



Glenmoor & Winton Academies

High Achievement – High Standards

Part of United Learning

Knowledge Organiser

KS4 - 2026/27

Student Name: _____

Table of Contents

Subject (Tick Once Studied)	Page	Notes
English	1-11	
☐ Power & Conflict Poetry	1-4	
☐ Macbeth	5-6	
☐ A Christmas Carol	7-9	
☐ An Inspector Calls	10-11	
Ethics	12-22	
☐ Relationships	12	
☐ Issues of Life & Death	13-14	
☐ Good & Evil	15	
☐ Human Rights	16-17	
☐ Christianity Beliefs	18	
☐ Christianity Practices	19	
☐ Islamic Beliefs	20	
☐ Islamic Practices	21	
☐ Writing Structure	22	
Geography	23-55	
☐ Command Words	23	
☐ Key Vocabulary	24	
☐ Natural Hazards	25-30	
☐ Living World	31-33	
☐ Coasts	34-35	
☐ Rivers	36-38	
☐ Urban Issues	39	
☐ Urban Issues - Lagos	40	
☐ Urban Issues - Bristol	41	
☐ Economic World	42-43	
☐ Economic World - Nigeria	44	
☐ Economic World – UK Futures	45	
☐ UK Resources	46	
☐ Water	47	
☐ Statistics	48	
☐ Graphs	49-50	
☐ Maps	51-52	
☐ Fieldwork	53-55	
History	56-79	
☐ Medicine Through Time	56-61	
☐ Superpower Relations & Cold War	62-66	
☐ Anglo-Saxon and Norman England	67-72	
☐ Weimar & Nazi Germany	73-79	

Mathematics	80-107	
☐ Number - Foundation	80-81	
☐ Algebra - Foundation	82-85	
☐ Probability & Statistics - Foundation	86-88	
☐ Geometry and Measure - Foundation	89-95	
☐ Number Ratio & Proportion - Higher	96-97	
☐ Algebra - Higher	98-101	
☐ Geometry & Measure - Higher	102-105	
☐ Probability & Statistics - Higher	106-107	
Science	108-137	
☐ B1 Cell Biology	108-109	
☐ B1 Organisation	110-111	
☐ B1 Infection & Response	112-113	
☐ B1 Bioenergetics	114-115	
☐ C1 Atomic Structure	116	
☐ C1 Bonding	117	
☐ C1 Quantitive Chemistry	118	
☐ C1 Chemical Changes	119	
☐ P1 Electricity	120	
☐ P1 Energy	121	
☐ P1 Particle Model	122	
☐ P1 Atomic Structure and Radiation	123-124	
☐ B2 Homeostasis	125-126	
☐ B2 Inheritance, Variation	127	
☐ B2 Ecology	128	
☐ C2 Rate of Reaction	129	
☐ C7 Organic Chemistry	130	
☐ C2 Chemical Analysis	131	
☐ C7 Chemistry of the Atmosphere	132	
☐ C7 Using Resources	133	
☐ P2 Forces and Motion	134	
☐ P2 Waves	135	
☐ P2 Magnets and Electromagnetics	136	
☐ Working Scientifically	137	



Glenmoor & Winton Academies

High Achievement – High Standards

Part of United Learning

English

Power and Conflict Poetry

1. London by William Blake (1794) Themes: Power, Inequality, Conflict	
- The speaker describes the inequality and suffering he sees and hears walking around the city. - Victorian. Written at the time of the French revolution. Romantic poet: attacked institutions such as the Church and the Monarchy for failing to help those who need it.	
Quatrains and ABAB rhyme scheme	2. Ozymandias by P.B Shelley (1818) Themes: Power, Nature
'Marks of weakness, marks of woe' 'Mind-forged manacles' 'Every blackning church appalls' 'runs in blood down palace walls'	- The narrator meets a traveller who tells him about a decayed statue. - Romantic poet. He shows human power is only temporary and cannot resist the power of nature. - Uses the figure of Ozymandias to criticise King George III (reigning monarch)
Sonnet form with an irregular (broken) rhyme	
'Sneer of cold command' 'King of kings' 'Look on my works, ye mighty, and despair!'	'Shattered visage.... Colossal wreck' 'Nothing beside remains'
3. My Last Duchess by Robert Browning (1842) Themes: Power, Control, Jealousy, Status	
- The Duke shows a visitor a portrait of his dead wife. He controls her by keeping her behind a curtain. - Uses the figure of an Italian Duke to criticise the concept of inherited power and female oppression.	
A dramatic monologue written in a block stanza with rhyming couplets	
'That's my last Duchess painted on the wall... none puts the curtain... but I' 'my gift of a 900-hundred-year-old name' 'I gave commands; then all smiles stopped' 'Neptune taming a seahorse'	
4. Extract from the Prelude by William Wordsworth (1850) Themes: Power of Nature, Fear, Insignificance of man	
- A boy steals a boat at night. At first, he is calm and confident but the sight of a huge mountain scares him and he flees back to the shore. - Romantic poet, highlighting feelings of sublime.	
A first-person narrative written in a block stanza with enjambment and a volta	
'sparkling light' 'glittering idly'	'huge peak, black and huge' 'Strode after me like a living thing' 'trouble to my dream'
5. Charge of the Light Brigade by Alfred Lord Tennyson (1854) Themes: Conflict, Reality and effect of War, Patriotism	
- A group of cavalry men follow orders that lead to their death. - Published six weeks after a disastrous battle, due to a blunder, against the Russians in the Crimean War. - The poem is a celebration of the soldier's courage and devotion to their country.	

Power and Conflict Poetry

Structure and Form	Written in chronological order with a broken refrain. The final stanza is shorter than the rest.	
Quotations	‘Stormed at with shot and shell’ ‘jaws of death’ ‘mouth of hell’	‘When can their glory fade... Honour the light Brigade... Noble six hundred’
6.Exposure by Wilfred Owen (1918) Themes: Conflict, Suffering, Nature, Reality of War, Patriotism		
Summary and Context	- The speaker describes war as a battle against the weather and conditions. - Owen is the only poet in the anthology with direct experience of war and wrote the poem during WW1. - Owen wanted to present the suffering, monotony and futility of war.	
Structure and Form	- Present tense - Refrain	
Quotations	‘merciless iced east winds that knife us’ ‘Dawn massing in the east her melancholy army’ ‘All their eyes are ice’	‘But nothing happens.’ ‘for love of God seems dying’
7.Bayonet Charge by Ted Hughes (1957) Themes: Conflict, Power, Reality of War, Nature, Patriotism		
Summary and Context	- Describes the terrifying experience of a soldier running across no man’s land during WW1. - Hughes doesn’t have first-hand experience of war. - Hughes explores the idealism of patriotism and the reality of fighting and killing.	
Structure and Form	- Begins in medias res - Enjambment and caesura	
Quotations	‘Suddenly he awoke and was running-raw’ ‘the patriotic tear that had brimmed in his eye’ ‘king, honour, human dignity, etcetera / Dropped like luxuries’ ‘His terror’s touchy dynamite’	
8.Storm on the Island by Seamus Heaney (1966) Themes: Power of Nature, Fear		
Summary and Context	The speaker describes a coming storm and how the island is prepared.	
Structure and Form	Block stanza and frequent enjambment	
Quotations	‘We are prepared...we build our houses squat’ ‘exploding comfortably’ ‘spits like a tame cat turned savage’ ‘Strange, it is a huge nothing that we fear’	
9.War Photographer by Carol Ann Duffy (1985) Themes: Conflict, Suffering, Reality of War, Memory		
Summary and Context	A war photographer develops photos at home in England and remembers the horrors of war.	

Power and Conflict Poetry

Structure and Form	- Four equal stanzas - Frequent caesura
Quotations	'spools of suffering set out in ordered rows' 'hands which did not tremble then but seem to now...half-formed ghost' 'blood stained in foreign dust' 'prick with tears between the bath and pre-lunch beers...'they do not care.'
10.The Emigrée by Carol Rumens (1993) Themes: Conflict, Power, Identity, Culture, Memory, Loss	
Summary and Context	- The speaker describes her positive memories of a home city that she was forced to flee due to conflict. - The home country of the speaker is not revealed – this ambiguity gives the poem a timeless relevance.
Structure and Form	- First person speaker in the past, then in the present tense. - The first two stanzas repeat the image of sunlight, and every stanza ends with the image of sunlight. - The final stanza has lots of end stopped
Quotations	'There once was a country... I left it as a child' 'I am branded by an impression of sunlight' 'my city takes me dancing... hides behind me ' 'tyrant... tanks... banned...accuse'
11.Checking out Me History by John Agard (2005) Themes: Power, Culture, Identity	
Summary and Context	- The speaker is angry he was not taught black history at school. - Agard was born in the British colony of Guiana; this poem challenges racism and prejudice.
Structure and Form	- The lack of punctuation, free verse, irregular rhyme scheme and the use of Creole (non-standard English) - Only poem in the Power and Conflict anthology not to end in punctuation
Quotations	'Dem tell me' 'I carving out me identity' 'bandage up me eye' 'Blind me to me own identity' 'Healing star'
12.Tissue by Imtiaz Dharker (2006) Themes: Power of Nature, Control, Identity	
Summary and Context	- Explores the idea that human life is both fragile and temporary through comparison to tissue and paper. - Also explores how we create structures (religion, money, nationhood etc.) & these can cause conflict. - This conflict might be avoided by valuing things that tell the real story of our lives.
Structure and Form	Free verse and enjambment
Quotations	'paper lets the light shine through 'well used books.. Koran' 'Pages smoothed and stroked and turned transparent with attention' 'raise a structure never meant to last'
13.Remains by Simon Armitage (2008) Themes: Conflict, Reality and effect of War, Guilt, Power, Memory, Loss	
Summary and Context	The speaker describes shooting a looter dead in Iraq and how it has affected him since returning home.
Structure and Form	Begins mid action Plural (we), changing to singular (I) Volta

Power and Conflict Poetry

Quotations	'probably armed, possibly not' 'end of story, except not really' 'dug in behind enemy lines' 'his bloody life in my bloody hands'
14. Poppies by Jane Weir (2009) Themes: Bravery, Reality and effect of War, Memory, Loss	
Summary and Context	A mother remembers sending her son off to war.
Structure and Form	Dramatic monologue Enjambment and caesura
Quotations	'spasms of paper red' 'steemed the softening of my face' 'released a songbird from its cage' 'hoping to hear your playground voice'
15. Kamikaze by Beatrice Garland (2013) Themes: Conflict, Power, Patriotism, Nature, Memory, Identity, Loss	
Summary and Context	- This poem explores a kamikaze pilot's journey towards battle and his decision to return home, triggered by the beauty of nature and memories of childhood. - Kamikaze pilots were known for their bravery and loyalty. To return from their mission would bring great dishonour and shame on the family.
Structure and Form	Third person narrator. Italicised section spoken by pilot's daughter. Pilot has no voice.
Quotations	'a shaven head full of powerful incantations' 'my mother... this was no longer the father we loved' 'he must have wondered which had been the better way to die'

Key vocabulary

Language

1	Metaphor	A comparison in which something is described as something else.
2	Simile	A comparison between two things using 'like' or 'as'
3	Personification	Describing a non-living thing as though it has human qualities
4	Repetition	A repeated word or phrase.
5	Alliteration	Repetition of a sound for effect.
6	Sibilance	Repeated 's' and 'sh' sounds

Structure

7	Stanza	A group of lines or ' verse ' in a poem.
8	Volta	A turning point in a poem.
9	Caesura	Punctuation in the middle of a line.
10	Enjambment	When a line/stanza runs into the next line/stanza.
11	End-stopped line	A line that ends with punctuation.
12	Refrain	Repeated line or phrase in a poem.

Perspective

13	Poet	The person who writes the poem.
14	Speaker	The person speaking in the poem.
15	Tone	The attitude/feeling behind what is being described.

Form

16	Dramatic Monologue	A poem spoken by one individual speaker to an imagined listener.
17	Free Verse	A poem with no set form or rhyme scheme.
18	Sonnet	A poem that contains 14 lines. Typically about love.
19	Quatrain	Stanza of 4 lines.

1. Historical context		3. Key themes	5. Key characters
King James I	King of Scotland and became King of England in 1603. Two big interests: kingship and witchcraft .	Ambition is a strong desire to do or achieve something. Macbeth and Lady Macbeth's ambition lead them to committing the crime of regicide.	Macbeth - Thane of Glamis - Begins as a loyal warrior - Ends a tyrannical king
Kingship	The state of being a king and the behaviour exhibited.	Guilt is the feeling of shame/regret after doing something wrong. Macbeth suffers hallucinations because of his guilt; Lady Macbeth sleepwalks and imagines blood before committing suicide.	Lady Macbeth - Macbeth's wife - She persuades Macbeth to murder King Duncan
Witches and the supernatural	Jacobean were superstitious . Believed that witches gained their power by selling their souls to the devil. There was an anti-witchcraft law .	Fate is someone's destiny outside of their control. Free will is the ability to make your own choices. The witches' prophecies might be self-fulfilling (destined to come true) but Macbeth's decisions and actions ensure they do.	Macduff - Macduff is Macbeth's antagonist (enemy) - Macduff is a dramatic foil (contrast) to Macbeth - He kills Macbeth
Gunpowder Plot	In 1605 , a group of rebels, including Guy Fawkes , attempted regicide (killing a king) by plotting to blow up Parliament.	Gender was believed to be the two sexes, male and female. Lady Macbeth rejects her gender role as she craves power and challenges the masculinity of Macbeth.	Banquo - Macbeth's closest friend and ally - He is also a foil to the character of Macbeth
Divine Right of Kings	The Divine Right of Kings was the belief that kings were chosen by God .	The supernatural is unnatural or mystical forces. The three witches give Macbeth prophecies that corrupt his character and lead to his downfall.	Fleance Banquo's son
The Great Chain of Being	Belief that everything on earth was part of a strict hierarchy (order) with God at the top .	Loyalty means showing constant support towards a person or institution. Betrayal is being disloyal to a person, country or group. Macbeth displays loyalty towards King Duncan at the beginning of the play. He then betrays his king and country when he murders Duncan.	King Duncan - King of Scotland at the start of the play - Murdered by Macbeth
The Role of Women	Society was 'patriarchal' (led by men). Women were expected to marry, bear children and be subservient to (serve) their husbands.		Malcolm - Duncan's eldest son and the rightful heir to the throne - At the end of the play, he becomes king
The Tragic Hero	Macbeth's downfall is caused by his hamartia (fatal flaw) of ambition.		The Witches - The witches are supernatural - The witches state prophecies that never give the full truth (they 'equivocate')
2. Structure and stagecraft		4. Writer's message	
Stage direction	Instructions for the actors. Usually, to reveal extra information about their character.	Shakespeare warns that breaking the natural order will cause disorder and chaos.	
Dramatic irony	When the audience knows something the characters do not.	Shakespeare exposes the dangers of being influenced by the supernatural.	
Key structural moments		Shakespeare reveals the dire consequences of unchecked ambition.	
Beginning	- Witches on stage first - First introduction to Macbeth is through the Captain praises his bravery in battle		
Middle	- Duncan is killed off stage - Porter scene - Macduff does not attend Macbeth's coronation		
Ending	- Lady Macbeth is absent - Lady Macbeth and Macbeth die off stage - Donalbain and Fleance do not return		

6.The plot		7.Key Quotations	
1.1	The three witches meet on the heath.	Macbeth	“For brave Macbeth... unseamed him from the knave to chaps...” (A1, S2) “O full of scorpions is my mind.” (A3,S2) “this tyrant whose sole name blisters our tongues” (A4, S3)
1.2	Captain tells Duncan about Macbeth and Banquo’s bravery and loyalty on the battlefield.		
1.3	Macbeth and Banquo meet the witches and learn of the first set of prophecies.	Lady Macbeth	“Take my milk for gall” (A1,S5) “When you durst do it, then you were a man” (A1,S7) “Out, damned spot, out I say!” (A5,S1)
1.4	Macbeth meets Duncan and is told that the king will visit him at his own castle.		
1.5	Lady Macbeth’s soliloquy. Lady Macbeth receives Macbeth’s letter and begins her manipulation of her husband.	Supernatural	“Fair is foul and foul is fair/hover through the fog and filthy air” (Witches A1,S1)... “So foul and fair a day I have not seen” (Macbeth A1 S3) “Instruments of darkness tell us truths’ (Banquo A1 S3)...”infected be the air...damn’d all those that trust them” (Macbeth A4, S2) “Stay you imperfect speakers, tell me more” (Macbeth A1 S3) “Come you spirits... unsex me here” (Lady Macbeth A1 S5)
1.6	Duncan arrives at Macbeth’s castle.		
1.7	Macbeth’s soliloquy. Macbeth tells Lady Macbeth that he will not commit regicide but she manipulates him into going ahead with Duncan’s murder.	Guilt	“Is this a dagger which I see before me?” (Macbeth A2 S1) “Never shake thy gory locks at me” (Macbeth Act 3 S4) “Amen stuck in my throat” (Macbeth A2 S2) “Will all great Neptune’s ocean wash this blood clean from my hand?” (Macbeth) “A little water clears us of this deed” (Lady Macbeth A2 S2) “All the perfumes of Arabia cannot sweeten this little hand” (Lady M A5 S1)
2.1	Banquo and Macbeth discuss the witches. Macbeth sees a vision of the dagger.		
2.2	Macbeth murders King Duncan and begins to experience guilt. Lady Macbeth reacts callously and questions his bravery.	Ambition	“make my seated heart knock at my ribs” (Macbeth A1, S3) “stars hide your fires, let not light see my black and deep desires” (Macbeth A1, S4) “Come thick night” (Lady Macbeth A1, S5) “Look like the innocent flower but be the serpent under it” (Lady Macbeth A1, S5) “vaulting ambition which overleaps itself” (Macbeth A1, S7) “this dead butcher and his fiend like queen” (Malcolm A5, S9)
2.3	Macduff finds Duncan’s body. The Macbeths pretend to be shocked.		
2.4	Macduff suspects Duncan’s sons meaning that Macbeth will become king.	Disorder	‘O horror, horror horror... most sacrilegious murder’ (Macduff A2, S3) “earth was feverous and did shake” (Lennox A2, S3) “horses eat each other” (Old Man A2, S4) ‘Bleed, bleed poor country...Great Tyranny’ (Macduff A4 S3)
3.1	Macbeth is anxious about Banquo so plans to murder him and his son Fleance.		
3.2	Macbeth talks to Lady Macbeth about his guilt and hints that he will murder Banquo and Fleance.	Motifs	- Light vs dark – “candles are all out” (Banquo A2, S1)...”out out, brief candle” (Macbeth A5, S5) - Clothes - “His title hang loose about him, like a giant robe upon a dwarfish thief”(Angus A5, S2) - Hands - “Secret murders sticking on his hands” (Angus A5, S2) - Sleep - “Macbeth doth murder sleep” (Macbeth A2, S2) - Birds - “Hell kite” (Macduff A4, S3) - Nature – “drown the weeds” (Lennox A5, S3)
3.3	Banquo is murdered but Fleance escapes.		
3.4	Macbeth sees Banquo’s ghost at his banquet.		
3.5	The witches meet with Hecate, the goddess of witches.		
3.6	Lennox hints that Macbeth committed the murder.		
4.1	The witches summon three new apparitions – each telling a new prophecy to Macbeth.		
4.2	Macbeth has Macduff’s family murdered.		
4.3	Macduff hears of his family’s murder and he and Malcom vow revenge on Macbeth.		
5.1	Lady Macbeth sleepwalks; she is overcome by guilt and tries to wash the blood from her hands.		
5.2	Malcolm and his English army approach.		
5.3	Macbeth is fearless because of the witches’ prophecies.		
5.4	Great Birnam wood moves as Malcolm’s army use branches as camouflage.		
5.5	Lady Macbeth dies. Macbeth realises he has been deceived by the witches.		
5.6	Malcolm and Macduff prepare to attack.		
5.7	Macbeth kills young Siward.		
5.8	Macbeth is killed by Macduff.		
5.9	Malcolm is crowned King.		

A Christmas Carol

The novella	Plot	Key quotation
Stave One Marley's Ghost	- It's Christmas Eve. Scrooge is introduced as a miser; he works as a debt collector with his clerk, Bob Cratchit. - His nephew Fred invites him to Christmas; Scrooge declines. - Charity collectors request a donation; Scrooge declines. - Scrooge is visited at night by the ghost of his old business partner, Jacob Marley. - Marley's ghost warns Scrooge he needs to change his ways; to help, he will be visited by three ghosts.	'hard and sharp as flint' 'as solitary as an oyster' 'I can't afford to make idle people merry' 'are there no prisons?' 'decrease the surplus population' 'I wear the chain I forged in life'
Stave Two Ghost of Christmas Past	- Scrooge is taken back to his lonely childhood. - He then revisits his old employer's (Fezziwig) Christmas party who spreads joy with his benevolence. - He meets his fiancée there, Belle, who later leaves Scrooge when his obsession with money becomes too strong.	'a lonely boy was reading near a feeble fire' 'the happiness he gives, is quite as great as if it cost a fortune' 'another idol has displaced me...a golden one' 'our contract is an old one'
Stave Three Ghost of Christmas Present	- Scrooge is taken on a tour of London and beyond. - He sees the Cratchit family Christmas and realises his clerk's son, Tiny Tim, is too ill to live. - Ignorance and Want are revealed to be living under the Ghost's robe.	'the whole quarter reeked with crime, with filth, with misery' 'brave in ribbons' 'I see a vacant seat. The child will die.'
Stave Four Ghost of Christmas Yet to Come	- The final ghost takes Scrooge on a journey to see various people reacting to his own death. - In this future, Tiny Tim has died. - Scrooge visits his own gravestone and begs for another chance.	'sponge away the writing on this stone' 'I will not shut out the lessons they teach'
Stave Five Scrooge's Redemption	- Scrooge wakes up on Christmas Day, overjoyed to be alive. - He sends a boy to buy a bird for the Cratchits. - He donates to charity and visits Fred for Christmas.	'I will live in the past, the present and the future' 'not a farthing less' 'to Tiny Tim, who did not die, he was a second father'

A Christmas Carol

Key characters	Description	Key quotations
Ebenezer Scrooge	Protagonist. Initially miserly, selfish and cold, he experiences a moral transformation into a charitable philanthropist.	• "squeezing, wrenching, grasping, scraping, clutching, covetous old sinner" • 'Bah! Humbug!' • 'I'm as light as a feather'
Marley's Ghost	Scrooge's late business partner. Marley symbolises the limitations of a life focused on greed and selfishness. He visits Scrooge in chains to warn him about his own future.	• 'dead as a doornail' • 'mankind was my business'
Bob Cratchit	The face of the poor. Scrooge's kind, mild-mannered clerk who is treated terribly. He is a very poor man with a large family, but the family are still cheery and grateful.	• 'the clerk...involuntarily applauded' • 'Think of that! Bob had but fifteen "Bob" a week himself'
The Ghost of Christmas Past	A figure that is both old and young. Its illuminating head symbolises how shining a light on memories from the past can be used to illuminate one's thoughts and behaviours in the future.	• 'Would you so soon put out... the light I give?'
The Ghost of Christmas Present	A majestic jolly giant, who is dressed in a green robe. This ghost shows Scrooge how others spend Christmas, forcing him to contemplate his own solitary existence.	• 'a Giant glorious to see; who bore a glowing torch' • 'come in and know me better man'
The Ghost of Christmas Yet to Come	A silent phantom wearing black robes. This ghost presents Scrooge with an ominous view of his own death and the lack of care or love surrounding it.	• 'I fear you more than any spectre I have seen'
Fred	Scrooge's nephew and foil. Fred's life is fulfilled through his joy, kindness and interactions with others.	• 'uncle, though it has never put a scrap of gold or silver in my pocket, I believe that it has done me good'
Tiny Tim	The son of Bob Cratchit and Mrs Cratchit. Tiny Tim is a young boy born with physical disabilities that his family are too poor to have treated, yet he still remains positive.	• 'God bless us, every one!'

A Christmas Carol

Charles Dickens' childhood	At 12, his father was sent to debtor's prison and Dickens was sent to label bottles in a factor near the prison.
Gothic literature	Contains themes of terror , gruesome narratives, supernatural elements, and dark , graphic scenery
Industrial Revolution	Everything converted from manual labour to machine-driven labour, causing a reduction in the amount of people needed for work. This increased poverty levels and crime in the cities.
Malthusianism	Malthus warned that the Industrial Revolution would lead to population growth, which would ultimately cause starvation and disease due to a shortage of resources for everyone.
The New Poor Law	This law allowed the poor to receive help only if they went to the workhouse. Workhouses were deliberately made to be miserable; the poor had to work for food and accommodation and often the poor would rather die than go to a workhouse.
Victorian Christmas	Dickens helped to popularise many of the elements we now associate with Christmas (food, decorations, music). Workers were given 2 days to celebrate.
Religion	Christianity was deeply embedded in to the Victorian way of life. Key beliefs would include sinners must show they have repented by carrying out a penance in order to be forgiven and redeemed.

Writer's message
Dickens reveals that everyone is capable of redemption.
Dickens promotes the importance of family and social responsibility.
Dickens exposes the damaging consequences of greed on individuals and society.

Theme	Description
Poverty	There were still significant distinctions between social classes. Life was terrible for the poorest: lack of money resulted in negligible food supply. For many, money was so tight that they required their children to work in order to survive.
Greed	Scrooge represents the selfish middle class who do not share their wealth. Dickens criticises how wealth has become associated with happiness, at the expense of relationships and good will.
Family	Scrooge is reminded that being together with family is more important than being miserly and isolated.
Redemption	Memory and empathy allows Scrooge to realise he was once connected to others and that now he is more fortunate than many. The Christmas spirit allows him to change his outlook and transform for the better.
Charity	Scrooge learns that the true meaning of Christmas is to spend time with loved ones and to be charitable to those less fortunate.

An Inspector Calls

1. Historical context		2. Writer's message		4. Structure and stagecraft	
1912	When the play is set. Just before WW1 and the sinking of the Titanic.	Priestley promotes a socialist ideology in which he argues for collective social responsibility and highlights the failings of capitalism.		Dramatic Irony	When the audience knows something the characters do not.
Edwardian Society	Divided by class. Those with the most money had the most power.	Priestley exposes the outdated attitudes of the older generation and suggests hope lies with the younger generation.		Stage Directions	Instructions for the actors. Usually to reveal extra information about their character.
Class System	The upper and lower social classes were segregated.	Priestley challenges existing social hierarchies of class and gender.		Cyclical structure	Ends how it begins: the cyclical twist takes us back to the events of Act 1 - a girl has died.
Class	Working class: hardest jobs/least money Middle class: professionals/business owners Upper class: inherited money, land, titles and power	Priestley is critiquing the leadership of the upper classes and the behaviour of those who abuse their power.		Antithesis	A person or thing that is the opposite of someone or something else.
WW1	Cost the lives of millions of men – raised questions about the leadership of the upper classes.	3. Key themes Social Responsibility: The act of looking after others in society. Sheila and Eric accept responsibility and change. The other characters remain selfish and do not change. Young and Old: The older generation are old-fashioned and reject the Inspector's socialist message. The younger generation challenge authority, accept responsibility, and change. Gender: The characters begin as stereotypes but Eva and Sheila challenge these. By the end of the play the women get stronger and the men get weaker. Class and Power: Class is your position in society. The upper classes have all the power and exploit (abuse) the working class. The Inspector exposes this and challenges the power of the Birling family.		Prop	• An object used by actors on stage during a performance • Photograph • Alcohol • Engagement ring
1945	When the play was written. Just after WW2 in which millions of people from all classes fought together.			The Inspector's entrance	• The Inspector's entrance could be seen as a symbolic confrontation between socialism and capitalism • 'We hear the sharp ring of a doorbell. Birling stops to listen.' (Act 1)
Socialism	A political ideology (belief) where all people are equal and should share equally in a country's money.			End of Act 1	• Sheila calls Gerald a 'fool' for thinking he can keep the truth from The Inspector. • 'The doors slowly opens and The Inspector appears, looking steadily and searchingly at them'
Labour Party	The Labour Party won the 1945 General Election and created the welfare state (benefits and the NHS).			End of Act 2	• The audience realise Eric would have been the father of Eva's child before Mr and Mrs Birling. • '(thunderstruck) my God! But – look here –' (Mr Birling) • '(agitated) I don't believe it. I won't believe it...' (Mrs Birling)
Capitalism	Businesses are privately owned. Profit and personal wealth are the most important thing.			End of Act 3	• The younger generation stand up to the older generation who dismiss their concerns. • 'It frightens me the way you talk' (Sheila) • 'Go to bed then, and don't stand there being hysterical' (Mr Birling) • The telephone rings for a second time (sharply) • 'They stare guiltily and dumbfounded. The curtain falls'
Women	In 1912 women's lives were controlled by their husbands. Women could not vote.				
Morality play	A play that teaches the audience lessons about how to live a good life.				
Polemic	A strong verbal or written attack.				

An Inspector Calls

5.The plot

Act 1	- The Birlings are celebrating the engagement of Sheila Birling to Gerald Croft. - Inspector Goole arrives claiming that a young woman called Eva Smith has just committed suicide. - Eva was employed by Mr Birling and was fired unfairly for organising a strike for higher wages. - Mr Birling refuses to take any responsibility. - She was then hired in a shop, Millwards, where Sheila used her influence and got Eva fired because she was jealous of her. - Sheila feels terrible remorse.
Act 2	- Gerald explains that he met Eva in The Palace (known for prostitutes) - He admits he used Eva as a mistress and leaves upset. - Mrs Birling was also involved; she refused to give Eva (now pregnant), any money when she came to beg for charity. - Mrs Birling is adamant that the father of the child take responsibility. This turns out to be her son, Eric and she is seen as a hypocrite.
Act 3	- Eric admits that he is the father of Eva's child. He feels terrible for what he has done. - The Inspector leaves and they are all shocked. - Gerald returns and informs the Birlings that there is no Inspector Goole working at the local police station. A phone call confirms this. - The final lines in the play state that a girl has just died and they are all to be interviewed by an inspector.

6.Key quotations

Mr Arthur Birling	'Unsinkable, absolutely unsinkable' (Act 1) 'Community and all that nonsense... mixed up like bees in a hive' (Act 1) 'It's my duty to keep labour costs down' (Act 1) '(triumphantly)' (Act 3) 'The famous younger generation, who know it all. They can't even take a joke -' (Act 3)
Mrs Sybil Birling	'A rather cold woman and her husband's social superior' (Stage Directions Act 1) 'Girls of that class' (Act 1) 'You have no power to make me change my mind' (Act 2) 'You slammed the door in her face' (Act 2) 'Its sounded ridiculous to me... I was purposefully justified... (triumphantly).' (Act 2)
Inspector Goole	'The lighting should be pink and intimate then brighter and harder' (Act 1) 'Creates at once an impression of massiveness, solidity, and purposefulness' (Act 1) 'A chain of events' (Act 1) '(massively) - public men have responsibilities as well as privileges' (Act 2) 'We are members of one body. We are responsible for each other' (Act 3) 'If men will not learn that lesson, they'll be taught it in fire and blood and anguish' (Act 3)
Eric Birling	'Half shy, half assertive' (Stage Directions Act 1) 'a chap easily turns nasty... threatened to make a row' (Act 3) 'And that's when it happened. That's the hellish thing' (Act 3) 'You're beginning to pretend now that nothing's really happened' (Act 3)
Sheila Birling	'Pleased with life and rather excited' (Stage Directions Act 1) 'Oh look mummy, isn't it a beauty?' (Act 1) 'I was in a furious temper' (Act 1) 'These girls aren't cheap labour, they're people' (Act 1) 'He's giving us the rope – so that we'll hang ourselves' (Act 2) 'It frightens me... But the point is you don't seem to have learnt anything' (Act 3)
Gerald Croft	'Well-bred young man-about-town' (Stage Directions Act 1) 'Fairy Prince' (Act 2) 'I installed her' (Act 2) 'I'm rather more – upset – by this business than I probably appear to be' (Act 2) 'Everything's all right now, Sheila. What about this ring?' (Act 3)
Eva Smith	'She had far too much to say so she had to go' (Mr Birling, Act 1) 'Counting their pennies in their dingy back bedroom' (Inspector Act 1) 'She lies with a burnt-out inside on a slab' (The Inspector, Act 2) 'As if a girl of that sort would ever refuse money' (Mrs Birling, Act 2) 'She was pretty and a good sport' (Eric, Act 3)



Glenmoor & Winton Academies

High Achievement – High Standards

Part of United Learning

Ethics



Paper 1

Ethics - Relationships

1. Marriage		
Christianity		
Church	Commitment in God's presence.	● <i>"Till death do us part"</i> ● <i>"Two become one flesh"</i>
Rings	Blessed by the priest and represent eternal love.	
Vows	Promises made to each other and God.	
Giving away	Bride's father 'gives' her to husband, as God did with Eve.	
Islam		
Nikah	Contract signed by groom & bride- say 'I accept' 3 times.	● <i>"Allah has created partners so you may take comfort in them"</i> ● <i>"The Provider"- 99 names</i>
Walimah	Celebratory feast-foods for fertility.	
Mahr	Payment from groom to bride to symbolise 'providing'	
Mosque or home	No set venue- Allah is everywhere.	

4. Purpose of Sex		
Christianity-Catholic		
Purpose	Reproduce in loving union.	• “Be fruitful and multiply” • “Continue the species”- Natural Law
Contraception	• Absolutist – immoral. • Over 50% young Catholics ignore this. • Relative– Zika virus.	
Cohabitation	Sinful– remain chaste until marriage as sex makes a couple “one flesh”.	
Christianity-Quakers		
Purpose	Show love /intimacy to a stable partner.	
Contraception	Permitted- we have autonomy and should reduce harmful consequences	Conscience= “small, still voice of God”
Cohabitation	Acceptable if there is love and respect.	

2. Family and Gender Roles		
Christianity		
Family	• Parents deserve respect • Parents teach rituals e.g. Lord's Prayer.	• "Be fruitful and multiply"- Genesis • "Honour thy mother and father"- 10 C
Gender Roles (traditional)	• Wives submit to husbands. • Men- provide finances, women-homemakers.	• "Christ is head of man, Man is head of woman" • "Ordered society"- 5 Primary Precepts
Gender roles (progressive)	• No set roles for husband and wife. • Women can have careers, like Lydia (sold purple cloth)	• "We are all one in Christ" Bible
Islam		
Family	• Children taught religion e.g. how to keep halal. • Grow ummah.	• "Paradise lies at the feet of your mother"- Hadith • "The Provider" 99 Names
Gender roles	• Men are providers and women are nurturers. • Roles set out in nikah.	

5. Same-Sex Relationships		
Christianity		
Catholic	• Immoral– cannot reproduce. • Not permitted eucharist if in sexual relationship.	• Family is "stable union between man and woman" Pope Leo
Quaker	• Accepted– campaigned since 2009. • 'Quaker Rainbow' LGBTQ+ support group.	• "An act that expresses affection is not sinful"- Quaker View of Sex
Islam		
Traditional	• Immoral– forbidden under Sharia Law. • 6 Muslim-majority countries have the death penalty for same-sex.	• "As for two men guilty of lewdness, punish both" • Story of Lut– Cities were destroyed by Allah in response to homosexuality.
Liberal	• Accepted– IMAAN= UK's leading LGBTQ+ Islam charity– group iftars.	• Couples "take comfort" in partner. • Allah is "most merciful"

3. Divorce, Separation & Remarriage		
Christianity- Catholic		
Divorce	• Divorce is morally wrong. • The marriage vows were a commitment made in God's presence. • Seek counselling– Marriage Care.	• <i>“Till death do us part”</i> • <i>“What God has joined let no man separate”</i> • <i>“Ordered society”- 5 Primary Precepts</i>
Separation	A couple may separate (live apart) but remain married.	
Remarriage	• Remarriage is considered adultery, as they are still married in God's eyes. • No eucharist allowed for those who have remarried.	
Islam		
Divorce	• Divorce not encouraged, but allowed. • Cannot divorce during pregnancy. • If wife initiates, she repays the mahr (dowry).	• <i>“Of all things hated by Allah, divorce is hated most.”</i> • Iddah- 3-month trial to fix the marriage.
Remarriage	Remarriage is encouraged as Allah wants us to <i>“take comfort”</i> in our partners.	

6. Gender Roles in Worship		
Christianity– Catholic		
Patriarchal Leadership	● Priests represent Jesus (a man). ● Women can't transubstantiate.	
Women's role	To assist the priest, hand out eucharist, worship with the congregation, nun	
Christianity– Church of England		
Equal Roles	● Women priests ordained since 1994. ● First female Archbishop of Canterbury 2026 (Sarah Mullally)	
Islam		
Traditional	● Male-only imams. ● Prophet Muhammad and the next caliphs (leaders) were all male. ● Men and women sit separately in a Mosque	
Progressive View	● Mariam Mosque in Denmark– jumma prayers female only. ● Ayisha– Led prayers for women. ● <i>"Equal as the teeth of a comb"</i>	

Commitment	Divorce	Roles	Responsibilities	Adultery	Contraception	Gender equality	Cohabitation
Being dedicated to something e.g. a marriage.	To legally end a marriage.	A person's position or job in society e.g. leadership.	Actions you are expected to carry out.	When a married person has sex with someone who is not their husband/wife.	Methods used to prevent pregnancy or STIs.	People of all genders having the same rights and opportunities.	To live together in a sexual relationship without being married.



Paper 1

Ethics - Issues of Life & Death

1. Creation	
Origin of the universe	
Christian	Humanist
The universe was designed by an omnipotent God (Father). Genesis 1: - Universe created ex nihilo - God spoke the world into existence "Let there be light". Design Argument: Paley's 'Watch Analogy' supports the idea of a designer due to the complexity of the world.	Universe is here by chance Big Bang Theory: Developed by Stephen Hawking - Universe is expanding from a singularity (13.7 billion years ago). - Red shift & background radiation from the explosion= evidence.
Origin of humans	
Christian	Humanist
Genesis 2: - Adam= dust, Eve=rib - Adam receives "breath of life" (soul) - Created on day 6 as the 'pinnacle'. - Created in the 'imago dei' - sharing a likeness to God.	Evolution: Charles Darwin - Natural selection- Useful mutations are passed down through offspring. - Survival of the fittest e.g. finches beaks. - Richard Dawkins (atheist)- Gene centred view of evolution. "We are survival machines".
2. Christian Interpretations of Genesis	
Fundamentalist: Evangelical Young Earth Creationist (Ken Ham)	- Literal interpretation- Genesis is a factual, historical account. - World is 10,000 years old (tracing back Adam and Eve's family tree).
Progressive Catholic	- Allegory- Genesis is not a historical account, but has hidden meanings eg. companionship. 40 different authors, 2000 yrs old, mistranslated. - Theistic guided evolution- God guided evolution over 7 'yom' (period of time) - Big Bang- God is the first cause of the Big Bang (proposed by George LeMaitre)

3. Environment			
Christianity			
Stewardship	A God-given special responsibility to care for creation and be global citizens .	"Care and cultivate" Garden of Eden (Genesis).	Christian Climate Action- Work with Extinction Rebellion e.g. blocking London roads, prayer for climate justice, Salisbury Cathedral banner.
Responsible dominion	God-given power to rule over nature on God's behalf. God's gift to humans.	"Rule over the fish of the sea and birds of the sky" (Genesis)	e.g. Fossil fuels, meat industry, deforestation is necessary for resources and space for humans.
Humanism			
Humanist Climate Action	Volunteers from Humanists UK who aim to promote sustainable living and raise awareness of the environmental crisis and how to tackle these issues.		Write to MPs, 'Plant a humanist forest'- A 2022 project, use renewable energy, limit carbon footprint.
Utilitarianism	'greatest good for greatest number' - Humans have a duty to leave a legacy for future generations of a healthy planet (global citizenship)		Climate change causes negative impact for humans e.g. climate refugees. Working to reduce this promotes the greater good.

4. Sanctity of life vs. Speciesism	
Religious view- Christianity and Islam	
Sanctity of life	- All life is sacred and belongs to God. - Human life should be treated with dignity and respect. - We have a soul "Breath of life".
Humanist view	
Equality of all life forms	- All sentient beings (ability to experience pain/pleasure) are important "the question is not can they talk, but can they suffer". - Against animal testing eg. PETA campaigns/ LUSH products (Poole).
Speciesism (Peter Singer)	- Religious attitudes are speciesist as they encourage humans to discriminate against other species "Christianity is our foe". - Humans evolved from animals so are not special. Rejects the concept of sanctity of life as the soul does not exist.

5. Abortion	
Pro-life: Unborn life should be protected.	
Catholic (absolute morality)	- Abortion is "never the lesser of two evils" Pope Francis ie. always wrong. - Against Primary Precept to 'Preserve Life' "Thou shall not kill". - Life begins at conception. "Before I formed you in the womb, I knew you".
Islam - Can be acceptable (halal)	- Not allowed for financial reasons (zakat can be used): "Do not kill your children for fear of poverty" Qur'an - Acceptable before the foetus receives a 'ruh' (soul) at 120 days.
Pro-choice: Pregnant women should have the right to choose.	
Humanist (relative morality)	- We have autonomy (control) over our bodies, not God - We should approach difficult situations with empathy. - Utilitarianism- "Greatest good..." - Reduces backstreet abortions.

Quality of life	Sanctity of life	Afterlife	Evolution	Global Citizenship	Euthanasia	Abortion	Environmental sustainability	Soul
The standard of health or happiness experienced by an individual.	All life is sacred and given by God.	The belief that life continues after death.	The process where physical characteristics of living creatures change over time.	The collective responsibility to look after the world.	Assisted suicide- ending a patient's life to relieve suffering.	The deliberate termination of a foetus up to 24 weeks.	To use natural resources responsibly to preserve them for future generations.	Non-physical, immortal part of a human.



Paper 1

Ethics - Issues of Life & Death

1. Euthanasia	
Catholic (absolutist-always wrong)	“It is a false act of compassion”- Pope Francis - Alternative is hospice palliative care eg. Forest Holme Hospice - Opposes Preserve Life precept
Islam (rarely acceptable)	- Active euthanasia wrong. Passive euthanasia may be allowed (brain-dead). “The term of every life is fixed by Allah”- interrupting Al-Qadr unless Allah has decided.
Humanism (individual’s choice)	- Allow if quality of life is poor. - We should have autonomy over our bodies (e.g Paul Lamb). - Dignity in Dying= campaign to legalise euthanasia in the UK, like Dignitas in Switzerland. - Terminally Ill Adults Bill faced scrutiny and blocked in House of Lords.

2. The Soul	
Dualism	The belief that we are made up of a spiritual soul & physical body.
Christianity	
God-given	“Breath of life” (Genesis)
Sanctity of life	“You body is a temple of the Holy Spirit”
Immortal	Our soul will live forever.
Islam	
Ruh	The Arabic word for soul. Ruh given at 120 days after conception.
Fitrah	Our souls have inner knowledge of Allah & good/evil.
Humanism	
Materialism	The belief that only the physical world is all there is (proven by empirical evidence).
Bertrand Russell	A Humanist philosopher- “When I die, my body shall rot. No part of shall survive.”

3. Judgement		
Christianity: judged on a mixture of faith and good works.		
Bodily resurrection	On Judgement Day we will be raised with new, immortal bodies (as Jesus did at the ascension). Rapture- Evangelical belief.	“The body is sown perishable and raised imperishable” (Bible).
Parable of the sheep & Goats	Jesus will judge everybody and those who have helped the least fortunate will go to Heaven.	“When I was hungry, you fed me”- Jesus
Islam: judged on faith and good deeds/intentions (niyyah).		
Barzakh	- A cold sleep our ‘ruh’ waits in until Day of Judgement. - Asked three questions in ‘the trial of the grave’ to determine peace experienced during barzakh.	
Noble recorders	Angels Raqib and Atid write down our deeds and niyyah in two books, ready to be weighed on Day of Judgement. This will determine how successfully we cross bridge of as-sirat.	
Day of Judgement	- Allah is ‘most-just’ and will judge us on our book of good and bad deeds presented by Raqib and Atid. - Dunya (earthly life) is a test from Allah.	

4.Afterlife		
Fundamentalist View: Real, physical places we will be resurrected to.		Progressive view: Spiritual existence/ feeling.
Heaven: - God created the “Heavens and the Earth” Genesis. - Will be united with God, angels, a new “tree of life.”		Heaven: - A feeling of closeness to God and comfort. “Heaven is within you” - Universalism- an omnibenevolent God would not send anyone to Hell.
Hell: - An eternal place of torture- darkness and fire. Sinners will join Satan. “Weeping and gnashing of teeth” (Bible).		Hell: - A state of separation from God. “Sinners will not reach eternal life”- not existing in any kind of afterlife is punishment enough. - Not physical place as disproven by science.
Islam: Akhirah (the everlasting life after death)		
Real, physical places.	As evidenced in the Qur’an (literal) and by Prophet Muhammed’s flight up to Jannah on the Night Journey with Angel Jibril.	
As-Sirat	Bridge to Jannah which is “thin as a hair and sharp as a sword”	
Jannah	Paradise with “rivers of milk & honey”, united with Allah. 7 stages- the prophets and angels are already in Jannah.	
Jahannam	A place of torture. For those who disbelieve “garments of fire”. 7 stages that increase in torment- the 7 th stage is for hypocrites.	
Humanism		
No afterlife	- There is no immortal part to us. No expectation of reward. - Should live this life being empathetic and respecting Human Rights as only our legacy will live on.	Bertrand Russell- “the things we care for will continue”

5.Funerals	
Christian Practice	Link to afterlife
Prayers and Hymns	Communicating with God in the hope the deceased with achieve a place in heaven.
Candles	Physical representation of hope and light– Jesus leading us to salvation.
Burial (coffin)	Ready for physical resurrection. “I am the resurrection and the life”.
Islamic Practice	Link to afterlife
Shahadah	- Said as a reminder of a Muslims lifelong faith. “There is no God but Allah and Muhammad is his messenger”. - Will support their experience in barzakh.
Buried in a white shroud, facing Mecca.	- This garment represents equality in death “equal as the teeth of a comb”. - Muslims aim to be buried in the same white shroud they wore on Hajj. - Sunnah act- commanded by Muhammed.
Humanist Practice	Link to afterlife
Celebrant	Celebrant supports family in remembering loved one
Music / eulogy	Focus on the legacy and memories of the loved one, no afterlife



Paper 1

Ethics - Good & Evil

1.Morality:		
Absolute morality	When an action is always right/wrong, regardless of the situation.	
Bible	Contains laws e.g. 10 Commandments	<i>Thou shall not kill/lie/ commit adultery</i>
Natural Law (Thomas Aquinas)	Catholics use of reason to act according to God's law.	<i>Preserve life / Live in an orderly society / Worship God/ Educate children/ Reproduce</i>
Qur'an	Literal word of Allah revealed to Prophet Muhammad.	<i>"Nor take life, which God has made sacred, except for just cause."</i>
Relative morality	When the rightness/wrongness of an action depends on the situation.	
Jesus' example	Jesus preached agape love.	<i>"Let he who is without sin cast the first stone"</i>
Virtues	Christian character traits.	Faith, hope, and charity.
Conscience	An internal voice guiding moral decisions.	<i>"Small, still voice of God."</i>
Sharia Law	Moral code derived from the Qur'an and Hadiths.	Food laws (Halal, Haram)
Fitrah	Inner sense of right and wrong.	<i>"Allah is closer than your jugular vein"</i>

2.Capital punishment (Death penalty)		
Christianity		
Fundamentalist (Evangelical)	In favour —acceptable as deterrent/retribution.	<i>"Eye for an eye, tooth for a tooth, life for a life" Old Testament</i>
Progressive (Catholic)	Against —Reform is more important as human life is sacred.	<i>"Forgive not seven times, but seventy times seven" Jesus</i>
Islam		
Fundamentalist	In favour —Acceptable to "protect the ummah" if there is "just cause".	<i>"Just cause" debated e.g. murder, adultery, homosexuality.</i>
Progressive	Against —Death penalty is inhumane.	Allah's 99 names "most merciful"

3.The problem of evil	
Problem of Evil	"If God is omniscient and omnibenevolent, why does suffering exist? - EPICURUS
Theodicy	Justifying God's existence in the face of evil and suffering
Moral evil	Evil and suffering caused by human actions (e.g. murder)
Natural Evil	Evil and suffering caused by nature (e.g. disease, earthquakes)
Christianity—origins and responses	
Theodicy of Job	• Origin: God allowed Satan to test Job's faith. • God's omniscience is beyond human understanding • God asks Job questions about the universe to show how Job cannot grasp God's ultimate plan – he is omniscient
Original sin theodicy	• Origin: Evil comes from human free will, not God. • Adam and Eve's choice to disobey led to sin entering the world (The Fall)
Soul- making theodicy	• Origin: God allows suffering as humans are still in the creation process (Imago Dei but not perfect) • Evil helps to grow spiritually to become worthy of heaven (Irenaeus) • Humans must have 'mastered temptation' and make responsible choices (John Hick)
Islam—origins and responses	
Shaytan	• Origin: Evil is caused by the devil or Shaytan's temptations • The refusal of Shaytan (Satan/the Devil) to bow down to Adam when ordered to by Allah. • 'Beware Shaytan in the small things' (Final Sermon)
Al Qadr	• Origin: suffering is part of Allah's divine plan (predestination) "most-wise" • If Muslims respond with patience and remain firm in their faith, they will be rewarded in Jannah.

4.Treatment of prisoners	
Prison Chaplains	 • Religious volunteers e.g. Salvation Army • Provide pastoral care e.g. emotional counselling • Perform religious services e.g. prayers, baptism • Access to religious texts, prayer mat and halal food
Prison reformers	 • Activists who work with and lobby the government to improve the prison system e.g. access to education, less overcrowding, rehabilitation. • Prison Reform Trust UK – charity that campaigns and lobbies the government for better prison conditions

5.Crime & Punishment		
Causes of Crime	Social, financial, personal	E.g. peer pressure, upbringing financial debt, addiction
Aims of punishment		
Reform	To improve a criminal's moral character e.g. education, counselling (Norway 20%)	<i>"Love your enemies" Christianity</i>
		
Retribution	Revenge on behalf of victim e.g. fine for stealing	<i>"Eye for an eye, life for a life" Christianity</i> <i>"Let harm be met by equal harm." Islam</i>
		
Deterrent	To prevent/discourage people from committing crimes e.g. death penalty.	<i>"As to the thief, cut off their hands" Islam</i>
		
Protection	To protect society from the criminal e.g. 'whole life order' - Wayne Couzens (police officer who killed Sarah Everard).	<i>"Protect the ummah" Islam</i>
		
6.Forgiveness		
Christianity		
Mercy	The merciful will achieve salvation once decided by God on Judgement Day <i>"Forgive us our trespasses" Lords Prayer</i>	
Jesus	Forgave humanity <i>"Forgive them Father."</i>	
Gee Walker		Forgave her son's murderers (racial attack)
Islam		
Allah	<i>"Most merciful" 99 names</i>	
Prophet Muhammad	Forgave the slave who murdered his uncle Hamza in Battle of Uhud. <i>"Paradise is for those who curb their anger"</i>	
Farid Ahmed		Forgave his wife's killer (Christchurch mosque attack, 2019). <i>"I don't want a heart boiling like a volcano."</i>

Morality	Free Will	Good	Evil	Sin	Justice	Punishment	Forgiveness
Standards that determine right from wrong (e.g. absolute)	To make decisions freely	Actions that are beneficial and are morally right.	Actions that are morally wrong (e.g. murder)	A deliberate wrong action that violates a religious law.	Where people are treated fairly and equally in a society.	A penalty given to someone for a crime or wrong they have done.	To give up the desire for revenge.



Paper 1

Ethics - Human Rights

1. Personal conviction		
Example	Actions against the law	Personal Conviction
Oscar Romero Archbishop of El Salvador	- Stood up against corrupt government (heavily censored freedom of speech). - Broadcasted names of the dead on the radio. - Met with the Pope and handed him a folder of Human Rights abuses. - Shot dead by the army.	All humans should be treated with dignity. Right to life/ free speech.
Example	Actions against the law	Personal Conviction
Malala Yousafzai Muslim school-girl from Pakistan	- Stood up against the Taliban regime - Continued going to school (shot on bus). - Wrote a blog about her experiences. - Gave interviews to the media eg. BBC. - Eg. Malala Fund-invest in girls education programmes.	- Human Right to an education. Religious inspiration - Khadija (Prophet Muhammed's first wife=educated businesswoman. "Equal as the teeth of a comb". Hadith.

2. Religious Expression (ways to show your religion).		
	Christianity	Islam
Action	Protesting against abortion (pro-life campaigners).	Five pillars, e.g. Salah (prayer), Hajj (pilgrimage) or zakat.
Clothes	Wearing the crucifix to represent Jesus' sacrifice.	Wearing hijab, niqab or burka: "guard your modesty" (Qur'an).
Words	Evangelism (converting others): "go and preach the gospel".	Stating the shahadah "There is only one God, Allah".

3. Extremism- should not ALWAYS be free to express beliefs.		
Anti-Abortion	George Tiller (a doctor) murdered by anti-abortion militant.	
KKK	Extreme white-supremacist group. Claim to be Christian. Committed violent lynchings of black people.	
Westboro Baptist Church	Anti LGBTQ+ (homophobic campaigns on sidewalk). Picket funerals of homosexual soldiers.	
ISIS	- Use violence to create an Islamic state e.g. Manchester arena bombing. - Criticised as ISIS do not represent Muslims- #notinmyname.campaign.	

4. Prejudice and discrimination		
CHRISTIANITY		
DISCRIMINATING (work to be done)	Same-sex marriage not permitted in Catholic church (anti Right to Marry). Pope Francis- Women will never be ordained as priests (anti Equality Act).	
EXPERIENCING DISCRIMINATION	Christianophobia - Christians treated with disrespect. e.g. Greggs Christmas advert. e.g. Belfast Bakery- 'gay cake' case.	
Christians have 'done enough' to tackle discrimination.	1 in 7 Christians are Persecuted globally e.g. North Korea 60,000 in labour camps. Open Doors (Christian charity) supports.	
ISLAM		
DISCRIMINATING (work to be done)	Same-sex relationships are illegal and punishable by death penalty in many Muslim-majority countries.	
EXPERIENCING DISCRIMINATION	2025 UK Government data: nearly 40% of all religiously motivated hate crimes target Muslim communities. 2019 New Zealand Mosque shooting	
Muslims have 'done enough' to tackle discrimination.	IMAAAN- LGBTQ+ support group. Miriam Mosque in Denmark- female imams.	

5. Censorship		
CHRISTIANITY		
Agree-can be positive	Should censor anything immoral that might lead people into sin.	"Bad company corrupts good character" (e.g. pornography).
Against- views should be shared	Christians believe it is their 'Right to Religion' to preach their faith publicly (evangelism).	Jesus told his disciples to "go and preach the gospel". E.g. Pro-life protests.
ISLAM		
Agree-Can be positive	- Censor images of Allah or the prophets. - Censor actions of ISIS.	- Shirk- sin of worshipping anything other than Allah. "If you have killed one man, it is as if you have killed humanity".
Against-religion should be visible.	Oppose censorship of religious clothing e.g. France. #Handsoffmyhijab	"Women should guard their modesty" - Islamophobic law.

6. Racism		
CHRISTIANITY		
Martin Luther King Jr	Baptist Minister and Civil Rights activist in 1960s USA- facing segregation Laws that separated white and black people. - Led peaceful marches (eg. Washington DC), sit ins and Montgomery Bus Boycott. Used pacifist methods. 'I have a dream' speech, which involved the Biblical teaching "All one in Christ".	
Church accused of Racism	- Christians used Biblical teachings to support slavery. E.g. the belief that Africans were descendants of Ham and were cursed due to the colour of their skin. - Abraham owned slaves without God's disapproval. 1 in 25 of the Church of England's serving clergy belong to an ethnic minority.	
Fighting against racism	Quakers- first Christian denomination to be classed as 'abolitionists' (helping slaves to escape via the underground railroad system). Agape in action.	
ISLAM		
Malcolm X	- Previously supported 'African racial superiority', called white people 'the devil'. - Changed views after Hajj- saw all races as equal.	
Qur'an	"Allah made Adam from soil of many colours"- celebrates diversity.	

7. Wealth and charity		
CHRISTIANITY		
Attitude	Money should not be worshipped- greed is a sin.	"Love of money is the root of all evil"
Acquisition (earn)	Christians should choose a job that benefits others e.g. doctor.	Gambling encourages greed (one of seven deadly sins) and love of money.
Use of wealth	Voluntary Tithe (10%) should help others in need (agape), or support church growth.	"Blessed are the poor" "Release the oppressed" Jesus.
Examples: Christian Aid & Tearfund	- They aim to end poverty and injustice worldwide. - Respond to humanitarian conflict eg. Crisis in the Middle East and natural disasters eg. floods in Pakistan, showing agape in action. - Pray for climate justice and develop sustainable farming in LEDC's.	
ISLAM		
Attitude	All wealth is Allah's (the provider)	Al Qadr; Inshallah (if Allah wills it).
Acquisition (earn)	Riba (earning interest charged on loans) is forbidden.	"Do not consume one another's wealth unjustly"- Allah is 'most-just'.
Use of wealth (spend)	Compulsory zakat (2.5%) should be given towards the poor, orphans and those in need. Sadaqah - extra act of giving.	"Protect the ummah" (Hadith) "Give your wealth in Zakat" Muhammed's Final Sermon.
Example: Islamic Relief & NZF.	- Palestine emergency appeal (overseas aid and orphan sponsorship programme for victims in Gaza). - Helping respond to Relative poverty in the UK- Hardship Relief Fund.	

Dignity	Censorship	Discrimination	Extremism	Human Rights	Personal Conviction	Prejudice	Relative Poverty	Absolute Poverty	Social Justice
Human life is valuable and should be respected.	Stopping something being said or worn as it may be offensive.	Treating people differently based on prejudice.	Believing in ideas that are very different from what the rest of society believe e.g. ISIS.	Rights that all humans have and are entitled to e.g. Right to Free Speech.	Something a person believes strongly e.g. Malala believed in education rights.	Prejudging people without good reason.	Being poor compared to others in the country.	Being so poor that basic needs aren't met e.g. food.	Ensuring everybody has equal rights e.g. MLK.

16

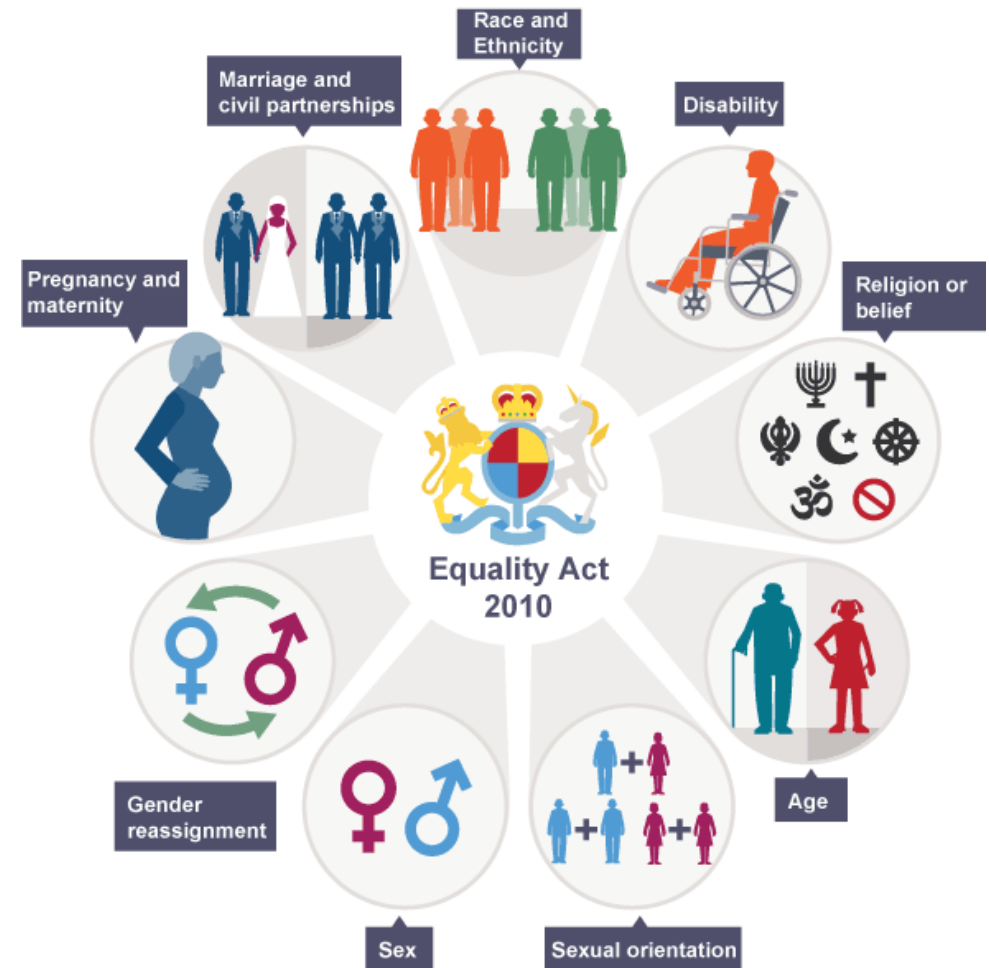
Paper 1

Ethics - Human Rights

UDHR

Universal Declaration of Human Rights
Established by the United Nations in 1948.
Outlines 30 fundamental rights and freedoms.

1 Equality Everyone is born free and equal in dignity and with rights.	2 Freedom from Discrimination You should never be discriminated against for any reason.	3 Life, Liberty and Security Everyone has the right to life, liberty and personal security.
4 Freedom from Slavery No-one shall be held in slavery or servitude.	5 Freedom from Torture No-one shall be subjected to torture or to cruel or degrading treatment.	6 Recognition as Person Before Law You have the right to be treated as a person in the eyes of the law.
7 Equality Before the Law You have the right to be treated by the law in the same way as everyone else.	8 Remedy by Tribunal You have the right to remedy by competent tribunal.	9 Freedom from arbitrary arrest No-one shall be subject to arbitrary arrest, detention or exile.
10 Fair Public Hearing You have the right to a fair public hearing.	11 Innocent until Proven Guilty You have the right to be considered innocent until proven guilty.	12 Privacy No-one has the right to interfere with your privacy, family, or home.
13 Freedom of Movement You have the right to freedom of movement in and out of the country.	14 Asylum You have the right to seek asylum in other countries from persecution.	15 Nationality You have the right to a nationality.
16 Marriage and Family You have the right to marriage and to raise a family.	17 Property You have the right to own property.	18 Freedom of Belief You have the right to freedom of belief and religion.
19 Freedom of Opinion You have the right to freedom of opinion and expression.	20 Freedom of Assembly You have the right to freedom of peaceful assembly and association.	21 Take Part in Government You have the right to take part in the government of your country.
22 Social Security You have the right to social security.	23 Work You have the right to desirable work and to join trade unions.	24 Rest and Leisure You have the right to rest and leisure.
25 Adequate Living Standard You have the right to a decent life, including food, clothing, housing, and medical care.	26 Education You have the right to education.	27 Participate in Cultural Life You have the right to Participate in the Cultural Life of Community.
28 Social Order You have the Right to a Social Order that Articulates this Document.	29 Mutual Responsibility We all have a responsibility to the people around us and should protect their rights and freedoms.	30 Freedom from State or Personal Interference There is nothing in this declaration that justifies any person or country taking away the rights to which we are all entitled.



Equality Act 2010 (UK Law)

The Act protects individuals who possess any of the nine specified "protected characteristics."



Paper 2

Ethics - Christianity Beliefs

1. Nature of God						
Omnibenevolent All-loving	<i>"For God so loved the world that He sent His only Son"</i>					
Omniscient All-knowing	<i>"Even the very hairs on your head are numbered."</i>					
Omnipotent All-powerful	God created world <i>'ex nihilo'</i>					
The Trinity	Father: Creator and source of all, speaks universe into creation Son (Jesus): God in human form (incarnation) involved in creation <i>"The Word was with God and became flesh"</i> Holy Spirit: the presence of God e.g. <i>breath of life</i> , spirit was <i>"hovering over the waters"</i>					
CHRISTIAN RESPONSES TO THE PROBLEM OF EVIL (THEODICY)						
Original Sin Theodicy	- Evil is a result of human's misuse of free will, not God. - Adam and Eve's choice to disobey led to sin entering the world (The Fall).					
Theodicy of Job	- We must trust in God's omniscience, he is beyond human understanding - Humans cannot grasp God's ultimate plan					
Soul-making Theodicy	- God allows suffering as it helps to grow spiritually to become worthy of heaven (Irenaeus) - Evil exists to make us better people and we must have <i>'mastered temptation'</i> and make responsible choices (John Hick)					
4. Life of Jesus						
Incarnation: God in human form, the miraculous birth of Jesus - Gabriel announced to Mary/born in a stable demonstrating humility. <i>"If you have seen me, you have seen the Father."</i> - Fulfilled Isaiah's prophecy of a Messiah (saviour)— <i>"born of a virgin"</i>						
Crucifixion: Jesus was nailed to a cross (Good Friday) - Carried his own cross/crown of thorns/pierced with spear by Roman <i>"Forgive them Father for they know not what they do."</i> - Fulfilled Isai's prophecy of a Messiah (saviour) <i>"pierced for our transgressions"</i>. Act of atonement: Jesus' death heals the rift between God and humans.						
Resurrection: Jesus rose from the dead 3 days after death (Easter Sunday). - Empty tomb found by Mary/appeared to his disciples on the Road of Emmaus and Doubting Thomas touched his wounds. <i>"He appeared to more than 500 brothers and sisters"</i>. - Victory over death shows believers can have eternal life.						
Ascension: Jesus physically rose up to Heaven (40 days after resurrection). - Disciples witness Jesus ascension, from a hill in Bethany, angels lifted Jesus behind the clouds (omnipotence). - Jesus said <i>"Go and preach the gospel"</i> - evangelise/spread his message (The Great Commission). - Jesus said <i>"I will be with you always"</i> (Holy Spirit guides Christians today—omnipresence).						
2. Creation						
GENESIS 1—CREATION OF THE UNIVERSE						
Ex nihilo: From nothing	'God said, <i>"Let there be light."</i> ' (The Father)					
Creation (6 days)	<i>"God saw that it was good"</i> - it is perfect					
Imago Dei: Image of God	<i>"He created them in His image."</i>					
GENESIS 2—CREATION OF HUMANS						
Adam	Made from dust, given a soul (<i>"breath of life"</i>)					
Eve	Made from Adam's rib, made as a ' companion ' for Adam					
ROLE AND NATURE OF HUMANS						
Nature	- Made in the image of God (Imago Dei) - Sinful by nature (original sin)					
Role	To reproduce—<i>"fill the earth and subdue it"</i> To have dominion—<i>"rule over the fish of the sea..."</i> To be stewards—<i>"care and cultivate"</i>					
5. Salvation						
How we achieve salvation						
Faith	- Faith in Jesus is necessary for salvation. Jesus said <i>"those who believe in me shall not die"</i> e.g. penitent thief. - Bible is a guide for Christians on how to live. Protestants: Bible is the highest authority. Salvation can be achieved by faith alone.					
Sacraments	Catholics: God's grace (unconditional love) and blessing is achieved through the sacraments e.g. baptism, eucharist. <i>"No-one can enter Heaven, unless born of water"</i>.					
Good works	Quakers: Jesus' teachings (e.g. agape love, forgiveness) inspires good works - Parable of the Sheep and the Goats: <i>"when I was hungry you fed me"</i>. <i>"Faith without action is dead"</i> (New Testament).					
Holy Spirit	Evangelicals: connecting to the Holy Spirit in worship to receive spiritual and physical healing (God's grace).					
Universalism	An omnibenevolent God would offer His grace and salvation to all					
3. Interpretations of Creation						
PROGRESSIVE (modern)						
Genesis = an allegory	- God did not make the universe in exactly 7 days (<i>"yom"</i>= Hebrew - 'period of time'). - Look for the deeper message e.g. Genesis shows God's omnipotence.					
Theistic-Guided Evolution	God started evolution process (George Lemaitre) and guides it					
The Big Bang	God is the first cause - caused the Big Bang ex nihilo .					
FUNDAMENTALIST (traditional)						
Genesis = a literal account	- The Genesis story is 100% accurate. <i>'Scripture is God-breathed.'</i> - Young Earth Creationists: Earth = 10,000 years old (tracing back Biblical family tree)					
Reject scientific theories	Evolution is a test of faith - humans were made special (imago dei) God carefully designed creation (Design Argument) therefore it cannot be random					
6. Afterlife (Eschatology)						
Judgement Day	Jesus will save those who have helped others. (The Parable of the Sheep and the Goats)					
	<table><tr><th>Fundamental View: Real physical place</th><th>Progressive view: Spiritual existence</th></tr><tr><td rowspan="2">Heaven <i>"God created the Heavens and the Earth"</i> - Will be united with God, angels, a new <i>"tree of life."</i> Bodily resurrection <i>"The body is sown perishable and raised imperishable"</i> </td><td> - A feeling of closeness to God and comfort: <i>"Heaven is within you"</i> Universalism- an omnibenevolent God would not send anyone to Hell. </td></tr><tr><td> - A state of separation from God. <i>"Sinners will not reach eternal life"</i> - not existing in any kind of afterlife is punishment enough. - Not physical place as disproven by science </td></tr></table>	Fundamental View: Real physical place	Progressive view: Spiritual existence	Heaven <i>"God created the Heavens and the Earth"</i> - Will be united with God, angels, a new <i>"tree of life."</i> Bodily resurrection <i>"The body is sown perishable and raised imperishable"</i>	- A feeling of closeness to God and comfort: <i>"Heaven is within you"</i> Universalism- an omnibenevolent God would not send anyone to Hell.	- A state of separation from God. <i>"Sinners will not reach eternal life"</i> - not existing in any kind of afterlife is punishment enough. - Not physical place as disproven by science
Fundamental View: Real physical place	Progressive view: Spiritual existence					
Heaven <i>"God created the Heavens and the Earth"</i> - Will be united with God, angels, a new <i>"tree of life."</i> Bodily resurrection <i>"The body is sown perishable and raised imperishable"</i>	- A feeling of closeness to God and comfort: <i>"Heaven is within you"</i> Universalism- an omnibenevolent God would not send anyone to Hell.					
	- A state of separation from God. <i>"Sinners will not reach eternal life"</i> - not existing in any kind of afterlife is punishment enough. - Not physical place as disproven by science					
Hell	- An eternal place of torture & darkness. Sinners will join Satan <i>"Weeping and gnashing of teeth"</i> (Bible)					

Omnipotent	Omnibenevolent	Trinity	Salvation	Atonement	Incarnation	Resurrection	Sacraments	Evangelism
God is all powerful.	God is all loving.	The three forms of God: The Father, Son and the Holy Spirit.	To be saved from sin and death. The aim of all Christians.	Jesus' death heals the rift between God and humans.	God in human form/flesh.	Jesus rising from the dead 3 days after his crucifixion.	Rituals that bring a blessing from God e.g. Eucharist.	Spreading the teachings of Christianity with the intent to convert others.



2021 Census	2011 Census
46.2% Christian	59.3% Christian
37.2% No religion	25.2% No religion
6.5% Muslim	4.9% Muslim

Paper 2

Ethics - Christianity Practices

1. Liturgical worship (Catholic)		
Style	Traditional worship style that follows a set pattern or structure.	
Importance and benefits	✓ Follows tradition and connects to past Christians (taught by Jesus). ✓ Easy to memorise or follow, requires little personal inspiration. ✓ Feeling of communal worship “where two or more gather...	
During worship:		
	How	Evidence
Sacraments	Rituals performed in church as part of a service by a priest. ● Transubstantiation of eucharist. ● Infant baptism with God-parents present, vows and holy water.	Eucharist- “This is my body broken for you”. Baptism- “No-one can enter Heaven unless born of water”.
Set prayer	A prayer that is scripted and recited aloud. ● Example= Lord’s Prayer. ● Taught by Jesus during his Sermon on the Mount. ● Aim= to teach his disciples to pray and allow Christians to build a better connection with God through communication.	“Hallowed be thy name”. “Forgive us our sins” “Give us this day our daily bread” FACTS- praise, confession, supplication.
2. Informal worship (Evangelical/ Protestant)		
Style	Spontaneous, lively worship that is free flowing and led by a pastor.	
Importance and benefits	✓ Bodies inherited by the Holy Spirit ✓ Connects to the actions of the disciples during Pentecost. ✓ Attracts younger believers and is inclusive to all.	
During worship:		
	How	Evidence
Sacraments	Rituals performed in concert halls and contemporary buildings led by a pastor. ● Memorialism- the eucharist is symbolic of Jesus’ sacrifice. ● Believers baptism- submerged in a baptismal pool after a personal testimony.	Eucharist- “Do this in memory of me”. Baptism- Jesus baptised in the River Jordan. E.g. Catch the fire church Bournemouth Beach baptisms.
Personal prayer	Improvised prayer from the heart. Feel the grace of God through the Holy Spirit.	“Speaking in tongues”.
3a. Individual worship (Quakers)		
Style	Worship that either happens alone, or in a group but in silent contemplation.	
Importance and benefits	✓ Grace delivered through the Holy Spirit when Quakers stand up to give ministry. ✓ Develops a closer, deeper and more genuine relationship with God.	

3b. Individual worship (Quakers)		
During worship:		
	How	Evidence
Sacraments	Rituals performed in concert halls and contemporary buildings led by a pastor. • Memorialism- the eucharist is symbolic of Jesus' sacrifice. • Believers baptism- submerged in a baptismal pool after a personal testimony.	Eucharist- "Do this in memory of me". Baptism- Jesus baptised in the River Jordan. E.g. Catch the fire church Bournemouth Beach baptisms.
Personal prayer	Quakers connect to their conscience and pray for social justice in the world.	"Small still voice of God".
4. Pilgrimage		
Taize (Tayzay) France	100,000 young pilgrims attend each year (youth camps). Importance=ecumenical focus "All one in Christ". Makes Christianity more attractive to wider audiences.	A week of camping, no luxuries and participation in chores. Importance= removes pride and greed "love of money is the root of all evil". Connects Christians with Jesus' humble outlook.
Walsingham Norfolk, UK	Walk barefoot for a mile from the Slipper Chapel to the Holy House. Importance= act of penance. Replicating Jesus' suffering.	Sprinkling of the well daily ceremony. Priest offers pilgrims a sip to drink, marks the cross on their forehead and pours onto hands. Importance= reminds Christians of their baptism, some claim healing properties.
5. Celebrations		
	How	Importance
Christmas Celebrates the Nativity	• Advent wreath or calendar-countdown. • Christingle (orange with candle). • Nativity play- recreating Jesus' humble birth. • Cards and gifts to celebrate God's gift to us. • Midnight Mass	"If you have seen me, you have seen the father"- incarnation. "Born of a virgin"- fulfilled Isaiah's prophecies, miracle showing omnipotence.
Easter Jesus' victory over sin and death	HOLY WEEK Maundy Thursday- The Lord's Prayer followed by the eucharist. Good Friday- stations of the cross in church Easter Sunday- sermon during joyful church service, Easter cards, Easter eggs to symbolise new life and resurrection.	"Wounded victor" God promised in Genesis 3. God's grace and salvation <i>"Pierced for our transgressions"</i> proving his messianic status. <i>"He is risen"</i> - shows omnipotence

6. Church in the UK-		
Role of the Church in the local community		
Religious	Worship services eg. sacraments such as marriage, eucharist, baptism as well as funerals. Showing love and devotion to God.	
Social/ Community functions	Food banks/street pastors/prison chaplains/Salvation Army/Youth Groups/ Nurseries	"When I was...Parable of Sheep & Goats "God is love". Reflecting Jesus' agape love
Is the UK still a Christian country?		
Yes Laws, festivals and traditions	• 26 bishops in House of Lords (total 779) • Laws based on 10 commandments e.g. 'Keep sabbath holy' (Sunday shops close). • Still the biggest religion in the UK (46% Census) • 2 weeks holiday for Christian celebrations. • Church schools eg. Catholic/ C of E	
No Diversity, pluralism and growth in secularism.	• Christmas has become commercialised (Average person spends £1,108) • Only 10% of Christians regularly go to Church • 2011-2021 census (Christianity-59% to 46%) • Increasingly pluralistic society: Islam increased from 4.9% (2011) to 6.5% (2021). • Non- religious increased to 37%. Churches being repurposed eg. Halo/Tesco	
7. Aims of the Worldwide Church: CREP		
Charity	• Showing agape in action by helping others in need • <i>Parable of The Sheep and Goats</i>	
Tearfund	Evangelical organisation that aims to end world hunger and poverty (helped over 50 countries). • Set up 67,000 churches globally. • 'This is Rubbish' campaign- promoting global citizenship. • Zambia- teaching conservation farming for crops.	
Reconciliation	• Resolve conflict between Christians "<i>Blessed are the peacemakers</i>".	
World Council of Churches	Aim to unite all Christians to promote peace, unity and justice " <i>All one in Christ</i> ". • 350 member churches signed up (part of the ecumenical movement). • 100 countries partake in annual prayer week.	
Evangelism	• Encourage church growth e.g. church planting or reverse mission trends (Africa). • "<i>Go and preach the Gospel</i>" e.g. door knocking • Mission: charity projects abroad (Gideons international handing out Bibles to hospitals). • Pentecostal Christians- modern megachurches	
Persecuted Christians (end persecution)	Discrimination against Christians exists in over 50 countries eg. prison, whipping, death penalty. Human Right to Religion denied.	
Past persecution	All but one of Jesus' disciples were martyred e.g. Peter crucified upside down. Oscar Romero shot during mass for his personal conviction inspired by Jesus' liberation theology.	
Open Doors	Set up world watch list, provides Christians in North Korea with Bibles and safe routes to escape. 60,000 Christians currently in labour camps there. <u>Raise awareness</u> for the 1 in 7 Christians facing persecution.	

Omnipotent	Omnibenevolent	Incarnation	Resurrection	Trinity	Sacraments	Evangelism	Atonement
God is all-powerful.	God is all-loving.	God in flesh e.g. Jesus	Jesus rising from the dead three days after his crucifixion.	The belief in one God with three forms- The Father, Son and Holy Spirit.	Rituals that bring a blessing from God e.g. eucharist	Preaching with the intention to convert others to Christianity.	Jesus death on the cross healed the rift between humans and God.



Paper 3

Ethics - Islamic Beliefs

1. Nature of Allah		
QUALITY	DEFINITION	EXAMPLE/TEACHING
TAWHID	The oneness of Allah	Shahadah- “There is no God but Allah...”
BENEFICENCE	Allah works for the benefit of humanity.	Forgave Adam- sent him to earth as the khalifah.
99 NAMES	99 ways to describe Allah	“The most excellent names belong to Allah, use them”
‘MOST MERCIFUL’	Allah’s compassion and forgiveness are endless	
OMNIPOTENT	Allah is all powerful, e.g. did miracles through Isa.	
TRANSCENDENT	Allah is not affected by laws of nature- He exists outside the universe.	
IMMANENT	Allah is close to us	“Allah is closer than your jugular vein”
TAQWA	Constant awareness of Allah	
SHIRK	The sin of worshipping other idols	

2. Akhirah (Afterlife)		
BARZAKH	Soul taken by Azrail to barzakh.	
3 QUESTIONS	Two angels ask 3 questions- <i>who is your prophet/ god/your religion?</i> Determines barzakh comfort	
JUDGEMENT	Raqib and Atid presents Allah with our book, then read aloud and weighed. “Whoever does an atoms weight of good will see it, and whoever does an atoms weight of evil will see it”	
AS-SIRAT	Bridge over Jahannam into Jannah- “thin as a hair /sharp as a sword”	
JANNAH	- Garden as eternal reward ‘Rivers of milk and honey’ 7 stages of Heaven 1st stage= water (Adam) 7th stage = divine light (Abraham) - Purpose = an eternal reward for believers who follow Shariah.	JAHANNAM - The depths Physical/mental torture “Garments of fire reserved for disbelievers” 7 stages of torture- darkness, boiling water, winds 1st stage = Least painful, for Muslim sinners 7th stage = The worst level of Hell, for hypocrites - Potentially just temporary “most merciful” - Purpose = a consequence of deliberate sin.
NO FREE WILL		
FREE WILL		
PRE-DESTINATION	- Al-Qadr - Preserved Tablet in Jannah- the destiny of the whole universe is on it - Insha’Allah (if Allah wills it) “The term of every life is fixed by Allah”	- Adalat- Allah is always “just”, always fair - injudgement - Tested Ibrahim’s free will (faith) - Raqib & Atid recording deeds - Life is a test to determine whether we will reach Jannah

3. Risalah (Prophethood)	
NAME	FACTS
ADAM	- First prophet; made from the “soil of many colours” - Built the first Kaaba - Forgiven by Allah for the first sin
IBRAHIM	- Father of Isaac and Ishma’il; founder of the Abrahamic faiths - Destroyed polytheist idols (hanif) & rescued by Allah - Willing to sacrifice his son (Ismail) for Allah - Rebuilt the Kaaba- footprints are there.
ISA	- Not God- just a man. - Virgin birth, performed miracles e.g. brought clay birds to life - Isa was not crucified, Allah sent him straight to Jannah - Will return to defeat the “false messiah”
MUHAMMAD	- Spread Islam in a polytheistic Mecca. - Jibril revealed Qur’an to him over 23 years. - Reclaimed Mecca peacefully and set out rules for lesser jihad - His sayings are recorded in the Hadith. - Known as the ‘seal of the prophets’
IMPORTANCE	- Reveal Allah’s nature to humanity and provide Shar’iah (straight path) “We make no distinction between them”- Qur’an.

4. Kutub (Holy Books)	
BOOK	FACTS
SAHIFAH	First holy scrolls given to Ibrahim but were lost.
TAWRAT (TORAH)	- Book given to Musa (Moses) - Contains laws & ideas on Paradise and Hell
ZABUR (PSALMS)	- Given to Dawud (David) - Contains poems praising Allah and nature
INJIL (GOSPELS)	- The Injils were teachings given to Jesus (Isa) - The Christian Gospels were written by others - Corrupted e.g. Jesus was not crucified
QUR’AN	- Given to Prophet Muhammad on the Night of Power by Angel Jibril. - The literal word of Allah. Written in Arabic. - Hafiz- a Muslim who memorises the Qur’an
HADITH	Records of Muhammed’s teachings– noted by family and friends “Paradise is at the feet of your mother”.
SUNNAH	The sayings, actions and practices of Muhammed.

5. Malaikah (Angels)	
God’s immortal servants, made from light.	
JIBRIL	- Revelation –reveals good news (e.g. Qur’an) - Has seen beauty of Paradise and horror of Hell - Cleansed Muhammad’s heart on Night Journey
MIKAIL	‘Nourisher’ - nourishes plants with rain - Nourishes human souls by protecting us - Keeps Shaytan (satan) out of Paradise
ISRAFIL	- Will blow horn in Jerusalem to start Judgement Day - Overcome by tears 3 times every day and every night at the sight of Hell
RAQIB & ATID	‘Noble recorders’ - Record our deeds and niyyah (thoughts).
SUNNI/SHIA BELIEFS ABOUT ANGELS	
SUNNI	Angels are servants of Allah and have no free will
SHIA	- Angels have limited free will but no desire to sin - Jibril told Prophet Muhammad that Ali should be leader

6. Sunni vs Shia	
SUNNI ISLAM	SHIA ISLAM
Rightful Caliph: Abu -Bakr (Friend)	Rightful Caliph: Ali (Son in law)
6 Articles of Faith	5 Roots in Usul ad-Din -
- Tawhid - Afterlife - Prophets, - Angels - Holy Books	- Tawhid - Afterlife - Prophets - Adalat - Imamate (Imans are spiritual descendants of Prophet Muhammad)

Tawhid	Risalah	Ummah	Mosque	Shariah	Jihad	Halal	Haram	Hanif
The basic Muslim belief in the oneness of Allah.	Messengers and Prophets of Allah e.g. Mohammad	Worldwide community of Muslims	A place of communal worship for Muslims	Means ‘straight path’/ refers to laws in Qur’an.	‘Struggle’- greater is inner struggle and lesser is physical struggle.	Permitted in Islam e.g. food rules.	Forbidden in Islam e.g. eating forbidden foods (pork).	Somebody with inner knowledge of God e.g. Ibrahim



Paper 3

Ethics - Islamic Practices

1. Five Pillars of Islam: core duties for Sunni Muslims		
IBADAH	Each of the Five Pillars is ibadah, an act of worship done intentionally to obey God.	
PILLAR	FACTS	TEACHING
SHAHADAH	- Declaration of faith. - Said at birth, death, reversion and before battle. - Emphasises tawhid (oneness) - Links to Risalah (Muhammed)	<i>"I bear witness there is no God but Allah, and Muhammad is His messenger"</i>
SALAH	- Prayer 5 times a day. Wudu before (cleaning ritual) - Set your niyyah, face Mecca prayer mat, and state "Allahu akbar". - Dua= personal prayers. - Friday prayers at mosque (men) = Jummah	<i>"The first thing a person will be judged on is prayer" (good deed)</i> <i>"Glorify him in the mornings and evenings" Night Journey- Reduced from 50 to 5 times</i>
ZAKAT (GIVING ALMS)	Compulsory 2.5% donated to charity (e.g. poor and travellers). - Islamic Relief= Palestine emergency appeal, orphans. - Voluntary giving = sadaqah	<i>"Those who help the poor are warriors for God's cause"</i> <i>"Protect the ummah"</i>
SAWM	- Fasting (no eating/drinking during daylight hours) in Ramadan. - Iftar (breaking fast in evening) with dates & water (sunnah) - Month of Night of Power (27th night)	<i>"Those who fast are close to God"</i> - Sunnah act- Muhammad fasted during Battle - Shaytan is chained during Ramadan
	WHAT?	WHY?
	Travel to Makkah	Birthplace of Muhammed.
	Wear white robes	State of purity (ihram).
	Circle Kaaba 7 times (tawaf)	Muhammad circled Kaaba as he smashed false idols.
	Drink water from Zam Zam well	To remember Angel Jibril leading Hajar and Ismail to water.
	Collect pebbles from Mount Arafat and pray until sunset	Place of the final sermon "Beware Shaytan". Perform Dua's (forgiveness).
	Throw stones at pillars of Jamarat	To remember Ibrahim rejecting Shaytan's temptation.
	Sacrifice an animal (Id ul-Adha)	To remember Ibrahim being willing to sacrifice Ishmael.

2. Jihad		
TYPE	FACTS	TEACHING
GREATER JIHAD (The inner struggle to be a good Muslim)	Examples: Getting up just before sunrise for Fajr prayer, avoiding temptation e.g. alcohol, giving up desire for revenge (Farid Ahmed: Forgave wife's murderer)	<i>"Paradise is for those who curb their anger and forgive"</i>
LESSER JIHAD (The physical struggle in self defence)	• Can't kill innocent civilians • Can't kill women/children • Must be declared by holy Muslim leader e.g. caliph • Cannot use exceeding force	<i>"Fight for God those who attack you"</i>
Origins	Muhammed peacefully fought the Makkans to defend the ummah and rededicate the Kaaba to tawhid.	
4. Obligatory Acts of Shia		
10 acts that Shia Muslims must perform		
ACT	MEANING	EXPLANATION
SALAH	3 times a day	Combine 5 prayers (Zuh and Asr).
SAWM	Fasting during Ramadan	Shia's will wait until the redness of the sky has completely gone.
PILGRIMAGE	May visit Shia shrines as well as performing Hajj.	May visit martyr Husayn's grave in Karbala (Arba'een- 40 days after Ashura).
KHUMS TAX	20% tax on wealth	Tax for wealthy Shia's to the Imam's and the poor .
TAWALLA	To love those who love Allah	Associate with Muslim who show faith and love e.g. <i>"and Ali is the friend of God"</i> .
TABARRA	To hate those who do not follow Allah	Dissociate with people who do not follow the Qur'an e.g. ISIS <i>"Garments of fire will be cut"</i>

3. Festivals		
FESTIVAL	WHY?	HOW IS IT CELEBRATED?
ID-UL- ADHA (FESTIVAL OF SACRIFICE)	Marks end of Hajj . Remembers Ibrahim's willingness to sacrifice Ismail.	- New clothes, gifts, Salat-ul-Adha (prayer) - Animal sacrificed/ meat shared with poor (Qurbani). - Say '<i>Eid Mubarak</i>'. In Britain: Muslims may ask a halal butcher to slaughter a sheep.
ID-UL-FITR (FESTIVAL OF FAST BREAKING)	3 days to celebrate the end of Ramadan	- Houses decorated e.g. banners/lights. - Special meals. - Say '<i>Eid Mubarak</i>' - Donate Zakat-ul-Fitr In Britain: May take day off work/school, follow UK moon sighting.
NIGHT OF POWER (Laylat Al Qadar)	Remembers Jibril revealing Qur'an to Muhammad. <i>"Holier than 1000 months"</i>	- Stay up praying and reciting Qur'an - Express gratitude for Allah <i>"Allahu Akbar"</i> - Congregational prayer in mosque - Retreat from daily life (focus on worship)
ASHURA	Shia Muslims remember death of martyr Husayn (Ali's son).	- Grieve, wear black, march through streets, re-enactment of Battle of Karbala. Self-flagellation (cut/whip selves) - Visit Husayn's shrine. - In Britain: donate blood, processions.
5. Being a Muslim in the UK		
ISSUE	DIFFICULT?	NOT DIFFICULT?
GREATER JIHAD	Temptation in UK (alcohol, gambling)	Focus on taqwa (God-consciousness)
SAWM	- Longer daylight hours - Routines/customs - Work and school	- Can drink/eat if very ill - Some schools allow no PE/ homework
SALAH	- No time at work/school - No public call to prayer	- Combine prayers to make up for those missed. - Over 2000 active facilities worldwide (mosques, prayer rooms)
HAJJ	- Costs between £4-10k Id-ul-Adha: sacrificing an animal is illegal. 45° heat causes heatstroke.	- Only must go once. - Can have a halal butcher slaughter an animal. Foreign office provides support.
ISLAMO-PHOBIA	2025 UK Government data: nearly 40% of all religiously motivated hate crimes target Muslim communities	Increasingly pluralistic society as shown by Census: Islam increased from 4.9% (2011) to 6.5% (2021)

Tawhid	Prophethood	Halal	Shariah	Haram	Mosque	Ummah	Jihad	Sunnah	Qibla	Hajj
The basic Muslim belief in the Oneness of Allah	Messengers of Allah (e.g. Muhammad)	Permitted (allowed) within Islam	Means 'straight path', refers to laws in Qur'an	Forbidden within Islam (e.g. pork)	Place of communal worship for Muslims	The worldwide Muslim community	'Struggle'- greater is inner struggle and lesser is physical struggle.	'The way of the prophet'. Actions that were performed by Muhammed.	Praying in direction of the Kaaba in Makkah	5-day Pilgrimage to Makkah.



Ethics – Writing structure

5 marks Describe

- Discourse markers
- **Sequential:** 'Firstly...
- **Comparative:** 'Similarly...
- **Adding:** 'Also, Additionally, Moreover...'



5 full sentences, NOT bullet points!
Read the question carefully 'what, why, importance, two'
Use as much tier 3 vocabulary as possible.
Join points together using discourse markers for flow.

2x

P.E.E. Paragraphs

8 marks
Explain



P: State whose perspective you have chosen and their view.
'Muslims believe...'
'Fundamentalist Christians see...'
'Some Christians reject...'

Ev: Give examples, statistics and/ or teachings to support the view above.
'For example...'
'This can be seen in the Biblical teaching...'
'This is demonstrated by...'

15 marks Discuss

Discuss- Create an argument. Paragraph in support, one paragraph against the statement. Evaluate and conclusion.

POINT: Some may agree/disagree with the statement that...
EVIDENCE: Teachings and examples.
EXPLAIN: This is because (give a few reasons/examples)
EVALUATE:
This view is arguably convincing as:
This view could be criticised as:

X2

EVALUATION STEMS IN ETHICS

+	=
Is it practical?	Is it impractical?
Does it promote Human Rights?	Is it unfair?
Is it in line with modern thinking?	Is it outdated?
It is in line with the religion?	Does it contradict the religion elsewhere?
Is it logical?	Is it muddled?

SENTENCE STARTERS

Adverb sentence starters

Surprisingly,
Contrastingly,
Notably,
Equally,
Foolishly,
Strangely,
Unquestionably,
Evidently,
Occasionally,
Largely,
Fairly,
Convincingly,
Arguably,

Evaluative sentence stems

Some people may say...
Arguably this is...
Seemingly, this perspective...
This view is convincing...
This is effective because...
The argument is compelling as...
This is a strong/weak viewpoint...
The evidence presented is insufficient...
Here, the argument is successfully highlighted in...
It appears that...
Arguably the strengths of this...
This view can be undermined...



Glenmoor & Winton Academies

High Achievement – High Standards

Part of United Learning

Geography

Command word	What does it mean?	Marks	Structure	Sentence starters
Assess	Make a judgement	6, 9	AKUUa x2 + Conc	AKUUa paragraph: ... to a large/small extent. For example... This means... therefore... However, ...
Calculate	Work it out	1, 2	Show your working!	Check to see how many decimal places
Compare	Similarities and differences	2, 3	Number of marks = number of statements	...whereas.../...however, .../...but...
Contrast	Differences			
Describe (the pattern or trend)	Say what you see in the graph, figure, or map	2, 3	GEO	In general, ... For example...and... However,
Discuss	Positives and negatives	6,9	AKUUa x2 + Conc	AKUUa paragraph: ... to a large/small extent. For example... This means... therefore... However, ...
Evaluate	Judge using evidence	6, 9	AKUUa x2 + Conc	AKUUa paragraph: ... to a large/small extent. For example... This means... therefore... However, ...
Explain	Give reasons	2, 4, 6	KUU x2	[Fig X shows...] ...This means...Therefore...
Explain the formation...	Give reasons	4, 6	POS	Firstly... Over time, ... Eventually...
Outline	Briefly explain	2, 3	KUU	...This means...Therefore...
Suggest	Give reasons	2, 4, 6	KUU x2	Fix X shows... This means... Therefore...
To what extent...	Judge the level to which you agree	6, 9	AKUUa x2 + Conc	AKUUa paragraph: I agree to a large/small extent. For example... This means... therefore... However, ...
Using your own knowledge	Case study details	Any	Check command word	Check the command word above.
Using Figure X...	Refer to the figure using words or numbers	Any	Check command word	Spend 30 seconds annotating the figure. Figure X shows...

Initial	Stands for...	E.g.
P	Process	Give a specific process e.g. Abrasion, saltation, deposition
O	Outline	Define the process
S	Sequence	Put the steps in order
Destructive ways erode the cliff through the process of abrasion (material in water that scrapes away at the cliff). Over time this slowly creates a cave. As erosion continues, next...		

Initial	Stands for...	What does it mean?	Example
G	General trend	Give the overall pattern	Overall, average temperatures have increased.
E	Examples	Give two data points as examples	For example, in 1950 it was 14°C whereas in 2000 it was 18°C.
O	Outlier	Give an anomaly (something that doesn't fit the trend)	However, in 1980 it did decrease briefly by 1°C.

Initial for...	Stands	Example
A	Assessment	The primary impacts of the Nepal earthquake were VERY significant.
K	Knowledge	This is because 499,000 homes were destroyed.
U	Understanding	This means that 4 million people were made homeless
U	Understanding	Therefore, people were living in temporary accommodation with out access to running water and so consequently got diseases like cholera.
a	Assessment	This was very significant as the government didn't have effective plans in place to support the victims.

Categorising	
Key vocabulary	Definition

Social	People, communities and culture.
Economic	Income, jobs and industry.
Environmental	Natural world and ecosystems.

Human	Humans, settlements, and our impact on the environment.
Physical	Naturally occurring features and Earth's systems.

Causes	Why something happens.
Impacts	What happens as a result of an event.
Management	Ways to control, respond to, or deal with an event.
Responses	How people, governments and countries react to and manage an event.

Scale	The size of an area affected.
Regional	Part of a country.
National	A country.
International	2 or more countries.
Global	The entire world.

Landform	A natural feature of the Earth's surface, such as a mountain, arch, waterfall.
Process	A natural or human action that changes the Earth over time.

Short term	Hours, days or weeks.
Long term	Years.

Positive	Good things.
Negative	Negative things.

HIC	Low income countries. GNI per capita of under \$1,045. (Poor) e.g. Haiti.
NEE	Newly emerging economies. Countries with recent, rapid economic development. e.g. Nigeria
LIC	High income countries. GNI per capita of over \$12,746. (Rich) e.g. UK.

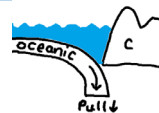
Tourism in Nepal has significant positive economic impacts (A). For example, it creates 500,000 (K) tertiary jobs just as tour guides or taxi drivers. This means that the employment rate is higher and so the government receives more income through tax (U). Therefore, they can invest this in improving infrastructure and services which in turn attract more tourists triggering the positive multiplier effect (U). However, tourism isn't a long-term solution as it can be unreliable like when covid hit and the 2016 earthquake which caused tourist numbers to drop by a third. (a)

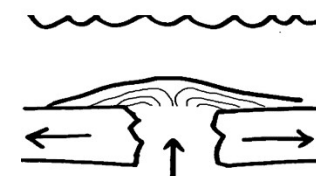
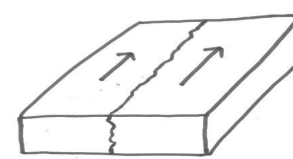
Useful words for all geography!

Key vocabulary	Definition
Agriculture	The practice of producing crops, and raising livestock (farming).
Biodiversity	The variety of plants and animals found in a particular ecosystem or biome.
Development	People getting richer and quality of life improving.
Disposable income	The amount of money someone has available to spend or save after tax.
Erosion	The wearing away of the Earth's surface by natural forces like wind, water, or ice
Globalisation	The process which has created a more connected world e.g. migration and TNCs.
Industry	The companies and activities involved in producing goods for sale. Factories.
Infrastructure	The basic equipment and structures needed for a city. E.g. roads, water supply, sewage.
Positive multiplier effect	The positive spin off effects that follow from investments in an area.
Quality of life	The wide range of human needs that should be met alongside economic growth. Must always give an example... E.g. improved access to health care.
Residents	A person who lives in an area.
Rural	Countryside
Services	Things humans need. E.g. schools/healthcare
Squatter settlements	An area of poor quality housing, lacking in services like electricity and sewage. Illegal cities in poorer countries.
Stakeholders	Any person, group, or company affected by a decision.
Sustainable	Meeting the needs of the present, without compromising the ability of future generations to meet their own needs.
Tax	Money that people and businesses pay to the government.
Urban	Towns and cities.

1. Natural hazards	
Key vocabulary	Definition
Natural hazard	A natural event that threatens people or causes damage. <i>E.g.</i> earthquakes.
Tectonic hazards	Caused by movement of the tectonic plates (volcanoes and earthquakes).
Atmospheric hazards	Created in the atmosphere (tropical storms, drought, tornadoes).
Hazard risk	The chance that a natural hazard may take place.
Earthquake	A sudden movement within the Earth's crust followed by a series of smaller shocks.
Volcano	An opening in the Earth's crust from which lava, ash and gases erupt.
Factors increasing hazard risk Why do more people die in some events than others?	
Vulnerability	More people living in dangerous areas <i>e.g.</i> squatter settlements in NEEs
Wealth	Poverty means countries can't afford effective protection / planning. <i>E.g.</i> No EQ proof buildings.
Nature of the NH	Higher magnitude earthquakes = higher risk. Lower risk for TS compared to EQ because of monitoring and prediction.

2. Distribution of tectonic hazards	
Plate margin	The boundary between two tectonic plates.
Tectonic plate	A rigid segment of the Earth's crust which floats across the mantle.
Hazard	Distribution
Volcanoes	At destructive + constructive margins <i>e.g.</i> The Ring of Fire round the Pacific Ocean
Earthquakes	Mostly on plate margins (all margins), largest along destructive and conservative margins.

3. Plate tectonic theory	
Theory	Explanation
Convection currents	Heat cycles in the mantle which makes the plates move due to friction. A result of magma heating and cooling. 
Slab pull	Oceanic plate subducts into the mantle and pulls the rest of the plate with it. 
Ridge push	The weight of the plates at ocean ridges, push the plates down due to gravity. 
Structure of the Earth	
Crust	The crust is made up of 7 large tectonic plates and several smaller ones.
	Oceanic crust Thin (5-10km). More dense. Can be made and destroyed.
	Continental crust Thick (30-50km). Less dense. Older, never destroyed.
Mantle	Semi molten rock that moves slowly in the mantle. Convection currents occur here.
Outer core	Liquid. Iron and nickel.
Inner core	Solid. 5500°C.
5. Key vocabulary	
Key vocabulary	Definition
Primary effects	The initial impact caused directly by the event. <i>E.g.</i> buildings collapse.
Secondary effects	The aftereffects that occur as indirect impacts. <i>E.g.</i> People are homeless.
Immediate responses	The reaction of people as the disaster happens and immediately after. <i>E.g.</i> evacuate the area.
Long term responses	Later reactions that occur in the weeks, months and years after. <i>E.g.</i> rebuild homes.

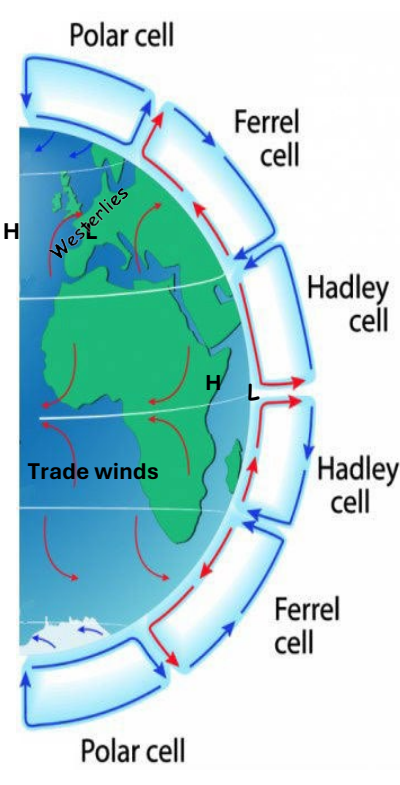
4. Plate margins	
Include processes and ensure correct sequence.	
Destructive margins Composite volcanoes. Earthquakes. 	Convection currents move two plates towards each other. - The oceanic plate is denser and so subducts - Due to friction, the oceanic plate melts. Pressure builds up. Magma is eventually released.. ...in an explosive eruption forming a composite volcano.
Constructive margins Shield volcanoes. Earthquakes. 	Convection currents move plates apart. - Magma from the mantle rises through the gap. - Runny lava travels a long distance before cooling. - A shield volcano is formed.
Conservative margins Earthquakes. NO volcanoes. 	- Convection currents move the plates side by side. - Friction builds up causing tension. - Eventually the tension will be released as waves of energy which is an earthquake. No volcanoes are found here.

6. Tectonic hazards vary between contrasting levels of wealth					
	LIC	\$1190	HIC	\$40,000	Explanation
Earthquake	Nepal 2015		New Zealand 2016		
Primary effects	👤 8,632 died 🏥 22 hospitals destroyed 🏠 499,000 homes destroyed 🗼 Dharahara Tower collapsed		👤 2 died 🏠 Only 36 red tagged buildings 💧 Water/power damaged 🚊 400km rail/road destroyed		NZ’s buildings are EQ proof. Poor building quality in Nepal and ineffective responses.
Secondary effects	💰 US\$5 billion in damages 📉 Tourist numbers decreased by 1/3 👤 4 million homeless, no water 🏔️ Avalanches on Everest (18 died)		💰 US\$8.5 billion in damages 👤 200 homeless from Waiau 🏔️ 100,000 landslides		NZ damage costs higher as expensive infrastructure.
Immediate responses	• India sent search/rescue teams in 15mins • Shelter- Kathmandu tent city • Charities like Oxfam gave aid		• 200 evacuated in 24 hours • Power restored in 24 hrs • Clean water supplies set up		Not adequate in Nepal, relied on aid. NZ had efficient plans in place.
Long term responses	• Took 2 years to repair road to Tibet • Asian Development Bank gave US\$200m		• New water pipes in 4 months • Road/rail repaired in 2yrs • \$250 relief fund for low-income families		Slow in Nepal (still ongoing). Very fast in NZ as more money.

8. Why do people continue to live in areas at risk from tectonic hazards?	
Factor	Explanation
Always lived there	Don't want to leave family / friends.
Poverty	People can't afford to leave.
Benefits	Volcanoes have fertile soil and geothermal energy. They bring economic benefits.
Protection	Earthquake proof buildings, with cross bracing for example, make people feel safe.

7. Management can reduce the risks from tectonic hazards				
	Planning	Prediction	Protection	Monitoring
Definition	Actions planned in advance to help communities to respond to disasters e.g. evacuation routes.	Attempts to forecast when and where a natural hazard will occur.	Adapting buildings and infrastructure to make them safer.	Recording physical changes to help predict.
Earthquake examples	Similar for both: Educate people to know what to do (Stop, Drop, Hold drills) Plan evacuations routes to shelters or safe zones (usually high land away from tsunami flooding risk).	X Can't reliably be done for earthquakes. But seismologists can suggest likely plate boundaries.	Earthquake resistant buildings i.e. reinforced concrete, bird cage frames, rubber in foundations.	Seismometers. Only gives a SMALL warning time e.g. 90s in Japan 2011, enough time to halt public transport.
Volcanoes examples	Stockpile emergency supplies i.e. water and tinned food.	Can be done if volcano is well monitored. E.g. rising sulphur levels, but some LICs don't have access to the technology.	Roofs strengthened to reduce damage from heavy ash. Trenches or barriers can be built to divert lava (but these are unsuccessful).	Seismometers, sulphur dioxide gas released, changes in shape of the volcano, increased temperature of nearby water.
How does it reduce the risks?	Fewer people are vulnerable. Often more efficient in HICs as people are better educated.	Allows evacuation, which can reduce deaths and injuries.	Buildings less likely to collapse reducing injury. But expensive.	Allows a warning to be given so plans like evacuation can be put in place.

9. Global atmospheric circulation

Factor	Explanation
Global atmospheric circulation	Worldwide system of winds, which transport heat from the Equator to the poles.
Key information	Wind is air blowing from HIGH to LOW pressure. The circulation occurs as CELLS. ↑ Low pressure = Rising air = Rain. ↓ High pressure = Sinking air = Clear skies.
 The diagram illustrates the three-cell model of global atmospheric circulation. It shows the Earth with latitude lines at 90°N, 60°N, 30°N, 0° (Equator), 30°S, 60°S, and 90°S. Air rises at the equator (0°N) due to intense solar heating, creating a low-pressure zone with high rainfall (rainforests). This air then moves back down to the surface at 30°N and 30°S, creating high-pressure zones (deserts). From these high-pressure areas, surface winds (trade winds) blow towards the equator and towards 60°S. At 60°N and 60°S, air rises again, creating low-pressure zones. The UK is located in the Ferrel cell between 30°N and 60°N, experiencing low-pressure weather. At the poles (90°N and 90°S), cold air sinks, creating high-pressure zones with low rainfall (<250mm). The diagram also labels the Westerlies in the Ferrel cells and the Polar cells at the poles.	At 90°N The North Pole, cool air sinks creating high pressure (<250mm rainfall). At 60°N air rises creating low pressure. The UK experiences low pressure weather. At 30°N air sinks creating high pressure (deserts <250mm rain). On the Equator 0°N air rises as the sun's heat is most concentrated. This creates low pressure with high rainfall. (Rainforests >2000mm of rain). At 30°S, surface winds from this area of high pressure blow towards the Equator (trade winds) and towards 60°S. At 60°S, low pressure draws in surface winds from the South Pole and 30°S. At 90°S, the South Pole, there is high pressure where cold air falls (<250mm rainfall).

10. Weather hazards in the UK

Hazard	Example
Extreme weather	A weather event that is significantly different from the average pattern and is especially severe or unseasonal.
Strong winds	Damage property / disrupt transport E.g. Storm Eunice or Storm Bert
Heavy rain	Can cause flooding, costing millions. E.g. Cockermouth 2009 314 mm of rain fell in 24 hrs.
Snow	Injury, death, travel disruption as roads and rail are blocked by snow. E.g. 2018 Beast from East.
Drought	Crop failure, rules to conserve water e.g. hose pipe bans.
Heatwaves	Pollution builds up- breathing problems. Death. BUT tourism benefits e.g. UK August 2022

11. Evidence that weather is becoming more extreme...

Our weather is naturally variable BUT extreme events are becoming more common and severe.

Hazard	Storm Ciara & Storm Dennis (February 2020, UK) - two back-to-back storms—winds over 90mph, thousand of homes damaged or evacuated, record-breaking rainfall in some areas.
Temperature	10 warmest years all occurred since 2002. 2022 was a record-warm year for the UK. Dec 2010 coldest month for 100 years.
Rainfall	More rainfall records broken between 2010 - 2014 than in any other decade.

12. An example of a recent extreme weather event in the UK

Name	2022 UK heatwave
Causes	Southerly winds from the Equator High pressure Climate change
Impacts	🔥 9 fires in London damaged property 🌾 Berry yields up 10-15% 💧 13 people died in rivers and lakes, including 7 teenage boys 🌡️ Temperatures over 40°C 🏠 Droughts in 8 out of 14 regions of England
Management strategies	Immediate responses Fire service put out fires—their busiest since WW2 Warnings on TV- Amber and Red Long term responses Stop burning coal as agreed in the COP26 international agreement Planting trees, aimed for 30,000 by 2024

Heatwaves are likely to become more frequent as climate change increases global temperature.

13. Tropical storms

Hurricanes, cyclones, typhoons are all tropical storms. They are low pressure weather events that bring very powerful winds.

Calm central point called the eye of the storm.

Factor	Explanation
Global distribution	5° – 30° north and south of equator (sea temp warm). There are more in the Northern hemisphere.
Relationship with ACM	Trade winds (from high to low pressure) send tropical storms to west.
Structure	• Circular • Can be 100s of kilometres wide • Eye- calm in centre (cool air falls, creating calm, stable conditions). • Eyewall- strong winds, torrential rain. • Edges- Wind speed falls, rain reduces.
How will climate change affect them?	
Distribution	Increase to higher latitudes where sea temperatures are increasing.
Frequency	Number could increase, and they could happen over a longer season.
Intensity	Stronger? More evaporation.

14. Formation of tropical storms

Include processes and correct sequence.

Conditions	5-30° latitude. > 60m ocean depth. Sea temperature > 27°C. Form summer and autumn.
-------------------	---

The diagram illustrates the formation of a tropical storm. It shows a cross-section of the ocean and atmosphere. Warm air is rising from the ocean surface, creating a low-pressure area. The Coriolis effect is shown as a curved arrow indicating the rotation of the air. The storm surge is shown as a bulge in the ocean surface. The eye of the storm is the calm center. The diagram is labeled with 'Coriolis Effect', 'Eye', 'CCCC', 'warm air rising', 'low pressure 74 mph', 'storm surge', and '27°C'.

1. Sun heats the ocean (27°C) causing **rapid evaporation**...
2. ...and low pressure as warm air rises.
3. The air cools, **condenses** forms clouds and rain (CCCC)
4. The cloud starts to spin due to the Coriolis effect, forming an eye in the centre.
5. Air rushes into this creating high wind speeds. (>74mph = **tropical storm**)
6. The low-pressure draws up the ocean and combines with the strong winds to form a **storm surge**.

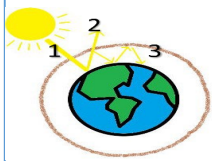
15. Tropical storms affect people and environments.

Generic	Typhoon Haiyan 2013	
	Philippines	
Primary effects	• Direct results of winds and rain. • Flooding, buildings destroyed, death.	• 6,201 deaths. • 1.1 million houses damaged. • 90% of Tacloban city destroyed.
Secondary effects	• Homelessness = poor health. • Lack of sanitation = diseases (cholera) • Food shortages = price increase.	• 4.1 million homeless. • 1.1 million tonnes of crops destroyed (rice).
Immediate responses	• Evacuate before the storm. • Provide food, water, blankets.	• Philippines Red Cross delivered basic food aid. • 800,000 evacuated (warnings given 2 days early).
Long term responses	• Repair homes and infrastructure. • Promote economic recovery.	• More cyclone shelters built. • No build zones.

16. How can we reduce the impacts?

Strategy	Explanation
Prediction / monitoring	• Satellites monitor storms. • Computer models predict the track. • Allows warnings so people can evacuate or protect their home.
Planning	• Emergency services train and prepare. • Plan evacuation routes to reduce deaths.
Protection	• Building design- stilts for flood risk. • Flood defences along the coasts. • Reduces the number of buildings destroyed so fewer injuries and deaths.

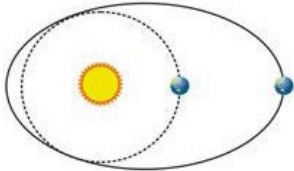
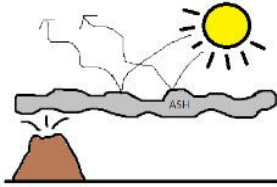
17. Climate change key terms

Key term	Definition
Climate change	- A change in the global climate from the expected. - Natural or human causes.
Quaternary period	2.6 million years ago until to today.
Glacial periods	Colder periods of time.
Interglacials	Warmer periods of time.
Greenhouse gases (GHGs)	Water vapour, carbon dioxide, methane, nitrous oxide, ozone, CFCs
	- Human activities release greenhouse gases (such as CO₂) - Greenhouse gases absorb the sun's energy, trapping heat in the atmosphere. - Global temperatures increase.

18. Evidence for climate change

Evidence	Definition
Photos	Comparing photos from the 1800's with today show glaciers have shrunk.
Ice cores	Trapped bubbles of ancient air in ice that show amount of greenhouse gases. More GHGs means a higher temperature.
Tree rings	Thinner rings indicate colder climates. Tell us about climate over 10,000 years.
Temperature records	Records for the last 200 years using thermometers.

19. Causes of climate change

Natural factors	Orbital changes	- Changes in the Earth's orbit from circular to elliptical. 96,000 years. - During the circular rotation the earth is closer to the sun = warmer. 
	Volcanic activity	- Large volcanic eruptions emit ash/gases into the atmosphere. - This block out the sun and reduces temperatures for short periods of time (volcanic winters). 
	Solar output	- The sun's output of energy changes on a 11 year cycle. - When solar output increases the Earth experiences warmer climates.
Human causes	Use of fossil fuels	- CO₂ is released into the atmosphere when fossil fuels are burnt. - This occurs with cars, factories and to make electricity.
	Agriculture	- Farming of livestock produces lots of methane and we now eat more meat. - Rice farming also releases methane.
	Deforestation	- Plants remove CO₂ from the atmosphere during photosynthesis. - When we cut down trees we stop them absorbing more CO₂.

20. Effects of climate change

On people	- Death rate has increased (some due to heat, some due to cold) - Migration needed from low-lying, coastal areas - Less clean water available + Higher temperatures bring more tourists to some areas.
Environment	- Ice caps melt - Sea levels rise: 82cm by 2100. - More extreme weather events (storms, wild fires, droughts)

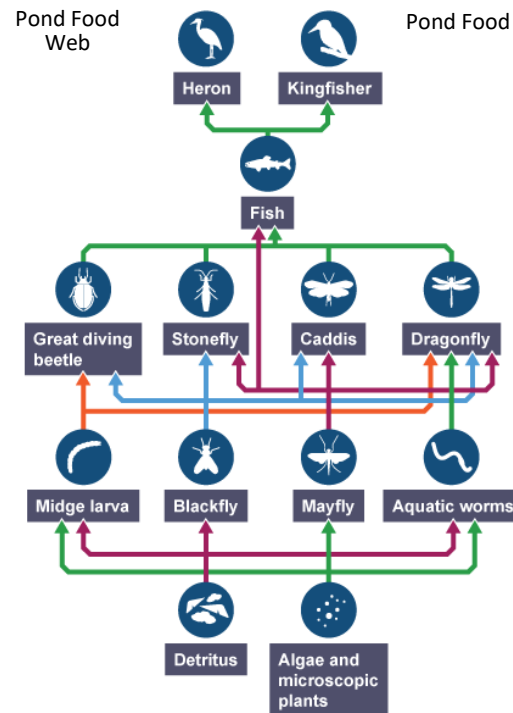
Poor countries tend to suffer the most as they do not have the money to adapt effectively to climate change. They are also often located in more vulnerable areas.

21. Managing climate change			
	Strategy	Explanation	Evaluation
Mitigation	Action taken to reduce the CAUSES of climate change.		
	International agreements e.g. COP 26.	In 2021, nearly 200 countries met for COP26. Countries agree to reduce use of fossil fuels.	+ Global reduction of CO ₂ - Because of pressure from India and China, countries only agreed to reduce the use of coal, not ban it completely
	Planting trees e.g. Great Green Wall, Africa.	This increases the amount of carbon dioxide that is stored in trees.	+ Also has other environmental benefits (reduce flooding etc). - Takes a long time for trees to grow
	Alternative energy production e.g. Thanet Wind Farm, Kent.	Replace fossil fuels with renewable energy to reduce greenhouse gas emissions.	+ Reduces CO ₂ emissions. - Expensive, needs large investment.
	Carbon capture and storage e.g. by Shell.	New technology which captures CO ₂ and stores it safely under- ground.	+ Reduces CO ₂ in the atmosphere - Expensive technology. Cost £1 billion per UK station converted.
Adaptation	Actions taken to reduce the IMPACTS of climate change.		
	Drought resistant crops e.g. millet in Kenya	Rainfall unreliable, temperatures increase but food can still be grown.	+ People can keep farming. - Drought resistant seeds are more expensive, increasing food prices
	Managing water supplies e.g. Sand dams, Kenya	Collect rainwater to use during times of drought, recycle waste water.	+ Collecting rainfall is cheap. - Recycling wastewater requires energy e.g. burning fossil fuels. - Depends on rainfall, doesn't work if there is no rainfall to collect.
	Building flood defences e.g. Thames Barrier	Sea levels are expected to rise by 82cm by 2100. Physical defences like flood barriers can be built. Cheaper options= earth embankments or houses on stilts.	+ Important as large areas are being affected. - Can be unaffordable for LICs.

1. What is an ecosystem?

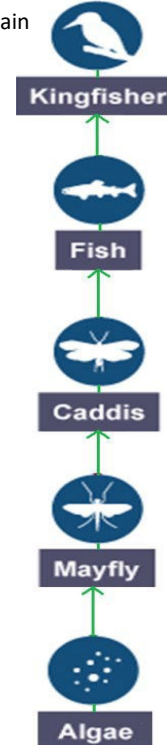
Term	Definition
Ecosystem	A community of plants and animals (biotic) and their environment (abiotic)
Biotic	Living elements e.g. plants, animals.
Abiotic	Non-living elements e.g. soil, climate.
Food chain	Arrows showing the flow of energy from producers to consumers.
Food web	These show the more complex connections between producers and consumers. Multiple food chains.
Producer	A plant that can absorb energy from the sun through photosynthesis.
Consumer	Organisms that eat other organisms. Primary consumers - grasshoppers. Secondary consumers eat herbivores.
Decomposer	An organism that breaks down organic material and recycles nutrients to the soil. E.g. bacteria and fungi.
Nutrient cycle	A set of processes whereby organisms extract the nutrients necessary for growth from soil or water, before passing them on through the food chain. Decomposers return these back to the soil. <pre> graph TD Rainfall --> LITTER LITTER -- Littering --> BIOMASS BIOMASS -- Plant uptake --> SOIL SOIL -- Leaching --> LITTER SOIL -- Weathering of parent rock --> LITTER LITTER -- Decomposition --> SOIL </pre>

Pond Food Web



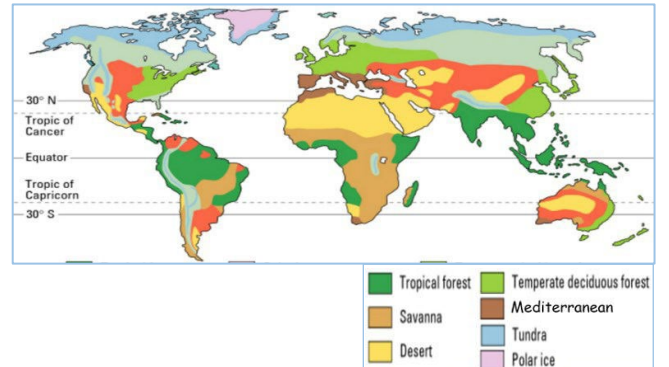
Food web & food chain: www.bbc.co.uk
Nutrient cycle: https://en.wikipedia.org/wiki/Nutrient_cycle

Pond Food Chain



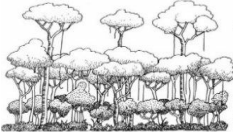
2. Example of a small-scale ecosystem

Name	Fresh water pond. The Lost Pond, Epping Forest.
Inter-relationships	Pond edge provides shelter for insects. Pond surface allows fish to prey on insects like dragonflies. Decomposers live on the pond bottom.
Balance between components	If fish die, there are less kingfishers as they don't have enough food. However, the caddis population grows. Fertilisers from fields draining into the pond causing water pollution. It can increase algae but reduce oxygen.



3. Large scale natural ecosystems

Biome	A large area of land with a similar plant and animal communities. They are large ecosystems.	
Name	Distribution	Characteristics
Polar	At poles. High latitudes.	Very cold and dry all year round (<250mm). Ice. Low biodiversity.
Tundra	Along Arctic Circle. 66°N	Winters very cold, short summers, little rainfall. Layer of frozen ground called permafrost. Treeless, mostly mosses and low shrubs.
Temperate deciduous	UK biome. Along mid latitudes.	Trees lose their leaves in the winter. 4 seasons. Warm summers, mild winters and rainfall all year round.
Mediterranean	40° – 45°N.	Hot and dry summer with mild winters.
Desert	Along Tropics. 15°-30°	Hot 40°C (cold at night), low rain (<250mm). Sparse vegetation. Sandy soils
Savanna	Between 15° – 30°.	Grass land with a wet and a dry season. Herds of animals grazing alongside predators. (Lion King)
Tropical rainforests	Along the equator.	High temperatures, heavy rainfall (>2000mm). High biodiversity.

4. Rainforest characteristics	
Characteristic	Description
Climate	Consistent all year round. No seasons. Hot (average temperature 28°C). Very wet. Over 2000mm rain each year due to location in a low pressure area.
Soil	Latosol soil (red as rich in iron). Infertile (heavy rain leaches nutrients). Some nutrients near surface (leaves rot).
Structure (4 layers)	- Emergents - Upper canopy - Lower canopy - Shrub layer 
Biodiversity	Very high >50% of all the species. But at risk due to deforestation.
Plants	Plants grow all year due to climate. Tall trees. Dense canopy blocks light from forest floor.
Nutrient cycle	Very rapid due to hot and humid climate. Leaves rot quickly returning nutrients to soil.

5. Adaptations to tropical rainforests			
	Name	Description	Explanation
Plants	Drip tips	Waxy leaves shaped like a funnel.	Adapts to high rainfall- Sheds water quickly to prevent rotting.
	Buttress roots	Wide roots visible above the surface. Roots within the soil stay shallow.	Adapts to shallow, infertile soil—Supports tall trees to access sunlight and absorbs nutrients from the shallow soil.
Animals	Jaguar	Spotted fur called rosettes.	Thick canopy—Provides camouflage on the dark forest floor.
	Sloth	Thick, dense coats with angled fur.	High rainfall— Funnels off high rainfall.
	Flying squirrel	Flaps of skin between their arms and legs.	Allows them to glide between the tall trees to avoid being eaten by predators on the forest floor.

6. Value of tropical rainforests	
To people	To the environment
25% of all medicines . Resources to sell like wood, nuts, rubber . Indigenous tribes live there.	>50% of all plants and animals (high biodiversity). Trees absorb carbon (slowing climate change) 28% of world's oxygen and 20% of world's fresh water .

7. Sustainable management	
Rate of deforestation	Varies across the world. Brazil— decreasing. Indonesia— increasing.
Strategy	Explanation
Selective logging and replanting	Only some high value trees are cut. Encourages growth of smaller trees. More trees should be replanted.
Conservation	Nature reserves are set up where trees are protected from economic activity.
Education	Educating locals on how to make money without deforestation. Eg Tonka beans
Ecotourism	Small scale, environmentally friendly tourism. Employs locals, uses local materials, educates tourists.
International hardwood agreements	Agreeing to stop illegal logging and promote sustainably sourced timber. E.g. FSC Forest stewardship Council.
Debt reduction	Debt cancelled in exchange for trees to be protected.

8. Tropical rainforest case study	
Name	Borneo (Malaysia), south east Asia.
Background	Rate of deforestation is faster in Malaysia than other tropical countries. From 1973-2015 30% of Borneo's forest was deforested.
Causes of deforestation	
The cutting down and removal of trees.	
Farming	Subsistence - Grow just enough food for their family. (Small impact) Commercial - Farming for profit. Malaysia was the 2 nd largest exporter of palm oil in 2025. 15 million tonnes.
Logging	Cutting down trees to sell. Largest exporter of tropical hardwood in 1980s. 85% of logging has been illegal. Clear felling now replaced by selective logging.
Road building	Roads constructed for access to mines. EG Sarawak, east Malaysia.
Mineral extraction	Removal of tin from the ground. 2023 tin exports earned \$58 million.
Energy development	Building dams for HEP floods the forest. Bakun Dam flooded 700km ² .
Settlement	Space cleared for houses. Eg Penan.
Population growth	Urban poor encouraged to migrate to the countryside to reduce overcrowding. Transmigration policy impacted 15,000ha.
Impacts of deforestation	
Soil erosion	- Roots no longer hold soil together. - Heavy rain washes the soil away.
Climate change	- Fewer trees mean less CO ₂ is absorbed, increasing the global warming.
Economic development	+ Provides jobs = more tax. Profit from selling tin, palm oil, HEP.

9. Hot desert characteristics	
Characteristic	Description
Climate	Very little rain. Under 250mm/yr Very hot. 45°C in the day. But cold at night 0°C (no clouds).
Soil	Sandy, infertile. Slow nutrient cycle and limited vegetation means nutrients aren't replenished.
Biodiversity	Low—very few plants and animals can survive.
Plants	Very sparse due to lack of rain. Many are succulents – cacti. Short life cycle to fit limited rain.
Nutrient cycle	Very slow due to lack of rain and plants. Means soil is infertile.
Interdependence	Few plants means few animals. People are using more water, reducing water available for plants and animals.. Beetles spread seeds through dung.

12. Causes of desertification		RPSOCO
The process by which land becomes drier and degraded.		
Cause		Explanation
Human causes	Population pressure	Our population is increasing which is leading to more...
	Removal of fuel wood	Trees cut down to build fires for cooking. Fewer roots mean the soil is eroded, so fewer plants can grow. No tree canopies to shade soil from evaporation.
	Over-grazing	Animals eat vegetation so nutrients aren't returned to the soil.
	Over-cultivation	Crops remove nutrients and don't replenish them so soil degrades.
Physical causes	Climate change	Higher temperatures and more unreliable rain. Dry soil erodes easily. Worsened by human causes.
	Soil erosion	Bare soil is exposed to wind and rain and so erodes. Made worse by human activity.
Assess	Human causes are worsening the physical causes.	

13. Strategies to reduce desertification		SWeAT
Strategy	Explanation	
Soil and water management	Bunds prevent soil washing down hills.	
	Irrigation takes water from rivers to water crops (but causes salinisation).	
Tree planting	- Tree roots hold soil together, provide shade, add moisture to soil. - E.g. Great Green Wall, Africa. 4831 miles	
Use of appropriate technology	- Magic stones reduce soil erosion. - Solar cookers = less deforestation. - EG solario safe.	

10. Adaptations to hot deserts			
	Name	Description	Explanation
Plants	Succulents (cacti)	Large, fleshy stems. Thick, waxy stems.	To store water during times of reduced rainfall. To reduce water loss by evaporation.
	Tap roots	Long root (7-10m)	To reach very deep water supplies, during periods of low rainfall.
	Dormant seeds	Germinate with rain. Short growth cycle.	As rain is unreliable, seeds germinate when it rains so they survive. They grow, flower and release seeds quickly so species survives.
Animals	Camel	Wide feet. Long eye lashes.	Spreads the camel's weight out to make it easier to walk on sand. To keep sand out of their eyes.
	Bat eared fox	Large ears.	Provides a large surface area to maximise heat loss.
	Desert jerboa	Nocturnal.	Bury underground during the day to escape high temperatures.

11. Hot desert case study	
Name	Thar Desert, in India and Pakistan.
Background	Most densely populated desert. 80 people per km ² .
Development opportunities	
Mineral extraction	Minerals sold for a profit and provides jobs. Limestone (used for building), kaolin (paper whitener).
Energy	Jaisalmer Wind Park is India's largest. Produces renewable energy that can be sold and supports industrial development.
Farming	Mostly subsistence. Indira Gandhi Canal now allows irrigation.
Tourism	A growing industry. Creates jobs such as guides, businesses make profit. Annual Desert Festival >10,000 tourists
Challenges for development	
Extreme temperatures	53°C in the day in July. Crops struggle. Working outside is hard.
Water supply	100 – 240mm rainfall per year so few crops can grow and industry struggles. Indira Gandhi Canal is now helping.
Inaccessibility	Tarmac melts, which makes transporting goods and accessing services difficult.

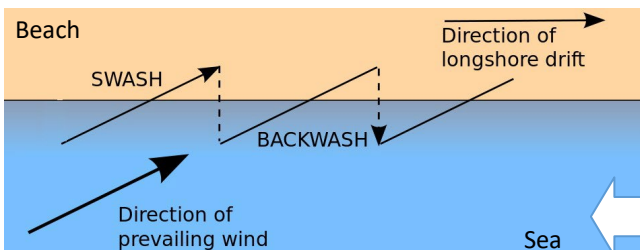
1. UK's diverse landscapes

Term	Definition
Relief	Shape of the land.
Upland areas	Land over 200m. Highlands. Steep. West of country.
Lowland areas	Land below 100m. Flat or rolling hills



2. Waves

Term	Definition
Swash	Movement of the water UP the beach in the direction of the prevailing wind.
Backwash	Movement of water DOWN the beach at right angles (90°) due to gravity.
Constructive waves	Build up the beach. Strong swash. Weak backwash. Low height, long wave length. Low frequency.
Destructive waves	Erode the coast. Weak swash. Strong backwash. Tall height, short wave length. High frequency.



3. Processes

Sub-aerial processes (above the sea)

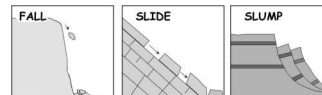
Weathering

Breakdown of rocks in situ.

Mechanical weathering	The breaking down of rocks without chemical reactions. e.g. freeze thaw.
Chemical weathering	The breaking down of rock caused by chemicals e.g. weak acid rain.

Mass movement

The downhill movement of material under the force of gravity.



Rockfall	Free fall of rocks under force of gravity.
Sliding	Material collapsing in a straight line.
Slumping	Material collapsing along a curved slip plane. The risk worsens when the soil is saturated.

Marine processes

Erosion

The wearing away of land.

Hydraulic power	The sheer force of the water compressing air into cracks causes bits to break off.
Abrasion	Sediment scraping against the cliff (like sandpaper) removing small pieces.
Attrition	Sediment collides causing it to become smaller and more rounded.
Solution	Minerals in the rock dissolve into the water.

Deposition

Dropping of material	Occurs when there is a loss of energy. e.g. Sheltered bays / when the wind drops.
-----------------------------	---

Transportation

Longshore drift	Zig zag movement of sediment along the coastline.
------------------------	---

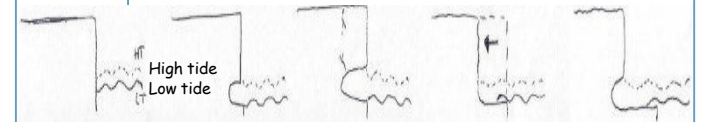
4. Erosional landforms

Headlands and bays

Step 1	Discordant coastlines have bands of more resistant hard (chalk) and soft rock (clay).	
Step 2	The soft rock is eroded faster through abrasion , creating bays.	
Step 3	The hard rock erodes slower and is left jutting out to sea forming a headland.	

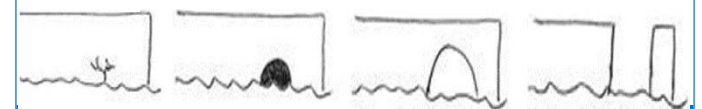
Wave cut platforms

Step 1	Waves erode cliff base between high and low tide
Step 2	Abrasion creates a wave cut notch which enlarges over time.
Step 3	The rock above the notch is unsupported so will collapse due to gravity (mass movement) .
Step 4	Cliff retreats , leaving a wave cut platform (the un-eroded original cliff left behind).



Cave, arch, stack

Step 1	Hydraulic power enlarges cracks in headland
Step 2	Over time they turn into a cave.
Step 3	Back of cave is deepened by abrasion until it erodes through the headland creating an arch.
Step 4	Weathering and erosion wear away at the arch until it eventually collapses (gravity).
Step 5	A stack is formed.



5. Example of a UK coastline. Dorset coastline.

Bays	Swanage Bay
Headlands	Peveril Point and Ballard Point
Wave cut platform	Kimmeridge
Arch	Durdle Door
Stack	Old Harry
Sand dunes	Studland
Spit	Sandbanks

6. Depositional landforms

Beaches e.g. Swanage

Step 1	Beaches form when deposition occurs.
Step 2	There needs to be a source of sediment nearby like soft cliffs.
Step 3	Constructive waves deposit material in sheltered areas like bays.

Sand dunes e.g. Studland

Step 1	Wind blows sand up the beach (saltation).
Step 2	Obstacles such as seaweed cause the wind speed to decrease resulting in deposition .
Step 3	Over time sand dunes build up and are colonised by marram and lyme grass. This vegetation stabilises the sand dunes.
Step 4	A wide sandy beach + constructive waves needed.

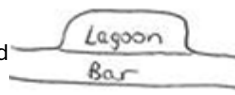
Spits e.g. Sandbanks

Step 1	Longshore drift transports sediment along the coast in the direction of the prevailing wind (swash and back-wash).
Step 2	Where the coastline changes direction...
Step 3	Sediment is deposited in calm weather out to sea. A salt marsh eventually forms behind the spit where it is
Step 4	sheltered. A hooked end can form due to a cross wind.



Bar

Step 1-4	As spit formation above.
Step 5	A spit grows and joins two head
Step 6	A lagoon forms behind the bar.



8. An example of a coastal management scheme

What?	Reasons for management	Management strategy	Effects and conflicts
Swanage Beach Management Scheme. Aim: Hold the line and protect tourism.	Soft clays and sand geology erodes quickly. Erosion could cost £20m in damaged by 2050. Beach brings £500,000/year.	HARD: 18 new timber groynes 2005-06. SOFT: Beach nourishment every 7 years using Poole Harbour sediment.	+ £2m of property is protected. BUT... X Cost £2.2m, only lasts until 2055. X Flooding still occurs e.g. 2020

7. Coastal management

Hard engineering

Man-made structures built to control the sea. Reduces flooding and erosion.

Strategy	Explanation	Costs	Benefits
Sea walls	A hard wall made from concrete that reflects waves back out to sea	Expensive (£2000 per/m). Life span 75 years.	Prevents flooding. Often a promenade for tourists.
Rock armour	Boulders piled up along the coast. These erode rather than the coast.	Boulders can be moved by waves and need replacing.	Cheap. Absorb wave energy.
Gabions	Wire cages filled with rocks at the base of cliffs. Absorb wave energy.	£100 per/m Metal corrodes over time.	Cheap and easy to build.
Groynes	Wooden fences at right angles top the coast. Prevent longshore drift = wider beach which absorbs wave energy.	Starve beaches further along the coast = more erosion there. Life span just 25 years.	Stops longshore drift removing beaches so help tourism. Fairly cheap.

Soft engineering

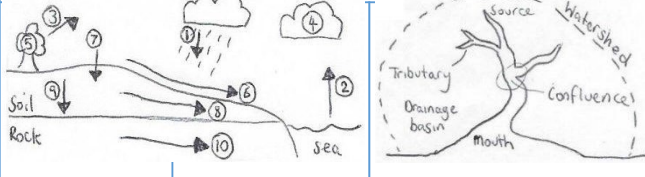
Schemes set up using a natural approach to managing the coast.

Strategy	Explanation	Costs	Benefits
Beach nourishment	Adding sand to beaches. Wider beaches absorb wave energy and stop erosion.	Needs redoing every 5 years. Sand has to be transported from elsewhere.	Blends with existing beach. Larger beaches encourage tourists.
Reprofiling	Sediment is moved to make beaches steeper.	Needs to be redone lots.	Cheap and simple. Reduces energy of the waves.
Dune regeneration	Creating or restoring sand dunes by planting marram grass to stabilise the sand. Fencing to protect areas.	Protects only a small area. Tourists don't like their access being restricted.	Sand dunes create a barrier between the sea and land. Stabilisation is cheap.

Managed retreat	Remove current defences, allow sea to flood the land behind (realign). Land eventually becomes marshland.	Land is lost = conflict for farmers.	Cheap and easy. New habitats created.
------------------------	---	--------------------------------------	---------------------------------------

1. The water cycle

Key vocabulary	Definition
Precipitation	Moisture falling from the atmosphere as rain, snow, sleet, hail.
Evaporation	Water changing from a liquid into a gas (water vapour).
Transpiration	Evaporation from plant leaves.
Condensation	Water vapour in the air changes into liquid water (clouds).
Interception	Water stored on the leaves of plants.
Surface run off	Water travelling over the surface of the land (increases when soil is saturated). →
Infiltration	Water soaking into the soil. ↓
Through flow	Water flowing sideways through soil →
Percolation	Water passing vertically through the soil and into the bedrock. ↓
Groundwater flow	Water flowing sideways through rock below the water table. →
Saturated	Holding as much water as can be held.

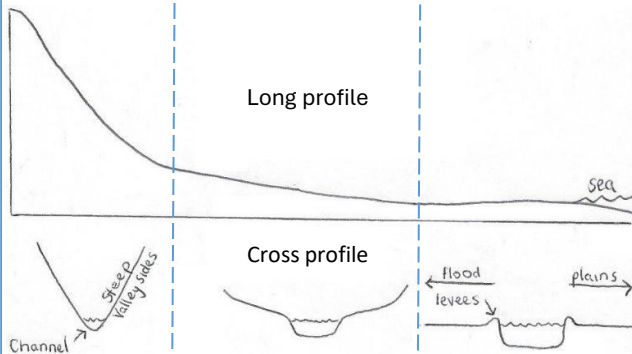


2. Parts of rivers

Key vocabulary	Definition
Source	The start of a river.
Mouth	The end of a river where it joins the sea.
Drainage basin	The area of land drained by a river.
Watershed	High land separating drainage basins.
Tributary	A smaller river, which joins a larger river.
Confluence	The point where two rivers meet.
Valley	Area of lower land between hills.
Channel	Part where the river water is.

3. How does a river change?

Long profile	Shows changes in the gradient of the river from its source to its mouth.		
Cross profile	It is a cross section (slice) across the river showing the shape of the valley.		
Upper course	Middle course	Lower course	



9. What causes flooding?

Physical factors	Prolonged rainfall	Saturates the soil so no further infiltration can occur.
	Heavy rainfall	Water arrives too quickly to infiltrate > more surface runoff.
	Relief	Steep land means water reaches the river channel faster.
	Geology	Impermeable rocks like granite.
Human factors	Urbanisation	More impermeable surfaces = more surface run off. Drains take water to river quickly.
	Deforestation	Trees intercept rainfall and soak up water. Cutting trees down means more water entering river.
	Agriculture	In winter, a lack of crops means more water enters river channel.

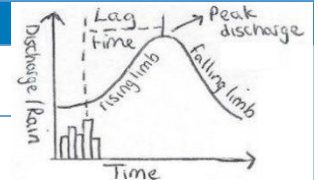
4. Fluvial processes

Erosion	
The wearing away and removal of material by a moving force such as a river.	
Vertical erosion	In the upper course, rivers erode downwards deepening the river channel
Lateral erosion	In the middle course, rivers erode sideways widening the river valley.
Hydraulic action	The sheer force of the river against the banks can cause air to be trapped in cracks, causing bits to break off.
Abrasion	Sediment carried by the river wears away the riverbed (like sandpaper).
Attrition	Sediment collides causing it to become smaller and more rounded.
Solution	Minerals in the rock dissolve into the water.
Transportation	
Traction	Large, heavy pebbles roll along the bed.
Saltation	Pebbles are bounced along the bed.
Suspension	Lighter sediment is carried by the water.
Solution	Some material is dissolved within water.
Deposition	
Dropping of material	Occurs when there is a loss of energy.

10. Hydrographs

A graph that plots river discharge after a storm and rainfall.

Discharge	Volume of water per sec. Cumecs
Peak discharge	Highest discharge.
Lag time	Delay between peak rainfall + discharge. Shorter the lag time, worse the flood risk.
Rising limb	Increase in river discharge as rainfall flows into the river (can be steep/gentle).
Falling limb	Decrease in river discharge.

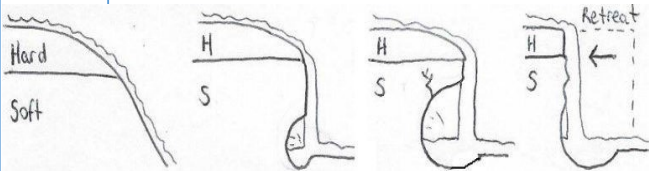


5. Erosional landforms

These occur in the **upper course** of the river.

Waterfalls and gorges

Char.	A drop in the river that water flows over.
Step 1	A band of hard rock sits on top of soft rock.
Step 2	Over time the soft rock will be eroded faster through abrasion creating a drop.
Step 3	The soft rock erodes further creating a plunge pool.
Step 4	This gets larger leaving an overhang.
Step 5	Eventually due to gravity the unsupported rock will collapse.
Step 6	The waterfall retreats upstream.
Step 7	A steep sided gorge is left behind.



Interlocking spurs

Char.	Hillsides that overlap. The river winds around them.
Step 1	Vertical erosion takes place, creating steep sided, V shaped valleys.
Step 2	The river is not powerful in the upper course so it winds around areas of hard rock.
Step 3	Creating hillsides that overlap.



6. Erosion + depositional landforms

These occur in the **middle course** of the river.

Meanders and ox bow lakes

Char.	A meander is a bend in the river. An ox bow lake is a semi-circular lake detached from the river.
Step 1	Erosion (mainly abrasion) on the outside of the bend creates a river cliff where the water is fast.
Step 2	Deposition on the inside of the bend creates a slip off slope where the water is slower.
Step 3	The meander gets bigger over time (migrates) creating a narrow neck.
Step 4	When the river floods, the water breaks through the neck.
Step 5	The bend is cut off forming an ox bow lake.



8. Example of a UK river

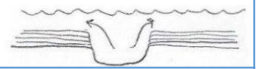
Name	River Tees, NE England.
Where?	Source at Cross Fell in the Pennines. Mouth on North Sea.
Upper course	V shaped valleys and interlocking spurs near Cauldron Snout in the Pennines. Gorge at Low Force. High Force waterfall (20m drop + gorge). Hard dolerite on top of soft sandstone.
Middle	Many meanders. e.g. Sockburn and Yarm.
Lower course	Flood plains and levees south of Darlington. Wide mudflat estuary into North Sea.

7. Depositional landforms

These occur in the **lower course** of the river.

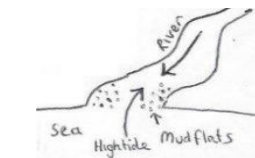
Flood plains

Char.	Wide, flat areas of land each side of a river. They flood. Fertile soil.
Step 1	Meanders widen the valley floor through lateral erosion .
Step 2	After heavy rain, a river may burst its banks, and the velocity slows due to friction .
Step 3	The river deposits the sediment .
Step 4	Layers build up over many floods.



Levees

Char.	Natural embankments along the edges of a river channel. Taller on the side of the river.
Step 1	When a river floods the water's velocity slows due to friction .
Step 2	The heaviest material is deposited first, but lighter material is carried further.
Step 3	This creates levees.
Step 4	These build up each time the river floods.



Estuaries

Char.	Tidal- where the river meets the sea. Often mudflats or salt marshes.
Step 1	Water from the river collides with the sea coming up the river mouth at high tide.
Step 2	Velocity slows so sediment is deposited . At low tide, mud flats are exposed.
Step 3	

11. River management			
Hard engineering			
Man-made structures built to control the flow of rivers and reduce flooding.			
Strategy	Explanation	Costs -	Benefits +
Dams and reservoirs	Barriers built across the river that control river flow . A reservoir (lake) forms behind.	Very expensive to build. Floods towns when created.	Makes hydroelectricity. Prevents flooding.
Channel Straightening	Meanders are removed to make the river straighter. Increases velocity .	May cause more flooding and erosion down stream.	Faster velocity means water leaves the area quickly reducing flood risk.
Embankments	Raised walls built along riverbanks (man-made levees). Increases capacity of the river.	Risk of severe flooding if flood water goes over or they break.	Floods less frequent as river can hold more water.
Flood relief channels	Channels built to divert water around towns. Adds capacity . Town doesn't flood.	River can flood when the channels merge further downstream.	Second channel can hold excess water from the river reducing flooding.

Soft engineering			
Schemes set up using knowledge of a river and its processes to reduce the effects of flooding.			
Strategy	Explanation	Costs -	Benefits +
Flood warning and preparation	Environment Agency warnings. Residents can add sandbags to their doors prior to floods	Some don't get the warning. Doesn't stop floods but reduces the damage.	People have time to protect their properties or evacuate. Reduces the economic impacts.
Flood plain zoning	Restrictions prevent building where flooding is likely. Farmland goes near the river.	Not always possible to change existing land uses.	Flood risk reduced as less impermeable surfaces. Impacts reduced.
Tree planting	Trees intercept and absorb water, therefore less water reaches the river.	Less land is available for farming.	Trees intercept the rainfall reducing flooding as discharge is lower..
River restoration	Making the river more natural so the floodplain floods naturally.	Local flood risk can increase.	Little maintenance is needed. Creates habitats.

12. EG of management scheme	
Where?	Cockermouth
Why was the scheme needed?	Large floods November 2009. Confluence of River Cocker and Derwent. Rivers hadn't been dredged—reduced capacity.
Management strategy	 120m self raising flood barrier.  9 glass panel flood walls.  2000 trees planted. • Flood Action Group. • 62% of the population agreed to text warnings. • Rivers dredged regularly.
Issues	 400 homes protected. £ Scheme cost £4.4 million pounds.  Storm Desmond in 2015 overwhelmed the defences again.

1. Global pattern of urban change

The world's population is growing rapidly. 55% of people in the world live in urban areas.

Urbanisation	An increasing percentage of people living in towns and cities.
HICs	• Very slow rate of urbanisation. • High urban population because urbanisation happened earlier. • Counter-urbanisation is happening here, where people move out of urban areas.
NEEs	• Fast rate of urbanisation due to natural increase and rural to urban migration. • Urban population is increasing rapidly.
LICs	• Fast rate of urbanisation. • Urban population low as many people still rely on farming for food or income.

2. Factors affecting urbanisation

Rural-urban migration	The movement of people from a rural area (countryside) to an urban area (towns and cities).
Push factors	Negative factors that make people leave an area e.g. drought, famine, war, few services.
Pull factors	Positive factors that attract people to an area e.g. better access to services, better paid jobs, access to electricity.
Natural Increase	When the birth rate is higher than death rate.

Key vocabulary

Social deprivation	When the area is very poor, people lack access to affordable housing and services such as healthcare or education.
Dereliction	Abandoned buildings (brownfield sites).
Urban greening	Process of increasing and preserving open space in urban areas <i>i.e.</i> parks.
Urban sprawl	Unplanned growth of urban areas into surrounding rural areas.
Integrated Transport System	• Different forms of transport are linked together to make it easy to transfer from one to another. • E.g. multiple bus routes and cycle lanes from outside Temple Meads Station in Bristol
Brownfield	Land that has been previously used and then abandoned.
Greenfield	Areas that have not been built on before.
Commuter settlements	A place where people live but travel elsewhere for work e.g. Yate à Bristol.

3. Megacities

Megacity	A city of more than 10 million people living there.
How many?	There are now 34. Rapidly increasing.
Where?	Most are in Africa and Asia.

4. Urban transport strategies used to reduce traffic congestion

Problems with congestion	 Air pollution (global warming).  Late for work, deliveries delayed.  Accidents, stress, asthma. • In Bristol, 200 people die every year as a result of air pollution.
Beryl Bikes	Shared bikes in Bournemouth and Poole.
Park and ride	Car parks on the outskirts of a town, with buses into the city centre.
Congestion charge	£18 daily charge for entering London city centre.
Car sharing lanes	Lanes you can drive in only if you have two or more people in your car. • Bristol has 2, there are only 10 in the UK.

5. Sustainable urban living

Sustainable urban living	Meeting the needs of the present without compromising the ability for future generations to meet their needs.
Water conservation	• Recycling grey water. • Dual-flush flush toilets.
Energy conservation	• Energy-efficient appliances (e.g. A-rated washing machines use less electricity per cycle) • South facing windows reduce need for heating. • Solar panels on roofs can generate renewable energy.
Waste recycling	Recycling bins.
Creating green space	Cools urban areas, encourages exercise, provides habitats for wildlife.

1. Location and importance of Lagos	
Location	South coast of Nigeria, close to the border with Benin. 
Regional	Good transport links make it a centre of trade. Large migrant population makes it culturally diverse.
National	80% of Nigeria's industry is located here, 30% of GDP (similar to GNI) is generated here.
International	Financial centre of West Africa. International airport.

2. Causes of urban growth in Lagos	
Rural to urban migration	1,200 migrants arrive each day from the countryside.
Natural increase	- High birth rate, 35.2 per 1000 per year (compared to 10.4 in the UK) - Migrants are young so are more likely to find a partner and have children.

3. Opportunities created by urban growth in Lagos	
Social	68% have a secondary education. - Electricity (Lagos uses 40% of Nigeria's). 8th best city for healthcare in Africa.
Economic	- Wages 4x higher than in rural areas. - Nollywood 2nd largest film industry, providing tertiary job opportunities.
Urban industrial areas	- Groups of industries located together. - Drury Business Park in Lagos is home to TNCs such as Unilever and Nestle, causing the <i>positive multiplier effect</i>. - Jobs provided > wages increase > spending increases > tax increases > infrastructure such as roads improve.

4. Challenges created by urban growth in Lagos	
Managing urban growth	66% live in squatter settlements (areas where homes are built illegally without basic services) e.g. Makoko (home to 250,000 people). - There are 13 squatter settlements in Lagos.
Providing clean water	- Only 40% of the city is connected to the state water supply. - Water supplies are often contaminated with sewage.
Providing sanitation	- Squatter settlements do not have access to sewers. - Up to 15 households can share 1 toilet. - Causes health problems e.g. cholera.
Providing energy	- Not enough reliable electricity for all. Only 14% of households get reliable electricity for more than 8 hours a day. - Neighbourhoods have to take turns for a few hours at a time.
Providing access to services Education /Healthcare	- Access is better than in rural areas, but not equal for all. 80% of health care in Lagos is private (people have to pay). - Poorer people are less likely to afford services.
Reducing unemployment	- Not enough formal jobs 60% work in the informal economy (not taxed and regulated), e.g. scavenging.
Crime	High crime rates in squatter settlements. Gangs like 'Area Boys' control Makoko so police do not enter.

5. Managing environmental issues		
	Challenge	How is it being managed?
Waste disposal	The city produces 9000 tonnes a day. Only 40% of rubbish is collected.	LAWMA starting to collect rubbish overnight to reduce congestion on the roads.
Air and water pollution	10,000 illegal industries cause air pollution - People burn fuel for generators to get electricity.	- Lagos has banned the import of mini generators. \$2.5million new water treatment plants - BUT people in Makoko still have to walk 3km to get water.
Traffic congestion	40% of Nigeria's cars are registered in Lagos. - Bad traffic congestion- 2 hour 'Go Slow'.	- Make bus services better. - For example, the Bus Rapid Transit network carries 200,000 a day (still not enough)

6. Example- How urban planning improves the quality of life for urban poor		
What?	How does it improve QoL?	Was it successful?
Makoko Floating School Educated 100 children.	- Collects rainwater, providing clean drinking water and reducing disease risk - Improved education leads to better future job prospects	✓ Increased quality of life. ✗ Collapsed after a storm in 2016. ✗ Didn't help enough children.

1. Distribution of population and major cities in the UK	
Population	66 million. Distribution is very uneven. 82% live in urban areas.
Cities	Most in flat areas and on the coasts. London is the capital.

2. Location and importance of Bristol	
Location	Southwest of the UK, near Junction of M4 and M5 motorways. 
Importance within the UK	8th most popular city for foreign tourists. 2 universities that attract young people for education.
Importance to wider world	- International airport (links to Europe). - Many TNCs located there (AirBus, BMW)

3. Impacts of migration on the growth and character of the city	
National migration	1851 - 1891 population doubled as people arrived looking for work. There were jobs in shipbuilding. - Now, young people migrate to Bristol for education and stay to find a job once they have graduated.
International migration	- Now, international migration is most important. Bristol's population is made up of 50 countries. - Somalia is the largest ethnic minority.
Impact on character	- Diversity provides many cultural opportunities. - St Paul's Carnival attracts 10,000/year.
Impact on growth	Grown 10% in 10 years to 2021. It's the fastest growing core city in the UK.

4. Urban change in Bristol
- Population growing steadily - Population is becoming more ethnically diverse - Deindustrialisation (factories closed). - Regeneration of Temple Quarter

5. Opportunities created by urban change	
Cultural mix 	- Caused by international migration. - St Paul's Carnival (attracts 40,000).
Recreation and entertainment 	- Caused by a younger population. - Entertainment (The Bristol Old Vic). - Shopping (Cribbs Causeway). 2 football teams.
Integrated transport 	- Caused by improved accessibility. Links different types of public transport. - Reduces congestion in the city.
Employment 	Caused by regeneration. 50 silicon businesses- quaternary jobs. TNCs create jobs. For example, China's Huawei spent £125million on a research and development facility.
Urban greening 	> 90% live within 350m of park/water. 2015 European Green Capital status.

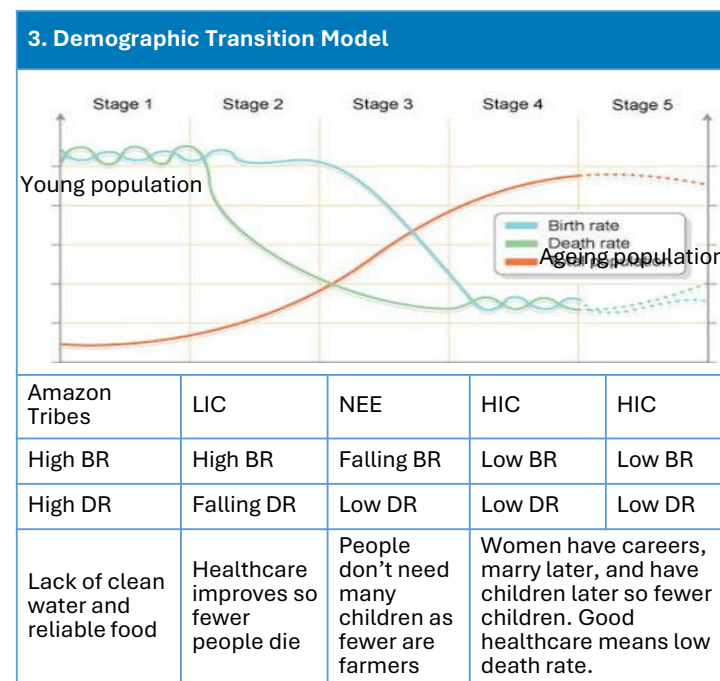
6. Challenges created by urban change	
Urban deprivation	Lacking access to services or low-income areas. E.g. parts of Filwood.
Spiral of decline	A loss of jobs leads to further businesses closing
Inequality in housing	Filwood- 50% in council housing. Stoke Bishop- 50% privately owned.
Inequality in education	In Filwood only 36% get top GCSE grades compared to 94% in SB.
Inequality in health	Life expectancy: Filwood- 78 years. Stoke Bishop- 83 years.
Employment	More are unemployed in Filwood than Stoke Bishop (only 3%)
Dereliction	Buildings that have been abandoned
Building on brownfield	Land already built on but now derelict, expensive to clean
Building on greenfield	Land not used before, destroys habitats
Waste disposal	>1/2 million tonnes of waste/year.
Urban sprawl	The growth of the city into the surrounding rural areas
Commuter settlement	Where people live e.g. Yate but travel to a nearby city e.g. Bristol for work

7. An example of an urban regeneration project			
Example	Why did it need regeneration?	What are the main features?	Successful?
Temple Quarter, Bristol	- The greenbelt is protected from urban sprawl—new buildings can't go there. - Brownfield site- poor environmental quality. - By the train station- poor impression for new visitors. - Deindustrialisation left derelict buildings.	⇒Enterprise Zone meant businesses pay cheaper rent and low tax if they locate here ⇒Bristol Arena music venue planned for Temple Island, moved to Filton ⇒Brunel's Engine Shed cost £1.7million to redevelop in order to maintain engineering heritage.	🏢 4,000 new tertiary and quaternary jobs by 2020, 17,000 by 2037. 🏡 Redeveloped brownfield site. ✗ Bristol Arena moved to rural-urban fringe.

1. What is development?	
Term	Definition
Development	People getting richer and quality of life improving.
Development gap	The economic and social difference between HICs and LICs.
Quality of life	A measure of happiness and health.
Standard of living	A measure of wealth \$
Economic development	Incomes increasing. Jobs changing from primary and secondary to tertiary and quaternary.
Ways to classify the world	
LIC	Low income countries. GNI per capita of under \$1,045. (Poor) e.g. Haiti.
NEE	Newly emerging economies. Countries with recent, rapid economic development.
HIC	High income countries. GNI per capita of over \$12,746. (Rich) e.g. UK.
Brandt line	A line drawn in the 1980s that split the world into rich north and poor south.

5. Consequences of uneven development	
Disparity	Difference
Disparities in wealth	Africa owns just 1% of global wealth
Disparities in health	Health care in LICs and NEEs is poorer. E.g. Life expectancy: UK 82, Nigeria 55
International migration	People move from LICs to HICs for better jobs and higher quality of life. E.g. Syrians to Europe

2. Measuring development		
Term	Cat.	Definition
Arrow shows how the indicator changes with development.		
GNI per capita	💰	Average income. Total income divided by the population. ✗ Doesn't take informal work into consideration and doesn't show inequality (it is an average).
Birth rate	👶	The number of babies born in a year per 1000 people. ✗ Can be influenced by government policy e.g. China's One Child policy
Death rate	👴	The number of people that die in a year per 1000 of the population. ✗ Can be higher in HICs due to elderly population
Infant mortality rate	👶	The average number of deaths of infants under the age of 1, per 1000 births per year.
Life expectancy	👴	The average number of years a person might be expected to live.
People per doctor	👨⚕️	The number of people who depend on a single doctor.
Literacy rate	📖	The percentage of people who can read and write.
Access to safe water	💧	The percentage of people who have access to clean water.
HDI <i>UK 0.940</i> <i>China 0.797</i> <i>Mali 0.410</i>	💰 👶 👴	Human Development Index. A combined measure that includes GNI per capita, life expectancy and adult literacy rate. Out of 1. + Best indicator as it includes social and economic indicators.
General problems		Difficult to record data in conflict zones, remote areas in LICs or areas with unstable government.



4. Causes of uneven development		
Factor	Explanation	
Physical	Natural disasters	Government must spend money rebuilding rather than education. Nepal 2015 EQ \$5bn.
	Land-locked	No coastline so it is difficult to trade. e.g. Nepal.
	Extreme climates	If it's too hot or cold farming is difficult e.g. Thar Desert (53°C July).
Economic	Debt	Money goes to pay off debt instead of healthcare and education.
Historical	Colonialism	European countries controlled resources in Asia and Africa. After regaining power, they were poor and civil wars often occurred. (Nigeria UK colony).
	War	Money spent on weapons instead.

6. Strategies to reduce uneven development		FAT MIDII
Strategy	Explanation	Evaluation
Fairtrade	When farmers are guaranteed a fair price for their products e.g. coffee. The increased income can be used to improve quality of life E.g. improve access to safe water or transport	+ Higher income means farmers can afford better education and healthcare. ✗ Poorest can't afford certification.
Aid	When a country donates resources (money, food, people) to another country. It can be short term emergency aid e.g. after an earthquake or long-term development aid e.g. NetsForLife in Abuja, Nigeria.	+ Nets For Life have provided 82,500 mosquito nets in Nigeria, reducing illness. ✗ Aid might not reach the people who need it.
Tourism	Visitors spend money in a country and infrastructure is improved. E.g. people visiting Nepal for trekking Himalayas.	+ Tourism provides jobs. ✗ Income can be seasonal.
Microfinance loans	Very small loans (e.g. \$100) which are given to people to help them start a small business.	+ Women can benefit from loans. ✗ Can lead to debt.
Investment	Countries or TNCs can invest in a country. E.g. Shell in Nigeria	+ Triggers multiplier effect due to increase in formal employment. ✗ Profits may go back to home country.
Debt relief	Money spent on education and healthcare instead of repaying loans. E.g. Nigeria's debt was cancelled 2005.	+ Improves quality of life (Life expectancy from 46-55 years in Nigeria) ✗ Corruption may mean people don't benefit.
Intermediate technology	Cheap and easy to use technology/machinery. It is appropriate to the needs of the local people. E.g. Solario Safe Cooker.	+ Affordable ✗ Small scale
Industrial development	Developing the secondary sector (factories). This brings jobs and higher income, which leads to improvements infrastructure such as roads due to higher taxes and more investment.	+ Triggers multiplier effect ✗ Causes air pollution

7. Tourism to reduce uneven development	
Nepal	LIC. Average income \$1,090. Suffered a civil war, and an earthquake in 2015. Attractions: Mount Everest, Katmandu.
Advantages	+ Tourism brought in \$445 million in 2015. + 500,000 jobs e.g. tour guides + 7% employment overall) + 8% GNI from Tourism
Disadvantages	- Locals are poorly paid. - EQ in 2015 reduced tourism by 1/3. - Some out of work for 7 months.
Summary	Provides jobs but it is unreliable. Nepal could use other strategies such as intermediate technology and industrial development in the long run.

Map of Nigeria



1. Introduction to Nigeria	
Located just north of the equator, in west Africa.	
Importance of Nigeria	
Globally	🌍 NEE 2014 - 21st largest economy. 🌍 5th largest contributor to UN peacekeeping.
Locally	🌍 Fastest growing economy in Africa.
Nigeria's context	
Political	→ Boko Haram have killed 17,000 people since 2002, mainly in the rural north of the country.
Environment	Rainforest in the south and Savanna north
Social	👤 500 ethnic groups 📖 Literacy rate 62%
Cultural	Nollywood (2 nd largest film industry)

2. Nigeria's changing industrial structure	
Term	Definition
Industrial structure	The proportion of primary, secondary, tertiary, and quaternary workers.
Primary sector	• Fewer farmers as people move to cities. • This is decreasing due to mechanisation and rural to urban migration.
Secondary sector	• More jobs in factories (10,000 illegal factories in Lagos). • This is increasing due to industrialisation.
Tertiary	• More jobs providing services such as banking and retail. • This is increasing due to investment from TNCs.

3. Transnational corporations	
Term	Definition
Transnational corporation	Companies that operate in more than one country. There are 40 operating in Nigeria. E.g. Shell.
Shell in Nigeria	
Advantages	+ 65,000 jobs + 91% contracts to Nigerian companies
Disadvantages	- Bodo oil spill 2008/09. 11 million gallons of oil spilt over 20km². - Gas flares cause breathing problems.
Summary	The Nigerian economy improves, but environment quality in Bodo decreases.

4. Impacts of economic development	
Impact on the environment	🌊 Bodo Oil spill (Shell 2008/09). 🌊 10,000 illegal industries in Lagos = air pollution.
Impact on quality of life	👤 Life expectancy from 46 to 55 years HDI has increased from 0.47 (2005) to 0.53 (2015). - Inequality: quality of life lower in squatter settlements such as Makoko in Lagos.

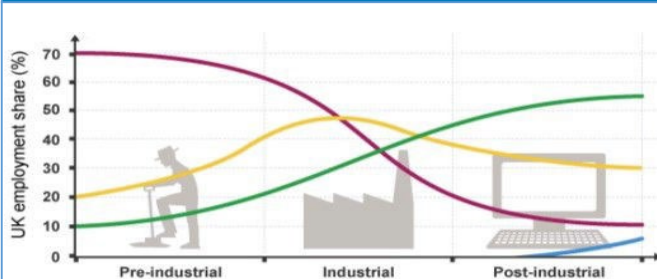
Economic world – The UK's changing economy

1. Place of the UK in the wider world	
Trade	• UK trades globally. • Exports worth £250bn. • Strong links with USA, Europe, Asia.
Culture	Shaun the Sheep in 170 countries.
Transport	• Heathrow airport flies to 84 countries, and 185 different places. • Channel tunnel link to France.
Electronic communication	Most trans-Atlantic cables go through the UK.

5. Nigeria's changing relationships	
Political relationships	Gained independence (UK in 1960) so took back control of resources. Joined commonwealth, to benefit from cultural links.
Trading relationships	Member of OPEC to increase income from oil trading. Used to trade more with USA (\$11bn), now China is more important (\$13.7bn).
6a. International aid in Nigeria	
Term	Definition
International aid	Help from another country.
Emergency aid	After a natural disaster or war. e.g. food, water, shelter after 2015 Nepal EQ.
Developmental aid	Long term support by charities or governments e.g. Water Aid.
6b. Aid in Nigeria	
What?	UK gave £360 million in 2014 down to £110m in 2022.
Nets for Life	• Nets to prevent malaria. • 82,500 given out in Abuja.
Problems with aid	• Sometimes it isn't sustainable. • Corruption means aid might not go where needed.

2. UK Economic and political links	
European Union	• Partnership of 27 countries. • 50% of our trade. • 40% of immigrants to UK came from EU • Voted leave in 2016. 31st Jan 2020 left.
Commonwealth	• Aims to improve wellbeing of members. • Commonwealth games every 4 years.

1. Economic change in the UK



Primary	Mining decreased due to mechanisation.
Secondary	Factories closed (deindustrialisation).
Tertiary	More jobs providing a service due to higher disposable incomes.
Quaternary	High-tech jobs including research and IT.

Why has our economy changed?

Deindustrialisation	The closure of factories because it's cheaper to manufacture in NEEs.
Government policies	A plan decided by a government to manage the country's economy.
Globalisation	The process which has created a more connected world e.g. migration and TNCs.

2. Post-industrial economy

Tertiary and quaternary sector employ 81%.

IT	Employs over 1.3m people.
Services	Retail is the largest sector, employs over 4.4m
Finance	London is the world's leading centre e.g. HSBC bank
Research	Government invested £33 bill in 2016.
Science parks	Groups of high-tech industries located close together, usually near universities. E.g. Southampton University Science Park
Business parks	Purpose built areas of offices and warehouses (on edge of cities). E.g. Cobalt Business Park in Newcastle.

3. Environmental impact of industry

Air and water pollution.

Releases CO₂ increasing the rate of global warming.

Transport of materials is by road → air pollution.

Example of modern industry being environmentally sustainable

Google	London Landscaper started 2018.
Bike and car spaces	Only 4 car spaces 686 bike spaces
Solar panels	Reduces fossil fuel consumption and reduces carbon footprint. Generates 20 MWh a year.
Rooftop gardens	Urban greening. < CO ₂ . 300m long, 250 trees.

4. Changes in the rural landscape

Population decline Cumbria	
Social changes	↓ Declined 0.8% from 2005-2015. ↓ Aging population = pressure on healthcare ↓ Less children so schools shut down
Economic changes	⚠ Shops shut e.g. Gamestation, M&S at risk. ⚠ Higher unemployment (8%)
Population growth North Somerset	
Social changes	↑ Grew 7.8% 2005-2015 due to an increase in people commuting to Bristol for high-paying jobs ↑ Traffic congestion on roads to Bristol ↑ Oversubscribed schools
Economic changes	⚠ house prices, less affordable ⚠ Employment / wages above average

5. Improvements in infrastructure

Road	Upgrading 'smart motorways' M4. New construction jobs, boost economy.
Rail	Faster journey times between London and other cities e.g. HS2 from near London, to Birmingham BUT line to Manchester scrapped and huge cost (£88bn)
Port	For trade (imports and exports) e.g. Liverpool2, doubles capacity to over 1.5m containers a year
Airports	Heathrow expansion. 3 rd runway £18.6 billion

6. North-South divide

Causes	Decline of heavy industry in North (coal). Investment in finance and service industry in the South.
Impacts in north	Higher unemployment / lower wages (40%) Poor health, lower life expectancy (10 years) There are SOME exceptions.
Strategies attempting to resolve regional differences	
HS2	High speed train connecting London with Birmingham. Costs £88bn. ✗ BUT doesn't go to central London and stops after Birmingham
Local Enterprise Partnerships	39 LEPs. Encouraging businesses to work with local authorities (the government). E.g. the Lancashire Partnership was on track to deliver 11,000 jobs by 2021. ✗ They were scrapped in 2024.

1. What are resources?	
Term	Definition
Resource	A supply of something that has a value (food, energy, water).
Significance for well being	
Resources are key to human wellbeing. Their social and economic benefits increase standard of living and quality of life.	
Food	Calories provide energy which are vital for people (work, school). More than 1 billion are malnourished (this $\Rightarrow$ chance of diseases).
Water	Needed for drinking, cooking, and washing. Dirty water makes people ill and can cause people to die due to diseases like cholera.
Energy	Allows industry to develop, creating jobs and making countries richer.
Resources inequality	
Distribution: Uneven	Not all countries have oil or lakes for fresh water.
Dependent on wealth	Rich countries can buy resources from other countries.
Consumption	• HICs consume the most • Rapidly increasing in NEEs. • Low in LICs. Can't afford to exploit resources or import them.

2. Food in the UK	
Demand	Increasing
Importing 40% food	Greater demand for exotic foods. We want seasonal foods all year round.
Problems with importing food...	
Carbon footprint	A measure of the greenhouse gases produced.
Food miles	The distance our food has travelled.
Current food trends in the UK...	
Agri-business	Large scale, industrial farming aimed to maximise the amount of food produced.
Organic produce	Food grown without the use of chemicals.
Eat local	Buy from local farms = lower food miles.

4. Water in the UK	
Demand	Demand is increasing (70% since 1985). Higher pop. > more houses > more water intensive appliances.
Water quality	Water quality improving. But pollution present from fertilisers, oil spills, vehicle pollutants.
Managing pollution	Stricter regulations on fertilisers, filtering water for sediment, purifying water (chlorine).

3. Energy in the UK	
Demand	Increasing (but consumption decreasing because of better technology).
Energy mix	The different energy resources used by a country. Renewable + non-renewable.
How is it changing?	1970 – 91% came from coal and oil. 2014—50% came from coal and oil More renewables.
Reduced domestic supplies coal, gas, oil	North Sea oil and gas is running out.
Issues with energy exploitation	Economic ⚡ Extraction is expensive. ⚡ UK must pay to import energy. Environmental 🛢️ Oil spills can leak toxic chemicals. 🔥 Burning fossil fuels release CO₂.

Areas of deficit	South east. High population and low rainfall.
Areas of surplus	North and west. Low population and high rainfall.
Water transfer	From areas of surplus to areas of deficit. E.g. Mid Wales (surplus) to Birmingham. BUT expensive, affects wildlife, social conflict. E.g. Kielder Reservoir transfer scheme.

1. Water overview

Water insecurity	Not having enough clean water.
Affected by:	• Rainfall available • Access to water • Size of population • Amount used
Water surplus	More than enough water. (supply > demand)
Water security	Having enough clean water to meet everyone's needs.
Water deficit	Not enough water. (demand > supply)
Water stress	When demand exceeds water supply for a certain period.
Aquifer	Underground layer of water stored in permeable rocks.
Permeable rock	Rock with pores (air spaces) in that can store water.

4. Impacts of insecurity

Pollution	When water is scarce people might use contaminated water causing diseases such as cholera.
Reduced food production	Water shortages mean less irrigation, causing malnutrition.
Industrial output	Water shortages means less manufacturing, means less jobs/taxes.
Potential for conflict	Some countries share water sources. E.g., Afghanistan and Iran share Helmand River. This can cause conflict.

2. Factors affecting water supply

Physical factors	• Climate – rainfall and temperature. • Geology – Impermeable rock = easy access.
Economic and social factors	• Over-abstraction – taking water faster than it can be replaced. • Pollution – industry and agricultural waste. • Infrastructure – having enough pumps, pipes and sewers to access to water. • Poverty – people and governments can't afford to get clean water into their homes

5. Water supplies can be increased

Dams/reservoirs	A storage dam across a river traps water creating a reservoir.
Water diversion	Redirects water from the surface to underground aquifers to prevent evaporation.
Water transfer	Moving water from dams to drier areas by canals. (From areas of surplus to deficit)
Desalination	Removing salt from sea water.

8. Water transfer example – STNWTP

Example	South to North Water Transfer Project, China
Water insecurity in North of China	• High population and rising living standards increase demand for water in the north. • Development increases demand from industry and agriculture. • Less rainfall than south.
STNWTP	• \$62bn project , transfers 44.9bn m ³ of water from south to north through canals + tunnels.
Advantages	• 20 cities have clean water including Beijing and Tianjin (100m people benefited) • Development = positive multiplier effect.
Disadvantages	• Large areas flooded destroying habitats. • 345 000 people moved (received little compensation). • Water in Beijing is expensive, due to costs of transporting and building infrastructure.

3. Factors affecting water demand

Population	More water for drinking, washing, etc.
Irrigation	70% of water used in agriculture More people mean higher food demand.
Industrialisation	More water in manufacturing.
Energy production	50 billion m ³ of freshwater used each year to generate electricity.
Living standards	More water used for toilets, showers.

6. Sustainable water supply

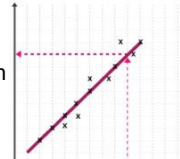
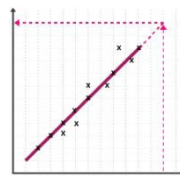
Sustainable water supply	Having enough clean water to meet everyone's needs today, without preventing future generations from meeting their own needs.
Water conservation	Using less water e.g. Fixing leaks and dual flush toilets (saves 3.5L).
Groundwater	Water stored in rock, managed by laws + fines.
Recycling	Using water again. E.g. for irrigation and industry.
Grey water	Recycled water that is used then treated e.g. water from showers used for watering plants

7. Sustainable water supply example – sand dams, Kenya

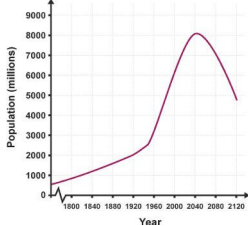
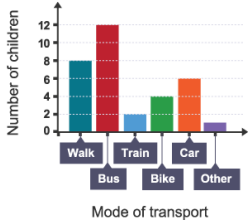
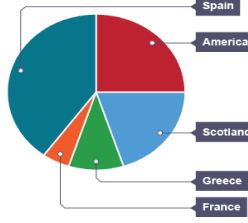
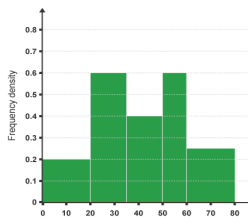
Example	1m high sand dams built across rivers to store water in Kenya, East Africa.
Water insecurity	• Hot and dry most of the year. • In dry season people travel 6-9 hours for water.
Who?	UDO - Utooni Development Organisation
Sand Dams	• Water trapped in sand behind 1m wall. • Sand stops evaporation. • Water extracted by digging a well in the sand or installing a pipe into the sand.
Advantages	• Cheap, local materials, reduced distance travelled to collect water. • Increases water supply.
Disadvantages	Small scale benefits.

Measures of central tendency		
Key vocabulary	Definition	Example: 9 3 5 4 7 3 8
Mean	Total of items ÷ number of items.	$(9+3+5+4+7+3+8) \div 7 = 5.57$
Median	Middle value (when they are in order). Or position can be calculated using $(n+1) \div 2$	3 3 4 5 7 8 9 = 5 $(7+1) \div 2 = 4^{\text{th}}$ position
Mode	Most common.	3 (appears twice) There can be several modes.
Modal class	Most common class.	-
Range	Difference between the highest and lowest value.	Highest 9 – lowest 3 = 6
Upper quartile	Value $\frac{3}{4}$ of the way through ordered data (smallest to largest).	3 3 4 5 7 8 9 = 8
Lower quartile	Value $\frac{1}{4}$ of the way through ordered data (smallest to largest).	3 3 4 5 7 8 9 = 3
Interquartile range	The difference between the upper and lower quartile.	Upper quartile 8 – lower quartile 3 = IQR 5

Percentages		
Strategy	Description	Example
Percentage	To give the amount (X) as a percentage of a sample (Y): $X \div Y \times 100$	45 out of 50 people travel by car... $45 \div 50 \times 100 = 90\%$
Percentage increase	- To calculate the percentage something has increased by. - Work out the difference between the two numbers (the increase). - Divide the increase by the original number. - Multiply the answer by 100%.	Population in 2020 = 65mill. Population in 2000 = 52 mill. $65\text{m} - 52\text{m} = 13\text{m}$ $13\text{m} \div 52\text{m} = 0.25$ $0.25 \times 100 = \mathbf{25\% \text{ increase}}$
Percentage decrease	- To calculate the percentage something has decreased by. - Work out the difference between the two numbers (the decrease). - Divide the decrease by the original number. - Multiply the answer by 100%.	Cars in 2020 = 40 Cars in 2000 = 70 $70 - 40 = 30$ $30 \div 70 = 0.43$ $0.43 \times 100 = \mathbf{43\% \text{ decrease}}$
Use of percentiles	- Percentiles are used to indicate the value below which a given percentage of observations fall. - For example, the 80th percentile is the value below which 80% of the observations occur and above which 20% of the observations occur.	

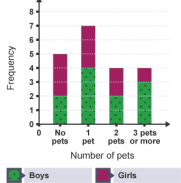
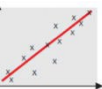
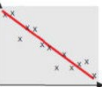
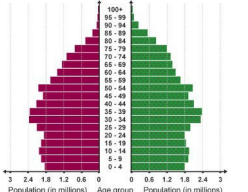
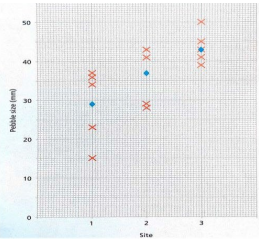
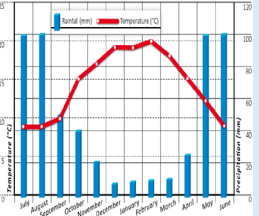
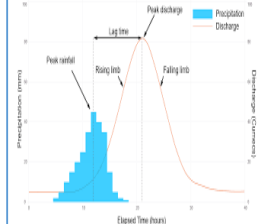
Relationships in bivariate data	
Strategy	Description
Bivariate data	Data for two variables that may be related. e.g. GNI per capita + life expectancy.
Graphed on...	Scatter graphs.
Lines of best fit	A straight line through the data. <i>Try to ensure an equal number of points each side of the line.</i>
Correlation	Positive Negative None  The closer the crosses to the line of best fit the stronger the correlation.
Interpolate	Estimating an unknown value from within the data set. 
Extrapolate	Estimate an unknown value that is outside the data set. Makes the data more uncertain. 

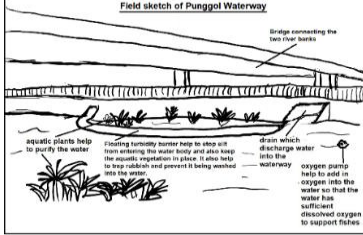
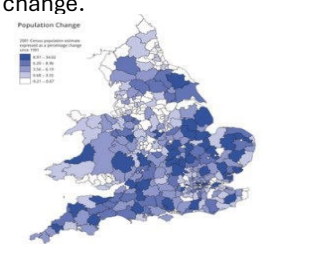
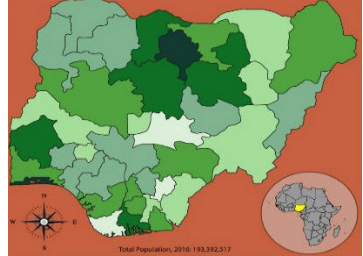
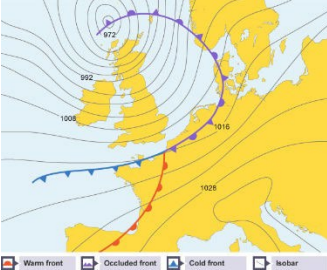
Geography - Graphs

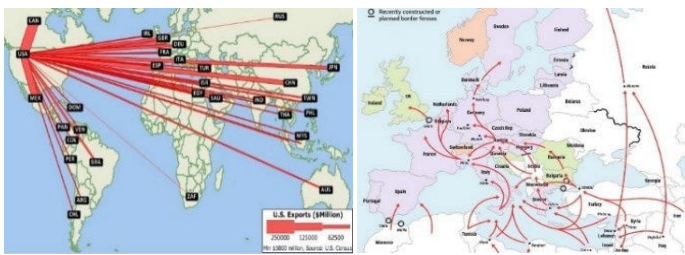
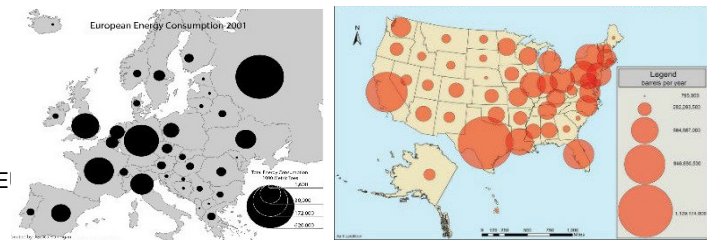
Graphical skills				
Name	Picture	Description	Example use	Evaluation
Line graph		Shows how variables change over time. Time is plotted on the X axis.	For continuous data e.g. the number of vehicles (buses, cars and motorbikes) that travel to an area over the day.	+ Able to estimate (interpolate) data using the trend of the line. + Easy to spot anomalies. ✗ Data points can cluster making it difficult to draw the line.
Bar graph		Each bar is the same width but of varying heights. Bars are drawn equal distance apart, but usually there is a gap between the bars.	For data which fits into categories e.g. the number of different types of car, plants or pets.	+ Simple to draw and read. + Easy to make comparisons of different quantities between categories. ✗ Difficult to find fractions or percentages without further analysis.
Pie chart		Shows the proportion of something by dividing a circle into different parts (slices).	To show percentages e.g. the percentage of people working in different employment sectors.	+ Visually effective at showing how a total quantity is divided up. + Easy to make comparisons between categories. ✗ Small quantities are difficult to represent with narrow slices. ✗ Hard to accurately interpret percentages unless numbered.
Pictogram		Shows the quantity of something by using appropriate symbols/pictures that are drawn to scale.	For data which fits into discrete categories e.g. the world population in different years shown with pictures of people to represent the quantity.	+ Visually effective at showing quantities. + Easy to read and identify overall trends. ✗ Difficult to accurately interpret data from symbols/pictures.
Histogram		Shows the frequency of something by using bars of different heights. Bars are touching.	For continuous data e.g. the amount of rainfall across a continuous timescale of 24 hours.	+ Visually effective at showing how frequency changes. + Easy to spot anomalies. ✗ Inappropriate intervals on x axis can distort data representation.

Geography - Graphs

Graphical skills

Name	Picture	Description	Example use	Evaluation
Divided bar chart		Each bar is the same width, but the bars are individually subdivided to show how the total quantity is divided up.	For discrete groups of data e.g. the percentage of people working in different employment sectors in different years.	+ Summarises large sets of data, allowing comparison. + Visually effective at showing how a total is divided up. ✗ Can be difficult to identify trends.
Scatter graph	Positive correlation  Negative correlation  No correlation 	Shows whether there is a relationship between two sets of data. Where data points are plotted close to the line of best fit the correlation is said to be strong.	For data for which you want to identify if there is a relationship between e.g. plotting life expectancy against GNI per capita.	+ Line of best fit can be drawn to show correlation, effectively showing a relationship. + Can easily spot anomalies when there is a strong correlation ✗ A correlation may be chance. ✗ If there are too few data points, it can be difficult to identify trends.
Population pyramid		A type of histogram in which the length of the bars is determined by the number of people in a population in that age group.	e.g. to show the structure of a population by identifying the number of males and females in age categories.	+ Visually effective at showing which age group has the greatest quantity of people in. + Can be used to give an approximate birth rate and death rate. ✗ Detail can be lost if large age intervals are used.
Dispersion graph		Shows the range of a set of data. The values are plotted on a vertical axis to show the spread.	e.g. to show the range of pebble sizes at different locations on a beach.	+ Visual representation of the range of a data set. + Can be used to determine central tendency (how spread out the data is) ✗ Difficult to plot if the range is small and data points plot close together.
Climate graph		A climate graph shows the average precipitation for each month in a year with a bar graph (blue) and the average temperature each with a line graph (red).	Hydrographs  A hydrograph shows the amount of precipitation over a continuous timescale on a histogram. It also shows the river discharge as a line graph.	

Graphical skills				
Map type	Example	Description	Evaluation	
Photos and sketch maps	 	Photos give real world data on a location, are easy to interpret and are cheap and easy to produce. Field sketches allow the artist to pick important geo- graphical data relevant to their enquiry. Photos can include aerial and satellite.	+ Shows human and physical features of location (land use, vegetation etc). + Photos are easy to produce and keep + Clear visual image of a place and its features ✗ Photos only show a single moment in time. ✗ Sketch maps might not be of good quality and miss vital information.	
Choropleth map	Choropleth map of population change.  Population density in Nigeria. 	Uses colours or shades to show data. Used for population density, age or income.	+ Very easy to identify spatial patterns and trends. ✗ Assumes that all area has the same data. ✗ Suggests abrupt changes between areas.	
Isoline map	 	Isolines can be on a map, graph or image. They connect locations of the same value. Most commonly seen as contour lines. Air pressure on weather maps.	+ Useful for showing gradual changes. ✗ Requires a lot of data to be effective. ✗ Can be confusing when gradient change is close together.	
Dot maps	Population of the UK.  	Dot maps are dots of a fixed size that are used to represent a data set. For example, one dot could be equal to one individual or one million for population size and distribution.	+ Easy to identify patterns. + Great visual tool for large amounts of data. ✗ Clustering of dots makes it impossible to read data. ✗ Areas may appear blank between dots.	

Graphical skills			
Map type	Example	Description	Evaluation
Desire lines and Flow line maps	Desire lines showing US exports. Flow line- Immigration 	Desire lines: Shows movement with a straight line. i.e. goods, trade, people. Line length can show distance. Flow lines: Have arrows and show the specific direction of movement (curved lines). Width of the line can show quantity.	+ Easy to understand. General trends are obvious. + Shows general movement and direction. + Lines can be proportional. ✗ Can get difficult to read if there are too many lines. ✗ Distance is not always accurate as line may just show general end point. ✗ DESIRE: doesn't show journey details, just start and end point. ✗ FLOW: Can be difficult to read if lines cross.
Proportional symbols		Maps that use symbols drawn in proportion to the size of the data. Any symbol can be used but circles are most common. Used for: energy consumption, cars owned, forest fires per state.	+ Easy to read as symbols are proportional. + Easy to read as symbols are proportional ✗ Difficult to calculate actual value. ✗ Symbol might obscure location or mean less accurate positioning on maps.

1. Stages in a fieldwork enquiry		
Stage	Example	
1	Question / Hypothesis	Tourism has an environmental impact in Swanage.
2	Data collection	Questionnaire. Environmental Quality Survey.
3	Data presentation	Bar chart, pie chart. Radar graph.
4	Data analysis	70% said tourists leave litter.
5	Conclusion	Tourism DOES have an environmental impact.
6	Evaluation	I need to increase my sample size for my questionnaire.
Possible enquiries		
Coasts	Does hard engineering reduce longshore drift?	
Rivers	Does velocity increase downstream?	
Urban	Regeneration has created social and economic opportunities in Boscombe.	

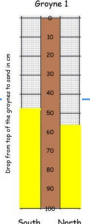
2 .Suitable location?		
Distance	Can you get there and back in a day?	
Access	Is the site public access? Is there anything in the way?	
Sampling opps.	Will it be busy enough to get a reliable sample size? Enough locations to survey?	
3. Risk assessment		
This is where you consider what could cause people harm while completing fieldwork and think about how to reduce the likelihood of this happening.		
Physical fieldwork	Drowning	Face the sea. Stay 5m from the water.
	Heat stroke	Check the forecast. Take suntan lotion and a hat.
Human fieldwork	Getting lost	Arrange a meeting spot. Carry a map.
	Traffic accident	Always cross at a crossing. Concentrate- no distractions.

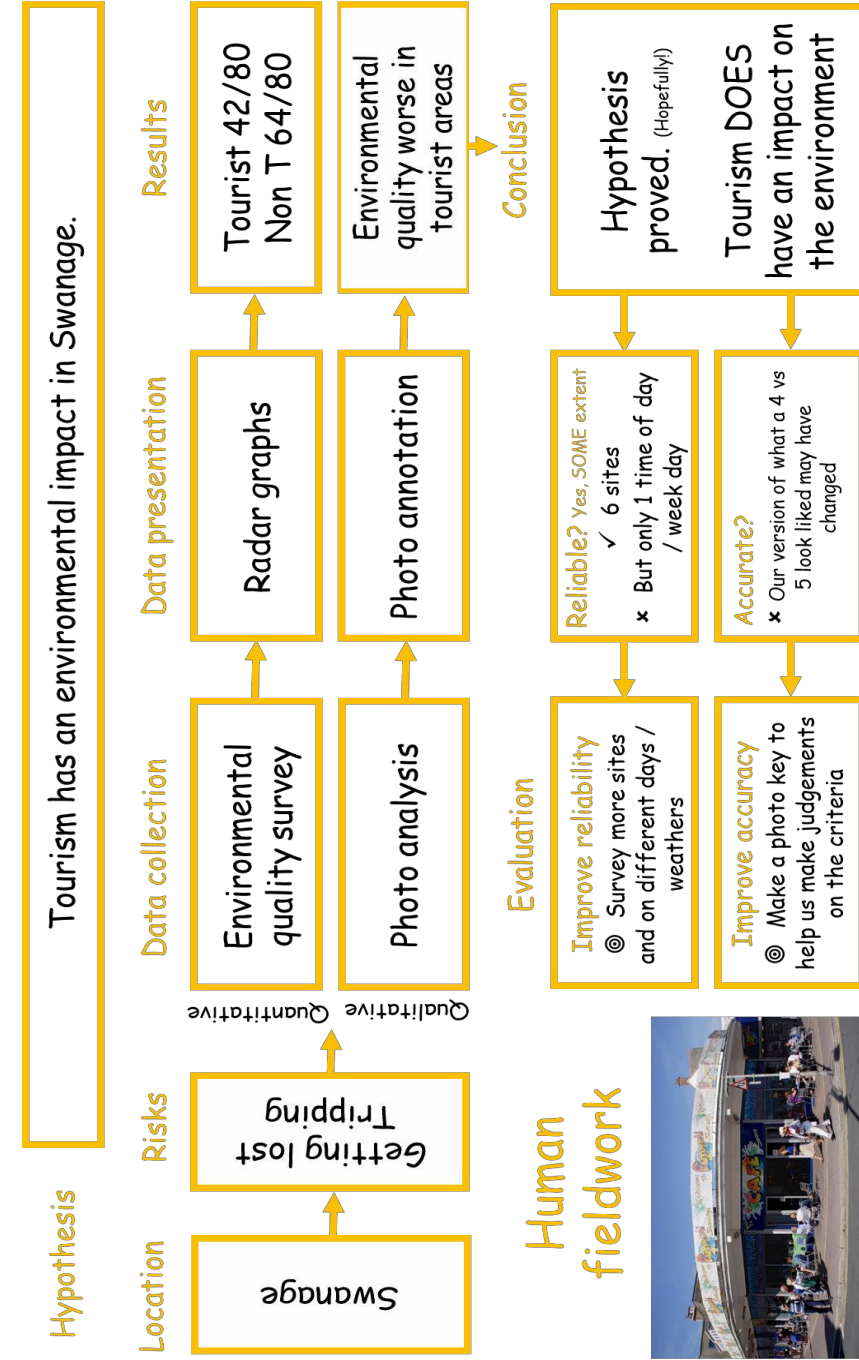
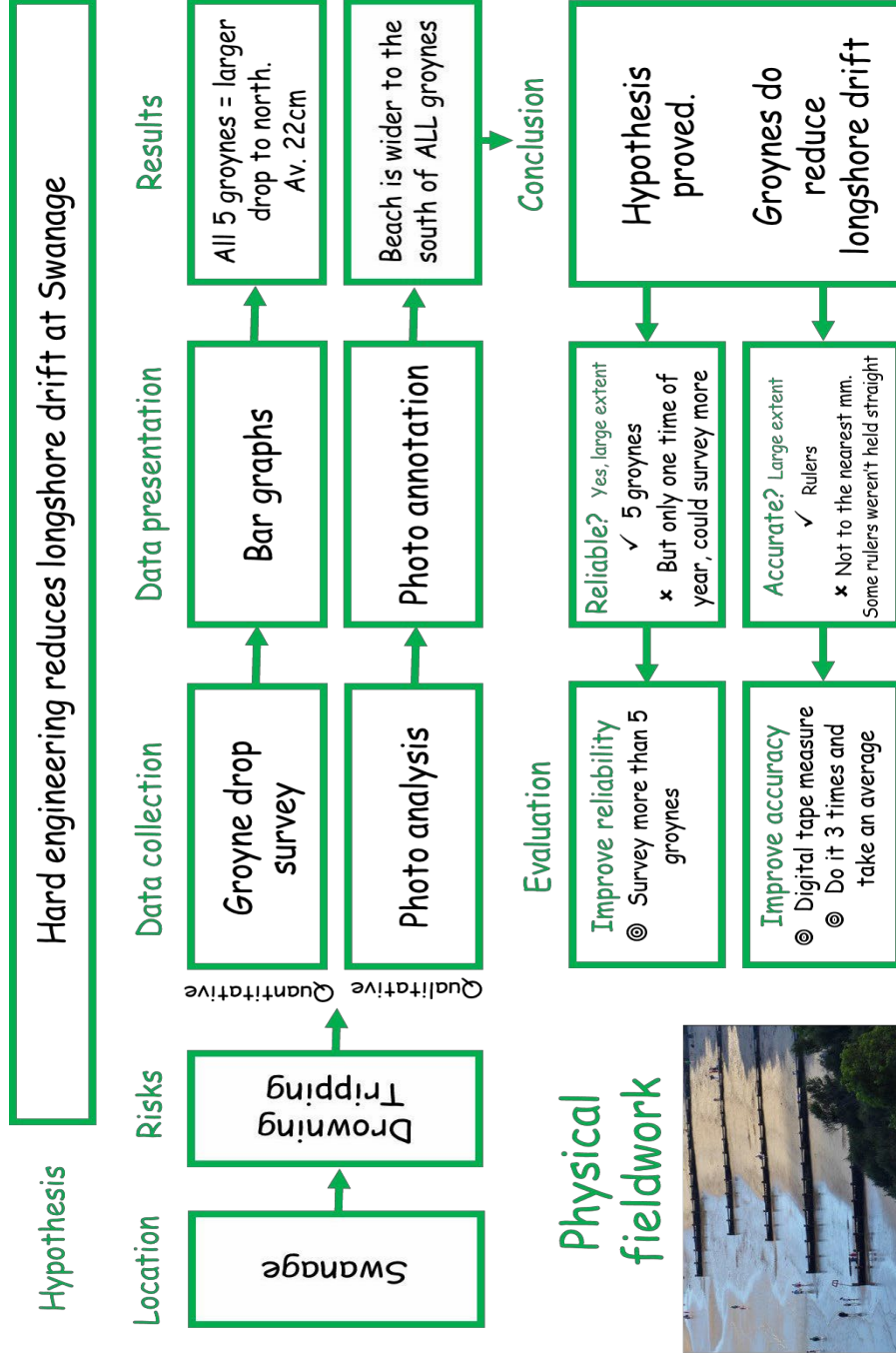
4. Types of data		
Key term	Definition	Examples
Primary data	Data that is collected first hand.	Measuring pebble size on a beach yourself.
Secondary data	Data that has been previously collected by someone else.	July temperatures for the last 30 years.
Quantitative data	Numerical data.	River depths.
Qualitative data	Opinion based data.	Questionnaire data / field sketches.

5. Sampling		
Why sample?	To save time. To avoid bias.	
Sample size	Number of data sets collected. Larger sample sizes make data more representative. (Reliable)	
Strategy	Description	Example
Random sampling	Collect data using a random number generator.	Picking up stones from a riverbed using a random number generator.
Systematic sampling	Collect data at specific intervals.	Sampling every 5 th groyne.
Stratified sampling	Collect data from different groups of a population to ensure fair representation.	Surveying 3 residential locations and 3 town centre locations.

7. Key terms	
Key vocabulary	Description
Data collection methods	How will you collect the data? e.g. questionnaire, river depths.
Data presentation	How will you present your data? e.g. bar graph, flow arrow map...
Accuracy	How close to the true value? (Is it correct to the nearest mm?)
Reliability	The extent to which an investigation produced consistent results. (If you do it again, would you get the same results?)
Validity	How suitable were your methods for answering the question it was intended to?
Limitations	Problems with what you did.
Anomalies	A result that is unusual or does not follow the trend of the other data.
Evaluation	How can you improve your enquiry?

6. Conclusion and evaluation	
Improve your methods	Is there better equipment you could have used? Should you have used a different sampling method?
Increase the reliability	Increase your sample size. Collect data at different times of the day or days of the week.
Increase the accuracy	Use digital fieldwork equipment. Take measurements 3 times and take an average.
Future studies?	Go at a different time of day / year? Add additional methods?

Own fieldwork: Swanage				
	Physical Investigation	Justification	Human Investigation	Justification
Location & hypothesis	Hard engineering reduces longshore drift in Swanage	Swanage is 25 miles away so we can get there and back in a day. Has groynes that we can access.	Tourism has an environmental impact in Swanage	We live in a tourist resort, like Swanage, so impact of tourism affects us.
Primary data collection method	Groyne drop survey, measuring drop on N and S side at a random spot, repeated every other groyne, over 5 groynes. 	Measuring the drop shows build-up of sand on one side. Random sampling on the groyne to find a spot without a tourist/sunbather. Systematic sampling covers a larger area of beach, and measuring each groyne 3x means we could get an average.	Environmental quality survey (EQS). Judging the surroundings in 3x tourist (T) and 3x non-tourist (non-T) areas. 	Quantitative data meant we could easily compare scores for tourist and non-tourist sites. Stratified sampling used to compare environmental quality in tourist vs non-tourist areas.
Primary data presentation	Bar charts	Simple and easy to plot. Drawing groyne in the middle shows drop clearly. But doesn't show location so difficult to analyse.	Radar graphs	4 axes to plot the scores for different criteria. Can show different sites on the same graph, but multiple sites are harder to read as lines overlap.
Secondary data collection method	Annotated aerial photo	Shows view from above to see sediment built up behind 8 groynes.	Annotated photo	Visual representation of the crowds and the litter.
Results	Average drop on north side was 22cm lower, showing groynes trap sediment on south side. Photo showed wider beach on S side of groynes.		Tourist sites scored average of 42, non-tourist sites scored average of 64. Tourist sites scored 22 points lower, showing lower environmental quality.	
Conclusion	Hypothesis accepted; hard engineering reduces longshore drift in Swanage.	We can be confident because: - All 5 groynes showed a lower drop on North side. - Average difference between north and south was 22cm. However, need to go back at a different time of year with different weather.	Hypothesis accepted; tourism has an environmental impact in Swanage.	We can be confident because: - Tourist locations scored 42 compared to 64 for non-tourist. - Taking an average of 3 sites reduces the likelihood of anomalies skewing results. However, might be different on a weekend.
Evaluation	Accuracy: Accurate to some extent. Tape measure wasn't always held completely straight so might be inaccurate (every measurement might underestimate the drop). BUT this wouldn't change our conclusion, because all the measurements would have been affected. Digital tape measure would improve accuracy. Reliability: Reliable to a large extent. Repeated measurements using systematic sampling on 5 groynes to get an average drop. However, we could sample more groynes.		Accuracy: Accurate to some extent. The EQS data was subjective, so people scored places differently. BUT the difference between the sites was 22, which is a significant gap so this would not affect conclusions. Reliability: Reliable to a large extent. We repeated the EQS at 3 tourist, and 3 non-tourist sites so we could take an average. Our data was collected on a weekday morning. It would have been different on a sunny Saturday. BUT this is only likely to have lowered the tourist site scores so we would have reached the same conclusion.	





Glenmoor & Winton Academies

High Achievement – High Standards

Part of United Learning

History

Paper 1: Medicine Through Time, 1250-Present

Medicine Through Time: Key People / Groups

1. Medieval

Hippocrates	- Theory of the Four Humours - Ideas used for over 1000 years
Galen	- Theory of Opposites - Wrote over 300 books - The Church taught that his ideas were correct and should not be challenged

2. Renaissance

William Harvey	- Proved that the heart pumped blood around the body - No impact at the time – took 50 years for ideas to be accepted
Thomas Sydenham	- Direct observation – doctors should not use books but observe the sick - Argued the Four Humours was completely wrong; each different disease needed a different treatment - His book <i>Observationes Medicae</i> was used by other doctors for 200 years
Andreas Vesalius	- Human dissection proved Galen had made 300 mistakes - His book the <i>Fabric of the Human Body</i> was published in 4 different languages and used in medical training - Inspired William Harvey
The Royal Society	- Set up in 1660 by King Charles II - Encouraged scientific research by the government

3. Enlightenment

Edward Jenner	- Created the first vaccine to prevent smallpox - Took over 50 years to be accepted
James Simpson	- Chloroform used to eliminate pain - Popularised by Queen Victoria during childbirth
Edwin Chadwick	- Chadwick Report identified cities were unhealthy and overcrowded - Advised that the government needed to support Public Health
John Snow	- Proved that cholera spread through contaminated water - Helped change attitudes towards Public Health
Florence Nightingale	- Nurse during Crimean War and helped reduce death rate from 40% to 2% - Created the Pavilion Plan and improved sanitation, ventilation and the cleanliness of hospitals - Wrote <i>Notes on Nursing</i> to improve nurses' training
Louis Pasteur	- Germ Theory stated bacteria caused disease - Disproved theories of miasma and Spontaneous Generation
Robert Koch	- Developed Germ Theory using chemical dyes - Proved that specific germs caused specific diseases - Created more vaccines and could prove how they worked
Joseph Lister	- Carbolic Acid used to prevent infection; reduced deaths in surgery by 30% - Inspired by Germ Theory

4. Modern

Paul Ehrlich	Created the first magic bullet Salvarsan 606
Alexander Fleming	Accidentally discovered first antibiotic penicillin
Florey and Chain	- Developed penicillin into effective human treatment - Mass production began in USA - Used to treat thousands of soldiers in WW2
Franklin and Wilkins	Took first X-Ray images of DNA
Crick and Watson	- Discovered the structure of DNA - Proved DNA was in every human cell and was passed from parents to child

5. WW1

Harvey Cushing	- Pioneered Brain Surgery - Used magnets to remove metal fragments from head injuries
Harold Gillies	- Pioneered Plastic Surgery - Developed skin grafts and jaw splints during the war

Paper 1: Medicine Through Time, 1250-Present

Medieval Medicine 1250-1500

6. Believed Causes of Disease

God	Disease sent as a punishment or as a test of faith
Miasma	Bad air caused by dirt/ waste or volcanic eruptions
Four Humours	- Blood, phlegm, yellow bile and black bile - Imbalance of humours resulted in illness - Idea supported by the Church for 1000 years
Supernatural	Movement of the planets/position of the stars

7. Medieval Treatments and Care for the Sick

Religious Treatments	- Praying, pilgrimages, fasting, self-flagellation 30% hospitals run by the Church who offered "care and prayer"
Miasma Treatments	- Herbs burnt and fires lit to ward-off bad smells - Regimen Sanitatis (keeping clean)
Humoral Treatments	- Bloodletting: leeches, cupping and cutting the veins - Purging: making a patient vomit/go to the toilet - Herbal remedies and steam baths
Astrological Treatments	- Star charts consulted before treating; treatments depended on alignment of the planets and zodiac signs - Herbs, bleeding, purging, cutting hair and nails at the right time
Medieval Medics	- Physicians: trained for 7 years, diagnosed illness based on the works of Galen but did not treat patients - Apothecaries: no formal training, mixed herbal remedies - Barber Surgeons: no formal training, carried out simple operations such as bloodletting, pulling teeth, amputations - Women: treated most people within their homes

8. Medieval Preventions and Public Health

Religious Prevention	Prayer, pilgrimage, fasting, self-flagellation
Miasma Prevention	Carrying pomanders, burning herbs, lighting fires, ringing bells to move the air away from them, keeping clean
Humoural Prevention	Preventions included eating a healthy diet and bathing regularly
Supernatural Prevention	Wearing amulets and charms to protect from evil spirits or buying incantations
Public Health	- Government was reactive, not proactive to Public Health - Cities were very dirty and helped to spread many diseases

9. Medieval Case Study: Black Death, 1348

Bubonic Plague	- Caused buboes (swellings) and fever leading to death - Killed one-third of the population in 1348
Believed causes	God deserting mankind, punishment for sin, unusual positioning of the planets, miasma
Treatments	- Religious: prayer, pilgrimage, self-flagellation - Humoural: bleeding, purging - Rational: lancing buboes
Government Action	- Quarantine: stopped people from running away and stopped victims from leaving their houses for 40 days - King ordered the cleaning of streets to remove miasma

10. Factors Affecting Progress

Change	Growth in hospitals, some herbal remedies worked
Continuity	- Church: controlled all medical knowledge, any challenges to existing ideas would be a challenge against God - Attitudes: all education was controlled by the Church - Government: reactive during the Black Death but at no other time to improve Public Health - Technology: non-existent - Individuals: Hippocrates and Galen wrote over 300 books and were respected

Paper 1: Medicine Through Time, 1250-Present

Renaissance Medicine 1500-1700

11. Believed Causes of Disease

Continuity with Medieval explanations	- God, Miasma & Four Humours remained popular - Astrology became less popular
Contact	During the plague, people identified that disease could spread between people but could not explain why

12. Renaissance Treatments and Care for the Sick

Humoural Treatments	Bleeding and purging remained as treatments due to a lack of alternatives
Transference	Belief illness could be passed onto something else e.g. using an onion to rub warts was believed to "transfer" the warts to the onion
Herbal Remedies	Discovery of the New World brought new medicines e.g. tobacco and bark from the cinchona tree to treat malaria
Hospitals	- Dissolution of the Monasteries meant many hospitals linked to the Church closed down - New hospitals opened which treated illness rather than just caring for patients. Pest Houses: specialised in one disease
Renaissance Medics	Physicians: trained for 7 years, most only diagnosed illness through books but some did dissect bodies Apothecaries: became professional and needed formal training - Barber Surgeons: now needed a license to carry out basic operations Women: still treated most people within their homes

13. Renaissance Preventions and Public Health

Regimen Sanitatis	Keeping clean combined with new ideas of moderation; avoiding fatty foods, drinking too much and being lazy
Miasma Prevention	- Removing sewage, draining bogs, cleaning the streets - Herbs burnt in the streets during the Great Plague - Smoking tobacco was encouraged as well as carrying a pomander
Public Health	Government remained reactive, not proactive to Public Health but did do more during the Great Plague

14. Renaissance Case Study: Great Plague, 1665

Believed Causes	God deserting mankind, punishment for sin, unusual positioning of the planets, miasma
Treatments & Prevention	Religious: prayer, pilgrimage, self-flagellation Humoral: bleeding, purging Rational: lancing buboes, plague doctors wore protective clothes
Government Action	- Quarantine for 28 days & homes with the infected had a red cross on the door - Public meetings, fairs and funerals were banned and theatres closed 40,000 dogs and 20,000 cats were killed - The dead were collected daily by appointed searchers and wardens

15. Factors Affecting Progress

Change	Church: declined in power during the Reformation allowing new ideas/dissection/improved knowledge. Humanism rejected the idea that God was responsible for everything. Technology: Printing Press spread knowledge that challenged the Church/ microscope and water pump influenced work of Harvey Government: Charles II set up the Royal Society & took action during the Plague Individuals: Royal Society, Sydenham, Vesalius and Harvey improved knowledge War: new injuries from guns encouraged a new approach to treatments
Continuity	Church: many people were still highly religious and turned to God for treatment/prevention during the Plague Attitudes: most ideas about medicine continued from the Medieval period Government: reactive during the Great Plague but at no other time to improve Public Health

Paper 1: Medicine Through Time, 1250-Present

Enlightenment Medicine 1700-1900

16. Believed Causes of Disease

Spontaneous Generation	- Incorrect theory that microbes were a product of decay - Believed microbes were spread by miasma - Supported by British Doctor Henry Bastian
Germ Theory	Correct theory produced by Louis Pasteur that microbes were the cause of decay and that germs caused disease

17. Enlightenment Treatments and Care for the Sick

Problems with Surgery	Pain, infection and blood loss
Surgical Development	- Anaesthetics: Chloroform solved the problem of pain - Popularised by Queen Victoria during childbirth - Antiseptics: Carbolic Acid solved the problem of infection - Led to aseptic surgery: surgery performed in a germ-free environment
Hospitals	- Hospitals reformed by Florence Nightingale - Hospitals followed the Pavilion Plan; improved ventilation, more windows, larger rooms and separate isolation wards - Hospitals were cleaned more regularly with clean bedding and fresh food given to patients
Enlightenment Medics	- Doctors: became more common in hospitals, with many junior doctors who were training - Nurses: training for nurses improved and many were middle class women - Pharmacies: apothecaries were now known as pharmacies - Women: many people were still treated at home by family members as hospital places were limited

18. Enlightenment Preventions and Public Health

Inoculations	- Deliberately infecting yourself with a disease to create an immune response to protect from that disease - Dangerous as it could lead to death of the person infected
Vaccinations	- Injection into the body that makes a person become immune to a disease - The smallpox vaccine was the first vaccine created by Edward Jenner using cowpox
Public Health	- Government ended their Laissez Faire attitude (not intervening in people's health) - First Public Health Act (1848) which encouraged clean water supplies - Second Public Health Act (1875) was compulsory and forced councils to provide clean water, sewage and monitor disease outbreak

19. Enlightenment Case Study: Cholera, 1854

Cholera	- Caused diarrhoea and sickness which led to dehydration - It was usually fatal – victims would die between 2 and 6 days - Affected the poorest people in society
Believed causes	- People believed that miasma and rotting material caused cholera - John Snow proved that cholera was caused by dirty water, however, could not prove this until Germ Theory was discovered
Treatment/Prevention	- Some steps were taken to try and clean up the cities to prevent the spread of cholera - John Snow removed the handle from the Broad Street Pump to prevent cholera spreading in Soho, London
Government Action	Invested in a new sewer system, however the government still believed that cholera was spread by miasma

20. Factors Affecting Progress

Change	- Church: Influence of the Church had declined rapidly - Government: Public Health Acts passed meaning that the government began to intervene in people's health - Individuals: Louis Pasteur and Robert Koch disproved Spontaneous Generation - Attitudes: Greater focus on developing scientific explanations due to the 'Enlightenment'
Continuity	Attitudes; ideas such as miasma still existed

Paper 1: Medicine Through Time, 1250-Present

Modern Medicine 1900-Present Day

21. Believed Causes of Disease

Hereditary Diseases	- Illness caused by genetic factors passed on from parents to children e.g. Downs Syndrome Human Genome Project; between 1990 – 2000 scientists mapped the human genome looking for mistakes which cause hereditary illness
Lifestyle Factors	Smoking; can cause cancers and heart disease Diet; can lead to diabetes and heart disease Alcohol; can lead to liver and kidney problems Tanning; can lead to skin cancer
Germ Theory	Accepted that microbes cause disease

22. Modern Treatments and Care for the Sick

Magic Bullets	- Chemical cure that attacks microbes in the body causing disease whilst leaving the body unharmed - Salvarsan 606; first magic bullet which treated syphilis - Prontosil; second magic bullet to treat blood poisoning
Antibiotics	- Treatment that destroys or limits the growth of bacteria in the body - Penicillin; the first true antibiotic - Streptomycin; antibiotic which treated tuberculosis
High-Tech Medical Treatments	- Radiotherapy; uses x-rays to target and shrink tumours - Chemotherapy; uses chemicals to treat cancers - Dialysis; used to 'wash' blood in patients with kidney failure - Keyhole surgery; using cameras and narrow instruments to operate through tiny incisions - Transplants of organs
Hospitals	- National Health Service (NHS) launched in 1948 to provide free health care for all - Access to medical care had improved
Modern Medics	Doctors, nurses and GPs

23. Modern preventions and Public Health

Vaccination Programmes	- Compulsory vaccinations funded by the government - Diphtheria vaccine (1942) - Polio vaccine (1950)
Laws	- Laws passed by the government to safeguard the health of the population - Clean Air Acts (1956 and 1968) to deal with smog (air pollution) in London - Health Act (2006); banned smoking in enclosed public spaces
Campaigns	- Public adverts to promote healthy lifestyle - Anti-alcohol, drug and smoking schemes e.g. Stoptober - Schemes to encourage health eating and exercise e.g. Change4life
Public Health	- Laissez-Faire approach ended - Government created the NHS in 1948

24. Modern Case Study: Lung Cancer

Lung Cancer	Second most common cancer in the UK
Believed Causes	- Mostly caused by external factors, such as smoking - Around 85% of cases are people who smoke or have smoked
Treatments / preventions	- Lung transplants - Radiotherapy and chemotherapy can limit the growth of cancerous cells
Government Actions	- Influencing behaviour; campaigns to advertise the dangers of smoking; images on cigarette packets and removing cigarettes from display in shops - Changing behaviour; banning smoking in workplaces, raising the legal age for buying tobacco and increasing taxation on tobacco products

25. Factors Affecting Progress

Change	- Technology: Shift towards laboratory medicine, big developments in high-tech medical diagnosis and treatment - Government: Laissez-Faire attitude ended, and the government had taken big steps in both treatment and prevention of illness - Individuals: Watson and Crick, Fleming, Florey and Chain - War: WW2 meant there was a need to find a treatment for infections
---------------	--

Paper 1: Medicine Through Time, 1250-Present

Medicine and Surgery in the First World War

26.Context of the Trenches

Trenches	• Dug in a zig zag pattern, 2.5m deep • Easier to defend than to attack
Front Line Trench	• Trench nearest the enemy where attacks would be made from • Protected by machine guns/barbed wire
Support Trench	• 80m behind the Front-Line Trench • Troops would retreat here
Reserve Trench	• 100m behind the Support Trench • Reserve troops could be mobilised
Communication Trenches	• Trenches which ran between the other trenches
Problems of moving wounded men	• Poor terrain; mud, craters and shell holes • Exposure to shelling and gunfire • Poor lighting at night

27.Chain of Evacuation

Stretcher Bearers	• Collected the wounded from No Mans Land • Each battalion had 16 stretcher bearers
Regimental Aid Post (RAP)	• Located close to the Front Line (within 200m) • Regimental Medical Officer gave immediate first aid to minor injuries
Dressing Stations (Advanced/ Main)	• Located in abandoned buildings, dug outs or bunkers (around 400m from Front Line) • Medical Officers and nurses would give first aid to soldiers
Casualty Clearing Station (CCS)	• Set up in factories and schools and staffed by trained doctors and nurses • Located further from Front Line for protection from attack • System of triage (walking wounded, hospital treatment, no chance of recovery) • Began to specialise in lifesaving operations
Base Hospitals	• Located near the French and Belgian coasts and accessed by rail • Began to experiment in new techniques due to laboratories and x-ray departments
RAMC	• All medical officers were members of the Royal Army Medical Corps

28.Key Battles of the First World War

First Battle of Ypres 1914	• The British blew up Hill-60 by tunnelling underneath it & reclaimed the high ground from the Germans • The British held onto control of the English Channel ports meaning supplies and reinforcements could reach them
Second Battle of Ypres 1915	• The first use of gas in the war with Germans using chlorine gas • German victory as Germans advanced two miles; 59,000 British men died
Battle of the Somme 1916	• The first use of tanks in warfare but with many technical problems • Huge number of British casualties, around 400,000
Battle of Arras 1917	• The British dug tunnels, linking existing caves and quarries to act as shelters against German attacks • The tunnels contained a light railway system and a fully functioning hospital
Third Battle of Ypres 1917	• Rain caused the terrain to become waterlogged, so men fell in shell holes and drowned • The battle plan failed as Germans were aware of the upcoming attack
Battle of Cambrai 1917	• The first use of stored blood to treat wounded soldiers for blood loss • The first large-scale use of tanks which were now able to move easily across the terrain and barbed wire

29.New Treatments in WW1

Treatments for Infection	• Debridement: cutting away of dead, damaged and infected tissue • Carrel-Dakin: cleaning the wound with a sterilised salt solution • Amputation: removal of wounded limbs
Mobile X Ray Units	• Used to identify shell fragments and bullets in wounds • Problems: would take a long time to x-ray, they could overheat quickly and could only be used for 1 hour at a time
Broken Bones	• Thomas Splint: used to keep the leg rigid during transportation • Increased the survival rate of leg injuries from 20% to 82%
Surgery	• Plastic Surgery: facial reconstruction using flesh and cartilage from the body • Neurosurgery: brain surgery using magnets to remove shrapnel and local anaesthetic to reduce brain swelling
Blood Loss	• Transfusions: sodium citrate was added to blood to allow for indirect blood transfusions (patients not in the same room) • Sodium citrate also allowed for blood to be stored without clotting for 2 days

30.Diseases and Illnesses in WW1

Trench Fever	• Transmitted by lice and gave flu like symptoms • Prevented by thorough delousing of uniforms
Trench Foot	• Painful swelling of the feet caused by prolonged exposure in water • Prevention; rubbing whale oil into feet, keeping feet dry and changing socks
Shell Shock	• Condition caused by stress of war • Symptoms included tiredness, headaches and complete mental breakdowns • Condition was not understood, soldiers were accused of cowardice
Gas Gangrene	• Infection in wounds caused by bacteria in the soil from fertiliser
Gas Attacks	• Chlorine: first used in 1915 and caused death by suffocation • Phosgene: first used at end of 1915 and caused death by suffocation but faster acting • Mustard: first used in 1917 which was an odourless gas which led to internal and external blisters • Gas masks were given to all British troops in July 1915

Paper 2: Superpower Relations and the Cold War 1941-1991

US President	Year	Event	Leader of Soviet Union
Roosevelt	1941	Formation of Grand Alliance	Stalin
	1943	Tehran Conference	
	1945	February: Yalta Conference May: WW2 ends (in Europe) July-August: Potsdam Conference	
Truman	1946	February: Long Telegram March: Iron Curtain speech September: Novikov Telegram	
	1947	March: Truman Doctrine June: Marshall Plan September: Cominform created	
	1948	Berlin Blockade & Airlift	
	1949	January: Comecon created April: NATO created May: Berlin Blockade ends August: Soviets test Atom bomb October: East Germany founded	
	1952	Hydrogen bomb created by USSR and USA	
Eisenhower	1955	Warsaw Pact formed	Khrushchev
	1956	February: Khrushchev's Secret Speech October-November: Hungarian Uprising	
	1958	Berlin Ultimatum	
	1959	January: Cuban Revolution September: Khrushchev visits Washington	
	1960	May: Paris Summit & U2 spy plane shot down	
Kennedy	1961	April: Bay of Pigs Invasion June: Vienna Summit August: Berlin Wall built	
	1962	October: Cuban Missile Crisis	
	1963	June: Kennedy visits Berlin July: Test Ban Treaty August: Hotline created	

Johnson	1967	October: Outer Space Treaty	Brezhnev
	1968	April: Prague Spring July: Nuclear Non-Proliferation Treaty August: Soviet invasion of Czechoslovakia November: Creation of Brezhnev Doctrine	
Nixon	1969	SALT talks begin	
	1971	July: SALT I signed	
Ford	1975	August: Helsinki Accords	
Carter	1979	June: SALT II December: Soviet Invasion of Afghanistan	Andropov
	1980	January: Carter Doctrine and US boycott of Moscow Olympics announced	
Reagan	1983	March: Reagan's Evil Empire speech and 'Star Wars' announced	Chernenko
	1984	May: Soviets announce boycott of LA Olympics	
	1985	March: Gorbachev becomes leader November: Geneva Summit	Gorbachev
	1986	October: Reykjavik Summit	
	1987	December: Washington Summit, INF treaty signed	
	1988	December: Gorbachev ends Brezhnev Doctrine	
	1989	August: Hungary opens its borders to the West November: Berlin Wall falls December: Communist governments fall in Bulgaria and Czechoslovakia	
Bush	1990	Malta Summit October: Germany officially reunifies	
	1991	December: Soviet Union breaks up	

Paper 2: Superpower Relations and the Cold War 1941-1991

Superpower Relations and Cold War Key People/Groups

Joseph Stalin	• Leader of USSR 1928-1953
Franklin D. Roosevelt	• President of USA 1933-1945 • Present during the Tehran and Yalta conferences
Winston Churchill	• Prime Minister of Great Britain 1940-1945 • Present during the Tehran and Yalta conferences • Delivered 'Iron Curtain' speech in 1946
Clement Attlee	• Prime Minister of Great Britain 1945-51 • Present at the Potsdam Conference
Harry S. Truman	• President of USA 1945-1953 • Introduced Truman Doctrine: policy of containment in Europe
Dwight Eisenhower	• President of USA 1953-1961
George Marshall	• US Secretary of State 1947-1949 • Established Marshall Aid
George Kennan	• US ambassador in Moscow • Created the Long Telegram
Nikita Khrushchev	• Leader of USSR 1953-1964
Imre Nagy	• Leader of Hungary 1956 • Announced intention to leave the Warsaw Pact
Janos Kadar	• Replaced Nagy as leader of Hungary after the Hungarian Uprising

John F. Kennedy	• President of USA 1961-1963
Fidel Castro	• Leader of Cuba 1959-2008
Leonid Brezhnev	• Leader of USSR 1964-1982
Alexander Dubcek	• Leader of Czechoslovakia 1968 • Introduced Prague Spring reforms
Jimmy Carter	• President of USA 1977-81 • Created Carter Doctrine
Hafizullah Amin	• Leader of Afghanistan ousted by the Soviets in 1979
Babrak Kamal	• Replaced Amin as pro-Soviet leader of Afghanistan • Fought against Mujahideen
Ronald Reagan	• President of USA 1981-1989 • Introduced the Reagan Doctrine "Rollback"
Mikhail Gorbachev	• Leader of USSR 1985-1991 • Responsible for "New Thinking"
George Bush	• President of USA 1989-1993
NATO	• Western military alliance
Warsaw Pact	• Eastern military alliance

Paper 2: Superpower Relations and the Cold War 1941-1991

Superpower Relations and Cold War Key Information

1. Ideological Causes of the Cold War

Ideology	System of ideas and beliefs which forms the basis of economic or political policy
Capitalism	- Ideology followed by the USA (West) during the Cold War - System allows for free democratic elections, class system & private ownership of business and property
Communism	- Ideology followed by the USSR (East) during the Cold War - System followed single-party rule, no class system and property and businesses are owned by the state
Grand Alliance	- Partnership formed between Great Britain, USSR and USA - Formed with the purpose of defeating the common enemy; Nazi Germany

2. Conferences

Tehran	- Largely positive for the Grand Alliance: Stalin, Roosevelt, Churchill - USSR agreed they would support USA in joining war against Japan US & British agreement to launch 'Second Front' against Nazi Germany to relieve pressure in the East
Yalta	- Largely positive for the Grand Alliance: Stalin, Roosevelt, Churchill - Germany & Berlin would be divided into 4 zones following defeat in WW1 - Creation of United Nations to promote peaceful resolutions
Potsdam	- Largely negative for the Grand Alliance: Stalin, Truman, Attlee - New US President took 'get tough' approach towards USSR - Loss of common enemy meant discussions became difficult - USSR angered by not being informed about US testing of atomic bomb

3. Soviet Expansion in Eastern Europe

Satellite State	Countries with communist governments which had little independence from the Soviet Union
Buffer Zone	Area of protection (Eastern Europe) for the Soviet Union which limited possibility of invasion from the West
Rigged Elections	System to ensure communist governments came to power in Eastern Europe after WW2

4. War of Words 1946

Long Telegram	- Produced by George Kennan (US ambassador in Moscow) - Reported Stalin sought destruction of capitalism and USSR would back down if faced with strong resistance
Iron Curtain Speech	- Delivered by British ex-Prime Minister Winston Churchill in Missouri, USA - Stated USSR was greatest threat to world peace - Stalin believed the speech reflected USA attitudes as Truman approved the speech
Novikov Telegram	- Produced by Nikolai Novikov (USSR ambassador in Washington) - Reported USA wanted world domination and American people would support the government if the nation went to war

5. Truman Doctrine

Truman Doctrine	- Policy of containment to prevent the spread of communism into Western Europe - Marked a stark change to the US's previous policy of isolationism
Marshall Aid	America providing economic aid to countries of Western Europe to prevent them becoming communist
Dollar Imperialism	Stalin viewed Marshall Aid as America's attempt to establish an American economic empire in Europe
Comecon	Financial aid in line with communist principles to the countries of Eastern Europe
Cominform	Political organisation that enabled Stalin to direct and control the governments of the satellite states

6. Berlin Crisis 1948-1949

Trizonia	Western powers (Great Britain, USA & France) combine their zones of occupation in Germany, 1948
Deutschmark	New currency introduced by Trizonia which results in Germany being economically split into two
Berlin Blockade	Stalin blocks all rail, road and canal access into West Berlin hoping the Western powers will hand over full control
Berlin Airlift	Western powers decide to fly supplies (food, clothing, medicine) into West Berlin
Military Alliances	- North Atlantic Treaty Organisation (NATO) – Western military alliance - Warsaw Pact – Eastern military alliance
Division of Germany	- East Germany becomes the German Democratic Republic (GDR) - West Germany becomes the Federal Republic of Germany (FDR)

Paper 2: Superpower Relations and the Cold War 1941-1991

7. Arms Race	
Atomic Bomb	- First created by USA in 1945 - Soviets create their own in 1949
Hydrogen Bomb	- First created by USA in 1952 - Soviets create their own in 1953
Intercontinental Ballistic Missiles (ICBMs)	First created by USA in 1957 and followed a few months later by the USSR. Could travel 4500km
Mutually Assured Destruction (MAD)	- By 1957 the US and USSR had enough weapons to destroy the world many times over - The idea that weapons were now developed to stop the other side from going to war at all

8. Hungarian Uprising 1956	
Reasons for the Hungarian Uprising	- No freedom of speech, fuel shortages, poor harvests & harsh leadership under Matyas Rakosi nicknamed "the Bald Butcher" - Khrushchev's "Secret Speech" denouncing Stalin's policies
Events of the Uprising	- Protests in Hungary—USSR appointed Nagy - Nagy announced an end to one-party Communist rule and the planned departure from the Warsaw Pact. Thought US would support - USSR invaded with 1000 tanks and 200,000 troops. 20,000 Hungarians died - Nagy arrested and executed and replaced with Janos Kadar
Consequences of Uprising	- USA verbally condemned invasion but took no military action - Britain & France were pre-occupied with Suez Canal crisis - USSR control of Eastern Europe increased

9. Berlin Crisis 1958-1961	
Causes of the Crisis	- Low standard of living in East Germany resulted in movement of skilled workers to West Germany known as the "Brain Drain" - This created a refugee crisis as millions of people travelled to West Germany seeking better pay and living conditions
Events of the Crisis	- Khrushchev issues the Berlin Ultimatum – demanding the withdrawal of Western troops Geneva Summit: no resolution reached but further talks are agreed Camp David: Soviets agreed to withdraw Berlin Ultimatum Paris Ultimatum: American U2 spy plane shot down by Soviets & America refuses to apologise for using spies Vienna Summit: Khrushchev reissues Berlin Ultimatum which is rejected by USA
Consequences of the Crisis	- August 1961: USSR begins construction of the Berlin Wall - USSR seen to be 'locking' people into communism - Social separation of East & West Berlin lasts for almost 30 years 1963—JFKs "Ich bin ein Berliner" speech

10. Cuban Revolution and Bay of Pigs Invasion	
Fidel Castro	Led the Cuban Revolution in 1959 and was a nationalist who sought Cuban independence from US control
Trade Embargo	- USA cut off trade in sugar and tobacco to financially punish Cuba - USSR offered to purchase Cuban sugar and supply oil & weapons
Bay of Pigs Invasion	- American invasion of Cuba using anti-Castro Cuban exiles trained by the CIA - Invasion was a failure as Castro was aware in advance - USA forced to pay millions in food and medical supplies to have captured invaders released

11. Cuban Missile Crisis	
Reasons for Crisis	- American U2 spy plane photographs missile launch pads on Cuba - US fear Soviet weapons 'in their own backyard'
Events of the Crisis	- Kennedy imposes a naval blockade around Cuba to stop ships carrying weapons. When Soviet ships reached it, they turned around - Khrushchev's 1st telegram offers to remove missiles from Cuba if USA promises not to invade. Kennedy did not respond. - Khrushchev's 2nd telegram offers to remove missiles from Cuba if USA removes missiles from Turkey - Kennedy responds to 1st telegram, ignoring the 2nd, and removes missiles in Turkey in secret
Consequences of Crisis	- Hotline communication link created between Washington & Moscow to promote peaceful relations - Test Ban Treaty prohibits testing of nuclear weapons in outer space, underwater or in atmosphere - Outer Space Treaty & Nuclear Non-Proliferation Treaty signed

12. Czechoslovakia and Prague Spring 1968	
Reasons for Prague Spring	- Secret Police maintained harsh communist control, few consumer goods, no freedom of speech and strict censorship - Dubcek became First Secretary creating "socialism with a human face"
Prague Spring	- Set of reforms introduced by Dubcek - Included reduced censorship, increased trade with the West & abroad travel for Czech citizens
Events of Soviet Invasion	500,000 Warsaw Pact troops invaded, Czech people showed passive resistance - Dubcek arrested and replaced with Gustav Husak
Consequences of Soviet Invasion	- Reforms were reversed - Weakened relations between West & East
Brezhnev Doctrine	Soviets had the right to invade any Eastern European country that threatened the security of the Warsaw Pact

Paper 2: Superpower Relations and the Cold War 1941-1991

Superpower Relations and Cold War Key Information

13. Détente

Détente	Period of reduced tensions between the USA and USSR
SALT 1	- US & USSR agreed to limit number of nuclear weapons - Both sides would exercise restraint if war looked likely
Helsinki Accords	- Basket 1: European borders & security - Basket 2: International cooperation - Basket 3: Human Rights
Apollo-Soyuz	Joint US-USSR space mission which signified end of space race
SALT II	- Plans to ban the testing & deployment of new types of ICBMs - Not ratified by US Congress due to Soviet invasion of Afghanistan

14. Soviet Invasion of Afghanistan 1979

Reasons for Soviet Invasion	- Communists came to power in 1978 - Afghan politician Hafizullah Amin arranged the murder of the communist Prime Minister - Amin entered talks with USA
Events of Soviet Invasion	- Amin assassinated and replaced with pro-Moscow leader Babrak Karmal - Conflict against anti-communists (Mujahideen) lasted 10 years - US supported the Mujahideen (funding & weapons)
Consequences of Soviet Invasion	- US announced boycott of Moscow Olympic Games in 1980 - USSR boycotted LA Olympic Games in 1984 - Abolishment of most US-Soviet trade
Carter Doctrine	US policy of containment extended to the Middle East and would use force to stop any country gaining control of oil rich states

15. Reagan's Second Cold War

Second Cold War	Period of tense relations between USA and USSR driven by President Reagan's new tougher approach towards communism
Strategic Defence Initiative (SDI) or "Star Wars"	- Plan to put satellites in space with lasers that could shoot down Soviet missiles - Actually years away from production but highlighted Soviet disadvantage
Reagan Doctrine	'Rollback of communism': US would support anti-communist groups trying to overthrow communist governments - US support given to non-communists in El Salvador & Grenada
Evil Empire Speech	Reagan's speech to Christian Evangelicals referring to the Soviet Union as the focus of evil in the modern world

16. Gorbachev's New Thinking

Reasons for reform	Low standard of living, large military expenditure, expensive war with Afghanistan
Perestroika	- Reconstruction by reforming the economy - Increased spending on housing and healthcare
Glasnost	- Openness by removing corruption and allowing opposition in government - Reducing media censorship
Other reforms	Reduced spending on arms & ending the Brezhnev Doctrine
Summits of 1980s	- Reykjavik 1986 - US removed missiles from Europe - Washington 1987 - INF Treaty signed - Moscow 1988 - Soviet withdrawal from Afghanistan - Washington 1990 - reducing strategic forces over next 7 years

17. Collapse of Soviet Control in Eastern Europe

Hungary	Opened border with non-communist Austria in May 1989
Poland	Free elections bring 'Solidarity' a non-communist trade union movement to power in August 1989
Czechoslovakia	Opened border with the West in September 1989
East Germany	- Berlin Wall is deconstructed by the people in November 1989 - Families & friends reunited & signified end of Cold War division - Reunification of Germany followed in 1990
Soviet Union	- Warsaw Pact dissolved in 1991 - Soviet states declared independence - Break of USSR announced by Gorbachev in December 1991

Paper 2: Anglo-Saxon and Norman England, 1060-1088

Anglo-Saxon and Norman Timeline

Year	Event	King
1042	Edward the Confessor becomes king	Edward the Confessor
1053	Death of Earl Godwin	
1055	Tostig is made Earl of Northumbria	
1064	Harold's Embassy to Normandy	
1065	- Uprising against Tostig - Tostig is exiled	
1066	- Death of Edward the Confessor - Harold becomes king - Battle of Gate Fulford (20 Sep) - Battle of Stamford Bridge (25 Sep) - Battle of Hastings (14 Oct) - Submission of the Earls - William becomes king (25 Dec)	Harold

Year	Event	King
1068	Revolt of Edwin and Morcar	William I
1069	- Death of Robert Comyn - Rebellions in the North - Harrying of the North begins	
1070	- Harrying of the North ends - Lanfranc becomes Archbishop of Canterbury - Hereward's rebellion in East Anglia	
1075	Revolt of the Earls	
1077	Robert Curthose rebels against William in Normandy	
1082	Bishop Odo is imprisoned by William	
1085	William orders the Domesday Book	
1087	- Death of William - William Rufus becomes king	William Rufus
1088	Bishop Odo leads a rebellion against William Rufus	

Paper 2: Anglo-Saxon and Norman England, 1060-1088

Anglo-Saxon and Norman Key People

Edward the Confessor	- Anglo Saxon king between 1042-1066 - Spent the early part of his life in exile in Normandy
Godwin	- Earl of Wessex between 1020-1053 - Built up huge power and wealth first under King Cnut and then later King Edward the Confessor
Harold Godwinson	- Son of Godwin - Was Earl of East Anglia before becoming Earl of Wessex when his father died in 1053 - Became king in 1066
Tostig Godwinson	- Younger brother of Harold Godwinson - Earl of Northumbria 1055-1065 - Supported Harald Hardrada's claim to the throne
Edith Godwinson	- Daughter of Godwin - Wife of King Edward
Edwin	- Anglo-Saxon Earl of Mercia - Led the rebellion against Tostig
Morcar	- Brother of Edwin - Became Earl of Northumbria in 1065
Stigand	Anglo Saxon Archbishop of Canterbury
Edgar the Aetheling	- Anglo-Saxon claimant to the throne in 1066 - Great nephew of Edward the Confessor
Harald Hardrada	- Claimant to the throne in 1066 - King of Norway - Killed at the Battle of Stamford Bridge
William of Normandy	- Duke of Normandy - King of England from 1066-1087

Bishop Odo	- Half-brother of William - Bishop of Bayeux - Acted as regent for William
Robert of Normandy	• William's eldest son - Nicknamed 'Robert Curthose' - Had a bad relationship with his father
William Rufus	- William's second son - Became king of England in 1087
Archbishop Lanfranc	- Norman Archbishop of Canterbury - Acted as a regent for William
Bishop Wulfstan	- Anglo-Saxon bishop who served the Normans - Led an army to defeat the Revolt of the Earls
Robert Comyn	- Norman appointed as Earl of Northumbria in 1069 - Killed by Anglo-Saxon rebels in Durham in 1069
Roger de Breteuil	- Norman Earl of Hereford - Leader of the Revolt of the Earls in 1075
Ralph de Gael	- Norman Earl of Norfolk - Leader of the Revolt of the Earls in 1075
Hereward the Wake	- Anglo Saxon thegn from East Anglia - Led a rebellion in 1070
Waltheof	- Anglo-Saxon Earl of Northumbria - Leader of the Revolt of the Earls in 1075
King Sweyn	- King of Denmark - Sent soldiers to support Anglo-Saxon rebellions
King Malcolm	- King of Scotland - Supported Edgar the Aetheling

Paper 2: Anglo-Saxon and Norman England, 1060-1088

Anglo-Saxon and Norman Key Information

1. Anglo-Saxon Society

King	Responsible for law, defence and Church
Earl	- Controlled an earldom or region of England - Four main earldoms Wessex, Northumbria, East Anglia & Mercia - Advised the king, upheld the laws, provided an army
Thegn	- Owned at least 5 hides of land - Provided military service
Ceorl	Peasants who worked the land
Slave	Lowest social class around 10% of population
Witan	- Council that advised the king - Made up of earls, thegns and bishops
Writ	Document used by the king to give instructions

2. Anglo-Saxon Economy and Legal System

Burh	A fortified town
Mint	Building used to produce coins on behalf of the government
Geld tax	Tax collected to pay for the defence of England
Tithing	A group of 10 families responsible for dealing with low level crime between each other
Hundred	A group of 10 tithings Responsible for supplying soldiers and collecting tax
Wergild	A fine paid by a murderer to the victim's family
Shire	A collection of hundreds where court cases would be heard
Shire Reeve	Responsible for the law enforcement and tax collecting in a shire

3. Power of the Godwin Family

Reasons for Godwin power	- Controlled Wessex, East Anglia and Northumbria - Edith married to King Edward - Godwin family were excellent soldiers
Danelaw	- Area of England that had been ruled by the Vikings - Culture and traditions were more Viking than Saxon

5. End of Edward's Reign

Rebellion against Tostig	- Northumbrian thegns rebelled against Tostig in 1065 - Harold supported the rebels against his brother Tostig - Tostig was sent into exile
Reasons for the succession crisis	- Edward died without any children - There was no established law about who became king. It was the Witan's choice. - Harold claimed Edward promised him the throne - William claimed Edward had promised him the throne - Harold Godwinson had a lot of influence in England - Harold had argued with Tostig - Harold had allegedly sworn an oath to William in 1064

4. Harold's Embassy to Normandy

Embassy to Normandy	- Official visit by Harold to William in 1064 - Norman sources say it was to promise William the crown - Anglo-Saxon sources say it was to free hostages
Hostage	People held as security to ensure oaths were kept

6. Claimants to the throne in 1066

Edgar the Aetheling	- Related to Edward - Raised in Hungary and only fourteen in 1066
Harald Hardrada	- Related to the old Viking kings of England - Was supported by Tostig Godwinson
William of Normandy	- Duke of Normandy who was apparently promised the throne in 1051 - A capable military leader who also had support of the Pope - Claimed Harold Godwinson had made him an oath in 1064
Harold Godwinson	- Earl of Wessex and capable military leader - Had much support among thegns and earls of England - Chosen by the Witan to be king - Allegedly promised the throne by Edward in 1066

Paper 2: Anglo-Saxon and Norman England, 1060-1088

7. Battles of Fulford and Stamford Bridge

Battle of Gate Fulford	- Edwin and Morcar defeated by Harald Hardrada - Hostages were arranged to be exchanged afterwards at Stamford Bridge
Battle of Stamford Bridge	- Harald Hardrada defeated by Harold Godwinson - Viking army was tired and taken by surprise
Housecarls	- Professional Anglo-Saxon warriors - Formed the core of Harold Godwinson's army
Fyrd	- Anglo Saxon men called to fight by their thegns - Not fully trained or well equipped - Only summoned in emergencies

8. Battle of Hastings

Battle of Hastings	- Harold Godwinson defeated by William - Harold died at the battle
The Anglo Saxon Army	- Made up of the fyrd and housecarls - Formed a shield wall on Senlac Hill
The Norman Army	- Made up of knights, foot soldiers and archers - Knights fought on horseback - Had the support of the Pope
Reasons for William's victory	- Well prepared and well experienced army - Harold's men were tired from Stamford Bridge - William's tactics: the feigned retreat caused the Anglo-Saxons to leave the hill

9. What happened after Hastings?

What did the Saxons do after Hastings?	- The Witan chose Edgar the Aetheling as king - Edwin and Morcar supported Edgar
What did William do after Hastings?	- William ordered his men to burn towns and villages as they marched inland - William secured the cities of Dover and Canterbury - William captured the royal capital of Winchester - William was crowned in London on Christmas Day 1066
The Submission of the Earls	- An event where powerful Anglo-Saxons swore loyalty to William - Stigand, Edgar, Edwin and Morcar all swore loyalty to William

10. Control and Marcher Earldoms

Williams actions to the Anglo Saxons	- Edwin and Morcar kept their lands - Stigand allowed to stay Archbishop of Canterbury - Thegns could buy control of land - Confiscation of land of people who fought at Hastings
Regent	A person who ruled when the king was away
Marches	Border lands
Marcher Earldoms	- Three earldoms created on the Welsh border - Shrewsbury, Chester and Hereford - Norman earls given greater independence to allow them to control the regions.

11. Castles

Why did the Normans build castles?	- Symbol of power - Control the Anglo-Saxons and prevent rebellions - Provide protection for soldiers
Features of motte and bailey castles	- Located in strategic places - Motte – hill - Bailey – enclosed area - Palisade – wooden walls - Keep – tower on the motte
Anglo-Saxon reactions to castles	- Castles were unpopular as the Saxons were forced to build them - Castles were a foreign influence as the Saxons were used to burhs

12. Revolt of Edwin and Morcar

Reasons for the revolt	- William would not let Edwin marry his daughter - Edwin and Morcar both lost land - The Anglo-Saxons hated the Geld Tax - The building of castles - The poor treatment of Saxons by Norman regents
William's response to the revolt	- Marched north with an army - Built 2 new castles in Warwick and Nottingham - Edwin and Morcar surrendered and were made to live at court

Paper 2: Anglo-Saxon and Norman England, 1060-1088

13. Northern Uprising

Reasons for the revolt	- Death of Robert Comyn - Edgar's return from Scotland - King Sweyn sends the Danish fleet
William's response	- Rapid march north - Danes bribed to leave - The Harrying of the North

14. Hereward's Rebellion

Reasons for the revolt	- Danish invasion of East Anglia in 1070 - Hereward's loss of land after the Norman invasion.
Main events of the rebellion	- The Danes captured the city of Ely - Hereward joined the Danes and captured Peterborough - The Normans paid the Danes to leave - The Normans recapture Ely - Hereward runs away - Earl Morcar is imprisoned

15. The Harrying of the North

Reasons for the Harrying of the North	- Revenge for the death of Robert Comyn - Punish the Anglo-Saxons and prevent future rebellions in the north - Send a message to other rebels
Impacts of the Harrying of the North	100,000 people died - Many refugees - Depopulation of the north - End of Anglo-Saxon rebellions
Forfeit	- Confiscation of land - Rebels forfeited their land
Tenant-in-chief	- An important land holder who was granted land by William 190 main tenant-in-chiefs (only 2 were Saxon)

16. Revolt of the Earls

The plotters	- Roger de Breteuil - Ralph de Gael - Waltheof
Reasons for the revolt	- All plotters had inherited less land than their fathers had possessed - The revolt happened when William was away.
Why the revolt failed	- Waltheof alerted the regent Lanfranc - The Danes did not arrive in time - William returned from Normandy - Bishop Wulfstan led an army and captured Roger

17. The Feudal System

Feudal System	System of land holding in return for service
Structure of the system	- King - Tenant-in-chief (Barons, Earls, Bishops) - Under tenant (Knights) - Villein (Peasant farmer)
Relief	Tax paid to inherit land
Homage	Oath of loyalty in return for land
Fief	The land given to a tenant-in-chief or under tenant
Knight Service	40 days of service to the king - Could be in the army or in a castle garrison
Labour Service	- Work given by a peasant/villein on their lord's land 2/3 days a week

18. Norman Church

Normanisation	The process of making things more Norman
Simony	The crime of selling Church positions
Pluralism	The crime of holding more than one Church position
Main changes made by Lanfranc	- Moved cathedrals to cities and had them rebuilt in the Norman style - Greater powers to Church courts - Limited Church corruption - Banned priests from getting married - Introduced new monasteries

Paper 2: Anglo-Saxon and Norman England, 1060-1088

19. Norman Government	
Regent	- Person who acted for the king when he was absent - Lanfranc, Odo and Fitz - Osbern acted as regent for William in England - Matilda (his wife) was regent in Normandy
Demesne	Land kept back by the king
Forest	- Area of land to be used for hunting - Largest was the New Forest
Forest Laws	- Series of laws that controlled the forest - Illegal hunting would be punished by blinding - Fines paid directly to the king
Sheriffs	- Norman equivalent to Shire Reeves - Collected tax for the king - Looked after law and order in their shires - Answered directly to the king and were used to run his demesne

20. Extent of change under the Normans	
Examples of change	- Anglo Saxon landholders mainly replaced by Normans - Removal of social classes: thegns, ceorls & slaves - More trade with Europe rather than Scandinavia - New buildings like castles and cathedrals - Forest laws
Examples of continuity	- Tax system - Burhs - Farming economy - England still Christian - Most laws remained

21. Domesday Book and Norman Aristocracy	
Domesday Book	Record of landholding ordered by William in 1085
Reasons for Domesday Book	- Raise tax to help with threat of Danish invasion - Provide accurate record of landholding
Aristocracy	Wealthy members of Norman society barons and knights etc
Chivalry	Code of behaviour of the aristocracy
Values of the Norman Aristocracy	- Military training - Religious - Enjoyed hunting - Demonstrated status through buildings

22. William's Family	
Problems created by Odo	- Harsh regent - Stole land from Church and others – undermined the Feudal System - Tried to take knights from England to make himself Pope - Imprisoned by William but released on his death
Why did Robert rebel against his father?	- William refused to make him Duke of Normandy - Poor relationship with William - Robert had the support of the King of France - Robert defeated William in battle

23. William's Death and Succession	
William's death	- Injured whilst fighting in France - Died in Rouen - Made Robert Duke of Normandy - Wrote a letter to Lanfranc asking him to support William Rufus to become king of England
Odo's rebellion in 1088	- Odo rebelled against William Rufus - Thought William Rufus would be too difficult to control - Rebellion failed as Robert never arrived with support and the lords in England mainly support Rufus

Paper 3: Weimar and Nazi Germany, 1918-1939

Weimar and Nazi Germany Timeline

Weimar Germany: 1919-1933	
Year	Event
1918	- Kaiser Wilhelm abdicates - Armistice signed
1919	- Treaty of Versailles signed - Spartacist Uprising - Weimar Constitution established
1920	Kapp Putsch
1923	- French occupation of Ruhr - Hyperinflation begins - Stresemann becomes Chancellor and Foreign Minister - Munich Putsch
1924	Dawes Plan
1925	- Mein Kampf published - Locarno Pact
1926	- Bamberg Conference - Membership of the League of Nations
1929	- Young Plan - Wall Street Crash and start of economic depression

Nazi Germany: 1933-1939

Year	Event
1933	- Hitler appointed as Chancellor - Reichstag Fire - Enabling Act - Concordat with Catholic Church
1934	- Night of the Long Knives - Death of President Hindenburg - Hitler becomes Fuhrer
1935	Nuremberg Laws
1936	Berlin Olympics
1938	Kristallnacht

Paper 3: Weimar and Nazi Germany, 1918-1939

Weimar and Nazi Germany: Key People/Groups

Kaiser Wilhelm II	- German Emperor during WW1 - Forced to abdicate in 1918
Friedrich Ebert	- Leader of SPD (Social Democratic Party) - First President of Weimar Republic 1919-25
Rosa Luxemburg and Karl Liebknecht	- Leaders of the Spartacist Uprising in 1919 - Both were shot dead, and Luxemburg's body was dumped in the canal
Gustav Stresemann	- Chancellor August-November 1923 & Foreign Secretary until 1929 - Responsible for economic recovery during the Weimar's 'Golden Years'
Paul von Hindenburg	- President of Germany from 1925 to 1934 - Pressured into appointing Hitler as Chancellor in 1933
Franz von Papen	- Chancellor of Germany in 1932 - Vice-Chancellor under Adolf Hitler from 1933 to 1934
Kurt von Schleicher	Chancellor of Germany in 1932 who wanted to create a military dictatorship
Adolf Hitler	- Joined DAP (German Workers Party) in 1919 and became leader in 1921 - Chancellor of Germany from 1933
Ernst Rohm	- Co-founder and leader of Hitler's private army (SA) - Murdered during the Night of the Long Knives in 1934
Joseph Goebbels	Reich Minister of Propaganda from 1933 to 1945
Heinrich Himmler	Leader of Hitler's private bodyguard (SS)
Martin Niemöller	Anti-Nazi Protestant pastor who set up the Pastors' Emergency League (PEL)
Ludwig Müller	Reich Bishop of Germany

Freikorps (Free Corps)	- Ex-soldiers from WW1 who had kept their weapons - Used by Ebert to put down the Spartacist Uprising
NSDAP (Nazi Party)	Founded from the DAP (German Workers Party) and renamed in 1921
SA	- Hitler's Private Army also known as the Sturmabteilung - Led by Ernst Rohm until 1934
SS	- Hitler's Private Bodyguard also known as Schutzstaffel - Led by Heinrich Himmler
Gestapo	- Nazi non-uniformed secret police - Identified those who criticised the regime
Reich Church	Pro-Nazi Protestant Church formed in 1936
Pastors' Emergency League (PEL)	- Anti-Nazi Protestant group which formed the Confessing Church in 1934 6000 Protestant pastors joined the Confessing Church
Edelweiss Pirates	Working class anti-Nazi youth group who wore American style clothing, and attacked members of the Hitler Youth
Swing Youth	Middle class anti-Nazi youth group who listened to American jazz music, drank alcohol and organised illegal dances
Hitler Youth	- Pro-Nazi male youth group - Members were aged 14 to 18 years old and followed military, political and character training activities
League of German Maidens	- Pro-Nazi female youth group - Members were aged 14 to 21 years old and followed domestic activities

Paper 3: Weimar and Nazi Germany, 1918-1939

Weimar and Nazi Germany: Key People/Groups

1. Germany in 1918

Problems in Germany at the end of 1918	- Food shortages due to British naval blockade - Mass debt (150 billion marks) - German navy mutinied at the port of Kiel
Abdicated	Kaiser was forced to give up his position of power on 9th November 1918
Reichstag	Name for the German parliament
Armistice	Peace agreement between Germany and the Allies to end the First World War

2. Weimar Constitution

Weimar Republic	Name of German government after WW1 and overseen by President Ebert until 1925
Constitution	Principles of government
Article 48	President's power to pass emergency laws without the approval of the Reichstag
Coalition	Government with more than one political party in power; often weak as laws are difficult to make as all groups in the coalition need to agree.
Proportional Representation	Voting system used in the Weimar Republic where the percentage of votes a party got matched their percentage of seats in the Reichstag

3. Treaty of Versailles

Treaty of Versailles	Document outlining the conditions of peace between
Diktat	Dictated peace; Germany was not allowed to negotiate the terms of the treaty and were forced to agree to the terms of Versailles
Article 231 (War Guilt Clause)	Term of the treaty that said Germany was to blame for the outbreak of WW1
Reparations	Name given to the fine Germany was forced to pay to the Allies after WW1 – totalling £6.6 billion
Dolchstoß	Belief that the German army was betrayed or 'stabbed in the back' by politicians
November Criminals	Name given to the politicians who signed the Armistice and Treaty of Versailles

4. Political Challenges to the Weimar Republic

Spartacist Revolt	Far-left (communist) uprising against the Weimar Republic in 1919 led by Rosa Luxemburg and Karl Liebknecht
Freikorps	- Ex-soldiers from WW1 who kept their weapons & were used by President Ebert to put down the Spartacist Uprising - The Freikorps then rebelled against the Weimar Republic
Kapp Putsch	Far-right uprising against the Republic in 1920 led by Wolfgang Kapp

5. Hyperinflation

Ruhr	Industrial region of Germany invaded by French and Belgian soldiers in 1923 when the German government failed to pay reparations
Hyperinflation	Extreme price increases caused by the government printing money to pay striking workers

Paper 3: Weimar and Nazi Germany, 1918-1939

6. Recovery under Gustav Stresemann

Rentenmark	Temporary currency introduced to resolve hyperinflation which was tied to the price of gold
Dawes Plan	Deal reduced reparations to £50 million per year
Young Plan	Deal reduced total reparations to £2.2 billion
Locarno Pact	Improved relations with France in agreeing to post-1919 border and keeping the Rhineland demilitarised
League of Nations	International peace organisation established by America after WW1; Germany joined in 1926

7. Weimar Society

Unemployment Insurance Act	Scheme which supported workers if they fell out of work due to unemployment or sickness
Housing Shortage Law	Enabled councils to seize large unoccupied properties and fill them with tenants
New Women	Term to describe young, unmarried employed women who smoked and drank alcohol in public bars, wore makeup and would go to nightclubs

8. Weimar Culture

Modernism	Arts which looked towards the future rather than the past
Expressionism	Arts which reflected the thoughts and feelings of the artist
New Objectivism	Arts which demonstrated the reality of life, even if it was negative
The Bauhaus College	Training centre for young artists and designers who wanted to follow new radical approaches

9. Early Nazi Party

DAP	German Worker's Party formed in 1919 by Anton Drexler
25 Point Programme	Political manifesto of the DAP based on the pillars of nationalism and socialism
NSDAP	Nationalist Socialist German Workers Party also known as the Nazis
SA	Hitler's private army formed in 1921 led by Ernst Rohm. Also known as Stormtroopers or Brownshirts

10. Munich Putsch

Munich Putsch	Nazi armed revolt which aimed to overthrow the Weimar Republic 1923
Reasons for the putsch	- Hitler was encouraged by a successful right wing revolution in Italy - In 1923 the Weimar looked weak so Hitler thought he would have support
Results of the Putsch	- Failed when nationalist politicians withdrew support - The police easily defeated the Nazis and 16 Nazis killed - Nazi Party was banned and Hitler was imprisoned - Nazis did gain fame
Mein Kampf	Hitler's memoir written during his time in Landsberg Prison known as 'My Struggle' which set out key Nazi beliefs

11. Nazi Development 1924-28

Gaue	Regions of Germany created by the Nazis to ensure each constituency of Germany had a Nazi representative (Gauleiter) who could share Nazi ideals with the local population
Rally	Mass meeting of people demonstrating support for a particular cause
Der Stermer	Nazi newspaper published daily to promote the successes of the NSDAP
SS	Hitler's private bodyguard set up in 1925 and led by Heinrich Himmler
Bamberg Conference	1926 meeting which decided the Nazi party would favour nationalist ideas over socialist ideas

Paper 3: Weimar and Nazi Germany, 1918-1939

12. Great Depression

Wall Street Crash	Collapse of the American stock market in 1929 which triggered an international financial crisis
Economic Effects	- German Civil Servant bank went bankrupt in 1929 - German industries and farms cut back production
Unemployment	6 million unemployed by 1933

13. Other reasons for Nazi support

Wealthy businessmen	Provided money to Hitler and the Nazis to prevent the communists from coming to power
Farmers	Hitler removed the policy on the confiscation of private land from the 25 Point Programme to increase rural votes
Young Germans	Supported the vibrancy of Nazi rallies and promises within Hitler's speeches
German Women	Many women believed the idea that voting for the Nazis was best for their country and their families

14. Hitler becomes Chancellor

Presidential Elections	March 1932 sees Hitler win 11 million votes which increases to 13 million votes in April 1932
Franz von Papen as Chancellor	- Replaced Brüning in May 1932 but has a weak government - Reichstag elections see the Nazis become the largest party winning 38% of the vote
Kurt von Schleicher as Chancellor	- Replaced von Papen in December 1932 but loses support of Hitler and the Nazis - Request to form a military dictatorship is rejected by Hindenburg
Hitler becomes Chancellor	- Appointed by Hindenburg in January 1933 - Von Papen becomes Vice-Chancellor in believing he can control Hitler

15. Reichstag Fire

Reichstag Fire	The fire on February 27th 1933 is blamed on the Communists after Marius van der Lubbe is found at the scene
Enabling Act	Hitler is given full powers to make laws for the next four years thereby ending Weimar democracy
Trade Unions	Banned under the Enabling Act as Hitler associated them with Communism
Law Against the Establishment of Parties	Illegalised all other political parties in Germany apart from the Nazi Party

16. Night of the Long Knives

Night of the Long Knives	Purging of Hitler's political and military rivals on 30th June 1934
Reasons for the purge	- Members of the SA were becoming more loyal to Rohm and felt undervalued by Hitler - Rohm supported socialist ideas - Himmler and the SS wanted to increase their own influence by limiting the power of the SA
Events of the purge	Around 400 people were assassinated including Rohm, von Schleicher and Strasser
Fuhrer	Title meaning 'leader' that Hitler gave himself by combining the roles of President and Chancellor following the death of Hindenburg in August 1934

Paper 3: Weimar and Nazi Germany, 1918-1939

17. Nazi Police State

SS	Nazi private police force during the 1930s who were put in charge of all other police and security services
Gestapo	Non-uniformed secret police who identified anyone who criticised or opposed the Nazi regime
Concentration Camps	Prisons located in rural areas run by the SS that contained political opponents of the regime as well as undesirables such as homosexuals and Jews
Nazi Lawyers Association	Judges had to swear an oath of loyalty to Hitler and were expected to always act in the interests of the Nazi party
People's Court	Enabled people to be tried for cases of treason against the state where judges were handpicked, and trials held in secret

18. Propaganda and Censorship

Reich Chamber of Culture	Organisation overseen by Goebbels which monitored all aspects of culture to ensure they were consistent with Nazi values and ideas
Propaganda	Creating opinions or attitudes to promote a political cause or point of view. An example would be the annual Nuremberg rallies
Censorship	Banning ideas or information considered to be a threat to a political order or regime. An example would be the banning of free press within Nazi Germany

19. Nazis and Religion

Concordat	Agreement signed with the Pope in 1933 where Hitler agreed not to interfere with practices of the Catholic Church, if in return, they promised not to speak out on political issues
Reich Church	Pro-Nazi Protestant Church led by Bishop Mueller which promoted Nazi views
Pastors Emergency League (PEL)	Anti-Nazi Protestant organisation created by Niemöller which campaigned against Nazi teachings
Confessional Church	Anti-Nazi Protestant Church created by Niemöller and Bonhoeffer. Over 6,000 pastors joined this Church

19. Opposition to the Nazis

Edelweiss Pirates	Working class teenagers who wore American style clothing and attacked members of the Hitler Youth on street corners
Swing Youth	Middle class teenagers who smoked, drank alcohol, organised illegal dances and listened to illegally imported

20. Nazi Policies towards Women

Kinder Küche Kirche (3 K's)	Children, Kitchen, Church – main traditional roles the Nazis wanted German women to follow
German Women's Enterprise (DFW)	Organisation led by Gertrud Scholtz-Klink which provided courses on childcare and cooking to help educate German women in line with traditional roles
Mother's Cross	An award (medal) given to mothers in recognition of the number of children they had; bronze for four, silver for six and gold for eight
Lebensborn (Fountain of Life)	Programme which supported women financially if they had children with SS soldiers

Paper 3: Weimar and Nazi Germany, 1918-1939

21. Nazi Policies towards Youth

Hitler Youth	- Boy members aged 14 to 18 years - Completed physical and military training such as small arms shooting and hiking expeditions
League of German Maidens	- Girl members were aged 14 to 21 years - Trained in domestic duties such as cooking and cleaning - They were also taught the importance of racial hygiene
Education	Race Studies were added to the school curriculum and the time spent on PE was doubled to create strong workers and healthy mothers
Nazi Teachers' League	Compulsory organisation for teachers in Germany who had to swear an oath of loyalty to Hitler and support Nazi ideas in their teaching

23. Nazi persecution of minorities

Herrenvolk 'master race'	The Nazis viewed the Aryan race as the master race and wanted German to become a pure Aryan nation
Untermenschen 'sub-human'	The Nazis viewed Eastern Europeans, gypsies, homosexuals, the disabled and Jews as sub-human
Gypsies	- Roma people who travelled from place to place and were persecuted for not contributing to society in not paying enough taxes - Thousand were arrested and later deported
Homosexuals	- Persecuted for lowering moral standards and spoiling the purity of the German race - Thousands were imprisoned
People with disabilities	- Persecuted for being a burden on society. - Disabled adults were subject to compulsory sterilisation whilst disabled children were murdered under the T4 Programme

22. Nazi Policies towards Workers

Labour Service (RAD)	- Provided public works to the unemployed such as repairing roads, planting trees and draining marshes - Six months service became compulsory in 1935
Autobahns	Motorway construction project to reduce unemployment which planned a 7,000 mile network of dual-carriageway roads across Germany
Rearmament	Introduction of military conscription to reduce unemployment with 1.3 million in the armed forces by 1939
Invisible Unemployment	- Policy of removing groups from unemployment records to make unemployment figures appear better - For example, women, Jews and those in concentration camps were omitted from unemployment records
Labour Front (DAF)	In place of trade unions, it set out the rights of workers in the workplace, maximum length of the working week and minimum pay levels although workers lost their right to negotiate pay and conditions
Strength Through Joy (KdF)	Provided leisure facilities for workers including theatre shows and foreign travel as well as the opportunity to earn a new Volkswagen car by paying weekly instalments
The Beauty of Labour (SdA)	Provided better facilities for workers including better toilets, changing rooms and canteens although workers were expected to do the decorating themselves for no extra pay

24. Nazi Persecution of the Jews

Early Persecution	- April 1933 – Jews banned from government jobs and Jewish civil servant and teachers were sacked - April 1933 – Boycott of Jewish shops and businesses 1934 – Jews banned from park and swimming pools
Nuremberg Laws: September 1935	- Jews become German 'subjects', not citizens - Jews lose the right to vote and hold German passports - Jews are forbidden from marrying or having sexual relations with German citizens
Kristallnacht: November 1938	- Triggered by the murder of a German politician, Ernst vom Rath, by a Polish Jew in Paris - Organised nationwide violence against Jews - Jewish property destroyed, synagogues burned and Jews killed - Jews were fined for the damage and thousands sent to concentration camps



Glenmoor & Winton Academies

High Achievement – High Standards

Part of United Learning

Mathematics

GCSE Foundation

Mathematics - Number

Key Vocabulary	Definition
Ascending	Increasing in size (or numerical value)
Compare	To look at two or more numbers and say what is similar or different.
Composite Numbers	A positive integer with more than two factors.
Consecutive	Describing things which follow each other in a particular order.
Cube Numbers	The result of multiplying a number by itself twice. 1, 8, 27, 64, 125, 216, 343, 512, 729, 1000
Decimal Places	The number of digits to the right of a decimal point in a decimal number.
Degree of Accuracy	Describing how precise or accurate a value is, in terms of number of decimal places or significant figures.
Denominator	The bottom number of a fraction. Must be an integer.
Descending	Decreasing in size (or numerical value)
Difference	The result of a subtraction.
Divisible	One number is divisible by another if it is capable of being divided exactly, without a remainder.
Equivalent	Of equal value.
Estimate	To find an approximate answer to a calculation by rounding the numbers involved, commonly to 1 significant figure.
Evaluate	To find the numerical value of.
Factor	An integer that divides another integer exactly, without a remainder.
Factor Pair	A set of two factors that have a particular product.
Fraction	A number which represents part (or parts of) a whole.
Highest Common Factor	The largest number that divides exactly into two or more numbers.
Improper Fraction	A fraction where the numerator is larger than the denominator.

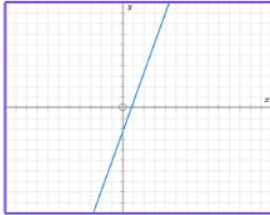
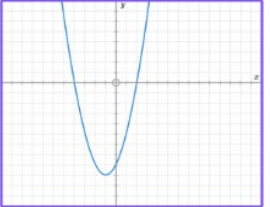
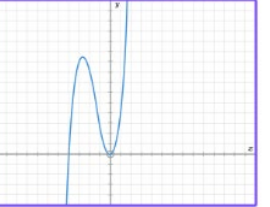
Key Equivalents		
FDP Conversion	$1 = \frac{1}{1} = 100\%$ $0.5 = \frac{1}{2} = 50\%$ $0.1 = \frac{1}{10} = 10\%$ $0.25 = \frac{1}{4} = 25\%$	$0.75 = \frac{3}{4} = 75\%$ $0.2 = \frac{1}{5} = 20\%$ $0.\dot{3} = \frac{1}{3} = 33.\dot{3}\%$

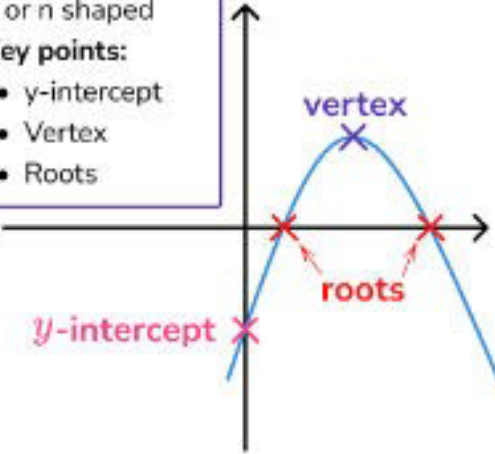
Key Vocabulary	Definition
Indices	The power of a number which shows how many times the number is multiplied by itself.
Inequality	The relationship between two numbers that are not equal to each other, shown using the symbols $<$, $>$, $\leq$, $\geq$ or $\neq$.
Integer	A whole number including positive and negative numbers and zero.
Lowest Common Multiple	The smallest number which appears in the list of multiples for two or more numbers.
Mixed Number	A number formed of both an integer (whole number) and a fraction.
Multiple	The result of multiplying a number by an integer, i.e. the times tables of a number.
Numerator	The top number of a fraction. Must be an integer.
Order of Operations	BIDMAS—Brackets, Indices, Division & Multiplication and Addition & Subtraction.
Power of 10	The product of multiplying 10 by itself, a number of times.
Prime Number	A positive integer with only two factors, 1 and itself. 2, 3, 5, 7, 11, 13, 17, 19, 23, 29
Product	The result of a multiplication.
Proper Fraction	A fraction in which the numerator is less than the denominator.
Remainder	In division, the amount leftover when a number does not divide exactly.
Square Numbers	The result of multiplying a number by itself. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225
Square Root	The particular factor of a number which can be multiplied by itself to produce that number.
Sum	The result of an addition.
Unit Fraction	A proper fraction with a numerator of 1.
Significant figures	The significant figures of a number are the digits which carry meaning (i.e. are significant) to the size of the number. The first significant figure of a number cannot be zero .

Mathematics - Number

Key Vocabulary	Definition
Equivalent Fractions	Fractions which have different numerators and denominators but represent the same value.
Dividing Fractions	Multiply by the reciprocal of the second fraction.
Percentage Increase/ Decrease	Calculating a percentage of an amount and either adding this onto (increasing) or subtracting this from (decreasing) the original amount.
Percentage Change	To calculate the percentage change, use the following: $\frac{\text{difference}}{\text{original}} \times 100$
Percentage Multiplier	The number you multiply a quantity by to increase or decrease it by a percentage. E.g. to increase by 10% the multiplier is 1.1.
Significant figure	The significant figures of a number are the digits which carry meaning (ie. are significant) to the size of the number. The first significant figure of a number cannot be zero .
Write number in standard form	A way of writing large or small numbers.
Product of prime factors / Prime factorisation	Finding which prime numbers multiply together to make the original number. Should be written as primes multiplied together. e.g. $20 = 5 \times 2 \times 2$ or as index form: $20 = 5 \times 2^2$
Simple Interest	Interest calculated as a percentage of the original amount.
Compound Interest	Interest calculated as a percentage of what you currently have.
Cube Root	The particular factor of a number which can be multiplied by itself twice to produce that number.

Key Vocabulary	Definition	
Write number in standard form	Where $a \times 10^n$ $1 \leq a < 10$ 1 500 000 in standard form is 1.5×10^6	
Base	The number that will be multiplied by itself (e.g. 5^3 the base is 5).	
Power	The small number in 10^3 , tells you how many times you multiply the base by itself. 10^3 means $10 \times 10 \times 10$.	
Index Number	Another word for power, plural is indices.	
10^4	Ten to the power four, means $10 \times 10 \times 10 \times 10$ because the power is 4.	
10^3	Ten Cubed, means $10 \times 10 \times 10$ because the power is 3.	
10^2	Ten squared, means 10×10 because the power is 2.	
10^1	Ten to the power one, just means 10 because the power is 1.	
10^0	Ten to the power zero. Anything to the power zero always equals 1.	
10^{-1}	Ten to the power negative 1 = 0.1	
10^{-2}	Ten to the power negative 2 = 0.01	
Growth & Decay / Compound Interest	Original amount x multiplier ^{time} For example: To calculate interest on £45,000 over 3 years at 3.2%. $£45000 \times 1.032^3 = £49459.71$	
Simple Interest	Interest is paid out each period instead of being added to the balance Total Interest earned = original amount x multiplier x time For example: To calculate simple interest on £45,000 over 3 years at 3.2%. Total interest earned = $£45,000 \times 0.032 \times 3 = £4320.00$	
Key units of measurement	Time 1 hour = 60 minutes 1 minutes = 60 seconds 1 hour = 3600 seconds	Length 1 cm = 10mm 1m = 100cm 1km = 1000m
	Mass 1kg = 1000g 1 tonne = 1000kg	Area 1cm ² = 100mm ² 1m ² = 10000cm ²

Key Vocabulary	Definition	
Straight line graphs	Are written in the form $y = mx + c$ Where m is the gradient (steepness) of the line and c is the y intercept (where it crosses the y axis) Parallel lines have equal gradients.	
Linear Graphs	The graph of $y = 3$ is a horizontal line crossing the y axis at $(0,3)$ The graph of $x = 3$ is a vertical line crossing the x axis at $(3,0)$ The mid-point of a line is exactly halfway. You find the mid-point by finding half way between both the x and y coordinates.	
Quadratic graph	For example $y = x^2 + 2x - 8$	
Cubic graph	For example $y = x^3 + 4x^2$	
Reciprocal	Reciprocal. For example $y = \frac{4}{x}$	

Key Vocabulary	Definition
Sketching a quadratic curve	The graph of a quadratic function is always u-shaped (positive x^2 coefficient) or n-shaped (negative x^2 coefficient).
Parabola	The shape made by the graph of a quadratic function.
Quadratic curve key features	Quadratic graph u or n shaped Key points: • y-intercept • Vertex • Roots 
Roots	The solutions of a quadratic equation, given as values not co-ordinates.
Satisfy	To fulfil the requirements or conditions of
Simultaneous equations	Two or more algebraic equations with the same unknown variables that can be solved to find solutions that satisfy both equations.
Point of intersection	Where two lines cross over one another.
Solving simultaneous equations graphically	Using the graphs of two or more equations to find the solutions for the variables. The solutions can be determined by finding the point of intersection of the graphs and reading the x and y values.

Mathematics - Algebra

Key Vocabulary	Definition
Algebra	A branch of mathematics in which letters are used to represent numbers.
Coefficient	A constant value which multiplies a variable. Always written before the variable.
Constant	A fixed number on its own.
Equation	A mathematical statement in which two expressions with equal values are connected by an equals sign.
Expand	To remove the brackets from an expression by multiplying terms and simplifying as necessary.
Expression	An algebraic expression is made up of two or more terms combined by operators.
Factorise	To rewrite an expression in brackets. Completed by finding the highest common factor, placing this outside the bracket and dividing by this to get an expression for inside the bracket.
Formula	An equation that shows the relationship between two or more variables.
Identity	An equation that is true for all values.
Linear	Contain only variables with a power of one, such as x
Simplify	To write an expression or fraction in a more concise form using the rules of algebra.
Solution	The value or values that can be substituted for the unknown in an equation to make it true.
Solve	To find the solution(s) to an equation by isolating the unknown.
Subject	The dependant variable in a formula or equation, identifiable by being on its own on one side of the equals sign.
Substitution	The process by which symbols are replaced by numbers in order to evaluate an expression or formula.
Term	A constant, variable or coefficient and one or more variables.
Unknown	A value that is not known in an equation.
Variable	A symbol, often a letter, whose value can vary.

Key Vocabulary	Definition												
Inverse operation	The opposite operation that is being performed on a variable.												
Term	A constant, variable or coefficient and one or more variables.												
Inequality	<table border="1"> <thead> <tr> <th colspan="2">Inequality Symbols</th></tr> </thead> <tbody> <tr> <td>$\neq$</td><td>not equal</td></tr> <tr> <td>$<$</td><td>less than</td></tr> <tr> <td>$\leq$</td><td>less than or equal to</td></tr> <tr> <td>$>$</td><td>greater than</td></tr> <tr> <td>$\geq$</td><td>greater than or equal to</td></tr> </tbody> </table>	Inequality Symbols		$\neq$	not equal	$<$	less than	$\leq$	less than or equal to	$>$	greater than	$\geq$	greater than or equal to
Inequality Symbols													
$\neq$	not equal												
$<$	less than												
$\leq$	less than or equal to												
$>$	greater than												
$\geq$	greater than or equal to												

Inequalities	Examples
Inequalities on a Number Line Inequalities can be shown on a number line. Open circles are used for numbers that are less than or greater than ($<$ or $>$) Closed circles are used for numbers that are less than or equal or greater than or equal ($\leq$ or $\geq$)	 $x \geq 0$  $x < 2$  $-5 \leq x < 4$

Key Term	Definition
Direct Proportion	If two quantities are in direct proportion, as one increases, the other increases by the same percentage.
Inverse Proportion	If two quantities are inversely proportional, as one increases, the other decreases by the same percentage.
Scale Factor	A number by which a shape is enlarged
Ratio	Comparing the size of one part to another. The ratio of a to b is written as a:b.
Equivalent ratio	Equivalent ratios are found by multiplying/dividing all parts of the ratio by the same value.

Mathematics - Algebra

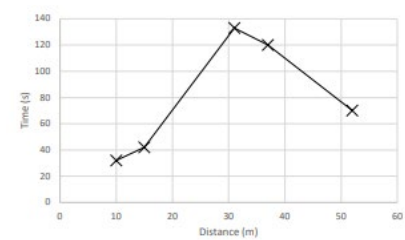
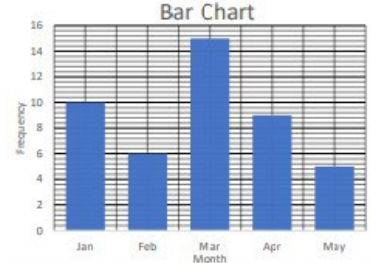
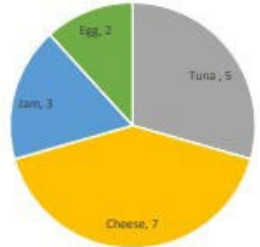
Key Vocabulary	Definition
Laws of indices	The rules for simplifying expressions involving powers of the same base number.
Multiplication Law:	$a^n \times a^m = a^{n+m}$
Division Law:	$a^n \div a^m = a^{n-m}$
Bracket Law:	$(a^n)^m = a^{nm}$
Power of 0:	$a^0 = 1$

Key Vocabulary	Definition
Linear Sequence	A number pattern with a common difference.
Term	Each value in a sequence is called a term.
Term-to-term rule	A rule which allows you to find the next term in a sequence if you know the previous term.
nth term	A rule which allows you to calculate the term that is in the nth position of the sequence. Also known as the 'position-to-term' rule. n refers to the position of a term in a sequence.

Key Vocabulary	Definition
Quadratic expression	A quadratic expression is of the form $ax^2 + bx + c$, where a, b and c are numbers and $a \neq 0$
Factorising with double brackets	Quadratic expressions of the form $ax^2 + bx + c$ are factorised using double brackets. E.g. $x^2 + 6x + 8 = (x + 4)(x + 2)$
Difference of two squares	The factorisation of an algebraic expression including two square terms, with one being subtracted from the other. E.g. $x^2 - 9 = (x + 3)(x - 3)$

Mathematics - Probability & Statistics

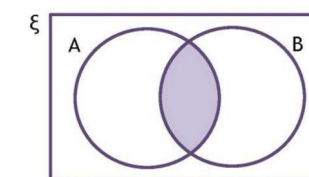
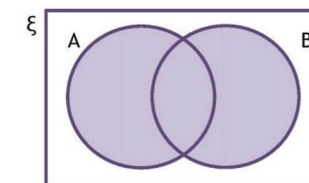
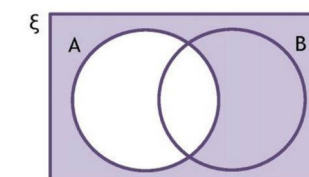
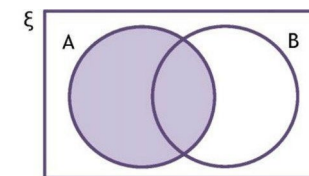
Key Vocabulary	Definition
Average	A single number or value that is used to represent a set of data. There are three main averages we focus on: mode, median and mean.
Data	Information in the form of facts and numbers.
Data point	A single item from a data set.
Data Set	A collection of data which all refers to the same category or topic.
Intersection	The numbers of elements that belong to both/all sets. In a Venn Diagram, this is where the circles overlap.
Mean	The sum of all the values in a data set, divided by the number of values in the data set.
Median	The middle value in an ordered list.
Mode	The most common value. It is possible to have more than one mode, or no mode.
Qualitative Data	A type of data that can be grouped under named categories, often described as data that can be described.
Quantitative Data	Types of data that can be represented numerically, often described as data that can be counted.
Range	The difference between the smallest and largest value.
Two-way Table	A diagram in which frequencies for two categories may be organised; one variable in rows and the other in columns.
Venn Diagram	A diagram in which circles are used to illustrate the relationships between different sets. Must have a box around it.

Key Vocabulary	Definition	Examples																					
Frequency Table	A table showing how often something occurs. Can include tally charts.	<table border="1"> <thead> <tr> <th>Score</th><th>Tally</th><th>Frequency (<i>f</i>)</th></tr> </thead> <tbody> <tr> <td>1</td><td> </td><td>4</td></tr> <tr> <td>2</td><td> </td><td>9</td></tr> <tr> <td>3</td><td> </td><td>6</td></tr> <tr> <td>4</td><td> </td><td>8</td></tr> <tr> <td>5</td><td> </td><td>3</td></tr> <tr> <td>6</td><td> </td><td>1</td></tr> </tbody> </table>	Score	Tally	Frequency (<i>f</i>)	1		4	2		9	3		6	4		8	5		3	6		1
Score	Tally	Frequency (<i>f</i>)																					
1		4																					
2		9																					
3		6																					
4		8																					
5		3																					
6		1																					
Line Graph	Uses lines to join points on a graph to represent a data set.																						
Bar Chart	A way of displaying data using horizontal or vertical bars which are the same width and have gaps between them.																						
Pie Chart	A method of displaying proportional information by dividing a circle up into different-sized sectors.																						
Key Term	Definition																						
Frequency	How many times something occurs.																						
Continuous data	Data that can take any value. E.g. height, weight, length.																						
Discrete data	Data that can only take certain values. E.g. shoe size.																						

Mathematics - Probability & Statistics

Key Vocabulary	Definition
Frequency polygon	A graph in which the frequency of a group is plotted against the midpoint of the group, with the points connected using straight line segments.
Probability	The likelihood of an event or outcome happening, a maximum probability is 1 (100%).
Probability Scale	Impossible Certain 0 0.5 1 $\downarrow$ Unlikely Even Likely $\downarrow$ $\uparrow$ $\uparrow$ $\uparrow$
Independent Events	Events where the outcome of the first event does not affect the probability of the second event.
Expected Outcome	Expected outcome = probability x number of trials
Tree diagram	A diagram which represents a sequence of events. The diagram has probabilities on the branches which can be used to calculate the probabilities of outcomes. The probability of a single outcome can be found by multiplying the probabilities along the branches. The probability of more than one outcome can be found by adding the probabilities of single outcomes together.

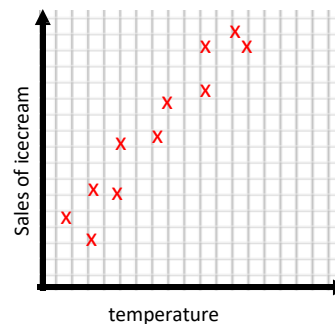
Key Vocabulary	Definition
Venn diagram	A diagram that uses overlapping circles to illustrate the relationships between two or more sets of data.
Intersection	The intersection of a Venn diagram is where two or more circles overlap.
Universal set	A set that contains all of the objects or elements being represented.
Set notation	Set notation is used to list numbers, objects, outcomes or probabilities from Venn diagrams. A – all elements in A A' – all elements not in A A $\cup$ B – all the elements in A or B or both A $\cap$ B – all the elements in both A and B



Mathematics - Probability & Statistics

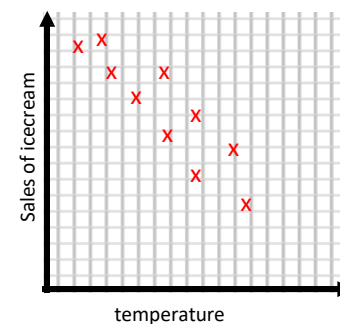
Key Vocabulary	Definition
Primary Data	Data that you have collected.
Secondary Data	Data that someone else has collected.
Bar Chart	Shows discrete data, there are gaps between the bars.
Pictogram	Shows discrete data, pictures are used to show frequencies, must have a key.
Time Series Graphs	Frequencies plotted over time. Points are joined with straight lines.
The Product Rule	Used to find the intersection of 2 or more probabilities, found by multiplying probabilities together.
Scatter Graphs	A graph of plotted points that compares two sets of information.
Describe relationship (scatter graphs)	Being specific about the trend seen with the variables involved e.g. as the temperature increases the sales of ice-cream also increases.

Key Vocabulary	Definition
Line of Best Fit	A line on your scatter graph that best describes the relationship between the two sets of data. • A straight line. • Goes roughly through the middle of the points on your scatter graph. • There should be an equal number of points above and below your line.
Correlation	Describes how two variables are linked.
Positive Correlation	As one variable increases so does the other variable.
Negative Correlation	As one variable increases the other decreases.
No Correlation	No relationship between the two variables.
Trend	A pattern in a set of results.
Outliers	A point that is far from the line of best fit.



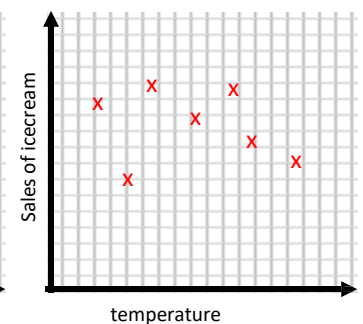
Upward trend in the position of the points

Positive Correlation



Downward trend in the position of the points

Negative Correlation

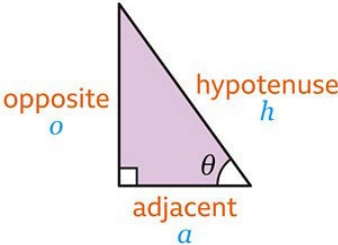
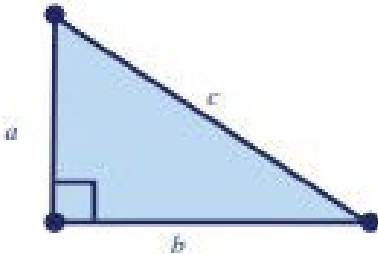


No particular trend in the position of the points

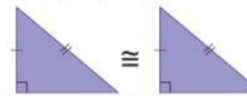
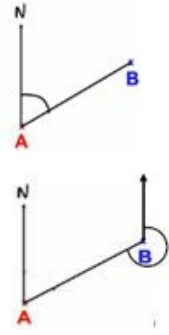
No Correlation

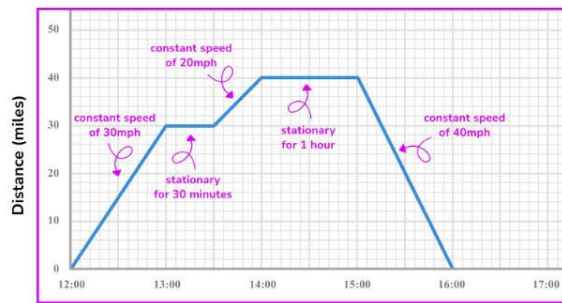
Mathematics - Geometry & Measure

Key Vocabulary	Definition
Right-angled triangle	A triangle that contains a 90° angle.
Hypotenuse	The longest side – opposite the right angle.
Opposite (length)	The length found opposite to the identified angle in a right-angled triangle.
Adjacent	The length found next to the identified angle in a right-angled triangle.
Trigonometry (right-angled triangles)	The relationship between side lengths and angles in right-angled triangles.
SOHCAHTOA	Method used to find missing lengths and angles in right-angled triangles.
SOHCAHTOA rules (Missing lengths)	$\text{SOH} \quad \sin \theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$ $\text{CAH} \quad \cos \theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$ $\text{TOA} \quad \tan \theta = \frac{\text{Opposite}}{\text{Adjacent}}$
SOHCAHTOA rules (Missing angles)	$\theta = \sin^{-1}\left(\frac{O}{H}\right)$ $\theta = \cos^{-1}\left(\frac{A}{H}\right)$ $\theta = \tan^{-1}\left(\frac{O}{A}\right)$

Key Vocabulary	Definition																								
Exact trigonometry values	Values for specific angles that are expected to be known for a non-calculator exam. <table><tr><td></td><td>0°</td><td>30°</td><td>45°</td><td>60°</td><td>90°</td></tr><tr><td>sin</td><td>0</td><td>$\frac{1}{2}$</td><td>$\frac{1}{\sqrt{2}}$</td><td>$\frac{\sqrt{3}}{2}$</td><td>1</td></tr><tr><td>cos</td><td>1</td><td>$\frac{\sqrt{3}}{2}$</td><td>$\frac{1}{\sqrt{2}}$</td><td>$\frac{1}{2}$</td><td>0</td></tr><tr><td>tan</td><td>0</td><td>$\frac{1}{\sqrt{3}}$</td><td>1</td><td>$\sqrt{3}$</td><td>–</td></tr></table>		0°	30°	45°	60°	90°	sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	–
	0°	30°	45°	60°	90°																				
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1																				
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0																				
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	–																				
Labelled right-angled triangle																									
Key term	Definition																								
Right angled triangle	A triangle that contains a 90° angle.																								
Hypotenuse	The longest side – opposite the right angle.																								
Pythagoras' theorem	For any right-angled triangle, the area of the square of the longer length (the hypotenuse) is equal to the area of the squares of the shorter lengths added together. $c^2 = a^2 + b^2$$a^2 = c^2 - b^2$$b^2 = c^2 - a^2$ 																								

Mathematics - Geometry & Measure

Key Vocabulary	Definition
Congruency	To have the exact same shape and size i.e. be identical
Congruent triangles	Two or more triangles are congruent if all three corresponding sides are equal in length and all three corresponding angles are equal in measure.
Conditions of congruency (triangles)	SSS (Side – Side – Side)  3 sides are respectively equal SAS (Side – Angle – Side)  2 sides and the included angle are respectively equal ASA (Angle – Side – Angle)  2 angles and the included side are respectively equal RHS (Right angle – Hypotenuse – Side)  Hypotenuse and one side are respectively equal
Similar shapes	Shapes that are enlargements of one another using a scale factor.
Bearings	- Measure from the North - Measured in a clockwise direction - Written using 3 digits Bearing of B from A (start at A) Bearing of A from B (start at B) 

Key Vocabulary	Definition
Compound measures	Types of measure that involve two or more different units e.g. speed, density, pressure.
Speed, Distance, Time	$Speed = \frac{Distance}{Time}$ $Distance = Speed \times Time$ $Time = \frac{Distance}{Speed}$
Density, Mass, Volume	$Density = \frac{Mass}{Volume}$ $Mass = Density \times Volume$ $Volume = \frac{Mass}{Density}$
Pressure, Force, Area	$Pressure = \frac{Force}{Area}$ $Force = Pressure \times Area$ $Area = \frac{Force}{Pressure}$
Distance-Time graphs	Graphs that depict a journey taken over time against the distance travelled. 

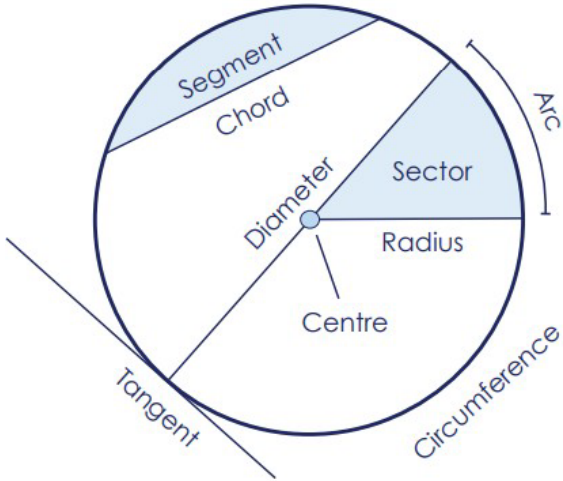
Mathematics - Geometry & Measure

Key Vocabulary	Definition
Acute Angle	An angle less than 90°.
Adjacent	Next to, or near.
Area	A measure of the space inside a closed two-dimensional shape.
Axes	The straight lines on a graph used to define the position of a point. The x-axis goes across (horizontal). The y-axis goes up (vertical).
Centimetre (cm)	A metric unit of length equal to one hundredth of a metre. 100cm = 1m
Compound Shape	A shape made up of two or more geometric shapes.
Coordinate	An ordered pair of points that show an exact position on a set of axes. Written (x, y).
Exterior Angle	An angle between one side of a shape and a line extending from an adjacent side.
Irregular Polygon	A polygon with unequal length sides and angles.
Kilometre (km)	A metric unit of length equal to one thousand metres. 1km = 1000m
Line of Symmetry	A line that can divide a shape into identical halves, which are mirror images of each other.
Metre (m)	The base unit of length in the international system of units.
Midpoint	The point exactly halfway between two points.
Millimetre (mm)	A metric unit of length equal to one thousandth of a metre. 10mm = 1cm
Obtuse Angle	An angle measuring between 90° and 180°.
Order of Rotation	The number of times that a shape appears identical during a turn of 360°.
Origin	The point with coordinate (0, 0).
Parallel	Two lines that will never cross and that will remain the same distance apart.
Perpendicular	Two lines that meet at an angle of 90°.

Key Vocabulary	Definition
Perimeter	The total distance around the outside of a closed two-dimensional shape.
Polygon	A closed two-dimensional shape made up of all straight edges.
Protractor	An instrument used to measure angles.
Quadrilateral	A two-dimensional shape with four sides.
Reflex Angle	An angle measuring between 180° and 360°.
Regular Polygon	A polygon with sides of equal length and angles of equal size.
Right-angle	A 90° angle.
Rotational Symmetry	A symmetry in which a shape may be rotated about a central point and appears identical after a turn of less than 360°.
Square Units	Units used to measure area.
Triangle	A two-dimensional shape with three sides.
Vertex	A point on a polygon at which two lines meet to form an angle.

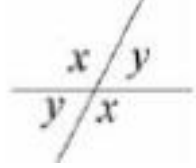
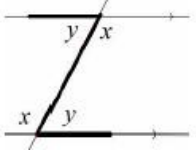
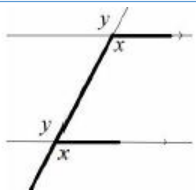
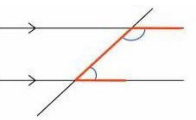
Key Vocabulary	Definition
Angles around a point	Angles around a point sum to 360°.
Angles on a straight line	Angles on a point on a straight line sum to 180°.
Angles in a triangle	Angles in a triangle sum to 180°.
Angles in a quadrilateral	Angles in a quadrilateral sum to 360°.
Key Vocabulary	Definition
Area of a rectangle or square	Length x width
Area of a parallelogram	Length x perpendicular height
Area of a triangle	$\frac{\text{Base} \times \text{perpendicular height}}{2}$
Area of a trapezium	where a and b are parallel sides and h is the perpendicular height. $\frac{1}{2}(a + b)h$

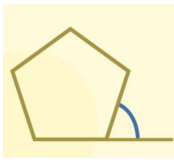
Mathematics - Geometry & Measure

Key Vocabulary	Definition
Parts of a circle	
Arc	A section of the circumference.
Sector	The area bounded by two radii and an arc.
Chord	A straight line joining any two parts of the circumference.
Circumference	The distance around the outside of the circle.
Diameter	A straight line going from one end of the circle to another passing through the centre.
Segment	The area bound by the circumference and a chord.
Tangent	A straight line that touches the circumference at a single point.
Pi (π)	The ratio of a circle's circumference to its diameter.

Key Vocabulary	Definition
Circumference	The perimeter of the circle. $C = \pi d$
Radius	$diameter \div 2$
Diameter	$2 \times radius$
Perimeter of semi-circle	$p = \frac{\pi d}{2} + d$
Perimeter of quarter circle	$p = \frac{\pi d}{4} + 2r$
Perimeter of three-quarter circle	$p = \frac{3}{4}\pi d + 2r$
Area of a circle	$A = \pi r^2$
Area of a semi-circle	$A = \frac{\pi r^2}{2}$
Area of a quarter-circle	$A = \frac{\pi r^2}{4}$
Area of three-quarter circle	$A = \frac{3\pi r^2}{4}$
Sector	Sectors are sections of a circle that are created by two radii and an arc.
Arc	A portion of the circumference.
Area of sector	$Area\ of\ a\ sector = \frac{\theta}{360} \pi r^2$
Length of arc	$length\ of\ arc = \frac{\theta}{360} \pi d$

Mathematics - Geometry & Measure

Key Vocabulary	Definition
Vertically Opposite Angles	Vertically opposite angles are equal. 
Alternate Angles	Alternate angles are equal. 
Corresponding Angles	Corresponding angles are equal. 
Co-Interior Angles	Co-Interior angles add up to 180°. 

Key Vocabulary	Definition
Sum of all angles in Polygons	n is the number of sides. $(n - 2) \times 180$
Internal angle in regular polygon	$\frac{(n - 2) \times 180}{n}$
External angle	The angle between a side of a polygon and an extended adjacent side.
Exterior angle regular polygon	 $\frac{360}{n}$

Key Vocabulary	Definition
Translation	Translate means to move a shape. The shape does not change size or orientation.
Rotation	The size does not change, but the shape is turned around a point.
Reflection	The size does not change, but the shape is 'flipped' like in a mirror. Line $x = ?$ is a vertical mirror line. Line $y = ?$ is a horizontal mirror line. Line $y = x$ is a diagonal mirror line.
Enlargement	The shape will get bigger or smaller in relation to a centre of enlargement. Multiply each side by the scale factor.
Centre	Used in rotations and enlargements as the centre for the transformation.

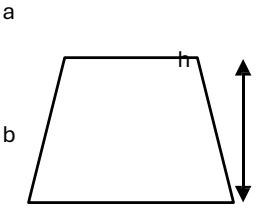
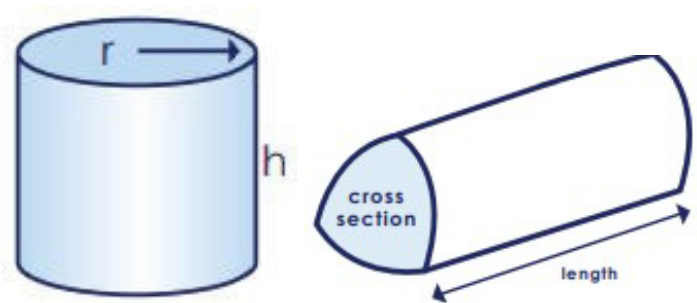
Key Vocabulary	Definition
Column vector	A vector whose components are listed vertically in a single column. The top number describes a movement to the right (positive value) or left (negative value) The bottom number describes a movement up (positive value) or down (negative value)

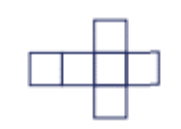
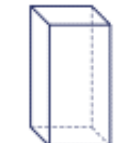
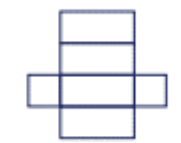
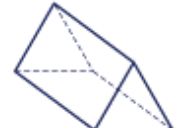
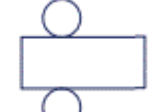
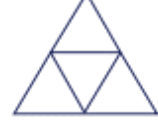
Mathematics - Geometry & Measure

Key Vocabulary	Definition
Properties of Solids	Faces = flat surfaces Edges = sides/lengths where faces meet Vertices = corners where edges meet
Plan	The view from directly above a 3D shape. You will see a 2D shape.
Side	The view directly to the side of a 3D shape. You will see a 2D shape.
Elevation	The view from the front and side of a 3D shape. You will see a 2D shape.
Sketch	To roughly draw a shape. Always label the sides and write any measurements on.

Key Vocabulary	Definition
Volume	The amount of 'space' a solid object occupies. Units: $\text{mm}^3, \text{cm}^3, \text{m}^3$
Volume of a Cube/Cuboid	You can also use the Volume of a Prism formula for a cube/cuboid. $V = \text{Length} \times \text{Width} \times \text{Height}$ $V = L \times W \times H$
Surface Area	The total area of all the faces of a 3D shape.
Surface area of a cylinder	$A = 2\pi rh + 2\pi r^2$
Volume of a Prism	$V = \text{Area of Cross Section} \times \text{Length}$

Mathematics - Geometry & Measure

Key Vocabulary	Definition	
Area of a trapezium	$\frac{a + b}{2} \times h$ 	
Face	A face is a single flat surface.	
Edge	An edge is a line segment between two faces.	
Volume	The amount of 'space' a solid object occupies. Units: mm^3, cm^3, m^3, etc. The volume of a prism $V = \text{Area of Cross Section} \times \text{Length}$ The volume of a cylinder $= \pi r^2 h$ 	
Volume of a cube / cuboid	Length x width x height	
Prism	A 3D shape with a constant cross-section.	
Cross-section	The 2D shape that is consistent throughout the prism.	

Key Vocabulary	Definition	Shape	Net
Cube	6 square faces 12 edges 8 vertices		
Cuboid	6 rectangular faces 12 edges 8 vertices		
Triangular Prism	5 faces 9 edges 6 vertices		
Cylinder	3 faces 2 edges 0 vertices		
Square-based Pyramid	5 faces 8 edges 5 vertices		
Triangular-based Pyramid	4 faces 6 edges 4 vertices		
Cone	2 faces 1 edge 1 vertex		
Sphere	1 face 0 edges 0 vertices Half a sphere is known as a hemisphere.		



Glenmoor & Winton Academies

High Achievement – High Standards

Part of United Learning

Mathematics

GCSE Higher

Number Ratio & Proportion - Higher

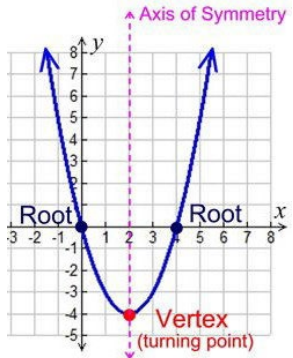
Key Vocabulary	Definition
Direct proportion	Two quantities are in direct proportion if they increase or decrease at the same rate, causing the ratio of the two values to be equal to a constant value.
Inverse/indirect proportion	Two quantities are in indirect proportion if one decreases as the other increases, for example speed and time.
Constant of proportionality	The constant value, often written k , relating quantities that are either directly or indirectly proportional.
Direct Proportion Formula	$y \propto x$ $y = kx$ for a constant k
Inverse Proportion Formula	$y \propto 1/x$ $y = k/x$ for a constant k

Key Vocabulary	Definition
Surd	An irrational number, depicted by the root of an integer.
Simplify surd	To simplify a surd, find the highest square number that divides into that number. $ \begin{array}{ccc} & \sqrt{45} & \\ \swarrow & & \searrow \\ \sqrt{9} & & \sqrt{5} \\ \swarrow & & \searrow \\ & 3\sqrt{5} & \end{array} $
Manipulating surds	Calculations with surds can be carried out using the following: $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$ $\sqrt{a} \times \sqrt{b} = \sqrt{ab}$ $\sqrt{a} \times \sqrt{a} = a$ $a\sqrt{b} \times c\sqrt{d} = ac\sqrt{bd}$
Rationalising surds	Converting the denominator of a fraction from an irrational number to a rational number using equivalent fractions. E.g. $\frac{8}{\sqrt{2}} = \frac{8 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} = \frac{8\sqrt{2}}{2} = 4\sqrt{2}$ $\frac{4}{(2+\sqrt{3})} = \frac{4(2-\sqrt{3})}{(2+\sqrt{3})(2-\sqrt{3})} = 8 - \sqrt{3}$

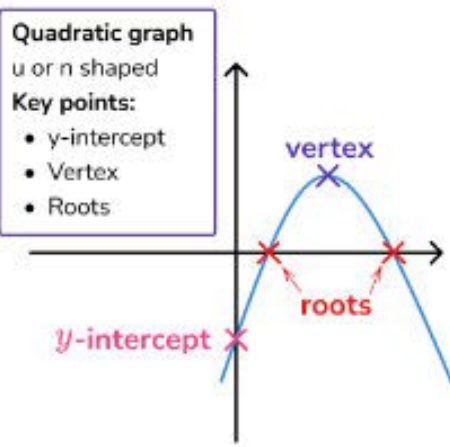
Number Ratio & Proportion - Higher

Key Vocabulary	Definition
Recurring decimal	A decimal number in which a figure or group of figures is repeated indefinitely. E.g. 0.666... or 1.858585... Represented by dots over the recurring numbers e.g. 0.11111111.... $0.\dot{1}$ 0.4343434343 $0.\dot{4}\dot{3}$ 0.765765765 $0.\dot{7}\dot{6}\dot{5}$ 0.237823782378237... $0.\dot{2}\dot{3}\dot{7}\dot{8}$

Key term	Definition															
Upper and lower bounds (Limits of accuracy)	Upper and lower bounds are the maximum and minimum values a number could have been before it was rounded, often written using error intervals. E.g A length (l) of 6.4cm, rounded to one decimal place would have an error interval of $6.35 \text{ cm} \leq l < 6.45 \text{ cm}$															
Calculations with bounds	Calculations involving bounds use these values within calculations. Which values to use in which calculation is summarised in the table below: <table><tr><th>Calculation with x and y</th><th>Upper bound</th><th>Lower bound</th></tr><tr><td>Addition (x + y)</td><td>$x_{upper} + y_{upper}$</td><td>$x_{lower} + y_{lower}$</td></tr><tr><td>Subtraction (x - y)</td><td>$x_{upper} - y_{lower}$</td><td>$x_{lower} - y_{upper}$</td></tr><tr><td>Multiplication (x x y)</td><td>$x_{upper} \times y_{upper}$</td><td>$x_{upper} \times y_{upper}$</td></tr><tr><td>Division ($\frac{x}{y}$)</td><td>$\frac{x_{upper}}{y_{lower}}$</td><td>$\frac{x_{lower}}{y_{upper}}$</td></tr></table>	Calculation with x and y	Upper bound	Lower bound	Addition (x + y)	$x_{upper} + y_{upper}$	$x_{lower} + y_{lower}$	Subtraction (x - y)	$x_{upper} - y_{lower}$	$x_{lower} - y_{upper}$	Multiplication (x x y)	$x_{upper} \times y_{upper}$	$x_{upper} \times y_{upper}$	Division ($\frac{x}{y}$)	$\frac{x_{upper}}{y_{lower}}$	$\frac{x_{lower}}{y_{upper}}$
Calculation with x and y	Upper bound	Lower bound														
Addition (x + y)	$x_{upper} + y_{upper}$	$x_{lower} + y_{lower}$														
Subtraction (x - y)	$x_{upper} - y_{lower}$	$x_{lower} - y_{upper}$														
Multiplication (x x y)	$x_{upper} \times y_{upper}$	$x_{upper} \times y_{upper}$														
Division ($\frac{x}{y}$)	$\frac{x_{upper}}{y_{lower}}$	$\frac{x_{lower}}{y_{upper}}$														
Suitable degree of accuracy	Finding a value to a suitable degree of accuracy involves finding the upper and lower bound of your calculation and finding what they both round to, this needs to be as accurate of a number as possible.															

Key Vocabulary	Definition
General quadratic equation	$ax^2 + bx + c = 0$
Quadratic formula	A formula that gives solutions of the general quadratic equation: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Completing the square	Quadratic expression factorised by completing the square and writing in the form: $(x + a)^2 + b$ E.g. $x^2 + 4x + 7 = (x + 2)^2 + 3$
Turning point	The point where the gradient of a function changes from positive to negative or negative to positive. The turning point can be found from completed square form using: $(-a, b)$. 
Key term	Definition
Iteration	Finding approximate solutions to equations using iterative methods.
Iterative formula	Tells us how to find the next solution, labelled as x_{n+1} , given the current solution, which is labelled as x_n .
Change of sign	If there is a change of sign for y for two particular values of x then we can say there is a root between these values of x and we can say that the equation $f(x) = 0$ will have a solution between these two values of x .

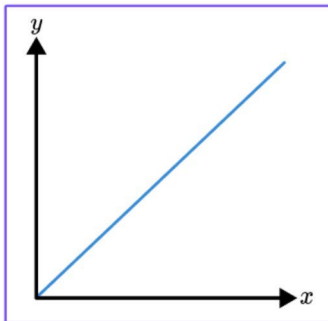
Key term	Definition
Algebraic proof	Even numbers: $2n, 2n+2, 2n+4, \dots$ Odd numbers: $2n+1, 2n+3, 2n+5, \dots$ Sum: add Product: multiply Difference: subtract Show it's a multiple: factorise Show it's even: show it's a multiple of 2
Even numbers	$2n, 2n+2, 2n+4 \dots$
Odd numbers	$2n-1, 2n+1, 2n+3 \dots$
Consecutive	Describing things which follow each other in a particular order.
Sum	The result of an addition.
Product	The result of a multiplication.
Difference	The result of a subtraction.
Show it's a multiple	Factorise
Show it's even	Show it's a multiple of 2 by factorising
Key term	Definition
Laws of indices	The rules for simplifying expressions involving powers of the same base number.
Multiplication Law:	$a^n \times a^m = a^{n+m}$
Division Law:	$a^n \div a^m = a^{n-m}$
Bracket Law:	$(a^n)^m = a^{nm}$
Power of 0:	$a^0 = 1$
Negative Indices:	$a^{-n} = \frac{1}{a^n}$
Fractional Indices:	$a^{\frac{n}{m}} = \sqrt[m]{a^n}$

Key Vocabulary	Definition
Equation of a circle	Equations of circles are given in the form $x^2 + y^2 = r^2$
Centre for a circle	The centre of the circle for equations in this form is always (0,0).
Gradient of the radius	The gradient of the radius is the negative reciprocal of the gradient of a tangent to a point on the circumference i.e. they are perpendicular.
Gradient of a curve	A tangent is drawn to the curve at a given point, the gradient of the tangent will be an estimation of the gradient of the curve at this point.
Coefficient	A constant value which multiplies a variable. Always written before the variable.
Sketching a quadratic curve	The graph of a quadratic function is always u-shaped (positive x^2 coefficient) or n-shaped (negative x^2 coefficient).
Parabola	The shape made by the graph of a quadratic function.
Quadratic curve key features	Quadratic graph u or n shaped Key points: • y-intercept • Vertex • Roots 
Roots	The solutions of a quadratic equation, given as values not co-ordinates.

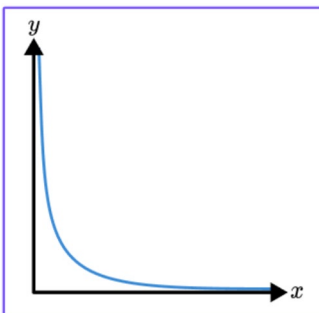
Key Vocabulary	Definition
Algebraic functions	Functions in algebra are described using function notation. The f in f(x) is known as the function being applied to a variable x . Other letters such as g and h are also commonly used.
Substituting into algebraic functions	Substitution of values into a variable to find an output or using an output to solve an equation to find an initial value.
Composite functions	Two or more functions that are combined together. To substitute into a composite function, the value given is first substituted into the function closest to the value and the result of this is the substituted into the next function back until all functions have been used. E.g. If $f(x) = 3x$ and $q(x) = x^2 + 1$, find $fg(2)$. $g(2) = (2)^2 + 1$ $g(2) = 5$ $f(5) = 3(5)$ $f(5) = 15, \text{ so } fg(2) = 15.$
Inverse functions	Inverse functions are the 'reverse' of the original function. Inverse functions use the notation $f^{-1}(x)$. E.g. If $f(x) = 3x + 7$, find $f^{-1}(x)$. $y = 3x + 7$ $y - 7 = 3x$ $\frac{y - 7}{3} = x$ $f^{-1}(x) = \frac{x - 7}{3}$

Key Vocabulary	Definition
Cubic	An equation with the highest power of x is x^3
Reciprocal	An equation where x is in the denominator.
Numerator	The top number in a fraction.
Denominator	The bottom number in a fraction.
Direct Proportion	Two quantities are in direct proportion if they increase or decrease at the same rate, causing the ratio of the two values to be equal to a constant value.
Inverse/Indirect Proportion	Two quantities are in indirect proportion if one decreases as the other increases, for example speed and time.

Direct proportion: Graphs which indicate a directly proportional relationship between x and y . Always intersect at the origin. For example, $y = x$

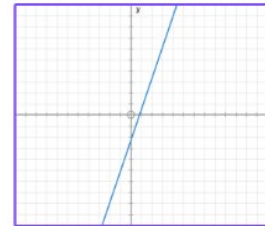


Indirect proportion: A reciprocal graph which is found in the first quadrant. Does not touch any axis.

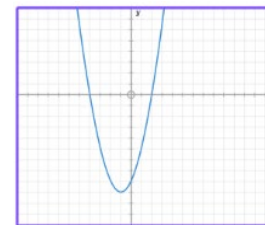


Graphs that need to be recognised

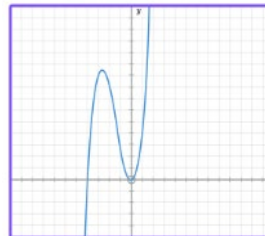
Linear: For example $y = 3x - 2$



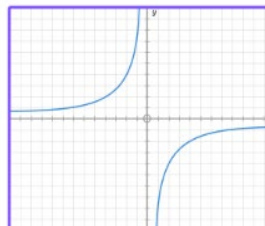
Quadratic: For example $y = x^2 + 2x - 8$



Cubic: For example $y = x^3 + 4x^2$

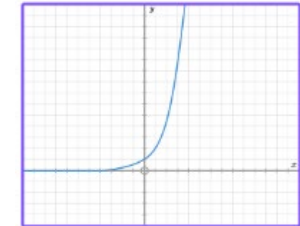


Reciprocal: For example $y = \frac{4}{x}$

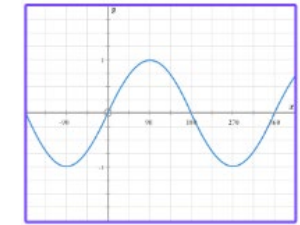


Graphs that need to be recognised

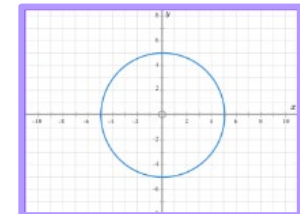
Exponential: For example $y = 2^x$



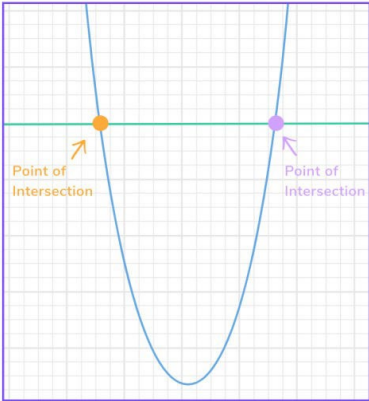
Trigonometric: For example $y = \sin(x)$



Circle: For example, $x^2 + y^2 = 25$



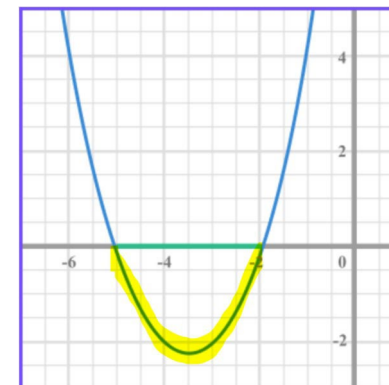
Key Vocabulary	Definition
Quadratic sequences	Ordered sets of numbers that follow a rule based on the sequence: $n^2 = 1, 4, 9, 16, 25, 36, \dots$
Quadratic sequence n^{th} term	The n^{th} term of a quadratic sequence will always contain an n^2 term. $an^2 + bn + c$
Finding the n^{th} term of a quadratic sequence	n Nth term rule 1st difference 2nd difference 1 $= a + b + c$ $\swarrow \quad \searrow$ $3a + b$ $\searrow$ $2a$ 2 $= 4a + 2b + c$ $\swarrow \quad \searrow$ $5a + b$ 3 $= 9a + 3b + c$

Key Vocabulary	Definition
Quadratic simultaneous equations	Quadratic simultaneous equations are two or more equations that share variables that are raised to powers up to a maximum of 2 e.g. x^2 and y^2
Quadratic simultaneous equations solutions	Quadratic simultaneous equations will have multiple solutions for x and y, due to the way the graphs intersect when drawn. A visual representation of this is below:  The points of intersection show a visual representation of the solutions. Due to the multiple points of intersection, there will be 2 solutions for x and 2 solutions for y.

Key Vocabulary	Definition
Quadratic inequalities	Can be solved to give a range of solutions that work for the inequality.
Range of solutions	We determine the range of solutions by sketching the graph of the quadratic equation that can be seen in the equation. The range of solutions is determined by the inequality symbol used in the question, determining whether the range we are interested in is above or below the x axis.

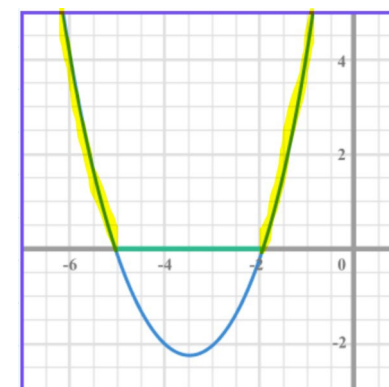
E.g.1

Solve $x^2 + 7x + 10 < 0$.
 $-5 < x < -2$.



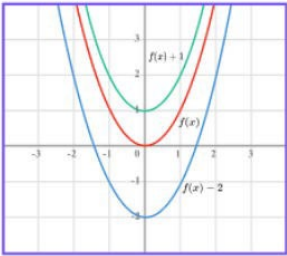
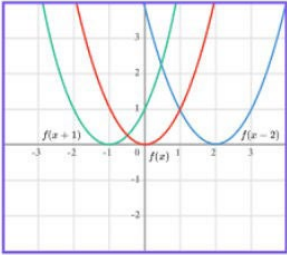
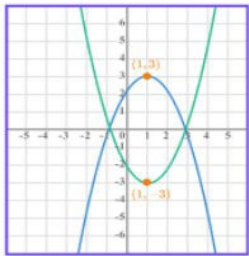
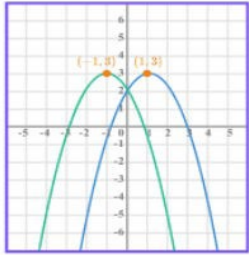
E.g. 2

Solve $x^2 + 7x + 10 \geq 0$
 $x \leq -5$
 $x \geq -2$



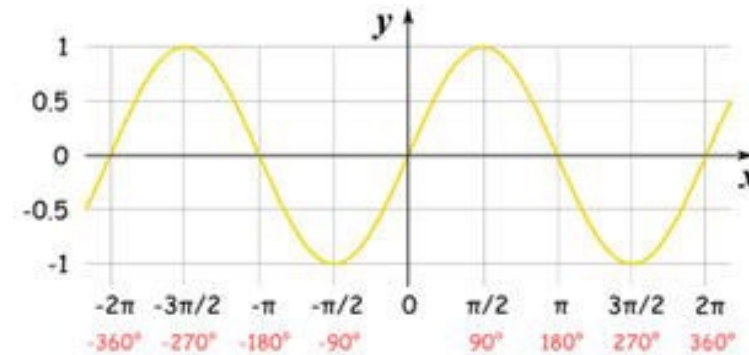
Key Vocabulary	Definition
Polynomial expression	A polynomial expression consists of two or more algebraic terms.
Expanding triple brackets	Expanding triple brackets starts with the expansion and simplification of two of the brackets. The resulting expression is then multiplied by the two terms found in the third bracket separately, and all terms simplified to a final expression.

Geometry & Measures - Higher

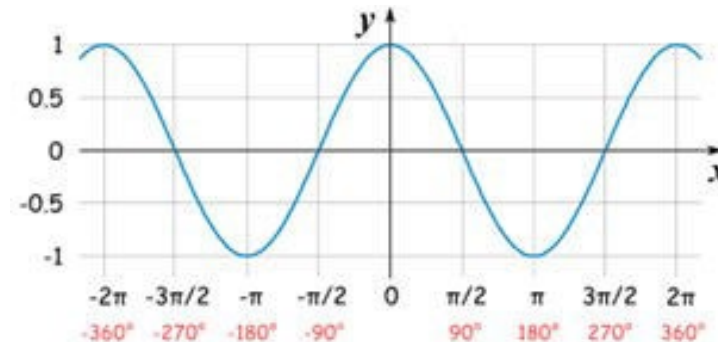
Key Vocabulary	Definition
Graph transformations	Involve performing transformations, such as translations and reflections, on the graph of a function.
Translations	 $f(x) + a$ Translation by vector $\begin{pmatrix} 0 \\ a \end{pmatrix} \uparrow$ Add a to the y coordinate  $f(x - a)$ Translation by vector $\begin{pmatrix} a \\ 0 \end{pmatrix} \rightarrow$ Add a to the x coordinate
Reflections	 $-f(x)$ Reflection in the x-axis $\updownarrow$ Multiply the y coordinates by -1  $f(-x)$ Reflection in the y-axis $\leftrightarrow$ Multiply the x coordinates by -1

Trigonometric graphs

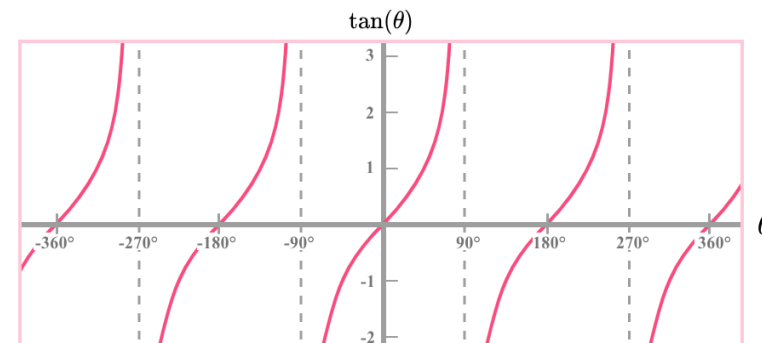
Sine Curve



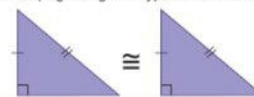
Cosine Curve



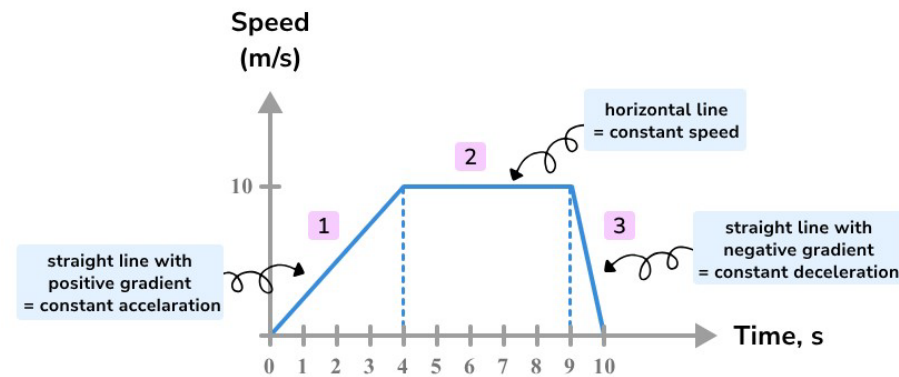
Tangent curve



Geometry & Measures - Higher

Key Vocabulary	Definition
Congruent	Exactly equal in shape and size.
Congruent triangles	Two or more triangles that are identical to one another in relation to side lengths and angle sizes.
Conditions of congruency	SSS (Side – Side – Side)  3 sides are respectively equal SAS (Side – Angle – Side)  2 sides and the included angle are respectively equal ASA (Angle – Side – Angle)  2 angles and the included side are respectively equal RHS (Right angle – Hypotenuse – Side)  Hypotenuse and one side are respectively equal
Vectors	Operations with vectors If $\begin{pmatrix} a \\ b \end{pmatrix}$, then $\begin{pmatrix} 2 \\ 6 \end{pmatrix} + \begin{pmatrix} 7 \\ -3 \end{pmatrix} = \begin{pmatrix} 9 \\ 3 \end{pmatrix}$ $b = \begin{pmatrix} 4 \\ -2 \end{pmatrix}$ $3b = \begin{pmatrix} 12 \\ -6 \end{pmatrix}$
Key Vocabulary	Definition
Surface area of a cylinder	Curved surface area = $2\pi rh$ Area of circle = πr^2
Surface area of a cone	<i>curved surface area</i> = πrl
Surface area of a sphere	<i>Surface area</i> = $4\pi r^2$
Surface area of a prism (including cube and cuboid)	Calculate the area of all faces and add them together.

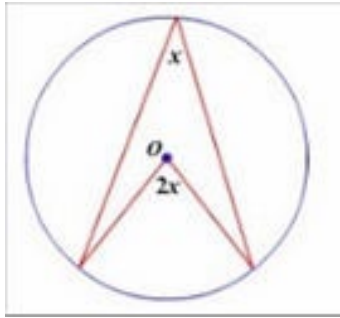
Key Vocabulary	Definition
Speed-time graph	A graph that shows the motion of an object against time. They may also be referred to as velocity-time graphs. Speed is shown on the y-axis and time on the x-axis.
Acceleration	the rate of change in speed over time, this is the gradient over a given time period on the graph. Acceleration units have the time unit squared e.g. $\frac{m}{s^2}$
Distance	Total distance is found by calculating the area under the speed-time graph.



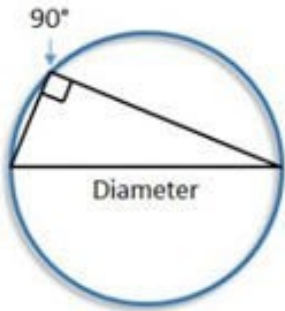
Key Vocabulary	Definition
Volume of a cylinder	$Volume = \pi r^2 h$
Volume of a cone	$Volume = \frac{1}{3} \pi r^2 h$
Volume of a sphere	$Volume = \frac{4}{3} \pi r^3$
Volume of a pyramid	$Volume = \frac{1}{3} \times \text{area of base} \times \text{height}$
Volume of a prism	Area of cross section x length

Geometry & Measures - Higher

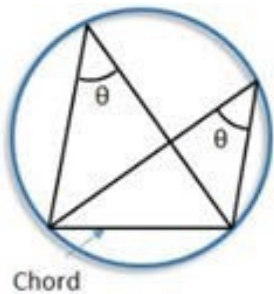
Circle Theorems



Angle at the centre is twice the angle at the circumference

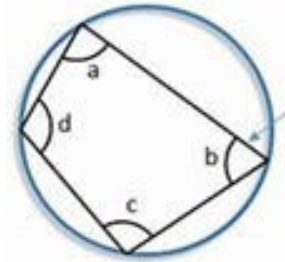


Angles in a semicircle are 90° .

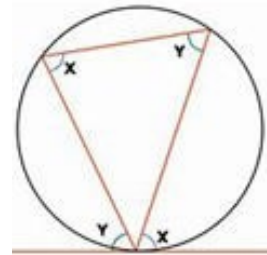


Angles in the same segment are equal.

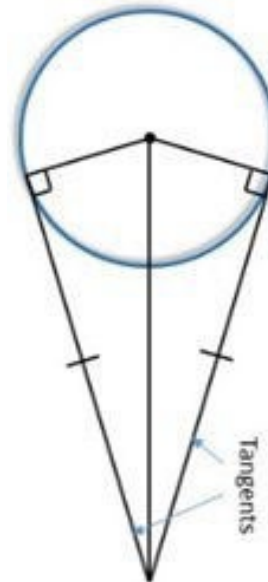
Circle Theorems



Opposite angles of a cyclic quadrilateral add up to 180°.



Alternate segment theorem: angles in alternate segments formed by a chord are equal.



Tangents from an external point are equal in length.

The tangent to a circle is perpendicular (90°) to the radius.

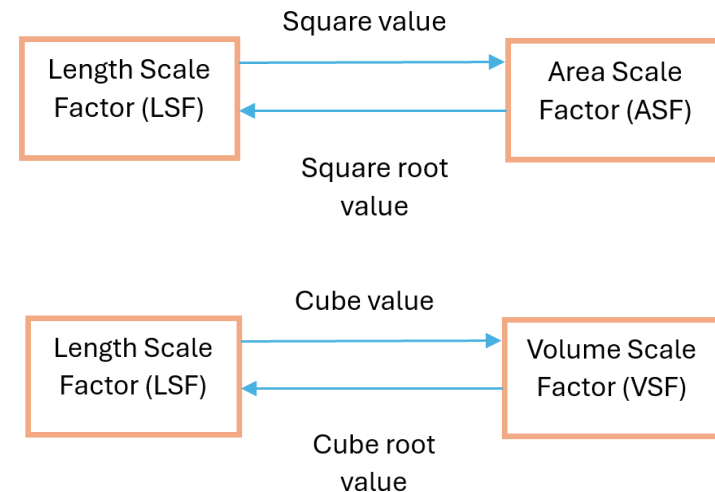
Geometry & Measures - Higher

Key Vocabulary	Definition
Sine rule	Demonstrates the relationship between the size of an angle in a triangle and its opposite side. The rule involves the use of 2 of the "pairs" of angles and their opposite sides.
Sine rule (Missing length)	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
Sine rule (Missing angle)	$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$
Cosine rule	Used to calculate a missing length or angle in a triangle if the sine rule is not possible to use.
Cosine rule (Missing length)	$a^2 = b^2 + c^2 - 2bc \cos A$
Cosine rule (Missing angle)	$A = \cos^{-1} \left(\frac{b^2 + c^2 - a^2}{2bc} \right)$
Area of a non-right angled triangle	Used to find the area of a triangle when we do not know the base and perpendicular height, usually in a non right- angled triangle: $A = \frac{1}{2} ab \sin C$

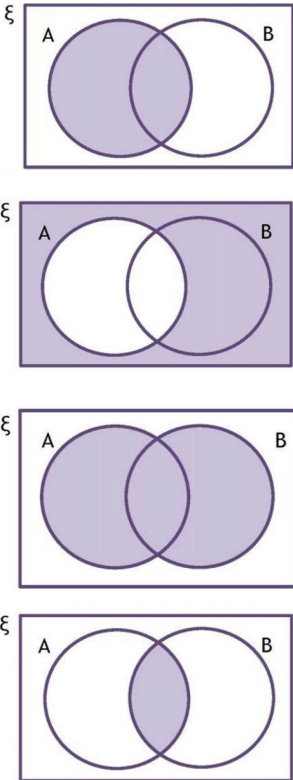
Key Vocabulary	Definition
Enlargements (negative scale factor)	Enlargements by a negative scale factor produce an enlarged image on the opposite side of the centre as the original shape. The image will appear upside down and will have also changed its size.
Invariant point	A point of invariance or an invariant point is a point or points which have remained in the same place once a transformation has taken place.

Key Vocabulary	Definition
Similar shapes	Shapes that are enlargements of one another using a scale factor.
Linear scale factor (LSF)	Used to convert lengths in similar shapes.
Area scale factor (ASF)	Used to convert areas in similar shapes.
Volume scale factor (VSF)	Used to convert volumes in similar shapes.
Converting scale factors	Conversions between the scale factors follow the pattern below:

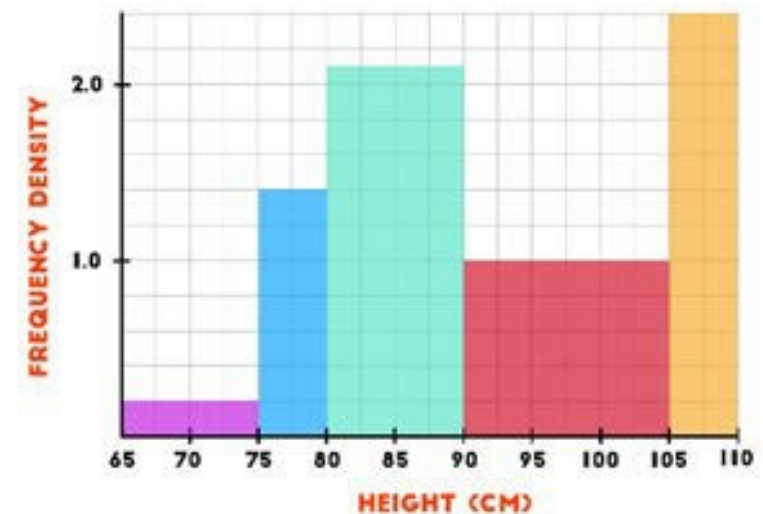
When using the correct scale factor, multiplication is used to find a missing value in the larger similar shape and division used to find a missing value in the smaller similar shape.



Probability & Statistics - Higher

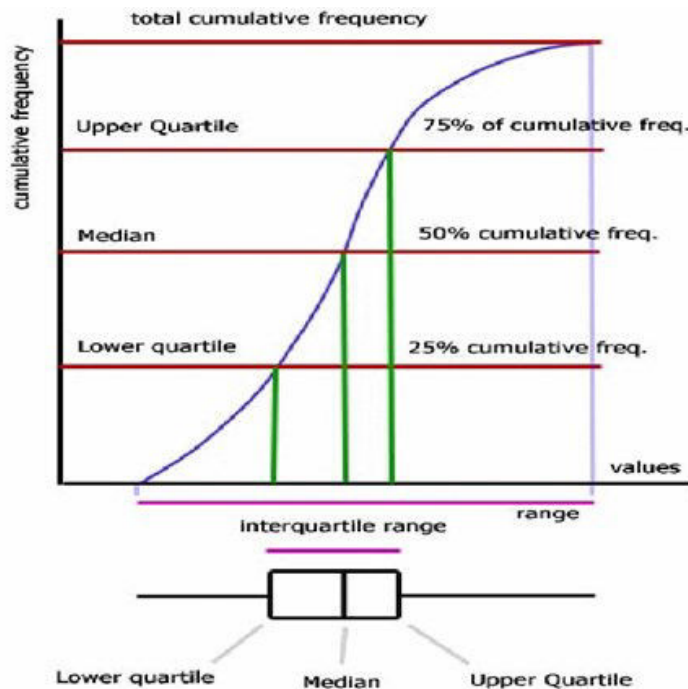
Key Vocabulary	Definition
Venn diagram	A diagram that uses overlapping circles to illustrate the relationships between two or more sets of data.
Intersection	The intersection of a Venn diagram is where two or more circles overlap.
Universal set	A set that contains all of the objects or elements being represented.
Set notation	Set notation is used to list numbers, objects, outcomes or probabilities from Venn diagrams. A – all elements in A A' – all elements not in A $A \cup B$ – all the elements in A or B or both $A \cap B$ – all the elements in both A and B 

Key Vocabulary	Definition
Histogram	A visual representation of grouped, continuous data where bars are used whose area represent the frequencies of the groups.
Frequency density	The frequency per unit for the data in each class, found using the formula: Frequency density is always found on the y-axis of a histogram.
Class width	The difference between the upper class limit and the lower class limit of a grouped data class.

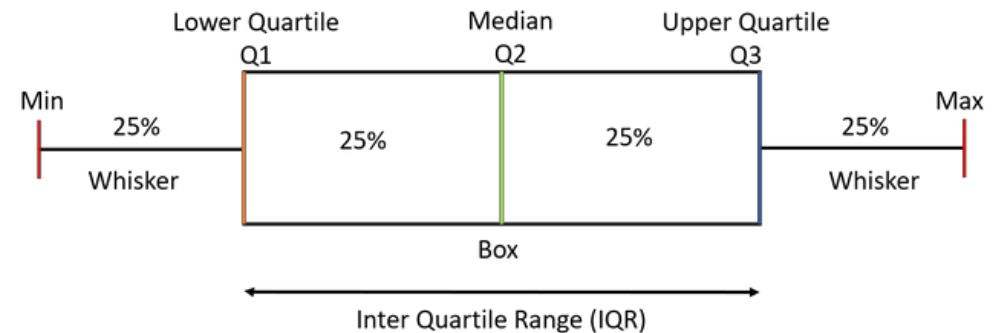


Probability & Statistics - Higher

Key Vocabulary	Definition
Cumulative frequency graph	Used to represent and analyse the distribution of large grouped data sets. Data points are plotted using the upper-class boundary of the data sets against cumulative frequency.
Cumulative frequency	A running total of the frequencies across a frequency distribution. Cumulative frequency is always labelled on the y-axis.
Median	Read off 50% through the cumulative frequency.
Upper quartile (UQ)	Read off 75% through the cumulative frequency.
Lower quartile (LQ)	Read off 25% through the cumulative frequency.



Key Vocabulary	Definition
Box plot	Used to compare datasets using key averages and data pieces.
Median	The middle value in an ordered set of data.
Upper quartile (UQ)	Found 75% of the way through an ordered data set.
Lower quartile (LQ)	Found 25% of the way through an ordered data set.
Inter-quartile range (IQR)	The difference between the upper quartile and lower quartile.
Comparing box plots	Box plots can be compared using the median values and a measure of spread (the range or the IQR). Values must be compared using more than or less than terminology and must be applied to the context of the question.



Key Vocabulary	Definition
Tree diagram	- A diagram which represents a sequence of events. The diagram has probabilities on the branches which can be used to calculate the probabilities of outcomes. - The probability of a single outcome can be found by multiplying the probabilities along the branches. - The probability of more than one outcome can be found by adding the probabilities of single outcomes together.
Dependent events	Events where the outcome of the first event affects the probability of the second event.
Independent events	Events where the outcome of the first event does not affect the probability of the second event.
Expected outcomes	How often an outcome is expected in an experiment. Can be calculated using: $\text{Expected outcome} = \text{probability} \times \text{number of trials}$



Glenmoor & Winton Academies

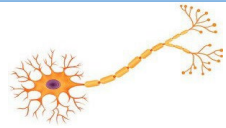
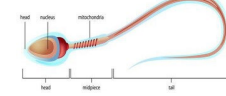
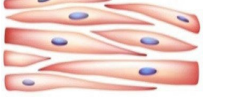
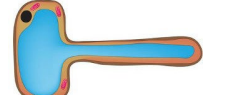
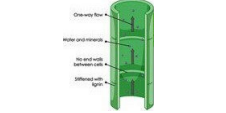
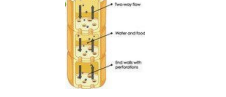
High Achievement – High Standards

Part of United Learning

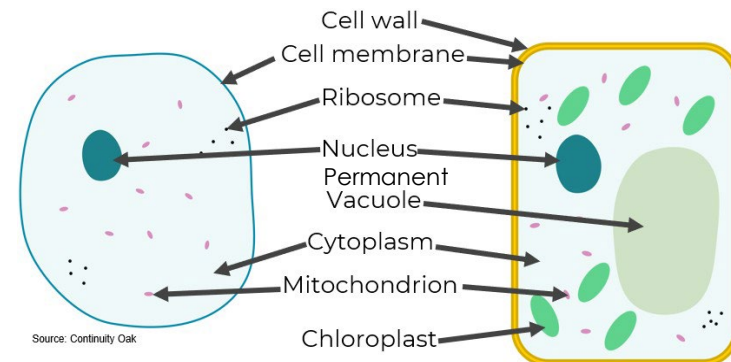
Science

Science – Cell Biology

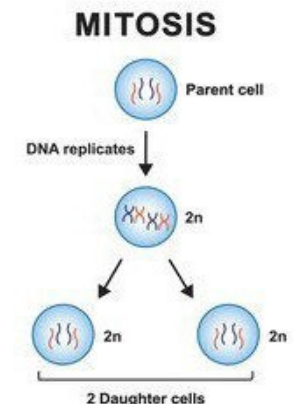
1. Key vocabulary	
1. DNA	The molecule that holds the genetic information in a cell.
2. Plasmid	A small loop of DNA, only found in prokaryotic cells (bacteria).
3. Eukaryotic cell	DNA contained within nucleus (plant and animal).
4. Prokaryotic cell	DNA not contained in nucleus (bacteria).
5. Cell differentiation	Cells become specialised by developing different sub-cellular structures to help them function.
6. Chromosomes	Found in nucleus of a cell, made of DNA. Usually found in pairs. Humans have 46 chromosomes (23 pairs) in a body cell.

3. Specialised cells		
Specialised cell	Image	How the structure relates to the function
1. Nerve cell		Elongated axon to transmit electrical impulses over a distance; large dendrites; fatty sheath covering the axon for insulation, to speed up transmission.
2. Sperm cell		Has a long tail to allow it to swim; contains many mitochondria to release lots of energy; streamlined head containing enzymes.
3. Muscle cell		Lots of mitochondria to release energy for muscle contraction; elastic fibres to allow the muscle to contract and relax.
4. Root hair cell		Has a large surface area and thin cell wall for water and mineral absorption.
5. Xylem cell		Strengthened walls by lignin for the transport of water and dissolved ions.
6. Phloem cell		Sieve plates to allow the transport of dissolved sugars.

2. Sub-cellular structures	Function
1. Nucleus	Controls the cell's activities and contains genetic material.
2. Cell membrane	Controls the movement of substances into and out of the cell.
3. Cytoplasm	Jelly-like substance where chemical reactions take place.
4. Mitochondria	The site of aerobic respiration.
5. Ribosome	Site of protein synthesis (proteins are made).
6. Cell wall	Strengthens the cell, made of cellulose.
7. Chloroplast	Site of photosynthesis (contains chlorophyll, a green pigment which absorbs light).
8. Permanent Vacuole	Filled with cell sap to help keep the cell turgid (stiff) to provide support.



4. Mitosis – cell division	
Stage	Description
1	Cell grows, number of sub-cellular structures (e.g. ribosomes and mitochondria) increases and DNA replicates to form two copies of each chromosome.
2	Nucleus divides and one set of chromosomes is pulled to each end of the cell.
3	Cytoplasm and cell membranes divide to form two identical cells.



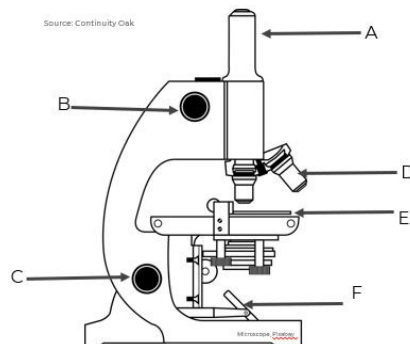
Science - B1 – Cell Biology

1. Microscopy

Term	Definition
1. Magnification	Magnification = size of image ÷ size of actual object
2. Focus	Start with lowest magnification to focus image.
3. Resolution	This is the measure of the level of detail you can see in the image using a microscope.
4. Light microscope	Device that uses visible light and a series of lenses to produce an enlarged image of an object, maximum magnification of 1500x and low resolution.
5. Electron microscope	Microscope with a much higher magnification and resolution than a light microscope so can be used to study cells in much finer detail and see sub-cellular structures.

3. Microscopes

A	Eyepiece lens	Where the viewer looks through to see the specimen
	Clips	Keep the specimen secure on the stage
B	Coarse focus	Moves the stage up and down
C	Fine focus	Used to make the image clearer
D	Objective lens	Changes the magnification of the image
E	Stage	Where the specimen is placed
F	Light	Produces light to see the specimen



2. Transport across membranes

Process	Definition	Image	Uses
1. Diffusion	The net movement of particles from an area of higher concentration to an area of lower concentration. Occurs in solutions and gases.		Movement of oxygen and carbon dioxide in gas exchange (lungs - alveoli; leaves - spongy mesophyll and stomata), and of the waste product urea from cells into the blood plasma for excretion in the kidney.
2. Osmosis	The diffusion of water from a dilute to concentrated solution, across a partially permeable membrane (shown in red).		Movement of water across cell membranes into and out of cells.
3. Active Transport	The movement of particles from a low concentration to a high concentration, using energy from respiration.		Absorption of mineral ions into plant root hairs from very dilute solutions in the soil. Absorption of sugar molecules from lower concentrations in the gut into the blood which has a higher sugar concentration.

4. Stem cells

A stem cell is an undifferentiated cell of an organism which is capable of giving rise to many more cells of the same type, and from which certain other cells can arise from differentiation. Stem cells may be able to help conditions such as diabetes and paralysis.

Embryo	Adult	Meristem
Can be cloned and made to differentiate into most different types of human cells.	Adult bone marrow can form many types of cells including blood cells.	Can differentiate into any type of plant cell, throughout the life of the plant.

In therapeutic cloning an embryo is produced with the same genes as the patient.

Science - B1 - Organisation

1. Levels of organisation: Cell → Tissue → Organ → Organ System → Organism

Cell	The smallest unit for building all organisms e.g., muscle cell.
Tissue	A group of cells with a similar structure and function, which work together to do a particular job e.g., muscle tissue.
Organ	A group of different tissues, which all work together to do a particular job e.g. heart.
Organ System	A group of different organs, which all work together to do a particular job e.g. circulatory system.
Organism	A living thing (capable of the 7 life processes).

3. Parts of the digestive system

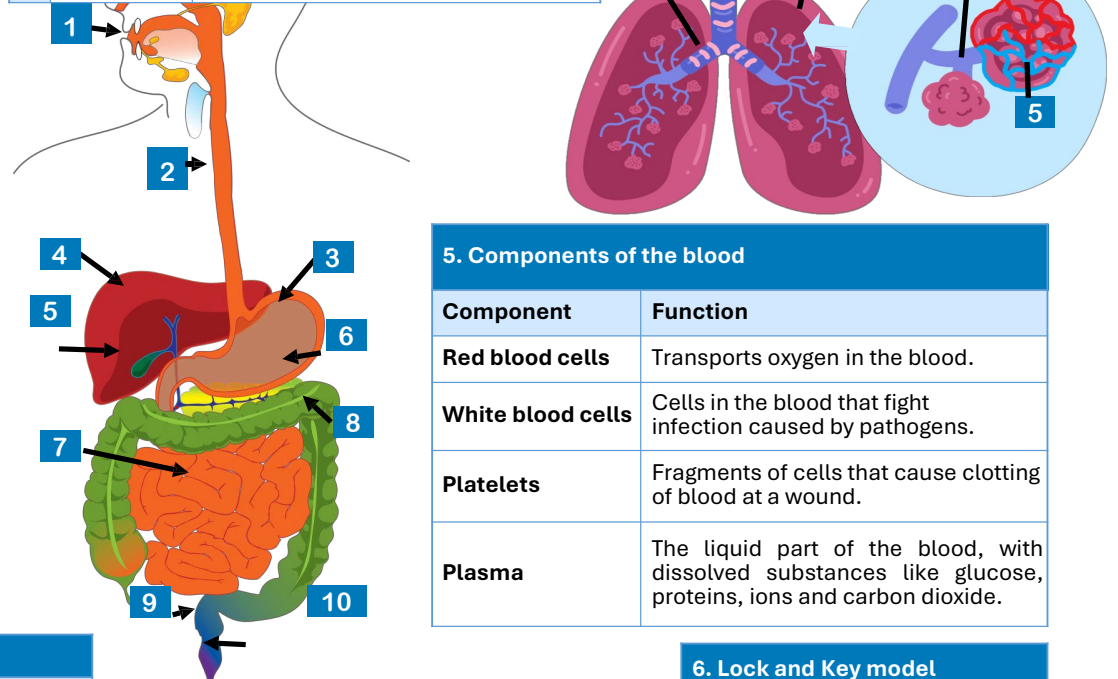
#	Organ	Function
1	Mouth	Mechanical digestion by chewing. Saliva from salivary glands, contains the enzyme amylase.
2	Oesophagus	Muscular tubing where peristalsis takes place.
3	Stomach	Mechanical digestion by churning. Cells in the lining of the stomach release acid to kill bacteria and produce the enzyme protease.
4	Liver	Produces bile
5	Gall bladder	Stores bile
6	Pancreas	Produces digestive enzymes
7	Small intestine	Chemical digestion: larger molecules are broken down into small soluble molecules which are absorbed into the blood.
8	Large intestine	Absorbs water from waste back into the bloodstream.
9	Rectum	Stores faeces
10	Anus	Ring of muscle allowing faeces to exit the body.

4. Digestive enzymes

Enzyme	Site of production	Site of action	Substrate	Product
Carbohydrase e.g. amylase	Salivary glands, pancreas and small intestine wall.	Mouth, small intestine	carbohydrates e.g. starch	Simple sugars e.g. glucose
Protease	Stomach, pancreas, small intestine wall.	Stomach, small intestine	Proteins	Amino acids
Lipase	Pancreas, small intestine wall	Small intestine	Lipids	Glycerol and fatty acids

2. Structure of the lungs

#	Name	Adaptations
1	Trachea	Tubes through which gases move. Lined with cartilage so they do not collapse
2	Lung	Organ where gas exchange occurs
3	Bronchus	Tubes through which gases move. Lined with cartilage so they do not collapse
4	Bronchiole	Tubes not lined with cartilage
5	Alveoli	Small sacs where gas exchange occurs. The alveoli are surrounded by capillaries, have a large surface area and are only one cell thick

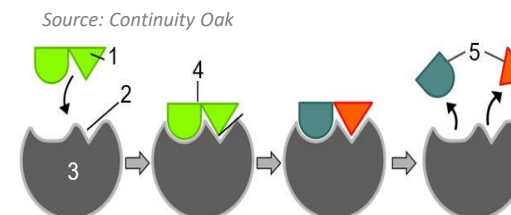


5. Components of the blood

Component	Function
Red blood cells	Transports oxygen in the blood.
White blood cells	Cells in the blood that fight infection caused by pathogens.
Platelets	Fragments of cells that cause clotting of blood at a wound.
Plasma	The liquid part of the blood, with dissolved substances like glucose, proteins, ions and carbon dioxide.

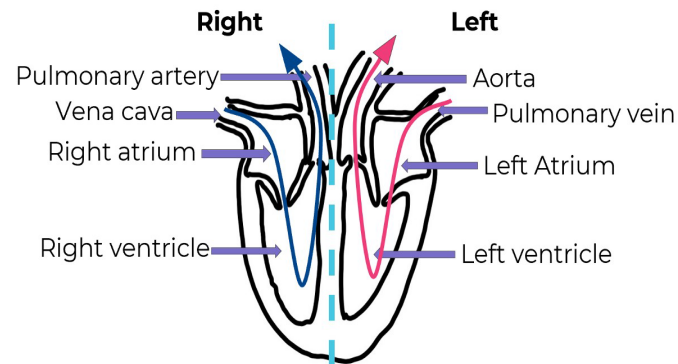
6. Lock and Key model

#	Organ
1	Substrate
2	Active site
3	Enzyme
4	Enzyme-substrate complex
5	Products



Science - B1 - Organisation

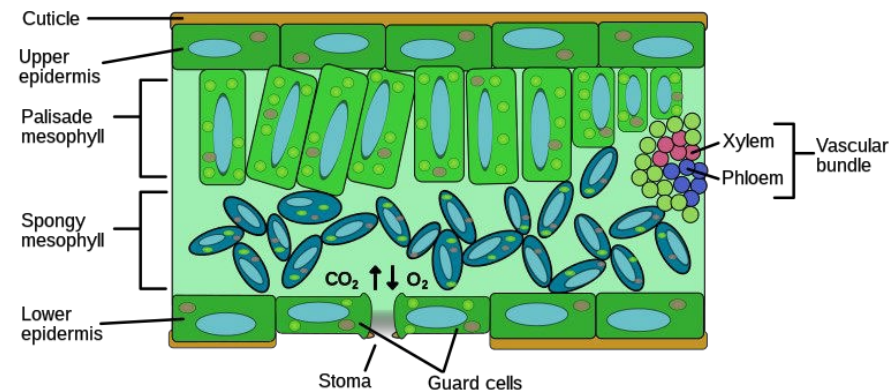
1. The Heart	
Structure	Function
1. Vena cava	Major vein carrying blood back to the heart from the body.
2. Right atrium	Smaller chamber of the heart which fills with blood from the vena cava.
3. Right ventricle	Large chamber pumps blood to the lungs.
4. Pulmonary artery	Artery carrying blood from the heart to the lungs.
5. Left atrium	Small chamber that fills with blood from the lungs.
6. Left ventricle	Large chamber that pumps blood around the body.
7. Aorta	Major artery carrying blood away from the heart to the body.



3. Blood vessels	
1. Artery	Transports blood away from the heart, thick and elastic walls.
2. Vein	Carries blood to the heart, valves prevent backflow.
3. Capillary	One cell thick for quick diffusion between blood and cells.

4. Helping the heart			
Treatment	How it works	Advantage	Disadvantage
1. Stent	Wire mesh opens a blocked artery.	Keeps artery open. Low-risk surgery.	Fatty material can rebuild.
2. Statin (drug)	Reduces cholesterol	Reduces fat being deposited in arteries.	Side effects e.g. liver damage.
3. Heart transplant	Replacement heart from a donor.	Long-term	Major surgery. Could be rejected.
4. Artificial heart	Man-made heart used while waiting for a transplant.	Not rejected. Keeps patient alive.	Short lifetime. Limited activity.

1. Organisation in Plants	
#	
1	Physical barrier to infection that prevents water loss.
2	Type of plant tissue that covers the surface of a plant allowing light through.
3	Tightly packed cells in leaf where photosynthesis takes place. Contains many chloroplasts.
4	Tissue in the leaf with air spaces between cells – specialised for gas exchange.
5	Opening that allows CO ₂ water vapour and O ₂ to diffuse in and out of the leaf.
6	Cells that open and close stomata to allow gas exchange to enter the leaf for photosynthesis.



Creative commons cc-by-sa-2.5 Wiki-media, H McKenna

5. Transport in plants	
1. Transpiration	The loss of water vapour from the leaves by evaporation from cells and then out through the stomata.
2. Translocation	The movement of dissolved sugar around the plant.

6. Factors Affecting Transpiration	
Factor	Effect on the rate of transpiration
1. Temperature	Increasing temperature increases the rate as water evaporates quickly.
2. Humidity	Increasing humidity decreases the rate as water evaporates slowly.
3. Wind speed	Increasing wind speed increases the rate as water evaporates quickly.
4. Light	Increasing light increases the rate as stomata open.

Science - B1 - Infection and Response

1. Key vocabulary				
1. Communicable	A disease spread from person to person caused by a pathogen.			
2. Pathogen	Micro-organism that causes disease. The four types of pathogen are bacteria, virus, fungus and protist.			
3. Bacteria	Causes disease by reproducing rapidly inside the body, and releasing toxins which damage tissues and make us feel ill.			
4. Virus	Causes disease by living and reproducing inside cells, causing cell damage.			
5. Vector	An organism which carries something e.g. a disease but isn't affected by it such as a mosquito.			
2. Diseases				
Disease	Pathogen	Symptoms	Transmission	Method of reducing transmission
1. Measles	Virus	Fever, red skin rash	Inhalation of infected droplets from sneezes and coughs.	Vaccination
2. HIV	Virus	Flu-like symptoms. Develops into AIDS over time which damages the body's immune system.	Sexual contact, exchange of bodily fluids, sharing needles.	Condoms, do not share needles
3. Tobacco mosaic virus (TMV) - plant only	Virus	Distinctive mosaic pattern of discolouration on leaves, affects growth of plant by reducing photosynthesis	Spread through the use of infected tools on healthy plants (direct contact).	Removing infected areas of the plant, sterilising gardening tools.
4. Salmonella	Bacteria	Fever, abdominal cramps, vomiting, diarrhoea.	Bacteria ingested in food prepared in unhygienic conditions, undercooked food.	Vaccination of poultry, ensure food cooked thoroughly, especially poultry.
5. Gonorrhoea	Bacteria	Thick yellow or green discharge from the penis or vagina, pain when urinating.	Sexual contact	Treatment with antibiotics, use of a barrier method of contraception e.g. condom.
6. Rose black spot—plant only	Fungus	Purple or black spots on leaves. Effects growth of plant due to reduction of photosynthesis.	Air, water or direct contact	Use of fungicides and/or removing and destroying the affected leaves.
7. Malaria	Protist	Recurrent episodes of fever.	Mosquito (vector)	Preventing mosquitoes breeding: mosquito nets and insect repellent.

3. Treatment	
1. Antibiotic	Drug which cures bacterial disease by killing pathogenic bacteria.
2. Painkiller	Drug which reduces pain, does not cure a disease but relieves symptoms.
4. Non-specific defence systems	
1. Skin	Acts as a barrier.
2. Nose	Hairs and mucus trap pathogens before entering lungs.
3. Trachea and bronchi	Cilia cells (small projections from cells) and mucus (produced by goblet cells) trap pathogens.
4. Stomach	Contains hydrochloric acid to kill pathogens that have been eaten.
5. Vaccination key vocabulary	
1. Vaccines	Dead or weakened form of a pathogen injected into the body.
2. Antigen	Protein on the surface of a pathogen which the body recognises as a foreign body.
3. Antibody	Protein produced by white blood cells which binds to the antigens on pathogen and helps them be destroyed.
4. Herd immunity	The protection given to a population against an outbreak of a specific disease when a very high percentage of the population have been vaccinated against it.
6. Stages of vaccination	
Stage	Effect
1	Dead or weakened pathogen injected into the body.
2	Antigens in the vaccine stimulate white blood cells to make antibodies.
3	Memory cells (type of white blood cell) can be used to make the correct antibody for that pathogen.
4	If the pathogen re-enters the body the white blood cells will respond quickly to produce the correct antibodies, preventing infection. The person is immune.

Science - B1 - Infection and Response

1. Drugs

Drug	Origin
1. Digitalis	Heart drug, originally from foxgloves.
2. Aspirin	Painkiller from willow trees.
3. Penicillin	Antibiotic originally from penicillium mould (fungus). Discovered by Alexander Fleming.

2. Drug trials- key vocabulary

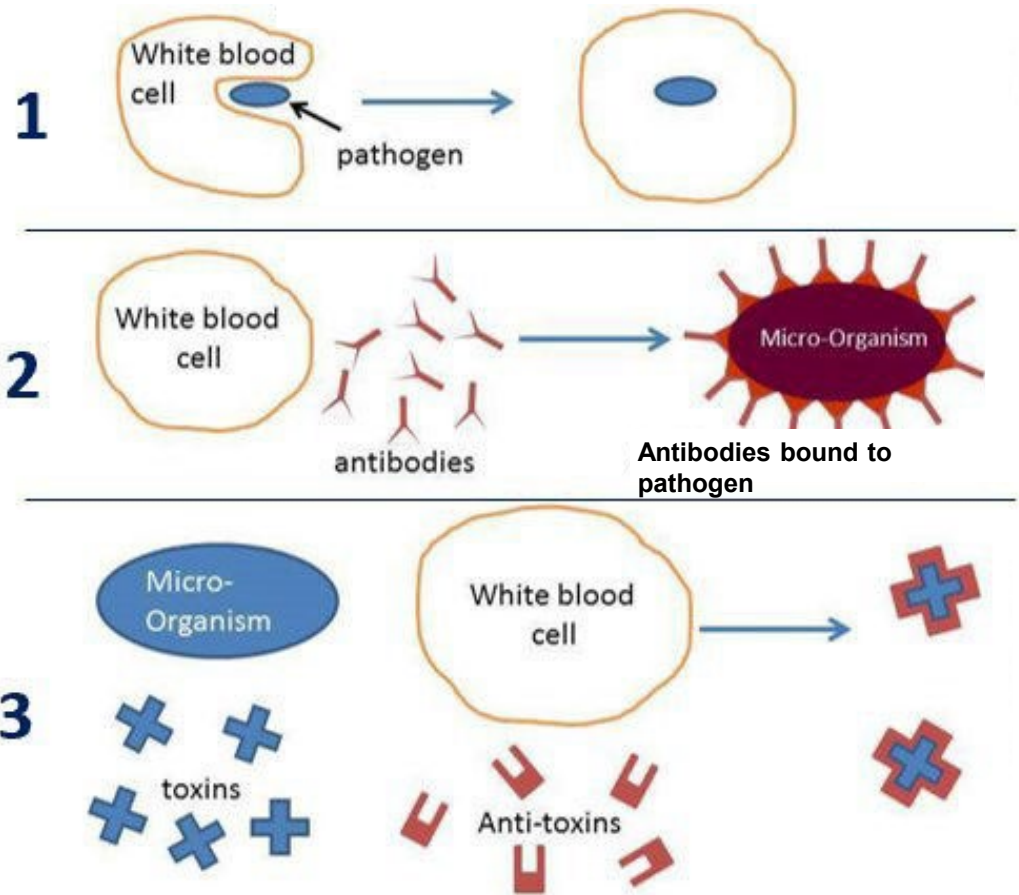
Key term	Definition
1. Efficacy	Whether the drug works
2. Dose	How much of the drug to use
3. Toxicity	If the drug has harmful side effects
4. Placebo	A fake drug
5. Double blind trial	Neither the doctor nor the patient know if they have the placebo or the real drug, to avoid bias

3. Stages in drug trials

1. Pre-clinical trials	- Tested on cells and tissues for toxicity and side effects - Tested on animals for toxicity and side effects
2. Clinical trials	- Low dose tested on healthy volunteers to check for side effects and toxicity - Test on small group of patients with the illness to find optimum dose (best dose with fewest side effects). Patients will go through double blind trials, to avoid bias - Large scale testing - Peer review, to avoid bias

4. White blood cells

1	Phagocytosis	engulfing and breaking down the pathogen
2	Produces antibodies	specific to the antigen
3	Produces antitoxins	to neutralise toxins

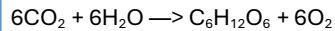


Science - B1 - Bioenergetics (Photosynthesis)

1. Photosynthesis

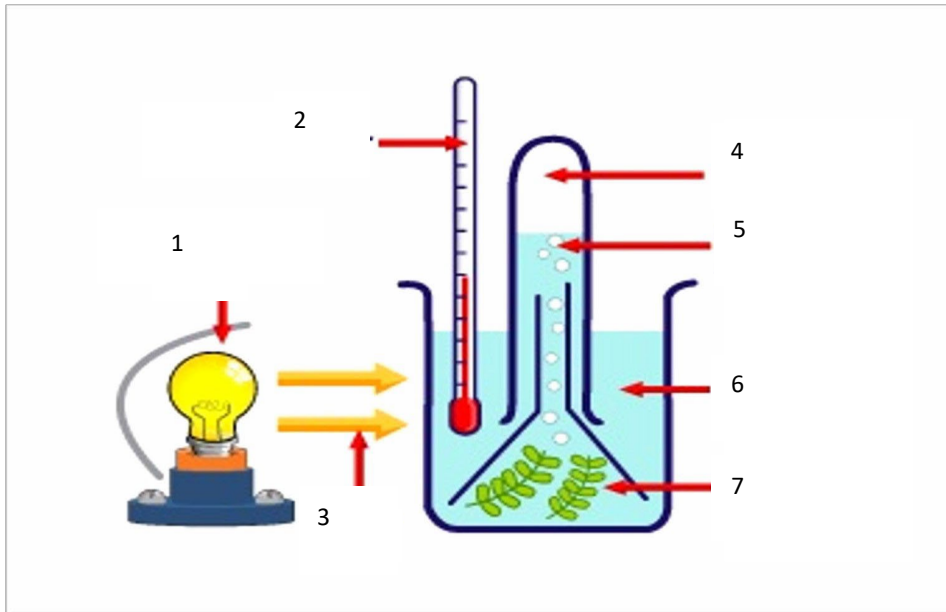
Endothermic chemical reaction that takes place in chloroplasts in leaves that produces glucose and oxygen from carbon dioxide and water

Carbon dioxide + water → glucose + oxygen



3. Required practical

Number	Label
1	Lamp (LED to control temperature)
2	Thermometer
3	Distance from light
4	Collected oxygen
5	Bubbles of oxygen (count number of bubbles produced per minute)
6	Water with sodium hydrogencarbonate
7	Pond weed

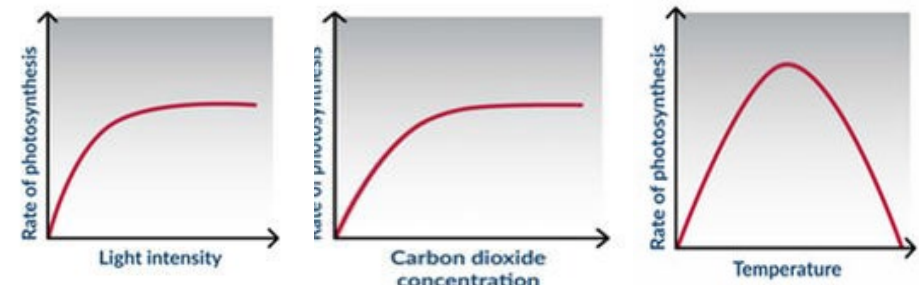


2. Uses of glucose from photosynthesis

1. Converted into starch for storage
2. Used to produce fats and oils for storage
3. Used to produce cellulose, which strengthens the cell wall
4. Used to produce amino acids for protein synthesis (to produce proteins, plants also use nitrate ions that are absorbed from the soil)
5. Used for respiration

4. Limiting factors:

1	Concentration of carbon dioxide
2	Light intensity
3	Amount of chlorophyll
4	Temperature



Light intensity (HT only)

Inverse square law	As distance from the light source increases, the light intensity decreases in a non-linear relationship.
---------------------------	--

Science - B1 - Bioenergetics (Respiration)

1. Respiration	
Key vocabulary	Definition
1. Respiration	A chemical process in all cells that releases energy from glucose.
2. Aerobic respiration	Respiration that uses oxygen to release large amounts of energy from glucose, occurs in the mitochondria.
3. Anaerobic respiration	Respiration that does not use oxygen and releases less energy from glucose, occurs in the cytoplasm.
4. Oxygen debt (HT only)	The amount of extra oxygen the body needs after exercise to react with accumulated lactic acid and remove it from the cells.

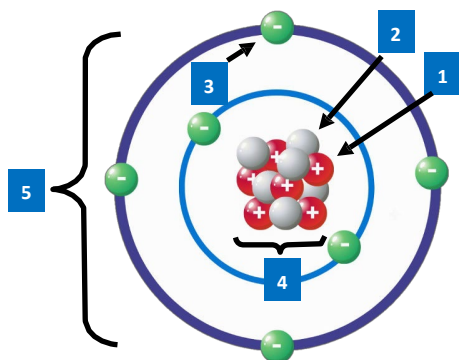
2. Respiration equations	
1. Aerobic respiration	Glucose + oxygen $\rightarrow$ carbon dioxide + water $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
2. Anaerobic respiration (muscles – animals)	Glucose $\rightarrow$ lactic acid
3. Anaerobic respiration (plants and yeast)	Glucose $\rightarrow$ Carbon dioxide + ethanol

3. Uses of anaerobic respiration	
1. Fermentation	Ethanol produced from anaerobic respiration in plants and yeast is used to make alcoholic drinks such as beer, wine, cider and spirits.
2. Baking	Carbon dioxide produced from anaerobic respiration in yeast is used to make bread rise.

4. Effect of exercise	
Effect	Reason
1. Increased heart rate	To deliver more oxygen and glucose to muscle cells and remove waste carbon dioxide.
2. Increased breathing rate	To get more oxygen into the blood quickly
3. Increased breath volume	Get more oxygen into blood per breath and remove waste carbon dioxide
4. Heart beats harder	More blood is pumped with every beat

5. Metabolism is the sum of all the reactions in a cell or body. Including:	
1.	Conversion of glucose to starch, glycogen and cellulose
2.	Formation of lipids from fatty acids and glycerol
3.	The use of glucose and nitrate ions to form amino acids which are turned into proteins
4.	Respiration
5.	Breakdown of excess proteins to form urea for excretion

Science - C1 - Atomic structure and the Periodic Table



	Name	Relative Mass	Relative Charge
1	Proton	1	+1
2	Neutron	1	0
3	Electron	very small	-1
4	Nucleus	A	+Z
5	Atom	A	0

2. Key vocabulary Definition

1. Atom	A neutral particle consisting of protons, neutrons and electrons. Number of protons = number of electrons.	
2. Mass number	Total of number of protons and neutrons in the nucleus of an atom.	23 Na 11
3. Atomic number	Number of protons in the nucleus of an atom; determines the identity of the element.	
4. Atomic radius	Distance from the centre of an atom's nucleus to the electrons (approx. 10^{-10}m or 0.1nm).	
5. Isotopes	Atoms of the same element (i.e. same number of protons) with different number of neutrons.	
6. Nanometre	$1 \times 10^{-9}\text{m} = 0.001\mu\text{m} = 0.000\,001\text{mm} = 0.000\,000\,001\text{m}$	
7. Nucleus	The positively charged centre of an atom made of protons and neutrons. Approximately 10 000 times smaller than the atom (approx. 10^{-14}m).	
8. Subatomic	Smaller than the size of an atom.	



		Definition
a	Relative atomic mass	Average mass of the element's atoms, calculated from the mass and abundance of its isotopes.
b	Element symbol	One or two-letter abbreviation for the element.
c	Element name	The official name of a chemical element.
d	Atomic number	Number of protons in an atom's nucleus.

1. Key vocabulary

Definition

1. Element	Substance that contains only one type of atom.
2. Mixture	Two or more elements and/or compounds not chemically combined together.
3. Compound	Contains two or more different elements chemically combined.
4. Group	Columns on the periodic table, informs us of the number of electrons in the outer shell of the atom. Contain 'families' of elements with similar properties.
5. Period	Rows on the periodic table, informs us of the number of electron shells in an atom.
6. Reactants	The substances that take part in a chemical reaction.
7. Products	The substances that are made in a chemical reaction.
8. Electronic structure	Pattern of electrons in shells. Shells fill from the inside; 1 st shell max 2, 2 nd shell max 8, 3 rd shell max 8, 4 th shell max 2
9. Ion	An atom with an overall positive or negative charge due to the loss or gain of electrons.

3. Method of...	For separating mixtures	Requirements	Example
1. Filtration	Insoluble solids from liquids/solutions	Filter funnel, filter paper	Sand from water
2. Crystallisation	Soluble solids from solvents	Heat energy for evaporation	Copper sulphate crystals from solution
3. Simple distillation	Two liquids of different boiling points	Heat energy, condenser	Ethanol (alcohol) from water
4. Fractional distillation	Many liquids of differing boiling points	Heat energy, condenser or fractionating column	Crude oil fractions
5. Chromatography	Different coloured compounds	Solvent, chromatography paper	Pigments in ink/dye

4. Scientist Contribution

1. Rutherford	Disproved 'plum pudding' model. Replaced with 'Nuclear model' Atom mostly empty space, nucleus positive where almost all the mass is concentrated.
2. Bohr	Modified the 'Nuclear' model: central nucleus with orbiting electrons at <u>specific distances</u> .
3. Chadwick	After the proton was discovered, provided experimental evidence for existence of neutrons.

Science - C1 - Bonding, Structures and Properties of Matter

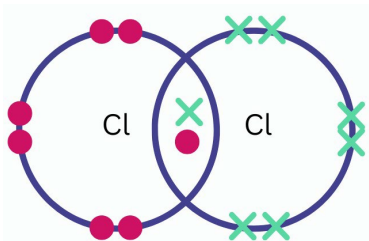
1. Key vocabulary

Term	Definition
1. Ionic bond	Between a metal and non-metal. Involves the transfer of electrons.
2. Covalent bond	Between non-metals only. Involves the sharing of electrons.
3. Ion	charged particles formed through the loss or gain of electrons. Metals and hydrogen form positive ions. Non-metals form negative ions.
4. Metallic bond	Between metal ions. Neat rows of positive metal ions surrounded by a sea of delocalised electrons.
5. Alloy	Harder than a pure metal. Different sized atoms distort the layers meaning they cannot slide.
6. Simple covalent structures	Small molecules with low melting and boiling points as they have weak intermolecular forces, so it doesn't take much energy to overcome these forces.
7. Molten	Melted (in the liquid state)
8. Aqueous	Dissolved in water (aq)

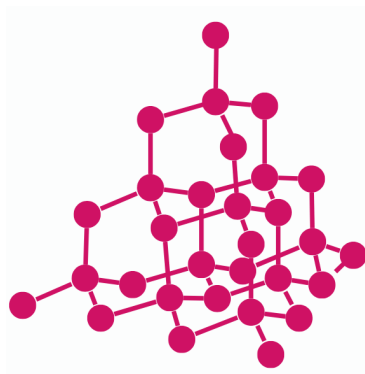
3. State symbols

Symbol	Meaning
(s)	Solid
(l)	Liquid
(g)	Gas
(aq)	Aqueous (dissolved in water)

Covalent bond



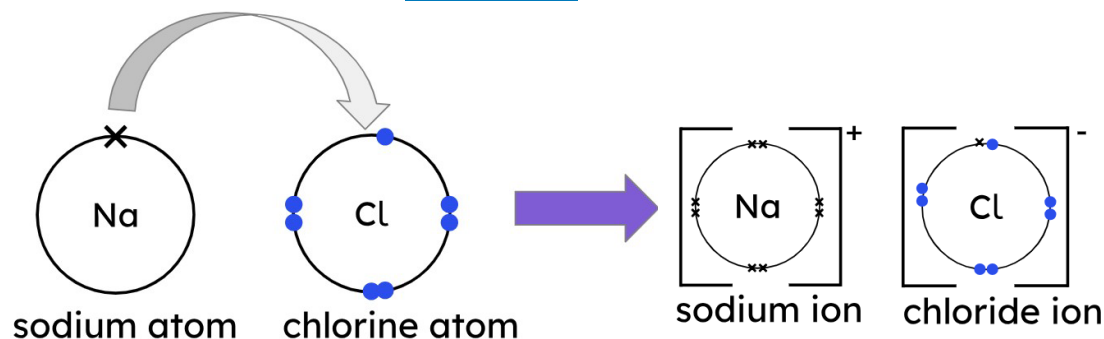
Diamond



2. Giant structures

Key term	Facts
1. Giant covalent structures	- High melting and boiling point as has strong covalent bonds between many atoms which take a lot of energy to break - e.g. Diamond, graphite and silicon dioxide
2. Diamond	- Four covalent bonds from each carbon atom to neighbouring carbon atoms. Does not conduct electricity as no free electrons - Hard and high melting and boiling point
3. Graphite	3 bonds between each carbon atom - Conducts electricity as has free electrons (delocalised electrons) - Soft as layers can slide
4. Giant ionic lattice	- High melting and boiling point as has strong electrostatic forces between many ions, so takes a lot of energy to overcome forces - Does not conduct when solid - Conducts electricity when molten or aqueous as ions are free to move
5. Polymer	- Made of many repeating units. - Large molecules with strong covalent bonds linking monomers - Strong intermolecular forces so solid at room temperature
6. Graphene	- Single layer of graphite - Useful in electronics and composites
7. Fullerenes	Molecules of carbon atoms with hollow shapes.
8. Buckminsterfullerene	- First fullerene to be discovered. Made of 60 carbons (C_{60}) - Spherical shape
9. Carbon nanotubes	Hollow carbon tubes. Very high strength to weight ratio.

Ionic bond



Science - C1 - Quantitative Chemistry

1. Key vocabulary	
Term	Definition
1. Conservation of mass	Mass cannot be created or destroyed, the mass of the products equals the mass of the reactants.
2. Relative formula mass (Mr)	The sum of the relative atomic masses of the atoms (in the numbers shown) in the formula.
3. Relative atomic mass (Ar)	The relative mass of one atom of a substance, i.e. the big number in periodic table.
4. In excess	More of the reactant is present in the reaction than is needed.
5. Uncertainty	The range of measurements about the mean i.e. for a repeated measurement, equal to (maximum – minimum)/2
6. Avogadro's constant (HT only)	The number of atoms, molecules or ions in a mole of a given substance. The value of the Avogadro constant is 6.02×10^{23} per mole.
7. Limiting reactants (HT only)	The reactant that is completely used up is called the limiting reactant because it limits the amount of product made, because the other reactant was in excess.

2. Equations	
Quantity	Calculation
1. Mr	Ar + Ar + Ar... Eg CO ₂ Mr = 12 + (2x16) = 44
2. Concentration (g/cm³)	$\frac{\text{Mass (g)}}{\text{Volume (cm}^3\text{)}}$
3. Moles of a substance (HT only)	$\frac{\text{Mass}}{\text{Mr (remember Mr Mole lives under mass)}}$
Concentration (mol/dm³) (HT only)	$\frac{\text{Moles}}{\text{Volume (dm}^3\text{)}}$

3. Concentration	
Key vocabulary	Definition
1. Concentration	Mass of dissolved substance in specific volume (e.g. dm ³).
2. Mass	The quantity of matter a substance is made up of. Measured in kilograms.
3. Volume	A measure of the amount of space that matter occupies.

4. HT only	
Skills needed	How to do it
1. Big numbers show moles	2Mg + O ₂ → 2MgO Means 2 moles of Mg react with 1 mole of O ₂ to form 2 moles of MgO
2. Balancing equations when given masses	Take the mass of each substance and divide by Mr. Write as a ratio. Simplify the ratio.

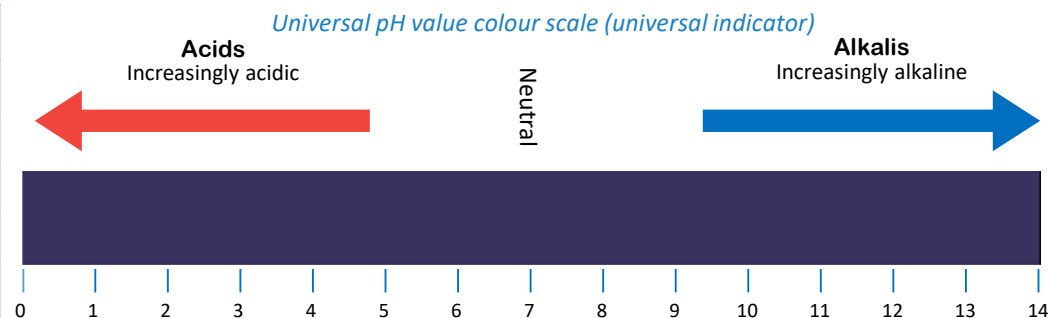
Science - C1 - Chemical Changes

1. Acids and alkalis

Key Vocabulary	Definitions
1. Acids	Contain H ⁺ ions, have a pH of less than 7
2. Alkalis	Contain OH ⁻ ions, have a pH of more than 7 (max 14)
3. Neutral	pH = 7
4. Neutralisation	Reaction between acid and alkali which produces a salt and water
5. Half equation	$H^+ (aq) + OH^- (aq) \rightarrow H_2O (l)$
6. Indicator	Changes colour in acids or alkalis. E.g. universal indicator
7. Crystallisation	Separation of salt from solution. Evaporate water partially to concentrate solution. Leave to cool to form crystals.
8. Strong/weak acid (HT only)	Strong Hydrogen ions fully dissociate e.g. nitric, hydrochloric and sulphuric acids / weak hydrogen ions only partially dissociate e.g. ethanoic, citric and carbonic acids.
9. Concentration (HT only)	Amount of solute dissolved in a given volume (dilute/concentrated). Measured in g/dm ³ or mol/dm ³

2. Electrolysis

Key vocabulary	Definitions
1. Electrolysis	The breaking down of a substance using electricity. Used if element is more reactive than carbon.
2. Electrolyte	The solution which is being broken down during electrolysis. Must be molten (melted) or aqueous to allow ions (charged particles) to move.
3. Aqueous	Dissolved in water (contains H ⁺ and OH ⁻ ions)
4. Oxidation	The loss of electrons or gaining of oxygen
5. Reduction	The gain of electrons or the loss of oxygen
6. Anode	The positive electrode
7. Cathode	The negative electrode
8. Anion	Ion that goes to anode (- ion)
9. Cation	Ion that goes to cathode (+ ion)
10. Rules of electrolysis	Negative electrode: Least reactive of hydrogen or metal (hydrogen unless copper, silver or gold present). Positive electrode: Group 7 halogen if halide present, oxygen from OH ⁻ if not.

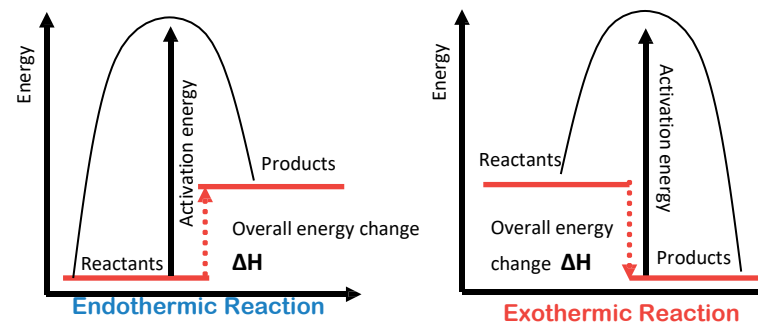


3. Common salts

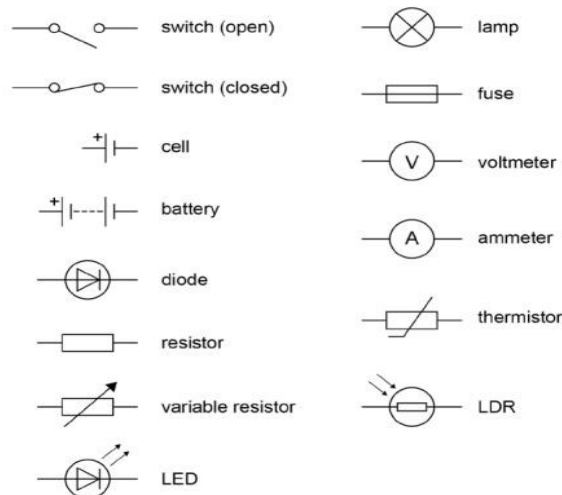
Acid	Salt
1. Hydrochloric acid	chloride
2. Sulfuric acid	sulfate
3. Nitric acid	nitrate

4. Reaction profiles

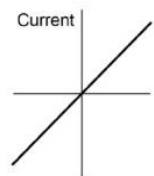
Key term	Definition
1. Exothermic	Releases energy to the surroundings. Feels hot
2. Endothermic	Takes in energy from the surroundings. Feels cold
3. Chemical reaction	Occurs when particles collide with sufficient energy.
4. Activation energy	Minimum amount of energy needed for reaction to occur.



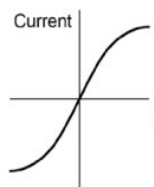
1. Circuit diagram symbols



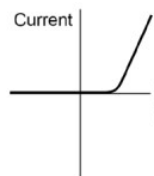
3. Resistors



Fixed Resistor (Ohmic Conductor)
Current and potential difference are **directly proportional**. Resistance is **constant**.



Filament Lamp
Resistance of a filament lamp is **not constant**. As temperature increases, resistance increases.

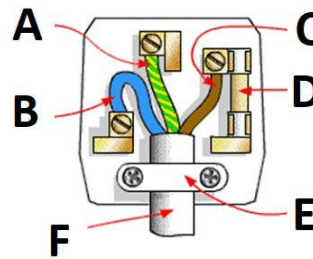


Diode/ LED
The **current** through a diode flows in **one direction only**. The diode has a **very high resistance in the reverse direction**.

2. V, I and R in Series and Parallel

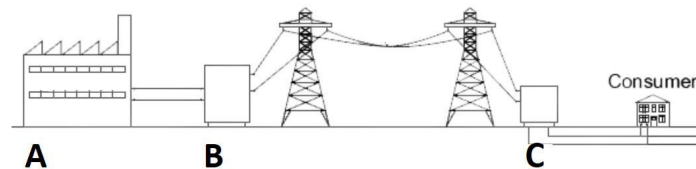
	Current	Potential Difference	Resistance
Series	The current is the same through each component.	The total potential difference of the power supply is shared between the components.	The more resistors, the greater the resistance . The total resistance of two components is the sum of the resistance of each component. $R_{total} = R_1 + R_2$
Parallel	Current through the whole circuit is the sum of the currents through the separate branches.	The potential difference across each branch is the same.	The total resistance of two resistors is less than the resistance of the smallest individual resistor .

4. The 3 core cable



A	Earth	Yellow and green colour. Potential difference of 0V. Carries charge to Earth if live wire touches the metal casing of an appliance (faulty).
B	Neutral	Blue colour. Completes the circuit. Potential difference should be 0V.
C	Live	Brown colour. Current flows to the appliance. Potential difference between this and other wires should be 230V.
D	Fuse	A safety device consisting of a strip of wire that melts and breaks an electric circuit if the current exceeds a safe level.
E	Cable grip	F Cable

5. National grid



Definition:
A series of **cables** and **transformers** linking power stations to consumers

A	Power station	Non-renewable power stations burn fossil fuels to boil water, which turns a turbine and generator, transferring chemical energy to electrical.
B	Step up transformer	Increases the potential difference for transmission across power cables. This reduces the current and therefore less heat is lost from the cables. This makes the National Grid efficient.
C	Step down transformer	Reduces the potential difference from the cables to 230V for use by consumers.

Science - P1 - Energy

1. Types of Energy Stores

	Term	Definition
Stores	1. Kinetic	Energy stored in a moving object
	2. Gravitational potential	Energy stored in an object in a gravitational field.
	3. Internal	Energy stored in all materials; due to the motion of particles (thermal) and forces between particles (chemical).
	4. Elastic potential	The potential stored in a spring or something stretchy that will spring back after being released
	5. Nuclear	Energy stored in nuclei of atoms, released through nuclear fission or fusion.
	6. Magnetic	The potential energy stored in a magnetic field
	7. Electrostatic	The energy stored when like charges are moved closer together/unlike charges are pulled
Transfers	1. Mechanical	A force moving an object through a distance
	2. Electrical	When an electric current flows through a device
	3. Heating	By conduction, convection, or radiation
	4. Radiation	Energy transferred by electromagnetic radiation (e.g. light)

3. Energy Resources

Name of Resource	Production	Advantages	Disadvantages
1. Coal	Burning coal heats water, producing steam which turns turbines to generate electricity.	Readily available – reliable	Non-renewable, inefficient, high water use, produces greenhouse gases.
2. Crude oil	Burned to heat water into steam to turn turbines to generate electricity.	High energy density, vast quantity of other products also made from oil.	Produces greenhouse gases, non-renewable, expensive
3. Natural Gas	Piped to consumer and burned on site.	Energy efficient, less greenhouse gases than coal.	Non-renewable, not available everywhere, limited applications
4. Solar	Energy converted to electricity using photosynthetic cells.	Abundant, free, renewable, no greenhouse gas	Not yet available everywhere, expensive to set up – unreliable
5. Tidal/Wave	Waves power turbines which generate electricity.	Readily available, renewable, close to cities	Difficult and expensive to harness wave power effectively – unreliable
6. Wind	Wind causes turbines to turn, which generate electricity.	Free, clean, no greenhouse gas emissions	Expensive to set up, can endanger birds - unreliable
7. Hydroelectric	Running water turns turbines to generate electricity.	Renewable, readily available	Set-up generate greenhouse gases and damages environment
8. Biofuel	Plant matter burned to power electricity generators.	Potentially renewable, recycles agricultural waste – reliable	Cultivation and burning of fuel can yield low level pollutants

2. Energy Stores and Systems

System	Energy Transfer
 An object projected upwards	Kinetic energy decreases. Gravitational potential increases
 A moving object hitting an obstacle	Kinetic energy transferred to the obstacle. (Sound, heat, deformation of the object)
 A vehicle slows down	Kinetic energy decreases as it is transferred to internal energy (thermal) e.g. in brakes.
 Water boiling in an electric kettle	Water's internal energy increases as energy is transferred from electrical energy

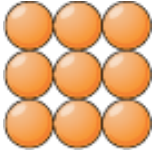
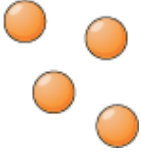
Unwanted energy transfers

Energy transfers can be reduced through lubrication and the use of thermal insulation.

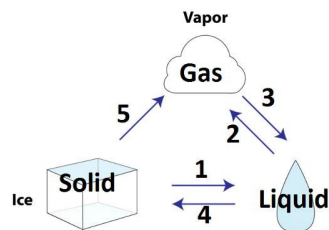
4. Key vocabulary	Definition
1. Renewable	A resource which can be replenished as it is being used.
1. Non-renewable	A resource that will run out, as it is being used at a greater rate than it can be replaced.

Science - P1 - Particle Model

1. Particle model

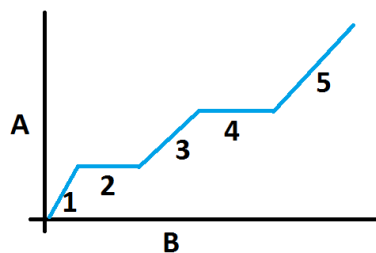
			
Organisation (Pattern)	Regular pattern	No pattern, random arrangement	No pattern, random arrangement
Spacing (Touching?)	All touching, close together	Close together but may still be touching	Wide spaces between, far apart
Motion (Movement of molecules)	Vibrate in a fixed position	Move and slide around each other	Move quickly in all directions

1. Melt
2. Boil
3. Condense
4. Freeze
5. Sublimate



1. Solid
2. Melting
3. Liquid
4. Boiling
5. Gas

A. Temp.
B. Heat absorbed

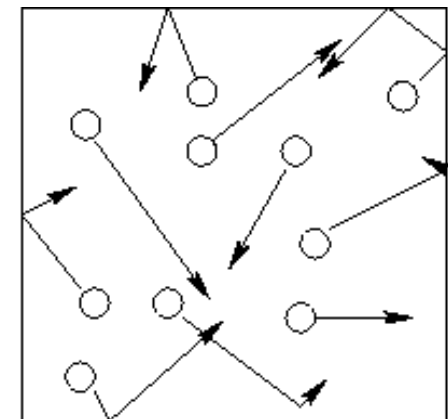
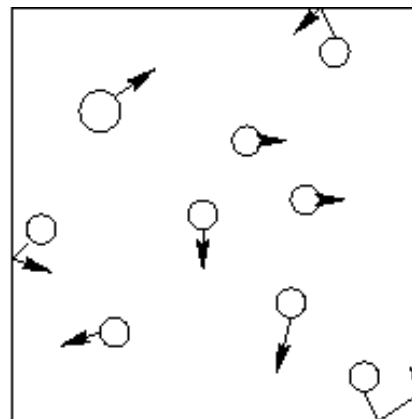


2. Key vocabulary

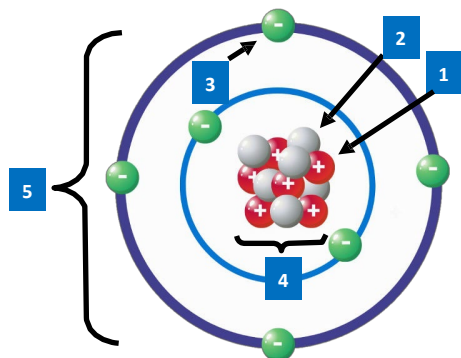
Term	Definition
1. Internal energy	The total kinetic energy and potential energy of all the particles (atoms and molecules) that make up a system.
2. Changes of state	Physical changes, the material recovers its original properties if the change is reversed.
3. specific heat capacity	The amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius.
4. specific latent heat	The amount of energy required to change the state of one kilogram of the substance with no change in temperature.
5. Specific latent heat of fusion	Change of state between solid and liquid
6. Specific latent heat of vaporisation	Change of state between liquid and gas / vapour
7. Pressure	Pressure is caused by the force exerted by particles in a gas when they collide with the walls of a container.
8. Density	The mass per unit volume
9. Mass	The amount of matter

3. Pressure in gases

Particles in a gas are constantly moving – so they store **kinetic energy**. They collide with the walls of their container, and exert a force when they do. The total force exerted on a certain area of the wall is the **gas pressure**.



Science - P1 - Atomic structure



	Name	Relative Mass	Relative Charge
1	Proton	1	+1
2	Neutron	1	0
3	Electron	very small	-1
4	Nucleus	A	+Z
5	Atom	A	0

1. Key vocabulary	Definition
1. Atom	A neutral particle consisting of protons, neutrons and electrons. Number of protons = no. of electrons
2. Mass number	Total of number of protons and neutrons in the nucleus of an atom
3. Atomic number	Number of protons in the nucleus of an atom; determines the identity of the element
4. Atomic radius	Distance from the centre of an atom's nucleus to the electrons (approx. 10^{-10}m or 0.1nm)
5. Nanometre	$1 \times 10^{-9}\text{m} = 0.001\mu\text{m} = 0.000\,001\text{mm} = 0.000\,000\,001\text{m}$
6. Nucleus	The positively charged centre of an atom made of protons and neutrons. Approximately 10 000 times smaller than the atom (approx. 10^{-14}m)
7. Subatomic	Smaller than the size of an atom

2. Key vocabulary	Definition
1. Isotopes	Atoms of the same element with the same number of protons and a different number of neutrons.
2. Positive ion	Formed when a metal atom loses electron
3. Negative ion	Formed when a non-metal atom gains electron
4. Electron shells	Electrons, in atoms that absorb electromagnetic radiation, can 'jump' to higher energy levels (electron shells). Electrons in atoms that emit electromagnetic radiation, can fall to lower energy levels (electron shells).



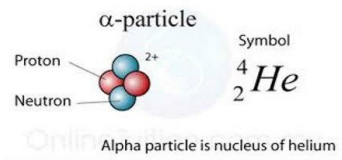
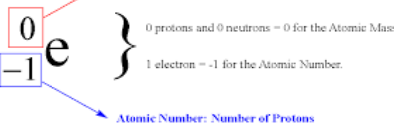
		3. Definition
a	Relative atomic mass	Average mass of the element's atoms, calculated from the mass and abundance of its isotopes
b	Element symbol	One or two-letter abbreviation for the element
c	Element name	The official name of a chemical element
d	Atomic number	Number of protons in an atom's nucleus

Development of the model of the atom

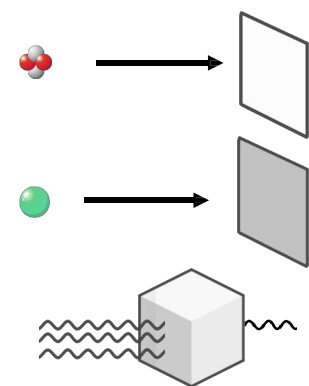
Model	DETAILS OF THE MODEL	EVIDENCE
1. Plum Pudding model	Atoms were thought to be spheres of positive charge containing scattered electrons.	Discovery of the negatively charged electron led to the Plum Pudding model .
2. The Nuclear Model	Atoms were then known to have: - a small positively charged nucleus - most of the mass concentrated in the nucleus - negatively charged electrons orbiting the nucleus	Rutherford's alpha particle scattering (gold leaf) (gold leaf) experiment showed positively alpha particles deflected significantly from concentrated centres of positive charge in atoms.
3. (Neils Bohr's addition to the Nuclear model)	Niels Bohr predicted that electrons orbit the nucleus in specific energy levels (electron shells). This was later proven by experimental evidence.	Niels Bohr discovered that electrons can: - move away from the nucleus when they absorb electromagnetic radiation - move closer to the nucleus when they emit electromagnetic radiation
4. Discovery of the neutron	Later we discovered the nucleus is made from small positively charged particles called protons. James Chadwick later discovered the neutron.	Experimental evidence revealed the existence of protons in the nucleus. Chadwick discovered neutrons 20 years after the discovery of the nucleus.

Science - P1 - Atomic Structure (Radiation)

Term	Definition
Radioactive Decay	Unstable nuclei release ionising radiation to become more stable
Activity	This is the rate at which unstable nuclei decay releasing radiation
Becquerel (Bq)	The unit for measuring activity. 1Bq = 1 nucleus decay per sec
Geiger-Muller Tube	A detector used to measure radioactivity

 Alpha Particle (α) Consists of 2 neutrons and 2 protons, making it the same as a helium nucleus.	Beta Particle (β)  A high speed electron ejected from a nucleus as a neutron turns into a proton
--	--

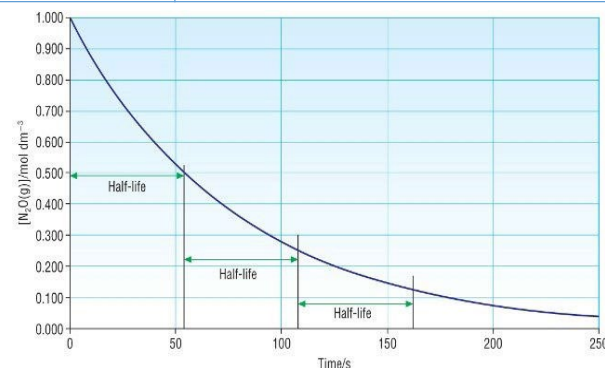
Gamma Ray (γ)	High frequency electromagnetic radiation emitted from a nucleus
--	---



α	Alpha	Fast moving helium nucleus stopped by skin or paper
β	Beta	High energy electron, stopped by aluminium plate
γ	Gamma high energy	Photons, stopped by dense material

CHARACTERISTIC	HIGHEST	LOWEST	
Weight	α	β	γ
Ionising power	α	β	γ
Range in air	γ	β	α
Penetration	γ	β	α

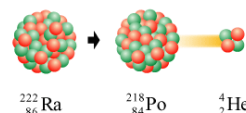
Term	Definition
Half Life (There are 2 definitions)	a) The time taken for the <i>number of nuclei</i> in a radioactive isotope to randomly decay to <i>half</i> the original number. b) The time taken for the <i>activity/ count rate</i> to <i>halve</i> .
Calculating Half Life	You need to use a graph like the one below to work out the time it takes for the radioactive count to halve.



Radioactive Contamination	a) Radioactive contamination is the <i>unwanted presence of radioactive atoms</i> on other materials. b) The <i>hazard</i> is caused by <i>radioactive decay</i> of these atoms c) The <i>hazard</i> depends on <i>the type of radiation</i> emitted d) Suitable <i>precautions</i> must be taken against any <i>hazard</i> presented by radioactive materials
Peer Review	It is important that scientific studies that have been published into the effects of contamination, are <i>shared and checked</i> by other scientific teams.

Nuclear equations

Alpha particle decay: The original element loses '2' off the proton number and '4' off the atomic mass as it becomes a new element:



Beta particle decay: The original element gains 1 x proton number as it decays to form a new element:



Carbon-14
(radioactive)

Nitrogen-14
(stable)

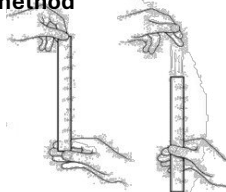
Beta particle

Science - B2 - Homeostasis and Response

1. Nervous system

Term	Definition
1. Homeostasis	Regulating the internal conditions of the body (temperature, water levels, blood glucose) to maintain optimum enzyme activity.
2. Central nervous system	Made up of brain and spinal cord
3. Synapse	Gap between 2 neurons. Signal passes between 2 neurons chemically as a neurotransmitter.
4. Reflex response	Fast response that by passes the brain, to protect us from harm.
5. Receptor	Eyes (light), skin (temperature and pressure), ears (sound), nose (smell), tongue (taste)
6. Effector	Muscles (contract) or gland (releases chemical)

2. Reaction time required practical

Term	Definition
1. Reaction time	Typically 0.2-0.9 seconds
2. Factors affecting reaction time	Caffeine consumption, hours of sleep, alcohol consumption, amount of practice
3. Ruler drop test method	 - Person A holds out hand with a gap between thumb and finger - Person B holds ruler with the zero at the top of person A's thumb - Person B drops ruler randomly and Person A must catch it - The distance on the ruler level with the top of person A's thumb is recorded - Repeat this three times - Repeat steps 1-5 after a factor has been changed - Use conversion table to convert ruler measurements into reaction time

3. Reflex arc

Stimulus → receptor → sensory neurone → relay neurone → motor neurone → effector → response

Hot pan → pain receptors → sensory neurone → relay neurone → motor neurone → hand muscles → release pan

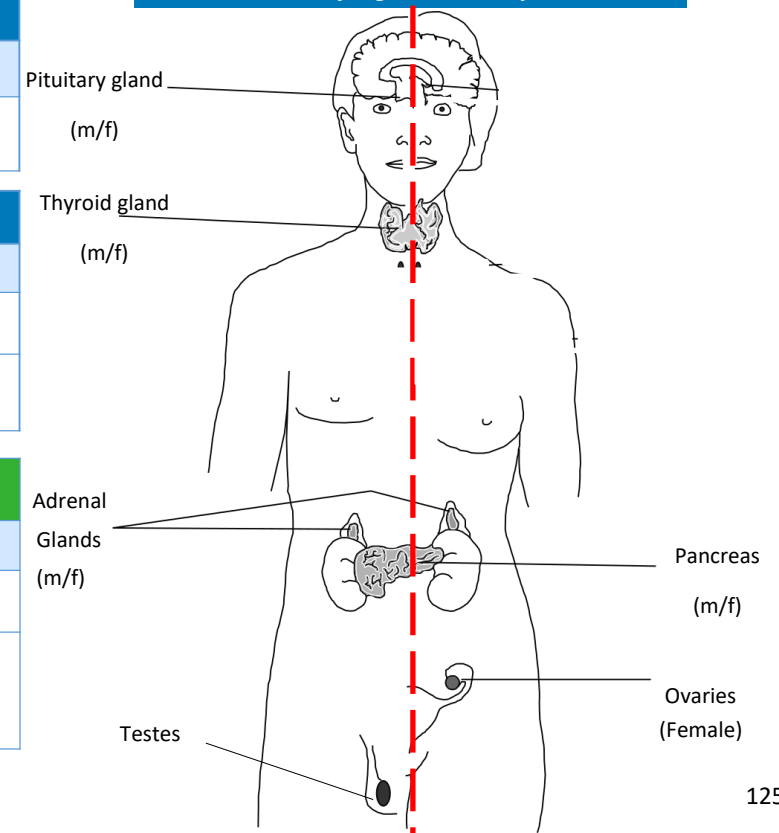
4. Endocrine system

Term	Definition
1. Endocrine system	Hormonal system - involves glands, hormones and blood vessels
2. Hormones	Chemical messengers released by glands that travel in bloodstream

5. Negative feedback (HT only)

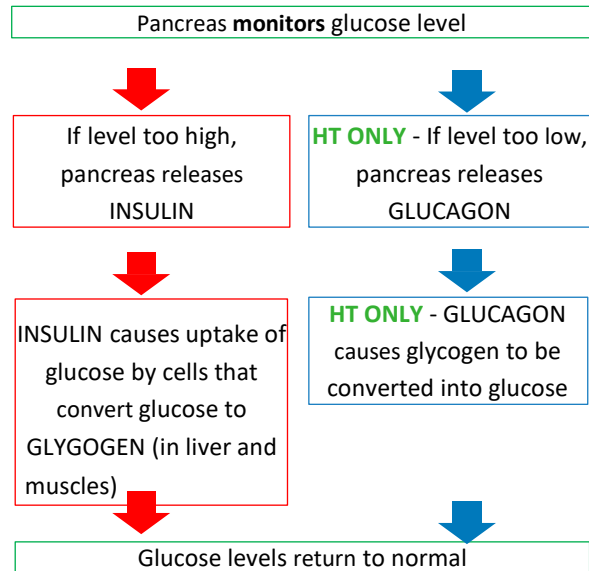
Key term	Definition
1. Thyroxine	Stimulates the basal metabolic rate. Plays an important role in growth and development.
2. Adrenaline	Produced in times of fear or stress. Increases the heart rate (more O ₂ and glucose delivery to brain and muscles). Prepares you for 'flight or fight'.

Major glands in body



Science - B2 - Homeostasis and Response

1. Blood glucose



2. Diabetes

Type 1	Type 2
Pancreas fails to produce enough insulin	Cells can no longer respond to insulin
Treated with insulin injections	Treated with carbohydrate controlled diet and exercise
	Risk factor - obesity

3. Menstrual cycle

Key vocabulary		Definition
1. Menstruation		Uterus lining sheds
2. Ovulation		Egg is released from ovary
3. Fertilisation		Egg and sperm join
Hormone	Gland	Function
1. FSH	Pituitary gland	Matures the egg
2. Oestrogen	Ovaries	Thickens uterus lining. Inhibits FSH
3. LH	Pituitary gland	Releases the egg (ovulation)
4. Progesterone	Ovaries	Maintain uterus lining

4. Contraceptives

Hormonal	Non-hormonal
Oral contraceptive (the pill) – contains oestrogen to inhibit FSH and stop egg maturing	Barrier methods (condom/diaphragm) – prevent sperm reaching egg
Skin patch, injection, implant – contains progesterone to inhibit maturation and release of egg for several months/years	Abstaining from intercourse when egg may be in oviduct
	Surgical methods - sterilisation
	Spermicidal agents – kill/disable sperm
Intrauterine device – prevents implantation of egg into uterus/releases hormone	

5. Fertility treatment (HT only)

Key vocabulary	Definition
1. Fertility drug	FSH/LH given to mature and release more eggs
2. IVF (in vitro fertilisation)	Fertility drug given → eggs collected and fertilised artificially → fertilised eggs develop into embryos → implanted into mother's uterus
3. Problems with IVF	- Emotionally and physically stressful - Success rates are low - Can lead to multiple births which are a risk to both the babies and the mother

Science - B2 - Inheritance, Variation and Evolution

1. Reproduction and genetics

Term	Definition
1. Sexual reproduction	2 parents, genetic variation in offspring
2. Asexual reproduction	Only one parent, produces clones (genetically identical offspring)
3. Gamete	Sex cell e.g. sperm/pollen and egg
4. DNA	Polymer, made up of two strands forming a double helix
5. Gene	Small section of DNA on a chromosome, that code for a particular protein
6. Genome	Entire genetic material of an organism
7. Chromosomes	Humans have 46 chromosomes in each cell, except gametes have 23 (half)
8. Sex chromosomes	Females – XX, males - XY

2. Inheritance

Term	Definition
1. Allele	A version of a gene
2. Dominant	Only 1 copy of allele is needed for condition to be expressed (e.g. DD or Dd)
3. Recessive	2 copies of the allele are needed for condition to be expressed (e.g. ff)
4. Homozygous	Same alleles present (e.g. FF or ff)
5. Heterozygous	Different alleles present (e.g. Ff)
6. Genotype	The combination of alleles
7. Phenotype	The characteristic expressed
8. Polydactyly	Condition where individual has extra fingers and toes – caused by a dominant allele
9. Cystic fibrosis	Disorder of cell membranes – caused by recessive allele
10. Characteristics controlled by a single gene	Fur colour in mice, red-green colour blindness in humans

3. Mitosis

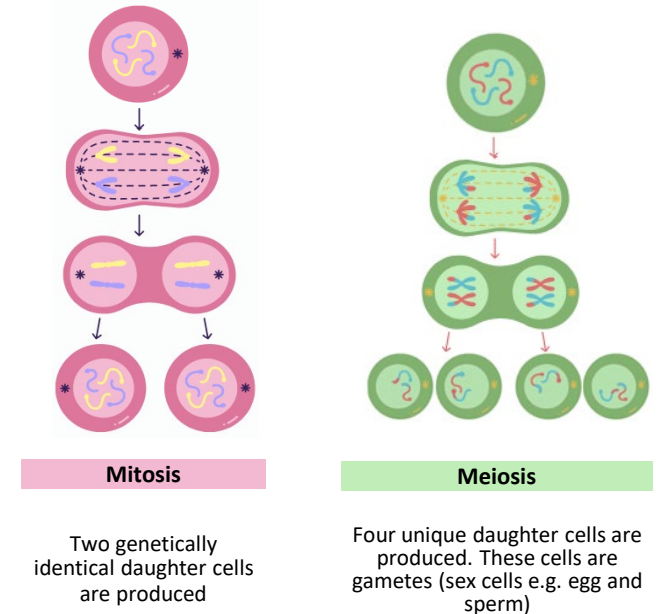
Produces all body cells (except gametes)

- | | |
|----------|---|
| A | Chromosomes in nucleus are duplicated |
| B | Cell divides into two genetically identical daughter cells. Same number of chromosomes as parent cell |

4. Meiosis

Produces GAMETES ONLY

- | | |
|----------|---|
| A | Chromosomes are duplicated |
| B | The cell divides twice to form four daughter cells, each with half chromosomes of parent cell |



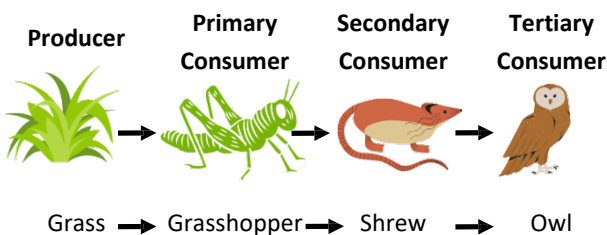
5. Variation and evolution

Term	Definition
1. Causes of Variation	Genetics (inherited e.g. eye colour), environment (developed characteristics e.g. scar), combination (both e.g. weight)
2. Evolution	Theory of Charles Darwin. Caused by natural selection. All organisms have evolved from simple life forms. Started billions of years ago.
3. Evidence for evolution	Fossil records and antibiotic resistance in bacteria
4. Fossil formation	- Hard parts being replaced by minerals - Parts of organism not decaying (e.g. preserved in ice) - Traces of organisms preserved (e.g. footprints)
5. Gaps in fossil record	Many organisms soft bodies so no fossilisation, some fossils have not been discovered yet, and some destroyed by geological activities.
6. Opposition to evolution	Ideas not originally accepted: - Not enough evidence - Didn't know mechanism of inheritance (genes) - People believed in God
7. Evolutionary tree	Method used to show how scientists believe organisms are related.

1. Ecosystems	
1. Habitat	The area in which an organism lives
2. Individual	Single organism
3. Population	Collection of organisms of the same species in a habitat
4. Community	Collection of populations in a habitat
5. Ecosystem	The interaction of a community of living organisms (biotic) with the non-living (abiotic) parts of the environment.
6. Competition	Plants compete for light, space, water and mineral ions. Animals compete for food, mates and territory.
7. Interdependence	Within a community each species depends on other species for food, shelter, pollination etc.
8. Adaptations	A feature an organism has that allows it to survive in its ecosystem.

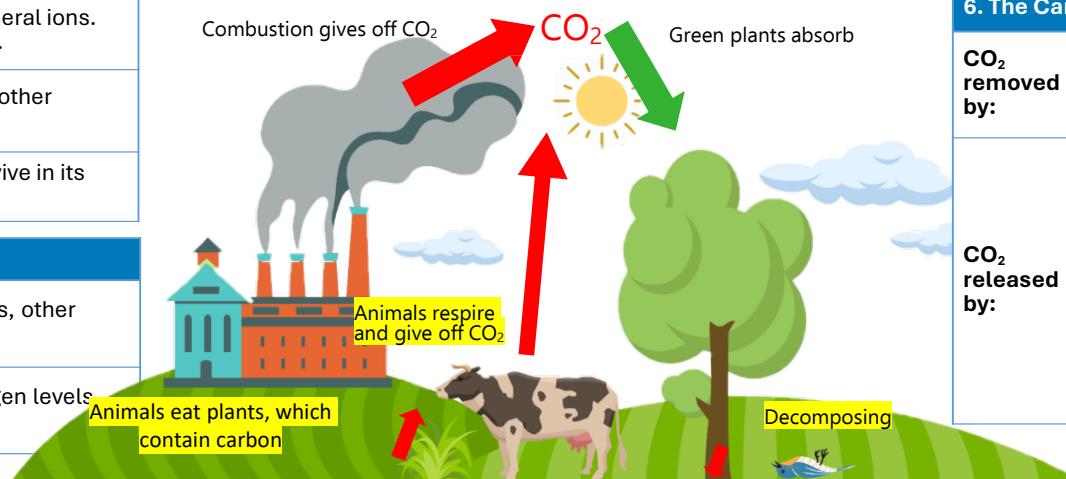
3. Biotic and Abiotic Factors	
1. Biotic factors	Availability of food, new predators, new pathogens, other species outcompeting each other
2. Abiotic factors	Light intensity, temperature, moisture levels, oxygen levels, wind intensity, carbon dioxide levels, soil pH

4. Food chain



5. Pollution	
1. Water	From sewage, fertiliser or toxic chemicals
2. Air	From smoke and acidic rain
3. Land	Landfill and from toxic chemicals

2. Biodiversity	
1. Biodiversity	The variety of all the different species of organisms in an ecosystem.
2. Factors that reduce biodiversity	Destruction of peat bogs, destroying habitats, releasing carbon dioxide into atmosphere (global warming), pollution, deforestation
3. Maintaining biodiversity	Breeding programmes, protection and regeneration of habitats, keeping hedgerows in farmers' fields, reduction of deforestation and carbon dioxide emissions, recycling rather than using landfill



6. The Carbon Cycle	
CO₂ removed by:	Photosynthesis (plants)
CO₂ released by:	Respiration (plants and animals), combustion (of fossil fuels), Decay and decomposition, destruction of peat bogs

7. Sampling techniques		
	Random sampling	Transect line
Use	Used to count total number of organisms in an area	Used to see pattern of organisms e.g. through a forest/across a river
Method	- Randomly place quadrat (to avoid bias) and count number of organisms. - Repeat 10 times and calculate a mean. - Work out area of field and area of quadrat. - Calculate total organisms by multiplying mean by number of quadrats that could fit in field	- Place a transect line using a 30m tape measure - Place the quadrat at 0m and count organisms. Record distance and organism number in table - Move quadrat to 5m and repeat, moving 5m each time - Plot a graph to see pattern of results

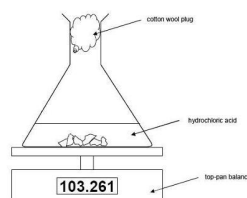
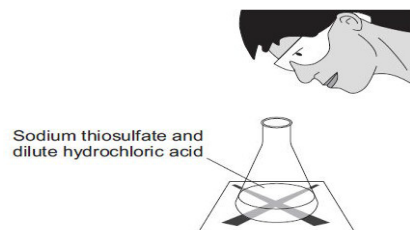
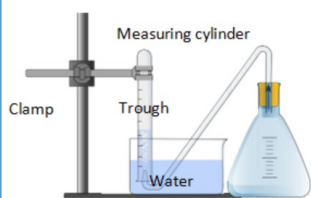
Science - C2 - Rate of Reaction

1. Key concepts

Key vocabulary	Definition
1. Rate of reaction	mass/volume of product formed or used up per unit time
2. The rate of reaction depends on (collision theory)	1. frequency of collisions between reacting particles 2. energy transferred during successful collisions 3. activation energy – the minimum energy that particles must have to successfully collide and form bonds
3. Mean rate of reaction	$\frac{\text{quantity of reactant used}}{\text{time taken}}$ OR $\frac{\text{quantity of product formed}}{\text{time taken}}$
4. Factors affecting rate of reaction	1) concentrations of reactants in solution 2) pressure of reacting gases 3) surface area of solid reactants 4) temperature of the reactants 5) presence of catalysts

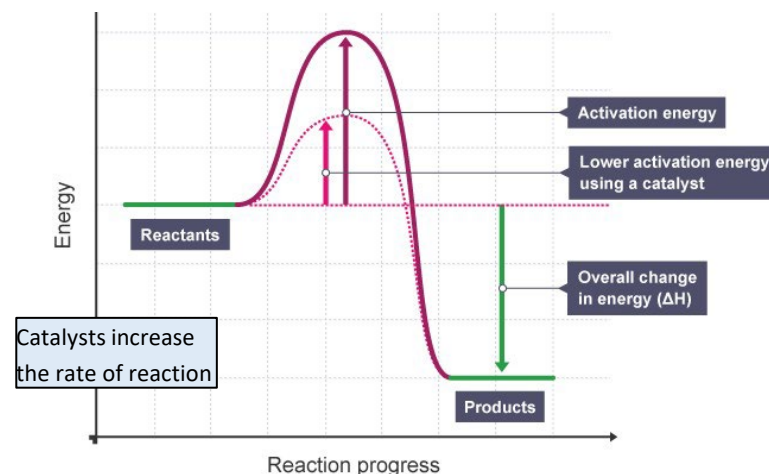
2. Methods

Measure the volume of gas produced. e.g. magnesium metal & dilute hydrochloric acid produces hydrogen gas	Timing the formation of product, e.g. sodium thiosulfate & hydrochloric acid makes a cloudy yellow precipitate, which is turbid (opaque).	Measure the change in mass e.g. calcium carbonate in dilute acid will release CO ₂ into air
--	--	---



4. The effect of changing conditions on equilibrium—Le Chatelier's principle (HT only)

CONCENTRATION	TEMPERATURE	PRESSURE
If the concentration of a reactant is increased, more products will be formed until equilibrium is reached again.	If the temperature is increased the relative amount of products at equilibrium increases for an endothermic reaction and decreases for an exothermic reaction.	An increase in pressure causes the equilibrium position to shift towards the side of the equation with fewer molecules.



3. Reversible reactions

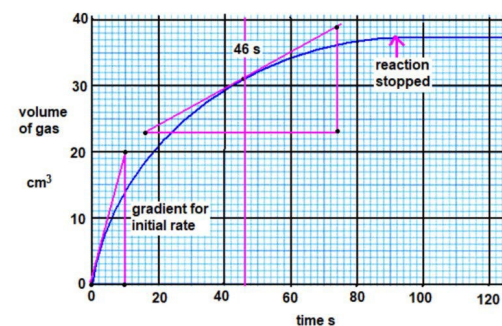
(products of the reaction can react to produce the original reactants)



Equilibrium is reached when the forward and reverse reactions occur at exactly the same rate in a closed system.

If it is exothermic in one direction, it will be endothermic in the other direction.

The direction of reversible reactions can be changed by changing the concentration.



Calculate the rate of a reaction by dividing the change in quantity of reactant (or product) by time taken. Steeper gradient means faster rate of reaction.

Science - C7 - Organic Chemistry

1. Key vocabulary

Term	Definition
1. Crude oil	Crude oil is a mixture made up of mostly hydrocarbons from the remains of plants and animals from millions of years ago, mostly plankton.
2. Hydrocarbon	A compound made from hydrogen and carbon atoms only
3. Fractional distillation	A process that separates crude oil into different fractions depending on its boiling point by evaporation and allowing to condense at different temperatures.
4. Alkane	A saturated hydrocarbon, single bonds between carbon atoms (used mainly as fuels).
5. Alkene	An unsaturated hydrocarbon, containing a double bond between two adjacent carbon atoms (used mainly to make polymers, e.g. plastics).
6. Cracking	The breakdown of a long chain alkane into a shorter chain alkane and a shorter chain alkene, by using steam or a catalyst.
7. General formula for an alkane	C_nH_{2n+2}

4. Alkanes

	Name	Formula	Structure
1	Methane	CH_4	$\begin{array}{c} H \\ \\ H-C-H \\ \\ H \end{array}$
2	Ethane	C_2H_6	$\begin{array}{c} H & H \\ & \\ H-C & -C-H \\ & \\ H & H \end{array}$
3	Propane	C_3H_8	$\begin{array}{c} H & H & H \\ & & \\ H-C & -C & -C-H \\ & & \\ H & H & H \end{array}$
4	Butane	C_4H_{10}	$\begin{array}{c} H & H & H & H \\ & & & \\ H-C & -C & -C & -C-H \\ & & & \\ H & H & H & H \end{array}$

5. Testing for alkanes and alkenes

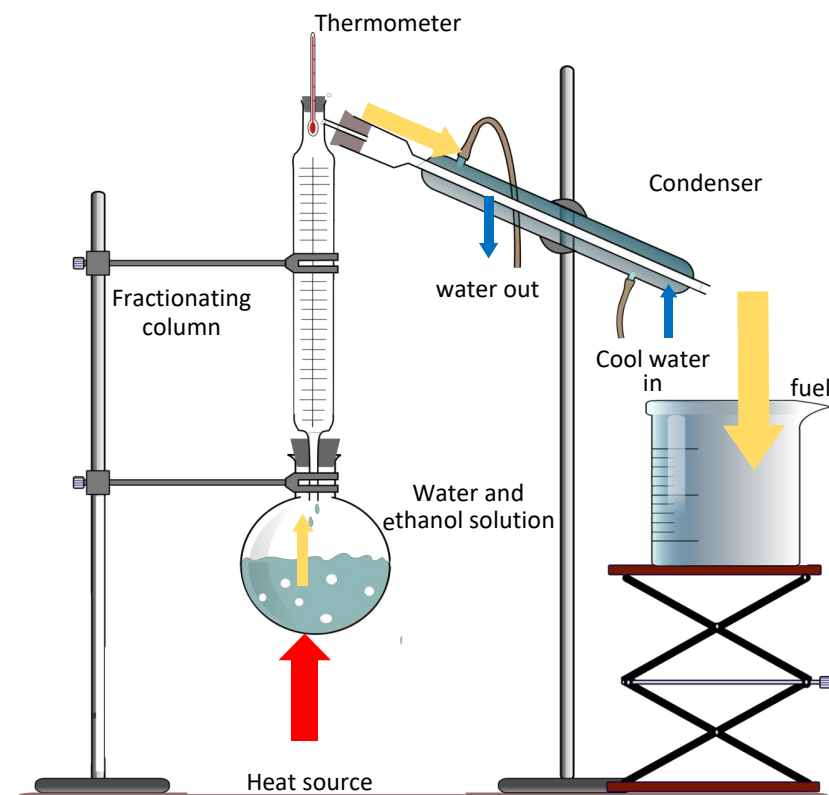
1. Alkanes	Bromine water will remain orange
2. Alkenes	Bromine water changes from orange to colourless

2. Combustion

1. Complete combustion	Hydrocarbon + oxygen $\rightarrow$ carbon dioxide + water
2. Incomplete combustion	Hydrocarbon + (lack of) oxygen $\rightarrow$ carbon monoxide + carbon + water

3. The properties of hydrocarbons

Property	Definition
1. Flammability	The ability of a chemical to burn or ignite
2. Viscosity	A measure of a fluid's resistance to flow
3. Boiling point	The temperature at which a liquid changes into a gas



Science - C2 - Chemical Analysis

1. Key vocabulary

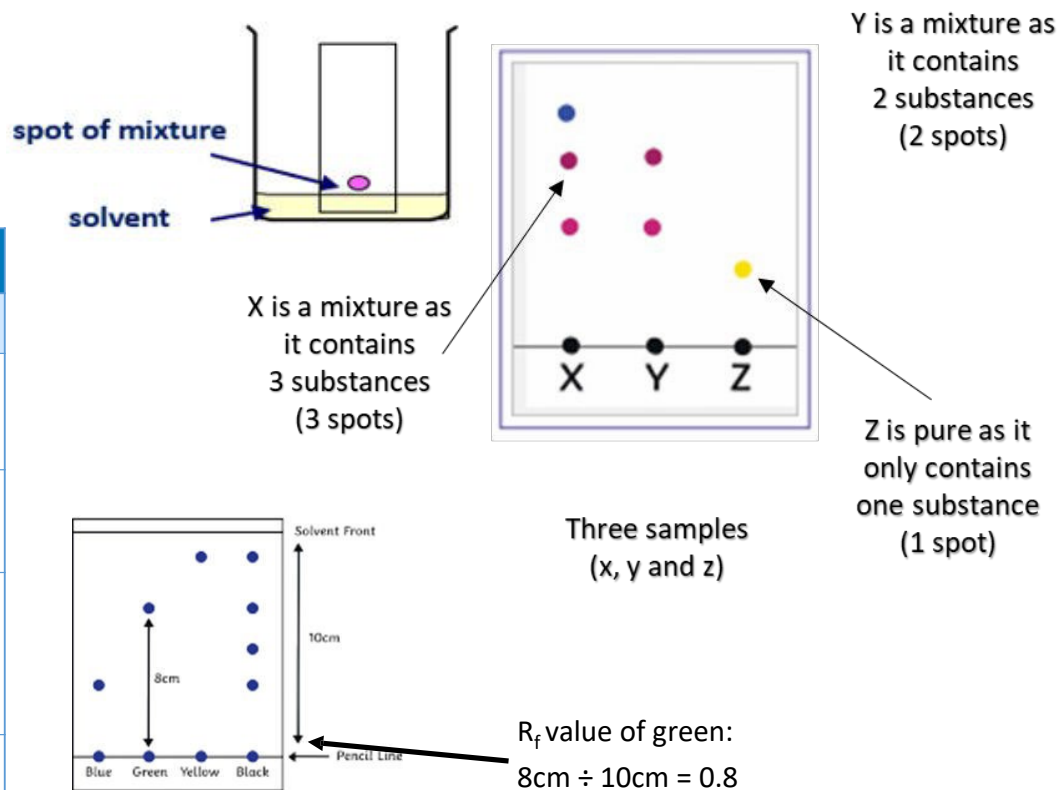
Term	Definition
1. Pure substances	Made up of one compound or element only
2. Impure substances	Made up of more than one element and/or compound
3. Formulation	A mixture that has been designed as a useful product
4. Chromatography	Technique used to separate mixtures of soluble substances
5. Solvent	Liquid part of a solution
6. Solute	Solid part of a solution
7. Solution	A dissolved solute in a solvent
8. Soluble	Can dissolve in a solvent
9. Insoluble	Cannot dissolve in a solvent

2. Gas tests

1. Oxygen, O₂	Place a glowing splint inside a test tube. The splint will relight in the presence of oxygen.
2. Hydrogen, H₂	Place a burning splint at the opening of a test tube. If hydrogen gas is present, it will burn with a squeaky-pop sound.
3. Chlorine, Cl₂	Damp litmus paper is held over the of gas. If the tube contains chlorine, the litmus paper becomes bleached and turns white.
4. Carbon dioxide, CO₂	Bubble the gas through the lime water. If the gas is carbon dioxide, the limewater turns cloudy.

3. Chromatography

Term	Definition
1. Mobile phase	Solvent is the mobile phase. The substances dissolve in the solvent. - The solvent then moves through the stationary phase.
2. Stationary phase	- Does not move - The paper is the stationary phase
3. R_f Value	This is the ratio of the distance moved by a substance to the distance moved by the compound, and can be calculated using: $R_f = \text{distance travelled by the substance} \div \text{distance moved by the solvent}$
4. Solubility	How easy it is for a substance to dissolve. How soluble a substance is determines how far it travels across paper.



Science - C7 - Chemistry of the Atmosphere

1. Proportions of gases in today's atmosphere (last 200 million years)



- 1 78% nitrogen
- 2 21% oxygen
- 3 1% other gases including carbon dioxide, water vapour and noble gases (argon most common)

3. The Earth's early atmosphere (from 4.6 billion years ago)

- 1 Intense volcanic activity released gases, mainly CO₂, that formed the early atmosphere and water vapour that condensed to form the oceans. (Atmosphere was similar to Mars and Venus today).
- 2 Volcanoes produced nitrogen and small proportions of methane and ammonia.
- 3 When oceans formed, CO₂ dissolved in the water and carbonates were precipitated as sediments, reducing CO₂ in the atmosphere.

5. Global climate change

Increasing global temperature is **causing** climate change.

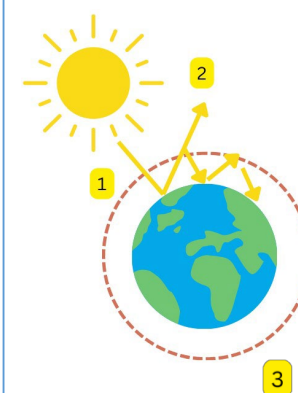
Effects of climate change include:
Melting ice caps
Rising sea levels
More severe storms
Disruption to migrations patterns

4. How oxygen increased

- 1 Algae and plants produced the oxygen that is now in the atmosphere by photosynthesis.
- 2
$$6 \text{ CO}_2 + 6 \text{ H}_2\text{O} \longrightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2$$

Carbon dioxide + water $\longrightarrow$ glucose + oxygen
- 3 Algae first produced oxygen about 2.7 billion years ago; oxygen levels have gradually increased to a level that allowed animals to evolve.

2. Enhanced greenhouse effect



- 1 Short wave electromagnetic (EM) radiation from the sun, penetrates the atmosphere.
- 2 Earth absorbs energy and re-emits longer wave EM radiation (infra-red).
- 3 Greenhouse gases in the atmosphere absorb EM radiation.
- 4 Atmosphere maintains more heat; temperature remains higher than it would otherwise be.

6. Carbon footprint

Carbon footprint	Total amount of carbon dioxide and other greenhouse gases emitted over the full life cycle of a product service or event
How to reduce carbon footprint	An individual's impact on carbon footprint may be limited to cutting their own use of fossil fuels

7. How carbon dioxide decreased

- 1 Algae and plants decreased the percentage of carbon dioxide in the atmosphere by photosynthesis.
- 2 Carbon dioxide was also decreased by the formation of sedimentary rocks, such as limestone, and fossil fuels, such as coal oil and natural gas, that contain carbon.

8. Common atmospheric pollutants and their sources

Pollutant	Source	Effect
Carbon monoxide (CO)	Incomplete combustion of fossil fuels (colourless and odourless)	TOXIC: Carried in the blood instead of oxygen
Sulfur dioxide and oxides of nitrogen (SO ₂ / NO _x)	Fossil fuels and the internal combustion engine	Acidic gases: respiratory problems and acid rain.
Particulates	Unburned hydrocarbons and other solids (soot)	Global dimming and health problems for humans.

9. Carbon Dioxide and Methane as Greenhouse Gases

Greenhouse gases	Carbon dioxide (CO ₂), methane (CH ₄), water vapour (H ₂ O)
Human activities increasing greenhouse gases	Combustion of fossil fuels, livestock, farming

Science - C7 - Using Resources

1. Earth resources	
1. Natural resources are sources of...	Food, building material (timber), clothing and fuel for warmth
2. Sustainable development	Development that meets the needs of current generations without compromising the ability of future generations
3. Finite	Will eventually run out
4. Potable water	Water that is safe to drink (Sufficiently low levels of dissolved salts and microbes)
HT only – alternative methods of extracting metals	
1. Phytomining	Plants to absorb metal compounds. The plants are harvested and then burned
2. Bioleaching	Bacteria oxidise metals to produce metal ions; metal compounds now present in leachate solutions
3. Displacement	Using waste iron to displace copper from its compounds
4. Electrolysis	Using an electric current to separate ions from solution

3. Waste water treatment	
1) Screening and grit removal 2) Sedimentation to produce sewage sludge (solid settles out) and effluent (liquid part at the top) 3) Anaerobic digestion of sewage sludge (microbes do not need oxygen) 4) Aerobic biological treatment of effluent (microbes breaking down liquid waste)	
Sewage and waste water	Requires treatment before being released into the environment (see 4 stages above)
Sewage and agricultural waste	Requires removal of organic matter and microbes
Industrial waste water	Requires removal of organic matter and harmful chemicals

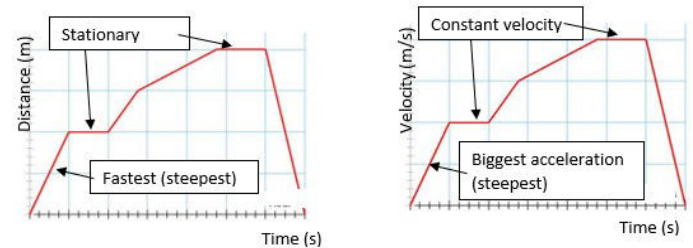
2. Potable water	
1. Potable water	Water that is safe to drink (sufficiently low levels of dissolved salts and microbes)
2. Most potable water is produced by...	1) choosing an appropriate source of fresh water 2) passing the water through filter beds 3) sterilising (killing microbes using; ozone, chlorine, or UV light)
3. Desalination is used when freshwater is limited, and only salty (e.g. sea) water is available.	Distillation or reverse osmosis; both require large amounts of energy.
4. REQUIRED PRACTICAL: Investigate three water samples from different sources for pH and the presence of dissolved solids; using distillation/evaporation, measuring mass before and after evaporation to detect dissolved solids.	

4. Life Cycle Assessments	
Life cycle assessments (LCA)	Carried out to assess the environmental impact of a product at all stages of its development.
Stages of a product's life (all to be assessed for their environmental impact)	- Extracting and processing raw materials - Manufacturing and packaging - Use and operation during its lifetime - Disposal at the end of its useful life - Transportation and distribution at each stage
Limited raw materials produce...	Metals, glass, building materials, clay ceramics and most plastics, and the energy required to make them.
Ways of reducing the use of resources	- Recycling, re-using, reducing use, e.g. glass bottles - Scrap iron added to a blast furnace to reduce extraction of iron ore

Science - P2 - Forces and Motion

1. Forces and motion	
Key vocabulary	Definition
1. Scalar	A scalar quantity has a magnitude (size) only
2. Vector	A vector quantity has both a magnitude (size) and a direction
3. Contact force	A force caused by objects physically touching each other
4. Non-contact force	Forces where the objects are separated, they do not need to be physically touching
5. Resultant force	Result of forces interacting (sum or difference)
6. Weight	The force acting on an object due to gravity (caused by Earth's gravitational field)
7. Centre of mass	Point at which an object's weight is considered to act
8. Newton-metre	Device to measure weight in Newtons (N)
9. Free fall	Acceleration when free falling = 9.8 m/s^2
10. Terminal velocity	When air resistance and weight are equal, no resultant force acts so object reaches a constant velocity

Momentum (HT only)	
Conservation of momentum	Momentum before and after a collision/explosion is the same



2. Newton's Laws of Motion	
1. First Law	If no resultant force is acting on an object, it will continue to move at same speed in same direction.
HT ONLY – Inertia	The tendency of objects to continue in their state of rest or of uniform motion
2. Second law	Force = mass x acceleration
HT ONLY – Inertial mass	A measure of how difficult it is to change the velocity of an object ($\text{inertial mass} = \frac{\text{Force}}{\text{acceleration}}$)
3. Third law	For a pair of interacting objects, the forces they exert on each other are equal but opposite.
~	Approximately equal symbol

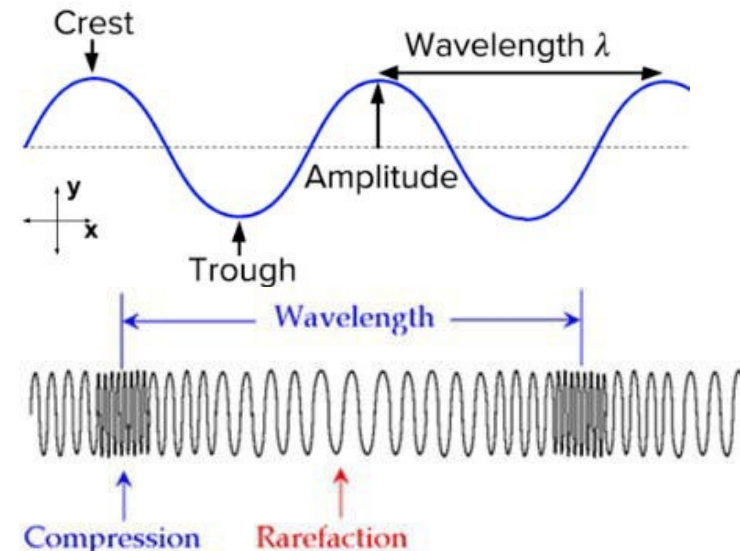
3. Speed	
1. Walking	1.5 m/s
2. Running	3 m/s
3. Cycling	6 m/s
4. Speed of sound	330 m/s
5. Speed of light	300,000,000 m/s (300 million)
6. Factors affecting speed	Age, terrain, fitness and distance travelled

4. Stopping distance	
1. Stopping distance	The sum of the distance travelled during the reaction time plus the distance travelled under the braking force. (Thinking distance + braking distance)
2. Reaction time	Typically 0.2 to 0.9s
3. Factors that affect thinking distance	Speed, tiredness, drugs and alcohol. Distractions may also affect a driver's ability to react.
4. Factors that affect braking distance	Speed, adverse road and weather conditions (wet/ icy) and poor condition of the vehicle (worn brakes/ tyres).
5. Dangers	Rapid deceleration can lead to overheating of brakes and/or loss of vehicle control.

Science - P2 - Waves

1. Describing waves

Term	Definition
1. Amplitude	Distance from rest position to maximum displacement
2. Wavelength	The distance from a point to the same point on the next wave
3. Frequency	The number of waves passing a point per second. Unit: Hz
4. Period	The time for one wave to pass a given point
5. Oscillation	Movement back and forth
6. Wave	Transfer of energy with no transfer of matter
7. Transverse wave	Oscillations perpendicular to direction of energy transfer (e.g. EM wave, ripples on water)
8. Longitudinal wave	Oscillations are parallel to direction of energy transfer (e.g. sound). Show areas of compression and rarefaction (spread out)



Transverse

Longitudinal

2. Electromagnetic (EM) spectrum

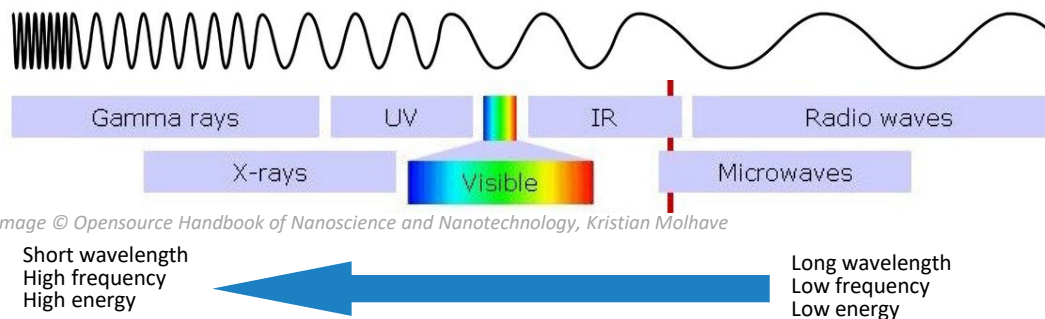


Image © Opensource Handbook of Nanoscience and Nanotechnology, Kristian Molhave

4. Uses and Risks of EM Radiation

EM Wave	Use	Why it's suitable (HT ONLY)
1. Radio Waves	Television and radio	Reflected by ionosphere so can broadcast over long distances
2. Microwaves	Satellite communications, cooking food	Able to pass through the atmosphere to satellites. Has a heating effect
3. Infrared	Electrical heaters, cooking food, infrared cameras	Has a heating effect. Emitted by objects so can be detected
4. Visible Light	Fibre optic communications	Able to pass along a cable by total internal reflection
5. Ultraviolet	Energy efficient lamps, sun tanning	Increases amount of melanin (brown pigment) in skin
6. X-Rays	Medical imaging and treatments	Absorbed by bone but transmitted through soft tissue
7. Gamma Rays	Medical imaging and treatments	Able to pass out of body and be detected by gamma cameras. Can kill cancerous cells

3. Properties of EM Waves and Sound Waves

Property	EM Wave	Sound Wave
1. Speed	300,000,000 m/s	330 m/s in air
2. Medium it can travel through	Can travel through anything, even a vacuum (space)	Solids, liquids, gases
3. Type of wave	Transverse	Longitudinal
4. Risk	UV, x-rays and gamma rays are ionising (damage cells)	Hearing damage

Science - P2 - Magnets and Electromagnets

1. Magnets

Term	Definition
1. Magnetic field	Where magnetic force is experienced. Always goes N to S
2. Poles	The ends of a magnet, where magnetic force is strongest
3. Repulsion	Force between two like poles (N to N or S to S)
4. Attraction	Force between two unlike poles (N to S)
5. Permanent magnet	Produces its own magnetic field
6. Induced magnet	A material that becomes magnetic when placed in a magnetic field. Temporary magnet. Cannot be repelled
7. Magnetic materials	Iron (steel), cobalt and nickel

Field around bar magnet

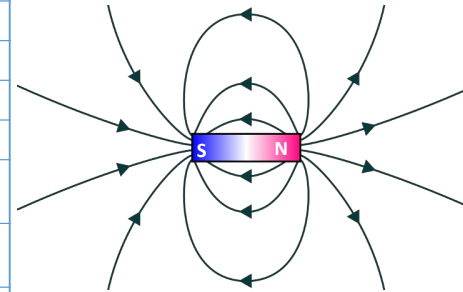
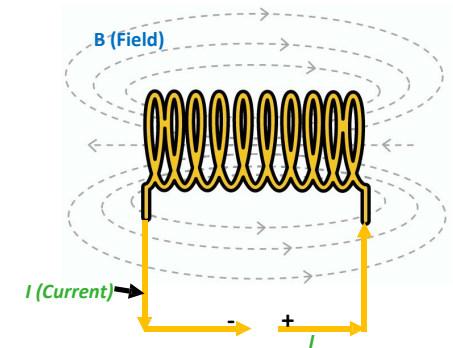


Image credit: Wikimedia Commons, Ischa1

Field around solenoid



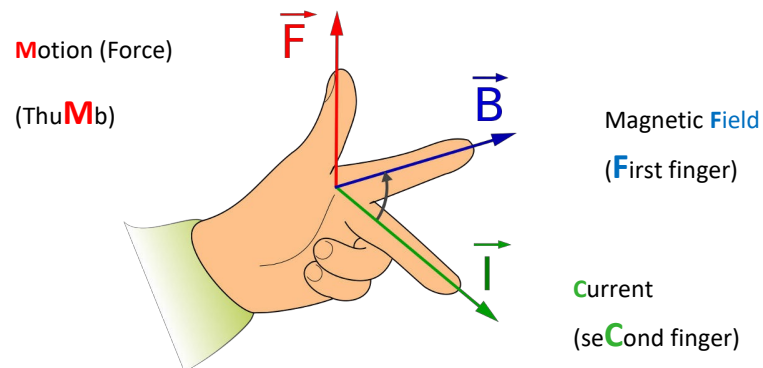
2. Electromagnets

Term	Definition
1. Electromagnet	Created by a flow of charge through a wire (current flows + to -)
2. Solenoid	Coil of wire. Magnetic field similar to bar magnet
3. Increasing strength	3 C's: Coil the wire, or add more coils Increase the current Add an iron core

HT ONLY - Motors

Term	Definition
1. Motor effect	When a wire carrying a current is placed in a magnetic field, the field interact causing a force to be exerted
2. Electric motor	A coil of wire carrying a current in a magnetic field rotating
3. Fleming's left hand rule	Used to determine direction of rotation of motor

HT ONLY - Fleming's Left Hand Rule



Science – Working Scientifically

Variables	Definitions and examples
Independent (IV)	The values that are changed or selected by the investigator.
Dependent (DV)	The value is measured for each change of the IV.
Control (CV)	This would affect the outcome of the investigation and therefore has to be kept constant.
Hypothesis	A suggestion of how variables are linked, which can be investigated.

Calculations	Definitions
Mean	Add the values and divide by the total number of values. Remember to discard any anomalies.
Range	The maximum and minimum values, or difference between them
Interval	The spacing between readings e.g. measuring every 10cm interval would be 0.1m
Resolution	The smallest division able to be measured using a measuring instrument e.g. a balance that measures to 0.1g
Uncertainty	Interval within which the true value can be expected to lie e.g. a length of 56 cm $\pm$ 2 cm would mean the true value could be anywhere between 54 cm and 58 cm. Equal to half the range.

Key	Definitions and examples
Accurate	Close to the true value
Precise	A small spread of values around the mean value
True value	This is the value that would be obtained in an ideal measurement
Valid conclusion	A conclusion which has been supported by valid data, ie data that has been collected as part of a fair test and with minimal errors
Fair test	Only the IV has been allowed to affect the DV.

Graph key words	Definitions and examples
Axis	x = IV, y = DV
Line of best fit (science only)	•straight line drawn with ruler or a smooth curve •shows the trend between two variables •NEVER dot to dot!
Anomaly	Result that does not fit the pattern. Ignore in mean calculations or when drawing line of best fit.

Errors	Definitions
Random error	Results varying in an unpredictable way. These can be reduced by taking more measurements and calculating a mean.
Systematic error	Measurements being different to the true value by a consistent amount each time. Can be addressed by taking the error into account
Zero error	When a zero measurement is not a true zero, e.g. a non-zeroed balance. Can overcome the error by adjusting the data appropriately
Measurement Error	the difference between a measured value and true value. Can be overcome by repeating and calculating a mean

Command words	Definition
Describe	To recall facts, events or a process accurately
Explain	To state the reasons why something happens
Suggest	To apply your scientific knowledge and understanding to a new/unfamiliar situation. Use words such as might or could
Compare	To describe the similarities and/or differences. Use words and phrases such as more than, less than, whereas, however. Use data in your answer if provided
Determine	To use given data or information to obtain an answer
Evaluate	To use the information supplied in the question, as well as your own knowledge and understanding, to consider evidence for and against and a conclusion
Justify	To use evidence from the information supplied to support an answer
Predict	Suggest a sensible answer
Plan	Write a step-by-step method to carry out an experiment

Prefixes	Value	Order of magnitude	Prefix symbol
mega	1 000 000	10^6	M
kilo	1 000	10^3	k
centi	0.01	10^{-2}	c
milli	0.001	10^{-3}	m
micro	0.000 001	10^{-6}	μ
nano	0.000 000 001	10^{-9}	n