (turning cogs) which have led to him being where he is.
What is meant by ‘king, honour, human dignity dropped like luxuries’?	Luxuries are things that are pleasant to have but not necessary; when you are fighting to survive luxuries are worthless; ‘honour’ and patriotism (‘king’) are ‘dropped’ on the battlefield because they are luxuries: only fighting and surviving matters.
What is meant by ‘his terror’s touchy dynamite’?	The soldier’s survival instincts. Dynamite can explode, but it needs a spark; the soldier’s survival instincts need the spark of danger to ‘light the fuse’; terror is this spark and the suggestion is that he will ‘explode’ when he reaches the enemy.
How does Hughes use sentence length to present the soldier as feeling overwhelmed?	The first sentence doesn’t end until part way through the second stanza. This means that the reader is given little pause and might struggle to take in everything that is happening: this mirrors the soldier’s experience on the battlefield.
How does Hughes structure the poem to present the soldier’s changing thoughts and feelings?	The poem starts in the middle of the action and the first stanza focuses on how overwhelming and chaotic it feels to be on a battlefield. The second stanza shows the soldier questioning why he is fighting and wondering if he is just a powerless cog in a machine. The third stanza shows the soldier’s survival instincts kick in (causing him to abandon his deep thoughts).





For more revision of this poem’, search for ‘Bayonet Charge poemanalysis.com’

‘My Last Duchess’ – Knowledge Organiser

What happens in the poem? It’s the 16th century and we’re in a Duke’s palace. The Duke is showing an emissary around. The emissary works for a Count and has come to negotiate the marriage of the Count’s daughter to the Duke. The Duke stops at a painting of his former – now dead – wife (his last Duchess). The Duke uses this as an opportunity to show his irritation that his wife seemed to be too happy around other men and hints that she may have been unfaithful. He seems to think she should have only smiled and blushed for him. The Duke says that he gave orders and that the smiles stopped – hinting that he had her killed. The Duke then calmly moves on to discussing his next marriage.

What is the context of the poem?

- The poem is based on real life people (and rumours about them).
- The Duke in the poem is Duke Alfonso II who ruled Ferrara in Northern Italy; the Duchess is his wife, Lucrezia de Medici.
- The Duke’s wife died in mysterious circumstances – there were rumours at the time that the Duke had her poisoned.
- Browning wrote the poem in the Victorian period.
- Although it set in the 16th century, the poem is seen by some as a criticism of Victorian values e.g. attitudes to women.

What is the significance of the title? The title shows the Duke’s desire to possess (‘my’); it also hints at the Duke’s almost obsessive focus in the poem on his last Duchess.

What are the central ideas in this poem?

- Some people feel a need to dominate others.
- Powerful people can be immoral.
- Power can cause people to see other human beings as objects.
- Women have historically been treated as objects.
- Paranoia and jealousy can lead people to cruel acts.

For more revision of this poem, search for ‘My Last Duchess Lit Charts’.




Key Vocabulary	Definition	Example
Dominate	To control someone or something (often in a negative way) because you have more power or influence.	It is not healthy for one person to _____ a relationship.
Obsession	Something or someone that you think about all the time.	The toy was his _____. He couldn’t think of anything else.
Possessive	Not wanting to share someone’s love and attention with anyone else.	The Duke is very _____ of the Duchess; he doesn’t want anyone else to share her affection.
Status	Social rank; position in the hierarchy.	Being important matters to some people; to them, _____ can be worth more than money.
Superiority	One person or thing better or more important than another.	Some people look down on others and act with a sense of _____.
Omnipotent	All powerful.	According to Christian belief, God is _____.
Stoop	To bend the top half of the body forwards and down.	If you are very tall, you might have to _____ in a house with low ceilings.
Countenance	The appearance or expression of someone’s face.	His countenance conveyed his fear.
Symbolise	To represent something else.	A sun might _____ light or happiness.
Diatribe	Another word for a rant.	The Duke’s _____ about his last wife shows the level of his irritation.

Key Quotes: ‘Notice Neptune though, / Taming a sea-horse’ ‘I choose / Never to stoop’ ‘I gave commands; / Then all smiles stopped together’

Writer’s Craft:	Explanation
What’s the effect of using ‘my’?	It suggests possession, as if the Duchess belongs to the Duke.
Why does Browning include the detail about only the Duke opening the curtains?	The curtains are in front of the picture of the Duchess; this detail allows Browning to demonstrate the Duke’s desire to dominate: he controls who sees his Duchess (in a way he couldn’t when she was alive).
The poem is a dramatic monologue. How does this make the Duke seem controlling?	It makes it seem as though the Duke even wants to control the conversation as no-one else (e.g. the emissary) is allowed to speak.
The poem is written as a single stanza. How does this make the Duke seem dominating?	It gives the reader little pause from the Duke’s speech; it is as if we are being dominated by his words.
The Duke says ‘I choose never to stoop’. Why does Browning include this?	To stop means to bend down. The Duke sees himself as superior (more important than) other people and thinks he would be lowering himself to even tell the Duchess that he is disgusted with her.
It is hinted that the Duke kills his wife. Why has Browning included this detail?	This shows the Duke’s obsession with control – he is so infuriated that he can’t fully control his wife’s physical responses (e.g. blushing) that he has her killed. It also shows how immoral the Duke is and how power can be abused.
What does the statue of Neptune taming a seahorse in this poem symbolise?	Neptune is the Roman god of the sea; a seahorse is a weak creature in comparison, but one that is wild. The statue symbioses how the Duke sees himself: as an almost omnipotent figure who has to tame his ‘wild’ wife (by killing her and then controlling who sees her blush by putting her portrait behind a curtain).
How does evidence about the Duke build up over the poem?	The reader’s impression of the Duke builds up gradually. As the poem progresses, there is more and more evidence that he is controlling, jealous and paranoid. This builds to the dramatic hint that he had his wife killed because he was irritated her, followed by his quick switch to the topic of his next marriage. This shows him to be immoral and remorseless.

‘Jekyll and Hyde’ – Knowledge Organiser

Context

Robert Louis Stevenson

- RLS 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.
- The descriptions of London in the novella are based on Edinburgh. London is described with areas of wealth and poverty.

Victorian London

- The population of 1 million in 1800 increased to 6.7 million in 1900, with 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.
- As London grew wealthy, poverty in the city also grew. The overcrowded city became rife with crime.
- Gothic and detective literature became more relevant. There were extreme areas of poor and rich within the city.
- In the novella, Jekyll lives in an affluent area of London, whereas Hyde lives in Soho (poor area). When Mr Hyde is in the novel it is usually night time.
- A high crime rate is shown when Hyde brutally kills Danvers Carew.

Religion vs. science

- Religious people believed that you should not go against God and what he created but then scientists such as Dr Jekyll manipulated DNA.
- The implications of ***Darwinism and evolution*** 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.
- In the novella, Lanyon and Jekyll are no longer friends, as Lanyon does not agree with Jekyll’s scientific experiments. Lanyon calls Jekyll’s work “scientific balderdash”.
- Mr Hyde behaves like an animal. He is described as one too- “ape like fury”. Ultimately, he cannot be controlled.

Reputation and duality

- Victorian Gentleman had to behave and act in a certain way in public in order to keep their reputation. They were expected to behave in a certain way and meant to only visit reputable establishments.
- In the novella, Jekyll creates the persona of Hyde in order to do what he wants in society and to keep his reputation. Jekyll is the good side, whereas Hyde is the evil side.

What it means to be a traditional Victorian Gentleman.

- Victorian Gentleman were meant show sexual restraint, low tolerance of crime, religious morality and a strict social code of conduct.
- In the novella, Utterson and Lanyon are typical Victorian Gentlemen. Jekyll does not behave like a Victorian gentleman at all times. This is because he is able to do immoral and criminal acts as Hyde.

Key Things to Remember

- The novella is set in London but Edinburgh influenced the setting of the novella.
- Edward Hyde is not a separate personality living in the same body as Henry Jekyll. Hyde is just Jekyll, having transformed his body into something unrecognisable, acting on unspecified urges that would be unseemly for someone of his age and social standing in Victorian London.
- When Lanyon witnesses the transformation, he sees Hyde transform into Jekyll.
- A typical Victorian gentleman would tend to own their own land and have a generous income. They would be helpful, respectful, secretive (keeping themselves to themselves) and reputable.

Characters	
Jekyll	A doctor and experimental scientist who is both wealthy and respectable.
Hyde	A small, violent and unpleasant-looking man; an unrepentant criminal.
Lanyon	A conventional and respectable doctor and former friend of Jekyll.
Utterson	A calm and rational lawyer and friend of Jekyll.
Poole	Jekyll’s manservant / butler.
Enfield	A cousin of Utterson and well-known man about town
Carew	A distinguished gentleman who is beaten to death by Hyde.

Themes	
Duality	Many contrasts in terms of setting, character and themes including: reality vs appearance, Jekyll and Hyde, light and dark, the good and evil side of someone, upper class London and Soho.
Secrecy and Silence	The novel's secrets come out in parts: -Enfield shares his story with Utterson, but he is only persuaded to share Hyde’s name at the end. -When Utterson hears Hyde's name he does not reveal that he has heard it before, in Jekyll's will. -From that point on, most of the story’s revelations are through a sequence of letter and documents, addressed, sealed and enclosed in safes, so that they need to be put together like a puzzle at the end. (The dependence on these sheets of paper for the unravelling of the mystery creates a sense of silence and isolation about each character.)
Reputation	Each man seems to be isolated from every other, and there is a sense that this masculine world has been hushed by the need to maintain social reputation. (Keep their secrets) The men in the novel avoid gossip. Through Mr. Hyde, Jekyll believes he can maintain his reputation while enjoying his darker urges.
Religion	Reference to Satan, God, religion & charity work. The men discuss various religious works. Mr Hyde’s evilness is shown as he defaces Dr.Jekyll’s favorite religious work. Mr. Hyde is often likened to Satan.
Gothic	The key features of the gothic genre are shown through the: setting e.g. the alleyway, character e.g. the antagonist of Hyde, the plot e.g. the vicious murder of Carew.
Good vs. Evil	Seen through the encounters that Hyde has with other characters, particularly with the murder Danvers Carew. It can also been seen with the differences between Hyde and Jekyll.
Duality	Many contrasts in terms of setting, character and themes including: reality vs appearance, Jekyll and Hyde, light and dark, the good and evil side of someone, upper class London and Soho.

Plot

- The Story of the Door: Passing a strange-looking door whilst out for a walk, Enfield tells Utterson about an incident involving a man (Hyde) trampling 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)
- Search for Hyde: Utterson looks at Dr. Jekyll's will and discovers that he has left his possessions to Mr. Hyde in the event of his disappearance / death. Utterson watches the door and sees Hyde unlock it, then goes to warn Jekyll. Jekyll isn't in. Poole tells him the servants have been told to obey Hyde.
- Dr. Jekyll was Quite at Ease: 2 weeks later, Utterson goes to a dinner party at Jekyll's house and tells him about his concerns. Jekyll laughs off his worries.
- The Carew Murder Case: 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 find Hyde, but are told he hasn't been there for 2 months. They find the other half of the cane.
- Incident of the Letter: 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.
- Remarkable Incident of Dr. Lanyon: Hyde has disappeared. Jekyll seems happier and more sociable until a sudden depression strikes him. Utterson visits 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 & leaves a note for Utterson to open after the death or disappearance of Jekyll. Utterson tries to visit Jekyll but is told (by Poole) that he's living in isolation.
- Incident at the Window: 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.
- The Last Night: 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.
- Dr Lanyon's Narrative: 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.
- Henry Jekyll's Full Statement of the Case: 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.

Terminology

Narrative Perspective	Who is narrating the plot or events of a story.
Pathetic fallacy	Using the elements of weather to predict events or show emotion.
Antithesis	The direct opposite of something.
Motif	A narrative element with symbolic meaning that repeats throughout a work of literature. Motifs may come in the form of reoccurring imagery, language, structure, or contrasts.
Zoomorphism	Giving animal-like qualities to anything that is not that animal such as humans, gods and inanimate objects.

Key Vocabulary

Countenance	A person's face or facial expressions.
Juggernaut	A huge, powerful and overwhelming force.
Duality	1. The quality or condition of being dual. 2. An instance of opposition or contrast between two concepts or two aspects of something
Evolution	The process by which different kinds of living organism are believed to have developed from earlier forms during the history of the earth.
Husky	1. Sounding low pitched and slightly hoarse. 2. (of a person) big and strong.
Hoarse	(of a person's voice) sounding rough and harsh, typically as the result of a sore throat or of shouting.
Morality	Principles concerning the distinction between right and wrong or good and bad behaviour.
Troglodytic	A person characterised by reclusive habits or outmoded or reactionary attitudes.
Phial	A small cylindrical glass bottle, typically used for medical samples or for potions or medicines.
Apothecary	A person who prepared and sold medicines and drugs.
Baize	A coarse, typically green woollen material resembling felt, used for covering billiard and card tables.
Balderdash	Senseless talk or writing; nonsense.
Façade	A deceptive outward appearance.
Austere	1. Severe or strict in manner or attitude. 2. (of living conditions or a way of life) having no comforts or luxuries.

Urban Issues & Challenges

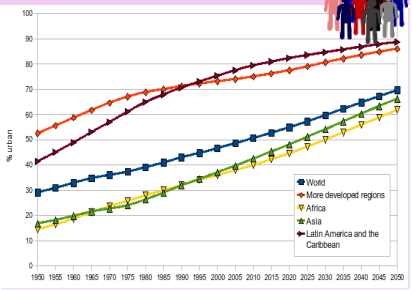
AQA

What is Urbanisation?

This is an increase in the amount of people living in urban areas such as towns or cities. In 2007, the UN announced that for the first time, more than 50 % of the world's population live in urban areas.

Where is Urbanisation happening?

Urbanisation is happening all over the word but in LICs and NEEs rates are much faster than HICs. This is mostly because of the rapid economic growth they are experiencing.



Causes of Urbanisation

Rural - urban migration (1) — **The movement of people from rural to urban areas.**

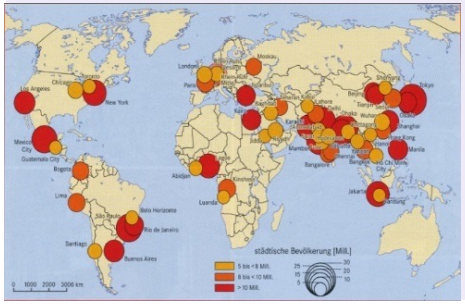
Push	Pull
• Natural disasters • War and Conflict • Mechanisation • Drought • Lack of employment	• More Jobs • Better education & healthcare • Increased quality of life. • Following family members.

Natural Increase (2) — **When the birth rate exceeds the death rate.**

Increase in birth rate (BR)	Lower death rate (DR)
• High percentage of population are child-bearing age which leads to high fertility rate. • Lack of contraception or education about family planning.	• Higher life expectancy due to better living conditions and diet. • Improved medical facilities helps lower infant mortality rate.

Types of Cities

Megacity — An urban area with over **10 million people** living there.



More than two thirds of current megacities are located in either NEEs (Brazil) and LICs (Nigeria). The amount of megacities are predicted to increase from 28 to 41 by 2030.

Sustainable Urban Living

Sustainable urban living means being able to live in cities in ways that do not pollute the environment and using resources in ways that ensure future generations also can use then.

Water Conservation

This is about reducing the amount of water used.

- Collecting rainwater for gardens and flushing toilets.
- Installing water meters and toilets that flush less water.
- Educating people on using less water.

Energy Conservation

Using less fossil fuels can reduce the rate of climate change.

- Promoting renewable energy sources.
- Making homes more energy efficient.
- Encouraging people to use energy.

Creating Green Space

Creating green spaces in urban areas can improve places for people who want to live there.

- Provide natural cooler areas for people to relax in.
- Encourages people to exercise.
- Reduces the risk of flooding from surface runoff.

Waste Recycling

More recycling means fewer resources are used. Less waste reduces the amount that eventually goes to landfill.

- Collection of household waste.
- More local recycling facilities.
- Greater awareness of the benefits in recycling.

Sustainable Urban Living Example: Freiburg

Background & Location	Sustainable Strategies
Freiburg is in west Germany. The city has a population of about 220,000. In 1970 it set the goal of focusing on social, economic and environmental sustainability.	• The city's waste water allows for rainwater to be retained. • The use of sustainable energy such as solar and wind is becoming more important. • 40% of the city is forested with many open spaces for recreation, clean air and reducing flood risk.

Integrated Transport System

This is the linking of different forms of public and private transport within a city and the surrounding area.

Brownfield Site

Brownfield sites is an area of land or premises that has been previously used, but has subsequently become vacant, derelict or contaminated.

Traffic Management

Urban areas are busy places with many people travelling by different modes of transport. This has caused urban areas to experience different traffic congestion that can lead to various problems.

Environmental problems

- Traffic increases air pollution which releases greenhouse gases that is leading to climate change.

Economic problems

- Congestion can make people late for work and business deliveries take longer. This can cause companies to loose money.

Social Problems

- There is a greater risk of accidents and congestion is a cause of frustration. Traffic can also lead to health issues for pedestrians.

Congestion Solutions

- Widen roads to allow more traffic to flow easily.
- Build ring roads and bypasses to keep through traffic out of city centres.
- Introduce park and ride schemes to reduce car use.
- Encourage car-sharing schemes in work places.
- Have public transport, cycle lanes & cycle hire schemes.
- Having congestion charges discourages drivers from entering the busy city centres.

Traffic Management Example: Bristol

In 2012 Bristol was the most congested city in the UK. Now the city aims to develop it's integrated transport system to encourage more people to use the public transport. The city has also invested in cycle routes and hiring schemes.

Greenbelt Area

This is a zone of land surrounding a city where new building is strictly controlled to try to prevent cities growing too much and too fast.

Urban Regeneration

The investment in the revival of old, urban areas by either improving what is there or clearing it away and rebuilding.

Urban Change in a Major UK City: Bristol Case Study

Location and Background

Bristol is in the country of England .
It is in the South West
Both the River Avon and Severn run through Bristol and eventually meet a body of water called the Bristol Channel.
The motorways M4 & M5 run through Bristol. Bristol is approximately 2.5km away from the country of Wales.

City's Importance

- Banksy (world famous graffiti artist) comes from Bristol
- Ribena invented in Bristol
- Aardman animations (Wallace and Gromit) based there
- First UK cycling city and to be awarded 2015 European Green capital
- Bristol airport (links to Europe and USA)
- Two universities

Migration to Bristol

Between 1851 and 1891 Bristol's population doubled as people arrived looking for work. In recent years migration from abroad has accounted for about half of Bristol's population growth. This has included large numbers from EU countries, in particular Poland and Spain.

Fifty countries are represented in Bristol's population. As well as their economic impact, migrants contribute to the cultural life of the city in music, art, literature and food. Bristol's large African and Afro- Caribbean population has had a significant impact, and has created a strong community spirit. The St Paul's Carnival attracts around 40000 people each year. Its aim is to help improve relations between the European, African, Caribbean and Asian communities.

City's Opportunities

Social: Bristol has Shopping centres like Cabot circus, Bristol Harbourside is full of restaurants and museums.

Economic: 30% of jobs are in finance, lots of hi-tech industries. Aardman industries (Wallace and Gromit). Defence industries. There are 50 micro-electronic and silicon design businesses in the Bristol area – the largest concentration outside California's Silicon Valley.

Environmental: Integrated transport; Britain's first cycling city. Good record of reusing brownfield sites. Lots of green space, 2015 European Green Capital.

City Challenges

Social: Social inequality between Filwood and Stoke Bishop. Filwood: Over 1300 crimes per year, In 2013 only 36% of students got top grades at GCSE. Stoke Bishop: Less than 300 crimes year, 94% of 16 year-olds got the highest grades in five or more GCSEs

Economic: Economic inequality between Filwood and Stoke Bishop. Filwood: One-third of people aged 16–24 are unemployed: over half are either long-term unemployed or have never worked. Stoke Bishop: Only 3% of people are unemployed.

Environmental: Bristol produces highest food waste per person on average than UK. Atmospheric pollution from traffic.

Bristol Harbourside Regeneration Project

SUCCESSES: Over 3,000 new jobs. A mixed commercial environment that includes café bars, restaurants, cinemas, shops.
New developments for the arts. Sports facilities.
An industrial museum and maritime heritage museum. The preservation and utilisation of listed buildings. Residential developments providing much needed housing. Rated as one of the best harbour-side redevelopments in the UK.
FAILURES: Concerns about how the area would fare during recession especially as it is so dependant on entertainment, it has done nothing to improve traffic congestion. New houses are very expensive.

Urban Change in a Major NEE City: RIO DE JANEIRO Case Study

Location and Background

Rio is a coastal city situated in the South East region of Brazil within the continent of South America. It is the second most populated city in the country (6.5 million) after Sao Paulo.

City's Importance

- Has the second largest GDP in Brazil It is headquarters to many of Brazil's main companies, particularly with Oil and Gas.
- Sugar Loaf mountain is world heritage site
- One of the most visited places in the Southern Hemisphere.
- Hosted the 2014 World Cup and 2016 Summer Olympics.
- Christ the Redeemer is a new 7 wonder.

Migration to Rio De Janeiro

The city began when Portuguese settlers with slaves arrived in 1502. Since then, Rio has become home to various ethnic groups.

However, more recently, millions of people have migrated from rural areas that have suffered from drought, lack of services and unemployment to Rio. People do this to search for a better quality of life.

This expanding population has resulted in the rapid urbanisation of Rio de Janeiro.

City's Opportunities

Social: Standards of living are gradually improving. The Rio Carnival is an important cultural event for traditional dancing and music.

Economic: Rio has one of the highest incomes per person in the country. The city has various types of employment including oil, retail and manufacturing.

Environmental: The hosting of the major sporting events encouraged more investment in sewage works and public transport systems.

City Challenges

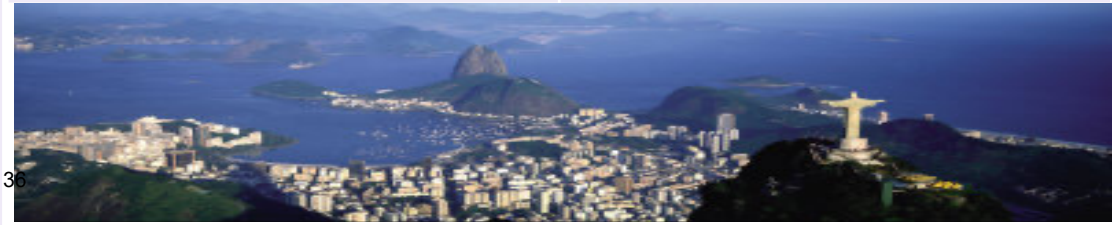
Social: There is a severe shortage of housing, schools and healthcare centres available. Large scale social inequality, is creating tensions between the rich and poor.

Economic: The rise of informal jobs with low pay and no tax contributions. There is high employment in shanty towns called Favelas

Environmental: Shanty towns called Favelas are established around the city, typically on unfavourable land, such as hills.

Self-help schemes - Rocinha, Bairro Project

- The authorities have provided basic materials to improve peoples homes with safe electricity and sewage pipes.
- Government has demolished houses and created new estates.
- Community policing has been established, along with a tougher stance on gangs with military backed police.
- Greater investment in new road and rail network to reduce pollution and increase connections between rich and poor areas.



Cycle 1 Knowledge Organiser: Crime and Punishment 1250-Present Day

	Crime and Criminals	Enforcement	Punishment
Medieval: 1250-1500	**Petty Crimes:** minor crimes e.g. theft under 12d, minor assaults, cheating customers **Felonies:** Serious crimes – punishment = death e.g. treason**,** murder, theft over 12d **Causes:** Poverty/desperation, poor harvests = famine e.g. 1315-21. Wars of Roses (civil war) 1455-1485 **New crimes:** Scolding -use of abusive speech – almost always used against women, Vagrancy - wandering country begging, Treason split into High Treason (against King/govt) Petty Treason (against anyone in authority over you)	**Sheriff:** In charge of county, unpaid, kept some of fines. Would be a powerful noble **Constables:** Usually wealthy farmers, controlled the hundred or parish, prepared men for war e.g. made sure men armed/ practised archery on Sunday. **Hue and Cry:** Responsibility of all people to catch criminals as no police force. If not done, whole village fined. **Royal Courts:** Highest courts – serious crimes. After 1293 Edward I ordered them to visit counties 2-3x/year (called **Assizes**). **Justices of the Peace (JPs):** established 1361, appointed by monarch. Gradually took over from Sheriffs. Quarter Sessions – courts run in each county 4x/year. **Church Courts:** deal with moral crime e.g. sex outside marriage. Less harsh punishments.	**Public humiliation:** Stocks/pillory - public throw rotten fruit/dung, public confession - especially for adultery/moral crime **Fines:** common punishment, petty crimes e.g. selling gone off food. These fines went to government or church officials who issued the fine e.g. sheriff. **Death:** Hanging most common, Burning for heresy. Local variations e.g. Dover= Thrown off cliffs. These variations got rid of by approx. 1350. **Imprisonment:** Not a common punishment. For those with unpaid fines/debts, for those awaiting trial or refusing to plead. Had to pay for food/bedding. **Avoiding punishment:** Join army, claim benefit of clergy, be pregnant, bribe
Early Modern: 1500-1750	**New Crimes:** • Moral crimes – Puritans in charge = increase in laws against immoral behaviour. Cromwell banned theatres, gambling, football. • vagrancy – rise in pop & low wages = rise in vagrancy. Printing press allows pamphlets about vagrants to be printed – increases fear of them. • Witchcraft - James I fear of witches, wrote Daemonology – book on witches. More accused of witchcraft. • Highway robbery - new roads (unlit), stagecoaches introduced, wealthy carried valuables as no banks.	**Hue and Cry:** See Medieval. **Assizes:** Government courts for most serious crimes, e.g. Murder, treason etc. lasted until 1971!, **Quarter sessions:** Run by JPs. Deal with less serious crimes. NOT felonies. **Petty sessions**: Also run by JPs. Take over the from Manor courts helped monarchs make sure law was enforced consistently. **Church Courts:** Particularly powerful due to influence of puritans – dealt with moral offences e.g. adultery, not going to church, swearing etc.	**Public Humiliation:** Stocks, ducking stool, scold's bridle **Corporal punishment (Whipping and branding):** became more common in EM period**, u**sed against vagrants – hole branded through ear **Death:** Hanging drawing and quartering for treason e.g. Guy Fawkes 1606, **Bridewells:** For vagrants, like a prison, forced to work. **Bloody Code:** Introduced 1688, capital offences increase 50 – 200, Black Act – out at night with blacked out face = hanging offence

Industrial: 1750-1900	**Rise in Crime rates 1750-1850:** • End of Napoleonic wars, 1815, Soldiers return & arms factories shut = unemployment. • Population rise/ urbanisation - cities cramped, no one knows each other, pickpocketing easy. • Industrial Revolution – more trade & more goods created = more things to steal. **Fall in Crime rates 1850-1900** More effective police, end of the Bloody Code. **New Crimes** 'White Collar Crime': non-violent crimes like fraud, mostly committed by businessmen e.g. cheating your company by taking the profits. Embezzlement. Railway crimes: Vandalism and fair dodging.	**Bow St Runners:** Set up by John Fielding, 1750. Constables paid to patrol streets after dark. Only in one area of London. 68 by 1800. Fielding also published Hue and Cry – newspaper with details of crimes committed & wanted criminals. **Metropolitan Police:** Set up by Robert Peel in 1829, 3000 officers. Hue & cry not working – too many people in cities. Just London. Success – crime rate reduced significantly. **Spread of Policing:** Municipal Corporations Act (1835) allowed counties to set up their own police forces. **Beginning of Technology:** Cameras = photograph crime scenes e.g. Jack the Ripper, telegraph improves communication.	**Capital Punishment:** Became more humane – long drop & new drop – break neck not strangle, moved behind prison walls not in public. Bloody Code (see Early Modern) ends 1820. **Prison:** becomes common punishment. • Govt changes – New prisons (Millbank/Pentonville), Separate/silent systems, Hard labour e.g. shot duty (carrying cannonballs) & the crank – turn handle 1000x per day. • Reformers – Elizabeth Fry, women's prison (education, taught sewing,) John Howard - improved hygiene. Stopped prisoners paying to be released at end of sentence. **Transportation:** Prisons full. Criminals sent to Australia – removed criminals from Britain & helped create the new colony.
Modern: 1900-present day	**New Crimes:** • Car Crime – Cars more common so new laws e.g. drink driving, seat belts, speeding • Hate Crimes– Increase in immigration = racist attacks. Made a crime along with LGBTQ+ attacks or attacks on religion. • Cyber Crime - creation of internet, online banking, illegal downloads. • Illegal drugs – linked to rise in Pop music • Covid – lockdown, masks etc **Crime Rate:** WWII: Bombed houses looted in Blitz, rationing = goods sold on black market. Sharp rise in crime after 1955 **–** new crimes (see above), more effective recording, more effective police and to claim insurance you need to report crime.	**Specialisation of police:** New types of specialised officers e.g. riot police, dog handlers, anti-terrorist **New technology:** CCTV, DNA evidence, mobile phones/radios – easier to catch/convict criminals **Role of Women:** Now allowed on juries & to be judges. More female magistrates than male. **Juvenile courts:** Young offenders (7-16), set up 1908. **Crown Prosecution Service (CPS):** Made decision if case goes to court, reduces power of police/chance for police harassment.	**Abolition of Capital Punishment:** Gradual process, 'Let him have it' case encouraged abolition (Derek Bentley hanged), abolished 1969 **Prison:** Reform – Alexander Patterson (silent system relaxed, education increased, allowed to earn money) **Young Offenders:** No longer sent to adult prisons. **'**Borstals' (prisons for <21Yrs old) set up 1902, Young Offender Institutes replaced Borstals in 1988 (10-17yrs). **Alternatives to prison:** Community service e.g. do something useful rather than prison, Electronic tags for those out on bail/probation.

5 factors of change	**Beliefs, Attitudes, and Values** – what people believed in. Not *just* religion, e.g. new scientific knowledge too **Wealth and poverty** – How much money people had and how this affects crime. **Urbanisation** – The growth of towns and cities as people move there from the countryside to get work and the population increases **Government** – Who is in charge and how the country is run. **Technology –** Anything made by humans to make their lives easier. Could be simple e.g. ploughs or complicated e.g. Computers

Y10 C1 Maths Foundation Key knowledge

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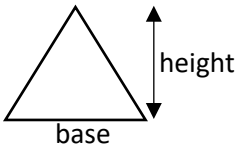
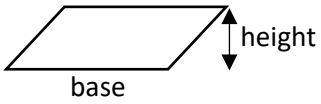
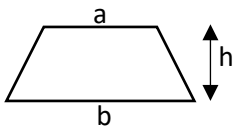
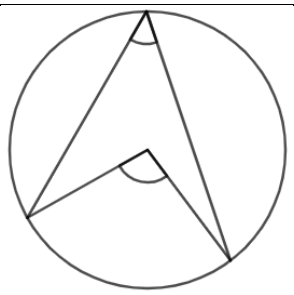
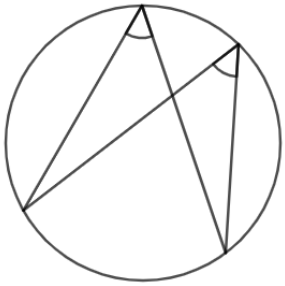
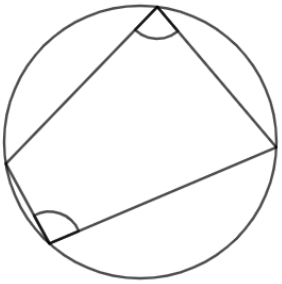
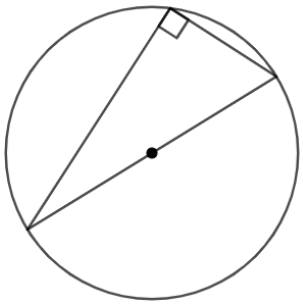
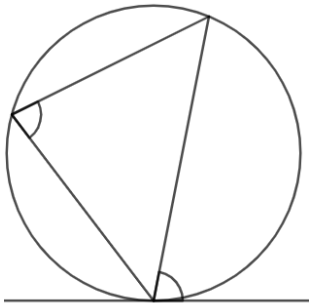
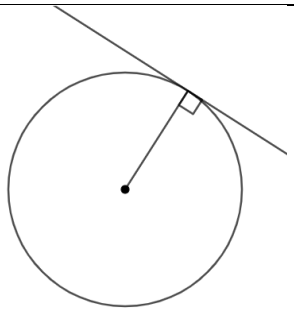
<tr><td>1</td><td>£1.50</td></tr>
</table>
Apples can be converted to cost by multiplying by 1.5</td></tr>
<tr><td>Area of a rectangle</td><td>$Area\ of\ rectangle = base \times height$</td></tr>
<tr><td>Area of a triangle</td><td>$Area\ of\ triangle = \frac{1}{2} base \times height$
 
</td></tr>
<tr><td>Area of a parallelogram</td><td>$Area\ of\ parallelogram = base \times height$
 
</td></tr>
<tr><td>Area of a trapezium</td><td>$Area\ of\ trapezium = \frac{1}{2}(a+b) \times h$
 
</td></tr>
<tr><td>Area of a circle</td><td>$area = \pi \times radius^2$</td></tr>
<tr><td>Average</td><td>The mean (add then divide), median (middle) or mode (most frequent). They measure the centre of a group of data.</td></tr>
<tr><td>Spread</td><td>The range. It measures how spread out a group of data is.</td></tr>
<tr><td>Frequency</td><td>How often something occurs.
For example, there are 3 red cars in the car park. Red cars have a frequency of 3</td></tr>
<tr><td>Transformation</td><td>There are 4 transformations at GCSE. They are Rotation, Reflection, Transformation, & Enlargement</td></tr>
<tr><td>Describe fully</td><td>Command words that are asking for all information about a transformation including the name.
<table>
<tr><th>Rotation</th><th>Reflection</th><th>Transformation</th><th>Enlargement</th></tr>
<tr><td>• Angle
• Direction
• Centre of rotation</td><td>• Mirror line</td><td>• Vector $\begin{pmatrix} x \\ y \end{pmatrix}$</td><td>• Centre of enlargement
• Scale factor</td></tr>
</table></td></tr>
</table>

Y10 C1 Maths Higher Key knowledge

Item	Description	
Direct proportion formulae	$y = kx$ $y = kx^2$ $y = kx^3$ $y = k\sqrt{x}$	y is proportional to x y is proportional to the **square** of x y is proportional to the **cube** of x y is proportional to the **square root** of x
Inverse proportion formulae	$y = \frac{k}{x}$ $y = \frac{k}{x^2}$ $y = \frac{k}{x^3}$ $y = \frac{k}{\sqrt{x}}$	y is **inversely** proportional to x y is **inversely** proportional to the **square** of x y is **inversely** proportional to the **cube** of x y is **inversely** proportional to the **square root** of x
Irrational number/Surd	A number that cannot be written as a fraction. Usually written as the square root of a number. Eg. $\sqrt{2}$ is irrational but $\sqrt{4}$ is not	

Circle theorems

The angle at the centre is double the angle at the circumference	Angles subtended by the same chord are equal	The opposite angles of a cyclic quadrilateral sum to 180°
		
The angle in a semicircle is 90°	The angle between a tangent and a chord is equal to the angle in the alternate segment	The angle between a tangent and a radius is 90°
		

Y10 French LC1 Sentence builder 1: I used to be… Tu étais comment?

Time expression	Past Imp.	adjective/noun	connective	past imperfect	noun/phrase
Quand j'étais jeune (When I was younger)	j'étais (I used to be)	mignon(ne) (cute) sympa (nice) idiot(e) (silly) marrant(e) (funny) sage (sensible) énervant(e) (annoying)	et (and) aussi (also)	je jouais (I used to play)	à Pierre-feuille-ciseaux (rock-paper-scissors) à cache-cache (hide and seek) au foot (football) au rugby (rugby) au netball (netball)
	j'habitais (I used to live)	à Paris (in Paris) en France (in France) au Canada (in Canada) aux États-Unis (in the USA) dans un village (in a village) avec mon père (with my dad)		j'allais (I used to go)	à l'école primaire (to primary school)
	je portais (I used to wear)	un short et un t-shirt (shorts and t-shirt) une jupe et une chemise (a skirt and shirt) une salopette (dungarees) un jean et un pull (jeans and a jumper) un pantalon et un sweat à capuche (trousers and a hoodie)		je faisais (I used to do)	du judo (judo) du surf (surfing) de la danse (dance) de la natation (swimming) de l'équitation (horseriding)
	j'aimais (I used to like)	les animaux (animals) les peluches (soft toys) les poupées (dolls) danser (to dance) jouer au + sport (to play…) lire des histoires (reading stories)	mais (but) cependant (however)	je n'aimais pas (I didn't like)	les animaux (animals) les peluches (soft toys) les poupées (dolls) danser (to dance) jouer au + sport (to play…) lire des histoires (reading stories)

time marker	present	infinitive verb	noun	connective	comparative	adjective
mais maintenant (but now)	je préfère (I prefer) j'aime (I like) je dois (I have to)	jouer (to play) habiter (to live) aller (to go) faire (to do) porter (to wear)	au jeux vidéos (video games) au netball en Angleterre (in England) à _____ (in + town/village) au cinéma au bowling de la planche à voile (windsurfing) de la natation (swimming) un jean (jeans) mon uniforme (my uniform)	parce que c'est puisque c'est car c'est (because it's)	plus (more) moins (less)	passionnant(e) (exciting) barbant(e) (boring) ludique (fun/funny) adulte (grown up) idiot(e) (silly)

Y10 French LC1 Sentence Builder 2 : Talking about hobbies – past/present/future : Qu'est-ce que tu aimes faire ?

Time marker	Tense/verb	activity	sub. clause	opinion phrase	intensifier	adjective
Normalement (Normally) D'habitude (Usually) Le weekend (on the weekend)	je joue (I play) tu joues (you play) il/elle/on joue (he/she/we play) nous jouons (we play) vous jouez (you play) ils/elles jouent (they play) je fais (I do) tu fais (you do) il/elle/on fait (he/she/we do) nous faisons (we do) vous faites (you do) ils/elles font (they do)	au foot au netball aux jeux en ligne (games online) de la guitare du piano du sport (sport) de la natation (swimming) de l'équitation (horseriding) du bowling(bowling) les magasins (shops) les corvées (chores)	quand il fait beau (when it's nice weather) quand il pleut (when it rains) quand il fait du soleil (when it's sunny) quand il neige (when it snows)	car c'est (because it's) je pense que c'est (I think it's) selon moi c'est (according to me it's)	très (very) assez (quite) vraiment (really) un peu (a bit) trop (too) hyper (super)	ludique (fun) passionnant (exciting) le/la meilleur(e) (the best) magnifique (magnificent) formidable (wonderful) agréable (enjoyable) incroyable (incredible)
Hier (Yesterday) Le weekend dernier (Last weekend)	j'ai joué (I played) tu as joué (you played) il/elle/on a joué (he/she/we played) nous avons joué (we played) vous avez joué (you played) ils/elles ont joué (they played) j'ai fait (I did) tu as fait (you did) il/elle/on a fait (he/she/we did) nous avons fait (we did) vous avez fait (you did) ils/elles ont fait (they did)	au foot au netball aux jeux enligne (games online) de la guitare du piano du sport (sport) de la natation (swimming) de l'équitation (horseriding) du bowling(bowling) les magasins (shops) les corvées (chores)	avec ma famille (with my familly) avec mes copains/copines (with my friends – m/f) avec ma sœur/mon frère (with my sister/brother)	car c'était (because it was) je pense que c'était (I think it was) selon moi c'était (according to me it was)		
Demain (tomorrow) Le weekend prochain (Next weekend)	je vais jouer (I'm going to play) tu vas jouer (you're going to play) il/elle/on va jouer (he/she/we're going to play) nous allons jouer (we're going to play) vous allez jouer (you're going to play) ils/elles vont jouer (they're going to play) je vais faire (I'm going to do) tu vas faire (you're going to do) il/elle/on va faire (he/she/we're going to do) nous allons faire (we're going to do) vous allez faire (you're going to do) ils/elles vont faire (they're going to do)	au foot au netball aux jeux en ligne (games online) de la guitare du piano du sport (sport) de la natation (swimming) de l'équitation (horseriding) du bowling(bowling) les magasins (shops) les corvées (chores)	s'il fait beau (if it's nice weather) s'il pleut (if it rains) s'il fait du soleil (if it's sunny) s'il neige (if it snows)	car ce sera (because it will be) je pense que ce sera (I think it will be) selon moi ce sera (according to me it will be)		

Y10 French LC1 Sentence Builder 3 : Qu'est-ce que tu voudrais faire à l'avenir ? Talking about hobbies/dreams – giving more complex opinions

Time marker	conditional tense	infinitive	noun phrase	connective	conditional	opinion phrase
A l'avenir (in the future) Un jour (one day) Si possible (If possible)	je voudr**ais** tu voudr**ais** il/elle/on voudr**ait** Nous voudr**ions** Vous voudr**iez** Ils/elles voudr**aient** (* would like) j'aimer**ais** tu aimer**ais** il/elle/on aimer**ait** nous aimer**ions** vous aimer**iez** ils/elles aimer**aient** (* would like)	faire (to do) aller (to go) jouer (to play) être (to be) apprendre (to learn)	de la planche à voile (windsurfing) un saut en parachute (a parachute jump) de la plongée (deep sea diving) le tour du monde (a world tour) à l'étranger pour étudier (abroad to study) au concert de_____ (to _____'s concert) au Louvre/aux musées (to the Louvre/to museums) au ____ pour mon pays (play _____ for my country) musicien/musicienne professionnel(le) (a professional musician) joueur de_____ a _____ player des langues étrangeres (foreign languages) jouer un instrument musical (to play a musical instrument)	car selon moi (because according to me) parce que je trouve que (because I find it) puisque je pense que (because I think that) car selon lui (because according to them) parce que il/elle trouve que (because he/she finds it) puisque il/elle pense que (because he/she thinks that)	ce serait (it would be)	une vraie aventure (a real adventure) une expérience inoubliable (an unforgettable experience) calmant/relaxant (calming/relaxing) bien pour l'esprit (good for the soul) bien d'être en plein air (good to be in fresh air) une expérience culturelle (a cultural experience) mon/son rêve (my/his her their dream) bon pour la santé (good for the health) bon pour la mentale (good for the mind) un challenge (a challenge) divertissant (entertaining) enrichissant (enriching)

Y10 French LC1 Sentence Builder 4 : Describing family celebrations: Qu'est-ce que tu vas faire pour fêter ton anniversaire ?

Time marker	tense phrase	occasion	subject	auxiliary	tense	opinion tense	opinion phrase
Récemment (recently) Hier (yesterday) l'année dernière (last year) Il y a deux ans (two years ago)	j'ai célébré (I celbrated) j'ai fêté (I celebrated) on a célébré (we celebrated) on a fêté (we celebrated)	mon anniversaire (my birthday) l'anniversaire de (the birthday of) le mariage de (the marriage of) les noces d'argent de (the silver anniversary of) le pacte civil de (the civil partnership of) les fiançailles de (the engagement of) la naissance de (the birth of) 	mon père/mon beau-père ma mère/ma belle-mère ma sœur/ma belle-sœur mon frère/mon beau-frère mon cousin ma cousine mon oncle ma tante mes grands-parents mon copain ma copine	j'ai (I) on a (we)	mangé au restaurant (ate in a restaurant) fait la fête (had a party) donné des cadeaux (gave presents) reçu des cadeaux (receieved presents) lancé des pétales (threw confetti) pris beaucoup de photos (took lots of photos) trop mangé (ate too much) dansé jusqu'à minuit (dansed until midnight)	c'était (it was)	un jour/soir inoubliable (an unforgettable day/evening) romantique (romantic) ludique (fun) passionnant (exciting) merveilleux (marvellous) formidable (wonderful) nul (rubbish) barbant (boring) fatigant (tiring)
Demain (tomorrow) A l'avenir (in the future) L'année prochaine (next year) Le weekend prochain (next week)	je vais célébrer (I'm going to celebrate) je vais fêter (I'm going to celebrate) on va célébrer (we're going to celebrate) on va fêter (we're going to celebrate)			je vais I'm going) on va (we're going)	manger au restaurant (to eat in a restaurant) faire la fête (to party) donner des cadeaux (to give presents) recevoir des cadeaux (to receive presents) lancer des pétales (to throw confetti) prendre beaucoup de photos (to take lots of photos) trop manger (to eat too much) danser jusqu'à minuit (to dance until midnight)	ce sera (it will be)	

Y10 French LC1 Sentence Builder 5 : French festivals & culture : Quels sont les fetes les plus importantes en France ?

Opinion verb	Festival nouns	pronoun	present tense phrase	opinion phrase	future tense phrase	Future verb	adjective
Ma fête préférée est (My favourite festival is) La fête préférée de ma mère est (The favourite festival of my mum is) La fête préférée de mon père est (The favourite festival of my dad is) La fête préférée de ma sœur est (The favourite festival of my sister is) La fête préférée de mon frère est (The favourite festival of my brother is)	le jour de Noël (Christmas Day) la fête Nationale (Bastille Day) le jour de l'an (New Year's Day) la fête des rois (Twelfth Night) la Chandeleur (Candlemas) la Saint Valentin (Valentine's Day) Mardi Gras (Shrove Tuesday) le 1er avril (April Fool's Day) Pâques (Easter) la fête de travail (May Day/Labour day) la fête des mères (Mother's Day) la Toussaint (All Saints' Day) la Saint-Sylvestre (New Year's Eve)	pour célébrer on (to celebrate we) la tradition est qu'on (the tradition is that we) normalement on (normally we) d'habitude on (usually we) 	s'offre des cadeaux (give presents) colle un poisson sur le dos (Stick a fish to the back) danse au bal (dance at a ball) fait la fête (have a party) fait un défilé (have a parade) regarde les feux d'artifice (watch the fireworks) envoie des cartes/fleurs (send cards/flowers) fait les crêpes (make pancakes) se déguise (dress up) prends des photos (take photos) mange un repas spécial (eat a special meal) on mange du chocolat (we eat chocolate)	quand je vais on France je (when I go to France I)	donnerai des cadeaux (will give presents) collerai un poisson sur le dos (will stick a fish to the back) danserai au bal (will dance at a ball) ferai la fête (will have a party) ferai un défilé (will have a parade) regarderai les feux d'artifice (will watch the fireworks) envoyerai des cartes/fleurs (will send cards/flowers) ferai les crêpes (will make pancakes) me déguiserai (will dress up) prendrai des photos (will take photos) mangerai un repas spécial (will eat a special meal)	ce sera (it will be)	un jour/soir inoubliable (an unforgettable day/evening) romantique (romantic) ludique (fun) passionnant (exciting) merveilleux (marvellous) formidable (wonderful) nul (rubbish) barbant (boring) fatigant (tiring)

Simple future verb tables:

	faire – to do	aller – to go	regular er verbs (regarder)	regular ir verb (finir)	regular re verb (attendre)
je/j'	ferai	irai	regarderai	finirai	attendrai
tu	feras	iras	regarderas	finiras	attendras
il/elle/on	fera	ira	regardera	finira	attendra
nous	ferons	irons	regarderons	finirons	attendrons
vous	ferez	irez	regarderez	finirez	attendrez
ils/elles	feront	iront	regarderont	finiront	attendront

Year 10 Spanish Learning Cycle 1 Sentence Builder 1:

¿Cuál es tu deporte favorito? – Which is your favourite sport?

<table>
<tr>
<td>Actualmente = nowadays
Ahora = now
Al momento = at the moment
Hoy en día = nowadays

Los martes = on Tuesdays</td>
<td>juego = I play
juegas = you play
juega = he/she/it plays
jugamos = we play
jugáis = you play
juegan = they play</td>
<td rowspan="2">al badminton = at badminton
al baloncesto = at basketball
al críquet = at cricket
al fútbol = at football
al golf = at golf
al netball = at netball
al rugby = at rugby
al tenis = at tennis
al tenis de mesa = at table tennis

al ajedrez = at chess
a los videojuegos = at videogames</td>
<td>porque es = because it is</td>
<td rowspan="5">chulo = cool
divertido = fun
emocionante = exciting
fascinante = fascinating
flipante = awesome
gracioso = funny
guay = cool
interesante = interesting
relajante = relaxing
raro = weird</td>
</tr>
<tr>
<td>Ayer = yesterday
El año pasado = last year
El verano pasado = last summer

Hace tres meses =
three months ago</td>
<td>jugué = I played
jugaste = you played
jugó = he/she/it played
jugamos = we played
jugasteis = you played
jugaron = they played</td>
<td>porque fue = because it was</td>
</tr>
<tr>
<td>Cuando era joven =
when I was young
Hace mucho tiempo =
a lot of time ago
En el pasado = in the past</td>
<td>jugaba = I used to play
jugabas = you used to play
jugaba = he/she/it used to play
jugábamos = we used to play
jugabais = you used to play
jugaban = they used to play</td>
<td>porque era = because it used to be</td>
</tr>
<tr>
<td>Actualmente = nowadays
Ahora = now
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Los martes = on Tuesdays</td>
<td>hago = I do
haces = you do
hace = he/she/it does
hacemos = we do
hacéis = you do
hacen = they do</td>
<td rowspan="2">deporte = sport
alpinismo = mountaineering
atletismo = athletics
boxeo = boxing
buceo = scuba diving
ciclismo = cycling
ciclismo de montaña = mountain biking
equitación = horseriding
escalada = climbing
esquí = skiing
gimnasia = gymnastics
monopatín = skate boarding
natación = swimming
patinaje = skating
piragüismo = canoeing/kayaking
senderismo = hiking
tiro con arco = archery
vela = sailing</td>
<td>porque es = because it is</td>
</tr>
<tr>
<td>Ayer = yesterday
El año pasado = last year
El verano pasado = last summer

Hace tres meses =
three months ago</td>
<td>hice = I did
hiciste = you did
hizo = he/she/it did
hicimos = we did
hiciestéis = you did
hicieron = they did</td>
<td>porque fue = because it was</td>
</tr>
<tr>
<td>Cuando era joven =
when I was young
Hace mucho tiempo =
a long time ago
En el pasado = in the past</td>
<td>hacía = I used to do
hacías = you used to do
hacía = he/she/it used to do
hacíamos = we used to do
hacíais = you used to do
hacían = they used to do</td>
<td>porque era = because it used to be</td>
</tr>
</table>

Year 10 Spanish Learning Cycle 1 Sentence Builder 2:

¿Crees que los grandes eventos deportivos son importantes? – Do you think that big sporting events are important?

<table>
<tr><td colspan="2">La Copa Mundial de Fútbol = Football World Cup
Los Juegos Olímpicos = The Olympic Games
Los Juegos Paralímpicos = The Paralympics
La Vuelta de España = The Tour of Spain</td><td>es = is

son = are</td><td>importante= important
necesario= necessary
beneficioso= beneficial
estúpido=stupid

una pérdida de dinero= a waste of money
una pérdida de tiempo= a waste of time</td><td rowspan="3">porque = because

dado que = given that

ya que = since</td><td>sirve para = serves (in order) to</td><td rowspan="2">promover la participación en el deporte = promote sports participation

regenerar los centros urbanos= regenerate city centres

elevar el orgullo national = raise national pride

transmitir los valores de respeto y disciplina = transmit the values of respect and discipline

unir a la gente = unite people

animar el turismo = encourage tourism</td></tr>
<tr><td>Todos los = All the
Demasiados = Too many
Muchos = Lots of
Algunos = Some
Ciertos = Certain
Otros = Other</td><td>eventos deportivos = sporting events</td><td>son = are</td><td>importantes= important
necesarios= necessary
beneficiosos= beneficial
estúpidos= stupid

una pérdida de dinero= a waste of money
una pérdida de tiempo= a waste of time</td><td>sirven para = serves (in order) to</td></tr>
<tr><td colspan="4"></td><td>hay = there is</td><td>el riesgo de ataques terroristas = risk of terrorist attacks

el coste de la organización/ seguridad = the cost of the organisation/ security

el dopaje = doping

la deuda = debt</td></tr>
</table>

*Another indefinite article worth knowing is **mismo = same**

Year 10 Spanish Learning Cycle 1 Sentence Builder 3: Weekends

¿Qué hiciste el fin de semana pasado? – What did you do last weekend?

¿Qué vas a hacer el fin de semana próximo? – What are you going to do next weekend?

El fin de semana pasado = last weekend	**fui a… = I went to…** visité… = I visited… jugué a = I played at… hablé con… = I spoke to… **hice… = I did…** trabajé en… = I worked in… estudié… = I studied… monté en = I rode… **vi… = I watched…** leí = I read…	**lo pasé = I had a … time**	bomba = blast fenomenal = phenomenal estupendo = amazing fantástico = fantastic **bien = well** interesante = interesting emocionante = exciting peligroso = dangerous **mal = bad** raro = weird solo = lonely fatal = awful terrible = terrible
Los fines de semana = at the weekends	**suelo ir a = I tend to go to…** **suelo** visitar = **I tend to** visit… **suelo** jugar a = **I tend to** play… **suelo** hablar con = **I tend to** speak to… **suelo hacer = I tend to do…** **suelo** trabajar = **I tend to** work in… **suelo** estudiar = **I tend to** study… **suelo** montar en = **I tend to** ride… **suelo ver = I tend to watch…** **suelo** leer = **I tend to** read…	**lo paso = I have a … time**	
El fin de semana que viene = next weekend **El fin de semana próximo = next weekend**	**voy a** ir a = **I am going to** go to… **voy a** visitar = **I am going to** visit… **voy a** jugar a = **I am going to** play… **voy a** hablar con = **I am going to** speak… to **voy a** hacer = **I am going to** do… **voy a** trabajar = **I am going to** work in… **voy a** estudiar = **I am going to** study… **voy a** montar en = **I am going to** ride… **voy a** ver = **I am going to** watch… **voy a** leer = **I am going to** read…	**lo voy a pasar = I am going to have a … time**	

Year 10 Spanish Learning Cycle 1 Sentence Builder 4: Asking someone out

¿Quieres salir conmigo? – Do you want to go out with me?

¿Quieres ir = do you want to go	**al** cine = **to the** cinema **al** centro = **to the** town centre **al** centro comerci**al** = **to the** mall **al** gimnasio = **to the** gym **al** concierto = **to the** concert **al** restaurante = **to the** restaurant a la plaza = **to the** town square a la piscina = **to the** swimming pool a la cafetería = **to the** cafe a la fiesta = **to the** party a la playa = **to the** beach ***a + el = al**	**conmigo? = with me**

Sí = Yes	Nos quedamos **a las** … = let's meet at**…[**time]	Nos vemos **más tarde** = see you **later**
No, lo siento = No I'm sorry	**tengo que = I have to** **quiero = I want to**	salir = to go out terminar mis deberes = to finish my homework visitar a mis abuelos = to visit my grandparents cuidar a mi hermana = to look after my sister **hacer** el vago = to laze around quedarme en casa = to stay at home
	estoy = I am	tomando el sol = sunbathing preparando la comida = preparing the food repasado para matemáticas = revising for maths escribiendo en mi blog = writing on my blog haciendo footing = jogging viendo una película = watching a film descansando = resting editando mi perfil en Facebook = editing my Facebook profiles subiendo fotos = uploading photos jugando al golf = playing golf esperando a mi amigo = waiting for a friend

Year 10 Spanish Learning Cycle 1 Sentence Builder 5:

¿Desde hace cuánto tiempo haces tus pasatiempos? – For how long have you been doing your hobbies?

¿Has tenido algún éxito en tus pasatiempos recientemente? – Have you had any successes in your hobbies recently?

practico el judo = I do judo **hago** fotografía = I **do** photography juego al golf = I play golf toco el saxofón = I **play** the saxaphone **voy al** club de ajedrez = **I go to** chess club **tengo** redes sociales **= I have** social media ahorro dinero para… = I save money for… **voy a** los conciertos = **I go to** concerts soy miembro del club de periodismo = I am a member of the journalism club leo las novelas de… = I read … novels reciclo = I recycle monto **en** bici = I ride **on** bike canto **en un** coro = I sing i**n a** choir	**desde hace = since**	**muy poco = very little** seis meses = six months **un** año = one year dos años = two years **mucho** tiempo = **a lot of** time **demasiado** tiempo = **too much** time	**me** ayuda **a** = it helps **me to**	olvidar **las** presiones **de la** vida = to forget about **the** pressures **of the** life desarrollar **mis** talentos = to develop **my** talents **hacer** nuevos amigos = **to make** new friends

hace = ago	**muy poco = very little** **seis meses = six months** **un año = one year** **dos años = two years** **mucho tiempo = a long time**	organicé **una** fiesta **para**… = I organised **a** party **for…** participé **en una** campaña = I took part **in a** campaign asistí a **un** torneo = I attended **a** tournament gané **un** trofeo/ partido = I won a trophy/ match gané **el** cinturón amarillo = I won **the** yellow belt aprobé **un** examen = I passed **an** exam subí fotos = I uploaded photos **fui a un** concierto de… = **I went to a** … concert **vi = I watched** canté en un concierto = I sang in a concert participé en una obra = I took part in a play	**me dió = it gave me**	**una** sensación **de** logro = **a** sense **of** achievement **más** confianza = **more** confidence **la** oportunidad **de ser** creativ@ = **the** opportunity **to be** creative **la** oportunidad de expresarme = **the** opportunity to express myself

Music Terminology that you will need to complete written coursework in all Components

Name	

You need to be familiar with the compositional and sonic feature terminology listed below, be able to discuss them in your written work, identify examples in recordings of your choice and use them in your composing/production coursework. The terms are grouped by feature

Compositional Feature	Terms to use	Definition	Relevant Style
Melody	Conjunct Disjunct	Melodies moving in steps (conjunct) or leaps (disjunct)	All styles
	Chromatic	Melodies based on the scale that moves in semitones	All styles
	Diatonic	Melodies based on the major scale	All styles
	Modal	Melodies based on a church mode	All styles
	Pentatonic	Melodies based on the pentatonic (5 note) scale	All styles
	Phrasing	How notes are grouped in "sentences" - tells singers and wind players when to breathe and strings players when to change bow direction	All styles
	Repetition	When a phrase is repeated	All styles
	Sequence	When a phrase is repeated bit each time a steps higher (ascending) or lower (descending) eg Ding Dong - Glooooooria	All styles
	Ornamentation	Decoration added to a note - trill, turn, bend, slide etc.	All styles
	Motif	Short musical idea	All styles
	Round/Canon	When one parts starts the tune and the 2nd part starts the same tune a little later eg Frere Jacques	All styles
	Riff/hook/ ostinato	Short repeated motif or catchy idea	All styles
	Head	The start of the main melody in jazz	All styles
	Improvisation	Making it up on the spot within the context of the chords or relevant scale	All styles

Compositional Feature	Terms to use	Definition	Relevant Style
Harmony	Major & minor triads	Three note chords (Ist, 3rd, 5th) - major (CEG) lighter and happier than minor (CEbG)	All styles
	Power chords	Chords that have no 3rd therefore are neither major nor minor (CG)	Popular styles
	7th Chords	Chords with an added 7th note - CEGBb	All styles
	Sus chords	Chords with a note that moves to resolve to the original triad - CEF becomes CEG	All styles
	Extended chords	Chords the have notes added beyond the 7th in to the next 8ve	All styles
	Suspensions	Notes held through a chord in to the next which then resolve.	All styles
	Inversions	When you change the order of notes of notes in a chord. CEG (Root position) EGC (1st Inversion) GCE (2nd inversion)	All styles
	Chord Sequence	Set order of chords eg 12 Bar blues or I, V, VI, IV	All styles
	Cadence	2 chords that make up the end of a phrase Perfect (sounds finished) V-I, Imperfect (sounds unfinished) IV-V	All styles
	Arpeggios	Notes of a chord played consecutively	All styles
	Broken chords	As above but split between parts	All styles
Tonality **Scales & modes**	Major scale	T, T, ST, T, T, T, ST- light and happy	All styles
	Minor scale	T, ST, T, T, ST, T+ST, ST dark, sad and moody	All styles
	Blues scale	Scale used in blues and jazz - C, Eb, F, F#, G, Bb	Blues & Popular styles
	Pentatonic scale	5 note scale eg. C D E G A	Popular styles & Oriental styles
	Modes	Aeolian (A-A), Dorian (D-D) etc Scales that came before the Major/Minor tonal system - used in the church choral writing	All styles
	Raga	Indian scale - different ones for differing occasions	World music
	Exotic scales	Further scales used in world music or created scales used in serialism	World music & 20th C classical styles

Compositional Feature	Terms to use	Definition	Relevant Style
Rhythm	Metre	Beats in a bar eg 4/4	All styles
	Tempo/bpm	Speed	All styles
	Syncopation	Offbeat - rhythm moves across the pulse beat - key feature Reggae	All styles
	Swing	Dotted rhythm, hump-ty dump-ty	
	One drop/skanking	One Drop - dropping the bass drum from the Ist beat of the bar giving distinctive reggae feel. Reggae Skank - stressing of offbeats in a 4 beat bar (2 & 4)	Reggae
	Polyrhythm	2 or more different rhythms going on at the same time eg 2 against 3	Samba, minimalism
	Hemiola	Making 2 bars of 3 beats sound like 3 bars of 2 beats	All styles
	Phasing	Shifting 1 phrase out of place by 1 note or beat.	Minimalism
	Regular	Regular even quaver pattern	All styles
	Dotted	Dotted notes giving hump-ty dump-ty rhythm pattern.	All styles
Structure/form	Verse Chorus or song form	Sections of a song eg typical song structure - Intro, verse, chorus, verse, chorus, bridge, chorus x2 ,outro	Popular styles
	Bridge/instrumental	Middle 8 or 16 bars in a pop song - different to the verse and chorus - contrast	Popular styles
	Intro/outro	Opening and ending of a song. Called coda in classical styles	Popular styles
	Strophic	Verse, verse, verse etc	Song styles
	Through composd	Where each verse is set to a new tune. Opposite of Strophic where each verse composed has the same tune (hymns/folk songs)	Song styles
	12 bar blues	12 Bar structure chord sequence common to blues, rock n roll and pop styles	Blues & Popular styles
	Binary/Ternary	A section B Section, ABA	All styles
	Rondo form	ABACAD - where the A section recurrs after each new section	All styles
	Variations	Different versions of an original theme - A, A1, A2, A3 etc	Classical styles
	Ground bass	Recurring bassline where different melodies are built over the top	Classical styles

Sonic Features	Terms to use	Definition
Instrumentation	Playing techniques	Pizzicato, plucked, picked, bowed, flutter tonguing, bottle neck, glissando, muted, double stopping
	Types of ensemble	Band, choir, orchestra, string quartet, jazz combo, duo, trio etc
	Electronic insts.	Synth, computer generated
Texture (layers)	Solo	I single part
	Duet	Duet 2 parts
	Homophonic	Melody & accompaniment
	Polyphonic	Lots of individual lines weaving together
	Monophonic	Single line of sound
	Unison	All singing/playing the same
Timbre	Sonic features	Sound features of an instrument
	Electronic sounds	Synth, computer generated
	FX effects	Reverb, Delay, overdrive, echo, wah-wah, chorus etc
Production	Mic use	Types of mic and how used
	Recording styles	analogue, didgital, stereo tracks, mono track
	Sampling	using small smaples of other msic in a track
	Looping	Where a section is repeated using the curly arrow
	Quantize/Snap	Bringing the MIDI in to time. Snap to grid/bar/beat - moves in to time
	Sequencing	Adding layers (tracks) using a DAW
	Automation	White line and dots (or separate track)that you can use to change volume etc
Digital Effects FX	Reverb	Simliar to echo - can be adjusted to resemble different space sizes, room, church, hall, arena
	Delay	Delays the sound then plays it back. You vary how much it delays.
	Chorus	Doubles the sound but slightly out of phase giving the impression of lots of the same part at the same time
	Flanger/Phaser	Simliar to chorus but Flanger thickens the sound - whooshing sound, Phaser adds a sweeping sound
	Distortion	Distorts the sound of the guitar & amp. Heavy and crunchy sustained sound
	Overdrive	Like distortion but more natural giving more of the orginal guitar sound
	Wah	Adds a "wah" sound to your instrument
	Pan	Shifing the sound from left to right
	Equaliser	Where you can balance the Low Mid & High sound ferquencies
	Compressor	Compresses (limits) the sound signals so it doesn't distort on peaks of volume and raises the lowest volumes
	Fade in/out	Gradually build/lessen the volume level of a track
	Volume	Changes the dynamic level.

Religion and Life

Euthanasia

Euthanasia is illegal in the UK, It can be seen as assisted suicide, therefore breaking the **Suicide Act of 1961. It can be viewed as manslaughter or murder and carries a prison sentence.**
Some people believe that people should have the right to end their own life if they are terminally ill, incapacitated or in severe pain. This is known as euthanasia. In the UK, this is currently against the law, although in some other countries it is legal (Switzerland, Netherlands and Belgium). Some Christians believe that people should not be able to end their own life because all life is sacred, and that the terminally ill should be cared for in **hospices** at the end of their lives.

Islam tells us that Euthanasia is **zulm: wrong doing against Allah.**

Active euthanasia: being given lethal drugs to end a persons life so there illness does not kill them.
Passive euthanasia: a person stops taking medication to end their life.

Sanctity of Life

Many religions believe that life is **sacred** because God created it, including Islam and Christianity. Christians believe that all life is sacred, and precious. Some Christians do not believe that anyone should take their own life or the life of someone else. Therefore some Christians believe that euthanasia and abortion is wrong, as it is wrong to end a human life. In all legal systems **murder** is the worst crime you could commit.

The Use of Animals

Many medicines are tested on animals before they can be used on humans to ensure that they are safe. This is very controversial because many people think that it cruel and unnecessary. However others believe that animal experimentation is necessary to make breakthroughs in science and technology, and to manufacture effective cures. For example many surgical procedures such as transplantation surgery were traditionally perfected on animals.
Christians and Muslims are allowed to eat meat in their diets, although Muslims do not eat pork and some Christians fast during Lent. **Vegetarian**: a person who does not eat meat.

Abortion

The law defines abortion as ***"the deliberate expulsion of a foetus from the womb, with the intention of destroying it"*.** In the UK abortion is allowed up until 24 weeks of a pregnancy under special circumstances, i.e. if two registered doctors agree that there is a danger to the women's mental or physical health, the foetus will be born with disabilities, or the mental or physical health of existing children will be put at risk. Some people do not believe that abortion is right because it means terminating the life of an unborn child. However, many people believe that it is the woman who should have the choice as to what happens to her body and therefore it is for her to make up her own mind. There are also circumstances such as rape, genetic abnormalities or failed contraception which cause debate on both sides of the argument.
In Islam, the life of the mother takes precedence – she is a fully developed human with responsibilities, whereas the foetus is not even born and will need everything doing for it.

Pro-Life: term used for arguments against abortion
Pro-choice: arguments in favour of having the CHOICE to choose an abortion

"Mutual respect for and tolerance of those with different faiths and beliefs and for those without faith"

Origins of the Universe and Life

Some Christians believe that the universe was created by God in 7 days. This is described in the bible in the book of **Genesis.** The bible says that Adam and Eve were the first man and women. Christians who believe the literal truth of the bible are known as **Creationists.** Other Christians think the creation story is a metaphor for the creation of the Universe, but do not believe that the world was created in 7 days. Scientists believe that the Universe was created billions of years ago and is constantly evolving. This is known a **the Big Bang Theory. Charles Darwin** was a famous scientist who came up with the theories of evolution and natural selection. This theory explains that humans are descended from apes and that species are constantly evolving to adapt to their changing environment.

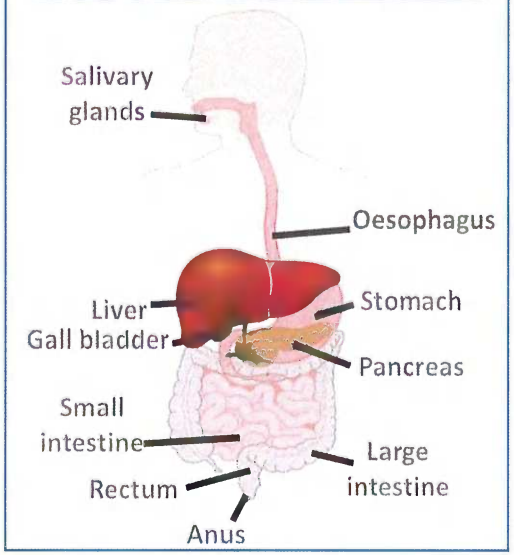
Stewardship: the idea that God created the world and that humans have a responsibility to look after it.
Dominion: the belief that God gave humans the right to decide what happens to the world and the species in it.

Biology 4.2 Organisation

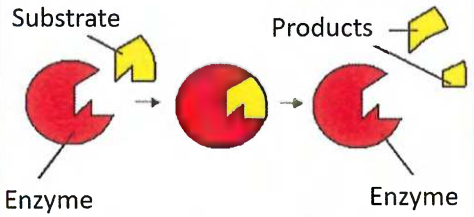
1. Cells, tissues, organs & systems

Cells	The basic building blocks of all living organisms. Eg. Muscle, skin, nerve, root hair and palisade leaf cells
Tissue	A group of cells with a similar structure and function (job). Eg. Muscle, heart, xylem and epidermal tissue
Organs	A group of tissues performing a specific function. Eg. Heart, liver, brain, roots, stem, leaf & flower
Organ systems	Groups of organs working together to form an organism. Eg. circulatory, nervous & transpiration systems
Eg Digestive system	The organ system in which several organs work together to digest & absorb food.

2. Human digestive system



3. How enzymes work



Lock & Key Model

Key term : Denature. If the optimum conditions are not correct for an enzyme, it loses it's shape and cannot attach to the substrate (nutrient molecule). It is "denatured".

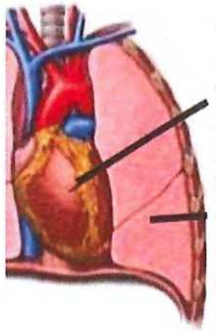
4. Digestive enzymes (biological catalysts) convert food into small, soluble molecules- can be absorbed into the bloodstream from the digestive system.

Enzyme	Nutrients acted upon	Products (smaller molecules)
Carbohydrase Eg. Amylase	Carbohydrate Eg. starch	Simple sugars Eg. glucose
Protease	Protein	Amino acids
Lipase	Lipid (fats & oils)	Glycerol & fatty acids

Key term : Bile. Made in the liver. Stored in the gall bladder. Alkaline. Neutralises HCl from the stomach and emulsifies fat.

Enzyme	Produced where in the body?	Optimum pH condition & temperature
Amylase	Salivary glands	pH7 37°C
Protease	Stomach, pancreas	pH2 37°C
Lipase	Pancreas, small intestine	pH8 37°C

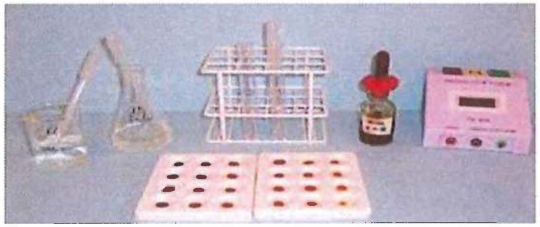
5. Cardiovascular System



Heart – organ that pumps blood around the body in a double-circulatory system.
Lungs – organs adapted for gaseous exchange (trachea, bronchi, bronchioles, alveoli)

6. RPA: Investigate the effect of pH on the rate of reaction of amylase on starch.

Amylase breaks down starch. Starch turns blue/black when iodine (an orange solution) is added.



Apparatus

- Starch solution (CV)
- Amylase solution (CV)
- Buffer solutions of different pH (**IV**)
- Spotting tiles
- Test tubes
- Water bath (temp **CV**)
- Iodine solution
- Stop clock

DV is the time at which the starch/ amylase solution no longer turns blue/black.

7. RPA: Use qualitative reagents to test for carbohydrate, proteins and lipids.

Food group	Reagent	Positive result
Glucose	Benedict's solution (heated) 	Bright blue to orange/ brick red 
Protein	Biuret's solution 	Bright blue to lilac 
Starch	Iodine solution 	Orange to blue/ black 
Lipid (Fat/oil)	Ethanol & water 	Clear to Milky/ cloudy 

Coronary heart disease (CHD) — Non-communicable disease where fatty material builds up in the coronary arteries.

9. Coronary heart disease treatments

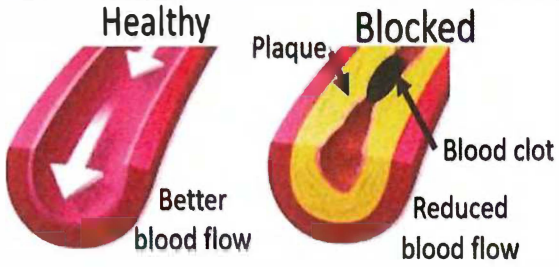
- **Stents** are inserted to keep the arteries open
- **Statins** are drugs to reduce cholesterol levels, slowing the rate of fatty deposits in the arteries.

Faulty heart valves

- Cause backflow of blood and lack of pressure to pump blood.
- Can be replaced by biological (animal) or mechanical (metal) valves.

Heart failure

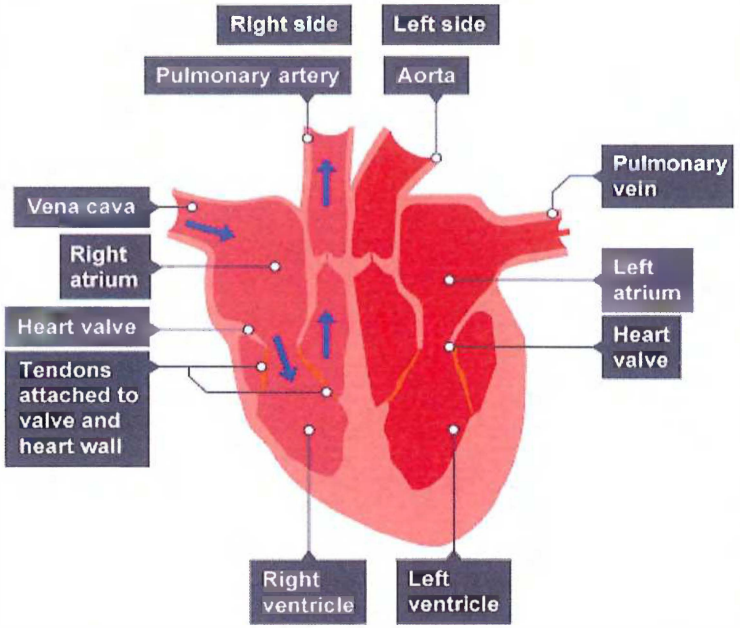
- Donor heart or heart & lungs transplant
- Artificial heart occasionally used temporarily.



8. Heart Structure

Right side of the heart receives deoxygenated blood **from** the body and pumps it to the lungs.

Left side of the heart sends oxygenated blood **to** the body.



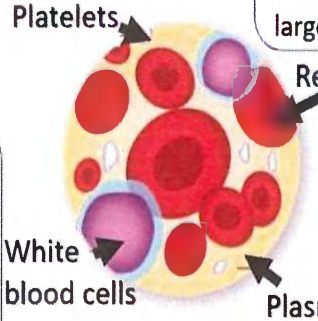
Non-communicable disease — A disease which is not contagious (is not infectious/cannot be passed on to someone else)

Pacemaker — Group of cells in the right atrium that control resting heart rate.

10. Parts of the Blood

Fragments of cells which collect at wounds & trigger clotting.

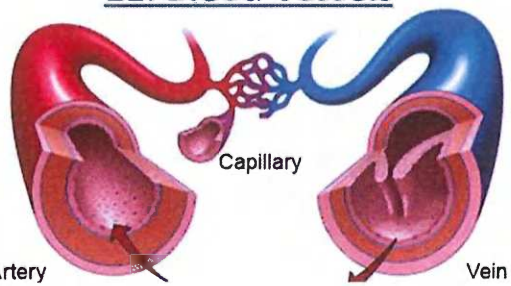
Transport oxygen to cells for respiration. No nucleus, biconcave shape to large surface area



Protect the body from infection. Phagocytosis. Antibody & antitoxin production

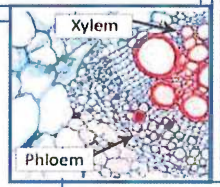
Transports cells, hormones, antibodies, urea, carbon dioxide & products of digestion.

11. Blood Vessels

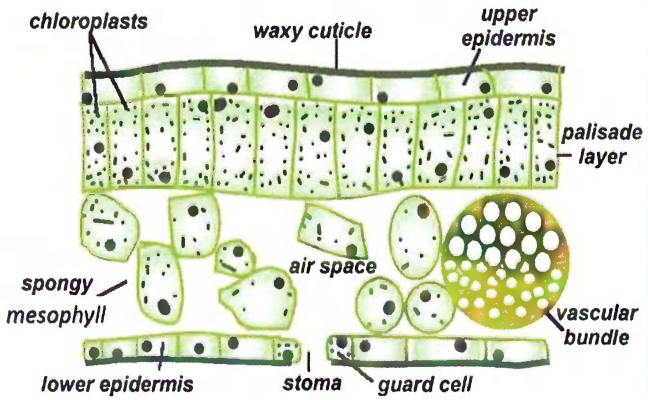


- Blood away from heart
- Thick muscular wall
- Small lumen
- Under high pressure

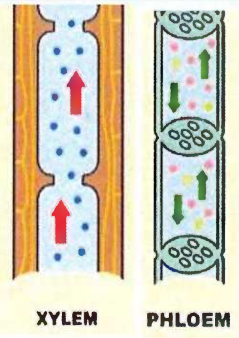
- Blood towards from heart
- Thinner wall
- Large lumen
- Under low pressure
- Valves



12. Cross-section through a leaf



Epidermis	Covers outer surface of leaf for protection
Palisade mesophyll	Main site for photosynthesis. Many chloroplasts
Spongy mesophyll	Air spaces between cells allow gases to diffuse



15. Transport systems in a plant:

Xylem vessels-
hollow tubes with lignin
Phloem tissue-
tubes of elongated cells with pores in the end walls for movement of cells sap

13. Plant organs: roots, stem, leaves form plant transport organ system.

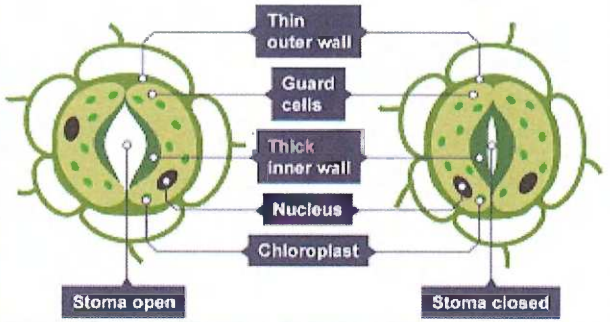
Transpiration: the movement of water **from roots to leaves** through xylem tissue. One direction only.

Factors affection the rate of transpiration:

- Changing temperature
- Humidity
- Air movement
- Light intensity

Translocation: the movement of dissolved sugars through the phloem tissue throughout the plant. Two way transport.

14. Stomata: open & close to regulate water loss and gas exchange



Photosynthesis

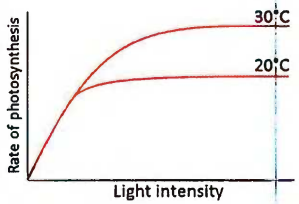
Carbon dioxide + water $\xrightarrow{\text{light}}$ glucose + oxygen

$CO_2 + H_2O \longrightarrow C_6H_{12}O_6 + O_2$

Uses of Glucose

- **respiration**: to transfer energy from glucose
- making **cellulose**: to make strong cell walls
- making **amino acids**: glucose is combined with nitrate ions to make amino acids which are the building blocks of proteins
- **stored as oil or fat**: glucose is converted into lipids and stored in seeds
- **stored as starch**: stored in roots, stems and leaves as an energy source when the rate of photosynthesis is slow. Storing glucose would cause the cell to absorb water and swell up. Starch is insoluble so does not cause this problem.

Interpreting Limiting Factor Graphs



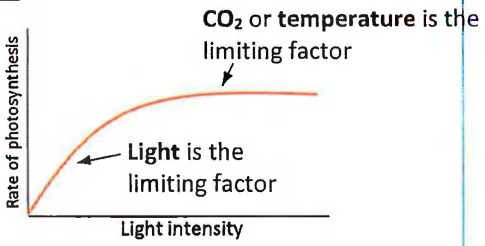
Initially the rate of photosynthesis increases for both lines as light intensity increases (light is the limiting factor).

Once light stops becoming the limiting factor: the lower temperature levels off sooner showing that 30°C produces a higher rate of photosynthesis. This means that temperature is a limiting factor at 20°C.

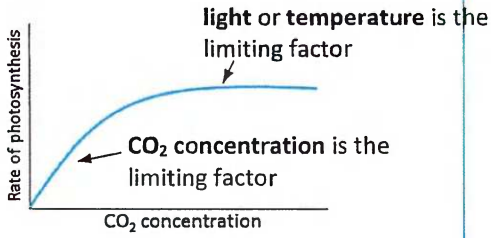
Limiting Factors

These three factors can prevent the rate of photosynthesis happening faster:

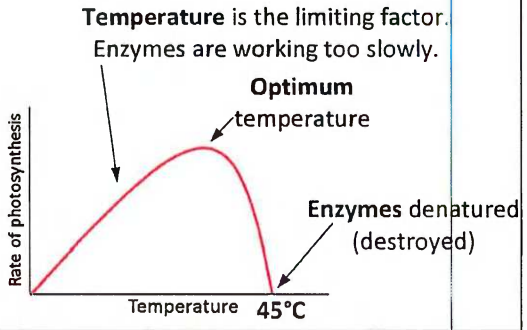
Light



Carbon dioxide



Temperature



Artificially Controlling Photosynthesis

Greenhouses can be used to provide ideal growing conditions for plants.

They trap the Sun's **heat**. In winter a heater can be used.

Artificial **lighting** can be used at night to increase the amount of time plants can photosynthesis for.

CO_2 levels can be increased with a **paraffin heater**. CO_2 is a product of the combustion of paraffin.

An enclosed greenhouse helps to limit **pests** and **disease** outbreaks. **Fertilisers** can be applied to provide the necessary minerals.

Controlling these conditions **costs money**. It is important the farmer provides the right amount of each to maximise the rate of photosynthesis (and therefore growth) without wasting money.

Measuring Photosynthesis

REQUIRED PRACTICAL
SEE PRACTICAL SHEET FOR DETAIL

Oxygen production is a measure of the rate of photosynthesis. Pond weed can be used to investigate the effect of light, temp. and CO_2 on the rate of photosynthesis.

Respiration

Respiration **transfers energy** from glucose. It occurs continuously in **all cells**. It is an **exothermic** reaction (transfers energy to the environment).

Metabolism

Metabolism is the total of all the chemical reactions happening in a cell or the body.

Each reaction is controlled by enzymes and many reactions link together.

Some reactions break down large molecules into smaller ones (eg. glucose is broken down in respiration, protein is broken down to produce urea) and others produce large molecules from smaller ones (eg. joining together glucose molecules to make starch).

Exercise

During exercise you need more energy, therefore the rate of respiration increases. This means cells require more oxygen and glucose:

- **Breathing rate increases** to get more oxygen into the blood.
- **Breath volume increases** to get more oxygen into the blood (also removes the increased amount CO_2 produced).
- **Heart rate increases** to pump more oxygen and glucose to the muscle cells (and remove waste CO_2).

Oxygen Debt

Vigorous exercise causes muscle cells to respire **anaerobically**, producing lactic acid. When you stop exercising you will have an **oxygen debt** – the amount of oxygen needed to react with and **break down the lactic acid** into CO_2 and water. Heart rate and breathing rate remain high to deliver the oxygen to the muscle cells until the levels of lactic acid decrease. The blood also carries lactic acid to the liver, where it is converted back into glucose.

Aerobic Respiration

Require **oxygen** and is the most efficient way to transfer energy from glucose. Occurs in the **mitochondria** in plant and animal cells.

Glucose + oxygen → carbon dioxide + water

$C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O$

Anaerobic Respiration

Occurs when there is a lack of oxygen in your muscles such as during vigorous exercise. This means glucose is not completely oxidised so the breakdown of glucose is incomplete and lactic acid is produced.

Glucose → lactic acid

Anaerobic respiration cannot be sustained for very long and is less efficient (produces less energy) than aerobic respiration.

Anaerobic Respiration in Plants and Yeast

Plants and yeast produce ethanol and CO2 instead of lactic acid.

Glucose → ethanol + carbon dioxide

In **yeast,** anaerobic respiration is called **fermentation** and is used to make:

- **Beer** and **wine**: alcohol is produced giving drinks their alcohol content.
- **Bread**: the **CO_2** produced causes the bread to **rise**.

Homeostasis - Nerves

Homeostasis means to maintain a **stable internal environment**, including water and ion levels, temperature and glucose levels. These are regulated by automatic control systems in our body.

Negative Feedback

This is the mechanism that keeps your internal body conditions constant. If the levels of something get too high or too low your body brings it back to normal.

Level too high

↓

Detected by a **receptor**

↓

Coordination centre receives, process the information and organises a response

↓

Response produced by the effector. This counteracts the change, returning the **level back to normal.**

Level too low

↓

Detected by a receptor

↓

Coordination centre receives, process the information and organises a response

↓

Response produced by the effector. This counteracts the change, returning the **level back to normal.**

Sometimes the body overcompensates (ie. level starts too high but the response makes the level too low). This is not a problem because negative feedback starts again.

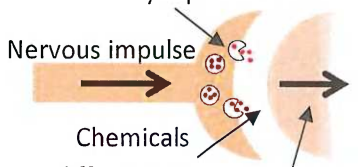
Nervous System

This allows your body to detect and react to its surroundings.

- **Central nervous system (CNS).** This is the brain and spinal cord. It co-ordinates the response
- **Sensory neurones** carry electrical impulses from receptors (cells that detect stimuli, eg. light receptors detect light) to the CNS.
- **Motor neurones** carry electrical impulses from the CNS to effectors
- **Effectors** are muscles and glands. They respond to electrical impulses.

Synapses

This is the connection between two neurones. Electrical signal causes chemicals to be released into the synapse.



The Reflex Arc

The reflex arc helps to protect your body. The neurones go through the **spinal cord** or **unconscious** part of the brain. This means the response is very quick. The pathway the electrical impulse takes is:

eg. a bright light or hot object. → Stimulus → Receptor → Sensory neurone → Relay neurone → Motor neurone → Effector → Response → A muscle contracts (eg. to pull your hand away from a hot object), or a gland releases a hormone.

eg. a light receptors in the eye, touch receptors in the skin.

This is in the spine or unconscious part of the brain.

Can be a muscle or a gland.

Homeostasis - Hormones

Hormones (Endocrine System)

Hormones are **chemicals** that are released into the blood by glands. They act on a target organ and can have long lasting effects.

Pituitary gland: releases many hormones that act on other glands, causing them to release hormones in turn.

Thyroid: produces thyroxin which regulates metabolism, heart rate and temperature.

Adrenal gland: produces adrenaline (fight or flight hormone).

Pancreas: produces insulin which regulates blood glucose levels.

Ovaries: produce oestrogen which helps regulate the menstrual cycle.

Testes: produce testosterone which control puberty and sperm production.

Nerves vs Hormones

Nerves	Hormones
Electrical impulses	Chemical messages
Carried by neurones	Carried in the blood
Fast acting	Slower action
Act for a short time	Act for a long time
Act on a precise area	Act on a more general area

Controlling Blood Glucose levels

Blood glucose levels are controlled by negative feedback. The pancreas is the organ responsible for controlling glucose levels by secreting the hormones insulin and glucagon.

Too much glucose

↓

Pancreas releases **insulin**

↓

Liver converts glucose into **glycogen** (which can be stored in the liver or muscles)

↓

Blood glucose returns to normal

Too little glucose

↓

Pancreas releases **glucagon**

↓

Liver converts **glycogen** into **glucose**

↓

Blood glucose returns to normal

Diabetes

This is a condition where your body is unable to control blood glucose levels properly.

Type 1: The pancreas produces too little insulin meaning blood glucose levels can rise too high. Insulin injections are needed and the person may have to avoid sugary foods. Insulin injections are an effective treatment for type 1 diabetes.

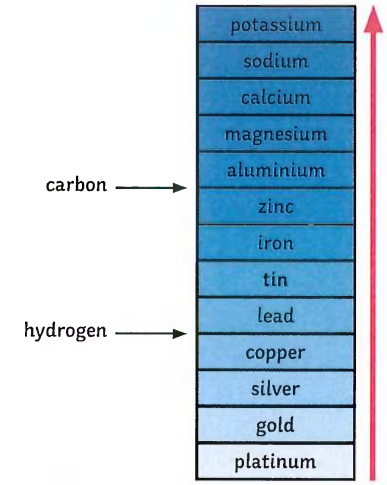
Type 2: The person becomes resistant to their own insulin. Obesity increases your chance of developing type 2 diabetes. A person can help control type 2 diabetes by exercising and controlling the amount of carbohydrates they eat.

AQA GCSE Chemistry (Combined Science) Unit 4: Chemical Changes Knowledge Organiser

The Reactivity Series

Here's a mnemonic to help you learn the order:

purple (potassium)
slime (sodium)
can (calcium)
make (magnesium)
a (aluminium)
careless (carbon)
zebra (zinc)
insane (iron)
try (tin)
learning (lead)
how (hydrogen)
camels (copper)
surprise (silver)
gorillas (gold)



The reactivity series is a league table for metals. The more reactive metals are near the top of the table with the least reactive near the bottom. In chemical reactions, a more reactive metal will displace a less reactive metal.

Reactions of Metals with Water

Metals, when reacted with water, produce a metal hydroxide and hydrogen.

lithium + water ⟶ lithium hydroxide + hydrogen

$2Li + 2H_2O \longrightarrow 2LiOH + H_2$

The more reactive a metal is, the faster the reaction.

Reactions of Metals with Dilute Acid

Metals, when reacted with acids, produce a salt and hydrogen.

Sodium + hydrochloric acid ⟶ sodium chloride + hydrogen

$2Na + 2HCl \longrightarrow 2NaCl + H_2$

Metals that are below hydrogen in the reactivity series **do not** react with dilute acids.

Reactions of Acids

The general formula for the reaction between an acid and a metal is:
acid + metal ⟶ salt + hydrogen

For example: hydrochloric acid + sodium ⟶ sodium chloride + hydrogen

$2HCl + 2Na \longrightarrow 2NaCl + H_2$

When an acid reacts with an alkali, a neutralisation reaction takes place and a salt and water are produced.

The general formula for this kind of reaction is as follows:

acid + alkali ⟶ salt + water

hydrochloric acid + sodium hydroxide ⟶ sodium chloride + water

$HCl + NaOH \longrightarrow NaCl + H_2O$

Naming Salts

The first part comes from the metal in the metal carbonate, oxide or hydroxide. The second part of the name comes from the acid that was used to make it.

For example, sodium chloride.

Acid Used	Salt Produced
hydrochloric	chloride
nitric	nitrate
sulfuric	sulfate

Redox Reactions (Higher Tier Only)

When metals react with acids, they undergo a redox reaction. A **redox reaction** occurs when both **oxidation** and **reduction** take place at the **same time.**

For example:

$2H^+ + Ca \longrightarrow Ca^{2+} + H_2$

The ionic equation can be further split into two half equations.

$Ca \longrightarrow Ca^{2+} + 2e^-$

Oxidation is loss of electrons.

$2H^+ + 2e^- \longrightarrow H_2$

Reduction is gaining of electrons.

Reactions with Bases

The general formula for the reaction between an acid and a metal oxide is:
acid + metal oxide ⟶ salt + water

sulfuric acid + copper oxide ⟶ copper sulfate + water

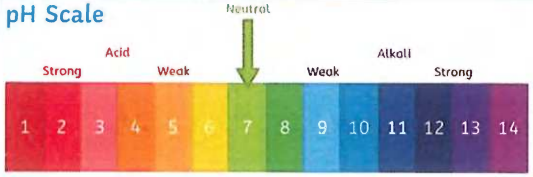
$H_2SO_4 + CuO \longrightarrow CuSO_4 + H_2O$

Reactions with Carbonates

The general formula for the reaction between an acid and a carbonate is:
acid + carbonate ⟶ salt + water + carbon dioxide

hydrochloric acid + calcium carbonate ⟶ calcium chloride + water + carbon dioxide

pH Scale



In aqueous solutions, acids produce H^+ ions and alkalis produce OH^- ions.

Neutral solutions are pH7 and are neither acids or alkalis.

For example, in neutralisation reactions, hydrogen ions from an acid react with hydroxide ions from an alkali to produce water:

$H^+ + OH^- \longrightarrow H_2O$

Making Soluble Salts

1. Make a saturated solution by stirring copper oxide into the sulfuric acid until no more will dissolve.

2. Filter the solution to remove the excess copper oxide solid.

3. Half fill a beaker with water and set this over a Bunsen burner to heat the water. Place an evaporating dish on top of the beaker.

4. Add some of the solution to the evaporating basin and heat until crystals begin to form.

5. Once cooled, pour the remaining liquid into a crystallising dish and leave to cool for 24 hours.

6. Remove the crystals with a spatula and pat dry between paper towels.

Strong and Weak Acids (Higher Tier Only)

A **strong** acid **completely dissociates** in a solution. For example: $HCl \longrightarrow H^+ + Cl^-$

Hydrochloric acid is able to completely dissociate in solution to form hydrogen and chloride ions.

Examples of strong acids include nitric acid (HNO_3) and sulfuric acid (H_2SO_4).

Weak acids in comparison only partially dissociate.

For example acetic acid **partially dissociates** to form a hydrogen and acetate ion.

$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$

The **double arrow** symbol indicates that the reaction is **reversible**. Both the forward and reverse reaction occur at the same time and the reaction never goes to completion.

The Process of Electrolysis

Electrolysis is the **splitting up** of an ionic substance using **electricity.**

On setting up an electrical circuit for electrolysis, two **electrodes** are required to be placed in the electrolyte. The electrodes are **conducting rods.** One of the rods is connected to the **positive** terminal and the other to the **negative** terminal.

The **electrodes** are **inert** (this means they do not react in the reaction) and are often made from **graphite** or platinum.

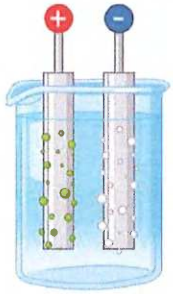
During the process of electrolysis, **opposites attract.** The positively charged ions will be attracted toward the negative electrode. The negatively charged ions will be attracted towards the positive electrode.

When ions reach the electrodes, the charges are lost and they become elements.

The **positive** electrode is called the **anode.**

The **negative** electrode is called the **cathode.**

Electrolysis of Aqueous Solutions



Gases may be given off or metals deposited at the electrodes. This is dependent on the reactivity of the elements involved.

If the metal is **more reactive** than **hydrogen** in the reactivity series, then **hydrogen** will be **produced** at the **negative cathode.** At the **positive anode,** negatively charged ions **lose** electrons. This is called **oxidation** and you say that the ions have been oxidised.

Using Electrolysis to Extract Metals

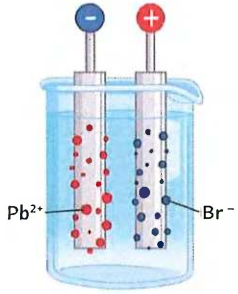
Metals are extracted by electrolysis if the metal in question reacts with carbon or if it is too reactive to be extracted by reduction with carbon. During the extraction process, large quantities of energy are used to melt the compounds.

Aluminium is manufactured by the process of electrolysis. Aluminium oxide has a high melting point and melting it would use large amounts of energy. This would increase the cost of the process, therefore molten **cryolite** is added to aluminium oxide to lower the melting point and thus reduce the cost.

Electrolysis of Molten Ionic Compounds – Lead Bromide

Lead bromide is an **ionic** substance. Ionic substances, when solid, are **not** able to conduct electricity. When molten or in solution, the ions are free to move and are able to carry a charge.

The **positive** lead ions are attracted toward the **negative cathode** at the same time as the **negative bromide** ions are attracted toward the **positive anode.**



Oxidation is the loss of electrons and reduction is the gaining of electrons. **OIL RIG** (Higher Tier Only).

We represent what is happening at the electrodes by using **half equations** (Higher Tier Only).

The lead ions are attracted towards the negative electrode. When the **lead ions** (Pb^{2+}) reach the cathode, each ion **gains two electrons** and becomes a neutral atom. We say that the lead ions have been **reduced.**

$Pb^{2+} + 2e^- \longrightarrow Pb$

The bromide ions are attracted towards the positive electrode. When the **bromide ions** (Br-) reach the anode, each ion **loses one electron** to become a neutral atom. Two bromine atoms are then able to bond together to form the covalent molecule Br_2.

$2Br^- \longrightarrow Br_2 + 2e^-$

AQA Combined Science: **Physics Topic 3 Particle Model of Matter**

Required Practical

Measuring the density of a regularly shaped object:

- Measure the mass using a balance.
- Measure the length, width and height using a ruler.
- Calculate the volume.
- Use the density (p = m/V) equation to calculate density.

Measuring the density of an irregularly-shaped object:

- Measure the mass using a balance.
- Fill a eureka can with water.
- Place the object in the water - the water displaced by the object will transfer into a measuring cylinder.
- Measure the volume of the water. This equals the volume of the object.
- Use the density (p = m/V) equation to calculate density.

Density

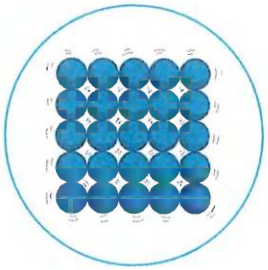
Density is a measure of how much mass there is in a given space.

Density (kg/m^3) = mass (kg) ÷ volume (m^3)

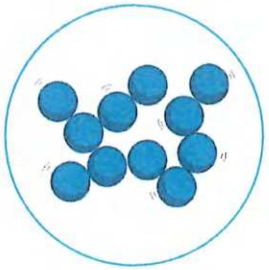
A more dense material will have more particles in the same volume when compared to a less dense material.

Particles

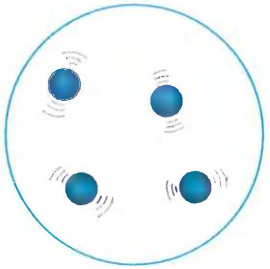
Solids have strong forces of attraction. They are held together very closely in a fixed, regular arrangement. The particles do not have much energy and can only vibrate.



Liquids have weaker forces of attraction. They are close together, but can move past each other. They form irregular arrangements. They have more energy than particles in a solid.



Gases have almost no forces of attraction between the particles. They have the most energy and are free to move in random directions.



Particles

Gas particles can move around freely and will collide with other particles and the walls of the container. This is the pressure of the gas.

If the temperature of the gas increases, then the pressure will also increase. The hotter the temperature, the more kinetic energy the gas particles have. They move faster, colliding with the sides of the container more often.

Density

The density of an object is $8050kg/m^3$ and it has a volume of $3.4m^3$ - what is its mass in kg?

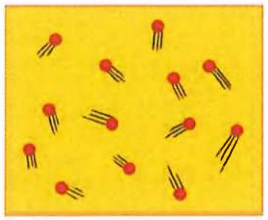
8050 = mass ÷ 3.4

8050 × 3.4 = mass

27 370kg

Internal Energy

Particles within a system have kinetic energy when they vibrate or move around. The particles also have a potential energy store. The total internal energy of a system is the kinetic and potential energy stores.

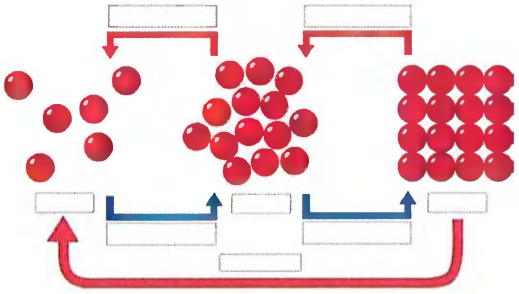


Low Temperature

High Temperature

If the system is heated, the particles will gain more kinetic energy, so increasing the internal energy.

Changing State

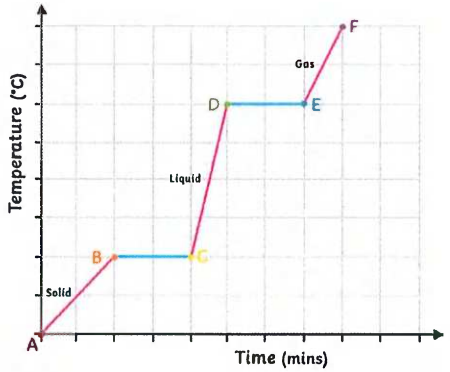


If a system gains more energy, it can lead to a change in temperature or change in state. If the system is heated enough, then there will be enough energy to break bonds.

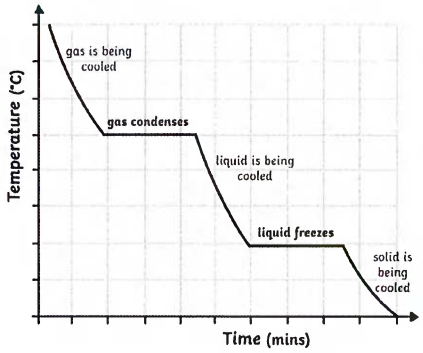
When something changes state, there is no chemical change, only physical. No new substance is formed. The substance will change back to its original form. The number of particles does not change and mass is conserved.

Specific Latent Heat

Energy is being put in during melting and boiling. This increases the amount of internal energy. The energy is being used to break the bonds, so the temperature does not increase. This is shown by the parts of the graph that are flat.



When a substance is condensing or freezing, the energy put in is used to form the bonds. This releases energy. The internal energy decreases, but the temperature does not go down.



The energy needed to change the state of a substance is called the latent heat.

Specific latent heat is the amount of energy needed to change 1kg of a substance from one state to another without changing the temperature. Specific latent heat will be different for different materials.

- solid → liquid - specific latent heat of **fusion**
- liquid → gas - specific latent heat of **vaporisation**

Specific Latent Heat Equation

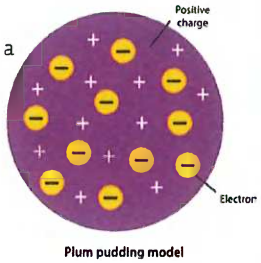
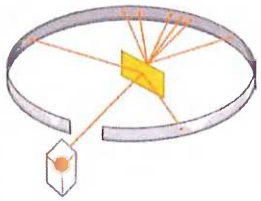
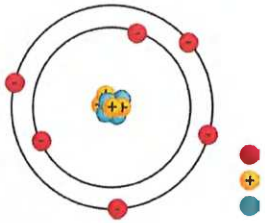
The amount of energy needed/released when a substance of mass changes state.

energy (E) = mass (m) × specific latent heat (L)

E = mL

Atomic Structure Knowledge Organiser – Foundation and Higher

Developing the Model of the Atom

Scientist	Time	Contribution
John Dalton	Start of 19th century	Atoms were first described as solid spheres.
JJ Thomson	1897	Thomson suggested the plum pudding model – the atom is a ball of charge with electrons scattered within it.  Plum pudding model
Ernest Rutherford	1909	Alpha Scattering experiment – Rutherford discovered that the mass is concentrated at the centre and the nucleus is charged. Most of the mass is in the nucleus. Most atoms are empty space. 
Niels Bohr	Around 1911	Bohr theorised that the electrons were in shells orbiting the nucleus. 
James Chadwick	Around 1940	Chadwick discovered neutrons in the nucleus.

Isotopes

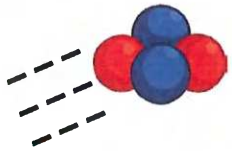
An isotope is an element with the same number of protons but a different number of neutrons. They have the same atomic number, but different mass numbers.

Isotope	Protons	Electrons	Neutrons
$^{1}_{1}H$	1	1	0
$^{2}_{1}H$	1	1	1
$^{3}_{1}H$	1	1	2

Some isotopes are unstable and, as a result, decay and give out radiation. Ionising radiation is radiation that can knock electrons off atoms. Just how ionising this radiation is, depends on how readily it can do that.

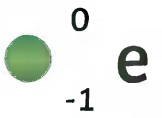
Alpha

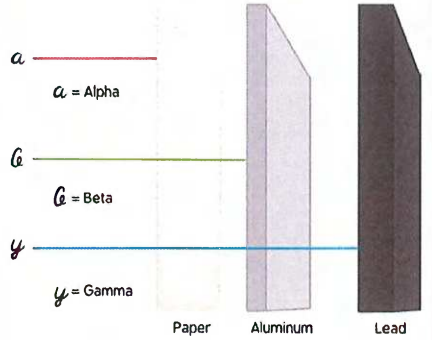
Alpha radiation is an alpha particle emitted from the nucleus of a radioactive nuclei. It is made from two protons and two neutrons. They can't travel too far in the air and are the least penetrating – stopped by skin and paper. However, they are highly ionising because of their size.



Beta

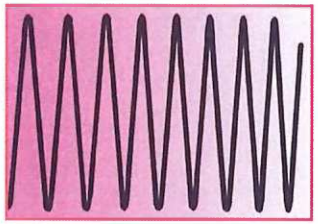
Beta radiation is a fast moving electron that can be stopped by a piece of aluminium. Beta radiation is emitted by an atom when a neutron splits into a proton and an electron.





Gamma

A gamma wave is a wave of radiation and is the most penetrating – stopped by thick lead and concrete.



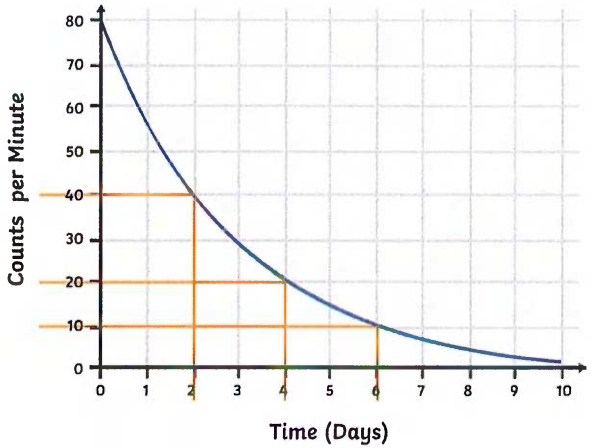
Half-life

The half-life is the time taken for the number of radioactive nuclei in an isotope to halve.

Radioactivity is a random process – you will not know which nuclei will decay. Radioactive decay is measured in becquerels Bq. 1 Bq is one decay per second.

Radioactive substances give out radiation from their nucleus.

A graph of half-life can be used to calculate the half-life of a material and will always have this shape:



Judging from the graph, the radioactive material has a half-life of two days.

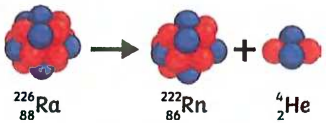
Irradiation

Irradiation occurs when materials are near a radioactive source. The source is sometimes placed inside a lead-lined box to avoid this.

People who work with radioactive sources will sometimes stand behind a lead barrier, be in a different room or use a remote-controlled arm when handling radioactive substances.

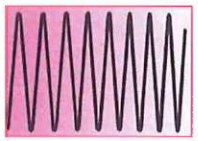
Alpha Decay Equations

An alpha particle is made of two protons and two neutrons. The atomic number goes down by two and its mass number decreases by four.



Gamma rays

There is no change to the nucleus when a radioactive source emits gamma radiation. It is the nucleus getting rid of excess energy.



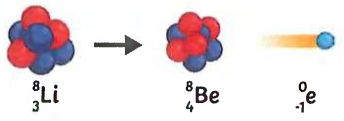
Contamination

When unwanted radioactive atoms get onto an object, it is possible for the radioactive particles to get inside the body.

Protective clothing should be worn when handling radioactive material.

Beta Decay Equations

A neutron turns into a proton and releases a an electron. The mass of the nucleus does not change but the number of protons increases.



Alpha radiation is more dangerous inside the body. It is highly ionising and able to cause a lot of damage. Outside the body it is less dangerous because it cannot penetrate the skin.

Beta radiation is less dangerous inside the body as some of the radiation is able to escape. Outside the body it is more dangerous as it can penetrate the skin.

Gamma radiation is the least dangerous inside the body as most will pass out and it is the least ionising. Gamma is more dangerous outside the body as it can penetrate the skin.

AQA Combined Science: **Physics Topic 5 Forces**

Scalar and Vector Quantities

A **scalar** quantity has **magnitude** only. Examples include temperature or mass.

A **vector** quantity has both **magnitude** and **direction**. Examples include velocity.

Speed is the scalar magnitude of **velocity**.

A vector quantity can be shown using an **arrow**. The size of the arrow is relative to the magnitude of the quantity and the direction shows the associated direction.

Contact and Non-Contact Forces

Forces either **push** or **pull** on an object. This is as a result of its interaction with another object.

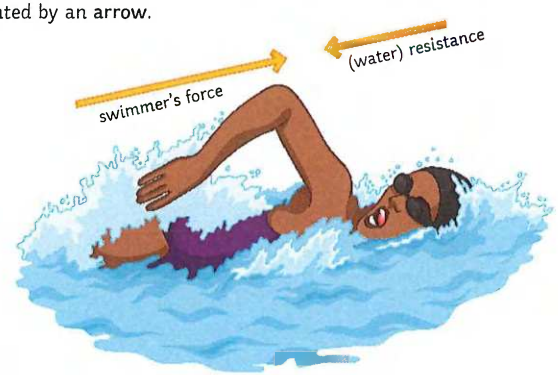
Forces are categorised into two groups:

Contact forces – the objects are touching e.g. friction, air resistance, tension and contact force.

Non-contact forces – the objects are not touching e.g. gravitational, electrostatic and magnetic forces.

Forces are calculated by the equation: **force (N) = mass (kg) × acceleration (m/s^2)**

Forces are another example of a **vector quantity** and so they can also be represented by an **arrow**.



Gravity

Gravity is the natural phenomenon by which any object with mass or energy is drawn together.

- The **mass** of an object is a scalar measure of how much matter the object is made up of. Mass is measured in **kilograms (kg)**.
- The **weight** of an object is a vector measure of how gravity is acting on the mass. Weight is measured in **newtons (N)**.

weight (N) = mass (kg) × gravitational field strength (N/kg)

(The gravitational field strength will be given for any calculations. On earth, it is approximately 9.8N/kg).

An object's **centre of mass** is the point at which the weight of the object is considered to be acting. It does not necessarily occur at the centre of the object.

The **mass** of an object and its **weight** are **directly proportional**. As the mass is increased, so is the weight. Weight is measured using a **spring-balance** (or **newton metre**) and is measured in **newtons** (N).

Resultant Forces

A **resultant force** is a single force which replaces several other forces. It has the same effect acting on the object as the combination of the other forces it has replaced.

The forces acting on this object are represented in a **free body** diagram.
The arrows are relative to the magnitude and direction of the force.

The car is being pushed to the left by a force of 30N. It is also being pushed to the right by a force of 50N.

The **resultant force is 50N – 30N = 20N**

The 20N resultant force is pushing to the right, **so the car will move right.**

When a resultant force is not zero, an object will **change speed (accelerate or decelerate)** or **change direction (or both).**

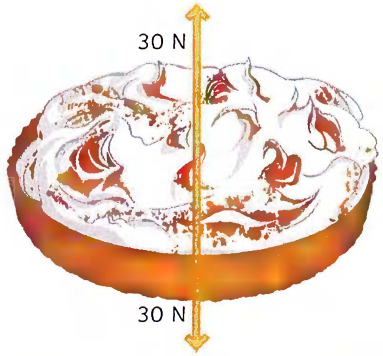
When an object is stationary, there are still forces acting upon it.

In this case, **the resultant force is 30N – 30N = 0N.**

The forces are in **equilibrium** and are **balanced.**

When forces are balanced, an object will either **remain stationary** or if it is moving, it will continue to move at a **constant speed.**

When resultant forces act along the same line, you calculate the resultant force as shown below.



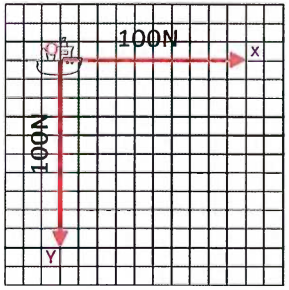
AQA GCSE Physics (Separate Science) Unit 5: Forces

Resultant Forces

A **vector diagram** can be used to determine the resultant of two forces that are not acting in a straight line.

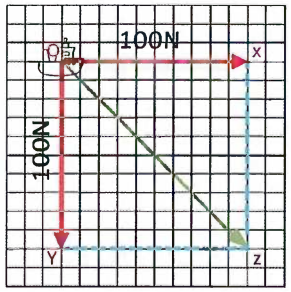
Worked example 1:

A boat is being pulled toward the harbour by two winch motors. Each motor is pulling with a force of 100N and they are working at right angles to each other. These forces are represented by lines OX and OY.



Construction lines can be added to the diagram to form rectangle OXZY. The line OZ is the diagonal of this rectangle.

OZ is the resultant force. It is the hypotenuse of the right-angle triangles OYZ and OXZ.



We can use the Pythagoras' theorem to calculate its length.

$$a^2 + b^2 = c^2$$

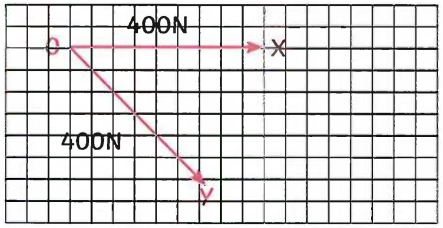
$100^2 + 100^2 = OZ^2$
$100^2 + 100^2 = 20\,000$
$\sqrt{20\,000} = 141.42$

The resultant force is 141.42N.

Alternatively, you can measure line OX and work out how many newtons are represented by each cm. Then measure the length of OZ and use your scale to calculate how many newtons the length represents.

Worked example 2:

A horse drawn carriage is pulled by two horses with a force of 400N each. The horses are pulling in different directions and are not acting at an angle of 90°. OX and OY represent the force from each horse respectively, they represent the same magnitude of force so they will be the same length.

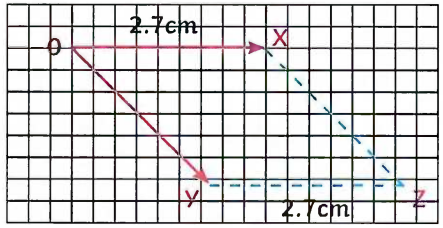


To calculate the resultant force in this situation we must use a **parallelogram of forces**.

First, measure the length of OX. In this example it is 2.7cm.

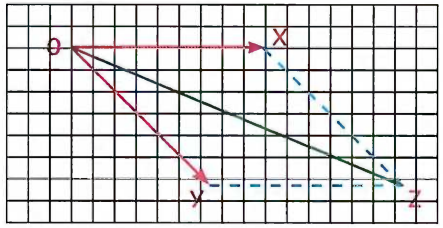
Draw a line 2.7cm long from Y, parallel to OX. Connect the end of this line to X to form a parallelogram.

The line OZ is the diagonal of this parallelogram. OZ is the resultant force.



The length of OX is 2.7cm and the force is 400N.

We can work out how many newtons are represented by each cm by doing the calculation:
400 ÷ 2.7 = 148.15
1cm = 148.15N



Measure OZ. In this example it is 5cm.
5 × 148.15 = 740.74
The resultant force is 740.74N.

Work Done and Energy Transfer

When an object is moved by a force, the force transfers energy to the object. The amount of energy transferred to the object is the work done.

The work done on an object depends on the size of the force and the distance moved. It can be calculated using the equation:

work done = force × distance

$$W = F\,s$$

One joule of work is done when a force of one newton causes a displacement of one metre.

1 joule = 1 newton metre

Worked example

A man's car has broken down and he is pushing it to the side of the road. He pushes the car with a force of 160N and the car is moved a total of 8m.

Calculate the work done.

work done = force × distance
= 160 × 8
= 1280J

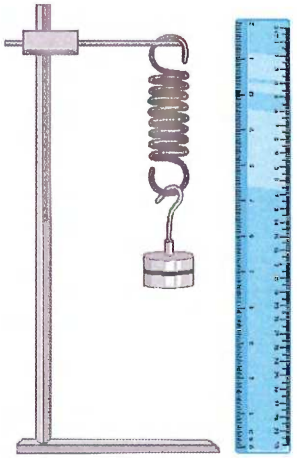
Not all of the energy transferred when work is done on an object is useful. For example, work done against the frictional forces of an object causes a rise in temperature of the object.

Required Practical Investigation Activity 6: Investigate the Relationship Between Force and Extension for a Spring

$F = k \times e$

force applied (N) = spring constant (N/m) × extension (m)

You should be familiar with the equation above and the required practical shown to the right.

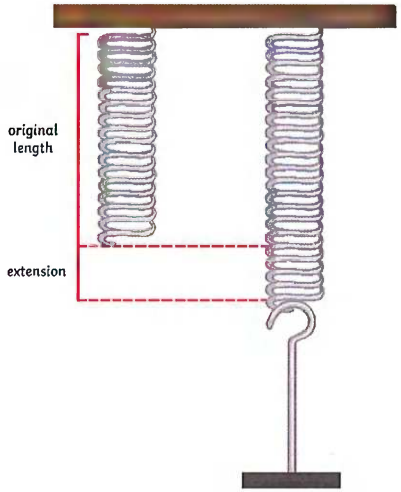


The spring constant is a value which describes the elasticity of a material. It is specific to each material. You can carry out a practical investigation and use your results to find the spring constant of a material.

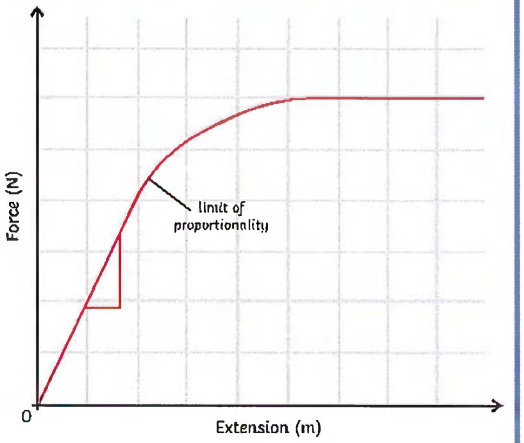
1. Set up the equipment as shown.
2. Measure the original length of the elastic object, e.g. a spring, and record this.
3. Attach a mass hanger (remember the hanger itself has a weight). Record the new length of the spring.
4. Continue to add masses to the hanger in regular intervals and record the length each time.

Once you have your results, you can find the extension for each mass using this formula: **spring length – original length**

The data collected is continuous so you would plot a **line graph** using the x-axis for extension (m) and the y-axis for force (N). As a result of Hooke's Law, you should have a **linear graph**. The **gradient of the graph is equal to the spring constant**. You can calculate it by rearranging the formula above or by calculating the gradient from your graph.



Spring Constant and Hooke's Law



Hooke's Law describes that the extension of an elastic object is **proportional** to the force applied to the object. However, there is a maximum applied force for which the extension will still increase proportionally. If the **limit of proportionality** is exceeded, then the object becomes **permanently deformed** and can no longer return to its original shape. This can be identified on a graph of extension against force when the gradient stops being linear (a straight line) and begins to **plateau**. The limit is shown on the graph above and this is the specific object's **elastic limit**.

Forces and Elasticity

When work is done on an elastic object, such as a spring, the energy is stored as elastic potential energy.

When the force is applied, the object changes shape and stretches. The energy is stored as elastic potential and when the force is no longer applied, the object returns to its original shape. The stored elastic potential energy is transferred as kinetic energy and the object recoils and goes back to its original shape.

Work Done: Elastic Objects

Work is done on elastic objects to **stretch** or compress them.

To calculate the work done (**elastic potential energy** transferred), use this equation:

$E\ (J) = 0.5 \times k \times e^2$

(elastic potential energy = 0.5 × spring constant × extension^2)

You might need to use this equation also: $F = k \times e$

Worked example:

A bungee jumper jumps from a bridge with a weight of 800N. The elastic cord is stretched by 25m. Calculate the work done.

Step 1: find the spring constant using $F = k \times e$

Rearrange to $k = F \div e$

$800 \div 25 = 32N/m$

Step 2: use the value for k to find the elastic potential energy (work done) using $E\ (J) = 0.5 \times k \times e^2$

$0.5 \times 32 \times 25^2$

E = 10 000J

Velocity

Velocity is a **vector** quantity. It is the **speed** of an object in a given direction.

Circular Motion (Higher tier only)

Objects moving in a **circular path** don't go off in a straight line because of a **centripetal** force caused by another force acting on the object.

For example, a car driving around a corner has a centripetal force caused by **friction** acting between the surface of the road and the tyres. When the Earth orbits around the Sun, it is held in orbit by **gravity** which causes the centripetal force.

When an object is moving in a circular motion, its **speed is constant**. Its **direction changes** constantly and because direction is related to **velocity**, this means that the velocity of the object is constantly changing too. The changes in velocity mean that the object is **accelerating**, even though it travels at a constant speed.

The acceleration occurs because there is a **resultant force** acting on the object. In this case, the resultant force is the velocity, which is greater than the centripetal force acting.

Forces and Motion: Distance vs Displacement

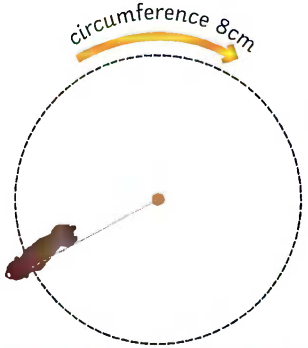
Distance is a **scalar quantity**. It measures how far something has moved and does not have any associated direction.

Displacement is a **vector** quantity. It measures how far something has moved and is measured in relation to the direction of a straight line between the starting and end points.

E.g. A dog is tethered to a post. It runs 360° around the post three times. Each 360° lap is 8m

distance = 8 × 3 = 24m

displacement = 0m (The dog is in the same position as when it started.)



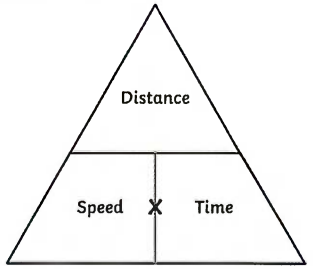
Speed

You should be able to recall the typical speed of different transportation methods.

Activity	Typical Value
walking	1.5m/s
running	3m/s
cycling	6m/s
driving a car	25mph (40km/h)
train travel	60mph (95km/h)
aeroplane travel	550mph (885km/h)
speed of sound	*330m/s*

These values are average only. The speed of a moving object is rarely constant and always fluctuating.

speed = distance ÷ time



You should be able to use this equation and rearrange it to find the distance or time.

Worked example:

John runs 5km. It takes him 25 minutes. Find his average speed in metres per second.

Step 1: convert the units

km → m (×1000) = 5000m

min → s (×60) = 1500s

Step 2: calculate $s = d \div t$

$s = 5000 \div 1500$

s = 3.33m/s

Worked example 2:

Zi Xin has driven along the motorway. Her average speed is 65mph. She has travelled 15 miles. How long has her journey taken? Give your answer in minutes.

Step 1: calculate $t = d \div s$

$t = 15 \div 65$

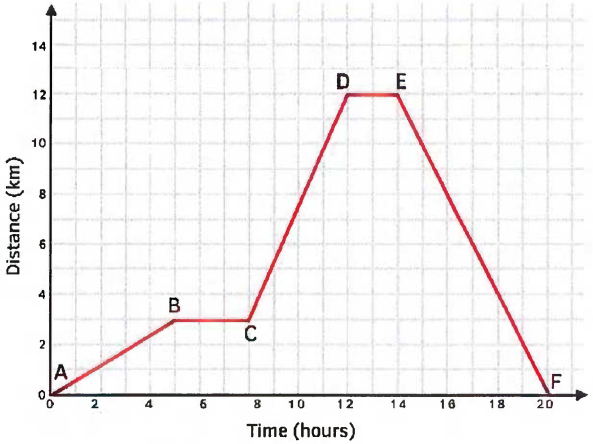
t = 0.23 (hours)

Step 2: convert units

hr → min (×60) = 13.8 minutes

Distance-Time and Velocity-Time Graphs

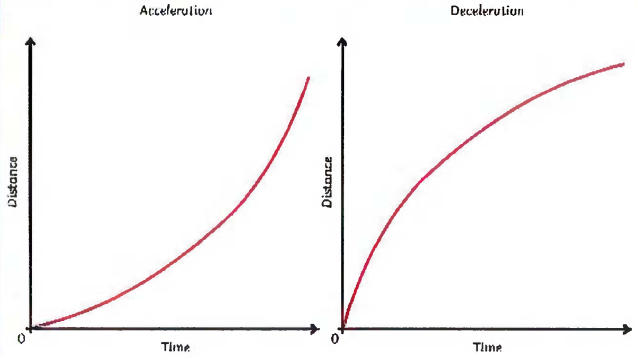
When an object travels in a **straight line**, we can show the distance which has been covered in a **distance-time graph**.



You should be able to understand what the features of the two types of graph can tell you about the motion of an object.

Graph Feature	Distance-Time Graph	Velocity-Time Graph
x-axis	time	time
y-axis	distance	velocity
gradient	speed	acceleration (or deceleration)
plateau	stationary (stopped)	constant speed
uphill straight line	steady speed moving away from start point	acceleration
downhill straight line	steady speed returning to the start point	deceleration
uphill curve	acceleration	increasing acceleration
downhill curve	deceleration	increasing deceleration
area below graph		distance travelled

Changing Speed on a D-T graph



When the graph is a **straight line**, it is representing a **constant speed**. A **curve** represents a changing speed, either **acceleration** or **deceleration**. The speed at any given point can be calculated by drawing a **tangent** from the curve and finding the **gradient** of the tangent.

Terminal Velocity

When an object begins moving, the force **accelerating** the object is much greater than the force resisting the movement. A resistant force might be **air resistance** or **friction**, for example.

As the **velocity** of the object increases, the force **resisting** the movement also increases. This causes the acceleration of the object to be reduced gradually until the forces become **equal** and are **balanced**. This doesn't cause the object to stop moving. As the object is already in motion, balanced forces mean it will continue to move at a **steady speed**. This steady speed is the maximum that the object can achieve and is called the **terminal velocity**.

The terminal velocity of an object depends on its shape and weight. The shape of the object determines the amount of resistant force which can act on it. For example, an object with a large surface area will have a greater amount of resistance acting on it.

Consider a skydiver and his parachute. When the skydiver first jumps from the aeroplane, he has a small area where the air resistance can act. He will fall until he reaches a terminal velocity of approximately 120mph.

After the skydiver releases his parachute, the shape and area has been changed and so the amount of air resistance acting is increased. This causes him to decelerate and his terminal velocity is reduced to about 15mph. This makes it a much safer speed to land on the ground.

Acceleration

Acceleration can be calculated using the equation:

$$\text{acceleration (m/s}^2\text{)} = \frac{\text{change in velocity (m/s)}}{\text{time taken (s)}}$$

Worked example:

A dog is sitting, waiting for a stick to be thrown. After the stick is thrown, the dog is running at a speed of 4m/s. It has taken the dog 16s to reach this velocity. Calculate the acceleration of the dog.

$a = \Delta v \div t$

$a = (4-0) \div 16$

$A = 0.25 m/s^2$

Changes in velocity due to acceleration can be calculated using the equation below. This equation of motion can be applied to any moving object which is travelling in a **straight line** with a **uniform acceleration**.

Final velocity^2 (m/s) – initial velocity^2 (m/s) = 2 × acceleration (m/s^2) × displacement (m)

or

$v^2 - u^2 = 2as$

Worked example:

A bus has an initial velocity of 2m/s and accelerates at 1.5m/s^2 over a distance of 50m. Calculate the final velocity of the bus.

Step 1: rearrange the equation: $v^2 - u^2 = 2as$

$v^2 = 2as + u^2$

Step 2: insert known values and solve

$v^2 = (2 \times 1.5 \times 50) + 2^2$

$v^2 = (150) + 4$

$v^2 = 154$

$v = \sqrt{154}$

$v = 12.41 m/s$

Braking Distance

The **braking distance** is the distance travelled by a vehicle once the **brakes are applied** and until it reaches a full stop.

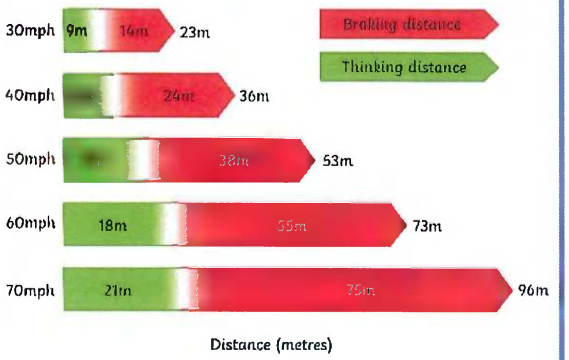
Braking distance is affected by:

- **adverse weather conditions** (wet or icy)
- **poor vehicle condition** (brakes or tyres)

When **force** is applied to the brakes, **work is done** by the **friction** between the car wheels and the brakes.

The work done reduces the **kinetic energy** and it is transferred as **heat** energy, increasing the **temperature** of the brakes.

increased speed = increased force required to stop the vehicle
increased braking force = increased deceleration

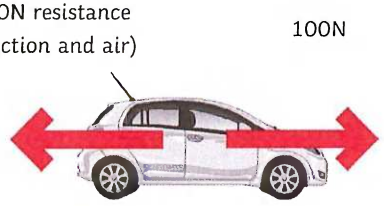


Large decelerations can cause a huge increase in **temperature** and may lead to the **brakes overheating** and the driver **losing control** over the vehicle

Newton's Laws of Motion: Newton's First Law

If the resultant force acting on an object is zero...

- **a stationary object will remain stationary.**
- **a moving object will continue at a steady speed and in the same direction.**



Inertia – the tendency of an object to continue in a state of rest or uniform motion (same speed and direction).

Newton's Laws of Motion: Newton's Second Law

The acceleration of an object is proportional to the resultant force acting on it and inversely proportional to the mass of the object

resultant force (N) = mass (kg) × acceleration (m/s^2)

Inertial mass – how difficult it is to change an objects velocity. It is defined as the ratio of force over acceleration.

Newton's Laws of Motion: Newton's Third Law

When two objects interact, the forces acting on one another are always equal and opposite.

For example, when a book is laid on the table, it experiences a reaction force from the table. The table pushes up on the book. The book also pushes down on the table. These two forces are equal and opposite.

Stopping Distance

The **stopping distance** of a vehicle is calculated by:

stopping distance = thinking distance + braking distance

Reaction time is the time taken for the driver to respond to a hazard. It varies from 0.2s to 0.9s between most people.

Reaction time is affected by:

- **tiredness**
- **drugs**
- **alcohol**
- **distractions**

You can measure human reaction time in the lab using simple equipment: a metre ruler and stopwatch can be used to see how quickly a person reacts and catches the metre ruler. The data collected is quantitative and you should collect repeat readings and calculate an average result.

Momentum

momentum (N) = mass (kg) × velocity (m/s)

The law of conservation of mass (in a closed system) states that the total momentum **before** an event is equal to the total momentum **after** an event.

Worked example:

Calculate the momentum of a 85kg cyclist travelling at 7m/s.

$p = m \times v$

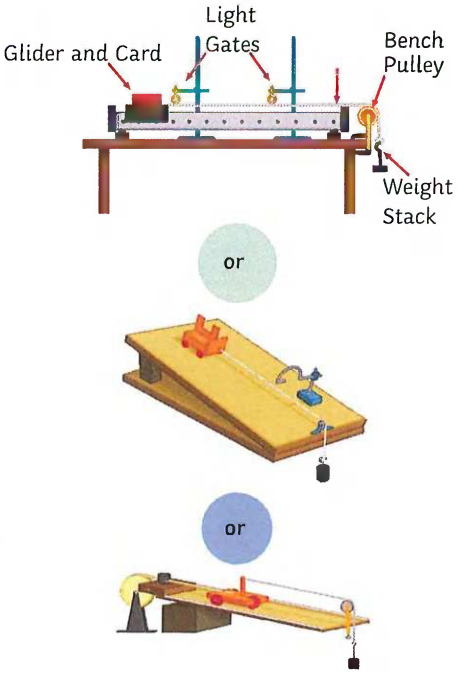
$p = 85kg \times 7m/s$

$p = 595kg\ m/s$

Required Practical Investigation 7

Aim: investigate the effect of varying the force on the acceleration of an object of constant mass, and the effect of varying the mass of an object on the acceleration produced by a constant force.

You may be given any of the following apparatus set-ups to conduct these investigations:



Something is a **fair test** when **only** the independent variable has been allowed to affect the dependent variable.

The independent variable was **force**.

The dependent variable was **acceleration**.

The control variables were:

- **same total mass**
- **same surface/glider/string/pulley (friction)**
- **same gradient if you used a ramp**