Wadham School

A Church of England Community School

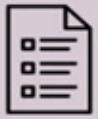
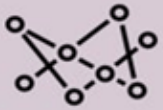
Knowledge Organisers
Year 10
Term 3
2023-2024

Name.....

Tutor group.....

"Life in all its fullness" John 10:10

How to use a knowledge organiser – step by step guide

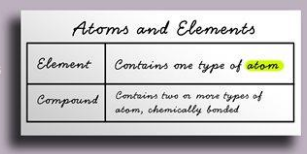
	Look, Cover, Write, Check	Definitions of Key Words	Flash Cards	Self Quizzing	Mind Maps	Paired Retrieval
Step 1	Look at and study a specific area of your KO. 	Write down the key words and definitions. 	Use your KO to condense and write down key facts or information onto flash cards. 	Use your KO to create a mini quiz. Write down your questions using your KO. 	Create a mind map with all the information you can remember from your KO. 	Ask a friend or family member to have the KO or flash cards in their hands. 
Step 2	Cover or flip the KO over and write down everything you can remember. 	Try not to use your KO to help you. 	Add pictures to help support. Then self-quiz using the flash cards. You could write questions on one side, and answers on the other! 	Answer the questions and remember to use full sentences. 	Check your KO to see if there are any mistakes on your mind map. 	They can test you by asking you questions on different sections of your KO. 
Step 3	Check what you have written down. Correct any mistakes in green pen and add anything you have missed. Repeat. 	Use your green pen to check your work. 	Ask a friend or family member to quiz you on the knowledge. 	Ask a friend or family member to quiz you using the questions. 	Try to make connections, linking the information together. 	Write down your answers, 

How to use Knowledge Organisers?

HOW TO USE KNOWLEDGE ORGANISERS TO CHECK YOUR UNDERSTANDING

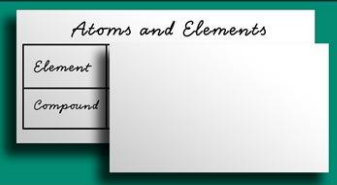
1 READ

CHOOSE A 'CHUNK' OF KNOWLEDGE ...
BUT DON'T CHOOSE TOO MUCH (2 - 9 FACTS)
WRITE DOWN YOUR LIST OF FACTS / DEFINITIONS
READ AND HIGHLIGHT KEYWORDS
RE-READ FOR A FEW MINUTES



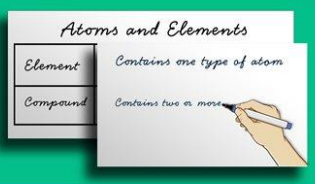
2 COVER

NOW COVER THE DEFINITIONS - CAN YOU STILL REMEMBER THEM?



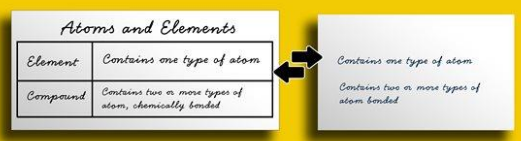
3 WRITE

NOW WRITE THE DEFINITIONS/FACTS AS ACCURATELY AS YOU CAN



4 CHECK

CHECK WHAT YOU GOT RIGHT AND WRONG



5 CORRECT

IT IS REALLY IMPORTANT TO CORRECT ANY MISTAKES AND ADD ANYTHING YOU MISSED

Beliefs and World Views

BWV Knowledge organiser: War, peace and conflict					
1	Conflict	Dispute between sides, can be between individuals, groups or nations.	11	Reconciliation	Making up and rebuilding relationships between two groups/sides after disagreement.
2	Forgiveness	Letting go of blame against a person for wrongs they have done; moving on.	12	Retaliation	To pay someone back for their harmful actions.
3	Holy War	War that is believed to be sanctioned by God.	13	Terrorism	Use of violence and threats to intimidate others; used for political purposes to build fear in the ordinary population.
4	Justice	Bringing fairness back to a situation.	14	Violence	Behaviour involving physical force which intends to hurt or kill.
5	Just War	Set of rules for fighting a war in a way believed to be justified and acceptable to God.	15	War	Armed conflict between two or more sides.
6	Nuclear deterrence	Having nuclear weapons with the aim of deterring/preventing other states attacking for fear of retaliation and nuclear war.	16	Weapons of Mass Destruction	Weapons which cause widespread, indiscriminate damage (e.g. nuclear, chemical, biological).
7	Nuclear weapons/war	A weapon of mass destruction which causes widespread damage and loss of life.	**Key Quotes**		
8	Pacifism	Belief that all violence is wrong, which then affects all behaviours.	"If anyone slaps you on the right cheek, turn them the other cheek also" Matthew 5:39		
9	Peace-making	Working to bring about peace and reconciliation.	"All who draw the sword die by the sword" Jesus Matthew 26:52		
10	Protest	A statement or action to express disagreement; can be an organised event to demonstrate disagreement with a policy or political action.	"Blessed are the peacemakers" Matthew 5:9		

Business

Marketing is:
finding the needs of customers and demonstrating how a business fulfils those needs in order to increase sales

Marketing
Finding the needs of consumers and demonstrating how a business meets those needs

Market research
The collection of data to help business decisions

2:1 The Role of Marketing

How can a business increase sales?
1. Advertise the product or service more in order to raise awareness of what is on offer
2. Introducing a new model that will appeal to more customers
3. Increase the range of products or services available
4. Reducing the price to sell more products - but will profits increase?
5. Selling the product in different countries to target a wider range of customers
6. Selling by different methods i.e. Online or offering digital distribution

2:2 Market Research

Before a business starts, it is important that the owners know exactly who their customers are likely to be.

Primary	Pros	Cons
Questionnaire	Cheaper than interviews Easily target certain people	Difficult to predict how many will be completed People may not understand the questions
Interviews	Questions can be explained Customers can be easily targeted	Expensive Customers may feel uncomfortable
Trials	Save money before making products widely available	Costly to set up
Focus groups	Data is accurate to the target market	Only small groups that take part so expensive

Pros: cheap and already available to use
Cons: not exactly what you need and could be out of date

Target market
The group of customers who a business aims to sell its products to

Primary research
Data collected first-hand (desk research)

Secondary research
Data collected by others (field research)

Qualitative data
Data based on opinions of those being asked

Quantitative data
Data based on facts or numbers

Business

2:3 Market Segmentation

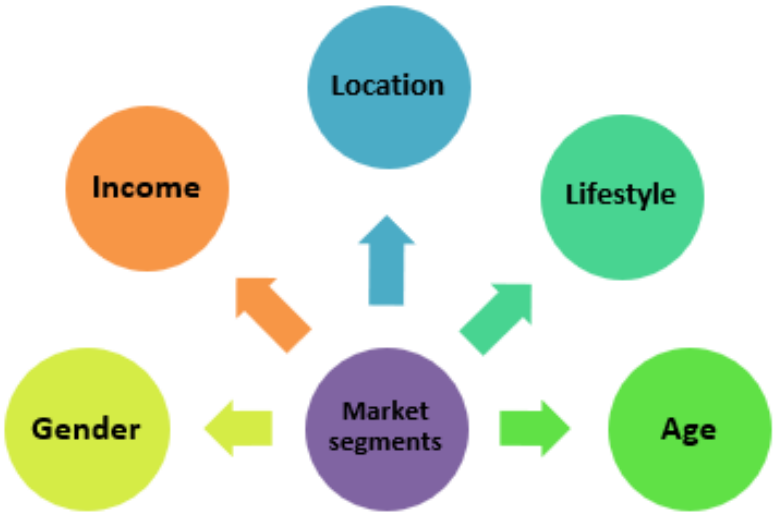
A watch can be segmented in a number of ways:

Age - Disney theme for children, plain for adults

Gender - made for men or women

Income - watches can be very cheap at £10 others can be very expensive at £1000's

Lifestyle - special watches for diving, running and other outdoor sports



Market segmentation
Splitting the market for a product into different parts, or segments

2:4 The Marketing Mix - Product

The product is a vital element of the marketing mix. The product or service must be something customers actually want.

Advertising a new product more widely can increase sales and extend the life of a product.

Reducing the price of a product can help to maintain sales and extend the life of a product.

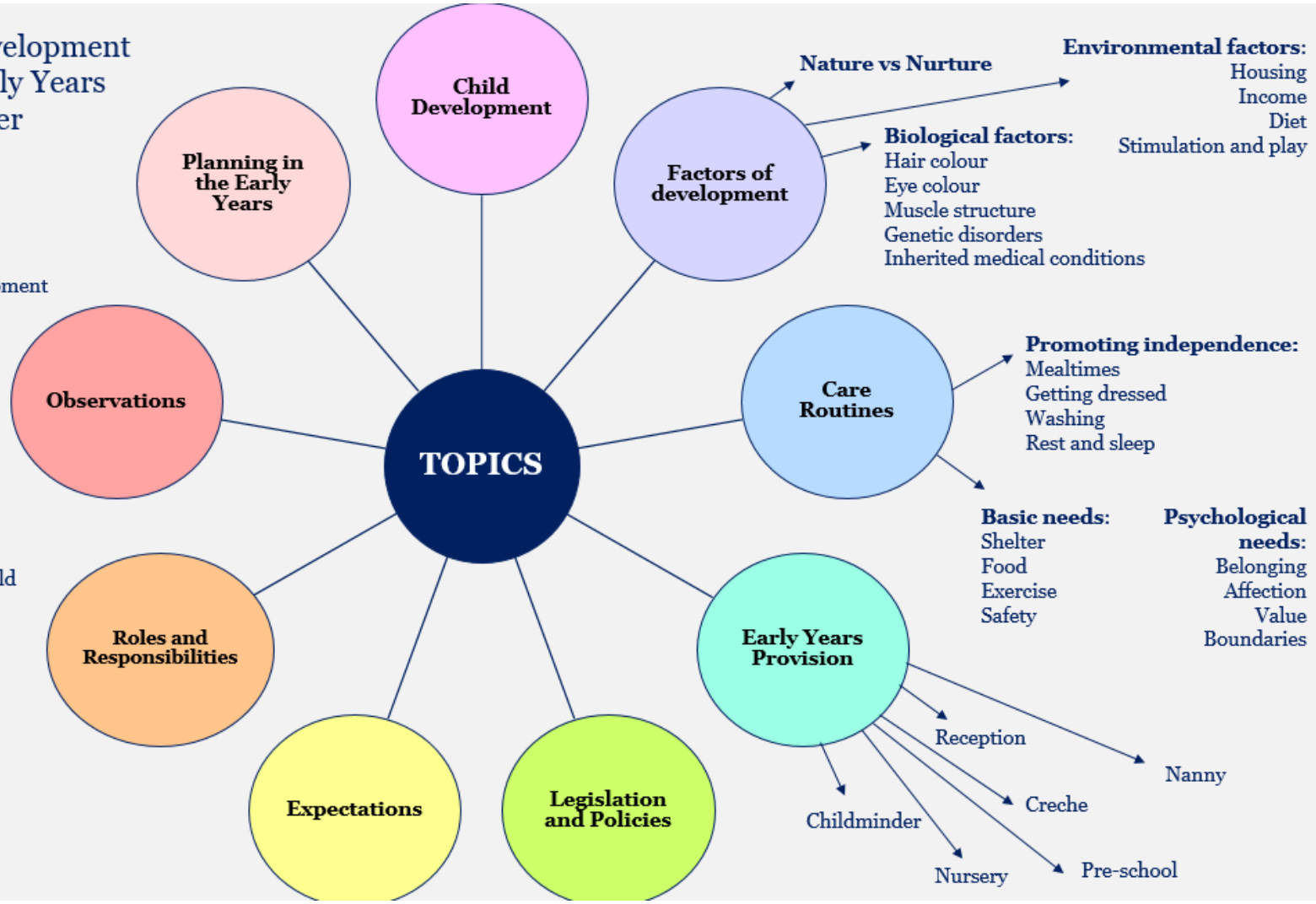
Selling in new markets i.e. abroad, opens the product up to a wider range of new customers and so extends the life of the product

Introduction
A product is first made available for sale
Growth
Sales are growing strongly
Maturity
Sales are at their highest level
Decline
Sales are falling

Level 1/2 Child Development and Care in the Early Years Knowledge organiser

KEY TERMS:

Physical development
Cognitive development
Language development
Social and emotional development
Holistic development
Nature vs Nurture
Transitions
Care needs
Play activities
Childcare provisions
Voluntary setting
Private setting
Independent setting
Statutory setting
Ofsted
United nations rights of a child
Data protection
Equality act
EYFS Framework
Inclusion
Diversity
Fairness
Inclusive practice
Safeguarding
SEN
Formative assessment
Summative assessment
Child centred approach



Analysis of Critical studies

1.Context	When where and why the work was created. Is the work characteristic of an artistic style, movement or time period?
2.Composition	Does the work communicate an action, narrative or story? Are there abstract elements? Has text been used? Does the title affect the way you interpret the work?
3.Shape and Form	What is the overall size, shape and orientation of the artwork? Is there a dominant visual language within the shapes and forms? Are there any three-dimensional forms? How does this affect the work from different viewpoints?
4.Tone and contrast	Are there any reflective or transparent surfaces? Are shadows depicted in the work? What are the light sources within the artwork?
5.Colour	Colour schemes? Contrasts? Colour palette?
6.Texture and Pattern	Are there textural, tactile or surface qualities within the work? How are these created?
7.Materials and Techniques	What materials have been used and why? Any specific properties? What skills or processes have been used?
8.Personal response	What is your emotional response to the piece? How does it connect to your work and how are you going to be inspired by the artwork.

Keywords

9.Visual Communication	The use of visual elements to convey ideas.
10.Materials	Clay, cardboard, metals, timbers, polymers and fabrics.
11.Techniques	Wood carving, bending, card and paper manipulation.
12.Processes	Scoring, cutting, chiselling, painting and sanding.
13.Line	Use of line drawings
14.Texture	Responding to the surface elements of materials
15.Form	The visual shape.
16.Pattern	A repeated decorative design.
17.Tone	Different shades of colour for different visual effects.

AQA English Language – Paper 1

Question Guidance (do the paper backwards):

Q5 – use the 'Here > There > Then > Now' frame. Here is an example with the dystopian story:

Here I am in the waiting room of this squat grey clinic with its squalid peeling walls. Years of slopping on beige discoloured paint still cannot hide the neglect and pervading sense of hopelessness. The chairs are frayed with bits of stuffing coughing out like the remnants of the past. A TV hangs loosely from the wall, it's black mirror reflecting the decaying interior. Buzzing fizzes through the air from the shivering light overhead. The emptiness crowds around me as I wait.

There is a poster on the wall, it is a strange choice: [describe picture exam provides]

Then memories flood back of the Malthusian collapse, the riots, the catastrophes, the violence and the dreams that came before this living nightmare. How did we get to this? Scientists had achieved the utopian ambition of immortality. They had plucked out the aging gene from this symphony of life and silenced it. Death was now only for the unfortunate or the poor whilst the eternal elite were everlasting. Genetic treatments stopped people dying from old age, now you could be young, beautiful, lovely, forever. Depending on your view it was either euphoric optimism trapped in amber or humanity diving into a stagnant pool of indulgence. There was just one problem: children. Scientists had stopped death but the cost was new life. Children were still being born so they brought in a test. A test to see if you were worthy enough, good enough, optimised enough for life.

Now, I am alone. No… with you awaiting the results of this test. Waiting to see if this whispered dream of a life inside me will be permitted to join the elite. When I found out about you, I was overjoyed, love filled my heart and I had such hope for the future. Fears have begun to sneak into my heart now I run my hands over you growing within. Will you be allowed to live or will they just discard you before you even have a chance? Why am I even talking to you? You barely exist yet.

They are calling me in.
Nobody dies anymore but will they let you live?

Q4 (20 marks, 25m) – identify the key bits of the statement, agree then add and analyse (use quotations and analyse language and structure repeatedly):
Your evaluation – consider the statement and other interpretations (although, whilst, despite, etc.)
Neat evidence – use precise quotations
Additional – use more precise quotations (at least 6)
Language – analyse word choice, imagery and other methods
Structure and form – analyse perspective, pace, tone and other methods
Intentions of writer – consider WHY the writer wrote it and the impact upon readers

Q3 (8 marks, 10m) – structural methods (start-middle-end):
Start-middle-end
Neat evidence – use precise quotations
Structure and form – analyse perspective, pace, tone and other methods such as repetition, motif, cliffhanger, contrast, development, syntax, etc.

Q2 (8 marks, 10m) – language methods (imagery, word choice and other methods):
Imagery – always analyse this.
Neat evidence – as precise as possible – focus on word choices etc.
Additional – get a wide range of quotations
Language – analyse word choices, imagery and other methods such as metaphor, simile, personification, oxymoron, emotive language and syntax.

Q1 (4 marks, 5m) - identify 4 things.

AQA English Language – Paper 2

Question Guidance (do the paper backwards):
Q5 – use the Presently, Personally, Publicly, Predictably frame to structure your response:
[Form feature: IF Article: headline & subheading
IF Letter: Dear Mr ???,

I am writing to you about…
IF Speech: 'Today I am here to talk to you about…']
Presently, we are like mindless addicts; preferring the heady rush of flippant fools and funny failures. Today's society is so immersed in the blizzard of triviality that [link to topic].

Personally, my own children, Edward and Alice, [link to topic]. It is easy to dismiss this as unimportant but the noxious influence of [topic] is as pervasive as it is dangerous.

Publicly, they (like so many their age) have [link to topic]. According to figures from Exeter University, over 75% of people [link to topic]. Professor Hill, who co-authored the report, stated: 'The issue with [topic] is a different kind of epidemic; causing untold damage. It is arguably worse because there is no vaccine.'

We must stop this!

Predictably, some people will… [consider opposing view] but this only perpetuates the problem. We have two options: continue with this intolerable situation or move forward to a future where we [positive link to topic]. Which would you rather choose?
[Form feature:
IF Article: do not add anything - end on the rhetorical question.
IF Letter: Yours sincerely,
[Your Name]
IF Speech: Thank you for listening.]

Q4 (16 marks, 20m) - compare writer's perspectives
Make links
Neat evidence – use precise quotations
Additional – link quotations across both sources
Language – analyse imagery, word choice and other methods
Structure and form – analyse perspective, tone and other methods
Intentions of writer – consider why it has been written and the impact on the reader
Your evaluation – consider which text demonstrates more or less of something

Q3 (12 marks, 15m) - analyse language
Imagery – always analyse this.
Neat evidence – as precise as possible – focus on word choices etc.
Additional – get a wide range of quotations
Language – analyse word choices, imagery and other methods such as metaphor, simile, personification, oxymoron, emotive language and syntax.

Q2 (8 marks, 10m) - summarise an idea across both texts
Make links, use neat evidence (borrow from Q4) and infer considering impact on reader.

Q1 (4 marks, 5m) - identify 4 true statements from a list of 8.

AQA English Literature – A Christmas Carol

Prepared Introduction (learn this):

Dickens presents _____ to criticise misanthropy in Victorian London. As a philanthropist, Dickens uses his didactic allegorical novella to demonstrate the importance of kindness. Dickens crafts this through Scrooge's redemption arc as he progresses from a 'covetous old sinner' to being 'quite a baby' symbolising his rebirth.

Make sure that you replace _____ with the focus of the question.

Key quotations to learn – prioritise the first 3 pairs.

1	**'solitary as an <u>oyster</u>'**	**'his own <u>heart</u> laughed'**
2	**'I wear the <u>chain</u> I forged in life'**	**'light as a <u>feather</u>'**
3	**'decrease the surplus <u>population</u>'**	**'are there no <u>prisons</u>?'**
4	**'biting** weather' 'freezing fog'	**'Golden** sunlight; Heavenly sky'
5	'gruff old **bell** was always peeping slily down at Scrooge'	'merry **bells'**
6	**'Want** is keenly felt, and **Abundance** rejoices.'	**'Ignorance'** & **'Want'** 'Beware … on his brow … **Doom'**
7	'Another idol has displaced me … a **golden** one'	'as good as **gold'**
8	**'tight-fisted** hand at the grindstone'	'apoplectic **opulence'**
9	'If these **shadows** remain unaltered by the Future, the child will die.'	'to Tiny Tim, who did not die, he was a **second father.**'
10	'a strange figure—like a **<u>child</u>**: yet not so like a child as like an **<u>old</u>** man'	'a **<u>jolly</u>** Giant, glorious to see; who bore a glowing torch…Girded round its middle was an antique scabbard; but no sword was in it'	'a solemn **<u>Phantom</u>**, draped and hooded, coming, like a **<u>mist</u>** along the ground, towards him.'

AQA English Literature – An Inspector Calls

Prepared introduction (learn this):

Priestley presents _____ to criticise capitalist culture within Edwardian England. As a socialist, Priestley wanted to inspire the younger generation in his WW2 audience to progress to a fairer and more equal society. Priestley crafts this through the cyclical structure to subvert the murder mystery genre so that rather than believing 'a man has to mind his own business' we realise that 'we are all responsible for each other'.

Make sure that you replace _____ with the focus of the question.

Key quotations to learn – prioritise the first 3 pairs.

1.	**'Burnt** her inside out'	**'Fire** and blood and anguish'
2.	**'unsinkable**, absolutely unsinkable'	'we're all in it – up to the **neck'**
3.	'obscene fat **carcass'**	'We are members of one **body'**
4.	'A **chain** of events'	'He's giving us the **rope** - so that we'll hang ourselves'
5.	'I'd give **thousands** - yes, thousands'	**'Millions** and millions and millions of Eva Smiths'
6.	'Look – **mummy** – isn't it a beauty?' / 'I'm sorry, **daddy'**	'Don't interfere, please, **father'** / **'Mother** - stop - stop!'
7.	'(with sharp sarcasm)…You were the wonderful **Fairy Prince**.'	'young and **fresh** and charming''
8.	'Girls of that **class**-' / 'Girls of that **sort'**	'You mustn't try to build up a kind of **wall** between us and that girl'
9.	'she was pretty and a good **sport'**	'Just used her…as if she was an **animal**, a thing, not a person'
10.	'it's better to ask for the **earth** than to take it.'	'To ask some – **questions'**

English Literature

ANALYSIS	
Argument	The writer presents [topic] to…
Neat evidence	The phrase '…' shows…
Additional	Additionally, the phrase '…' adds to…
Language	The imagery suggests…
Your evaluation	A reader may also understand…
Structure and form	Structurally, the… tone emphasises…
Intentions of writer	The writer's intentions may have been to…
Society and context	Contextually, the writer may be reflecting…

POETIC POEMS	Definition
Personification	Giving something human characteristics
Oxymoron	Contradictory phrase
Enjambment	Continuing a line of poetry
Tone	Mood or atmosphere
Imagery	Descriptive language
Contrast	Very different things put together
Perspective	Viewpoint
Onomatopoeia	Words that sound like the thing
Extended	Carrying on
Metaphor	Saying something is something else
Simile	Saying something is like something else

A PERSUADER	Definition
Alliteration	Repeating same sound at starts of words
Points	Clear reasons to add to your argument
Exaggeration	Overstating
Repetition	Saying the same thing over and over
Statistics	Using numbers to represent facts
Unique ideas	Unusual or ways of approaching an issue
Anecdote	A short story used to make a point
Direct address	Talking to the audience
Emotive language	Appealing to people's feelings
Rhetorical questions	Questions not intended to be answered.

A Christmas Carol

Key words	Definition
Miser	Someone who hoards money (Scrooge)
Misanthrope	Someone who hates people (also Scrooge)
Philanthropist	Someone who loves people
Avarice	Greed
Moralising	Teaching good and bad
Supernatural	Ghosts and unexplainable phenomena
Paradox	Contradictory things
Patriarchy	Male dominated society
Idolatry	Worshiping something
Benevolence	Goodness
Prosperity	Becoming rich
Idealistic	Seeing things as perfect
Didactic	Teaching
Allegory	A story that teaches
Morbid	Relating to death
Arrogance	Believing yourself to be better than others
Immorality	Not doing the right thing
Anagnorisis	A revelation or moment of truth
Peripeteia	A sudden change in fortune
Redemption	Becoming good.

Shaping, forming and manipulation

1.Forming	A process that changes the dimensions or shape of a solid material, without changing the volume.
2.Shaping	A process that involves pouring or forcing liquid material into a mould
3.Bending	Forcing something into a curve or an angle
4.Former	A device in a required profile that a material can be formed against
5.Jig	A device to hold a piece of work

Casting and moulding

6.Sand casting	A process where a mould made from sand is filled with molten metal
7.Pressure die casting	A shaping process where metal is forced into a reusable metal mould
8.Injection moulding	A shaping process for polymers, where the polymer is forced into a reusable metal mould
9.Soldering	A joining process where metal parts are attached together using a filler wire which melts and runs between them, typically melted using a soldering iron.
10.Brazing	A joining process where metal parts are attached together using a filler wire which melts and runs between them, with heat provided by either a flame or oven.
11.Welding	A joining process for metal parts where the edges of the parts are melted and form the joint, with additional filler metal if needed.

Heat and chemical treatment

12. Normalising	A heat treatment that results in metal that is tough with some ductility.
13.Annealing	A heat treatment that makes metal softer and easier to work.
14.Hardening	A heat treatment that increases the hardness and strength of a metal due to a change in the arrangement of the atoms within it.
15.Quenching	The rapid cooling of a hot metal by immersing it in a liquid, often oil or brine.
16.Tempering	A heat treatment to remove some of the brittleness in hardened steel at the cost of some hardness.

THE KEY ELEMENTS OF FILM FORM (KEOFF)

CINEMATOGRAPHY – use of the camera. MISE-EN-SCENE – content of the shot. SOUND – what we hear. EDITING- individual shots are assembled into a film.

CAMERA ANGLES

HIGH (HA) – The camera is above the subject.
LOW (LA) – The camera is below the subject.
CANTED (DUTCH) – The subject appears tilted.
60° ANGLE SHOTS (off-centre shots) - camera is positioned to the left or the right of centre.
EYE LEVEL – The camera is level with the subject's eyes.
BIRD'S EYE – The camera is high above in the air.
WORM'S EYE – The camera is low to the ground.
AERIAL SHOT – viewed from the sky,

CAMERA DISTANCES

EXTREME LONG SHOT (XLS) – subject is far away.
LONG SHOT (LS) – whole subject can be seen.
MEDIUM / MID SHOT (MS) – subject visible from thighs upward.
CLOSE UP (CU) – top of head & shoulders visible.
EXTREME CLOSE UP (ECU) – face or partial face.

CAMERA MOVEMENT

PAN – movement left to right / right to left.
TILT – movement up & down.
DOLLY – camera moves forward / backward.
TRACK – camera follows the action (usually sideways).
ZOOM – camera lens moves in or out on subject.
CRANE – smooth camera move in and out of the action from above or below.
STEADICAM – stabilised camera moves anywhere.
HAND-HELD – un-stabilised (shaky) camera moves anywhere.
POV – point-of-view camera mimics a subject's vision.
DRONE – ariel shot with unrestricted movement.

LIGHTING - How light has been used by the cinematographer. At its most basic level, lighting allows film-makers to capture an image. More than this it creates images where the lighting itself adds mood and meaning.
HIGH KEY – lots of light, using more filler lights to appear more like daylight or 'normal' lighting.
LOW KEY- less light & shadows, uses only key & back lights to appear more like darkness or night-time.

Film Aesthetic - Considers how all KEOFF are combined artistically. Including individual shots, their composition and mise-en-scène in general. Elements can be used throughout a film and create a distinctive 'look' or style creating the 'spectacle' of film which engages spectators

MISE-EN-SCENE

SETTING - Where the scene is, when the scene is and the objects used to show this.
PROPS – (property) objects that play a role in telling the story.
COSTUME - Clothes & accessories.
HAIR & MAKE-UP - style of hair or wig, prosthetics & appliances.
FACIAL EXPRESSION & BODY LANGUAGE – Performance / Acting, how people move their body and faces
POSITIONING – the placement of characters and objects in relation with one another.
COLOUR – Specific colours in the scene or the overall colour, tone or temperature of a scene.
Useful performance words:
Shy, flirtatious, adventurous, immature, wild, carefree, courageous, realistic, silly, childish, aggressive, camp, brash, rash, irresponsible, chemistry, imposing, child-like, method acting.

EDITING

TRANSITIONS:
CUT – where the film changes from one shot (image) to the next.
JUMP CUT – Sudden cut from one shot to another
FADE-OUT – the image slowly disappears, usually, to black.
DISSOLVE – one image fades out as the next fades in.
CUT AWAY – film cuts to something else off screen or in close up.
WIPE – Image wipes to reveal a new image.
MATCH-ON ACTION – a cut that shows two views of the same action.
GRAPHIC MATCH – One object is matched by one of a similar shape on the next shot.
PACE OF EDITING:
FAST PACED – lots of quick shots typically used to convey action & excitement.
SLOW PACED – less shots in a sequence, longer shots typically used to convey calm or importance, lets the audience drawn breath and take things in.
USEFUL EDITING WORDS /TERMS:
Cross-cutting, parallel, non-linear editing, 180 degree rule, sequence, master shot, juxtapose, superimposition, ellipsis, insert, Kuleshov, continuity editing, montage, transition, , flashback,

SOUND

DIEGETIC - Sound that occurs within the world of the film. Sound the characters can hear.
NON-DIEGETIC - Sound that does **NOT** occur in the world of the film; sound characters cannot hear.
DIALOGUE - Commonly used as way of referring to the sound of two people talking.
CONTRAPUNTAL - Sound that is in contrast to the images.
PARALLEL - Sound that suits and fits or is similar to the images.
SOUND BRIDGE - sound continues over a transition in a film. Connects the one scene to another.
LEITMOTIF - A frequently recurring bit of melody or soundtrack associated with a person, thing, or emotion; often used as a 'theme tune' for a specific character.
ASYNCHRONOUS SOUND - Sound which is **NOT** in-sync with the action on the screen - both in terms of timing and atmosphere.
SCORE is the music written to be played in the background of the film.
SOUNDTRACK a collection of pre-recorded songs chosen to represent the mood or feeling of the film.
Useful soundtrack words:
Bombastic, dramatic, moving, sweeping, evocative, pulsing, fast, crawling, piercing, shrill, playful, delicate, chilled, soaring, spritely, imposing, pacey, regal, languid, gloomy, scary.
SOUND EFFECTS help to emphasise the sound that something makes, are also vital for any film.
Useful sound effects words:
Deafening, harsh, loud, subtle, brash, muffled, melodious, bang, buzz, crackling, screech, snapping, thud, rustle, howl, echoing, growl, whimper, rumble, roar, vociferous.
ADR - Additional dialogue recording; an actor re-records dialogue or other sounds after filming.
SYNCHRONOUS SOUND - Sound matched to movements occurring in the scene e.g. when footsteps correspond to feet walking.
AMBIENT SOUND - Sound which helps to set a scene by providing background noise.

Film Studies

Food

Functions of ingredients
Ingredients provide a variety of functions in recipes.

Carbohydrate, protein and fat
Carbohydrate, protein and fat all have a range of properties that make them useful in a variety of food products.

Carbohydrates perform different functions in food.
They can:

- help to cause the colour change of bread, toast and bakery products (dextrinisation);
- contribute to the chewiness, colour and sweet flavour of caramel;
- thicken products such as sauces and custards (gelatinisation).

Maillard reaction
Foods which are baked, grilled or roasted undergo colour, odour and flavour changes. This is primarily due to a group of reactions involving amino acids (from protein) and reducing sugars.

Dextrinisation
When foods containing starch are heated they can also produce brown compounds due to dextrinisation. Dextrinisation occurs when the heat breaks the large starch polysaccharides into smaller molecules known as dextrins which produce a brown colour.

Caramelisation
When sucrose (table sugar) is heated above its melting point it undergoes physical and chemical changes to produce caramel.

Gelatinisation
When starch is mixed with water and heated, the starch granules swell and eventually rupture, absorbing liquid, which thickens the mixture. On cooling, if enough starch is used, a gel forms.

Proteins perform different functions in food products.
They:

- aerate foods, e.g. whisking egg whites;
- thicken sauces, e.g. egg custard;
- bind ingredients together, e.g. fishcakes;
- form structures, e.g. gluten formation in bread;
- gel, e.g. lime jelly.

Gluten formation
Two proteins, gliadin and glutenin, found in wheat flour, form gluten when mixed with water. Gluten is strong, elastic and forms a 3D network in dough. In the production of bread, kneading helps untangle the gluten strands and align them. Gluten helps give structure to the bread and keeps in the gases that expand during cooking.

Gelation
Gelatine is a protein which is extracted from collagen, present in animal connective tissue. When it is mixed with warm water, the gelatine protein molecules start to unwind. On cooling, a stable, solid network is formed, trapping the liquid.

Denaturation
Denaturation is the change in structure of protein molecules. The process results in the unfolding of the protein's structure. Factors which contribute to denaturation are heat, salts, pH and mechanical action.

Food

Coagulation
Coagulation follows denaturation. For example, when egg white is cooked it changes colour and becomes firmer (sets). The heat causes egg proteins to unfold from their coiled state and form a solid, stable network.

Aeration
Products such as creamed cakes need air incorporated into the mixture in order to give a well-risen texture. This is achieved by creaming a fat, such as butter or baking spread, with sugar. Small bubbles of air are incorporated and form a stable foam.

Fats performs different functions in food.
They help to:

- add 'shortness' or 'flakiness' to foods, e.g. shortbread, pastry;
- provide a range of textures and cooking mediums;
- glaze foods, e.g. butter on carrots;
- aerate mixtures, e.g. a creamed cake mix;
- add a range of flavours.

Plasticity
Fats do not melt at fixed temperatures, but over a range. This property is called plasticity.

Raising agents
Raising agents include anything that causes rising within foods, and are usually used in baked goods. Raising agents can be:

- biological, e.g. yeast;
- chemical, e.g. baking powder;
- mechanical, e.g. adding air through beating or folding.

Functional ingredients
These are ingredients that are specifically included in food for additional health benefits. They include:

- probiotics – 'good' bacteria that may have a positive impact on human health;
- prebiotics – food ingredients that promote the growth of beneficial microorganisms in the gut;
- sterols/stanols – compounds that can lower cholesterol;
- healthy fats (e.g. omega-3);
- added vitamins and minerals (more than in the original food).

Colloidal systems
Colloidal systems give structure, texture and mouthfeel to many different products.

System	Disperse phase	Continuous phase	Food
Sol	Solid	Liquid	Unset jelly
Gel	Liquid	Solid	Jelly
Emulsion	Liquid	Liquid	Mayonnaise
Solid emulsion	Liquid	Solid	Butter
Foam	Gas	Liquid	Whipped cream
Solid foam	Gas	Solid	Meringue

Food

Why is food prepared and cooked?

Food is prepared and cooked to:

- make the food more palatable – improves flavour, texture and appearance;
- reduce the bulk of the food;
- provide variety and interest to meals.

Methods of cooking food

The methods of cooking are divided up into groups. These are based on the cooking medium used.

They are:

- moist/liquid methods, e.g. boiling;
- dry methods, e.g. grilling;
- fat-based, e.g. frying.

Selecting the most appropriate way of preparing and cooking certain foods is important to maintain or enhance their nutritional value.

- Vitamins can be lost due to oxidation during preparation or leaching into the cooking liquid.
- Fat-based methods of cooking increase the energy (calories) of the food.
- The use of different cooking methods affects the sensory qualities of the food.

Key terms

Conduction: The exchange of heat by direct contact with foods on a surface.

Convection: Currents of hot air or hot liquid transfer the heat energy to the food.

Functional ingredients: Included in food for additional health benefits.

Heat transfer: Transference of heat energy between objects.

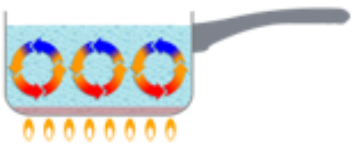
Radiation: Energy in the form of rays.

Tenderisation

- Mechanical tenderisation – a meat cleaver or meat hammer may be used to beat the meat. Cutting into small cubes or mincing can also help.
- Chemical tenderisation (marinating) –the addition of any liquid to flavour or soften meat before cooking.

There are three ways that heat is transferred to food.

- Conduction – the exchange of heat by direct contact with foods on a surface.
- Radiation – energy in the form of rays.
- Convection – currents of hot air or hot liquid transfer the heat energy to the food.



Year 10 French Spring Term 1: Au collège

Les verbs	*Verbs*
1. étudier	*to study*
2. apprendre	*to learn*
3. porter	*to wear*
4. commencer	*to start/begin*
5. participer	*to participate*
6. gagner	*to win*
7. organiser	*to organise*
8. chanter	*to sing*
9. jouer	*to play*
10. récolter	*to raise (money)*
11. aller	*to go*

Les matières	*School subjects*
12. le commerce	*business*
13. le dessin	*art*
14. le français	*French*
15. la biologie	*the UK*
16. la chimie	*chemistry*
17. la physique	*physics*
18. la technologie	*technology*
19. l'allemand	*German*
20. l'anglais	*English*
21. l'EPS	*PE*
22. l'informatique	*Computing*
23. les arts ménagers	*home studies*
24. l'instruction civique	*citizenship*

Le collège	School
25. le gymnase	*sports hall*
26. le hall	*hall*
27. le terrain de basket	*basketball court*
28. la bibliothèque	*library*
29. la cantine	*canteen*
30. la cour de recreation	*playground*
31. la salle de sport	*gym*
32. les salles de classe	*classrooms*
33. les vestiaires	*changing rooms*
34. les labos de science	*science labs*
35. les élèves	*students*
36. les professeurs	*teachers*
37. la récreation	*breaktime*

Le règlement scolaire	*School rules*
38. être à l'heure	*be on time*
39. faire ses devoirs	*do homework*
40. porter l'uniforme	*wear uniform*
41. mâcher du chewing-gum	*chew gum*
42. utiliser son portable	*use mobile phone*
43. beaucoup de bijoux	*lots of jewellery*
44. trop de maquillage	*too much make-up*
45. manquer les cours	*miss lessons*
46. juste	*fair*
47. raisonnable	*reasonable*

L'uniforme scolaire	*School uniform*
48. un polo	*a polo shirt*
49. un sweat/un pull	*a sweatshirt/a jumper*
50. une chemise	*a shirt*
51. un pantalon	*trousers*
52. une jupe	*a skirt*
53. une robe	*a dress*
54. une veste	*a blazer/jacket*
55. une cravate	*a tie*
56. mes propre vêtements	*my own clothes*
57. la mode	*fashion*
58. démodé	*old-fashioned*

Les succès au collège	*Successes at school*
59. fier/fière	*proud*
60. l'orchestre	*orchestra*
61. le club	*club*
61. le conseil d'administration	*school council*
62. l\équipe	*team*
63. l'échange scolaire	*school exchange*
64. la sortie scolaire	*school trip*
65. un prix	*a prize*
66. un spectacle	*a show*
67. un tournoi /concours	*a tournament/competition*
68. une association caritative	*a charity*

Geography

An ecosystem is a natural system that comprises a **community of plants and animals** that interact with each other and their physical environment.
Non-living elements (soils, rocks, water, sunlight etc) and **living elements** (plants, animals, bacteria etc)
Scales – Pond (local), Regional (sand dunes, woodland or forest), **global scale (biomes)** tropical rainforests, deserts and tundra environments.

Small scale ecosystems – Freshwater ponds
Animals and plants living in deeper water at the bottom of the pond will have less light and Oxygen, but also have to cope with more wind etc.
Living things at the edges of a pond (the margins) have more light and Oxygen, but also have to cope with more wind etc

Producers using energy from the sun, and convert it into sugar (or glucose).
Consumers then get their energy by eating the producers for their sugars.

Links energy flows from one food sources to another.
Trophic pyramid composed of many primary producers, a smaller number of primary consumers, and even smaller number of secondary consumers and a tiny number of tertiary consumers.
Food chains – food moves up the line from producer to tertiary consumer.

Links energy flows from one food source to another.
Trophic pyramid composed of many primary producers, a smaller number of primary consumers, and even smaller number of secondary consumers and a tiny number of tertiary consumers.
Food chains – food moves up the line from producer to tertiary consumer.

However, this is too simplistic. Animals might eat many other plants and animals, not have just one source of food. It is better to consider the flows as a **Food Webb;** that considers all of the connections between the plants and animals within an ecosystem like a pond.
Decomposers – bacteria and insects etc. That decompose dead materials.

The distribution and characteristics of large scale natural global ecosystems – large scale ecosystems location is determined largely by climate – how much precipitation and sunlight is available?
What is the relief of the area like? Wind? Eg temperate deciduous forest.
Climate is reasonably stable with not great variation throughout the year.
Deciduous forests have trees with broadleaves (eg Oak) that are shed in the autumn months.

Geography

Disappear in the interiors of continents at temperatures become more extreme and precipitation levels fall. Lots of other biomes as shown on the map.

Tropical rainforests – distinctive characteristics Tropical rainforest – great biodiversity, located across the Equatorial regions. Four square miles of tropical rainforest have 1500 flowering plant species and 750 types of trees.

Factor 1 – Climate – Loads of rain – over 2000mm of rainfall per year. Rainfall in each month. Temperatures are very even, averaging 27°C every day with very little variation. Allows for incredible plant growth.
Factor 2 – soils and nutrients – very deep, some of the deepest in the world. Latosol, a typical tropical forest soil.
High rainfall weathers the rock below and masses of vegetation allow deep soils to form.
Very nutrient poor as you go down through the soils as rainwater LEACHES the nutrients and minerals out of the soil.
Soils are often red in colour as they are rich in iron. NUTRIENT CYCLING very important. This is a good example of the INTERDEPENDENT (where things rely upon each other) nature of the forest.
As vegetation dies it is quickly decomposed by insects, bacteria and fungi.
This releases nutrients into the surface of the soil which is taken up quickly by the plants.
Factor 3 – water recycling – roots of plants take up water from the ground, rain is intercepted, water then evaporates into the atmosphere and forms clouds to make the next day's rain.
Factor 4 – Stratification (layers) Competition between plants for light and space. Adaptations such as buttress Roots, Llanas, epiphytes, drip tips to cope.
Factor 5 – competition and interdependence – food webs in Tropical forests
Factor 6 – people – indigenous groups eg Kayapo in Brazil use forests for food, water and shelter.
Under pressure due to subsistence and commercial farming, logging, road building, mineral extraction, energy development, settlement, and population growth.

Deforestation – cutting down of forest for other uses – impacts includes:

1. **Environmental** – loss of biodiversity and genetic resources, loss of forest cover, increased soil erosion, loss of nutrient cycle, damage to water cycle
2. **Economic** – better transport, more raw materials eg coal, more farm products, more wood, greater energy production, boosts GCP

Year 10 German Spring Term 1: Im Urlaub und zu Hause!

Verben	*Verbs*
1. fahren	*to go (drive)*
2. gehen	*to go (on foot)*
3. machen	*to make/do*
4. verbringen	*to spend time*
5. mieten	*to hire*
6. wohnen	*to live/stay*
7. übernachten	*to stay*
8. haben	*to have*
9. sein	*to be*
10. verbessern	*to improve*

Länder und Orte	*Countries and Places*
11. im Norden	*In the north*
12. Im Osten	*In the east*
13. Im Süden	*In the south*
14. Im Westen	*In the west*
15. Das Reiseziel	*Travel destination*
16. Das Urlaubsziel	*Holiday destination*
17. im Ausland	*Abroad*
18. Im Inland	*At home*
19. Europa	*Europe*
20. Bayern	*Bavaria*
21. Spanien	*Spain*
22. Italien	*Italy*
23. die Türkei	*Turkey*
24. Italien	*Italy*
25. Österreich	*Austria*
26. Kroatien	*Croatia*
27. ans Meer	*to the sea*
28. an einen See	*to a lake*
29. an den Strand	*to the beach*
30. an die Küste	*to the coast*
31. in den Wald	*in the forest*
32. in die Berge	*to the mountains*

Das Wetter	*The weather*
33. das Gewitter	*thunderstorm*
34. der Hagel	*hail*
35. der Nebel	*fog*
36. der Regen	*rain*
37. die Wolken	*the clouds*

Urlaubsarten	*Types of holiday*
38. Abenteuerurlaub	*Adventure holiday*
39. Aktivurlaub	*Active holiday*
40. Sightseeingurlaub	*Sightseeing holiday*
41. Sommerurlaub	*Summer holiday*
42. Strandurlaub	*Breach holiday*
43. Urlaub auf Balkonien	*Staycation*
44. Winterurlaub	*Winter holiday*
45. Zelten	*Camping*
46. draußen	*Outside*
47. abenteuerlustig	*Adventurous*
48. Ich will nichts tun.	*I want to do nothing.*
49. Vollpension	*full board*
50. Halbpension	*half board*
51. das Zimmer	*the room*

In der Stadt	*In town*
52. Es gibt…	*There is/are…*
53. eine Autobahn	*a motorway*
54. einen Bahnhof	*a train station*
55. einen Campingplatz	*a campsite*
56. ein Freibad	*an outdoor pool*
57. eine Grundschule	*a primary school*
58. eine Fußgängerzone	*a pedestrianised area*
59. viele Geschäfte	*lots of shops*
60. viele Sehenswürdigkeiten	*lots of sights*
61. viele Vorteile	*lots of advantages*
62. viele Nachteile	*lots of disadvantages*
63. keinen Flughafen	*no airport*
64. kein Kino	*no cinema*
65. keine Strände	*no beaches*

Vor- und Nachteile	*Advantages and disadvantages*
66. auf einem Bauernhof	*on a farm*
67. auf dem Land	*in the countryside*
68. in einem Dorf	*in a village*
69. in der Nähe von…	*near…*
70. viel Lärm/Verkehr	*lots of noise*
71. Fahrradwege	*cycle paths*
72. Buslinie	*bus routes*
73. Öffentlichen Verkehrsmittel	*public transport*

GCSE History – Knowledge Organiser – Superpower Relations and the Cold War - Topic 1 - The Origins of the Cold War, 1941-58

History

1. Key dates

Feb 1943	Tehran Conference
Feb 1945	Yalta Conference
July-Aug 1945	Potsdam Conference
Aug 1945	End of Grand Alliance
1946	Long Telegram and Novikov's Telegram
1947	Truman Doctrine and Marshall Plan
1947	Cominfom set up
1948	Berlin Blockade/Airlift
1949	Comecom and Nato set up
1955	Warsaw Pact was created
1956	Hungarian Uprising and Soviet Invasion

2. Key Terms/Concepts

Alliance	An agreement to help others out
Iron Curtain	Phrase used by Churchill to describe how Europe was divided
Telegram	A message only for certain people
Communism	An ideology based on equality
Capitalism	An ideology based on individual enterprise and profit
Satellite State	Countries taken over by the Soviet Union
Marshall Plan	$13 Billion given by the USA to rebuild Europe
Truman Doctrine	A speech that said that the US would hold back the spread of communism
Cominform	Arranged what communist parties would do
Comecon	Soviet Unions version of the Marshall Plan
NATO	North Atlantic Treaty Organisation
Bizonia	UK and US Berlin that was joined together
Warsaw Pact	Collective defense treaty
Ideology	A set of political ideas about how society should be run
Blockade	To stop anything coming into a certain place/country/area

3. Key people

Stalin	Leader of the Soviet Union till 1953
Churchill	PM of Britain up till the Yalta conference
Roosevelt	US president up till Yalta
Truman	US President after Yalta
Kennan	US ambassador in Russia sent the long telegram
Novikov	Soviet ambassador in US
Khrushchev	Soviet Union leader between 1953 and 1964
Rakosi	Hungarian Leader under Stalin
Nagy	Hungarian leader under Khrushchev

1. Key dates	
1945	Berlin is divided
Nov 1958	Khrushchev's Belin Ultimatum
1959-61	Geneva, Camp David, Paris and Vienna conferences
April 1961	Bay of Pigs Incident
Aug 1961	Berlin Wall built
1962	Cuban Missile Crisis
1963	Limited Test ban Treaty
1968	Prague Spring/Invasion of Czechoslovakia
1968	Brezhnev Doctrine

2. Key Terms/Concepts	
Ultimatum	Final decision/order
Summit	Meeting to discuss important issues
Bay of Pigs incident	Where US troops and Cuban exiles tried to invade Cuba
Exile	Living outside your own country by choice
Prague Spring	A period of increased political freedom
Berlin Wall	Wall built to divide East and West Berlin
Brezhnev Doctrine	The right to invade satellite states if security was threatened
M.A.D.	Mutually Assured Destruction
Détente	A less stressful informed relationship between the USA and the Soviet Union
Hotline Agreement	Direct phone line set up to communicate between US and Soviet Union
Conference	A meeting where ideas are shared

3. Key people	
John F. Kennedy	US President 1961-63
Fidel Castro	Cuban leader 1959-2015
Alexander Dubcek	Czechoslovakian leader in 1968
Leonid Brezhnev	Leader of Soviet Union after 1964
Josip BrozTito	Leader of Yugoslavia

GCSE History – Knowledge Organiser – Superpower Relations and the Cold War – Topic3 – The End of the Cold War Crises, 1970-91

History

1. Key dates	
1972	SALT 1
1975	Helsinki Agreement
1979	SALT 2
Dec 1979	Soviet Invasion of Afghanistan
1980	Carter Doctrine
1981	Regan becomes President - Second Cold War
March 1983	SDI started – Star Wars
Sept 1983	Shooting down of KAL007
1985	Geneva Conference
1987	INF treaty
1988-89	Gorbachev announces changes to Soviet foreign policy ending Brezhnev Doctrine
Nov 1989	Berlin Wall falls
1991	End of the Cold War

2. Key Terms/Concepts	
S.A.L.T.	Strategic Arms Limitation Treaty
Treaty	An agreement
Glasnost	'Openness' –freedom of speech
Perestroika	'Restructuring' new ways of doing things
Carter Doctrine	End of cooperation with Soviet Union and confronted it instead
Mujahideen	Afghan rebels who fought the Soviets in Afghanistan
I.N.F.	Intermediate-Range Nuclear Forces
Evil Empire	Regan's description of the Soviet Union
S.T.A.R.T.	Strategic Arms Reduction Treaty 1991
S.D.I	Strategic Defense Initiative
KAL007	South Korea Plane shot down by Soviet Union

3. Key people	
Ronald Regan	US President 1981-91
Mikhail Gorbachev	Soviet Union leader 1985-91
Jimmy Carter	US president 1977-81
Hafizullah Amin	Replaced Soviet choice Taraki as leader of Afghanistan
Barbrak Karmal	Made president of Afghanistan after Amin was killed

10.5 Angles and bearings.....

What do I need to be able to do?

By the end of this unit you should be able to:

- Understand and represent bearings
- Measure and read bearings
- Make scale drawings using bearings
- Calculate bearings using angle rules
- Solve bearings problems using Pythagoras and trigonometry

Keywords

Cardinal directions: the directions of North, South, East, West
Angle: the amount of turn between two lines around their common point
Bearing: the angle in degrees measured clockwise from North
Perpendicular: where two lines meet at 90°
Parallel: straight lines always the same distance apart and never touch. They have the same gradient.
Clockwise: moving in the direction of the hands on a clock
Construct: to draw accurately using a compass, protractor and or ruler or straight edge.
Scale: the ratio of the length of a drawing to the length of the real thing
Protractor: an instrument used in measuring or drawing angles.

Sparx

Measure & draw angles: M331, M780, U447

Scale drawings: M112

Directions: M910

Understand and represent bearings: M416

Measure and read bearings: M260

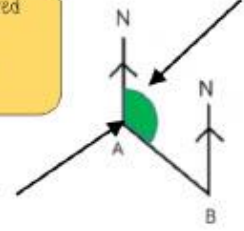
Bearings with angles: U107

Mathematics

Understand and represent bearings

- A bearing is always measured from **NORTH**
- It is always given as three figures

The angle indicated starts from the North line at A and joins the path connecting A to B



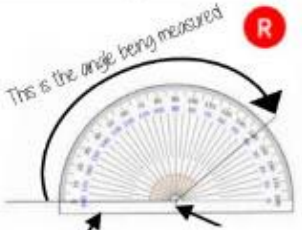
This angle shows the bearing of **B from A**

The bearing of B from A is calculated by measuring the highlighted angle

The sentence... "Bearing of ____ from _____" is really important in identifying the bearing being represented

Using **estimation** it is clear this angle is between 090° and 180°

Measure angles to 180°



The base line follows the line segment

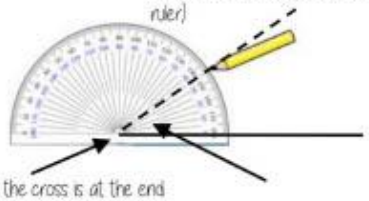
Make sure the cross is at the point the two lines meet

Read from 0° on the base line. Remember to use estimation. This is an obtuse angle so between 90° and 180°

Draw angles up to 180°

Draw a 35° angle

Make a mark at 35° with a pencil and join to the angle point (use a ruler)



Make sure the cross is at the end of the line (where you want the angle)

The angle

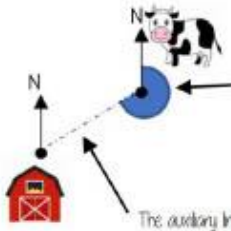
Scale drawings

1 : 20

For every 1cm on the model there are 20cm in real life

Remember: Scale drawings ONLY change lengths and distances. Angles remain the same.

Measure and read bearings



The bearing of the cow to the barn

This angle is measured from **NORTH**

It is measured in a clockwise direction

Estimation indicates this angle is between 180° and 270°

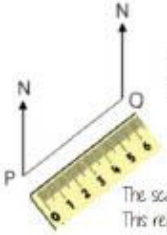
Use a protractor to measure accurately

Remember bearings are written as three figures

The auxiliary line is drawn to help you measure and draw the angle that is measured to represent the bearing

Scale drawings using bearings

Remember – angles **DO NOT** change size in scaled drawings



The bearing measurements do not change from "real life" to images

The units in the ratio scale are the same

The scale may need to be calculated from the image. This represents 30km from P to Q

6cm = 30km

6:3,000,000

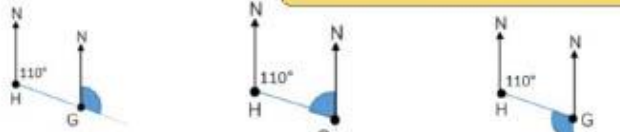
Directions

Clockwise

Anti-Clockwise

Bearings with angle rules

Because two North lines are **PARALLEL**....



They form **corresponding** angles and therefore are the same size

They form **co-interior** angles and add up to 180°

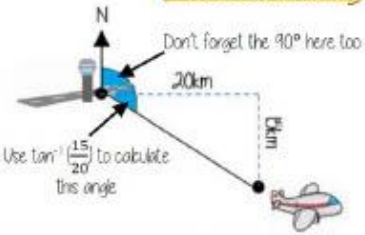
They form **alternate** angles and therefore are the same size

Bearings with right-angled geometry

Look for Right-angles: Pythagoras Trigonometry (Sin, Cos, Tan)

"Due West" bearing of 270° makes a 90° angle

"Due East" bearing of 090° makes a 90° angle



A plane flies East for 20km then turns South for 15km. Find the bearing of the plane from where it took off.

Angle notation

The letter in the middle is the angle. The arc represents the part of the angle.

Angle Notation: three letters $A\hat{B}C$ This is the angle at B = 113°

$\angle ABC$ is also used to represent the angle at B

Mathematics

10.6 Working with circles.....

What do I need to be able to do?

By the end of this unit you should be able to:

- Recognise and label parts of a circle
- Calculate fractional parts of a circle
- Calculate the length of an arc
- Calculate the area of a sector
- Understand and use volume of a cone, cylinder and sphere
- Understand and use surface area of a cone, cylinder and sphere

Keywords

Circumference: the length around the outside of the circle – the perimeter
Area: the size of the 2D surface
Diameter: the distance from one side of a circle to another through the centre
Radius: the distance from the centre to the circumference of the circle
Tangent: a straight line that touches the circumference of a circle
Chord: a line segment connecting two points on the curve
Frustrum: a pyramid or cone with the top cut off
Hemisphere: half a sphere
Surface area: the total area of the surface of a 3D shape

Parts of a circle: U767

Fractional parts of a circle: M231, U950,

Arc length: U221

Sector area: U373

Volume of a sphere: U617

Volume of a cone and cylinder: U116, U915

Surface are of a sphere: U771

Surface are of cones and cylinders: U771, U464

Sparx

Mathematics

Fractional parts of a circle

A circle is made up of 360°

30° represents $\frac{30}{360}$ of a full circle

$\frac{30}{360} = \frac{1}{12}$

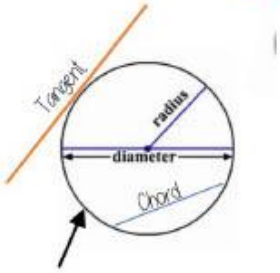
Formula to remember
Area of a circle = πr^2
Circumference of a circle = πd or $2\pi r$

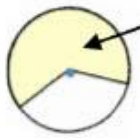
$\frac{270}{360}$ of a full circle (in degrees)
$\frac{6}{8}$ of a full circle (in equal parts)
$\frac{3}{4}$ of a full circle

The fraction of the circle is as $\frac{\theta}{360}$

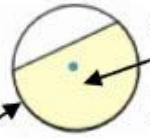
θ represents the degrees in the sector

Parts of a circle R





Sector (part of the circle made from two radii)

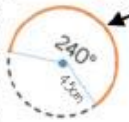


Segment (part of the circle made from a chord)

An arc is a part of the circumference

Arc length

Remember an arc is part of the circumference
Circumference of the whole circle = $\pi d = \pi \times 9 = 9\pi$



Arc length = $\frac{\theta}{360} \times$ circumference

$= \frac{240}{360} \times 9\pi$
$= \frac{2}{3} \times 9\pi = 6\pi$

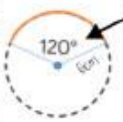
Perimeter

Perimeter is the length around the outside of the shape
This includes the arc length and the radii that encloses the shape

Perimeter = $\frac{\theta}{360} \times$ circumference $+ 2r$ $= 6\pi + 9$

Sector area

Remember a sector is part of a circle
Area of the whole circle = $\pi r^2 = \pi \times 6^2 = 36\pi$



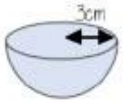
Sector area = $\frac{\theta}{360} \times$ area of circle

$= \frac{120}{360} \times 36\pi$
$= \frac{1}{3} \times 36\pi = 12\pi$

Volume of a sphere

Volume Sphere = $\frac{4}{3}\pi r^3$

NOTE This is now a **cubed** value



Volume Sphere = $\frac{4}{3}\pi r^3$
$= \frac{4}{3} \times \pi \times 3^3$
$= \frac{4}{3} \times \pi \times 27 = 36\pi$

A hemisphere is half the volume of the overall sphere
$= 36\pi \div 2$
$= 18\pi$

Look out for hemispheres being placed on other 3D shapes, e.g. cones and cylinders

Volume of a cone and a cylinder

Volume Cylinder = $\pi r^2 h$

A cylinder is a prism – cross section is a circle

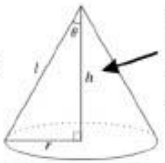
Volume Cone = $\frac{1}{3}\pi r^2 h$

A cone is a pyramid with a circular base

$V = \pi r^2 h$
$= \pi \times 4^2 \times 10$
$= \pi \times 160$
$= 160\pi$ cm^3

Give your answer in terms of π' means NOT in terms of pi

$= 502.7$cm^3

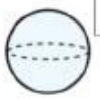


The height of a cone is the perpendicular height from the vertex to the base

Look out for trigonometry or Pythagoras theorem – the radius forms the base of a right-angled triangle

Surface area of a sphere

Surface area = $4\pi r^2$



Radius = 5cm

Surface area = $4\pi r^2$
$= 4 \times \pi \times 5^2$
$= 4 \times \pi \times 25$
$= 100\pi$

The curved surface area of a sphere

A hemisphere has the curved surface AND a flat circular face

$= 100\pi \div 2 = 50\pi$
$= 50\pi + \pi \times 5^2$

Hemisphere $= 75\pi$

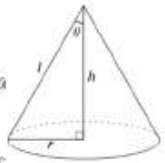
Surface area of cones and cylinders

Surface area cylinder = $2\pi r^2 + \pi dh$

The area of two circles (top and bottom face) + the area of the curved face

The length of shape B is the circumference of the circles

Curved surface area Cone = πrl



Look out for the use of Pythagoras to calculate the length l

Total surface area = curved face + circle face (area of base)

Mathematics

10.7 Vectors.....

What do I need to be able to do?

By the end of this unit you should be able to:

- Understand and represent vectors
- Use and read vector notation
- Draw and understand vectors multiplied by a scalar
- Draw and understand addition of vectors
- Draw and understand addition and subtraction of vectors

Keywords

Direction: the line our course something is going
Magnitude: the magnitude of a vector is its length
Scalar: a single number used to represent the multiplier when working with vectors
Column vector: a matrix of one column describing the movement from a point
Resultant: the vector that is the sum of two or more other vectors
Parallel: straight lines that never meet

Understand and represent vectors: U632

Vectors multiplied by scalar: U564, U660,

Addition and subtraction of vectors: U903

Extension: U781, U560

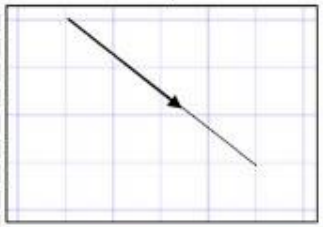
Sparx

Mathematics

Understand and represent vectors

Column vectors have been seen in translations to describe the movement of one image onto another

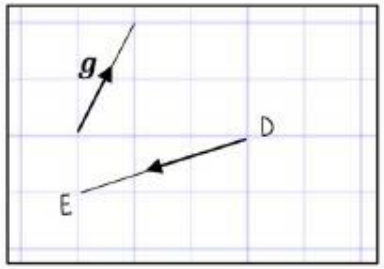
Movement along the x-axis → $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$ ← Movement along the y-axis



Vectors show both direction and magnitude

The arrow is pointing in the direction from starting point to end point of the vector	The direction is important to correctly write the vector	The magnitude is the length of the vector (This is calculated using Pythagoras' theorem and forming a right-angled triangle with auxiliary lines)	The magnitude stays the same even if the direction changes

Understand and represent vectors



Vector notation $\overrightarrow{DE}$ is another way to represent the vector joining the point D to the point E

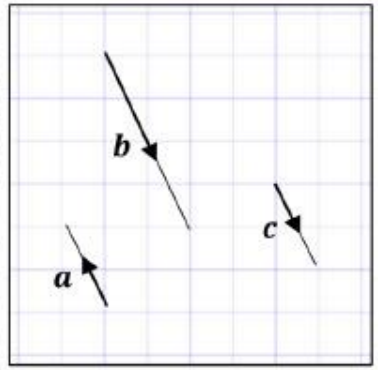
$\overrightarrow{DE} = \begin{pmatrix} -3 \\ -1 \end{pmatrix}$

The arrow also indicates the direction from point D to point E

Vectors can also be written in bold lower case so $\boldsymbol{g}$ represents the vector $\boldsymbol{g} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$

Vectors multiplied by a scalar

Parallel vectors are scalar multiples of each other



$\boldsymbol{b} = 2 \times \boldsymbol{c} = 2\boldsymbol{c}$

Multiply $\boldsymbol{c}$ by 2 this becomes $\boldsymbol{b}$. The two lines are parallel

$\boldsymbol{a} = -1 \times \boldsymbol{c} = -\boldsymbol{c}$

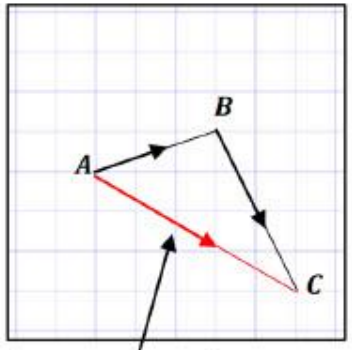
The vectors $\boldsymbol{a}$ and $\boldsymbol{c}$ are also parallel. A negative scalar causes the vector to reverse direction

$\boldsymbol{b} = -2 \times \boldsymbol{a} = -2\boldsymbol{a}$

$\boldsymbol{a} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $\boldsymbol{b} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$ $\boldsymbol{c} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$

Addition of vectors

$\overrightarrow{AB} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$ $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$



$\overrightarrow{AB} + \overrightarrow{BC}$

$= \begin{pmatrix} 3 \\ 1 \end{pmatrix} + \begin{pmatrix} 2 \\ -4 \end{pmatrix}$

$= \begin{pmatrix} 3+2 \\ 1+-4 \end{pmatrix}$

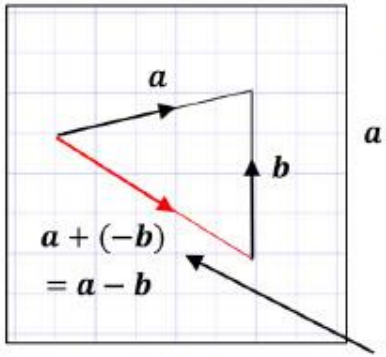
$\overrightarrow{AC} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$

Look how this addition compares to the vector $\overrightarrow{AC}$

The resultant

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC} = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$

Addition and subtraction of vectors



$\boldsymbol{a} = \begin{pmatrix} 5 \\ 1 \end{pmatrix}$ $\boldsymbol{b} = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$

$\boldsymbol{a} + (-\boldsymbol{b}) = \begin{pmatrix} 5 + & -0 \\ 1 + & -4 \end{pmatrix} = \begin{pmatrix} 5 \\ -4 \end{pmatrix}$

The resultant is $\boldsymbol{a} - \boldsymbol{b}$ because the vector is in the opposite direction to b which needs a scalar of -1

Music for film and video games

AOS4

1 – Key Composers

John Williams
Hans Zimmer
Danny Elfman
James Horner

Martin O'Donnell*
Michael Salvatori*

2 – Instruments and families

Woodwind – flute, oboe, cor anglaise, clarinet, bassoon.

Brass – Trumpet, French Horn, Trombone, Tuba

Strings – Violin, Viola, 'Cello, Double Bass, Harp

Percussion – Timpani, cymbals, glockenspiel, xylophone, triangle, woodblock

Keyboard – Piano, Organ, Harpsichord

Voice – Choir, Upper, Lower, SATB

Technology – synthesised sound, effects

3 – Leitmotif

Musical theme that represents a character or thing in a film. It can alter to reflect the characters emotions, locations or situation.

The instrument, interval, rhythm, pitch and articulation will help portray the character

4 – Key terms

SOUNDTRACK – The music and sound recorded on a motion-picture film.
STORYBOARD – A graphic organiser in the form of illustrations and images displayed in sequence to help the composer plan their soundtrack.
CUESHEET – A detailed listing of **MUSICAL CUES** matching the visual action of a film so that composers can time their music accurately.
CLICK TRACKS – An electronic **METRONOME** which helps film composers accurately time their music to on-screen action through a series of 'clicks' (often heard through headphones)
DIEGETIC FILM MUSIC – Music within the film for both the characters and audience to hear *e.g. a car radio, a band in a nightclub or sound effects.*
NON-DIEGETIC FILM MUSIC – Music which is put "over the top" of the action of a film for the audience's benefit and which the characters within a film can't hear – also known as **UNDERSCORE**

4 – Typical musical depictions

Element	Feature	Link to mood
Melody	• Ascending Melody • Descending Melody • Large Leaps	• Excitement, positive, speed • Dark, rest, thinking • Alien, monster (unless perfect 5th which is heroic)
Tonality	• Major • Minor • Dissonance	• Happiness, Optimism, success • Sadness, Seriousness • Fear, pain, Anguish
Instrumentation	• Strings • Brass • Percussion • Woodwind	• Passion, grief, fear, tension, lightness • War, Royalty, ceremony, heroes • War, movement, fighting • Nature, romance
Texture	• Solo line • Block Chords • Multiple layers	• Isolation, peaceful • Marching, togetherness • Action, speed

Music for film and video games AOS4

4 – Typical musical depictions

Element	Feature	Link to mood
Tempo, Metre, Rhythm	• Strong sense of pulse • Dance rhythms • Rhythmic ostinato • Irregular metre • Rubato/free rhythm	• Purposeful, action • Party, playfulness • Menace, tension • Excitement, unpredictability • Space
Dynamics	• Loud • Soft • Crescendo • Diminuendo • Sforzando	• Surprise, power, size • Gentleness, small things, intimacy • Emotions, intensifying • Endings, weakness • Sudden

6 – Also listen to…

Call of Duty – Michael Giacchino, Inception – Hans Zimmer, Star Wars – John Williams, Emmanuel Fratianni: Avatar

Classical music in films – Rachmaninov piano concerto 2 in Brief Encounter, Barbers Adagio for Strings in Platoon, La Mama Morte in Philadelphia.

THE HECTIC TEACHER
RESOURCE

CONSENT

Personal Development

Define: *Sexual Consent*

The giving of permission by a person to engage in any form of sexual activity including penetrative and oral sex.

Define: *Affirmative Consent*

Consent is only given when a person agrees verbally to engage in sexual activities including penetrative and oral sex.

Define: *Coercion*

The action or practice of persuading someone to do something they wouldn't normally do or something they don't want to do by using force or threats.

Define: *A person who is a minor*

A person who is under the age of 18 and legally considered a child.

Consent is:

1	**Freely given.** It's not okay to pressure, trick, or threaten someone into saying yes.
2	**Reversible.** It's okay to say yes and then change your mind — at any time!
3	**Informed.** You can only consent to something if you have all the facts.
4	**Enthusiastic.** You should do stuff you WANT to do, not things people expect you to do. If someone doesn't seem enthusiastic stop and check in.
5	**Specific.** Saying yes to one thing (like going to the bedroom to make out) doesn't mean you're saying yes to other things (like having sex).

When can consent not be given?

1	**When a person is drunk or high,** to the point that they are unable to speak or look after themselves.
2	**Asleep or Passed Out** – if they are not conscious they are unable to agree to any sexual activity. If someone passes out whilst engaging in sexual activity – STOP!
3	**They are Underage –** Legally a person under the age of 16 cannot give consent to any sexual activity.
4	**Mental disability or learning difficulties** which mean they are unable to fully understand what they are consenting to.

What does the Law say?

Act	Definition	Consequence
Rape	A rape is when a person uses their penis without consent to penetrate the vagina, mouth, or anus of another person.	**Rape** is punished by a maximum of fifteen years' in prison. **Aggravated Rape** is punished by a maximum of twenty years' in prison Both offences would result in placement on the sex offenders register.
Sexual Assault	Sexual assault is when a person is coerced or physically forced to engage against their will, or when a person, touches another person sexually without their consent. Touching can be done with any part of the body or with an object.	Up to 10 years in prison and placement on the sex offenders register
Sex Between Minors	When both parties involved the sexual activity are under 16 but have consented to the activity.	Technically the law is that **if two** 13 – 15 year old's engage in consensual sexual activity and each knows that the other is under 16, they will both be guilty of an offence carrying a maximum penalty of five years' imprisonment, however it is unlikely the CPS will prosecute. If one party is under 13 and the other under 18 it is statutory Rape which is punishable by Life imprisonment, but the average is 6-7 years when prosecuted.

Who Can you turn to for help and Support

Parents or trusted family members	The Police / Community support officers
School Safe Guarding Team or any member of staff.	
NSPCC	Helpline: 0808 800 5000 (24 hours, every day) nspcc.org.uk
Childline	Helpline: 0800 1111 (24 hours, every day) https://www.childline.org.uk
Rape Crisis	Helpline: 0808 802 9999 (12-2:30 and 7-9:30) rapecrisis.org.uk
Survivors UK – Male Rape and Sexual Abuse Support	survivorsuk.org
RASAC (Rape and Sexual Abuse Support Centre)	National Helpline: 0808 802 9999 (12-2.30 & 7-9.30) rasasc.org.uk

THE HECTIC TEACHER
RESOURCE

MENTAL WELLBEING

Personal Development

Define: *Mental Wellbeing*

Mental wellbeing describes your mental state - how you are feeling and how well you can cope with day-to-day life. Our mental wellbeing is dynamic. It can change from moment to moment, day to day, month to month or year to year.

Define: *Emotional Literacy*

The ability to understand and express feelings.
Emotional Literacy involves having self-awareness and recognition of one's own feelings and knowing how to manage them.

Define: *Primary Emotions*

There are 5 primary emotions but over 600 words in the English language for different emotions. The primary emotion groups are:

1. Joy
2. Anger
3. Sadness
4. Disgust
5. Fear

Define: *Mental Illness*

Mental illnesses comprise of a broad range of problems, with different symptoms. However, they are generally characterized by some combination of abnormal thoughts, emotions, behaviour and relationships with others.

They can only be diagnosed by a Doctor or Mental Health Professional

Signs of good mental wellbeing

- Feeling relatively confident in yourself and have positive self-esteem
- Feeling and express a range of emotions
- Building and maintaining good relationships with others
- Feel engaged with the world around you
- Live and work productively
- Cope with the stresses of daily life
- Adapt and manage in times of change and uncertainty

Things that can affect our mental wellbeing

Everyone is different and what affects someone's mental wellbeing won't necessarily affect others in the same way. Everyone will have times when they have low mental wellbeing, where they feel stressed, upset or find it difficult to cope.
Common life events that can affect your mental wellbeing include:

- loss or bereavement
- loneliness
- relationship problems
- issues at work
- worry about money

However there are times when there is no discernable reason for the way a person feels which can be extremely frustrating.

There are some factors that may make people more vulnerable to experiencing a period of poor mental wellbeing. These may have happened in the past or might still be happening now:

- Childhood abuse, trauma, violence or neglect
- Social isolation or discrimination
- Homelessness or poor housing
- A long-term physical health condition
- Social disadvantage, poverty or debt
- Unemployment
- Caring for a family member or friend
- Significant trauma as an adult, such as military combat, being involved in a serious accident or violent crime

Signs of poor mental wellbeing

- Erratic changes in mood and behavior
- Distancing from friends and family.
- Loss of interest in things that they used to be interested in.
- Excessive sleeping or not sleeping.
- Increased alcohol consumption.
- Poor concentration and being easily distracted
- Finding it hard to make decisions
- Feeling overwhelmed by things & tearfulness
- Finding it difficult to control your emotions
- Irritability and short temper or aggression

The Importance of Self Care

At times people may feel guilty for spending time on themselves. But it's essential for mental wellbeing and can help people to be more resilient.

Some self care techniques include

- Mindfulness
- Doing something you enjoy
- Relaxation techniques
- Get outdoors and fresh air
- Exercise

If someone is living with a mental health problem, taking steps to look after their mental health can help you improve your wellbeing.
Strategies can include:

- Talking to someone
- Knowing triggers and warning signs
- Keeping a mood diary
- Building your self esteem.

The Importance of Positive Relationships

Connecting with others can help us to feel a greater sense of belonging and can help to challenge feelings of loneliness.

- **Make time for the people you love.** Keeping regular contact with friends and family, whether it's face-to-face, on the phone or by text, can strengthen your relationships.
- **Join a group.** Think of the things you like to do, such as drawing, gardening or sport and look for local groups. Meeting others with a shared interest can increase your confidence and build your support network.
- **Talk about the way you feel.** Opening up to a trusted friend or family member can help you to feel listened to and supported. Just acknowledging your feelings by saying them out loud can help.
- **Use peer support.** If you're finding things difficult, talking to people who have similar feelings or experiences can help you to feel accepted.

Where to get more help and support

- Parents and trusted family.
- School Staff and Wellbeing Team
- Your Doctor or Practice Nurse
- MIND - https://www.mind.org.uk Help line - **0300 123 3393** open 9am to 7pm, Monday to Friday or Text: 86463
- Young Minds - https://youngminds.org.uk Text: 85258 or Parents Helpline: 0808 802 5544
- Stem4 - https://stem4.org.uk/

THE HECTIC TEACHER
RESOURCE

Body Image and Eating Disorders

Personal Development

Define: *Body Image*

The perception that a person has of their physical self and the thoughts and feelings that result from that perception.

Define: *Eating Disorder*

Any of a range of psychological disorders characterized by abnormal or disturbed eating habits

Define: *Anorexia*

An emotional disorder characterized by an obsessive desire to lose weight by refusing to eat.

Define: *Bulimia*

An emotional disorder characterized by a distorted body image and an obsessive desire to lose weight, in which bouts of extreme overeating are followed by fasting or self-induced vomiting or purging.

Define: *Binge Eating*

The consumption of large quantities of food in a short period of time, typically as part of an eating disorder.

Factors affecting body image

- Puberty and the changing body.
- The Media
- Peers and Family

Ways to promote positive body image

- Accept Your Body.
- Remember Nobody's perfect.
- Don't body-shame yourself.
- Build a better habits.
- Like Your Body - Find things to like about your looks.
- Take Care of Your Body
- Eat healthy foods.
- Get a good nights sleep.
- Be active every day.
- Keep to a healthy weight.

Statistics on Eating Disorders

- Between 1.25 and 3.4 million people in the UK are affected by an eating disorder
- Around 25% of those affected by an eating disorder are male
- Eating disorder are most common in individuals between the ages of 16 and 40 years old

Causes of Eating Disorders

Eating disorders are not simply about food; the behaviours that accompany them may often serve as a coping mechanism or a way to feel in control. Eating disorders have many causes which are individual to the person however some common causes are:

- Distorted Body Image
- Bullying
- Depression and/or Anxiety

Symptoms of Eating Disorders

Symptoms of eating disorders will vary between individuals and type of eating disorder. Not matching the symptoms exactly does not mean that someone does not have an eating disorder, however, some common symptoms include:

- Eating very little food or eating large amounts of food in a short time in an uncontrolled way
- Having very strict habits, rituals, or routines around food
- Spending a lot of time worrying about your body weight and shape
- Changes in mood
- Deliberately making yourself ill after eating
- Avoiding socialising when food may be involved
- Withdrawing from social groups, hobbies you used to enjoy or from family life
- Physical signs such as digestive problems or weight being very high or very low for someone of your age and height.

Treatments for Eating Disorders

Although there is no easy treatment for eating disorders, they are treatable and manageable. The treatment will often be linked to the underlying causes of the eating disorder.
Common treatments include:

- Cognitive behavior therapy
- Talk Therapy
- Group support
- Medication – Anti-Depressants

The best course of treatments will be decided by a Doctor and team of specialists. In sever cases in-patient treatment might be necessary.

Where to get more help and support

- Parents and trusted family
- School Staff, school nurse and Wellbeing Team
- Your GP or Practice Nurse
- Youth Access - www.youthaccess.org.uk
- The Mix - www.themix.org.uk
  Freephone: 0808 808 4994 (13:00-23:00 daily)
- B-eat - www.b-eat.co.uk
  Helpline: 0808 801 0711 (Daily 3pm-10pm)
- Men Get Eating Disorders Too - .mengetedstoo.co.uk
- Anorexia & Bulimia Care - exiabulimiacare.org.uk
  Helpline 03000 11 12 13 (option 1: support line, option 2: family and friends)

GCSE PE

1.1.d. Respiratory System Key Terms		
1	**Aerobic capacity**	The maximum amount of oxygen your body can take in and use, measured with the V02 max test
2	**Aerobic Exercise/ Activity**	When oxygen is used for the duration of exercise to make energy, usually at moderate intensity at a continuous rate.
3	**Alveoli**	Small air sacks in the lungs which are the site of gas exchange.
4	**Anaerobic Exercise/ Activity**	'Without oxygen'. High intensity exercise for short periods of time where oxygen is <u>not</u> predominantly used to produce energy
5	**Breathing rate**	Number of breaths taken per minute
6	**Gas exchange**	The movement of O2 and CO2 between the alveoli and capillaries and the working muscles and capillaries.
7	**Minute ventilation**	(minute volume) Then volume of gas inhaled OR exhaled from the lungs in 1 minute
8	**Mitochondria**	the place in each muscle cell where energy is produced
9	**Respiratory Muscles**	Muscles which help air move in and out of the lungs (diaphragm and intercostals)
10	**Respiration system**	gets oxygen into the body and removes carbon dioxide. It's made up of the mouth/nose – bronchi- bronchioles and alveoli
11	**Tidal volume**	The amount of air breathed in or out in one breath. Measured in ml
12	**Trachea (windpipe)**	The pipe which connects the nose/mouth to the bronchi

A Great Photographic Composition

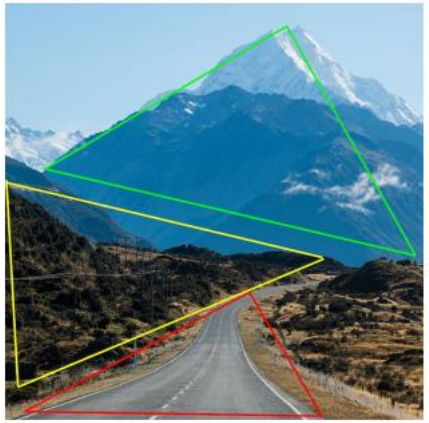
RULE OF THIRDS

FIBONACCI SPIRAL

FRAMING DEPTH

SYMMETRY

GOLDEN TRIANGLES



VANISHING POINT

LANDSCAPE DEPTH

PHI GRID

LEADING LINES

LINES AND PATTERNS

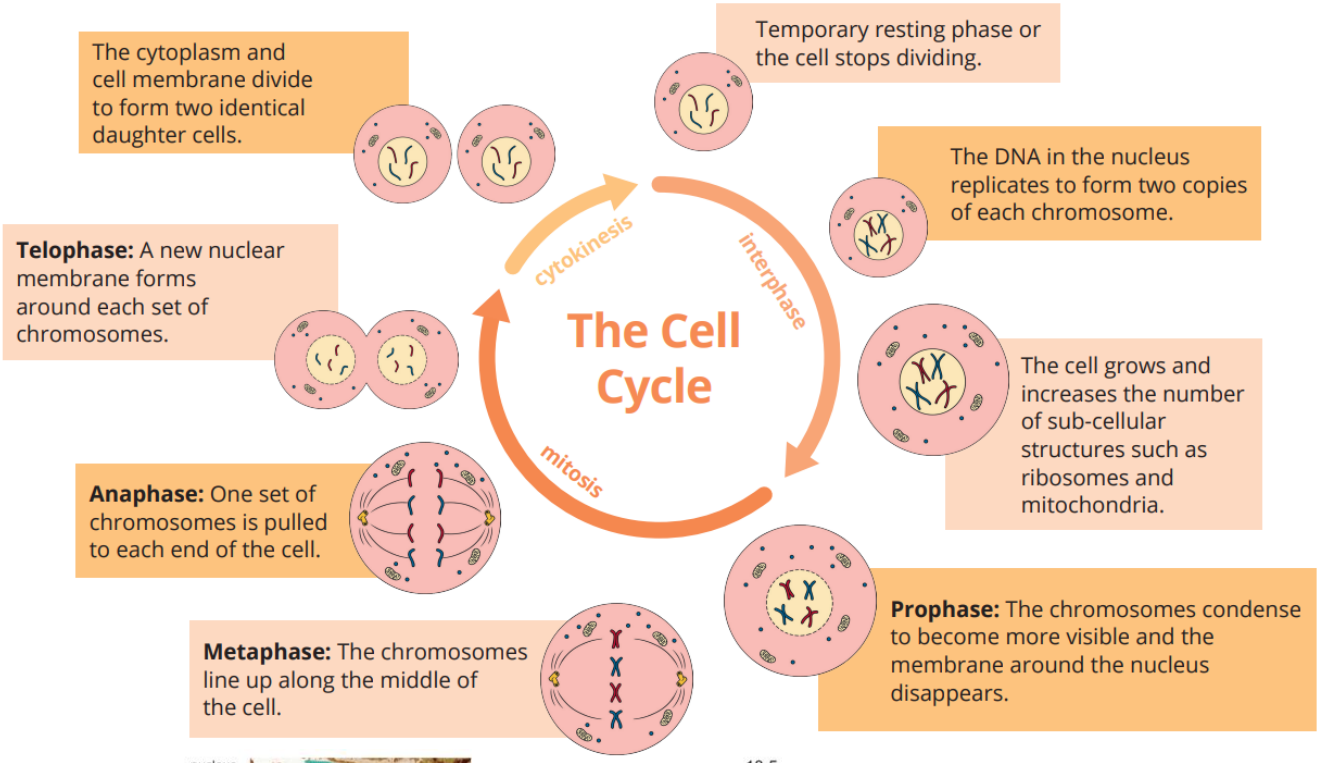
Photography

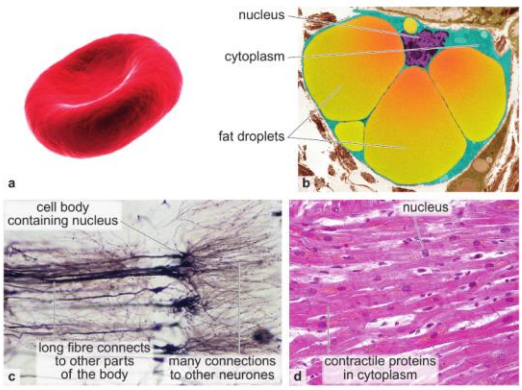
Biology – B2 Cells & Control

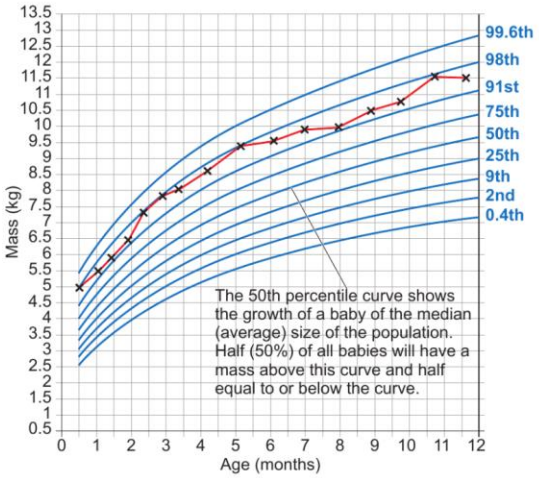
CB2a Mitosis

Word	Pronunciation	Meaning
anaphase	***an**-na-fays*	The stage of mitosis in which the separated chromosomes move away from each other.
asexual reproduction		Producing new organisms from one parent only. These organisms are genetically identical to the parent.
cancer cell		Cell that divides uncontrollably.
cell cycle		A sequence of growth and division that happens in cells. It includes interphase and mitosis, and leads to the production of two daughter cells that are identical to the parent cell.
clone		Offspring from asexual reproduction. All the cells in a clone are genetically identical to each other and to the parent's cells.
cytokinesis	*site-O-kY-**nee**-sis*	When the cytoplasm of the cell is separated as the cell membrane is pinched to divide the cell into two daughter cells.
daughter cell		New cell produced by cell division.
diploid	***dip**-loyd*	A cell with two sets of chromosomes.
DNA replication	*rep-li-**kay**-shun*	The copying of the DNA within a cell.
haploid	***hap**-loyd*	A cell with one set of chromosomes.
interphase	***in**-ter-fays*	The stage when the cell prepares itself for the process of cell division, and DNA replication takes place. The cell also makes more of its sub-cellular structures.
metaphase	***met**-a-fays*	The stage of mitosis when the chromosomes line up across the middle of the cell.
mitosis	*my-**toe**-sis*	The process of cells dividing to produce two daughter cells that are genetically identical to the parent.
multicellular	*mul-tee-**sell**-U-lar*	An organism that is made of many cells.
prophase	***prO**-fays*	The stage of mitosis in which the nucleus starts to break down and spindle fibres appear.
spindle fibre	***spin**-del **fY**-ber*	Filament formed in a cell during mitosis, which helps to separate chromosomes.
telophase	***tee**-lO-fays*	The stage of mitosis in which the chromosomes arrive at opposite ends of the cell and the nucleus membrane reforms.
tumour	***tyoo**-mer*	Lump formed of cancer cells.

Biology – B2 Cells & Control







Cell differentiation

Although all animals develop from a single cell, not all the cells in their bodies are the same. Cells produced by mitosis are the same as the cell from which they were formed. However, the new cells may then change in different ways, so they become specialised for different functions. The process that changes less specialised cells into more specialised ones is called **differentiation**.

CB2b Growth in animals

Word	Pronunciation	Meaning
differentiation	*diff-er-en-shi-**ay**-shun*	When a group of similar things, such as cells, become different in form from each other.
growth		A permanent increase in the number or size of cells in an organism.
percentile	*pur-**sent**-iyl*	A $\frac{1}{100}$th division of a group. For example, 10 per cent of the data items are below the 10th percentile and 50 per cent are below the 50th percentile.

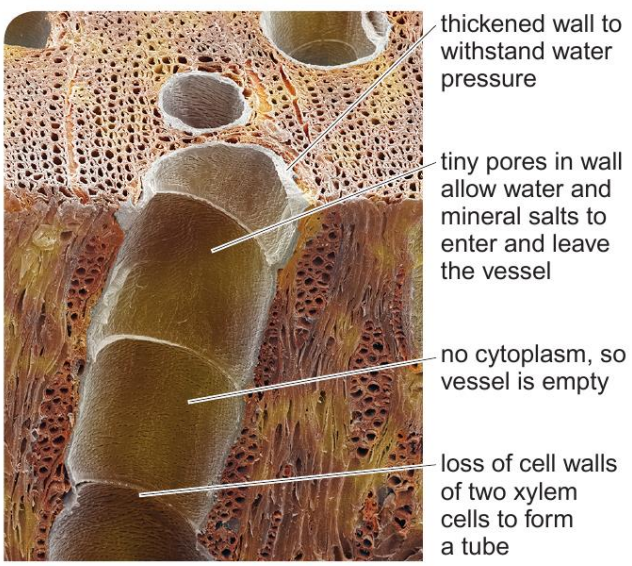
Biology – B2 Cells & Control

CB2c Growth in plants

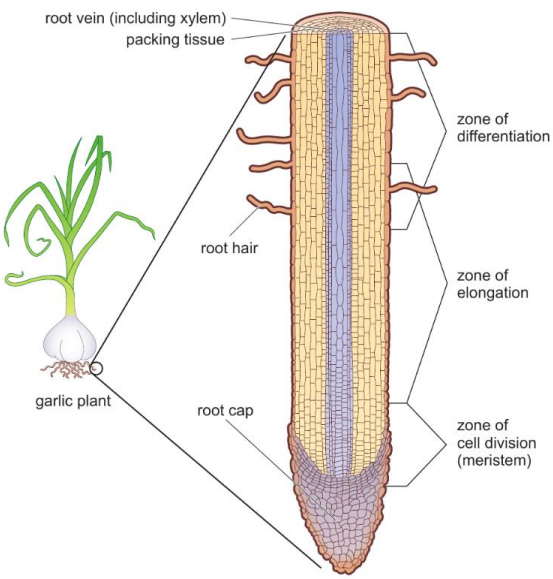
Word	Pronunciation	Meaning
differentiate		To change into different types, for example when meristem cells differentiate into specialised cells such as xylem or root hair cells.
elongation		When something gets longer (such as a cell in a plant root or shoot before it differentiates into a specialised cell).
meristem		A small area of undifferentiated cells in a plant, such as near the shoot tips and root tips, where cells are dividing rapidly by mitosis.
root hair cell		Cell found on the surface of plant roots that has a large surface area to absorb water and dissolved mineral salts quickly from the soil.
xylem cell	*zy-lem sell*	Cell that joins with other xylem cells to form long, thick-walled vessels after they die. The vessels carry water and dissolved mineral salts through the plant.

A group of cells near the end of each shoot and root allows plants to continue growing throughout their lives. These groups of cells are called **meristems**. The cells in meristems divide rapidly by mitosis. Many of the cells produced then increase in length (**elongation**), and **differentiate** into specialised cells that have different functions.

There are many kinds of specialised plant cell, such as **root hair cells** and **xylem cells**. Each kind of cell has certain features so that it is adapted to its function. The many different kinds of specialised cell in a plant allow the plant to carry out many different processes effectively.



C A xylem vessel is a long tube formed from many dead xylem cells.

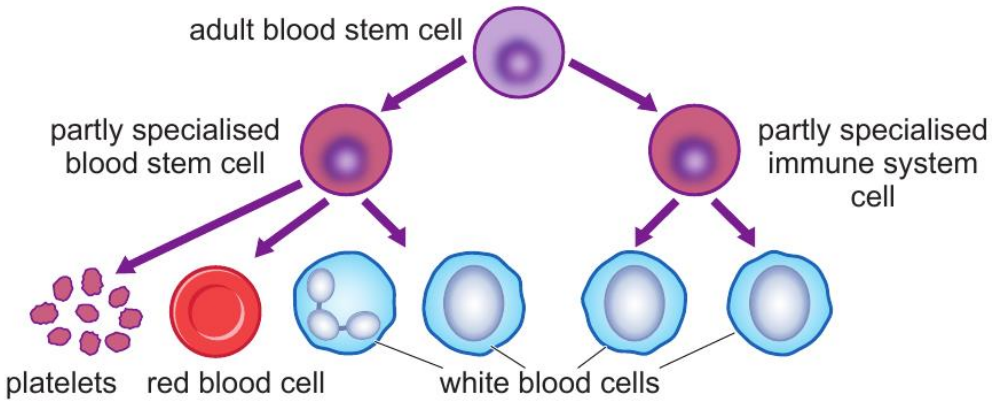


B The zones of an onion root tip where cells divide, elongate and differentiate into specialised cells. (Note: colour has been added to help identify different tissues.)

Biology – B2 Cells & Control

CB2d Stem cells

Word	Pronunciation	Meaning
adult stem cell		Stem cell found in specialised tissue that can produce more of the specialised cells in that tissue for growth and repair.
cancer	*can-ser*	Disease caused by the uncontrolled division of stem cells in a part of the body.
embryonic stem cell		Stem cell from an early embryo that can produce specialised cells of many different types.
meristem cell		Stem cell found in a plant meristem.
rejection		When the immune system attacks and kills cells and tissue that come from another person, such as blood (after transfusion) or stem cells.
stem cell		Unspecialised cell that continues to divide by mitosis to produce more stem cells and other cells that differentiate into specialised cells.



C Blood stem cells are found in marrow in the middle of long bones (such as the femur). They continue to divide throughout life to produce new blood cells.

Stem Cells

Embryonic stem cells are **undifferentiated** cells, they have the potential to turn into any kind of cell.

Adult stem cells are found in the bone marrow, they can only turn into some types of cells e.g. blood cells.

Uses of stem cells:

- Replacing faulty blood cells;
- making insulin producing cells;
- making nerve cells.

For Stem Cell Research	Against Stem Cell Research
Curing patients with stem cells - more important than the rights of embryos.	Embryos are human life.
They are just using unwanted embryos from fertility clinics, which would normally be destroyed.	Scientists should find other sources of stem cells.

Stem Cells in Plants

In plants, stem cells are found in the **meristem**. These stem cells are able to produce clones of the plant. They can be used to grow crops with specific features for a farmer, e.g. **disease resistant.**

Biology – B2 Cells & Control

CB2e The nervous system

Word	Pronunciation	Meaning
axon		The long extension of a neurone that carries an impulse away from the dendron or dendrites towards other neurones.
axon terminal		Small 'button' at the end of the branches that leave an axon.
central nervous system		The main part of the nervous system – the brain and spinal cord. Abbreviated to CNS.
CNS		Stands for central nervous system.
dendrite		A fine extension from a neurone, which carries impulses towards the cell body.
dendron		Large, long extension of a sensory neurone that carries impulses from dendrites towards the axon.
impulse		Electrical signal transmitted along a neurone.
myelin sheath	*__my__-ell-in __sheeth__*	Fatty covering around the axons of many neurones. It speeds up the transmission of impulses along their length and helps to insulate them from one another.
nerve cell		Another term for neurone.
nervous system		An organ system that contains the brain, spinal cord and nerves, and carries impulses around the body. This system helps us to sense and respond quickly to changes inside and outside our bodies.
neurone	*__nyor__-own*	A cell that transmits electrical impulses in the nervous system.
neurotransmission	*new-rO-trans-__mish__-un*	Impulses passing from neurone to neurone.
receptor cell	*re-__sep__-tor sell*	Cell that receives a stimulus and converts it into an electrical impulse to be sent to the brain and/or spinal cord.
response		Action that occurs due to a stimulus.
sense organ		Organ that contains receptor cells.
sensory neurone	*__sens__-or-ee __nyor__-own*	Neurone that carries impulses from receptor cells, towards the central nervous system.
spinal cord	*__spy__-nal __cord__*	Large bundle of nerves, leading from the brain and down the back.
stimulus		Change in a factor (inside or outside the body) that is detected by receptors. Plural: stimuli.

CB2f Neurotransmission speeds

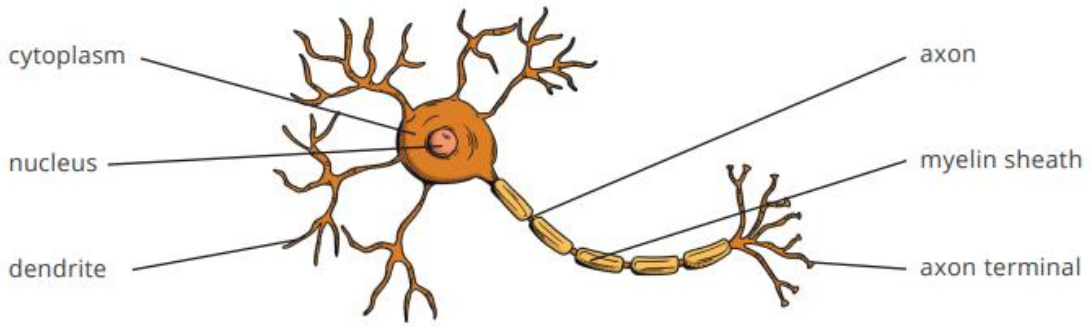
Word	Pronunciation	Meaning
effector		Muscle or gland in the body that performs an action when an impulse from the nervous system is received.
motor neurone	*__mO__-ter __nyor__-own*	Neurone that carries impulses to effectors.
neurotransmitter	*new-rO-trans-__mit__-ter*	Substance that diffuses across the gap between two neurones at a synapse, and triggers an impulse to be generated in the neurone on the other side of the synapse.

Biology – B2 Cells & Control

reflex	***ree**-flex*	Response to a stimulus that does not require processing by the brain. The response is automatic. Also called a reflex action.
reflex arc	***ree**-flex **ark***	Neurone pathway consisting of a sensory neurone passing impulses to a motor neurone (often via a relay neurone), which allows reflexes to occur.
relay neurone	***ree**-lay **nyor**-own*	A short type of neurone, found in the spinal cord and brain. Relay neurones link with sensory, motor and other relay neurones.
synapse	***sY**-naps*	Point at which two neurones meet. There is a tiny gap between neurones at a synapse, which cannot transmit an electrical impulse.

The Human Nervous System

In a nervous response, the key components of the control system are linked by nerve cells called **neurones**. Neurones are an example of **specialised cells**. They transmit electrical impulses through the nervous system to cause responses to occur.



Neurone Feature	Specialised Function
axon	A long, stretched-out fibre of cytoplasm which the electrical nerve impulse travels along.
axon terminal	Where chemicals called **neurotransmitters** are released. These pass across **synapses**, allowing the nerve impulse to pass between different neurones.
dendrite	Branches which receive neurotransmitter chemicals from other neurones. The dendrites convert these chemicals into electrical signals which travel down the body of the neurone.
myelin sheath	Layer of fatty tissue which surrounds the axon of some (but not all) neurones. It insulates the axon allowing the nerve impulse to be transmitted more efficiently.

There are three types of neurone:

1. **Sensory** neurones link the **receptor** to the **coordination centre**.
2. **Motor** neurones link the **coordination centre** to the **effector**.
3. **Relay** neurones are found within the coordination centre and connect the sensory and motor neurones.

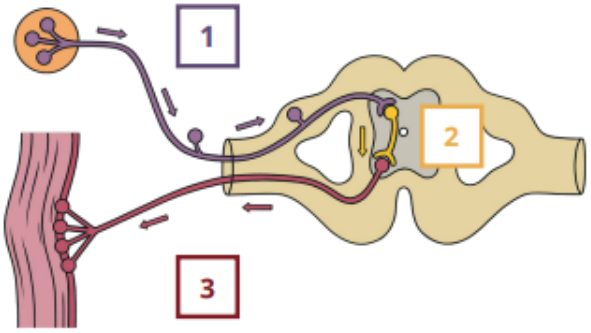
Nerve impulses travel along the following pathway:

[stimulus] → receptor → sensory neurone → coordination centre → motor neurone → effector → [response]

Biology – B2 Cells & Control

Reflex Arc

A reflex action occurs to prevent you from coming to harm. They do not require conscious thought: they are **rapid** and **automatic**.



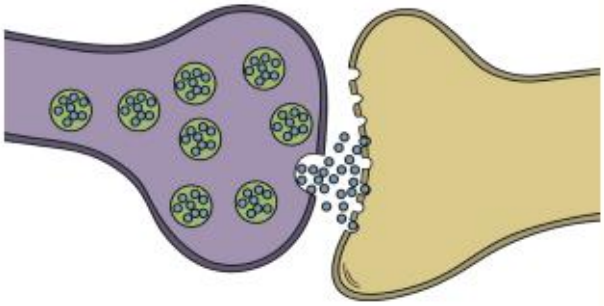
During a reflex action the nerve impulse travels along the following pathway:

1. The **receptor** detects a **stimulus** internally or from the environment. This causes a nerve impulse to travel along the **sensory neurone** to the closest part of the **central nervous system** (CNS). This is not always in the brain.
2. The CNS is the **coordination centre** for a reflex action and coordinates the response. This does not involve the conscious part of the brain to enable the response to be rapid. The **relay neurone** connects the **sensory neurone** to the **motor neurone**. The gaps between the neurones are called **synapses**.
3. The electrical impulse travels along the **motor neurone** to the **effector**. This causes a response to occur which prevents or reduces harm.

[stimulus] → receptor → sensory neurone → relay neurone → motor neurone → effector → [response]

Synapses

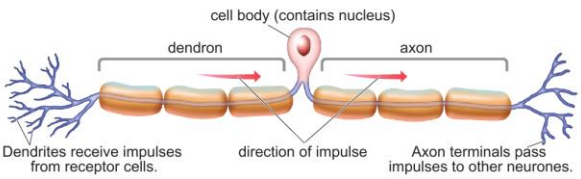
The small gaps between neurones are called **synapses**. The electrical nerve impulse cannot cross these gaps.



When the nerve impulse reaches the end of one neurone it causes chemicals called **neurotransmitters** to be released into the gap.

These **diffuse** across the gap and bind to receptor sites on the second neurone. This causes the second neurone to transmit an electrical nerve impulse.

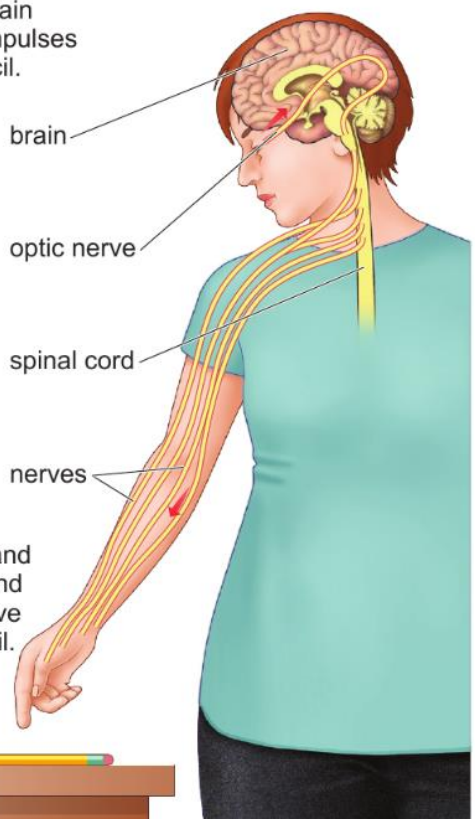
Synapses account for a slight reduction in the speed of the transmission of nerve impulses.



D a sensory neurone

1 Impulses from receptor cells in the eye are transmitted by sensory neurones in the optic nerve to the brain. The brain processes these impulses and 'sees' the pencil.

2 The brain can send more impulses to tell parts of the body to do something (the response).



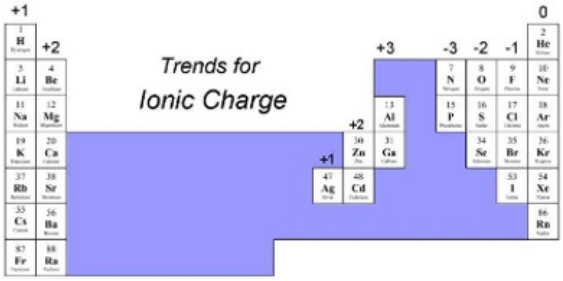
3 Muscles in the hand receive impulses and make the hand move to pick up the pencil.

Chemistry – C5-C7 Bonding

Ions

Atoms are more stable with a full outer shell of electrons and they will lose or gain electrons to achieve this

Atoms that loose electrons (metals) gain a positive charge. Atoms that gain elelctrons (non-metals) gain a negative charge. An ion is an atom with a charge

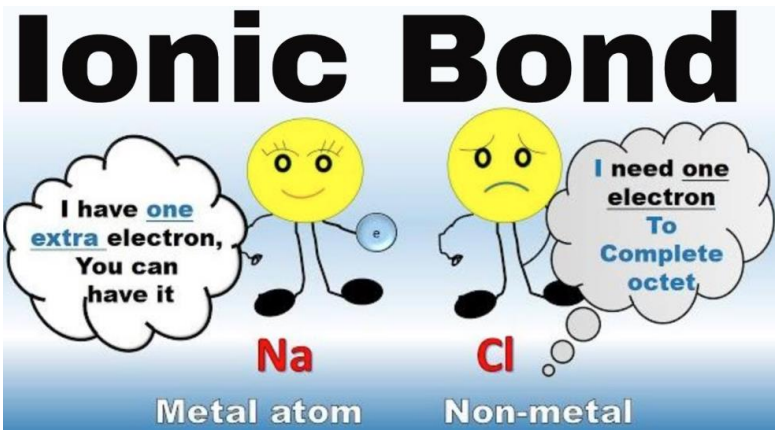


You can work out charges on ions from the position of atoms in the Periodic Table.

You need to be able to calculate the number of protons, neutrons and electrons in different ions and draw electron structure of ions showing their charge outside of brackets.

SC5a Ionic bonds

Word	Pronunciation	Meaning
anion	***an**-i-on*	Negatively charged ion.
bond		A force that holds some atoms tightly together.
cation	***cat**-i-on*	Positively charged ion.
electrostatic force		Force of attraction between oppositely charged particles, and force of repulsion between particles with the same charge.
ion		Atom or group of atoms with an electrical charge. Atoms become positively charged ions if they lose electrons and negatively charged if they gain electrons.
ionic bond		Strong electrostatic force of attraction between oppositely charged ions.

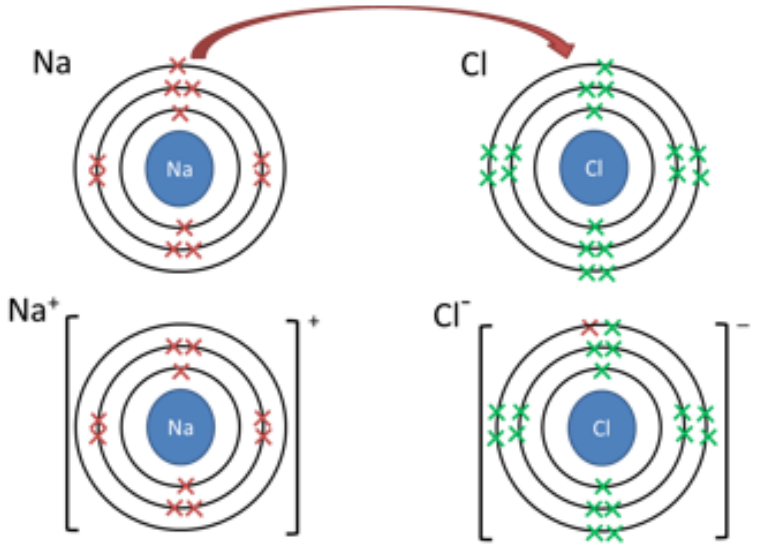


Chemistry – C5-C7 Bonding

Ionic bonds

Ionic bonds form between metals and non-metals. Metals have extra electrons and they **lose** them to form positive ions. Non-metals have electron gaps and they **gain** electrons to form negative ions.

In an ionic bond the metal 'gives' its electrons to the non-metals to form positive and negative ions



An ionic bond is the electrostatic attraction between a positive and negative ion.

SC5b Ionic lattices

Word	Pronunciation	Meaning
crystals	***kris**-tals*	Solids that are made up of a regular repeated pattern of atoms, molecules or ions, which form fixed shapes with flat surfaces and sharp edges.
ionic compound		Substance containing ions, formed by the loss and gain of electrons between two or more elements.
lattice structure		Regular grid-like repeating arrangement of particles such as atoms, molecules or ions.
polyatomic ions		A group of atoms that have a positive or negative charge due to the loss or gain of electrons.

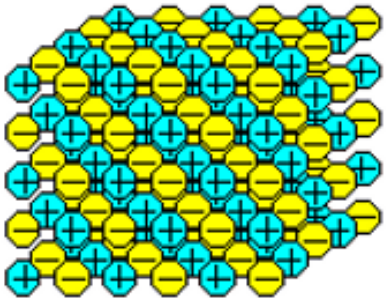
SC5c Properties of ionic compounds

Word	Pronunciation	Meaning
anode	*an-**ode***	The positive electrode.
aqueous solution	***a**-kwi-ous sol-**ution***	A solution in which water is the solvent.
cathode	*cath-**ode***	The negative electrode.

Chemistry – C5-C7 Bonding

Ionic compounds

Ionic compounds consist of regular arrangements of positive and negative ions called an ionic lattice



Ionic lattice structure

Positive and negative ions combine in fixed ratios to give neutral compounds.

You can work out the charge on most positive and negative ions from their position in the periodic table and then use the cross over rule to give the formula of the compound

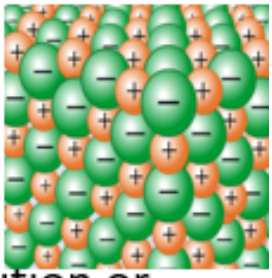
Mg^{2+} Br^-

$MgBr_2$

Sulphate	SO_4^{2-}
Carbonate	CO_3^{2-}
Nitrate	NO_3^-
Hydroxide	OH^-

The formulas of some polyatomic anions you just have to learn!

Properties of ionic compounds



Ionic compounds-

1. Form crystals with high melting points
2. Dissolve in water to give solutions
3. Conduct electricity when dissolved in solution or molten but not when solid

You need to be able to use the structure of an ionic compound (Lesson 3) to **explain** why ionic compounds have these properties. Use the following **keywords / ideas**

- Giving / receiving electrons
- Ions /positive ion /negative ion
- Giant ionic structure / ionic lattice
- Strong electrostatic force (+ve attracts –ve)
- Fixed ions in solid/ free ions in solution / when molten
- Dissolves in water / water solvates (surrounds) ions

Chemistry – C5-C7 Bonding

SC6a Covalent bonds

Word	Pronunciation	Meaning
covalent bond	*co-**vay**-lent*	The bond formed when a pair of electrons is shared between two atoms.
dot and cross diagram		Diagram, to explain what happens when a bond is formed, which uses dots and crosses to represent the electrons of different atoms.
double bond		The bond formed when two pairs of electrons are shared between the same two atoms.
electrostatic forces		Forces of attraction between oppositely charged particles, and forces of repulsion between particles with the same charge.
molecular		Referring to substances that are made up of molecules.
molecular formula		This shows the actual number of atoms of each element that combine to make a molecule of a substance.
molecule		A group of two or more atoms joined together by covalent bonds.
outer electron shell		The electron shell (or energy level that contains electrons) which is furthest away from the nucleus.
valency	***vay**-len-see*	The number of covalent bonds formed by an atom (or the charge number of the ion formed by an atom).

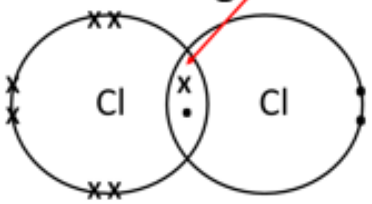
Covalent bonds

Covalent bonds form between two non-metals. Non-metals have spaces for electrons, and they can **share** electrons, so it is 'as if' both atoms have a full outer shell.

You need to be able to draw covalent bonds between two atoms using 'dot and cross' diagrams and stick diagrams

Cl — Cl

For dot cross diagrams you only need to draw the outer shell electrons



A covalent bond is a pair of electrons shared between the two atoms. A double covalent bond (double bond) consists of 4 shared electrons

O=O

Covalent bonds are strong bonds

Chemistry – C5-C7 Bonding

SC7a Molecular compounds

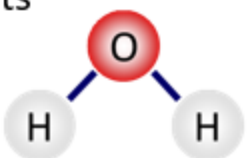
Word	Pronunciation	Meaning
bond		A force that holds some atoms tightly together.
compound		Contains atoms of more than one element chemically joined together with bonds.
covalent bond	*co-**vay**-lent*	The bond formed when a pair of electrons is shared between two atoms.
covalent, simple molecular structure		Two or more atoms covalently bonded together to form a distinct unit.
element		A simple substance, made up of only one type of atom.
intermolecular force		A weak force of attraction between molecules.
monomer		A small, simple molecule that can be joined in a chain to form a polymer.
poly(ethene)		A common polymer made of ethane monomers.
polymer		A long-chain molecule made by joining many smaller molecules (monomers) together.

Simple molecular compounds

Covalent bonds are found in two types of structures – Simple molecules and giant covalent structures. Most common gases are simple molecules. A **molecule** is a small group of atoms that go around together. Simple molecular compounds have strong covalent bonds holding the atoms together in a molecule. Between the molecules there are weak intermolecular forces which are much more easily broken.

Properties

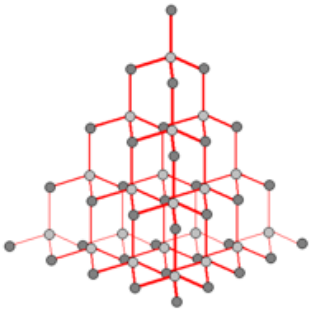
- Gases and liquids with low melting and boiling points
- Do not conduct electricity



Keywords to describe simple molecules

Shared electrons, strong covalent bonds between atoms, simple molecules, weak **intermolecular forces** between molecules

Chemistry – C5-C7 Bonding



Giant covalent structures
Hard, strong, high melting point

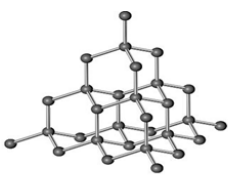
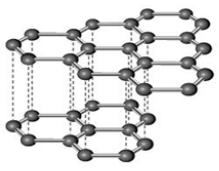
Giant covalent structures

In giant covalent structures every atom is joined to other atoms with a strong covalent bond.

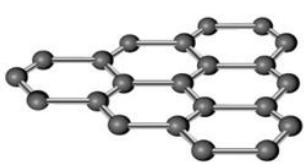
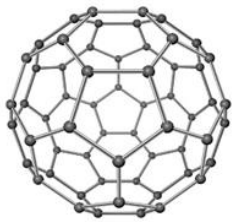
	PROPERTY	EXPLANATION
Melting & boiling points	VERY HIGH	Need to break all strong covalent bonds
Electrical conductivity	DOES NOT CONDUCT	No mobile charged particles
Strength	STRONG	Rigid arrangement of atoms held by covalent bonds
Solubility in water	INSOLUBLE	

SC7b Allotropes of carbon

Word	Pronunciation	Meaning
allotropes		Different structural forms of the same element.
covalent, giant molecular structure		Three dimensional lattice of carbon atoms linked by covalent bonds.
delocalised electron		An electron that is free to move and can carry an electrical current.
fullerene		A simple molecule in which each carbon atom is covalently bonded to three other carbon atoms, forming spheres or tube shapes.
graphene		An allotrope of carbon consisting of a sheet that is one atom thick, with atoms arranged in a honeycomb shape.
lubricant		A substance placed between two moving surfaces to reduce the friction between them.

Material	Structure	Bonding	Properties	Uses
Diamond	 Giant covalent	Every carbon atom bonded to 4 other carbon atoms with strong covalent bonds. Carbon atoms form tetrahedral shapes	Hard, strong High melting point Does not conduct electricity Does not dissolve	Cutting equipment
Graphite	 Giant covalent	Every carbon bonded to 3 other carbon atoms to form hexagons which form layers. Strong covalent bonds in the layers Weak forces of attraction between layers	Forms layers which slide over each other High melting point Conducts electricity along layers Does not dissolve	Pencil lead Electrodes Lubricant

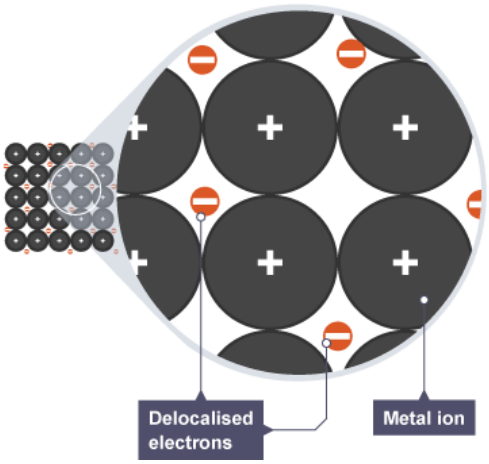
Chemistry – C5-C7 Bonding

Graphene	 graphene Giant covalent	Every carbon bonded to 3 other carbon atoms to form hexagons in a single layer. A single layer of graphite	Strong but flexible High melting point Conducts electricity along sheet
C_{60}	 Simple molecular	Large molecule with 60 atoms. In the molecule every carbon bonded to 3 other carbons with strong covalent bonds. Weak intermolecular forces between molecules	Molecules are strong Low melting points

SC7c Properties of metals

Word	Pronunciation	Meaning
electrical conductivity		Allowing electricity to pass through.
lattice	***latt**-iss*	An arrangement of many atoms or other particles that are bonded together in a fixed regular (grid-like) pattern.
malleable	***mal**-ee-uh-buhl*	A substance that can be hammered or rolled into shape without shattering.
metallic bonding		The type of bonding found in metals. We can think of it as positively charged ions in a 'sea' of negatively charged electrons.
metals		Any element that is shiny when polished, conducts heat and electricity well, is malleable and flexible and often has a high melting point.
non-metals		Any element that is not shiny, and does not conduct heat and electricity well.

	PROPERTY	EXPLANATION
Melting & boiling points	**HIGH**	**Strong attraction between nucleus of atoms and delocalised e-' s**
Electrical conductivity	**CONDUCTS**	**Outer shell electrons free to move**
Strength	**STRONG**	**Layers can slide while maintaining metallic bonding**
Solubility in water	**INSOLUBLE**	



CC8: Acids and alkalis knowledge organiser

Chemistry – C8 Acids

Lesson 1 Acids alkalis and indicators

Acids contain Hydrogen ions H^+

The common acids that you will come across at GCSE are

Hydrochloric acid	HCl
Sulphuric acid	H_2SO_4
Nitric acid	HNO_3

These are all acids as they produce hydrogen ions H+ in solution

How acidic a solution is depends on the concentration of hydrogen ions and this can be measured using the pH scale either using an indicator or a pH meter

An indicator is a substance which changes colour in acid/alkali

pH	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Colour of Universal Indicator	Highly acidic			weakly acidic			neutral			weakly alkaline			Highly alkaline	
	Red			orange		yellow	green			purple			blue	

Universal indicator is not good for doing titrations. For this you need either Phenol phthalein or methy orange

Indicator	Colour in acid	Colour in alkali
Phenol phthalein	colourless	pink
Methyl orange	red	yellow

Lesson 2 Strong and weak acids (HIGHER)

Acids can be classified as concentrated or dilute or weak and strong

A strong acid	A weak acid
All of the acid splits up into ions (dissociates) when the acid dissolves in water High concentration of H+ Low pH	Only some of the acid splits up into ions when it is dissolve in water Lower concentration of H+ Higher pH (still acidic)
HCl Hydrochloric acid	CH_3COOH Ethanoic acid

The concentration of hydrogen ions decreases by a factor of 10 every time the pH is increased by 1 **(HIGHER)**

Lesson 3 Bases

A base is a metal oxide or hydroxide e.g. CuO or $Ca(OH)_2$

Bases can neutralise acids to give salt and water only

General equation: **base + acid → salt + water BASHO**

Hydrochloric acid HCl	Makes Chlorides
Sulphuric acid	Makes Sulphates
Nitric acid	Makes Nitrates

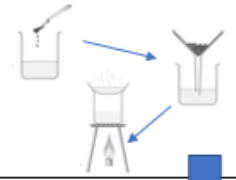
The salt that is made depends on the acid used and the base

Word equation: copper oxide + sulphuric acid → copper sulphate + water

Symbol equation: $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$

A salt can be made by the reaction of an acid and a base. For example you can make copper sulphate by reacting copper oxide with sulphuric acid

- Add excess base to acid to neutralise all the acid
- Filter off the excess base
- Evaporate the water from the solution to get crystals of the salt



Lesson 4 Alkalis and neutralisation

An alkali is a base that is soluble in water e.g. NaOH

Alkalis produce hydroxide ions (OH-) when dissolved in water

Since alklis are bases they react with acid to give salt and water

acid + alkali → salt + water BASHO

Hydrochloric acid + sodium hydroxide → sodium chloride + water

$HCl + NaOH \rightarrow NaCl + H_2O$

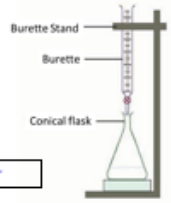
A reaction in which the hydrogen ions from the acid are removed is a neutralisation reaction. In this case the hydrogen ions from the acid (H+) react with hydroxide ions from alkali (OH-) to make water

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

Lesson 5 Titration

To make a salt from an acid and an alkali you need to use a titration

- Using a **pipette** transfer a known volume of alkali into a **conical flask**
- Add a few drops of **indicator**
- Add acid from a **burette** slowly until you are near to the indicator changing colour (end point) Not universal indicator
- Add the acid drop-wise until the indicator changes colour. Record the volume of acid.
- Repeat the experiment with no indicator.
- Evaporate the water from the solution to leave the salt



Lesson 6 Acid and metal

Acids can be neutralised with metals. If the metal is reactive enough hydrogen gas is produced as well as a solution of the salt.

metal + acid → salt + hydrogen MASH

magnesium + hydrochloric acid → magnesium chloride + hydrogen

$Mg + 2HCl \rightarrow MgCl_2 + H_2$

The test for hydrogen gas it that it makes a squeeky pop when a lit split is added

Lesson 7 Acid and metal carbonate

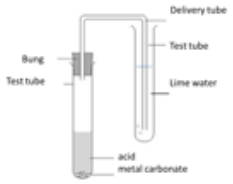
Acids can be neutralised with metal carbonates. In this case carbon dioxide gas is produced as well as a solution of the salt.

metal carbonate + acid → salt + water + carbon dioxide CASHOCO

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

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

The test for carbon dioxide gas is that lime water turns milky when carbon dioxide is bubbled through it



Lesson 8 Precipitation reactions

Salts that are insoluble can be made using precipitation reactions. In a precipitation reaction the metal and non-metal part of two compound swap round to give two new compounds. If one of these is insoluble it forms a precipitate.

Lead nitrate + potassium iodide → lead iodide + potassium nitrate

$Pb(NO_3)_2 (aq) + 2KI (aq) \rightarrow PbI_2 (S) + 2KNO_3 (aq)$

The precipitate must be lead iodide as potassium nitrate is soluble!

To pepare an insoluble salt from a precipitation reaction simply mix the two solutions together, filter off the precipitate (salt) and dry

Solubility Rules

To know if a salt is soluble in water or not you need to learn your solubility rules

All group one metals salts are soluble

All nitrates are soluble etc.

Lesson 9 Summary – Acids and making salts

To make soluble salts neutralise acids use one of the 3 methods. Use a different method if starting with an insoluble base or an alkali

base + acid → salt + water BASHO

metal + acid → salt + hydrogen MASH

metal carbonate + acid → salt + water + carbon dioxide CASHOCO

To make an insoluble salt use a precipitation reaction and use solubility rules to determine which.

You need to able to

- Know the names and formulas of common acids
- Know the colour changes for indicators in acid and alkali (not just UI)
- Write word and symbol equations for the neutralisation reactions
- Describe methods for making soluble and insoluble salts
- Explain what happens in neutralisation reaction
- Write ionic equations for neutralisation reactions **(HIGHER)**

Chemistry – C8 Acids

SC8a Acids, alkalis and indicators

Word	Pronunciation	Meaning
acid	***ass**-id*	A solution with a pH of less than 7 and that contains an excess of hydrogen (H^+) ions. Acids turn litmus red.
acidic		Containing or having the properties of an acid. (adjective)
acidity		The amount of acid in a solution.
alkali	***alk**-al-lie*	A solution with a pH of more than 7 and that contains an excess of hydroxide (OH^-) ions. Alkalis turn litmus blue.
alkaline		Having a pH of more than 7.
alkalinity		The amount of alkali in a solution.
aqueous solution	***a**-kwee-us*	A solution with water as the solvent.
concentration	*con-sen-**tray**-shun*	A measure of how much solute is dissolved in a solvent such as water. (Units g dm^{-3} or mol dm^{-3})
indicator		A substance that changes colour depending on the pH of a solution.
neutral	***new**-tral*	A substance that is neither an acid nor an alkali. Neutral solutions have a pH of 7 and the same concentrations of hydrogen (H^+) and (OH^-) ions.
pH scale		A numerical scale up to 14 that measures the acidity or alkalinity of a solution based on the concentrations of hydrogen (H^+) and (OH^-) ions.
universal indicator		An indicator, containing a mixture of different pH indicators, designed to produce a range of colours depending on the pH.

SC8b Looking at acids

Word	Pronunciation	Meaning
concentrated	***con**-sen-tray-ted*	Containing a large amount of solute dissolved in a small volume of solvent.
dilute	*dYe-**loot***	Containing a small amount of solute dissolved in a large volume of solvent.
dissociate	*dih-**sOh**-shee-ayt* *OR dih-**sOh**-see-ayt*	To split up or separate into different parts. For example, acid molecules dissociate into H^+ ions and negative ions when they dissolve in water.
pH meter		Electronic device used to measure the pH of a solution.
strong acid		An acidic solute that dissociates completely into ions when it dissolves.
weak acid		An acidic solute that does not dissociate completely into ions when it dissolves.

Chemistry – C8 Acids

SC8c Bases and salts

Word	Pronunciation	Meaning
base		Any substance, soluble or insoluble, that neutralises an acid, forming a salt and water only.
crystallisation	*cris-tal-l-**zay**-shun*	The process of forming crystals.
filter (verb)		To remove or separate a solid from a liquid by passing the mixture through a porous material.
neutralise (verb)	***new**-trall-eyes*	To make a solution neither acidic nor alkaline. During neutralisation a base reacts with an acid, forming a salt and water.
salt		An ionic compound produced by a neutralisation reaction.
state symbols		Standard set of symbols written after chemical formulae to indicate the state of a substance. These are: solid (s), liquid (l), gas (g) and dissolved in water (aq)

SC8d Alkalis and balancing equations

Word	Pronunciation	Meaning
alkali	***alk**-al-lie*	A solution with a pH of more than 7 and that contains an excess of hydroxide (OH^-) ions. Alkalis turn litmus blue. A soluble base.
balanced equation	*eck-**way**-shun*	A way of writing out what happens in a chemical reaction using symbols to represent the substances involved.

SC8e Alkalis and neutralisation

Word	Pronunciation	Meaning
burette	*b'your-**ett***	Apparatus used to accurately measure the volume of solution that has been added during a titration.
end-point		In a titration, when just enough solution has been added from the burette to react with all the solution in the flask.
pipette	*pip-**ett***	Apparatus used to accurately measure a set volume of a solution, which can be used in a titration.
titration	*tie-**tray**-shun*	Method used to mix acids and alkalis in the correct proportions to produce a solution containing only salt and water. It can be used to find the concentration of an acid or an alkali.

Chemistry – C8 Acids

SC8f Reactions of acids with metals and carbonates

Word	Pronunciation	Meaning
effervescence	*eff-er-**ves**-ens*	Fizzing or a stream of bubbles produced during a reaction.
half equation		A balanced equation, including electrons, that shows what happens to one substance during a redox reaction.
ionic equation		A balanced equation that only shows the ions that react together. The spectator ions are not included in the equation.
oxidation	*ox-id-**ay**-shun*	A reaction in which a substance gains oxygen or in which an atom or ion loses electrons.
reactivity series		A list of metals in order of reactivity with the most reactive at the top.
reduction	*re-**duk**-shun*	A reaction in which a substance loses oxygen or in which an atom or ion gains electrons.
spectator ions		These are ions that do not change during a reaction.

SC8g Solubility

Word	Pronunciation	Meaning
precipitate	*pre-**sip**-et-tate*	An insoluble product formed when solutions of two soluble reactants are mixed.
precipitation	*pre-sip-et-**tay**-shun*	A reaction in which an insoluble product is formed from two soluble reactants in solution.

Physics – P6 radioactivity

SP6a Atomic models

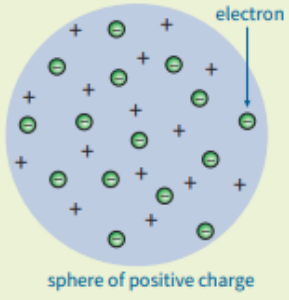
Word	Pronunciation	Meaning
alpha particle		A particle made of two protons and two neutrons, emitted as ionising radiation from some radioactive isotopes.
atom		The smallest neutral part of an element that can take part in chemical reactions.
electron		A tiny particle with a negative charge and very little mass.
element		A simple substance made up of only one type of atom.
kinetic theory		The model that explains the properties of different states of matter in terms of the movement of particles.
nucleus		The central part of an atom or ion.
particle theory		Another term for kinetic theory.
subatomic particle		A particle that is smaller than an atom, such as a proton, neutron or electron.

Dalton's model

John Dalton thought the atom was a neutral solid sphere you cannot divide into smaller parts.

Plum pudding model

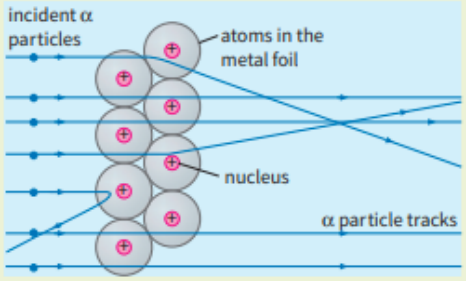
The discovery of negatively charged electrons led to the plum pudding model – a cloud of positive charge with electrons embedded in it.



Alpha scattering experiment

Positively charged alpha particles were fired at a thin sheet of gold foil.

- Most went straight through
- Some were deflected by small amounts
- 1 in 10 0000 deflected through large angles



Nuclear model

To explain the results, scientists deduced that there is a small positively charged nucleus at the centre of the atom where most of the mass is concentrated. The negative electrons orbit the nucleus

Bohr's model

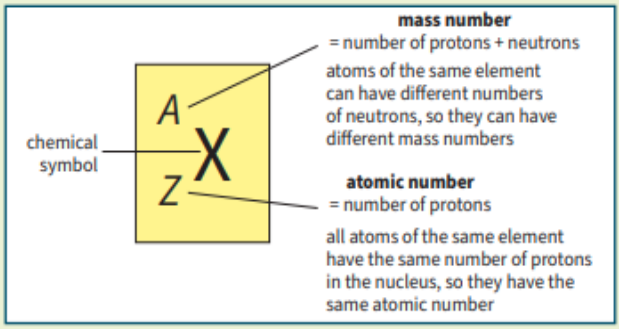
Bohr suggested the electrons orbit at specific distances called energy levels.

Basic structure of an atom

The nucleus, which is 10 000 times smaller than the radius of the atom, consists of two particles:

- positively charged protons
- neutrons which are neutral

An atom is uncharged overall and has equal numbers of protons and electrons.



Isotopes are atoms of the same element, with the same number of protons but a different numbers of neutrons.

Physics – P6 radioactivity

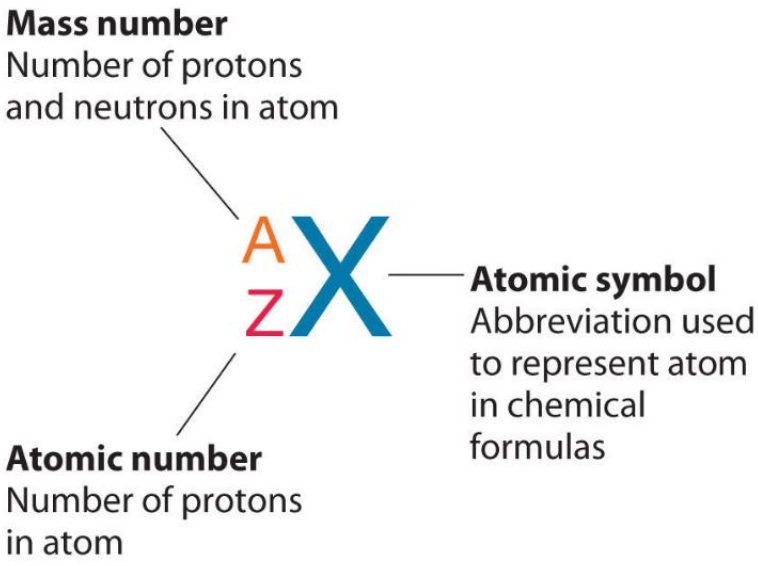
SP6b Inside atoms

Word	Pronunciation	Meaning
atomic number		The number of protons in the nucleus of an atom. It is also known as the proton number.
isotope		Atoms of an element with the same number of protons (atomic number) but different mass numbers due to different numbers of neutrons.
mass number		The total number of protons and neutrons in the nucleus of an atom. It is also known as the nucleon number.
neutron		A particle found in the nucleus of an atom having zero charge and mass of 1 (relative to a proton).
nucleon		A particle found in the nucleus (neutron or proton).
nucleon number		Another term for mass number.
proton		A particle found in the nucleus of an atom, having a positive charge and the same mass as a neutron.
proton number		The number of protons in an atomic nucleus. Another term for atomic number.
relative mass		The mass of something compared to the mass of something else which is often given the mass of 1.

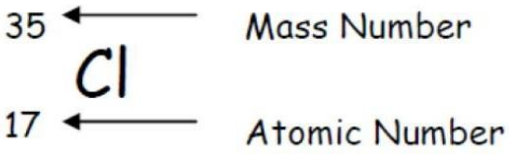
The nucleus, which is 10 000 times smaller than the radius of the atom, consists of two particles:

- positively charged protons
- neutrons which are neutral

An atom is uncharged overall and has equal numbers of protons and electrons.

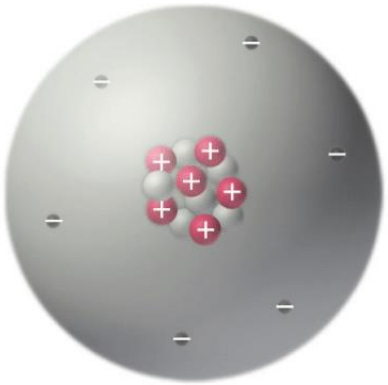


Nuclide Notation



No Protons = 17
No Electrons = 17
No Neutrons = 35 -17 = 18

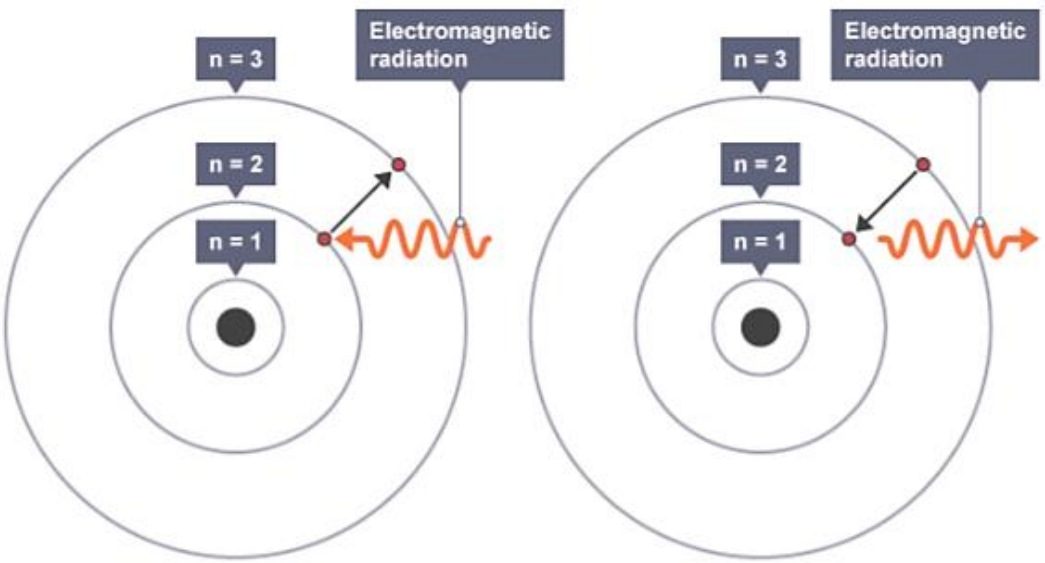
6 protons
6 neutrons
6 electrons



Physics – P6 radioactivity

SP6c Electrons and orbits

Word	Pronunciation	Meaning
absorption spectrum		A spectrum of light (or other electromagnetic radiation) that includes black lines. These are caused by some wavelengths being absorbed by the materials that the light (or radiation) passes through.
electromagnetic radiation		A form of energy transfer, including radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays.
electron shell		Area around a nucleus that can be occupied by electrons. Shells are usually drawn as circles. Also called an electron energy level or an orbit.
electronic configuration	*el-eck-**tron**-ik con-fig-your-**ay**-shun*	The arrangement of electrons in shells around the nucleus of an atom.
emission spectrum	*em-**ish**-un **spek**-trum*	A set of wavelengths of light or other electromagnetic radiation showing which wavelengths have been given out (emitted) by a substance.
ion	***I**-on-eyes-ing ray-dee-**ay**-shun*	An atom or group of atoms with an electrical charge due to the gain or loss of electrons.
ionising radiation		Radiation that can cause charged particles (ions) to be formed. It can cause tissue damage and DNA mutations.
orbit		A word used to describe the way electrons move around the nucleus of an atom.
positive ion		An atom that has lost electrons and so has an overall positive charge.
visible light		Electromagnetic waves that can be detected by the human eye.
visible spectrum		The part of the electromagnetic spectrum that can be detected by our eyes.
wavelength		The distance between a point on one wave and the same point on the next wave.



Physics – P6 radioactivity

The Bohr atom

Even though Rutherford had proven the existence of the nucleus, scientists were unsure how electrons fitted into this new model.

In 1913, **Niels Bohr** revised Rutherford's model by suggesting that the electrons orbited the nucleus in different energy levels or at specific distances from the nucleus.

By doing this, he was able to explain that since particular chemicals burn with certain-coloured flames; the pattern of energy released by electrons in the chemical reaction must be the same for every single atom of that element.

Therefore, electrons cannot be arranged at random, but they must have fixed levels of energy within each type of atom.

Bohr's 'solar system' model of the atom is the way that most people think about atoms today.

When atoms absorb energy, perhaps by absorbing electromagnetic radiation, the electrons at a particular level are pushed up to higher levels (at bigger distances from the nucleus) - they become 'excited'. In time, they jump back down to a lower level releasing light of definite frequencies.

Ions

Normally, atoms are neutral. They have the same number of protons in the nucleus as they have electrons orbiting around the nucleus.

Atoms can lose or gain electrons due to collisions or other interactions. When they do, they form charged particles called ions:

- if the atom **loses** one or more electrons, it becomes a **positively-charged ion**
- if the atom **gains** one or more electrons, it becomes a **negatively-charged ion**

A helium atom has two electrons in an energy level outside the nucleus. The atom is neutral as it has two positive protons and two negative electrons.

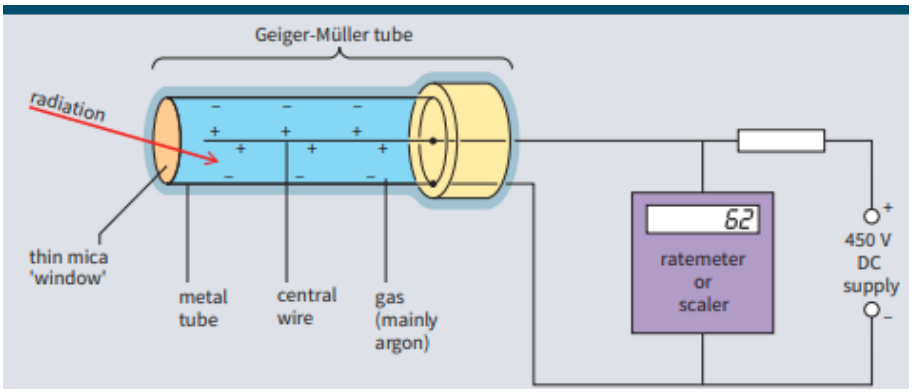
Physics – P6 radioactivity

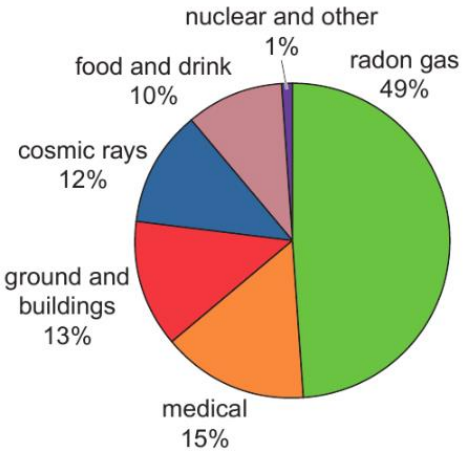
SP6d Background radiation

Word	Pronunciation	Meaning
background radiation		Ionising radiation that is around us all the time from a number of sources. Some background radiation is naturally occurring, but some comes from human activities.
cosmic rays		Charged particles with a high energy that come from stars, neutron stars, black holes and supernovae.
count rate		The number of alpha or beta particles or gamma rays detected by a Geiger–Müller tube in a certain time.
dose		The amount received at one time – for example, the amount of radiation a person receives.
Geiger–Müller (GM) tube	***guy-ger moul-er tyoob***	A device that can detect ionising radiation and is used to measure the activity of a radioactive source.

Sources of background radiation

Chart B below shows the sources of background radiation averaged over the UK. The main source is radon gas. This radioactive gas is produced by rocks that contain small amounts of uranium. Radon diffuses into the air from rocks and soil and can build up in houses, especially where there is poor ventilation. The amount of radon in the air depends on the type of rock and its uranium content. Rock type and building stone vary around the country and so does the amount of radon.





B sources of background radiation in the UK

Measuring radioactivity

Radioactivity can be detected using photographic film, which becomes darker and darker as more radiation reaches it. However, the film has to be developed in order to measure the amount of radiation (the **dose**). People who work with radiation often wear film badges (called dosimeters) to check how much radiation they have been exposed to. Newer dosimeters use materials that change colour without needing to be developed.

Physics – P6 radioactivity

SP6e Types of radiation

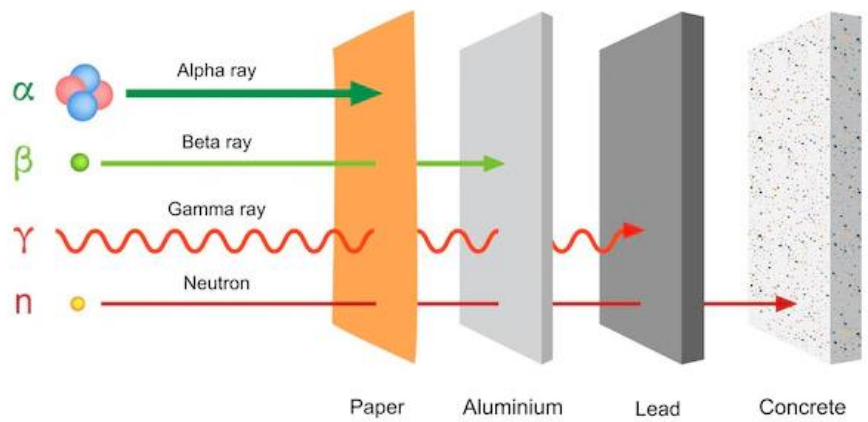
Word	Pronunciation	Meaning
alpha particle		A particle made of two protons and two neutrons, emitted as ionising radiation from some radioactive isotopes.
beta particle		A particle of radiation emitted from the nucleus of a radioactive atom when it decays. It is an electron.
decay (radioactive)		When an unstable nucleus changes by giving out ionising radiation to become more stable.
gamma ray		A high-frequency electromagnetic wave emitted from the nucleus of a radioactive atom.
penetrate		To go through.
positron		The anti-particle of an electron, having the same mass but opposite charge. Positron emission is a type of beta decay.
random		Any process that cannot be predicted and can happen at any time is said to be random.
unstable		An unstable nucleus in an atom is one that will decay and give out ionising radiation.

Radioactive decay

Radioactive decay is when nuclear radiation is emitted by unstable atomic nuclei so that they become more stable. It is a *random* process. This radiation can knock electrons out of atoms in a process called **ionisation**.

Type of radiation	Change in the nucleus	Ionising power	Range in air	Stopped by	Decay equation
α alpha particle (two protons and two neutrons)	nucleus loses two protons and two neutrons	highest ionising power	travels a few centimetres in air	stopped by a sheet of paper	${}^{A}_{Z}X \rightarrow {}^{(A-4)}_{(Z-2)}Y + {}^{4}_{2}\alpha$
β beta particle (fast-moving electron)	a neutron changes into a proton and an electron	high ionising power	travels ≈ 1 m in air	stopped by a few millimeters of aluminium	${}^{A}_{Z}X \rightarrow {}^{A}_{(Z+1)}Y + {}^{0}_{-1}\beta$
γ gamma radiation (short-wavelength, high-frequency EM radiation)	some energy is transferred away from the nucleus	low ionising power	virtually unlimited range in air	stopped by several centimetres of thick lead or metres of concrete	${}^{A}_{Z}X \rightarrow {}^{A}_{Z}X + {}^{0}_{0}\gamma$

Penetrating power of Alpha, Beta and Gamma ray through Paper, Aluminium, Led and Concrete



Physics – P6 radioactivity

SP6f Radioactive decay

Word	Pronunciation	Meaning
nuclear equation		An equation representing a change in an atomic nucleus due to radioactive decay. The atomic numbers and mass numbers must balance.

SP6g Half-life

Word	Pronunciation	Meaning
activity		The number of emissions of ionising radiation from a sample in a given time. Activity is usually given in becquerels (Bq).
becquerel (Bq)	***beck**-er-ell*	The units for the activity of a radioactive object. One becquerel is one radioactive decay per second.
half-life		The average time taken for half of the radioactive nuclei in a sample of radioactive material to have decayed. It is also the time taken for the activity of a source to fall to half its value.
probability		The likelihood of an event happening. It can be shown as a fraction from 0 to 1, a decimal from 0 to 1, or a percentage from 0 to 100 per cent.

Half-life

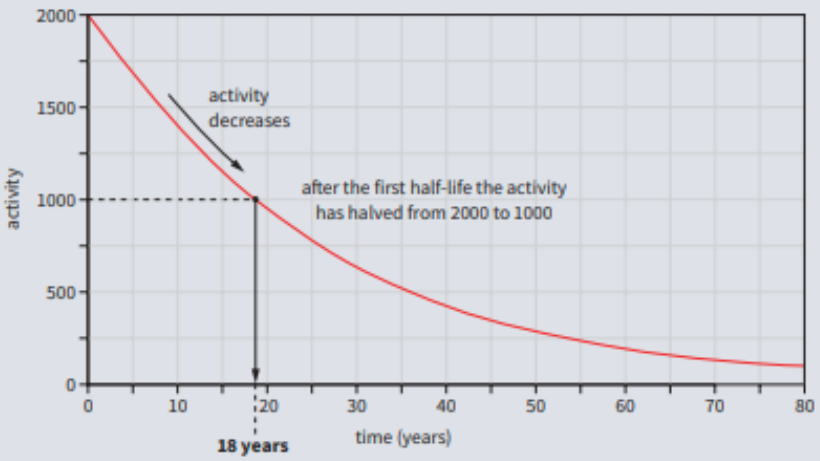
The **half-life** of a radioactive source is the time

- for half the number of unstable nuclei in a sample to decay
- for the count rate or activity of a source to halve.

The half-life of a source can be found from a graph of its count rate or activity against time.

To find the reduction in activity after a given number of half-lives:

1. calculate the activity after each half-life
2. subtract the final activity from the original activity.



The time taken for the activity to halve is 18 years. This is the half-life of this substance.

(HT only) Net decline can be given as a ratio: $\text{net decline} = \frac{\text{reduction in activity}}{\text{original activity}}$

SP6i Dangers of radioactivity

Word	Pronunciation	Meaning
contaminate		An unwanted addition that makes something unsuitable or impure, e.g. a person may be contaminated with a radioactive substance.
mutation		A change to a gene caused by a mistake in copying the DNA base pairs during cell division, or by the effects of radiation or certain chemicals.

Extra - Triple Physics – P6 radioactivity

SP6j Radioactivity in medicine

Word	Pronunciation	Meaning
external radiotherapy		Treatment of cancer by sending radiation into the body from outside.
gamma camera		A camera that detects gamma rays.
internal radiotherapy		Treatment of cancer by putting a radioactive source inside the body.
PET scanner		A medical scanning technique that detects gamma rays caused by the interaction of a positron from a radioactive source with an electron.
tumour		A lump formed of cancer cells.

Uses of radioactive materials

Radioactive materials have many uses and are determined by their half-life and by the properties of the radiation they release, alpha, beta or gamma.

Use	Type of radiation	Half-life
Tracer A radioactive material is injected into the body and cameras are used to make an image of where the radiation is. This can take very detailed images of inside the body.	**Gamma** · Weakly ionising so it will have less effect on the cells in the body. · Very penetrating so it can pass through the body to be detected by the camera.	**Short** Activity decays to a safe level quickly.
Treating cancer inside the body A radioactive material is placed inside the tumour to kill the cancer cells.	**Beta** · Strongly ionising so it will kill the cells it is absorbed by. · Moderately penetrating so it can pass through the whole tumour to kill all the cells without affecting healthy cells.	**Short** Activity decays to a safe level quickly.
Treating cancer from outside the body Radiation is aimed at the tumour from outside the body.	**Gamma** · Very penetrating so can pass through the body to reach the cancer cells. · Weakly ionising so it has less effect on the healthy cells.	**Long** As the source is outside the body it can be stored safely and used time and time again.
Monitoring the thickness of paper or foil A source is placed on one side of a sheet of paper or foil and a detector on the other side. If the count is too low, not enough radiation could penetrate and the paper is too thick.	**Beta** · Moderately penetrating, can pass through the paper but the count wold be affected by the thickness. Alpha would not penetrate the paper at all, and gamma would not be affected by changing the thickness.	**Long** As the source can be stored safely and used time and time again.
Smoke detectors Radiation in the detector ionises the air, which creates a current. If there was smoke in the detector it would block the radiation and the current would change, setting off the alarm.	**Alpha** · Very ionising to create the current. · Least penetrating so will be blocked by smoke particles.	**Long** So that the activity does not change enough to change the current produced.

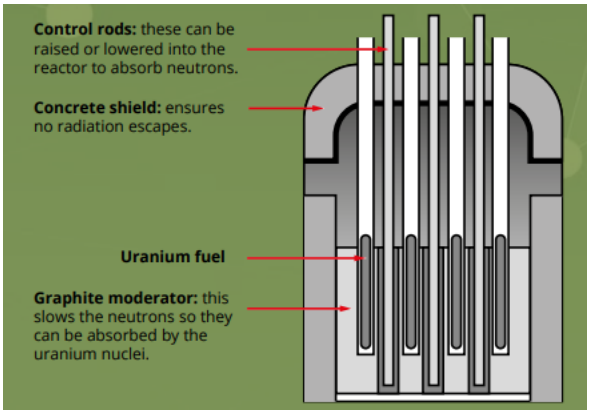
Extra - Triple Physics – P6 radioactivity

SP6k Nuclear energy

Word	Pronunciation	Meaning
climate change		Changes that will happen to the weather as a result of global warming, which is caused by the increase in the amount of carbon dioxide in the atmosphere.
decommission		To dismantle safely.
fossil fuel		A fuel formed from the dead remains of organisms over millions of years (e.g. coal, oil or natural gas).
non-renewable		Any energy resource that will run out because it cannot be renewed, such as oil.
nuclear fission	***fish**-un*	The reaction in which the nucleus of a large atom, such as uranium, splits into two smaller nuclei.

Word	Pronunciation	Meaning
nuclear fusion	***few**-zshun*	The reaction in which nuclei of light atoms, such as hydrogen, combine to make the nucleus of a heavier atom.

In a fission reaction **one neutron** starts the reaction and **2 or 3 more are released**. In a nuclear reactor these neutrons can go on to **cause another reaction**. If this proses in not controlled this **chain reaction** can become out of control and cause a meltdown.



The **control rods** are key to ensuring the reaction does not go out of control, they **absorb 2 out of the 3 neutrons** released from each fission reaction and so will only allow **one neutron to cause a reaction**.
The **moderator slows** the neutrons released to ensure that they can be **absorbed by the uranium** nuclei to cause another reaction.

Comparison

Fission	Fusion
Technology already developed	Not possible in a sustainable way
Fuel, uranium, is running out	Fuel, deuterium, is plentiful
The new nuclei produced are radioactive and have a variety of half-lives so must be stored safely	Produces stable helium nuclei
Requires moderators and control rods to ensure a safe and controlled chain reaction	Requires high temperature and pressure
Releases less energy	Releases more energy

Extra - Triple Physics – P6 radioactivity

SP6h Using radioactivity

Word	Pronunciation	Meaning
irradiate		To expose something to ionising radiation (e.g. in order to sterilise food or medical equipment with gamma rays).
sterilise	*ste-rill-eyes*	To destroy microorganisms (e.g. bacteria, viruses and fungi) in or on an object. It can be carried out using radioactive sources.
tracer	*tray-ser*	A radioactive substance that is deliberately injected into the body or into moving water. It allows the movement of the substance to be followed by detecting the ionising radiation emitted.

SP6l Nuclear fission

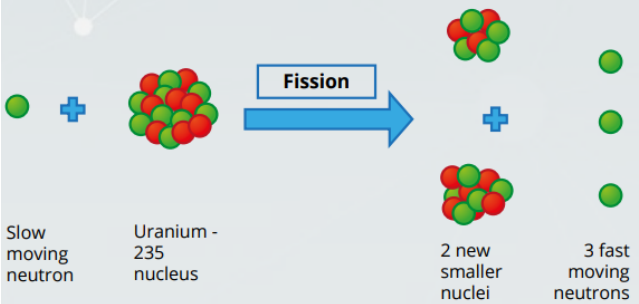
Word	Pronunciation	Meaning
chain reaction		The sequence of reactions produced when a nuclear fission reaction triggers one or more further fissions.
control rod		A rod that can be lowered into the core of a nuclear reactor to absorb neutrons and slow down the nuclear chain reaction.
core		The innermost part of something.
daughter nucleus		A nucleus produced when the nucleus of an unstable atom splits into two during fission or when a radioactive nucleus decays by emitting an alpha or beta particle.
fuel rod		A rod containing the nuclear fuel for a nuclear reactor.
moderator		A substance in a nuclear reactor that slows down neutrons, so that the nuclear fuel can absorb them more easily.

SP6m Nuclear fusion

Word	Pronunciation	Meaning
electrostatic repulsion		A force between two electrical charges that have the same sign, which pushes them apart.

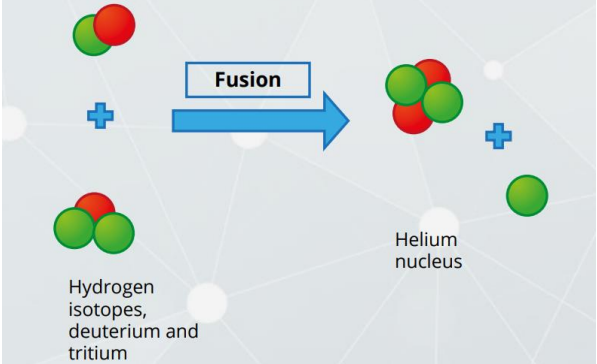
Fission

Fission reactions take place in nuclear reactors to produce energy.
In this reaction a slow-moving **neutron is absorbed** by a uranium-235 nucleus which then **splits into 2 smaller** nuclei and releases 2 or 3 fast moving neutrons.



Fusion

In a fusion reaction, **two small nuclei** are fused together to create **one larger** nucleus. This requires a lot of energy to start as you have to overcome the repulsion between the two positive nuclei.

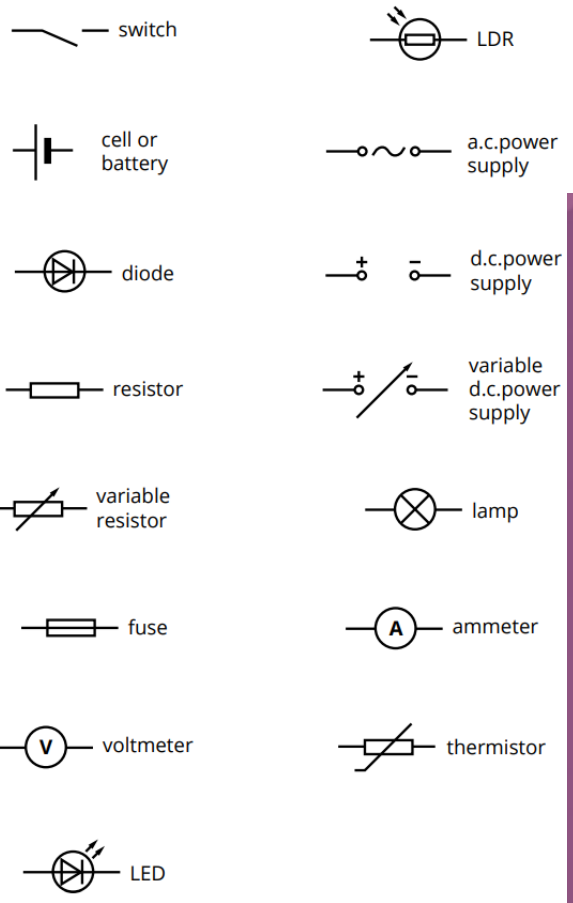


Physics P10-P11 Electricity

When you draw a circuit; remember to draw the **correct symbols** in place first then connect using **straight** lines to represent the **wires**.

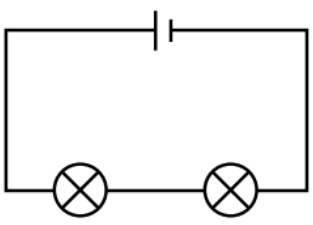
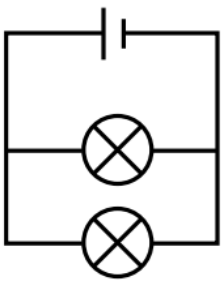
1. Electrical circuits	
Delocalised electrons	Electrons that are free to move between many different atoms.
Conventional current	The flow of positive charge from the positive terminal towards the negative terminal (goes in the opposite direction to electrons).
Electron flow	Electrons flow from the negative terminal towards the positive terminal.
Series circuit	A circuit in which there is only one path for the current to flow.
Parallel circuit	A circuit with multiple paths for the current to flow.

The following symbols are used to represent different electrical components:



2. Current and potential difference	
Amperes, A	The unit of measurement for current. Amps for short.
Ammeter	Used for measuring current. Connected in series.
Potential difference	Aka voltage. This is what pushes electrons around a circuit.
Volts, V	The unit of measurement for potential difference.
Voltmeter	Used for measuring potential difference. Connected in parallel.
Current in series circuits	The same at all points in the circuit.
Current in parallel circuits	Less on the branches than at the battery. Current on branches adds up to that at the battery.
Potential difference in series circuits	Potential difference is shared between the components on a circuit. It adds up to be the same as the battery.
Potential difference in parallel circuits	The same across each branch as it is across the battery.

Series and parallel circuits

Series	Parallel
	
Equal current everywhere in the circuit. **Voltage** is **shared** between the components but must add to the voltage from the power source.	**Current** is **shared** between the components but must add to the current from the power source. **Equal voltage** across each component.

Physics P10-P11 Electricity

3. Current, charge and energy	
Charge	The amount electricity that has flowed through a circuit.
Coulombs, C	The unit of measurement for charge.
Current	The number of coulombs of charge that flows past a point each second.
Calculating charge	Charge = current x time Q = I x t Charge = coulombs Current = amps Time = seconds
The meaning of volts	The amount of energy transferred by each coulomb of charge. One volt = 1 joule per coulomb.
Calculating energy	Energy = charge x potential difference E = Q x V Energy = joules Charge = coulombs Potential difference = volts

Current is measured using an **ammeter** which must be connected in **series**.

Voltage is measured using a **voltmeter** which must be connected in **parallel**.

Resistance can be calculated using this equation:

$$\text{Current (A)} = \frac{\text{Voltage (V)}}{\text{Resistance } (\Omega)}$$

Series	Parallel
When you add resistors in series, the resistance increases according to this equation. $R = R_1 + R_2$	When you add resistors in parallel, the resistance of the circuit decreases. $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$

The **power** of a circuit represents the energy transferred per second. It is measured in Watts where **1W = 1 Joule per second.**
These equations can be used to calculate power:

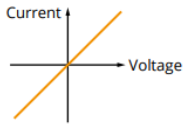
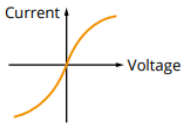
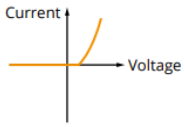
Power(W) = Voltage(V) × Current(A)
Power(W) = Current(A)² × Resistance(Ω)
Energy(J) = Power(W) × Time(s)

4. Current, resistance and potential difference	
Resistance	The difficulty with which current passes through materials.
Ohms, Ω	The unit of measurement for resistance.
High/low resistance	Higher resistance → better insulator Lower resistance →better conductor
Calculating current	Current = potential diff / resistance I = V / R Current = amps, A Potential diff = volts, V Resistance = ohms, Ω Note: This equation is normally written as V = IR.
Changing current	Higher voltage → higher current Higher resistance → lower current

5. Resistors	
****Resistors**	Circuit components with differing resistance to control how much current flows to parts of a circuit.
****Resistors in series**	Total resistance is the sum of each of the resistors.
****Voltage and resistors in series**	Voltage is shared in proportion to the resistance. The resistor with more resistances takes more of the voltage. Calculate this using V=IR.
****Resistors in parallel**	Think about each branch of the circuit as a different series circuit. Resistors on different branches do not affect each other.
****Variable resistors**	Resistors where you can change the resistance to adjust the current.

6. Controlling resistance	
****LDR**	Light-dependent resistor. High resistance in dark, low resistance in light.
****Thermistor**	High resistance when cold, low resistance when hot.
****Diode**	High resistance in one direction, low resistance in the other.
****Filament lamp**	High resistance causes the filament to heat up, producing light.

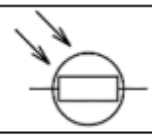
Physics P10-P11 Electricity

Resistor or wire (At a constant temperature)	Filament lamp	Diode
		
Constant resistance	Resistance increases at higher voltages	Very high resistance (no current) until a specific voltage

These are the results you would get from each device. You must learn the shape of the curve and be able to describe why it is that shape.

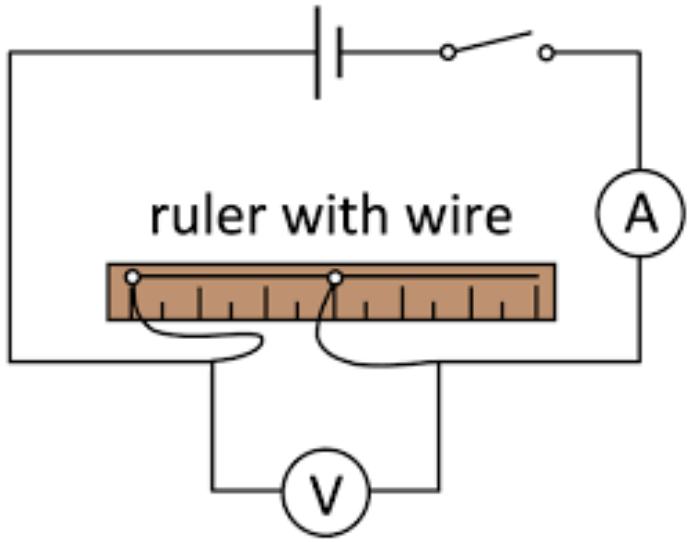
****Resistor graph**	Current increases in direct proportion to voltage (straight line going through (0,0)).
****Filament lamp graph**	Current increases as voltage increases, but levels out eventually.
****Diode graph**	Graph slopes up with a positive voltage but stays at 0 with a negative voltage.

7. Core practical – investigating resistance (CP15)	
***CP15 - Aim**	To explore how resistance changes in different circuits.
***CP15 - Investigating resistance**	Set up a circuit with an ammeter, resistor and voltmeter across the resistor. Vary the voltage and record voltage and current.
***CP15 - Investigating series circuits**	Set up a series circuit with an ammeter, two bulbs and voltmeters across each bulb and the power supply. Vary the voltage and record all readings
***CP15 - Investigating parallel circuits**	Set up a parallel circuit with two bulbs and ammeters on each branch and by the power supply, and voltmeters across each bulb and the powers supply. Vary voltage, record all readings.
***CP15 - Results**	Resistor – doubling voltage doubles current Series circuit – voltage at bulbs half of that at power supply

****Diode**	
****LDR**	
****Thermistor**	

8. Energy transfer	
****Calculating energy transfer**	Energy = current x potential difference x time E = I x V x t Energy = joules Current = amps Potential difference = volts Time = seconds
****Resistance and energy transfer**	Electrons flowing through wires collide with atoms and lose energy. This energy is transferred to heat.
****Electrical energy dissipation**	When electrical energy is transferred to wasted heat energy by resistance.
****Reducing resistance**	Use thicker wires, use shorter wires, use lower-resistance metals, reduce the temperature.

The **power** of a circuit represents the energy transferred per second. It is measured in Watts where **1W = 1 Joule per second.**
These equations can be used to calculate power:



Physics P10-P11 Electricity

9. Electrical power	
Power	The rate of energy transfer.
***Watts, W**	The unit of power: 1 W = 1 joule per second
***Power and work done**	$P = \frac{E}{t}$ Where 'P' is power in W, 'E' is work done in J, 't' is time in s.
***Power, current and voltage**	$P = I \times V$ Where 'P' is the power in W, 'I' is the current in A, V is the potential difference in V.
****Power, current and resistance**	$P = I^2 \times R$ Where 'P' is the power in W, 'I' is the current in A, 'R' is the resistance in Ω.

10. Using electricity	
***Mains electricity**	The electricity supplied from wall sockets.
***National grid**	The systems of power lines and sub-stations that distributes electricity from power stations to homes and businesses.

There are three other safety devices used in these circuits:

Fuse	Stops the **current** if it becomes too **large**. It does this by melting a wire in the fuse. This means the fuse must be replaced once it has 'blown'. This prevents the device overheating.
Miniature circuit breaker (MCB)	Stops the **current** if it becomes too **large**. Reacts more **quickly** and can be **reset**. This prevents the device overheating.
Residual current circuit breaker (RCCB)	Stops the current if the current in the **neutral wire is different to the live wire** *(remember, when the circuit is operating normally the current will be the same in both).* Reacts to a **very small** difference, reacts very **quickly** and can be **reset**. This will protect the user from a serious electric shock.

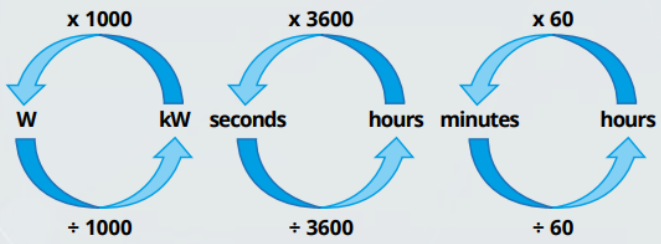
11. Electrical safety	
***Live wire**	Brown, 230 V, connects the appliance to the power station.
***Neutral wire**	Blue, 0 V, completes the circuit.
***Earth wire**	Green and yellow, 0 V. Connects the appliance to the ground so current can flow there in the event of a short circuit.
***Fuse**	A thin metal wire that melts and breaks the circuit if there is too much current.
****Circuit breaker**	Breaks the circuit if too much current flows.
****Advantages of circuit breakers**	Quicker than fuses, just need switching rather than replacing.

***Heaters**	Transfer energy from electrical to thermal.
***Motors**	Transfer energy from electrical to kinetic.
****Direct current**	Current that flows in one direction.
****Alternating current**	Current that switches direction many times each second.
****Frequency of mains current**	Mains current alternates (switches direction) 50 times each second. The frequency is 50 Hz.

The **power** of a circuit represents the energy transferred per second. It is measured in Watts where **1W = 1 Joule per second.**
These equations can be used to calculate power:

Power(W) = Voltage(V) × Current(A)
Power(W) = Current(A)² × Resistance(Ω)
Energy(J) = Power(W) × Time(s)

In order to calculate the cost, these equations are used:
Units used (kWh) = Power (kW) × time (hours)
Cost = Units used × Cost per unit
Both equations are given on the equation sheet, **but it is important that you can convert between units correctly**. Often power is given in Watts and time in seconds or minutes.



Statistics

2a Qualitative & discrete data.....

Learning outcomes:

- Draw and interpret pictograms.
- Draw and interpret bar charts and vertical line graphs.
- Draw and interpret multiple and composite bar charts.
- Draw and interpret stem and leaf diagrams.
- Draw and interpret pie charts.
- Compare data sets displayed in pie charts.
- Interpret and compare data in pie charts representing different sized samples.

Keywords:

Pictograms, bar charts and vertical line graphs

- A **pictogram** uses symbols or pictures to represent a number of items.
- In a **bar chart**, bars are **equal width** with equal spaces between them. The height (or length) of the bar represents the **frequency**.
- A **vertical line graph** is similar to a bar chart, but uses lines instead of bars.
- **Multiple bar charts** have more than one bar for each class. A **key** shows what each bar represents. The frequencies of each category can easily be compared.
- A **composite bar chart** compares data for each category in a single bar, divided into components that show the frequency for each part. A key identifies each component.
  - The **total frequencies** and the frequencies of each component group can be compared.
- **Bar charts** and **vertical line graphs** show trends and patterns in data.

Stem and leaf diagrams

- A **stem and leaf diagram** shows numerical data split into a 'stem' and 'leaves'. The numbers are written in order. A key shows how to combine the stem and leaves to read the numbers.
- A stem and leaf diagram shows the shape of the data distribution in the same way as a bar chart, but retains the original data values.
- A **back-to-back stem and leaf diagram** shows two sets of data with the same stem. The smallest values on each row are always nearest the stem.

2b Continuous data.....

Learning outcomes:

- Interpret and compare population pyramids.
- Interpret and compare choropleth maps.
- Draw and interpret histograms with equal class intervals.
- Draw and interpret frequency polygons.
- Draw and interpret cumulative frequency step polygons for discrete data.
- Draw and interpret cumulative frequency diagrams for grouped data.
- Identify the shape of distributions of data including symmetry, positive skew and negative skew.
- Calculate and use frequency density to draw histograms with unequal class widths.
- Interpret and compare data sets displayed in histograms with unequal class widths.
- Recognise when graphs are misleading.
- Interpret and compare data sets presented in different formats.
- Choose an appropriate format to represent data and explain your choice.

Keywords:

Pie charts

- A **pie chart** is a way of displaying data when you want to show how something is shared or divided. Pie charts show proportions but not accurate data values.
- The **area of each sector** of a pie chart is proportional to the frequency it represents. The **area of the whole pie chart** is proportional to the total frequency.

H

- **Comparative pie charts** are used to compare two sets of data with different total frequencies.
  - The areas of the two circles should be **in the same ratio** as the two total frequencies.
  - To compare the **total frequencies**, compare the **areas**. To compare **proportions**, compare the individual **angles**.

Population pyramids

- **Population pyramids** are similar to stem and leaf diagrams. They show the age groups in a population, usually divided by gender.

Choropleth map

- A **choropleth map** is used to classify regions of a geographical area. Regions are shaded with an increasing depth of colour. A key shows what each shade represents.
- A choropleth map can be a diagram rather than an accurate map.

Histogram

- A **histogram** is similar to a bar chart but, because the data is continuous, there are no gaps between the bars.

H

- To draw a **histogram for unequal class intervals**, adjust the height of the bars so the **area** of the bar represents the frequency. The height of each bar represents the **frequency density**.
- Frequency density = $\frac{\text{frequency}}{\text{class width}}$
- You can compare data from histograms if they have the same class intervals and the same frequency density scales.

Frequency polygons

- A **frequency polygon** joins the midpoints of the tops of the bars of a histogram with straight lines. A frequency polygon may be drawn with or without a histogram.

Cumulative frequency

- **Cumulative frequency** is the running total of the frequencies from each class interval.
- For discrete data, you can draw a **cumulative frequency step polygon**. Plot the cumulative frequencies against the upper class boundaries. Join the steps with straight lines.
- For grouped continuous data, you can draw a **cumulative frequency diagram**. Plot the cumulative frequencies against the upper class boundaries. Join the points with a smooth curve or straight lines.
- Cumulative frequency diagrams can be used to estimate or predict other values.

Distributions

- The **shape of a distribution** is the shape formed by the bars in a histogram, or by a frequency polygon, or by the rows of a stem and leaf diagram.
- A **distribution** can be **symmetrical**, or have **positive skew** or **negative skew**.

Misleading diagrams

- **Three-dimensional diagrams** make comparisons difficult as data proportions appear distorted.
- Diagrams without clear scales, labels or keys may be misleading.

2c Tabulation…..

Learning outcomes:

- Extract information and interpret data in tables.
- Represent data in a table.
- Represent and interpret data in two-way tables.

Keywords:

Recording data

- A **database** is a collection of information.
- A **two-way** table shows information in two categories.
- **Tables** give exact data values for different categories, but do not show trends and patterns as clearly.
- **Bivariate data** has two variables.