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An Inspector Calls by JB Priestley (1945)

When?	Summary and Themes/Ideas	Quotations
Act 1	The wealthy businessman, Arthur Birling and his wife, Sybil, are having an engagement party for their daughter, Sheila, who is engaged to Gerald Croft, an upper-class man – son of a Lord. Their son, Eric, is also present. Edna is the family's maid – highlighting **inequality** and Birling family **exploitation of working-class labour.**	**Stage Directions:** *'Champagne glasses, decanters of port, cigar box and cigarettes.'* **Stage Directions:** *'The lighting should be pink and intimate until the Inspector arrives, and then it should be brighter and harder.'* **Stage Directions:** *Mr Birling is a "heavy-looking, rather portentous man"* **Stage Directions:** *Mrs Birling is a "rather cold woman and her husband's social superior."* **Stage Directions:** *'(they) are pleased with themselves.'* **Birling:** *"Giving us the port, Edna?"* **Mrs Birling (to Mr Birling):** *"Arthur, you're not supposed to say such things-"* **Sheila (to Gerald): [half serious, half playful]** *"except for all last summer, when you never came near me."* **Mrs Birling (to Sheila):** *"Now, Sheila, don't tease him. When you're married you'll realise that men with important work to do sometimes have to spend nearly all their time and energy on their business. You'll have to get used to that, just as I had."* **Birling (to Gerald):** *"You're just the kind of son-in-law I always wanted."* **Birling (to Gerald):** *"Crofts and Birlings…working together – for lower costs and higher prices."* **Sheila (to Eric):** *"You're squiffy."* **Gerald (to Sheila):** *'[produces a ring case]'* **Sheila (to Gerald):** *"Is it the one you wanted me to have?"*
	Birling's speeches relate **to business and profit**. Priestley uses dramatic irony to mock him.	**Birling (to Eric and Gerald):** *"the interests of Capital – are properly protected."* **Birling (to Eric and Gerald):** *"(the Titanic)…unsinkable, absolutely unsinkable."* **Gerald (to Mr Birling):** *"[laughs]: You seem to be a nice well-behaved family."* **Birling (to Eric):** *"Just let me finish, Eric.. I'm talking as a hard headed, practical man of business."* **Birling (to Eric and Gerald):** *"As if we were all mixed up together like bees in a hive."*
	Inspector Goole arrives and tells them of the suicide of a young woman of around 23.	**Birling (to Eric and Gerald):** *"Community and all that nonsense…a man has to mind his own business and look after himself and his own – and – [we hear the sharp ring of a front door bell]."* **Stage Directions: The Inspector** *'creates at once an impression of massiveness, solidity and purposefulness.'* **Inspector (to the Birling family):** *"Two hours ago a young woman died in the infirmary…Burnt her inside out, of course."* **Inspector (to the Birling family):** *she left a "sort of diary". "She'd used more than one name. But her original name – her real name – was Eva Smith."* **Inspector (to Mr Birling):** *"One person and one line of enquiry at a time."*

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Act 1	The Inspector shows Birling (but won't show Gerald and Eric yet) a photo of her. Mr Birling sacked a girl (Eva Smith) from his factory for asking for a pay rise. He does not accept **responsibility**.	**Inspector (to the Birling family):** *"A chain of events."* **Stage Directions: The Inspector:** *'[cutting through massively]'* **Birling (to the Inspector): About Eva** *"A good worker too."* **Birling (to the Inspector): About Eva** *"She'd had a lot to say – far too much."* **Birling (to the Inspector):** *"They wanted the rates raised…I refused, of course."* **Inspector (to Mr Birling):** *"It's my duty to ask questions."* **Birling (to the Inspector):** *"Well, it's my duty to keep labour costs down."* **Eric to (Mr Birling):** *"Why shouldn't they try for higher wages?"* **Gerald (to Mr Birling):** *"I know we'd have done the same thing. Don't look like that, Sheila."*
	The Inspector shows Sheila a picture of the girl. Sheila forced the manager at Millwards to dismiss a girl because she was jealous. She takes full **responsibility**. The Inspector reveals her name change to Daisy Renton and Gerald reacts.	**Sheila (to Mr Birling):** *"But these girls aren't cheap labour – they're people."* **Sheila (to the Inspector) [miserably]:** *"So I'm really responsible?"* **Sheila (to the Inspector):** *"But she was very pretty and looked as if she could take care of herself."* **Sheila (to the Inspector):** *"I was absolutely furious" and "I was very rude to both of them."* **Inspector (to Sheila):** *"And so you used the power you had."* **Sheila (to the Inspector):** *"I'll never, never do it again to anybody."*
Act 2	Gerald had an affair with a working-class girl, representing **exploitation of working-class females**, that he picked up at the Palace Bar. He appears to be shocked and deeply saddened by her death. Sheila hands back her engagement ring and Gerald seems to understand why. Gerald asks if he can leave for a while to go for a walk.	**Inspector: [Sternly to them both.]** *"We have to share something. If there's nothing else, we'll have to share our guilt."* **Sheila (to Mrs Birling):** *"We all started like that – so confident, so pleased with ourselves."* **Mrs Birling (to the Inspector):** *"Girls of that class –"* **Sheila (to Mrs Birling):** *"You mustn't try to build up a kind of wall between us and that girl."* **Gerald (to the Inspector):** *"women of the town -" and "I hate those hard-eyed dough-faced women."* **Birling (to the Inspector):** *"….But you must understand that a lot of young men -"* **Gerald (to the Inspector):** *"She was intensely grateful. I became at once the most important person in her life."* **Gerald (to the Inspector):** *"She looked young and fresh and charming."* **Sheila (to Gerald):** *"You were the wonderful Fairy Prince."*
	Mrs Birling, as chair of the Brumley Women's Organisation, a charity, refused to help the girl, saying that she should have gone to the father of her unborn child. She refuses to **accept any blame** at all.	**Inspector (to Mr Birling) [massively]:** *"Public men, Mr Birling, have responsibilities as well as privileges."* **Mrs Birling (to the Inspector):** *"She was giving herself ridiculous airs."* **Mrs Birling (to the Inspector):** *"Girls of that class."* **Mrs Birling (to the Inspector):** *"Unlike the other three, I did nothing I'm ashamed of...I consider I did my duty."* **Mrs Birling (to the Inspector):** *"I told her it was her business to make him responsible."* **Mrs Birling (to Sheila):** *"I think you [Sheila] ought to go to bed."* **Mrs Birling (to the Inspector):** *"They're overtired."*

An Inspector Calls by JB Priestley (1945)

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Act 3	Eric is revealed as the father of a girl's child. Inspector reveals that he forced himself upon the girl. Eric reveals that he stole money from his father's firm to give to her. He is appalled.	**Mrs Birling (to Eric):** *"you're not that type –"* **Eric (to the Inspector):** *"I was in that state when a chap easily turns nasty."* **Inspector (to Eric):** *"Just used her… as if she was an animal, a thing, not a person."* **Eric (to Mr Birling):** *"you're not the kind of father a chap could go to when he's in trouble."* **Eric (to his family)** *"The girl's dead and we all helped to kill her and that's what matters."*
	The Inspector's final speech tries to teach them to take **responsibility for all members of society.**	**Inspector (to the Birlings):** *"One Eva Smith has gone – but there are millions and millions and millions of Eva Smiths and John Smiths still left with us…We don't live alone. We are members of one body. We are responsible for each other. And I tell you that the time will soon come when, if men will not learn that lesson, then they well be taught it in fire and blood and anguish. Good night."*
	The Birling family's dysfunction is revealed after the Inspector leaves.	**Birling [angrily to Eric]:** *"You're the one I blame for this."* **Eric (to Mr Birling):** *"What does it matter now whether they give you a knighthood or not?"* **Eric (to Mr Birling):** *"I'm ashamed of you as well -"*
	Gerald returns to reveal that their visitor was not a policeman. Birling discovers that no woman has committed suicide. Birling, his wife, and Gerald are relieved. Sheila and Eric understand that they have still **behaved immorally**.	**Eric (to the family):** *"He was our police inspector all right."* **Birling [slowly] (to the family):** *"That man wasn't a police officer."* **Sheila [bitterly] (to the family):** *"I suppose we're all nice people now."* **Sheila (to Mr Birling):** *"Don't interfere please, Father."* **Sheila (to the family):** "I remember what he said, how he looked, and what he made me feel." **Eric (to the family):** *"The fact remains that I did what I did…And the rest of you did what you did to her."* **Gerald (to Sheila):** *"Everything's all right now, Sheila. What about this ring?"* **Sheila (to Gerald):** *"I rather respect you more than I've ever done before."* **Sheila (to Gerald):** *"You and I aren't the same people who sat down to dinner."* **Birling (to Eric and Sheila):** *"Now look at the pair of them – the famous younger generation who know it all. And they can't even take a joke -"*
	The family receive a phone call indicating that an Inspector is arriving.	**Birling:** *"That was the police. A girl has just died – on her way to the Infirmary – after swallowing some disinfectant. And a police inspector is on his way here – to ask some – questions."*

Macbeth by William Shakespeare (1606)

When?	Summary and Themes/Ideas	Quotations
Act 1	The witches, mysterious/ manipulative **equivocators**, plan to meet Macbeth.	**1.1. Third Witch:** *"There to meet with Macbeth."* **1.1. Witches:** *"Fair is foul, and foul is fair; / Hover through the fog and filthy air."*
	Macbeth is celebrated for murdering the traitorous Macdonald but is established as a **violent** and brutal war hero, **the archetype of masculinity.**	**1.2. Captain (to Duncan):** *"For brave Macbeth, - well he deserves that name - …"unseamed him from the nave to th'chops."* **1.2. Duncan (to Captain):** *"O valiant cousin! Worthy gentleman!"* **1.2. Captain:** *"Macbeth and Banquo…As canons overcharg'd with double cracks, so they doubly redoubled strokes upon the foe."*
	The witches deliver their prophecies to Macbeth and Banquo; the catalyst to Macbeth's **ambition** to become King. Whilst Banquo is **honourable**, questioning the prophecies and the witches' intentions, Macbeth acknowledges their potential **deception** but ignores this and remains curious.	**1.3. Third Witch:** *"A drum, a drum: Macbeth doth come."* **1.3. Macbeth (to Banquo):** *"So foul and fair a day I have not seen."* **1.3. Witches (to Macbeth):** *"All hail, Macbeth, that shalt be king hereafter!"* **1.3. Banquo:** *"Good sir, why do you start, and seem to fear things that do sound so fair?"* **1.3. Witches (to Banquo):** *"Thou shall get kings, though thou be none. / - So all hail, Macbeth and Banquo!"* **1.3. Macbeth (to Witches):** *"Stay, you imperfect speakers, tell me more."* **1.3. Banquo (aside):** *"What, can the Devil speak true?"* **1.3. Macbeth (to Ross):** *"Why do you dress me in borrowed robes?"* **1.3. Banquo (aside to Macbeth):** *"The instruments of darkness tell us truths, win us with honest trifles to betray's in deepest consequence."* **1.3. Macbeth (aside):** *"Two truths are told, as happy prologues to the swelling act…This supernatural soliciting cannot be ill; cannot be good…If good, why do I yield to that suggestion, whose horrid image doth unfix my hair and make my seated heart knock at my ribs against the use of nature."* **1.3. Banquo:** *"Look how our partner's rapt…new honours come upon him like our strange garments, cleave not to their mould, but with the aid of use."*
	King Duncan announces Malcom as a rightful heir to the throne, following the **Divine Right of Kings**. Macbeth's **ambition** awakens as he now craves **power** and knows he must secure the **regicide**.	**1.4. Duncan (about previous Thane of Cawdor):** *"There's no art to find the mind's construction in the face: he was a gentleman on whom I built an absolute trust."* **1.4. Macbeth (aside):** *"The Prince of Cumberland! That is a step on which I must fall down or else o'erleap, for in my way it lies."* **1.4. Macbeth (aside):** *"Stars, hide your fires, let not light see my black and deep desires, the eye wink at the hand. Yet let that be, which the eye fears when it is done to see."*
	After hearing about the prophecies, Lady Macbeth becomes ambitious and encourages **deception** in order to secure **power**, **subverting** the **Jacobean stereotypes of women**.	**1.5. Lady Macbeth (soliloquy):** *"I do fear thy nature is too full o' the milk of human kindness to catch the nearest way."* **1.5. Lady Macbeth (soliloquy):** *"Take my milk for gall, you murd'ring ministers, wherever in your sightless substances you wait on nature's mischief."* **1.5. Lady Macbeth (to Macbeth):** *"Bear welcome in your eye, your hand, your tongue; look like th'innocent flower, but be the serpent under't."* **1.5. Lady Macbeth:** *"My keen knife see not the wound it makes nor heaven peep through the blanket of the dark."* **1.5. Lady Macbeth:** *"Come you spirits that tend on mortal thoughts, unsex me her, and fill me from the crown to the toe top-full of direst cruelty."*

Macbeth by William Shakespeare (1606)

When?	Summary and Themes/Ideas	Quotations
Act 1	Duncan arrives at Macbeth's castle, naïve to the **deception** of the Macbeths. Macbeth's inner thoughts are revealed as he is in turmoil, unsure whether to maintain his **loyalty** to Duncan or pursue his **ambition**. Lady Macbeth **emasculates** and **persuades him**.	**1.6. Duncan:** *"This castle hath a pleasant seat; the air nimbly and sweetly recommends itself unto our gentle senses...(to Lady Macbeth) give me your hand."* **1.7. Macbeth (soliloquy):** *"(Duncan) hath been so clear in his great office, that his virtues will plead like angels, trumpet-tongued against the deep damnation of his taking-off."* **1.7. Macbeth (soliloquy):** *"Bloody instructions, which being taught, return to plague th'inventor."* **1.7. Macbeth (soliloquy):** *"I have no spur to prick the sides of my intent, but only vaulting ambition, which o'erleaps itself and falls on th'other -"* **1.7. Macbeth (to Lady Macbeth):** *"We will proceed no further in this business."* **1.7. Lady Macbeth (to Macbeth):** *"Was the hope drunk wherein you dressed yourself?...When you durst do it, then you were a man."* **1.7. Macbeth (to Lady Macbeth):** *"Away, and mock the time with fairest show, false face must hide what the false heart doth know."*
Act 2	Banquo and Macbeth meet. Macbeth's **dishonesty** begins as he claims he has not thought about the prophecies. Alone, Macbeth sees a vision of a dagger and goes to kill Duncan.	**2.1. Banquo (to Fleance):** *"A heavy summons lies like lead upon me."* **2.1. Banquo (to Macbeth):** *"I dreamed last night of the three weird sisters."* **2.1. Macbeth:** *"I think not of them."* **2.1. Macbeth (soliloquy):** *"Is this a dagger which I see before me, the handle toward my hand? Come let me clutch thee."* **2.1. Macbeth (soliloquy):** *"It is the bloody business which informs thus to mine eyes."* **2.1. Macbeth (soliloquy):** *"Nature seems dead and wicked dreams abuse the curtain'd sleep."* **2.1. Macbeth (soliloquy):** *"With Tarquin's ravishing strides towards his design moves like a ghost."* **2.1. Macbeth (soliloquy):** *"Hear it not, Duncan; for it is a knell that summons thee to heaven or to hell."*
	Macbeth's **guilt** is evident after his **regicide/betrayal** whilst Lady Macbeth appears untroubled.	**2.2. Macbeth:** *"As they had seen me with these hangman's hands…I could not say 'Amen'...But wherefore could not I pronounce 'Amen'?"* **2.2. Macbeth:** *"Methought I heard a voice cry, 'Sleep no more: Macbeth doth murder sleep' – the innocent sleep."* **2.2. Lady Macbeth (to Macbeth):** *"Go get some water and wash this filthy witness from your hand."* **2.2. Macbeth (soliloquy):** *"Will all great Neptune's ocean wash this blood clean from my hand?"* **2.2. Lady Macbeth (to Macbeth):** *"My hands are of your colour; but I shame to wear a heart so white. I hear a knocking…A little water clears us of this deed."* **2.2. Macbeth:** *"Wake Duncan with thy knocking! I would thou couldst!"*
	Macbeth's castle has become a metaphorical hell due to the **unnatural** disruption to **societal order**. Duncan's sons suspect **treason and deception**, causing them to flee Scotland.	**2.3. Porter:** *"Here's a knocking indeed: if a man were porter of hell-gate, he should have old turning the key…I pray you, remember the porter."* **2.3. Lennox:** *"The earth was feverous and did shake."* **2.3. Macduff:** *"The Lord's anointed temple and stole thence the life o' the building!"* **2.3. Macbeth:** *"His gash'd stabs look'd like a breach in nature"* **2.3. Donalbain:** *"There's daggers in men's smiles; the nea'er in blood, the nearer bloody."*

Macbeth by William Shakespeare (1606)

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Act 2	Ross discusses the series of **unnatural** occurrences happening in Scotland and reports Macbeth has been crowned King.	**2.4. Ross:** *"Dark night strangles the travelling lamp."* **2.4. Old Man:** *"A falcon, towering in her pride of place, was by a mousing owl hawk'd at and kill'd."* **2.4. Old Man:** *"tis said they (Duncan's horses) eat each other."* **2.4. Macduff:** *"Adieu, lest our old robes sit easier than our new."*
Act 3	Banquo is suspicious of Macbeth. Macbeth is troubled, particularly about the prophecy that Fleance will become King, which causes concern for Lady Macbeth.	**3.1. Banquo (soliloquy):** *"Thou hast it now, King, Cawdor, Glamis, all…and I fear thou played'st most foully for't."* **3.1. Macbeth:** *"To be thus is nothing, but to be safely thus…Our fears in Banquo stick deep."* **3.1. Macbeth:** *"Upon my head they placed a fruitless crown and put a barren sceptre in my gripe, thence to be wrenched with an unlineal hand."* **3.2. Macbeth:** *"We have scorched the snake, not killed it."* **3.2. Macbeth:** *"Duncan is in his grave; after life's fitful fever he sleeps well."* **3.2. Macbeth:** *"O, full of scorpions is my mind, dear wife."* **3.2. Macbeth:** *"Come, seeling night, scarf up the tender eye of pitiful day and with thy bloody and invisible hand cancel and tear to pieces that great bond which keeps me pale. Light thickens, and the crow makes wing to th'rooky wood."*
	After the murder of Banquo (and failed murder of Fleance), Macbeth's **guilt** for his murderous actions lead him to more hallucinations. Lady Macbeth criticises Macbeth for his behaviour. Macbeth realises he cannot change his **fate**.	**3.3. Banquo:** *"O' treachery! Fly, good Fleance, fly, fly, fly!"* **3.4. Macbeth (to ghost):** *"Thy bones are marrowless, thy blood is cold."* **3.4. Macbeth (to ghost):** *"Thou canst not say I did it; never shake thy gory locks at me!"* **3.4. Lady Macbeth:** *"Are you a man?...This is the very painting of your fear; this is the air-drawn dagger which you said led you to Duncan."* **3.4. Macbeth:** *"It will have blood they say: blood will have blood. Augures have by maggot-pies, and choughs, and rooks brought forth the secret'st man of blood. What is the night?"* **3.4. Macbeth (to Lady Macbeth):** *"I am in blood stepped in so far that returning were as tedious as go o'er… strange things I have in head that will to hand, which must be acted ere they may be scanned."*
Act 4	Macbeth's doubt and desire to maintain **power** pushes him to seek **supernatural** guidance from the witches.	**4.1. The witches:** *"By the pricking of my thumbs, something wicked this way comes; open locks, whoever knocks."* **4.1. Macbeth:** *"I conjure you, by that which you profess, howe'er you come to know it, answer me."* **4.1. Macbeth:** *"Tell me, thou unknown power."* **4.1. The apparitions:** *"Beware Macduff; none of woman born shall harm Macbeth; Macbeth shall never vanquished be until Birnam Wood to high Dunsinane Hill shall come against him."*
	Macbeth becomes increasingly **corrupt** as he orders for the murder of Macduff's family who question Macduff's decision to flee to England.	**4.1. Macbeth (aside, about Macduff):** *"The very firstlings of my heart shall be the firstlings of my hand."* **4.1. Macbeth (aside, about Macduff):** *"Give to th'edge o'th'sword his wife, his babes, and all unfortunate souls."* **4.2. Lady Macduff (about Macduff to son):** *"He loves not…for the poor wren, the most diminutive of birds, will fight, her young ones in her nest, against the owl."* **4.2. Ross (to Lady Macduff):** *"He is noble, wise, judicious and best knows the fits o' the season."* **4.2. Son:** *"Young fry of treachery!"*

Macbeth by William Shakespeare (1606)

When?	Summary and Themes/Ideas	Quotations
Act 4	Scotland suffers as a result of Macbeth's **unlawful kingship**.	**4.3. Malcolm:** *"This tyrant, whose sole name blisters our tongues."* **4.3. Macduff:** *"Bleed, bleed poor country…Not in the legions of horrid hell can come a devil more damned in evils to top Macbeth."* **4.3. Malcolm:** *"I think our country sinks beneath the yoke; it weeps, it bleeds, and each new day a gash is added to her wounds. I think withal there would be hands uplifted in my right."* **4.3. Macduff:** *"Not in the legions of horrid hell can come a devil more damn'd in evils to top Macbeth."* **4.3. Doctor (to Malcolm, about the English King):** *"At his touch such sanctity hath heaven given his hand, they presently amend."*
Act 5	Lady Macbeth is consumed by **guilt** and madness.	**5.1. Gentle woman:** *"She has light by her continually, 'tis her command...it is an accustomed action with her, to seem thus washing her hands."* **5.1. Lady Macbeth (sleepwalking):** *"Out, damned spot! Hell is murky…yet who would have thought the old man to have had so much blood in him."* **5.1. Lady Macbeth (sleepwalking):** *"The Thane of Fife had a wife. Where is she now? What, will these hands ne'er be clean?"* **5.1. Lady Macbeth:** *"Here's the smell of blood still; all the perfumes of Arabia will not sweeten this little hand."* **5.1. Lady Macbeth:** *"Come, come, come, come, give me your hand; what's done cannot be undone."*
	Macbeth's **hubris** blinds him to the approaching army who are seeking to dethrone him from his **illegitimate rule**.	**5.2. Angus (about Macbeth):** *"Now does he feel his secret murders sticking on his hands…Now does he feel his title hang loose about him, like a giant's robe upon a dwarfish thief."* **5.3. Macbeth:** *"Bring me no more reports, let them fly all."* **5.3. Macbeth:** *"The heart I bear shall never sag with doubt nor shake with fear."* **5.5. Macbeth:** *"Our castle's strength will laugh a siege to scorn."* **5.5. Macbeth:** *"I have almost forgot the taste of fears."*
	After Lady Macbeth's death, Macbeth considers the **meaninglessness** of life.	**5.5. Macbeth (after Lady Macbeth's death):** *"She should have died hereafter…Tomorrow, and tomorrow, and tomorrow creeps in this petty pace...and all our yesterdays have lighted fools the way to dusty death. Out, out, brief candle, life's but a walking shadow, a poor player that struts and frets his hour upon the stage and then is heard no more. It is a tale told by an idiot, full of sound and fury, signifying nothing."*
	Macduff kills Macbeth who now realises his **fate**. Malcolm becomes **rightful king and the natural order** is restored.	**5.7. Macduff (to Macbeth):** *"Tyrant, show thy face!"* **5.8. Macduff (to Macbeth):** *"Turn, hell-hound, turn!."* **5.8. Macduff (to Macbeth):** *"Despair thy charm…Macduff was from his mother's womb untimely ripped."* **5.8. Macbeth:** *"Be these juggling fiends no more believed, that palter with us in a double sense."* **5.9. King Malcolm:** *"call home our exiled friends abroad that fled the snares of watchful tyranny."* **5.9. King Malcolm:** *"Producing forth the cruel ministers of this dead butcher, and his fiend-like queen, who, as 'tis thought, by self and violent hands, took off her life."*

The Strange Case of Dr. Jekyll and Mr. Hyde (1886)

When?	Summary and Themes/Ideas	Quotations
Chapter 1	The writer establishes the character of Utterson as a typical **Victorian** gentleman: a loyal and strict character who has a desire to maintain his **reputation** and who refuses to interfere with other people's business. Enfield and Utterson later meet and comment on the **duality** of the setting (London) which is reflective of the **duality of man**. This duality of man is then evidenced when Enfield recounts Hyde's **degenerate** appearance and barbaric trampling of a child. Utterson becomes very interested in Hyde, particularly as Hyde was in possession of a cheque that had the signature of a very **respectable** man.	**Chapter 1. Utterson:** *"The last good influence in the lives of down-going men."* **Chapter 1. Utterson:** *"Austere with himself."* **Chapter 1. Utterson:** *"I incline to Cain's heresy."* **Chapter 1. London:** *"The shop fronts stood like rows of smiling saleswomen."* **Chapter 1. London:** *The back of Jekyll's house is described as a "sinister block of building" which "showed no window."* **Chapter 1. London:** *"A fire in a forest."* **Chapter 1. Hyde:** *"Trampled calmly over the child's body."* **Chapter 1. Enfield (to Utterson):** *"It was hellish to see."* **Chapter 1. Hyde:** *"Like some damned Juggernaut."* **Chapter 1. Enfield:** *"Hyde responds with 'black sneering coolness.'* **Chapter 1. Hyde:** *"There is something wrong with his appearance; something displeasing, something down-right detestable."* **Chapter 1. Hyde:** *"He gives a strong feeling of deformity."* **Chapter 1. Enfield (to Utterson):** *"Let us make a bargain never to refer to this again."*
Chapter 2	Utterson's curiosity about Hyde grows as it is revealed that he benefits from Jekyll's will. This manifests in Utterson's nightmares about the **crime and immorality** at large in London. Dr Lanyon criticises Jekyll's approach to **science**, which is the source of their conflict and representative of the **conflict between science and religion in the Victorian era.** Utterson's curiosity causes him to confront Hyde and he is horrified at his **degenerate** and animalistic appearance. In fear for his safety, Utterson decides to warn Jekyll but learns from Poole, the butler, that Hyde has a key to Jekyll's laboratory.	**Chapter 2. Utterson:** *"Imagination was engaged, or rather enslaved."* **Chapter 2. Utterson:** *"The human Juggernaut trod the child down."* **Chapter 2. London:** *"Through wider labyrinths of lamplighted city."* **Chapter 2. Utterson:** *"If he be Mr. Hyde, I shall be Mr. Seek."* **Chapter 2. Lanyon:** *"A hearty healthy dapper red-faced gentleman."* **Chapter 2. Lanyon (to Utterson):** *"Henry Jekyll became too fanciful for me. He began to go wrong, wrong in mind."* **Chapter 2. Lanyon (to Utterson):** *"Such unscientific balderdash would have estranged Damon and Pythias."* **Chapter 2. Jekyll:** *"Hissing intake of the breath."* **Chapter 2. Jekyll:** *"Snarled aloud into a savage laugh."* **Chapter 2. Jekyll:** *"Pale and dwarfish."*
Chapter 3	Two weeks later, Utterson visits Jekyll and challenges him about his friendship with Hyde. Jekyll mocks Utterson, comparing Utterson's worries to Lanyon's adherence to **traditional scientific pursuits.** Jekyll refuses to reveal the details of his strange relationship with Hyde. Although Jekyll is a prominent, **upper-class** scientist, there are hints that this is a façade, hiding his growing **immorality and devolution.**	**Chapter 3. Jekyll:** *"Well-made, smooth-faced man."* **Chapter 3: Jekyll:** *"Lanyon is 'an ignorant blatant pedant.'* **Chapter 3. Jekyll:** *"Dr. Jekyll grew pale to the very lips and there came a blackness about his eyes."* **Chapter 3. Jekyll (to Utterson):** *"The moment I choose, I can be rid of Mr Hyde."* **Chapter 3. Jekyll (to Utterson):** *"This is a private matter, and I beg of you to let it sleep."*

The Strange Case of Dr. Jekyll and Mr. Hyde (1886)

When?	Summary and Themes/Ideas	Quotations
Chapter 4	One year later, London has become increasingly **Gothic** and **crime and immorality** has become more dominant due to Hyde's uncontrollable behaviour and disregard for **social order**. It is revealed that he brutally murdered an innocent **upper-class Victorian gentleman** and has now disappeared.	**Chapter 4. London:** *"A great chocolate covered pal lowered over heaven."* **Chapter 4. London:** *"Fog rolled over the city."* **Chapter 4. London:** *"Reinvasion of darkness."* **Chapter 4. London:** *"Like some district of a city in a nightmare."* **Chapter 4. London:** *"London was started by a crime of singular ferocity and rendered all the more notable by the high position of the victim."* **Chapter 4. Carew:** *"Aged, beautiful gentleman" with "innocent, old-world kindness."* **Chapter 4. Hyde:** *"He broke out in a great flame of anger."* **Chapter 4. Hyde:** *"Like a madman."* **Chapter 4. Hyde:** *"Clubbed him to death" with "ape-like fury."* **Chapter 4. Hyde:** *"Hailing down a storm of blows."*
Chapter 5	Jekyll removes himself from society as he realises the **dangers of toying with duality and pushing scientific boundaries.** He has becomes ill and guilty because of the actions of his monstrous alter-ego Hyde but insists that Hyde has gone. After it is revealed that there is a resemblance between Jekyll's handwriting and Hyde's handwriting, Utterson realises that Jekyll has pretended to be Hyde in a letter, saying he has disappeared, and fears for Jekyll's **reputation**.	**Chapter 5. Jekyll:** *"Deathly sick."* **Chapter 5. Jekyll (to Utterson):** *"Utterson, I swear to God … I will never set eyes on him again."* **Chapter 5. Jekyll:** *"Feverish manner."* **Chapter 5. Jekyll:** *"The doctor seemed seized with a qualm of faintness."* **Chapter 5. Jekyll (to Utterson):** *"O God, what a lesson I've had."* **Chapter 5. Utterson:** *"Henry Jekyll forge for a murderer! And his blood ran cold in his veins."*
Chapter 6	Jekyll continues to shield himself from society in a desperate attempt to keep Hyde's identity a secret and maintain his **reputation**. Lanyon falls sick after witnessing Hyde's transformation into Jekyll. Lanyon is impacted by the **immorality** Hyde has unlocked using **science** and fears the power he now has. Lanyon eventually dies, leaving a letter for Utterson to open if Jekyll dies or disappears.	**Chapter 6. Jekyll:** *"His face seemed to open and brighten."* **Chapter 6. Jekyll:** *"Confined himself."* **Chapter 6. Lanyon:** *"He had his death-warrant written legibly upon his face."* **Chapter 6. Lanyon:** *"The rosy man had grown pale; his flesh had fallen away."* **Chapter 6. Lanyon:** *"Deep seated terror of the mind."* **Chapter 6. Lanyon:** *"Lanyon declared himself a doomed man."* **Chapter 6. Lanyon (to Utterson):** *"I sometimes think if we knew all, we should be more glad to get away."* **Chapter 6. Lanyon (to Utterson):** *"If I am the chief of sinners, I am the chief of sufferers also."*
Chapter 7	Utterson and Enfield witness Jekyll's **devolution** as he involuntarily transforms into Hyde at the window.	**Chapter 7. London:** *"Full of premature twilight."* **Chapter 7. Jekyll:** *"Like some disconsolate prisoner."* **Chapter 7. Jekyll:** *"Smile was struck out of his face."* **Chapter 7. Enfield and Utterson:** *"Froze the very blood of the two gentleman."* **Chapter 7. Enfield and Utterson:** *"They were both pale and there was an answering horror in their eyes."*

The Strange Case of Dr. Jekyll and Mr. Hyde (1886)

When?	Summary and Themes/Ideas	Quotations
Chapter 8	Utterson hears from Poole about Jekyll's **degenerate** and animalistic behaviour whilst he has been locked in the lab. They break into the lab to find Hyde's body with a test tube in his hand. Utterson's **ignorance** prevents him from realising the truth behind Jekyll and Hyde and believes that Hyde has poisoned himself. Before leaving the lab, Utterson finds a package containing Jekyll's 'confession' and a letter asking Utterson to read Lanyon's letter.	**Chapter 8. Servants:** *"Stood huddled together like a flock of sheep."* **Chapter 8. Jekyll:** *"Cry out like a rat."* **Chapter 8. Jekyll:** *"Weeping like a woman or a lost soul."* **Chapter 8. Jekyll:** *"Masked thing like a monkey jumped whipped into the cabinet."* **Chapter 8. Jekyll:** *"Dismal screech of animal terror."* **Chapter 8. Poole (to Utterson):** *"It went down my spine like ice."* **Chapter 8. Jekyll:** *"There lay he body of a man sorely contorted and still twitching."* **Chapter 8. Utterson:** *"Utterson knew that he was looking on the body of a self-destroyer."*
Chapter 9	Lanyon's letter describes the terror of seeing Jekyll transform into Hyde. His beliefs about science and society have been disproven by Jekyll's **devolution** into Hyde.	**Chapter 9. Jekyll (to Lanyon):** *"You who have so long been bound to the most narrow and material views, you who have denied the virtue of transcendental medicine."* **Chapter 9. Lanyon:** *"A certain icy pang along my blood."* **Chapter 9. Hyde:** *"A prodigy to stagger the unbelief of Satan."* **Chapter 9. Hyde:** *"His face become suddenly black, the features seemed to melt and alter."* **Chapter 9. Jekyll:** *"Like a man restored from death – there stood Henry Jekyll."* **Chapter 9. Lanyon:** *"The deadliest terror sits by me at all hours of the day and night."* **Chapter 9. Lanyon:** *"My life shaken to its roots."*
Chapter 10	Jekyll describes the experience of discovering his **duality** and his gradual loss of control of his alter-ego Hyde who he created. Jekyll's attempts at **repression** are futile as the natural evil within him grows in strength. However, it is revealed that Jekyll did find great freedom in becoming Hyde as he was able to indulge in **immorality** without damaging his **reputation**.	**Chapter 10. Jekyll:** *"Man is not truly one but truly two."* **Chapter 10. Jekyll:** *"Younger, lighter, happier in body."* **Chapter 10. Jekyll:** *Hyde began to "turn towards the monstrous."* **Chapter 10. Jekyll:** *"My devil had long been caged, he came out roaring."* **Chapter 10. Jekyll:** *"The power of Hyde seems to have grown with the sickliness of Jekyll."* **Chapter 10. Jekyll:** *"I looked upon that ugly idol in the glass."* **Chapter 10. Jekyll:** *"Edward Hyde, alone in the ranks of mankind, was pure evil."* **Chapter 10. Jekyll:** *"I mauled the unresisting body, tasting delight from every blow."*

Love and Relationships Poetry

	When?	Summary and Themes/Ideas	Quotations	Link
Family Relationships	**Before you Were Mine** (Duffy, 1993)	• The speaker looks at a photo of her mother and enviously imagines her previous teenage life; there is a mother-**daughter role-reversal in the relationship**. • She admires the beauty and excitement of her mother's young life and considers what she has **lost** as a mum • Duffy's also describes memories of her own childhood **fascination and jealousy** with the mementos of her mother's youthful existence.	1. Your polka-dot dress blows round your legs. Marilyn." 2. "my loud possessive yell" 3. "In the ballroom with the thousand eyes, the fizzy, movie tomorrows" 4. "stamping stars from the wrong pavement." 5. "you sparkle and waltz and laugh before you were mine."	**Follower** Both speakers admire, yet feel disconnected and guilty about their parent.
	Follower (Heaney, 1966)	• The speaker admiringly looks back at how he used to respect his father, but also how his dad made him feel **inadequate**. • He **admiringly** describes the 'expert' way his father handled the horse-plough, and how much he wanted to emulate him when he grew up. • Now, it is his father who 'keeps stumbling' after him - their roles are **reversed**. He feels **guilt** at his chosen profession of poet.	1. "His shoulders globed like a full sail strung" 2. "An expert." "wing… headrig…. Sock" 3. "I was a nuisance, tripping, falling,/ yapping always." 4. "keeps stumbling/ behind me, and will not go away."	**Before You Were Mine** Both speakers admire, yet feel disconnected from, their parent.
	Mother, any Distance (Armitage, 1993)	• The speaker's mother helps him as he moves into his first adult home; he feels **supported**, excited yet anxious. • The speaker describes the process of measuring an empty house with his mother. She clings on to the other end of the measuring tape, symbolising the **connection and support he feels from her.** • The speaker gets further and further away from his mother as he ascends to the top of the house and separates from her. He feels nervous but also excited at the possibilities of his **new independent freedom and possibilities**	1. "You come to help me measure" 2. "the acres of the walls, the prairies of the walls." 3. "unreeling/ years between us. Anchor. Kite." 4. "I space-walk" 5. "opens on an endless sky/ to fall or fly."	**Walking Away** Both speakers reflect on the inevitable separation of parent and child as they grow older.
	Walking Away (Day-Lewis, 1956)	• The poet reflects on a powerful when he first watched his son play football. • After the match, he watched him walking away with his friends towards the school, and he sensed that his son was leaving behind his father and setting out into the world. • He concludes that love must involve giving the loved one **freedom and independence** – and letting go **feelings of possession**	1. "like a satellite/ wrenched from its orbit, go drifting away." 2. "half-fledged thing set free/ Into a wilderness," 3. "like a winged seed loosened from its parent stem," 4. "And love is proved in the letting go."	**Mother, any Distance** Both speakers reflect on the inevitable separation of parent and child as they grow older.
	Climbing my Grandfather (Waterhouse, 2000)	• The speaker describes climbing up his grandfather as if he is a mountain. • The mutual **affection and intimacy** between the speaker and his grandfather are clear. • The poet also uses the climb to symbolise **growing up and discovering opportunities**	5. "I discover/ the glassy ridge of a scar" 6. "a smiling mouth to drink among teeth." 7. "the skin of his finger is smooth and thick/ like warm ice." 8. "knowing / the slow pulse of his good heart."	**Eden Rock and Follower** Both speakers have powerful yet painful memories of loved ones.

Love and Relationships Poetry

	When?	Summary and Themes/Ideas	Quotations	Link
Family Relationships	**Eden Rock** (Causley, 1988)	• He describes a **comforting** vision of an idyllic childhood scene in which his parents, young again, are spreading out a picnic on the other side of a stream and beckoning for him to come and join them. • He is anxious when he realises that the stream symbolises the change from **life to death**.	1. "Her hair, the colour of wheat," 2. "The same three plates…three suns" 3. "Crossing is not as hard as you might think." 4. "I had not thought that it would be like this."	**Climbing My Grandfather and Follower** Both speakers have powerful yet painful memories of loved ones.
Loss, Loneliness, Bitterness, Suffering	**When We Two Parted** (Byron, 1816)	• The poet remembers feeling **sorrow and bitterness** when a lover betrays him, who he blames for the break up • He also feels **shame** of her ruined **reputation** • He struggles to understand how he ever loved her and feels bitter in his **isolation and grief**.	1. "When we two parted/ in silence and tears," 2. "Pale grew thy cheek and cold, / Colder thy kiss;" 3. "Why wert thou so dear?" 4. "They heart could forget,/ Thy spirit deceive."	**Neutral Tones** Both speakers have experienced a painful disconnection from their partner, that make them angry and bitter.
	Neutral Tones (Hardy, 1867)	• The poet describes a **memory** of a moment of parting from a lover. It is winter, and everything is cold and dead, like their love. • Since that parting, he has learned by bitter experience that love is **deceptive and untrustworthy**. • This **bitterness** and **misery** frames the memory of their parting and his world view.	1. "And the sun was white," 2. "And a few leaves lay on the starving sod," 3. "The smile on your mouth was the deadest thing" 4. "A grin of bitterness" 5. "And a pond edged with greyish leaves."	**When We Two Parted** Both speakers have experienced a painful disconnection from their partner, that will haunt them, making them angry and bitter, for the rest of their lives.
	The Farmer's Bride (Mew, 1912)	• The speaker (persona) and his wife are trapped in a **loveless**, **imbalanced and isolating** marriage, in a community where his wife is treated as less-than-human. • The farmer describes how the woman he married three years ago has run away and had to be locked in the house, demonstrating his **power** and **control** over her. • He describes the **beauty** of his young wife, showing how much he desires her, but she sleeps separately, emphasising her **vulnerability** and his **frustration**.	1. "We caught her, fetched her home at last/ And turned the key upon her, fast." 2. "More like a little frightened fay." 3. "Flying like a hare" 4. "Sweet as the first wild violets," 5. "The brown of her - her eyes, her hair, her hair!"	**Porphyria's Lover** Both speakers are frustrated by the fact that they cannot be with their lovers. They overpower, trap, and therefore control their lovers.
	Porphyria's Lover (R. Browning, 1836)	• The speaker (persona) is a disturbed and lonely man who **obsesses** over his lover. • He decides to kill his visiting lover to keep them together forever. • He murders his beloved at the moment he feels sure that she worships him and he wants to **possess** her completely. Once she is dead, he has complete **control** and invents her desires. • Instead of hiding the body, he sits up all night with it. • He claims there is a lack of judgement from God for what he has done.	1. "The sullen wind […] did its worst to vex the lake" 2. "she was mine, mine fair, / Perfectly pure and good:" 3. "As a shut bud that holds a bee,/I warily oped her lids:" 4. "And yet God has not said a word!"	**The Farmer's Bride** Both speakers are frustrated by the fact that they cannot be with their lovers. They overpower, trap, and therefore control their lovers.

Love and Relationships Poetry

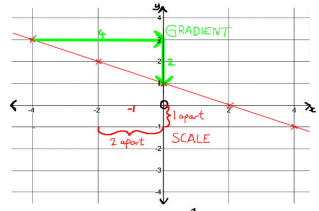
	When?	Summary and Themes/Ideas	Quotations	Link
Strong connection between people	**Letters from Yorkshire** (Dooley, 2002)	• The speaker **contrasts** her life, working as a journalist, with that of a man who corresponds with her by letter. • The nature of the relationship is not specified, although it is made clear that it is not romantic. • The man has a life connected with **nature**, and he writes to the speaker of the changing seasons and his agricultural work. • Thanks to their regular communication, they have a strong **spiritual connection**, although they live apart.	1. "His knuckles singing" 2. "Is your life more real because you dig and sow?" 3. "feeding words onto a blank screen" 4. "pouring air and light into an envelope." 5. "our souls tap out messages across the icy miles."	**Winter Swans** Both speakers overcome distance between them and their loved one, by finding comfort in nature. They use nature to find connection.
	Winter Swans (Sheers, 2005)	• The poet is part of a couple who walk by a lake following two days of stormy weather. • Although they walk together, they appear **distant** from one another. The couple observe swans by the lake, and one of them notes that swans 'mate for life'. • By the end of the poem, the lovers seem to have learned from **Nature** and the swans, as their **intimacy and connection** is **restored**.	1. "the waterlogged earth/ gulping for breath at our feet" 2. "a show of tipping in unison." 3. "icebergs of white feather," 4. "our hands, that had, somehow,/ swum the distance between us/ and folded… like a pair of wings"	**Letters from Yorkshire** Both speakers overcome distance between them and their loved one, by finding comfort in nature. They use nature to find connection.
	Sonnet 29 (E Browning, 1850)	• The speaker has such strong feelings for her husband that they **overwhelm** her completely; he is always on her mind. • But her thoughts cover him and **obscure** her love for him. • She wants him to throw off her thoughts, so that she can be **intimate**	1. "my thoughts do twine and bud/ About thee, as wild vines, about a tree" 2. "O my palm tree," 3. "burst, shattered, everywhere!" 4. "breathe within thy shadow a new air,"	**Singh Song!** Both speakers have all-consuming feelings of love for their partners.
	Singh Song! (Nagra, 2007)	• Singh, a Sikh shopkeeper of Indian parentage, describes his daily life where he experiences **prejudice** from his customers. • He tends to neglect his shop because of his desire for his wife • The shopkeeper's wife is **unconventional and rebellious** in appearance and behaviour • At night, Singh enjoys spending time with his wife when everyone else is asleep, dreaming by moonlight, and telling her how **precious and invaluable** she is to him.	1. "my bride / she effing at my mum / in all di colours of Punjabi" 2. "red crew cut" and "Tartan sari" 3. "di worst Indian shop" 4. "each night I say, / Is priceless baby - "	**Sonnet 29** Both speakers have all-consuming feelings of love for their partners.
	Love's Philosophy (Shelley, 1819)	• The **Romantic** speaker tries to win a lover by pleading with her to follow the example of nature, where all things naturally live in harmony, and are **intimate**. • He tries to make her feel guilty for making him **disillusioned** in the world and **God**	1. "Nothing in the world is single; / All things by a law divine / In one another's being mingle." 2. "See the mountains kiss high heaven" 3. "No sister-flower would be forgiven" 4. "What are all these kissings worth,/ If thou kiss not me?"	**Winter Swans** Both speakers use nature to find connection. **Singh Song!** Both speakers are confident and joyful **Porphyria's Love** – power and control

Rearranging Formulae

Make x the subject	Get x on its own	*Make f the subject of the formula* $\frac{2(f+g)}{h} = 3 - g$
2 lines annoy me	Get it onto 1 line	$\times h \quad \times h$ $2(f+g) = h(3-g)$
Successful elimination	With an inverse operation	$2f + 2g = 3h - gh$ $-2g \quad -2g$
If you do it to one side	Do it to the other to keep the balance	$\frac{2f}{2} = \frac{3h-gh-2g}{2}$ $f = \frac{3h-gh-2g}{2}$

Linear (straight line) graphs & y = mx + c

All graphs	Check the scale
Drawing graphs	Draw a table and plot the points
Equation of a straight line	Y = mx + c
How do we find it?	Gradient and point
Gradient is	For 1 along, how much up or down
How do you find it?	Box method
Y-intercept is	When x = 0
x-intercepts or roots	when y=0
Parallel lines	Equal gradients
Perpendicular lines	Negative reciprocal gradients

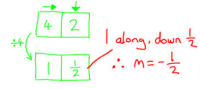


Draw the line $y = -\frac{1}{2}x + 1$

x	-4	-2	0	2	4
y	3	2	1	0	-1

$y = -\frac{1}{2}x + 1$

$m = -\frac{1}{2}$



$y = -\frac{1}{2}(0) + 1$

$y = 1$

So $c = 1$

Point D (12, -5) is on the line y_1

$(-5) = -\frac{1}{2}(12) + c$

$-5 = -6 + c$

$1 = c$

$(0) = -\frac{1}{2}(x) + 1$

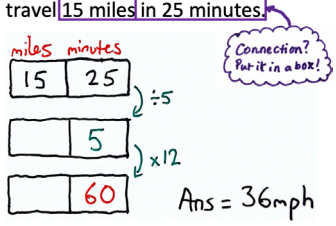
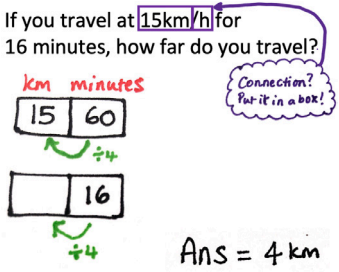
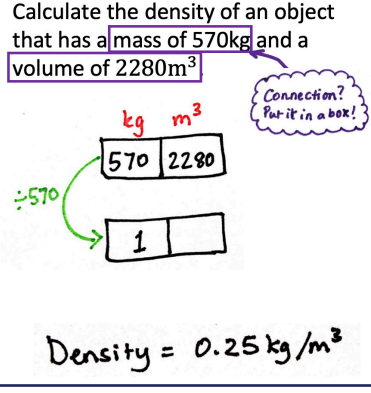
$-1 = -\frac{1}{2}x$

$2 = x$

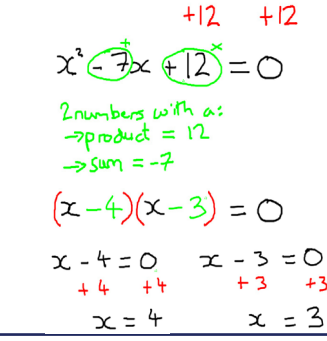
$m_y = -\frac{1}{2} \quad m_{\nearrow} = -\frac{1}{2}$

$m_y = -\frac{1}{2} \quad m_{\perp} = 2$

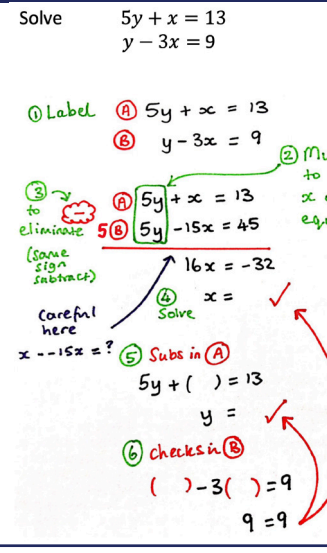
Compound Measures

Compound measures	Box Method	Calculate average speed if you travel 15 miles in 25 minutes. 
Speed distance time	Box method miles minutes	If you travel at 15km/h for 16 minutes, how far do you travel? 
Density mass volume	Box Method kg m^3	Calculate the density of an object that has a mass of 570kg and a volume of 2280m^3 

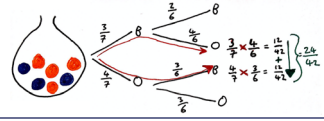
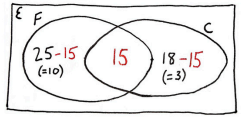
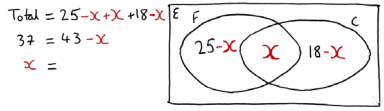
Solving Quadratic Equations

Solving quadratic equations	Make them equal to zero	
And then?	It's always wise to factorise!	
Successful elimination	With an inverse operation	

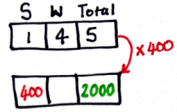
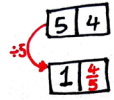
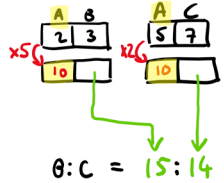
Simultaneous Equations

2 equations 2 unknowns	Simultaneous equations Same sign subtract	
Subs in A	Checks in B	
Subs in B	Checks in A	

Probability

Probability	Always adds up to 1	**Find x.** number rolled: 1, 2, 3, 4, 5, 6 probability: 0·1 + 0·15 + 0·2 + 0·1 + x + 0·3 = 1
Sample Space Diagrams	Two fair events, set up a table	**You toss two fair coins. What is the probability of both showing tails?** H T H HH HT T TH TT $P(TT) = \frac{1}{4}$
Probability Tree Diagrams	Across times, down add	**Calculate the probability of getting one of each colour.** 
If you see 'and'?	Times	**Evaluate the probability of rolling a 5 on a fair six-sided dice and getting heads from a fair coin toss.** $P(5) = \frac{1}{6}$ $P(H) = \frac{1}{2}$ → $P(5 \text{ AND } H) = \frac{1}{6} \times \frac{1}{2}$ =
If you see 'or'?	Add	**Evaluate the probability of getting an even number or a 3 on a fair six-sided dice.** $P(\text{even}) = \frac{1}{2}$ $P(3) = \frac{1}{6}$ → $P(\text{even OR } 3) = \frac{1}{2} + \frac{1}{6}$ =
Venn Diagrams	Start in the middle and work your way out	**25 people like football, 18 like cricket.** **a) How many in total if 15 like both?**  Total = 10 + 15 + 3 =
And if we can't	Call it x	**b) How many like both if 37 like either?** 

Ratio and Proportion

Ratio questions	Box method with a total	To make juice I mix 1 part squash with 4 parts water. How much squash do I need for 2L of juice? Connection? Put it in a box! 
		Write the ratio 5:4 in the form 1 : n  Answer: 1 : $\frac{4}{5}$
Two ratios	Two box methods	A:B = 2:3 and A:C = 5:7. What is the ratio of B:C?  B:C = 15 : 14

Standard Form

Adding and subtracting (in standard form)	Make them ordinary numbers	Calculate $(7.5\times10^3)+(2.5\times10^4)$ 7.5×10^3 → 7500. 2.5×10^4 → 25000. 7500 + 25000 = 32500 $= 3.25\times10^{\square}$
Multiplying and dividing (in standard form)	Use index laws	Calculate $(1\times10^3)\div(5\times10^5)$ $\frac{1\times10^3}{5\times10^5}=\frac{1}{5}\times\frac{10^3}{10^5}=0.2\times10^{-2}$ $=2\times10^{-1}\times10^{-2}$ $=2\times10^{\square}$

Compound interest (Growth and decay)

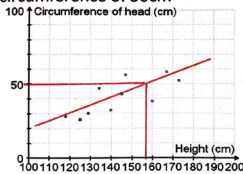
Compound interest	$O \times M^T = F$	A bank pays 3% interest. How much will a deposit of £1500 be worth after 4 years? $O \times M^T = F$ $O = 1500$ $M = 1.03$ $T = 4$ $1500 \times 1.03^4 =$
T stands for	Time	

Statistics

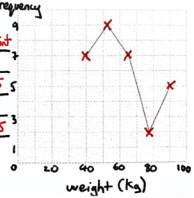
Mode	Most	Find the mode, median, mean and range of the following numbers: 8, 12, 4, -3, 1, 6, 1, 3 -3 1 1 3 4 6 8 12 mode = 1 median = $\frac{3+4}{2}$ mean = $\frac{-3+1+1+3+4+6+8+12}{8}$ range = 12 − (−3)
Median	Middle value (put them in order)	
Mean	Fair, always find the total	
Range	Spread (biggest – smallest)	
Estimate the mean	Midpoints	The table shows road accidents reported in December. Estimate the mean number of accidents reported
And then?	$\frac{\sum fx}{\sum f}$	
Scatter graphs	Line of best fit	Estimate the height of someone with a head circumference of 50cm Ans = 157cm
Frequency polygon **(frequency diagram)**	Plot the midpoints & join them up	Draw a frequency polygon to show the information below

Accidents reported	Frequency (f)	midpoint (x)	fx
0 - 4	15		
5 - 9	10		
10 - 14	1		
15 - 19	5		
	$=\sum f$		$=\sum fx$

Ans = $\frac{\sum fx}{\sum f}$



Weight w (kg)	Frequency	midpoint
$30 \le w < 50$	7	40
$50 \le w < 55$	9	52.5
$55 \le w < 75$	7	65
$75 \le w < 80$	2	77.5
$80 \le w < 100$	5	90



Rearranging Formulae

Make x the subject	Get x on its own
2 lines annoy me	Get it onto 1 line
Successful elimination	With an inverse operation
If you do it to 1 side	Do it to the other to keep the balance
'x's and brackets on both sides	Expand and simplify
'x's on both sides	Get rid of the smallest x
Collect what we want on one side	Put the rest on the other
It's always wise to factorise	To factorise
Why this time?	Get the x on its own

Make f the subject of the formula in the formula below

$$\frac{2(f+g)}{h} = 3 - fg$$

$\times h \quad \times h$

$$2(f+g) = h(3-fg)$$

$$2f + 2g = 3h - fgh$$

$+fgh \quad +fgh$

$$2f + 2g + fgh = 3h$$

$-2g \quad -2g$

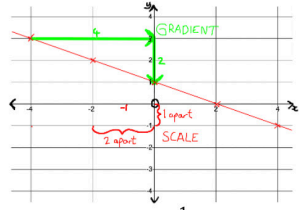
$$2f + fgh = 3h - 2g$$

$$\frac{f(2+gh)}{2+gh} = \frac{3h-2g}{2+gh}$$

$$f = \frac{3h-2g}{2+gh}$$

Linear Graphs (straight lines)

All graphs	Check the scale
Drawing graphs	Draw a table and plot the points
Straight line graphs	Y = mx + c
Gradient is	For every 1 to the right, how much up or down
How do you find it?	Box Method
Y-intercept	When x = 0
X-intercepts	Roots, When y = 0
Equation of a line	Gradient and point
Parallel lines	Equal gradient
Perpendicular lines	Negative reciprocal gradients



Draw the line $y = -\frac{1}{2}x + 1$

x	-4	-2	0	2	4
y	3	2	1	0	-1

$y = -\frac{1}{2}x + 1$

$m = -\frac{1}{2}$ — 1 along, down $\frac{1}{2}$ $\therefore m = -\frac{1}{2}$

$y = -\frac{1}{2}(0) + 1$

$y = 1$

So $C = 1$

Point D (12, -5) is on the line y_1

$(-5) = -\frac{1}{2}(12) + C$

$-5 = -6 + C$

$1 = C$

$(0) = -\frac{1}{2}(x) + 1$

$-1 = -\frac{1}{2}x$

$2 = x$

$m_y = -\frac{1}{2} \quad m_{\parallel} = -\frac{1}{2}$

$m_y = -\frac{1}{2} \quad m_{\perp} = 2$

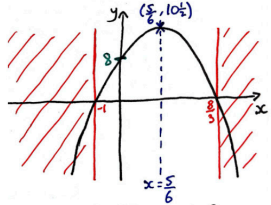
Simplifying Algebraic Fractions

It's always wise	To factorise	Simplify $\frac{4}{x^2-1} - \frac{2}{x^2+x}$
Adding/ subtracting fractions	Find the LCM	$= \frac{4}{(x+1)(x-1)} - \frac{2}{x(x+1)}$ $\times x \qquad \times (x-1)$ $= \frac{4x}{x(x+1)(x-1)} - \frac{2(x-1)}{x(x+1)(x-1)}$ $= \frac{4x-2(x-1)}{x(x+1)(x-1)}$ $= \frac{4x-2x+2}{x(x+1)(x-1)}$ $= \frac{2x+2}{x(x+1)(x-1)}$
It's always wise	To factorise	$= \frac{2(x+1)}{x(x+1)(x-1)}$ $= \frac{2}{x(x-1)}$

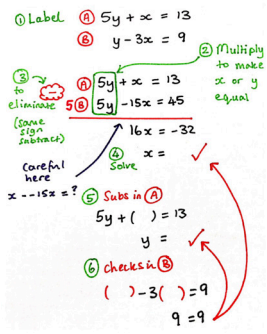
Compound Measures

Compound measures	Box Method	Calculate average speed if you travel 15 miles in 25 minutes.
Speed distance time	Box method miles minutes	miles / minutes: 15 | 25 ÷5 → 5 | ×12 → 60
Density mass volume	Box Method kg m^3	Ans = 36mph

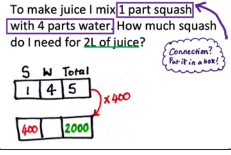
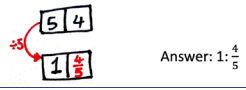
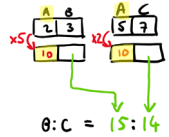
Solving Quadratics

Solving quadratic equations	Make them equal to zero	Solve $3x^2 + 12x = 6$ $-6 \quad -6$ $3x^2 + 12x - 6 = 0$ $3(x^2 + 4x - 2) = 0$ $\div 3 \quad \div 3$ ← Can't factorise $x^2 + 4x - 2 = 0$ $x^2 + 4x - 2 = 0$ $(x+2)^2 - 4 - 2 = 0$ $(x+2)^2 - 6 = 0$ $+6 \quad +6$ $(x+2)^2 = 6$ $x+2 = \pm\sqrt{6}$ $x = -2 \pm \sqrt{6}$
What do we look for?	Common Factors	
And then?	It's always wise to factorise	
And if that fails?	Complete the square	
Solving quadratic inequalities	Sketch the graph	Solve $-3x^2 + 5x + 8 \leq 0$ $-3 \rightarrow$ Sad $-3x^2 + 5x + 8 = 0$ $+3x^2 \quad -5x - 8 \quad +3x^2 - 5x - 8$ $0 = 3x^2 - 5x - 8$ $0 = (x+1)(3x-8)$ $x+1 = 0 \qquad 3x-8 = 0$ $x = -1 \qquad 3x = 8$ $x = \frac{8}{3}$
Sketching graphs	4 steps	
Step 1	Shape	
Step 2	Roots, when y = 0	
Step 3	Sketch	 $x \leq -1 \qquad x \geq \frac{8}{3}$
Step 4	Check: y-intercept, when x = 0	when $x = 0$ $y = -3(0) + 5(0) + 8$ $y = 8$
And if you need the turning point	Use symmetry and substitute	Line of symmetry is midway between -1 and $\frac{8}{3}$ where $x = \frac{5}{6}$ when $x = \frac{5}{6}$ $y = -3(\frac{5}{6}) + 5(\frac{5}{6}) + 8$ $y = 10\frac{1}{2}$ Turning point = $(\frac{5}{6}, 10\frac{1}{2})$

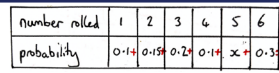
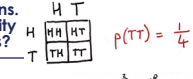
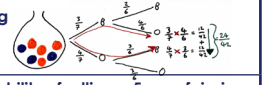
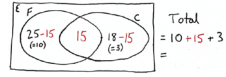
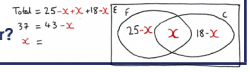
Simultaneous Equations

2 equations 2 unknowns	Simultaneous equations	Solve $5y + x = 13$, $y - 3x = 9$ 
If you subs in A	Checks in B	
If you subs in B	Checks in A	

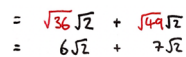
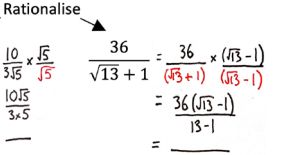
Ratio and Proportion

Ratio questions	Box method with a total	To make juice I mix 1 part squash with 4 parts water. How much squash do I need for 2L of juice? 
		Write the ratio 5:4 in the form 1 : n  Answer: $1:\frac{4}{5}$
Two ratios	Two box methods	A:B = 2:3 and A:C = 5:7. What is the ratio of B:C? 

Probability

Probability	Always adds up to 1	**Find x.** 
Sample space diagram	Two fair events, set up a table	**You toss two fair coins. What is the probability of both showing tails?** 
Probability Tree Diagrams	Across times, down add	**Calculate the probability of getting one of each colour.** 
If you see 'and'?	Times	**Evaluate the probability of rolling a 5 on a fair six-sided dice and getting heads from a fair coin toss.** 
If you see 'or'?	Add	**Evaluate the probability of getting an even number or a 3 on a fair six-sided dice.** 
Venn Diagrams	Start in the middle and work your way out	**25 people like football, 18 like cricket.** **a) How many in total if 15 like both?**  **b) How many like both if 37 like either?** 
And if we can't	Call it x	

Surds

Always make your life simple	Simplify first	Simplify $\sqrt{72} + \sqrt{98}$ 
Simplifying surds	Highest square factor	
Rationalise the denominator	Get rid of the surd	
Irrational only	Times by a surd	
Irrational and rational	Difference of two squares	

Bounds

Bounds	Error intervals, draw a number line	A = 4.6 (2sf) and B = 0.07 (1sf) A: 4.5, 4.6, 4.7 — LB$_A$ = 4.55, UB$_A$ = 4.65 B: 0.06, 0.07, 0.08 — LB$_B$ = 0.065, UB$_B$ = 0.075 $(AB)_{max} = UB_A \times UB_B = 4.65 \times 0.075 =$ $(A+B)_{max} = UB_A + UB_B = 4.65 + 0.075 =$ $\left(\frac{A}{B}\right)_{max} = \frac{UB_A}{LB_B} = \frac{4.65}{0.065} =$ $(A-B)_{max} = UB_A - LB_B = 4.65 - 0.065 =$
Calculating with bounds	Error intervals for every value	

Recurring Decimals

Recurring decimals to fractions	Make the recurring parts match	Express $0.9\dot{2}\dot{6}$ as a fraction. $x = 0.926262626\ldots$ $1000x = 926.262626\ldots$ $-\ 10x = 9.262626\ldots$ $990x = 917$ $x =$

Standard Form

Adding and subtracting (in standard form)	Make them ordinary numbers	Calculate $(7.5\times10^3) + (2.5\times10^4)$ $7.5 \times 10^3 = 7500.$; $2.5 \times 10^4 = 25000.$ $7500 + 25000 = 32500 = 3.25 \times 10^{\square}$
Multiplying and dividing (in standard form)	Use index laws	Calculate $(1\times10^3) \div (5\times10^5)$ $\frac{1\times10^3}{5\times10^5} = \frac{1}{5} \times \frac{10^3}{10^5} = 0.2 \times 10^{-2}$ $= 2\times10^{-1} \times 10^{-2}$ $= 2\times10^{\square}$

Statistics

Mode	Most common	Find the mode, median, mean and range of the following numbers: 8, 12, 4, -3, 1, 6, 1, 3 -3 1 1 3 4 6 8 12 mode = 1 median = $\frac{3+4}{2}$ = mean = $\frac{-3+1+1+3+4+6+8+12}{8}$ = range = $12-(-3)$ =
Median	Middle value when in order	
Mean	Fair, always find the total	
Range	Spread (biggest – smallest)	
Estimate the mean	Midpoints	The table shows road accidents reported in December. Estimate the mean number of accidents reported
And then?	$\frac{\sum fx}{\sum f}$	Accidents reported / Frequency (f) / midpoint (x) / fx 0 - 4 / 15 5 - 9 / 10 10 - 14 / 1 15 - 19 / 5 Ans = $\frac{\sum fx}{\sum f}$; $\sum f$ = ; $\sum fx$ =
Scatter graphs	Line of best fit	Estimate the height of someone with a head circumference of 50cm Circumference of head (cm) vs Height (cm) Ans = 157cm
Frequency polygon **(frequency diagram)**	Plot the midpoints & join them up	Draw a frequency polygon to show the information below Weight w (kg) / Frequency / midpoint $30 \le w < 50$ / 7 / 40 $50 \le w < 55$ / 9 / 52.5 $55 \le w < 75$ / 7 / 65 $75 \le w < 80$ / 2 / 77.5 $80 \le w < 100$ / 5 / 90 Frequency; weight (kg)
Histograms	Frequency is area	The histogram shows the heights of 65 animals. Estimate how many are between 40 and 60cm. frequency between 40 and 60cm = Area$_A$ + Area$_B$ A = b x h = 10 x 1 = B = b x h = 10 x 0.5 = frequency density; height (cm)

Algebraic Proportionality

Algebraic proportionality	General formula first
$y \propto x$	$y = kx$
$y \propto \frac{1}{x}$	$y = \frac{k}{x}$
Specific formula?	Substitute values to find k

y = 32 when x = 4. Find y when x = 5, if...

a) y is proportional to x^2

$y \propto x^2$

$y = kx^2$

$(32) = k(4)^2$

$2 = k$

$y = 2x^2$

$y = 2(5)^2$

$=$

b) y is inversely proportional to x^2

$y \propto \frac{1}{x^2}$

$y = \frac{k}{x^2}$

$(32) = \frac{k}{(4)^2}$

$512 = k$

$y = \frac{512}{x^2}$

$y = \frac{512}{(5)^2}$

$=$

Compound interest (Growth & Decay)

Compound interest	$O \times M^T = F$
T stands for	Time

A bank pays 3% interest. How much will a deposit of £1500 be worth after 4 years?

$O \times M^T = F$

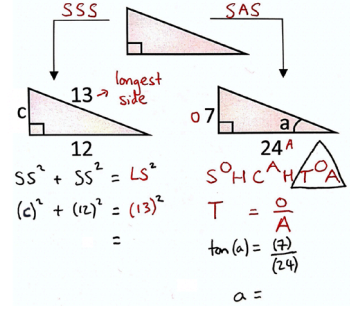
$O = 1500 \quad M = 1.03 \quad T = 4$

$1500 \times 1.03^4 =$

Right-angled Trigonometry

Right-angled triangle	Pythagoras or Trig
Side side side	Pythag, pythag, label the longest side
Side angle side	SOH CAH TOA Label the 2 sides Cover up the one you want And use the formula

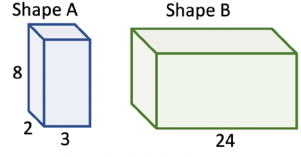
Find the unknown values a and c

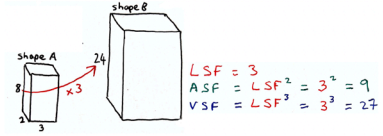


Similar Shapes

2 shapes	Side by side
First thing	Length scale factor
Area scale factor	Length scale factor squared
Volume scale factor	Length scale factor cubed

Find the surface area and volume of shape B (all lengths in cm).





Surface area$_B$ = $SA_A \times ASF$

$= SA_A \times 9$

$=$

Volume$_B$ = $V_A \times VSF$

$= V_A \times 27$

$=$

Biology Unit 1: Organisation

1	**What is digestion of food and why is it important?**	Digestion breaks down large, complex food molecules into smaller ones that can be absorbed directly into the blood
2	**How do our teeth help us digest food?**	They break the food into smaller pieces, to increase the total surface area
3	**What are the functions of saliva in digestion?**	1. To moisten food to allow easier swallowing 2. To start chemical digestion of carbohydrates by enzymes
4	**What are the 7 main food groups?**	In any order: fats, proteins, carbohydrates, fibre, minerals, vitamins and water
5	**Which of the 7 main food groups are large polymer molecules?**	Fats, carbohydrates and proteins
6	**What is a polymer?**	A large molecule made up of repeating units of similar or identical small molecules
7	**How does stomach acid help digestion?**	1. It helps enzymes digest proteins 2. It provides an optimum pH for protease enzymes
8	**What is an enzyme?**	A biological catalyst - a protein that speeds up a reaction without being used up
9	**What is the order in which food passes through the digestive system?**	Mouth -> oesophagus -> stomach -> small intestine -> large intestine -> rectum -> anus
10	**What is the function of the small intestine?**	To absorb sugars, lipids, amino acids, vitamins and minerals from digested food
11	**How is the small intestine adapted to improve absorption of digested molecules**	Structures called villi increase the surface area for increased diffusion into the blood
12	**What is the function of the large intestine?**	To absorb water from the remains of food leaving waste behind
13	**What is bile and where is it made?**	A substance made in the liver that emulsifies fat and neutralises stomach acid
14	**Name where carbohydrase is made in the body**	Salivary glands, pancreas and small intestine

15	**What do carbohydrases break down and what is produced?**	Carbohydrates to simple sugars (e.g. amylase breaks down starch to glucose)
16	**Name where protease is made in the body**	Stomach, pancreas and small intestine
17	**What do proteases break down and what is produced?**	Proteins to amino acids
18	**Where is lipase made in the body?**	Pancreas and small intestine
19	**What do lipases break down and what is produced?**	Lipids (fats) to fatty acids and glycerol
20	**What are the products of digestion used for?**	To build new carbohydrates, lipids and proteins in cells, and for energy
21	**What is the test for protein in food?**	Add Biuret reagent to Sample of food. Reagent turns from blue to purple or violet
22	**What is the test for glucose (sugar) in food?**	Add Benedict's reagent to a sample of food and heat. Reagent turns from blue to orange/red
23	**What is the test for starch in food?**	Add iodine solution to a sample of food. Reagent turns from orange to blue/black
24	**What is the test for fats/lipids in food?**	Add ethanol or Sudan III to food and shake. Upper layer turns cloudy white (red if using Sudan III)
25	**What is the active site of an enzyme?**	Part of the surface which joins to a substrate and where the reaction happens
26	**What is a substrate?**	The molecule that is acted on by an enzyme (for example, being broken down)
27	**Why is the active site of an enzyme called 'complementary'?**	It fits the shape of the substrate perfectly (like a glove fits a hand-ish)
28	**Name two factors that can affect the shape of an enzyme's active site**	pH and (high) temperature
29	**What happens when an enzyme is denatured?**	Its active site changes shape permanently so the substrate can no longer fit

Biology Unit 1: Organisation

30	**In Biology, what do we mean by 'tissue'?**	A group of identical (or very similar) cells working together to do a particular job
31	**In Biology, what do we mean by 'organ'?**	A collection of different types of tissue that all work together to perform a specific function e.g. heart, lungs
32	**In Biology, what is an organ system?**	A group of organs that work together to perform a particular function
33	**Name the human organ systems**	Digestive system, nervous system, circulatory system, skeletal system, reproductive system, endocrine system
34	**Which system transports substances around the body?**	The circulatory system
35	**Name the two types of chambers in the heart and state their relative positions**	Upper chambers - Atria (singular: atrium) Lower chambers - Ventricles
36	**When the muscles in the atria contract, where does the blood go to?**	To the ventricles
37	**When the muscles in the ventricles contract, where does the blood go to?**	Out of the heart, either into the pulmonary artery or into the aorta
38	**What is the job of the heart valves?**	To prevent backflow of blood in the heart
39	**To where does blood flow after leaving the right hand side of the heart?**	The lungs
40	**To where does blood flow after leaving the left hand side of the heart?**	The rest of the body, except the lungs
41	**Which vessels carry blood away from and to the heart?**	Arteries away from and veins to the heart
42	**Which blood vessel takes blood back to the heart from the rest of the body?**	Vena cava
43	**Name the blood vessel by which blood leaves the heart to the lungs**	Pulmonary artery
44	**Name the blood vessel by which blood leaves the lungs to go back to the heart**	Pulmonary vein
45	**Which blood vessels have thick walls containing muscle tissue and elastic fibres?**	Arteries
46	**Which blood vessels have thinner walls and contain valves?**	Veins
47	**Name two key adaptations of capillaries**	Very thin wall (only one cell thick) to reduce distance diffusion must occur across, and very narrow also to reduce this distance
48	**Where is the "natural" pacemaker of the heart located?**	The right atrium
49	**What protects the lungs?**	The rib cage
50	**Which gases diffuse between the bloodstream and the lungs?**	Oxygen from the lungs to the blood, carbon dioxide from the blood to the lungs
51	**Name the structure which carries air from the nose and mouth to the lungs**	Trachea
52	**Name the two structures which branch off from the trachea**	Bronchi (singular: bronchus)
53	**Name the structure which branch off from the bronchi**	Bronchiole(s)
54	**What are the small gas exchange structures in the lungs called?**	Alveoli (singular: alveolus)
55	**Describe adaptations of alveoli to make them an efficient gas exchange surface**	Thin walls (one cell thick); Rich capillary network; Efficient movement of blood through capillaries; Folded inner surface; Alveoli contain mucus
56	**How does having thin walls improve diffusion in the alveoli?**	It decreases the distance that gases have to travel
57	**How does a rich capillary network around the alveoli improve diffusion of gases?**	It increases the size of the gas exchange surface
58	**How does the movement of blood in the capillaries surrounding the alveoli improve diffusion of gases?**	It maintains the concentration gradient between the alveoli and the blood
59	**How does the folded inner surface of the alveoli increase the diffusion of gases?**	It increases the surface area

Biology Unit 1: Organisation

60	**How does the mucus in the alveoli improve diffusion?**	It dissolves gases from the air for more efficient gas exchange
61	**What is the component of blood called that carries all of the blood cells in it?**	Plasma
62	**Which gas dissolves in blood plasma for transport from the organs to the lungs?**	Carbon dioxide
63	**What does blood transport from the small intestine to other organs?**	Soluble products of digestion
64	**What key gas do red blood cells transport?**	Oxygen
65	**What major organelle do red blood cells lack?**	A nucleus
66	**What do red blood cells contain that allows them to carry oxygen?**	Haemoglobin
67	**What do white blood cells do?**	Defend the body against microorganisms
68	**What do platelets do?**	Help clot the blood at wound sites
69	**What are the coronary arteries?**	Supply the heart muscle tissue with blood
70	**What occurs in coronary heart disease (CHD)?**	The coronary arteries become blocked with fatty deposits, narrowing them
71	**How can coronary heart disease cause heart attacks?**	Lack of blood to heart muscle cells means they can't release energy and contract
72	**How do stents treat coronary heart disease?**	Re-opens the blocked coronary artery, restoring blood flow
73	**How do statins treat coronary heart disease?**	Decreases blood concentration of cholesterol, reducing build-up of fatty deposits in the coronary arteries
74	**Why are faulty heart valves life-threatening?**	They allow back-flow of blood in the heart
75	**Name two types of replacement heart valves**	1. Mechanical 2. Biological (e.g. pigs or sheep)
76	**Describe a treatment used in the case of total heart failure**	Heart transplant

77	**Name a risk of surgical intervention in heart disease**	Infection
78	**When would an artificial heart be used?**	1. To allow the heart to rest and recover 2. To keep the patient alive ahead of a transplant
79	**Give examples of plant tissues**	Epidermal, palisade mesophyll, spongy mesophyll, xylem, phloem, meristem
80	**Name three plant organs**	Leaves, stems and roots
81	**What is the role of plant epidermal tissue?**	To cover and protect
82	**What is the role of the palisade mesophyll tissue in plants?**	This is where photosynthesis happens
83	**What is the role of the spongy mesophyll tissue in plants?**	This is where gas exchange occurs
84	**What is the role of xylem tissue in plants?**	Transport of water (and ions) from the roots
85	**What is the role of phloem tissue in plants?**	Transport of dissolved sugars (from the leaves)
86	**What is the role of meristem plant tissue?**	To divide into cells at the growing tips of shoots and roots
87	**What is transpiration?**	Movement of water from roots to leaves, then leaving the leaves via evaporation
88	**Name some factors which affect the rate of transpiration in plants.**	1. Temperature 2. Humidity 3. Air movement 4. Light intensity
89	**What is translocation?**	Movement of sugars from the leaves to the rest of the plant through phloem vessels
90	**Describe the adaptations of xylem tissue**	Hollow tubes strengthened by lignin
91	**Describe the adaptations of phloem tissue**	Elongated cells with pores in the end cell walls to aid movement of dissolved sugars
92	**What is the role of stomata?**	Openings through which water, oxygen and carbon dioxide move in and out of the leaf
93	**What do guard cells do?**	Control the opening and closing of stomata to control water loss and gas exchange in plants

Biology Unit 2: Infection and Response

1	**What is a communicable disease?**	A disease which can be passed on to others
2	**What are the four types of microorganisms that can cause disease?**	Bacteria, viruses, fungi, protists
3	**What are pathogens?**	Microorganisms that cause infectious disease
4	**Name four ways in which diseases caused by pathogens can be spread**	Through air, through water, direct contact (e.g. STDs), vectors
5	**Name four ways in which the spread of diseases can be reduced or prevented**	Hand-washing, safer sex practices, vaccination, eradication of vectors
6	**How do bacteria damage body cells?**	They release harmful molecules called toxins
7	**State the symptoms of the measles virus?**	Fever and a red skin rash
8	**How is the measles virus spread?**	Inhalation of droplets from sneezes and coughs
9	**What are symptoms of Salmonella infection?**	Fever, abdominal cramps, vomiting and diarrhoea
10	**How are Salmonella bacteria spread?**	Under-cooked/unhygienic food preparation
11	**How is the spread of Salmonella controlled in the UK?**	In the UK, chickens are vaccinated against Salmonella to control the spread
12	**What are the symptoms of a Gonorrhoea infection?**	Thick yellow or green discharge from the vagina or penis and pain on urination
13	**How are Gonorrhoea bacteria spread?**	Gonorrhoea is spread by sexual contact
14	**How can the spread of Gonorrhoea be reduced?**	Treatment with antibiotics or use of a barrier method of contraception e.g. condoms
15	**What are the symptoms of athlete's foot?**	Damaged skin and toe nails
16	**What microbe causes athlete's foot?**	A microscopic fungus
17	**How can the spread of athlete's foot be prevented?**	By treating the skin with anti-fungal chemicals and washing clothes regularly.
18	**What are the symptoms of malaria?**	Fever, shaking and liver damage
19	**Which kind of microbe causes malaria?**	A protist
20	**How is malaria spread?**	By mosquitoes
21	**How is the spread of malaria controlled?**	Eradication of vectors (e.g. mosquitoes); use of mosquito nets to avoid being bitten
22	**What are the early symptoms of HIV infection?**	HIV initially causes a flu-like illness
23	**How does HIV lead to AIDS?**	Disables the immune system so it can no longer deal with other infections or cancers
24	**How is HIV spread?**	Sexual contact or exchange of body fluids (e.g. blood) when drug users share needles
25	**Why is there a short delay between infection by a pathogen and feeling ill from the infection?**	Bacteria and viruses reproduce rapidly inside the body but not instantly
26	**Why might viruses cause more damage than bacteria?**	Viruses live and reproduce inside cells, causing cell damage
27	**In what way might bacteria cause damage to cells and tissues?**	Bacteria may produce poisons (toxins) that damage tissues and make us feel ill

Biology Unit 2: Infection and Response

28	**What is Tobacco Mosaic Virus and what type of organism does it affect?**	A widespread plant pathogen affecting many species of plants including tomatoes
29	**What are the symptoms of Tobacco Mosaic Virus?**	A distinctive 'mosaic' pattern of discolouration on the leaves which affects plant growth due to lack of photosynthesis
30	**What is rose black spot disease and how does it spread?**	A fungal disease where purple or black spots develop on leaves, which often turn yellow and drop early. It spreads by water or wind
31	**How does rose black spot fungus affect a plant?**	It affects the growth of the plant as photosynthesis is affected due to discolouration and destruction of the leaves
32	**How can rose black spot be treated?**	Using fungicides and/or removing and destroying the affected leaves
33	**What are the first line non-specific defence systems of the human body against pathogens?**	Skin, nose, trachea and bronchi, stomach
34	**What is the role of the immune system?**	If a pathogen enters the body the immune system tries to destroy the pathogen
35	**Name three ways in which white blood cells help to defend against pathogens**	Phagocytosis, antibody production, antitoxin production
36	**What is phagocytosis (fag-go-sy-toe-sis)?**	A white blood cell surrounds and engulfs a pathogen, then digests it and destroys it
37	**What are antibodies?**	Small proteins that attach to antigens on the outer surface of pathogens
38	**What are antitoxins?**	Small molecules that attach to toxin molecules and stop them being dangerous

39	**What are antigens?**	Small protein molecules on the outside of pathogen cells
40	**What does a vaccination contain?**	A small quantity of dead or inactive forms of a pathogen
41	**What is the purpose of vaccination programmes?**	To prevent illness in individuals and reduce spread of the pathogen in a population
42	**How does the contents of a vaccine prevent future infection?**	Stimulates white blood cells to produce antibodies. If the same pathogen re-enters the body white blood cells respond quickly to produce more of the correct antibodies, preventing infection
43	**What is 'herd immunity'?**	Where enough people in a population are immune so that the spread of disease stops
44	**What are the advantages of a mass vaccination programme?**	1. Protects individuals from a particular pathogen 2. Protects a population against epidemics 3. Reduces days off work and school 4. Reduces the costs to the NHS
45	**Why are children vaccinated against the measles virus?**	Measles is a serious illness that can be fatal if complications arise
46	**Which three diseases are prevented by the MMR vaccine?**	Measles, mumps and rubella
47	**What is an epidemic?**	The spread of an infectious disease throughout a community
48	**What are the disadvantages of a mass vaccination programme?**	1. Can be expensive 2. Some people could have an allergic response to the vaccine 3. May be against people's religious beliefs
49	**What is an antibiotic?**	A drug that kills bacteria (but not other types of pathogen)
50	**What are the current concerns around antibiotic treatment?**	The emergence of bacterial strains resistant to antibiotics means many antibiotics no longer work effectively

Biology Unit 2: Infection and Response

51	**How do antibiotics work?**	Preventing the bacterial cell wall from forming or preventing DNA from replicating
52	**What issues are there with the treatment for Gonorrhoea?**	Easily treated with the antibiotic penicillin until many resistant strains appeared
53	**What is the aim of antiretroviral drugs?**	To stop the virus replicating inside cells
54	**What are the issues with treating viral diseases?**	Antibiotics cannot kill viral pathogens. It is difficult to develop drugs that kill viruses without also damaging the body's tissues
55	**What are painkillers used for?**	Painkillers and other medicines are used to treat the symptoms of disease but do not kill pathogens
56	**Which drug was first made from plants called foxgloves?**	Digitalis (to treat heart disease)
57	**Which drug was first made from willow tree extracts?**	Aspirin (people used to chew on twigs from willow trees to relieve pain!)
58	**Where did we first discover penicillin?**	In a type of fungus (a mould)
59	**What are many modern drugs based on?**	Chemicals found in plants or microorganisms
60	**How are most drugs made now?**	By expert chemists in the pharmaceutical industry
61	**In terms of drugs, what does 'efficacy' mean?**	How well the drug works (treating or reducing the symptoms)
62	**In terms of drugs, what does 'dose' mean?**	A safe amount of drug that is also effective
63	**What do we mean by drug 'toxicity'?**	How dangerous a drug could be
64	**What are 'side effects'?**	Unwanted effects of a drug
65	**What the features of a good medicine?**	Effective, safe, and stable
66	**What is preclinical testing?**	Testing chemical in a laboratory using cells, tissues and live animals
67	**What happens in the first stage of clinical trials?**	Drugs are tested on healthy volunteers to see if the drug is safe
68	**What happens in the second stage of the clinical trial?**	Drugs are tested on healthy volunteers and patients to find the best dose
69	**What is a double-blind trial?**	Where neither the patient nor the doctor knows whether the drug or a placebo is being given to the patient
70	**What is a placebo?**	A tablet which looks like the real medicine but which contains no active drug
71	**Why are placebos used in drugs trials?**	To avoid bias

Biology Unit 2: Bioenergetics

1	**What is the word equation for photosynthesis?**	Carbon dioxide + water -> glucose + oxygen (light above the arrow)
2	**What is the balanced chemical symbol equation for photosynthesis?**	$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
3	**Which gas is a reactant in the photosynthesis reaction?**	Carbon dioxide
4	**Which gas is a product of the photosynthesis reaction?**	Oxygen
5	**What energy transfer occurs in photosynthesis?**	Light energy to chemical energy
6	**Where does photosynthesis occur in a plant or algal cell?**	Chloroplasts
7	**What is the name of the green pigment in chloroplasts?**	Chlorophyll
8	**What is the function of chlorophyll?**	Captures light energy
9	**Which leaf cells are specialised to do photosynthesis?**	Palisade cells (in the leaf)
10	**What are three major factors which affect the rate of photosynthesis?**	Temperature, light intensity, carbon dioxide concentration
11	**What is the relationship between light intensity and rate of photosynthesis?**	The higher the light intensity, the higher the rate of photosynthesis
12	**Which organic molecule is a product of photosynthesis?**	Glucose
13	**Which large carbohydrates molecules are made from glucose in plant cells?**	Starch and cellulose
14	**How do plant cells use glucose?**	Used for respiration, converted into insoluble starch for storage, used to produce fat or oil for storage, used to produce cellulose which strengthens the cell wall and/or used to produce amino acids for protein synthesis
15	**What else, other than glucose, do plants need to produce proteins?**	Nitrate ions
16	**Where are mineral ions absorbed from and through which plant organ?**	From the soil, through the roots
17	**What is the chemical test for starch in a plant's leaf?**	Boil the leaf in water, then use warm alcohol to remove the chlorophyll. Finally add iodine solution; starch produces a dark colour
18	**What is aerobic respiration?**	How energy is released from glucose with oxygen
19	**What is anaerobic respiration?**	How energy is released from glucose without oxygen
20	**Where does aerobic respiration happen in a eukaryotic cell?**	In the mitochondria

Biology Unit 2: Bioenergetics

21	**Where does anaerobic respiration happen in any cell?**	In the cytoplasm
22	**What is the balanced chemical equation for aerobic respiration?**	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
23	**What is the word equation for anaerobic respiration in animal cells?**	Glucose -> lactic acid
24	**What is the word equation for anaerobic respiration in plant and yeast cells?**	Glucose -> ethanol + carbon dioxide
25	**Is more or less energy transferred in anaerobic respiration compared to aerobic respiration?**	Less, due to incomplete breakdown of glucose
26	**How have humans used anaerobic respiration in plant and yeast cells to make food and drink?**	Production of bread and alcoholic drinks
27	**Why does the heart rate increase during exercise?**	To supply more blood to muscle cells
28	**Which reactants for aerobic respiration does the blood contain?**	Glucose (in plasma) and oxygen (in red blood cells)
29	**Name three physical ways in which the human body reacts to an increased demand for energy**	Heart rate, breathing rate and breath volume all increase
30	**Which chemical is produced in respiring muscle cells if there is not enough oxygen?**	Lactic acid
31	**Which complex carbohydrate is stored in the muscle cells to provide chemical energy?**	Glycogen
32	**What is an oxygen debt?**	The amount of extra oxygen the body needs after exercise to react with the accumulated lactic acid and remove it from the cells
33	**What does a build-up of lactic acid cause in muscles?**	Muscle fatigue
34	**What is produced when enzymes chemically break down carbohydrates?**	Simple sugar monomers
35	**What is produced when enzymes chemically break down lipids?**	Fatty acids and glycerol
36	**What is produced when enzymes chemically break down proteins?**	Amino acids
37	**What is "metabolism"?**	The sum of all the reactions in a cell or the body
38	**Where is lactic acid converted back into glucose?**	The liver
39	**How is lactic acid transported to the liver?**	In the blood

Chemistry Unit 3: Quantitative

1	**What is the conservation of mass?**	That atoms cannot be created or destroyed
2	**When a metal forms a metal oxide, why does the mass increase?**	Because oxygen atoms have been added
3	**When an acid reacts with a metal, why does the mass decrease?**	Because a gas is produced and escapes
4	**What is relative formula mass?**	The sum of the relative masses of each atom in a compound
5	**What are the four state symbols and what do they stand for?**	(s) solid (l) liquid (g) gas (aq) aqueous
6	**What symbol do we use for relative formula mass?**	Mr
7	**What is a mole?**	A number of particles
8	**What is Avogadro's number?**	6.022×10^{23}
9	**What formula relates moles, mass and Mr?**	Moles = mass/Mr
10	**What is a limiting reactant?**	A reactant that does not have enough mass to react with all the product
11	**What is the unit for concentration? (Double only)**	g/dm^3
12	**Which formula relates concentration, mass and volume?**	concentration = mass/volume
13	**If the amount of solute in a solution is increased, what happens to its concentration?**	Increases
14	**If the volume of water in a solution is increased, what happens to its concentration?**	Decreases

Chemistry Unit 4: Chemical Changes

1	**What is the reactivity series?**	A list of elements ordered by their reactivity
2	**How can metals be placed in order of their reactivity?**	Add the metals to water or acid and see which ones react the most (by how much fizzing there is)
3	**What is the name for a reaction where oxygen is removed from a compound?**	Reduction
4	**Explain why zinc can be extracted from zinc oxide with carbon but magnesium cannot be extracted from magnesium oxide with carbon**	Magnesium is more reactive than carbon, Zinc is less reactive than carbon, Carbon can therefore remove oxygen from zinc oxide but not magnesium oxide
5	**Explain why gold and silver can be found naturally in the Earth's crust**	They are very unreactive
6	**What process is used to extract metals more reactive than carbon?**	Electrolysis
7	**Define oxidation in the context of loss and gain of electrons**	Oxidation is the loss of electrons
8	**Define reduction in the context of loss and gain of electrons**	Reduction is the gain of electrons
9	**Which of the substances below has been oxidized and which has been reduced? $Al^{3+} + Fe \rightarrow Fe^{3+} + Al$**	Aluminium has been reduced and iron has been oxidised
10	**Show two half equations for the reaction below: $Al^{3+} + Fe \rightarrow Fe^{3+} + Al$**	$Al^{3+} + 3e^- \rightarrow Al$, $Fe \rightarrow Fe^{3+} + 3e$-
11	**Define acid in terms of pH**	A substance with a pH of less than 7
12	**Define acids in terms of ions**	A substance which releases H^+ ions in solution
13	**State the three common acids and give their formulae**	Hydrochloric acid, HCl(aq), Sulphuric acid, H_2SO_4(aq), Nitric acid, HNO_3
14	**Which ions do the common acids form in solution?**	HCl forms H^+ and Cl^-, H_2SO_4 forms $2H^+$ and SO_4^{3-}, HNO_3 forms H^+ and NO_3^-
15	**What is a neutral solution?**	A solution with a pH of 7.
16	**How do you measure pH?**	With an indicator or pH probe.
17	**What is a base?**	A metal oxide, hydroxide or carbonate that will react with an acid. E.g. copper oxide
18	**What is an alkali?**	A soluble base. E.g. sodium hydroxide
19	**Which ions are always present in a solution of an alkali?**	OH^-

Chemistry Unit 4: Chemical Changes

20	**What is a salt?**	A compound formed when some or all of the hydrogen from an acid is replaced by a metal
21	**What type of salts are formed by the three main acids?**	Hydrochloric acid produces chlorides, sulphuric acid = sulphates, nitric acid = nitrates
22	**What is a neutralisation reaction?**	A reaction involving an acid that results in a neutral solution
23	**Which ions always react together in a neutralization reactions between acids and alkalis?**	H^+ and OH^-
24	**Write the equation showing the reaction between H+ and OH^- ions**	$H^+ + OH^- \rightarrow H_2O$
25	**Complete the equation: metal + acid →**	→ salt + hydrogen gas
26	**Complete the equation: metal hydroxide + acid →**	→ salt + water
27	**Complete the equation: metal oxide + acid →**	→ salt + water
28	**Complete the equation: metal carbonate + acid →**	→ salt + water + carbon dioxide
29	**How do you make a soluble salt from an acid?**	React the acid with a base.
30	**If a salt is in solution, how do you extract it as a solid?**	Allow the water to evaporate off (crystallisation)
31	**What is a strong acid?**	An acid which completely splits up into its ions in water. E.g. when HCl is in water all the HCl molecules split up into H^+ and Cl^-
32	**What is a weak acid?**	An acid which will have some molecules which do not split up into their ions when in water.
33	**What is the relationship between the strength of an acid and its pH?**	As an acid increases in strength the pH decreases.
34	**What is a concentrated acid?**	An acid where there are lots of acid particles in the water.
35	**What is a dilute acid?**	An acid where there are fewer acid particles in the water.
36	**How is pH measured?**	pH is related to the concentration of H^+ in a solution.
37	**Which ions are in NaCl**	Na^+ and Cl^-
38	**Which ions are in $CaCO_3$**	Ca^{2+} and CO_3^{2-}
39	**Which ions are in $Mg(OH)_2$**	Mg^{2+} and 2 ions of OH^-
40	**Which ions are in H_2SO_4**	2 ions of H^+ and one SO_4^{2-}
41	**Which ions are in NH_4OH**	NH_4^+ and OH^-

Chemistry Unit 4: Chemical Changes

42	**Which ions are in $(NH_4)_2O$**	2 ions of NH_4^+ and one O^{2-}
43	**What is the formula of calcium chloride?**	$CaCl_2$
44	**What is the formula of aluminium nitrate?**	$Al(NO_3)_3$
45	**What is the formula of iron (III) oxide?**	Fe_2O_3
46	**What is the formula of magnesium fluoride?**	MgF_2
47	**What is the formula of sodium sulphate?**	Na_2SO_4
48	**What is the formula of copper (I) oxide**	Cu_2O
49	**Is this process oxidation or reduction? $Al \rightarrow Al^{3+} + 3e^-$**	Oxidation
50	**Is this process oxidation or reduction? $Na^+ + e^- \rightarrow Na$**	Reduction
51	**Is this process oxidation or reduction? $F_2 + 2e^- \rightarrow 2F^-$**	Reduction
52	**Is this process oxidation or reduction? $Fe^{2+} \rightarrow Fe^{3+} + e^-$**	Oxidation
53	**Balance this ionic equation: $Ca + Na^+ \rightarrow Ca^{2+} + Na$**	$Ca + 2Na^+ \rightarrow Ca^{2+} + 2Na$
54	**Balance this ionic equation: $Mg^{2+} + Na \rightarrow Na^+ + Mg$**	$Mg^{2+} + 2Na \rightarrow 2Na^+ + Mg$
55	**Balance this ionic equation: $Al + Ca^{2+} \rightarrow Al^{3+} + Ca$**	$2Al + 3Ca^{2+} \rightarrow 2Al^{3+} + 3Ca$
56	**In this reaction, what has been oxidised and what has been reduced? $Mg^{2+} + 2Na \rightarrow 2Na^+ + Mg$**	Na has been oxidised, Mg^{2+} has been reduced
57	**In this reaction, what has been oxidised and what has been reduced? $2Al + 3Ca^{2+} \rightarrow 2Al^{3+} + 3Ca$**	Al has been oxidised, Ca^{2+} has been reduced
58	**In this reaction, what has been oxidised and what has been reduced? $K + Na^+ \rightarrow K^+ + Na$**	K has been oxidized, Na^+ has been reduced
59	**What is electrolysis?**	Using electricity to break down a substance
60	**What happens to an ionic substance when it is melted or dissolved in water?**	The ions become free to move around
61	**What is the name for the positive electrode?**	The anode
62	**What is the name for the negative anode?**	The cathode
63	**Are positive ions attracted to the anode or the cathode?**	Cathode

Chemistry Unit 4: Chemical Changes

64	**Are negative ions attracted to the anode or the cathode?**	Anode
65	**At which electrode would $Zn^{2+}(aq)$ turn into $Zn(s)$?**	Cathode (needs to gain electrons)
66	**At which electrode would $Cl^{-}(aq)$ turn into $Cl_2(g)$?**	Anode (needs to lose electrons)
67	**Balance the half equation: $Al^{3+} + e^{-} \rightarrow Al$**	$Al^{3+} + 3e^{-} \rightarrow Al$
68	**Balance the half equation: $Cl^{-} \rightarrow Cl_2 + e^{-}$**	$2Cl^{-} \rightarrow Cl_2 + 2e^{-}$
69	**Balance the half equation: $O^{2-} \rightarrow O_2 + e^{-}$**	$2O^{2-} \rightarrow O_2 + 4e^{-}$
70	**What will be the products for the electrolysis of molten iron bromide?**	Iron and bromine
71	**What will be the products for the electrolysis of molten zinc oxide?**	Zinc and oxygen
72	**What will be the products for the electrolysis of molten sodium chloride?**	Sodium and chlorine
73	**For the extraction of which metals is electrolysis needed?**	Ones more reactive than carbon, e.g. aluminium
74	**What are the two main disadvantages of using electrolysis to extract metals?**	Requires a large amount of energy to melt the compounds and to produce the necessary electricity
75	**Why is aluminium oxide mixed with cryolite when extracting aluminium?**	To lower the melting point
76	**What is produced at the anode and cathode in the electrolysis of aluminium oxide?**	Aluminium at the cathode and oxygen at the anode
77	**Why does the anode need to be replaced in the electrolysis of aluminium oxide?**	The anode wears away because the oxygen produced reacts with the carbon electrode to form carbon dioxide.
78	**What is produced at the cathode in the electrolysis of solutions?**	If the metal is less reactive than hydrogen, the metal is produced. If it is more reactive than hydrogen, hydrogen is produced.
79	**In the electrolysis of sodium chloride solution, what are the products?**	Chlorine gas and hydrogen gas
80	**Why is sodium not produced in the electrolysis of sodium chloride solution?**	It is more reactive than hydrogen so hydrogen is produced instead.
81	**What is produced at the anode in electrolysis of solutions?**	Either a halogen or oxygen (when there is no halogen present)

Chemistry Unit 5: Energy Changes

1	**State the law of conservation of energy.**	Energy cannot be created or destroyed, it can only transferred from one place to another.
2	**How does the law of conservation of energy apply to chemistry?**	In all chemical reactions, energy is either transferred to the surroundings or from the surroundings.
3	**What is an exothermic reaction?**	A reaction where energy is transferred to the surroundings.
4	**Give two examples of exothermic reactions.**	Combustion, respiration
5	**What happens to the temperature of the surroundings during an exothermic reaction?**	They increase. The thermometer is included in "the surroundings" so shows the temperature increasing.
6	**What is an endothermic reaction?**	A reaction where energy is transferred from the surroundings.
7	**Give two examples of endothermic reactions.**	Thermal decomposition reactions, citric acid and sodium hydrogencarbonate.
8	**What happens to the temperature of the surroundings during an endothermic reaction?**	They decrease. The thermometer is included in "the surroundings" so shows the temperature decreasing.
9	**State two uses of exothermic reactions**	Self-heating cans, hand warmers
10	**State two uses of endothermic reactions**	Some cooling sports injury packs
11	**What are reactants?**	The substances involved in a chemical reaction
12	**What are products?**	The substances formed when reactants have a chemical reaction
13	**What is a reaction profile?**	A diagram which shows whether the reactants have more or less energy than the products.
14	**If the reactants have more energy than the products, what kind of a reaction must have taken place?**	An exothermic one. The missing energy has been transferred to the surroundings.
15	**If the reactants have less energy than the products, what kind of a reaction must have taken place?**	An endothermic one. The extra energy has been take in by the surroundings.
16	**Is breaking bonds endothermic or exothermic?**	Endothermic.
17	**Is making bonds endothermic or exothermic?**	Exothermic.
18	**How do we work out the overall energy change of a reaction?**	Work out the difference between the energy needed to break all the bonds in the reactants and the energy released to form all the bonds in the products.

Physics Unit 2: Electricity

1	What does LDR stand for?	Light dependent resistor
2	What does LED stand for?	Light emitting diode
3	What is a battery?	Two or more cells together
4	How are ammeters connected?	In the loop/in series
5	How are voltmeters connected?	Across the component/in parallel
6	What are the 3 types of charge?	Positive, negative and neutral
7	What is the relative charge of an electron?	-1
8	What is the unit of charge?	coulomb or C
9	Why are certain materials electrical conductors?	They contain delocalised electrons
10	What do we call materials which are not electrical conductors?	Electrical insulators
11	What does the word rate mean?	Per second
12	Define current.	The rate of flow of charge
13	State the unit of current.	amps or A
14	What does 1 A mean?	1 coulomb per second
15	What component measures current?	Ammeter
16	Which particles are responsible for electricity in circuits?	Electrons
17	What are two common types of power supply?	Cells/batteries and mains
18	Define potential difference.	Energy transferred per unit of charge
19	The potential difference of a power supply is…	The energy the power supply transfers to each unit of charge
20	The potential difference across a component is…	The energy each unit of charge transfers to the component
21	What is voltage usually called?	Potential difference
22	State the unit of potential difference.	volts or V

23	What does 1 V mean?	1 joule per coulomb
24	What component measures potential difference?	Voltmeter
25	State the unit of resistance.	ohms or Ω
26	Which direction does conventional current flow?	Positive to negative
27	Which direction do electrons flow?	Negative to positive
28	State the equation linking current, charge and time using words.	Charge = Current x Time
29	What symbol is used instead of writing the word 'charge'?	Q
30	What symbol is used instead of writing the word 'current'?	I
31	What symbol is used instead of writing the word 'time'?	t
32	State the equation linking current, charge and time using symbols	Q = It
33	State the name AND the power of 10 for this prefix: T	Tera, 10 to the power of 12
34	State the name AND the power of 10 for this prefix: G	Giga, 10 to the power of 9
35	State the name AND the power of 10 for this prefix: M	Mega, 10 to the power of 6
36	State the name AND the power of 10 for this prefix: k	Kilo, 10 to the power of 3
37	State the name AND the power of 10 for this prefix: c	Centi, 10 to the power of -2
38	State the name AND the power of 10 for this prefix: m	Milli, 10 to the power of -3
39	State the name AND the power of 10 for this prefix: μ	Micro, 10 to the power of -6
40	State the name AND the power of 10 for this prefix: n	Nano, 10 to the power of -9

Physics Unit 2: Electricity

41	State the equation linking potential difference, charge and energy using words.	Energy = Charge × Potential Difference
42	What symbol is used instead of writing the words 'potential difference'?	V
43	What symbol is used instead of writing the word 'energy'?	E
44	State the equation linking potential difference, charge and energy using symbols.	E = QV
45	State the equation linking potential difference, current and resistance using words.	Potential Difference = Current x Resistance
46	What symbol is used instead of writing the word 'resistance'?	R
47	State the equation linking potential difference, resistance and current using symbols.	V = IR
48	How are resistance and current related when potential difference is constant?	Inversely proportional OR as resistance increases, current decreases
49	How are potential difference and current related when resistance is constant?	Directly proportional OR as potential difference increase, current increases
50	How do we check that 2 variables are directly proportional?	Divide the variables at least 3 times. Answer should be the same every time.
51	How do we check that 2 variables are inversely proportional?	Multiply the variables at least 3 times. Answer should be the same every time.
52	What is a variable resistor?	A component whose resistance can be changed
53	State the relationship between the length of a wire and its resistance	Directly proportional
54	What does directly proportional look like on a graph?	Straight line through the origin
55	When current passes through wires and components, what happens to them?	They heat up

56	How does the temperature of a wire affect its resistance?	As temperature increases, resistance increases
57	Why do we switch circuits off between readings?	So the wires don't heat up and increase resistance
58	When resistors are connected in series the total resistance is…	The sum of the resistances
59	When resistors are connected in parallel the total resistance is…	Less than the lowest resistance
60	Why is total resistance lower than the smallest resistance when resistors are connected in parallel?	More paths means more current. More current means less resistance.
61	What do we call graphs which show the relationship between current and potential difference for a component	I-V plots
62	Why are variable resistors used in circuits to measure the I-V characteristics of components?	To vary the current and potential difference of the component.
63	State the relationship between current and potential difference for an ohmic conductor.	Current is directly proportional to potential difference at constant temperature
64	State an example of an ohmic conductor.	A wire or a fixed resistor
65	Is a wire at a constant temperature an ohmic conductor?	Yes
66	Is a fixed resistor at a constant temperature an ohmic conductor?	Yes
67	Is a filament lamp an ohmic conductor?	No
68	Is a diode an ohmic conductor?	No
69	Why are wires and resistors ohmic conductors?	Their resistance stays constant as current changes
70	Why are filament lamps and diodes not ohmic conductors?	Their resistance changes as current changes
71	State another name for an ohmic conductor.	Linear

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72	State another name for a non-ohmic conductor.	Non-linear
73	Why does the resistance of a filament lamp increase as current increases?	The temperature of the filament increases causing ions to vibrate more
74	How does the resistance of a filament lamp change as the potential difference across it increases?	Current increases so temperature increases so resistance increases
75	State the properties of a diode.	Current only flows through a diode in one direction.
76	Describe the resistance properties of a thermistor.	As temperature increases, resistance of thermistor decreases.
77	What happens to the resistance of a thermistor as it gets hotter?	Decreases
78	What happens to the resistance of a thermistor as it gets colder?	Increases
79	Describe the resistance properties of an LDR.	As light intensity increases, resistance of LDR decreases.
80	What happens to the resistance of an LDR as it gets brighter?	Decreases
81	What happens to the resistance of an LDR as it gets darker?	Increases
82	State an example of an application of a thermistor in a circuit.	A thermostat
83	State an example of an application of an LDR in a circuit.	Automatic lighting
84	In what type of circuit are all the components in one loop?	Series
85	In what type of circuit are the components in multiple loops?	Parallel
86	In a circuit, one component breaks and all the components stop working. What type of circuit is it?	Series
87	In a circuit, one component breaks and all the other components still work. What type of circuit is it?	Parallel
88	State the current rule for components connected in series.	Same current through each component
89	State the potential difference rule for components connected in series.	Potential difference of power supply is shared between the components
90	State the current rule for components connected in parallel.	The total current of the circuit is the sum of the currents through the components
91	State the potential difference rule for components connected in parallel.	The potential difference across each component is the same
92	When cells are connected together in series, how is the total potential difference calculated?	Add the potential differences of the cells together
93	What does dc stand for?	Direct current
94	What does ac stand for?	Alternating current
95	Describe direct current.	Current that is always in the same direction
96	Describe alternating current.	Current repeatedly reverses direction
97	Describe the potential difference of an ac supply	Continuously reverses polarity
98	What is the frequency of the domestic ac supply in the UK?	50 Hz
99	What does the word frequency mean in physics?	Number of cycles per second
100	State the unit of frequency.	hertz or Hz
101	What is the potential difference of the domestic ac supply in the UK?	230 V
102	Are batteries dc or ac?	dc
103	Is the mains supply dc or ac?	ac
104	What are the 3 wires in a three-core cable?	Live, neutral and earth

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105	**Which wire in a three-core cable is brown?**	Live
106	**Which wire in a three-core cable is blue?**	Neutral
107	**Which wire in a three-core cable has green and yellow stripes?**	Earth
108	**What colour is the live wire in a three-core cable?**	Brown
109	**What colour is the neutral wire in a three-core cable?**	Blue
110	**What colour is the earth wire in a three-core cable?**	Green and yellow stripes
111	**What surrounds the outside of wires in household electrical goods?**	Electrical insulation
112	**Which wire in a three-core cable carries the alternating potential difference from the supply?**	Live
113	**Which wire in a three-core cable completes the circuit?**	Neutral
114	**Which wire in a three-core cable is a safety wire to stop the appliance becoming live?**	Earth
115	**What is the potential difference between the live wire and earth?**	230 V
116	**What is the potential difference between the neutral wire and earth?**	0 V
117	**What is the potential of the earth wire?**	0 V
118	**Describe the role of a fuse in a circuit.**	It melts and breaks the circuit if the current is above a certain value
119	**Which wire in a three-core cable is the fuse connected to?**	Live
120	**State 2 risks of electricity.**	Electrocution and fire
121	**Why is it dangerous for the live wire to touch the neutral or earth wire?**	Short circuit, low resistance, high current, fire
122	**Why is it dangerous to touch a live wire, even when the circuit is off?**	Electrocution
123	**Define power.**	Energy transferred per second
124	**State the equation linking current, potential difference and power using words.**	Power = Current x Potential Difference
125	**What symbol is used instead of writing the word 'power'?**	P
126	**State the unit of power.**	watts or W
127	**State the equation linking current, potential difference and power using symbols.**	P = IV
128	**State the equation linking current, resistance and power using words.**	Power = current^2 x resistance
129	**State the equation linking current, resistance and power using symbols.**	P = I2R
130	**What store of energy does an electric motor have?**	Kinetic
131	**State the equation linking time, energy and power using words.**	Energy = Power x time

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132	State the equation linking time, energy and power using symbols.	E = Pt
133	What is the name given to the system of cables and transformers linking power stations to consumers?	The National Grid
134	What are the two parts of The National Grid?	Cables and Transformers
135	What do step-up transformers do?	Increase the potential difference
136	What do step-down transformers do?	Decrease the potential difference
137	How do step-up transformers increase the efficiency of energy transfer in The National Grid?	Increasing potential difference decreases current, reducing energy loss due to heat
138	Which type of materials become electrically charged when rubbed against each other?	Insulators
139	Which particles move from one material to another to cause a build up of static charge?	Electrons
140	When electrons move from one material to another, which material builds up a positive charge?	The material which loses electrons
141	When electrons move from one material to another, which material builds up a negative charge?	The material which gains electrons
142	Describe the force when 2 positively charged objects are brought close together.	Repulsion OR they repel
143	Describe the force when 2 negatively charged objects are brought close together.	Repulsion OR they repel
144	Describe the force when a positively charged object is brought close to a negatively charged object.	Attraction OR they attract
145	Is the electrostatic force a contact or non-contact force?	Non-contact
146	Which force between surfaces is responsible for electrons transferring from one material to the other?	Friction
147	Why does friction between objects cause the objects to become charged?	Electrons transfer from one object to the other
148	What name is given to the region of space around a charged object?	Electric field
149	How does the strength of an electric field depend on the distance from the charged object?	The greater the distance from the charged object, the weaker the electric field
150	When an charged object is placed in an electric field, what does it experience?	A force
151	How does the size of the force between charged objects depend on their distance apart?	The greater the distance between the charged objects, the weaker the force
152	When drawing the electric field around a positively charged object, which way do the arrows point?	Away from the object
153	When drawing the electric field around a negatively charged object, which way do the arrows point?	Towards the object
154	When drawing the electric field around a charged object, what must you ensure?	(1) At least 4 arrows, (2) pointing in the right direction, (3) perpendicular to and (4) touching the surface
155	When the potential difference between a charged object and a neutral object is high enough, what can happen?	Sparking

Physics Unit 3: Particle Model of Matter

1	**In the particle model of matter, what are 'particles'?**	Atoms, molecules or ions
2	**What are the 3 states of matter?**	Solid, liquid and gas
3	**Describe the arrangement of particles in a solid.**	Closely packed, regular arrangement
4	**Describe the motion and kinetic energy of the particles in a solid.**	Vibrate about fixed positions, low kinetic energy
5	**Describe the forces between particles in a solid.**	Strong
6	**Describe the arrangement of particles in a liquid.**	Closely packed, not regular arrangement
7	**Describe the motion and kinetic energy of the particles in a liquid.**	Move around, higher kinetic energy than in a solid
8	**Describe the forces between particles in a liquid.**	Weaker than in a solid
9	**Describe the arrangement of particles in a gas.**	Far apart
10	**Describe the motion of the particles in a gas.**	Move freely and randomly with a range of speeds and directions
11	**Describe the kinetic energy of the particles in a gas.**	High
12	**Describe the forces between particles in a gas.**	Almost zero
13	**Which state of matter: Particles closely packed and vibrate on the spot.**	Solid
14	**Which state of matter: Particles close together and can move over each other.**	Liquid
15	**Which state of matter: Particles far apart and move freely.**	Gas
16	**When a force decreases the volume of a substance the substance has been …**	Compressed
17	**Which state(s) of matter can be compressed?**	Gas
18	**Why can gases be compressed?**	There is space between the particles
19	**Why can't liquids and solids be compressed?**	There isn't space between the particles
20	**Which state(s) of matter take the shape of their container?**	Liquid and gas
21	**Why do liquids and gases take the shape of their container?**	The particles can move around
22	**Why don't solids take the shape of their container?**	The particles can't move around
23	**Which state(s) of matter can flow?**	Liquid and gas
24	**Why can liquids and gases flow?**	The forces between particles are weak enough for the particles to move around
25	**Why can't solids flow?**	The forces between particles are too strong so the particles can't move around
26	**Which state of matter is usually the best conductor of heat and electricity?**	Solid
27	**Why are solids usually the best conductors of heat and electricity?**	The particles are closely packed
28	**When the volume of a substance increases due to an increase in temperature the substance has …**	Expanded
29	**Why do substances expand when heated?**	The particles gain kinetic energy and move further apart
30	**Name the state change: Solid to liquid.**	Melting
31	**Name the state change: Liquid to gas.**	Boiling
32	**Name the state change: Gas to liquid.**	Condensing
33	**Name the state change: Liquid to solid.**	Freezing
34	**Name the state change: Solid to gas.**	Sublimation
35	**Which state changes can occur when a substance is heated?**	Melting and boiling

Physics Unit 3: Particle Model of Matter

36	**Which state changes can occur when a substance is cooled?**	Condensing and freezing
37	**At what temperature do melting and freezing take place?**	The melting point
38	**Why do substances have different melting points?**	Different forces between particles
39	**At what temperature do melting and freezing take place for water?**	0°C
40	**At what temperature do boiling and condensing take place?**	The boiling point
41	**At what temperature do boiling and condensing take place for water?**	100°C
42	**What is conserved during changes of state?**	Mass
43	**Why is mass conserved during state changes?**	No particles are added or taken away
44	**Are changes of state reversible or irreversible?**	Reversible
45	**Are changes of state physical or chemical changes?**	Physical
46	**Why are changes of state physical changes?**	They are reversible and no new substance is made
47	**What is evaporation?**	The change from liquid to gas below the boiling point
48	**What name is given to the mass per unit volume of a material?**	Density
49	**Define density.**	Mass per unit volume
50	**What is volume?**	The amount of space an object fills
51	**State the unit of volume.**	m^3 or cubic metres
52	**Which state of matter is usually the most dense?**	Solid
53	**Which state of matter is usually the least dense?**	Gas

54	**Why are solids usually denser than liquids and gases?**	More particles per unit volume
55	**Why do substances usually get less dense when heated?**	The particles gain kinetic energy and move further apart
56	**What happens to the density of a gas when it is compressed?**	Increases
57	**What happens to the density of a substance when it is heated and expands**	Decreases
58	**What symbol is used instead of writing the word 'density'?**	ρ (the Greek letter rho)
59	**What symbol is used instead of writing the word 'mass'?**	m
60	**What symbol is used instead of writing the word 'volume'?**	V
61	**State the unit of mass.**	kg or kilogram
62	**State the unit of density.**	kg/m3 or kilogram per cubic metre
63	**State the equation linking density, mass and volume.**	Mass = density x volume
64	**State the equation linking density, mass and volume using symbols.**	m = ρV
65	**How is density related to floating?**	Less dense substances float on more dense substances
66	**Why do hotter fluids rise above colder fluids?**	Hotter fluids are less dense than colder fluids
67	**What piece of equipment is used to measure mass?**	Mass balance
68	**What piece of equipment is used to measure the volume of a liquid?**	Measuring cylinder
69	**What piece of equipment is used to measure length?**	Ruler
70	**What piece of equipment allows length to be measured much more accurately than a ruler?**	Micrometer OR vernier callipers

Physics Unit 3: Particle Model of Matter

71	**How is the volume of a cuboid found?**	Length × width × height
72	**How is the volume of an irregular solid found?**	Displacement of water
73	**How do you convert from g into kg?**	÷ 1000
74	**How do you convert from cm3 to m3?**	÷ 1,000,000
75	**In what case would an object absorb heat from the surroundings?**	When the surroundings are hotter than the object.
76	**In what case would an object lose heat to the surroundings?**	When the surroundings are colder than the object.
77	**When the kinetic energy of the particles in a substance increases, what happens to the substance?**	Temperature increases
78	**When the kinetic energy of the particles in a substance decreases, what happens to the substance?**	Temperature decreases
79	**What is a system?**	A group of interacting parts
80	**When particles move faster, their ..... energy increases.**	Kinetic
81	**When particles move further apart, their ..... energy increases.**	Potential
82	**What name is given to the total kinetic and potential energy of all the particles in a system?**	Internal energy
83	**Define internal energy.**	The total kinetic and potential energy of all the particles in a system
84	**When a substance is heated and increases in temperature without changing state its particles gain ..... energy.**	Kinetic
85	**When a substance is heated and changes state without changing temperature its particles gain ..... energy.**	Potential
86	**Which part of internal energy relates to changes of temperature?**	Kinetic energy

87	**Which part of internal energy relates to changes of state?**	Potential energy
88	**On a cooling or heating curve, what is happening in the sloping sections?**	Change of temperature
89	**On a cooling or heating curve, what is happening in the horizontal sections?**	Change of state at constant temperature
90	**What is room temperature approximately?**	20°C
91	**What piece of equipment is used to measure temperature?**	Thermometer
92	**When the temperature of a system is increased, what 3 things affect how much the temperature changes?**	Mass, type of material and energy input
93	**Define the specific heat capacity of a substance.**	Amount of energy needed to increase the temperature of 1 kg of the substance by 1°C
94	**State the unit of specific heat capacity.**	joules per kilogram per degree Celsius OR J/kg°C
95	**State the unit of energy.**	joules OR J
96	**State the unit of temperature.**	degrees Celsius or °C
97	**What symbol is used instead of writing the word 'energy'?**	E
98	**What symbol is used instead of writing the words 'specific heat capacity'?**	c
99	**What symbol is used instead of writing the word 'temperature'?**	θ (the Greek letter theta)
100	**What symbol is used instead of writing the word 'change'?**	Δ (the Greek letter delta)
101	**The amount of energy needed to change the state of 1 kg of the substance with no change in temperature is called the ...**	Specific latent heat
102	**Define the specific latent heat of fusion of a substance.**	Amount of energy needed to melt 1 kg of the substance with no change in temperature

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103	**Define the specific latent heat of vaporisation of a substance.**	Amount of energy needed to boil 1 kg of the substance with no change in temperature
104	**State the unit of specific latent heat.**	joules per kilogram OR J/kg
105	**What symbol is used instead of writing the words 'specific latent heat'.**	L
106	**Latent heat of fusion relates to which state change?**	Solid to liquid OR melting
107	**Latent heat of vaporisation relates to which state change?**	Liquid to gas OR boiling
108	**Why does ice melt faster when placed on most metals than on most non-metals?**	Metals are better conductors of heat
109	**Why does ice melt faster when placed on a surface which is a better conductor of heat?**	Heat transfers to the ice faster
110	**The force exerted by particles in a gas colliding with each other and the walls of the container causes …**	Gas pressure
111	**What causes gas pressure?**	Collisions of particles
112	**In what 3 ways can gas pressure be increased?**	Smaller volume, higher temperature, more particles
113	**State the relationship between temperature and pressure (when volume is kept constant).**	Directly proportional
114	**Explain why increasing the temperature of a gas increases the gas pressure.**	Particles have more kinetic energy and move faster so collide more often with a greater force
115	**Explain why decreasing the temperature of a gas decreases the gas pressure.**	Particles have less kinetic energy and move slower so collide less often with a smaller force
116	**Complete this sentence: Decreasing the temperature of a gas ……. the gas pressure.**	Decreases
117	**Complete this sentence: Increasing the temperature of a gas ……. the gas pressure.**	Increases
118	**State the relationship between volume and gas pressure (when temperature is kept constant).**	Inversely proportional

119	**Explain why increasing the volume of a gas decreases the gas pressure.**	Particles are further apart so collide less often
120	**Explain why decreasing the volume of a gas increases the gas pressure.**	Particles are closer together so collide more often
121	**Complete this sentence: Decreasing the volume of a gas ……. the gas pressure.**	Increases
122	**Complete this sentence: Increasing the volume of a gas ……. the gas pressure.**	Decreases
123	**When the pressure inside a closed container is much bigger than the pressure outside the container, what can happen?**	Explosion
124	**When the pressure outside a closed container is much bigger than the pressure inside the container, what can happen?**	Implosion/collapse
125	**When the pressure outside an open container is bigger than the pressure inside, what happens?**	Air moves into the container
126	**When the pressure inside an open container is bigger than the pressure outside, what happens?**	Air moves out of the container
127	**What symbol is used instead of writing the word 'pressure'?**	p
128	**State the unit of pressure.**	pascals or Pa
129	**What is 'work' in physics?**	The energy transfer by a force
130	**When work is done on a gas what happens to the gas?**	Internal energy and temperature increases
131	**Why does the internal energy of the air in a tyre increase when the tyre is pumped up?**	Work is done on the air so the air's temperature increases
132	**How can gas turn to liquid without increasing temperature?**	Increasing pressure

Physics Unit 4: Atomic Structure

1	State the approximate radius of an atom.	1 x 10^{-10} m
2	Fill in the blank: The radius of the ..... is less than 1/10000 of the radius of the atom.	Nucleus
3	Approximately how many times smaller than the radius of an atom is the radius of a nucleus?	10,000
4	State the names of the 3 particles which make up atoms.	Protons, neutrons and electrons
5	Which particles are found in the nucleus of atoms?	Protons and neutrons
6	Which particles orbit the nucleus?	Electrons
7	Where are the protons and neutrons found in an atom?	Nucleus
8	Where are the electrons found in an atom?	Orbiting the nucleus
9	Where is most of the mass of an atom concentrated?	Nucleus
10	Where is the positive charge of an atom concentrated?	Nucleus
11	State the relative charge of a proton.	+1
12	State the relative charge of a neutron.	0
13	State the relative charge of an electron.	-1
14	State the relative mass of a proton.	1
15	State the relative mass of a neutron.	1
16	State the relative mass of an electron.	About 1/2000 (very small)
17	The electrons are arranged at different distances from the nucleus. What are these different distances called?	Energy levels
18	How can an electron move to a higher energy level (further from the nucleus)?	Electron absorbs electromagnetic radiation
19	How can an electron move to a lower energy level (closer to the nucleus)?	Electron emits electromagnetic radiation
20	What can happen to an electron when it absorbs electromagnetic radiation?	Moves to a higher energy level
21	What can happen to an electron when it emits electromagnetic radiation?	Moves to a lower energy level
22	If most of the mass of an atom is concentrated in the nucleus, what does this mean about the rest of the atom?	Mostly empty space
23	In an atom, the number of what particle is equal to the number of protons?	Electrons
24	Why do atoms have no overall electrical charge?	Equal number of protons and electrons
25	What word do we use when something has no overall electrical charge?	Neutral
26	State the overall charge of an atom.	0
27	All atoms of a particular element have the same number of which particle?	Protons
28	What is the number of protons in an atom of an element called?	Atomic number
29	What is the atomic number of an atom?	The number of protons (which is also the number of electrons)
30	What is the total number of protons and neutrons in an atom called?	Mass number
31	What is the mass number of an atom?	The total number of protons and neutrons
32	When representing an atom as a symbol, what does the smaller number represent?	The number of protons (which is also the number of electrons) OR the atomic number
34	When representing an atom as a symbol, what does the bigger number represent?	The total number of protons and neutrons OR the mass number
35	When atoms of the same element have different numbers of neutrons what are these atoms called?	Isotopes
36	What are isotopes?	Atoms of the same element with different numbers of neutrons
37	If atoms lose one or more outer electrons, what do they become?	Positive ions

Physics Unit 4: Atomic Structure

38	If atoms gain one or more outer electrons, what do they become?	Negative ions
39	What can lead to a scientific model being changed or replaced?	New experimental evidence
40	Before the discovery of the electron, what did people think atoms were?	Tiny indivisible spheres
41	Which model suggested that the atom is a ball of positive charge with negative electrons embedded within it?	Plum pudding model
42	Describe the plum pudding model of the atom.	Ball of positive charge with embedded negative electrons
43	Which experiment led to the nuclear model of the atom?	Alpha particle scattering experiment OR Rutherford's gold foil experiment
44	Which model suggests that the mass of the atom is concentrated in the centre in a positively charged nucleus?	Nuclear model
45	Describe the nuclear model of the atom.	Dense, positively charged nucleus surrounded by orbiting electrons.
46	Which model replaced the plum pudding model of the atom?	Nuclear model
47	Which model of the atom was proved wrong by the alpha scattering experiment?	Plum pudding model
48	What did Niels Bohr add to the nuclear model?	Orbiting electrons
49	Which scientist suggested that electrons orbit the nucleus at specific distances?	Bohr
50	What did James Chadwick discover about the atom?	Neutrons
51	Which scientist showed that neutrons exist?	Chadwick
52	How did the alpha scattering experiment show there is a dense, positively charged nucleus in the centre of the atom?	Some alpha particles rebounded at more than 90°

53	How did the alpha scattering experiment show that the atom is mostly empty space?	Most alpha particles went straight through
54	In the alpha scattering experiment, why are the alpha particles repelled from the nuclei?	Nuclei and alpha particles both have a positive charge and like charges repel
55	Describe radioactive decay.	Unstable nuclei emit radiation to become more stable
56	What name is given to the process where unstable nucleis emit radiation to become more stable?	Radioactive decay
57	How does an unstable nucleus become more stable?	Emitting radiation
58	What is a radioactive source?	The object which emits nuclear radiation
59	Complete the sentence: Radioactive decay is a ..... process.	Random
60	Define 'activity'.	Rate of nuclear decay
61	What word means 'the rate of nuclear decay'?	Activity
62	State the unit of activity.	becquerel OR Bq
63	What does 'becquerels/Bq' mean?	Number of decays per second
64	Define 'count rate'.	Number of decays recorded per second by a detector
65	What phrase means 'the number of decays per second recorded by a detector?'	Count-rate
66	Why is count rate always less than activity?	Only some of the radiation passes into the detector
67	State the name of a radioactive decay detector.	Geiger-Muller tube
68	What is an alpha particle?	2 protons and 2 neutrons
69	An alpha particle is the same as a nucleus of what element?	Helium
70	What is the difference between a helium atom and an alpha particle	Helium atom also has 2 electrons

Physics Unit 4: Atomic Structure

71	What is a beta particle?	A high speed electron
72	What happens in a nucleus when a beta particle is emitted?	Neutron turns into a proton
73	What is a gamma ray?	High energy electromagnetic radiation
74	Apart from alpha, beta and gamma, what else can be emitted from a nucleus as nuclear radiation?	A neutron
75	Which of alpha, beta and gamma is the most penetrating?	Gamma
76	Which of alpha, beta and gamma is the least penetrating?	Alpha
77	Which of alpha, beta and gamma is the most ionising?	Alpha
78	Which of alpha, beta and gamma is the least ionising?	Gamma
79	State the relationship between ionisation and penetration for nuclear radiation.	The more ionising, the less penetrating
80	State the range in air of alpha.	About 5 cm
81	State the range in air of beta.	About 1 m
82	State the range in air of gamma.	Unlimited
83	What can alpha be stopped by?	Paper
84	What can beta be stopped by?	Thin aluminium foil
85	What can gamma be stopped by?	Thick concrete or lead
86	Which type of radiation would be attracted to the positive side of an electric field?	Beta
87	Which type of radiation would be attracted to the negative side of an electric field?	Alpha
88	Which type of radiation would not be deflected by an electric field?	Gamma

89	When writing the symbol for an alpha particle what numbers go at the top and bottom?	Top = 4, Bottom = 2
90	When writing the symbol for an beta particle what numbers go at the top and bottom?	Top = 0, Bottom = -1
91	When an alpha particle is emitted from a nucleus, what happens to the atomic and mass number?	Atomic number decreases by 2; Mass number decreases by 4
92	When a beta particle is emitted from a nucleus, what happens to the atomic and mass number?	Atomic number increases by 1; Mass number doesn't change
93	When a gamma ray is emitted from a nucleus, what happens to the atomic and mass number?	No change
94	When radiation is emitted from an unstable nucleus, what is the resulting nucleus called?	Daughter nucleus
95	What name is given to the time it takes for half the number of nuclei in a sample to decay?	Half-life
96	What name is given to the time it takes for the activity of a sample to half?	Half-life
97	Define half-life.	The time it takes for the number of nuclei in a sample to half.
98	After 1 half-life, what fraction of the nuclei in a radioactive sample will remain?	1/2
99	After 2 half-lives, what fraction of the nuclei in a radioactive sample will remain?	1/4
100	After 3 half-lives, what fraction of the nuclei in a radioactive sample will remain?	1/8
101	After 4 half-lives, what fraction of the nuclei in a radioactive sample will remain?	1/16
102	After 5 half-lives, what fraction of the nuclei in a radioactive sample will remain?	1/32
103	What word is used for 'the unwanted presence of materials containing radioactive atoms on other materials'?	Contamination

Physics Unit 4: Atomic Structure

104	What word is used for 'the process of exposing an object to nuclear radiation'?	Irradiation
105	In which case does the object itself become radioactive? Contamination or irradiation?	Contamination
106	Why are irradiated things not themselves dangerous?	They do not become radioactive
107	State 3 safety precautions that should be taken when using radioactive sources.	Long tongs, use sources for minimum possible time, stand far away
108	What phrase means 'scientists checking the work of other scientists'?	Peer review
109	Which radiation type is most dangerous to humans if emitted inside the body and why?	Alpha because it is the most ionising
110	Why is ionising radiation dangerous to the human body?	Damages cells, mutation of DNA, increased risk of cancer
111	State two natural sources of background radiation.	Rocks; Food and drink; Cosmic rays from space; Radon gas
112	State two man-made sources of background radiation.	Nuclear power; Nuclear weapons testing; Medical
113	When using a detector to measure radiation from an object, what must you subtract from the reading?	Background count

114	How many mSv in a Sv?	1000
115	Why can radioactive materials with shorter half-lives be more dangerous?	High activity initially
116	Why can radioactive materials with shorter half-lives be less dangerous?	Activity drops to a safe level quickly
117	Which type of radiation is used in an ionisation smoke alarm?	Alpha
118	Why is alpha radiation used in ionisation smoke alarms?	Low penetration so blocked by smoke
119	Why are beta and gamma radiation not used in ionisation smoke alarms?	They would penetrate the smoke
120	Should the radiation source in an ionisation smoke alarm have a short or long half-life?	Long
121	Which type of radiation is used in thickness monitoring?	Beta
122	Why is beta radiation used in thickness monitoring?	The amount of beta that penetrates depends on thickness
123	Should the radiation source used in thickness monitoring have a short or long half-life?	Long
124	Which type of radiation is used to detect leaks in pipes?	Gamma
125	What should the approximate half-life of the radiation source used to detect leaks in pipes be?	Several days
126	Which type of radiation is used to sterilise sealed medical equipment?	Gamma
127	Which type of radiation is used in medical tracers?	Gamma
128	Why is a gamma source used for medical tracers?	Low ionisation means less damage to cells and high penetration so it can be detected outside the body

Physics Unit 4: Atomic Structure

129	What should the approximate half-life of the radiation source used in medical tracers be?	A few hours
130	Why should the half-life of the radiation source used in medical tracers be just a few hours?	Less irradiation of body so less damage to cells
131	What name is given to the splitting of a large and unstable nucleus?	Nuclear fission
132	Give an example of a large, unstable nucleus which can undergo nuclear fission.	Uranium or plutonium
133	What must the large, unstable nucleus first do before fission can occur?	Absorb a neutron
134	What happens during nuclear fission?	Large unstable nucleus splits into 2 smaller nuclei, 2 or 3 neutrons, gamma rays and energy
135	What store of energy do the fission products have?	Kinetic
136	Where does the energy released in nuclear fission come from?	Mass converts into energy
137	The neutrons released in nuclear fission can go on to cause further fission events. What is this called?	Chain reaction
138	In a nuclear reactor, which part absorbs neutrons to stop a chain reaction going out of control?	Control rods
139	In a nuclear reactor, which part slows down neutrons so they can be absorbed by large unstable nuclei?	Moderator
140	What causes the explosion caused by a nuclear weapon?	Uncontrolled chain reaction
141	State 2 advantages of using nuclear power to generate electricity.	No greenhouse gases, fuel has high energy density
142	State 2 environmental disadvantages of using nuclear power to generate electricity.	Toxic, radioactive waste which needs to be buried, risk of accidents like Chernobyl, non-renewable fuel
143	What name is given to the joining of two light nuclei (e.g. hydrogen) to form a heavier nucleus (e.g. helium)?	Nuclear fusion
144	Where does the energy released in nuclear fusion come from?	Mass converts into energy
145	What two conditions are needed for nuclear fusion to occur?	High temperature and pressure
146	Why are high temperature and pressure needed for nuclear fusion to occur?	To overcome electrostatic repulsion between nuclei
147	Why do nuclei repel each other?	Nuclei all have a positive charge and like charges repel
148	What advantages does fusion have over fission?	No radioactive waste, more energy per kg released, hydrogen is abundant

Separate Science Only

Further Quantitative		
1	**What is the yield of a chemical reaction?**	The amount of useful product
2	**What is the theoretical yield of a chemical reaction?**	The yield which you would expect to get in a reaction
3	**What is the percentage yield of a chemical reaction?**	The mount of actual product divided by the theoretical yield
4	**Why is the % yield almost never 100%?**	Reversible reaction, loss of product on separation, unexpected side reactions
5	**What is atom economy?**	The amount of starting material that ends up as useful product
6	**Why is atom economy important?**	Economic and sustainability reasons
7	**How is atom economy calculate?**	100 x Mr desired product/ Mr of all reactants
8	**What are the two units for concentration?**	g/dm^3 and mol/dm^3
9	**Which formula relates concentration, moles and volume?**	Concentration = moles/ volume
10	**What is the purpose of titration?**	Establish the concentration of an unknown solution
11	**Why are burettes used for some measurements and pipettes for others?**	Pipettes measure a fixed volume, burettes measure a variable volume
12	**What do the moles of gases and their volumes have in common?**	At the same temperature they occupy the same amount of volume
13	**What is the volume of one mole of any gas at room temperature and pressure?**	24dm^3

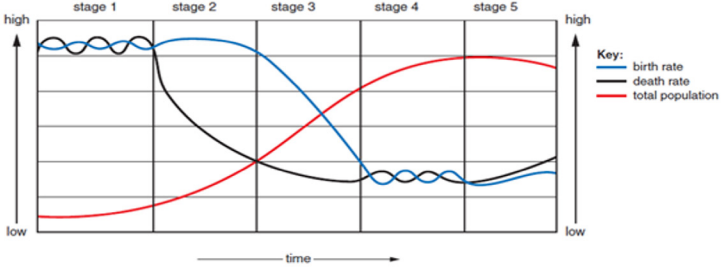
Chemical Cells		
1	**What is a chemical cell?**	A unit which contains chemicals which produce electricity through a reaction
2	**What are the main components of a chemical cell?**	An anode, a cathode and an electrolyte
3	**What is an electrolyte?**	A solution containing ions which allows current to flow.
4	**What does the potential difference of a cell depend on?**	The type of electrode and the electrolyte.
5	**What is a battery?**	Two or more cells connected in series
6	**What happens to the electrodes in a chemical cell?**	The more reactive metal depletes and the less reactive one increases in size.
7	**In non-rechargeable cells, why do the chemical reactions stop over time?**	One of the reactants becomes used up.
8	**How can certain cells be recharged?**	Applying an external electric current
9	**How does the reactivity of the metal electrodes affect the size of the potential difference?**	The greater the difference in reactivity, the greater the potential difference.
10	**What is a fuel cell?**	A cell which uses a fuel and oxygen (or air) to generate electricity.
11	**What are the products in a hydrogen fuel cell?**	Water
12	**State three advantages of hydrogen fuel cells**	Do not need to be recharged, no pollutants are produced, can be different sizes for different uses
13	**State three disadvantages of hydrogen fuel cells**	Hydrogen is highly flammable, hydrogen is sometimes produced through non-renewable means, hydrogen is difficult to store
14	**Complete the equation which occurs at the negative electrode of a hydrogen fuel cell $2H_2 + 4OH^- \rightarrow$**	$4H_2O + 4e^-$
15	**Complete the equation which occurs at the positive electrode of a hydrogen fuel cell $O_2 + 2H_2O \rightarrow$**	$4OH^-$
16	**Why can some cells not be recharged?**	Because the reaction is not reversible

Changing Economic World

Key Processes: Measuring Economic Development
Development is a measure of social and economic progress in a country. When countries develop, the quality of life for people who live there improves.
Countries can be classified as: **High Income Countries (HICs), Newly Emerging Economies (NEEs), or Low-Income Countries (LICs).**

Development indicator	Definition	When a country develops, the number gets...
Gross National Income (GNI)	The total value of money (goods and services) produced by a country in a year including overseas income.	Higher
GNI Per Capita	The GNI of a country divided by the number of people who live there.	Higher
Birth Rate	The number of births per thousand people of the population each year.	Lower
Death Rate	The number of people who die per thousand people of the population each year.	Lower
Infant Mortality Rate	The number of babies that die before their first birthday per thousand per year.	Lower
People Per Doctor	The average number of poeple for each doctor.	Lower
Literacy Rate	The % of people ages over 15 who can read and write.	Higher
Access To Safe Water	The percentage of people who can get access to safe drinking water.	Higher
Life Expectancy	The average age a person is expected to live to in a country.	Higher

Key Diagrams: The Demographic Transition Model (DTM)



Using just one development indicator can cause problems because:

- The data may not be **reliable**. Corrupt governments lie.
- Using one indicator only focuses on one aspect of development and not everything. **You need to look at social and economic features to get a true picture of the quality of life in a country.**
- The GNI per capita alone can be misleading because it is an average meaning **inequalities are hidden** within the country.

Stages of the DTM

Stage 1:
- Limited medical care + poor diet = high infant mortality.
- Strong religious values = high birth rate.
- Example: Indigenous Tribes in the Amazon Rainforest.

Stage 2:
- Increase in access to basic medical care = decreased infant mortality and death rate.
- Diets also improved.
- Birth rate remains high as children are needed to work on farms.
- Birth rate also remains high as religion plays a significant role in society.
- Example: Afghanistan.

Stage 3:
- Decrease in birth rate as women are able to access education.
- Decrease in birth rate as religion loses importance in society and contraception becomes available.
- Death rate continues to decline due to improvements in diet, healthcare and physical fitness.
- Total population continues to increase as there is natural increase.
- Example: India.

Stage 4:
- Birth rate remains low and fluctuating as women put careers before having children.
- Death rate remains low due to improvements in healthcare, diet and physical fitness.
- Total population reaches its peak and begins to fall.
- Example: The UK.

Stage 5:
- Death rate is greater than birth rate = natural decrease.
- Ageing population due to improvements in healthcare, diet and physical fitness.
- Children are expensive so birth rates continue to fall.

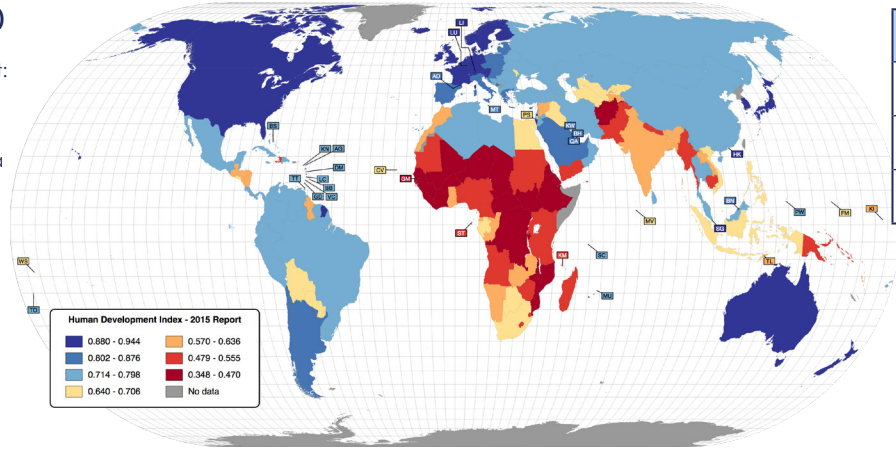
Changing Economic World

The Human Development Index (HDI)

The HDI is a **composite index** (combines three measures) to measure development:

- Life expectancy at birth
- Years of schooling
- Gross National Income (GNI) per capita

A country is given a score between 0 and 1 (1 being the most developed).



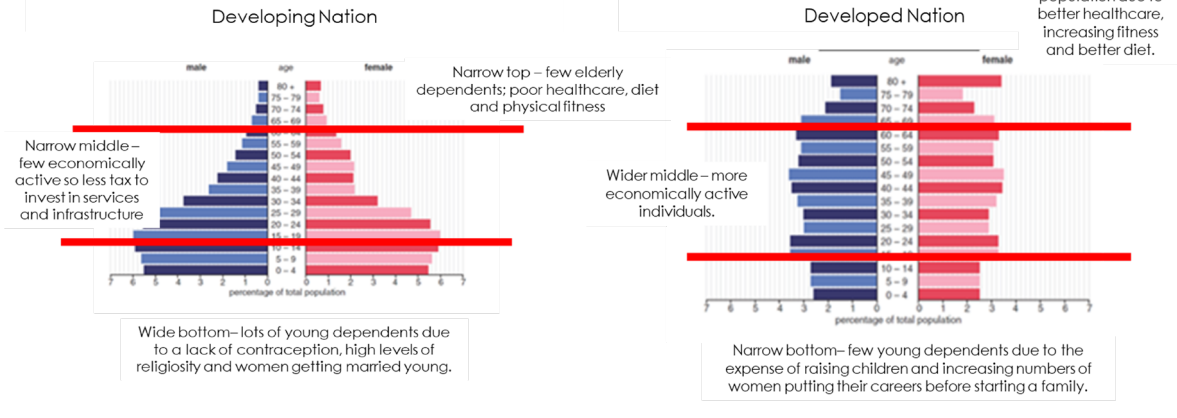
HDI Score	Level of Development
> 0.850	Very high (developed)
0.550 - 0.850	High/medium (emerging)
<0.550	Low (developing)

Population structure means the number / proportion of people in **each age range**, for each **gender**. Population pyramids show the population structure of the country they represent.

There are three groups on a population pyramid:

1. **Economically active** – 16-65 age group, working age and can provide taxes.
2. **Young dependents** – 0-15 age range, rely on the working age for support via taxes.
3. **Elderly dependents** – 65+ age range, rely on the working age for support via taxes.

Population Pyramids



Changing Economic World

Key Processes:

Factors Causing Uneven Development

Physical

- Climates that are extremely hot, dry or cold mean that not much will grow e.g. plants or crops.
- Not only does this cause less food to be produced which can lead to malnutrition (a lack of proper nutrition), but this further leads to a greater likelihood of diseases resulting in less productivity and a lower quality of life.
- Significant numbers of natural disasters result in serious infrastructure damage.
- Consistent and serious infrastructure damage requires tax revenue to be spent on rebuilding infrastructure as opposed to improving services – this holds services back.

Economic

- Countries in debt must pay back the loans with interest. This reduces the amount of tax that they have to invest in services and infrastructure.
- Countries that export primary products (raw materials like wood) make less profit than countries which export manufactured goods. This reduce the amount of tax countries have to invest in services and infrastructure.

Historical

- Colonialism: Many countries in Asia, South America and Africa have spent a lot of time and money on civil wars and political struggles for power since being made separate from European superpowers.

Consequences of Uneven Development: Differences in Wealth (1)

A large gap emerges between those with lots of money and those with very little.

Wealth has a large impact on quality of life because wealthy people can afford to buy goods and services that make their lives safer, more comfortable and with more opportunities.

Consequences of Uneven Development: Differences in Health (2)

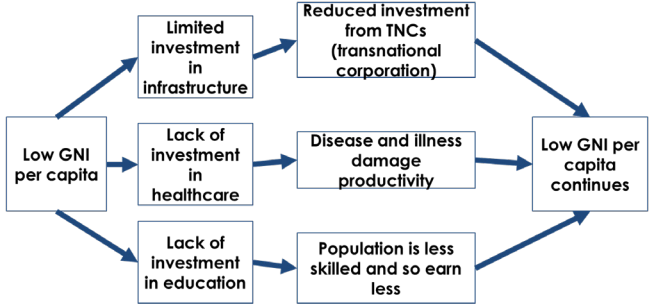
More affluent people can afford healthcare and rich government can afford to build hospitals and train doctors.

Consequences of Uneven Development: International Migration (3)

People choose to leave LICs and NEEs because of these differences in wealth and health in search of better paid jobs/ economic opportunities as this leads to a higher quality of life in HICs.

Key Diagrams:

Low Income Countries (LIC) continue to have a low level of wealth as the example below shows...



Application:

Tourism in Kenya

Background: Kenya is a low-income country in East Africa.

Attractions: Tribal culture, safari wildlife, warm climate, beautiful scenery.

Positive Impacts

- 12% of GDP = Tourism = tax from this can be spent development of services which can improve quality of life.
- 600,000 direct and indirect employees working in the tourism industry - 10% of all jobs in Kenya.
- 24 national parks charge entry fees = protect environment and wildlife.
- Since 2000, Kenya's HDI has increased from 0.45 to 0.55.

Negative Impacts

- Only a small proportion of the money earned goes to locals. The rest goes to big companies based in HICs overseas, so doesn't reduce the development gap.
- Some Masai tribespeople were forced off their land to create national parks for tourists.
- Tourist vehicles damaged the environment e.g. safari vehicles destroying vegetation and disturbing animals.

Changing Economic World

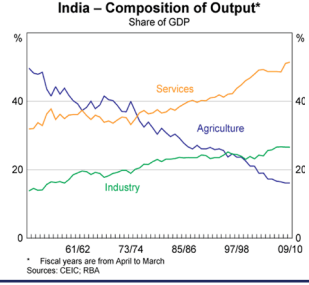
Application: India's Economic Development.

Location and Importance of India

- India is an NEE with a population of approx. 1.4 billion and is still growing.
- India was a British colony until 1947 but is now the world's largest democracy.
- India has a medium level of development (HDI=0.61). Some 20% of the population live in poverty.
- Bollywood is watched by millions worldwide influencing culture and dress sense.

India's Changing Industrial Structure

- Primary Industry (e.g. agriculture) employs 50% of the working population but only makes up 17% of India's GDP.
- Secondary Industry (e.g. manufacturing) employs 22% of the working population.
- Tertiary (services) and Quaternary (knowledge) have become a much larger part of the economy, employing 29% of the workforce. Lots of this growth is due to IT firms and supplying services for foreign companies. These industries make up 53% of India's GDP.



Impacts of Development on India's Economy and Environment

Positive Impacts of Economic Development:

- Daily wages have increased by 42 rupees since 2010, increasing the tax revenue of the government so more can be spent on improving services and infrastructure.
- From 1990 to 2008, access to clean water in India increased by 20% to 88% of the population.
- Less forests are being cut down for fuel, so biodiversity is greater.

Negative Impacts of Economic Development:

- Mining in Maharashtra led to the destruction of habitats, threatening the Bengal tiger.
- Large population has resulted in significant use of fossil fuels. Delhi, the capital, is now one of the most polluted cities on the planet. Health issues from air pollution are high.
- Some jobs are dangerous, with little pay and long hours e.g. coal mining which can cause breathing issues reducing quality of life for workers.

Political and Economic Context of India

Political Context:

- India has long-running conflicts with China and Pakistan over its borders. This has led to conflict in the past.
- India implemented the TAPI pipeline collaborating with Turkmenistan, Afghanistan, and Pakistan so it could be supplied with natural gas for its industries.

Economic Context:

- Since 1991 India reduced tariffs and joined trade alliances (e.g. the Asia-Pacific Trade Agreement with Bangladesh, China, South Korea and Sri Lanka).
- India has set up its own TNCs like TATA Steel which employs 6,000 people in South Wales constructing steel rods for use in construction.

Impacts of Aid in India

Aid = A form of help given from one group of people to another.

Benefits of Aid to India:

- Until 2015 India received £200 m in long-term aid from the UK to tackle poverty.
- Top-down aid has been used for large infrastructure projects like dams.
- £10 m was given by the UK as short-term aid after the Gujarat earthquake in 2001.
- Bottom-up aid such as water aid trains locals to use water pumps improving quality of life.

Costs of Aid to India:

- Top-down aid in the Narmada Valley Development Dam project has caused areas to flood creating reservoirs downstream.
- Long-term aid corruption means money is not reaching the neediest.
- Bottom-up aid is very small scale and water aid is not reaching all communities.
- Short-term after the 2001 earthquake did not provide locals with new skills to build better housing nor help with the rebuilding process.

TNCs in India

Unilever is one of the world's biggest food and consumer goods manufacturers, with its headquarters in Holland/London. Hindustan Unilever is its Indian subsidiary

Advantages:

- 16,000 people are employed.
- Brings significant tax revenue. Hindustan Unilever has sales of $4.5 billion a year.
- Runs development schemes e.g. Project Shakti helping poor women in rural villages become entrepreneurs by providing loans. It has helped 45,000 women.
- It has helped to provide sanitation to 115 m people.

Disadvantages:

- Profits go back to the UK-Netherlands as Unilever is a Dutch-British company
- Mercury contaminated glass from the factory at Kodaikanal was dumped killing 45 people. Mercury can cause health and environmental problems e.g. brain damage.

Changing Economic World

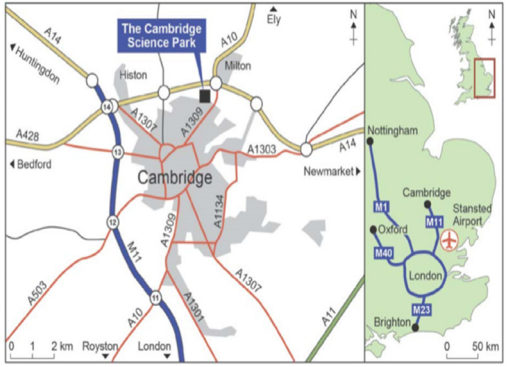
Application:

Economic and Industrial Change in the UK

- Prior to the 1800s the majority of jobs in the UK were part of the primary sector.
- Mechanisation triggered a larger scale rural to urban migration and provided a vast worker base during the industrial revolution.
- In this period, the UK had an economy which was dominated by manufacturing (the secondary sector). By the year 1900, 55% of jobs were in this sector.
- From 1960, secondary industries declined and were replaced by tertiary and quaternary industries. In 2017, tertiary and quaternary industries made up 83% of the UK workforce.

The Rise of Science and Business Parks

- Located on the outskirts of cities = land is cheap and expansion easy.
- Near airports, main roads and motorways = making client access, commuting and transportation of goods easier.
- Located near to top universities e.g. Cambridge University = attract high-skilled graduates to work in the quaternary sector.



Industry and the Environment

- Jaguar Landrover major UK car manufacturer (owned by the Indian TNC TATA) and is based in Coventry.
- It has built a new facility at Gaydon in Warwickshire with aim of achieving the companies' Destination Zero mission, that is, zero emissions, zero accidents and zero congestion.
- Home to almost 13,000 highly-skilled engineers and based on a site is 4,000,000m^2, it is equivalent in size to almost 480 football pitches.

Methods to make the factory more sustainable include:

- Up to 20 per cent of its energy will come from almost 3,000m^2 of photovoltaic solar panels on the roof, and the remainder from 100 per cent renewable sources.
- The same glazing technology as the Eden Project has been used to bring natural light into the building wherever possible and make it more energy efficient.
- A natural landscape is at the heart of the site, creating an ecologically diverse area, reusing 80,000m^3 of natural soil excavated during the construction process to increase biodiversity and create habitats.

Social and Economic Changes in Rural Landscapes

1. Population growth

North Somerset

- Easy access to commuters travelling to Bristol via M4.
- Wages are now above national average.

2. Population decline.

South Lakeland, Cumbria

- Transportation in and around South Lakeland is difficult e.g. Leeds is a 2-hour drive away.
- Agriculture in decline e.g. young people moving away.

Figure 2 – A photograph of Clevedon, North Somerset

Figure 3 – A photograph of South Lakeland, Cumbria

Changing Economic World

Why and how has the UK economy changed?

- Deindustrialisation, the shutting down of factories in inner city areas, occurred because it cheaper to outsource production to NEEs like India as workers had fewer rights and worked longer hours.
- The UK government also de-regulated industries removing taxes which encouraged competition and reduced costs of products for consumers.
- However, the removal of protection from overseas competition meant some business had to shut down because they were no longer able to compete, meaning a loss of jobs in particular areas.

Several important tertiary industries in the UK today include:

1. **Services** = E.g. retail and entertainment. Retail employs 4 million people in the UK.
2. **Information Technology** = Over 670,000 people work in IT.
3. **Finance** = The UK is home to many banking and financial TNCs.
4. **Research** = Research and Development (R&D) is increasing in the UK, making use of the UK's skilled university graduates. In 2016, over £33 billion was spent on R&D in the UK.

Figure 10 – A photograph of the HSBC global headquarters in London.

The North South Divide

Economic and social indicators tend to be more **positive** in the south of the UK than the north.

Causes of the N/S Divide

- **Deindustrialisation**:

This had a greater negative impact on the north of the UK.

- **The growth of the service sector:**

This benefitted the south more than the north.

- **The Pull of London:**

London generates 22% of the UK GDP.

People and businesses cluster in the southeast of England because of a positive multiplier effect caused by the city.

Solution to the N/S Divide:

- **Devolution**:

The UK has devolved powers to mayors (such as the Mayor of Greater Manchester). This ensures that decisions match the local needs rather than being decided from Westminster.

- **Enterprise Zones:**

Areas where taxes are lowered, there is improved infrastructure and planning rules are simpler. This encourages businesses to establish themselves in the north.

- **Northern Powerhouse:**

Extend coverage of superfast broadband and spending £70 million on improving schools.

UK Transport Improvements

Strategy	Description	Advantages	Disadvantages
Felixstowe Expansion	The largest port in the UK and the 8th busiest in Europe. Plans to double in size and double its profit.	Will accommodate 6,000 more cargo ships a year.	Will destroy the habitat of wading birds like the Curlew.
Smart Motorways	Removal of the hard shoulder to increase the number of lanes.	Increases capacity reducing congestion.	Conversion process increases disruption adding to the congestion.
Heathrow Third Runway	£14 billion expansion to build a third runway by 2026 increasing yearly capacity by 260,000 flights.	Will bring more tourists to the UK.	761 homes and the entire village of Longford will be destroyed.
HS2 Rail Network	Plan to improve rail links between London, Birmingham, Manchester and Leeds by improving capacity on the lines and shortening journey times.	Link the north and south, decreasing journey times and increasing capacity.	Route passes through 130 protected wildlife sites.

UK Connections to the Wider World

The world today is more global and more interdependent than ever before. This means that people and countries around the world rely on each other.

Trade	UK exports are worth £160 billion each year.
Culture	Shaun the Sheep is shown in over 170 countries.
Transport	Heathrow flies people to over 84 countries.
Electronic Communication	Trans-Atlantic cables carry digital data from the UK across the Atlantic Ocean.

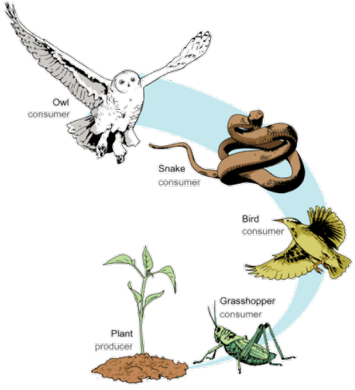
The Living World

Key Terms

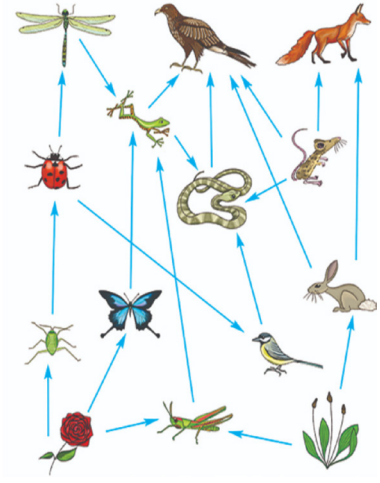
Ecosystem	All the biotic (living) and abiotic (non-living) features of an area and how they are connected.
Producer	An organism or plant that is able to absorb energy from the sun through photosynthesis.
Consumer	Creature that eats plants or other animals.
Decomposer	An organism that breaks down dead plant and animal matter returning nutrients to the soil.

Key Diagrams

Food chain
A diagram showing what eats what in an ecosystem.



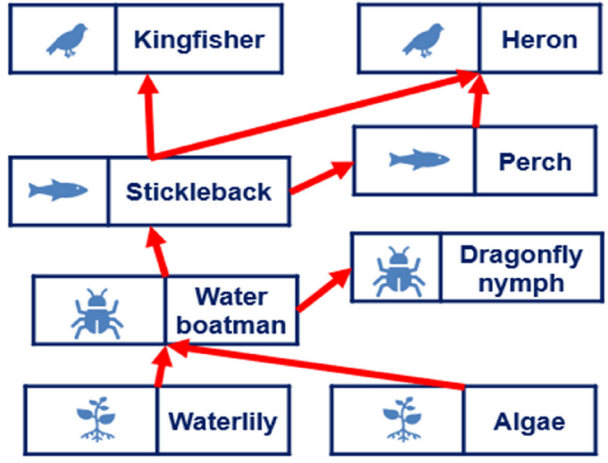
Food web
A diagram showing many different food chains and how the overlap.



Application

Slapton Ley is located on the south coast of England in the county of Devon.

Slapton Ley is a freshwater **lagoon** which is separated from the sea by a shingle barrier which is a landform known as a **bar**.



Changes affecting the Slapton Ley reed bed ecosystem:

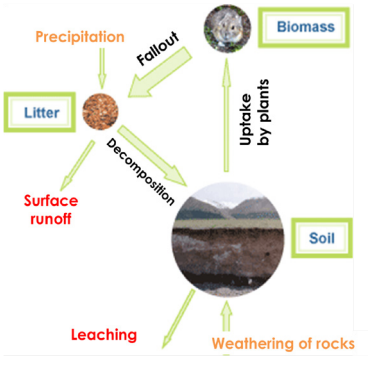
1) In the last 15 years, high numbers of tourists have been visiting Slapton Ley in the summer which can scare away the herons.

2) The shingle bar is being eroded by the sea. If it breaks through, the freshwater lagoon will be contaminated by sea water.

The Living World

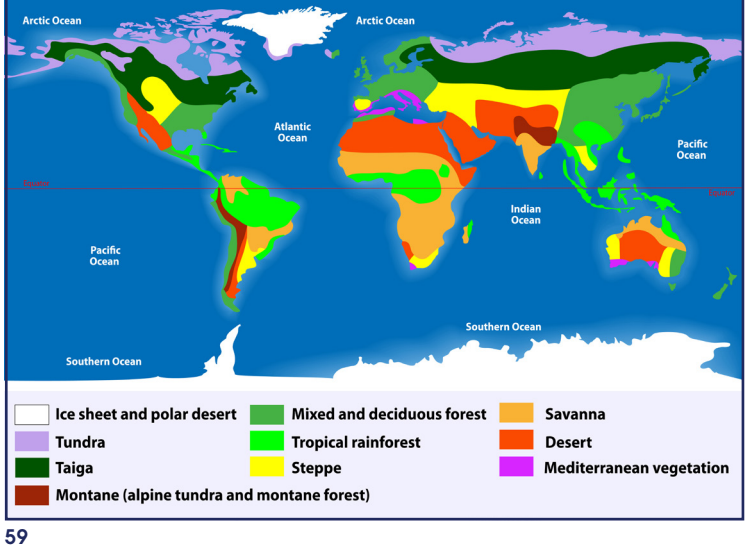
Key Processes

The Nutrient Cycle



Key	
Inputs	Orange
Stores	Blue
Transfers	Black
Outputs	Red

Distribution of Biomes



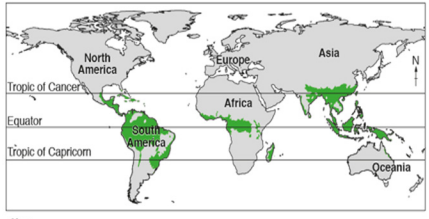
Key Biome Characteristics

Biome	Key Characteristics
Tropical Rainforests	• Along equator (Asia, Africa / South America). • 6% of earth's surface. • 25°C – 30°C and over 250mm rain per month.
Tropical Grasslands (Savanna)	• Between equator and tropics. • 20 – 30°C and between 500 - 1,500 mm of rain per year. • Wet and dry seasons.
Deserts	• Tropics (Sahara and Australia). • Over 30°C and less than 300 mm per year rain. • 20% of land's surface.
Deciduous Forests	• Higher latitudes (W Europe, N America, New Zealand). • 5 – 20°C and between 500 – 1,500 mm rain per year. • 4 distinct seasons. • Lose leaves in the winter to cope with the cold.
Coniferous Forest (Taiga)	• 60°N (Scandinavia / Canada). • Cone-bearing evergreen trees. • No sunlight for part of the year.
Tundra	• Above 60°N (Arctic Circle). • Less than 10°C and less than 500mm per year rain. • Cold, icy and dry means 2 month growing season.

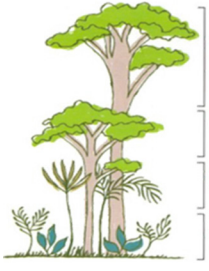
The Living World

Key Characteristics

Distribution of Tropical Rainforest



Layers of a Tropical Rainforest



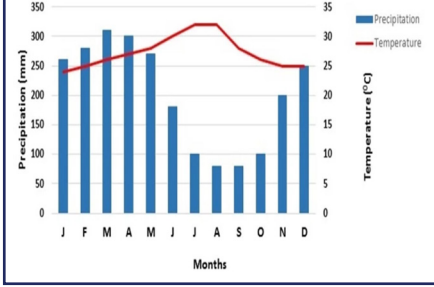
Emergent Layer: 45 m high trees. Leaves are tough and little with a waxy coating.

Canopy: 20-40 metres high. Leaves have drip tips to easily enable water to run off the.

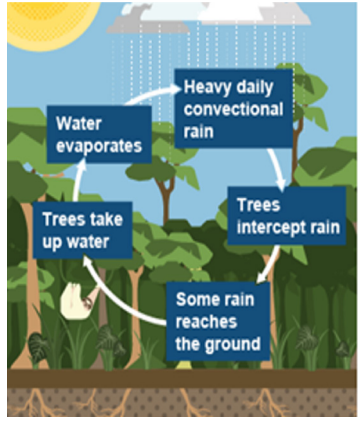
The Understory: 12 metres above the ground. Only receives 2-15% of sunlight of the canopy.

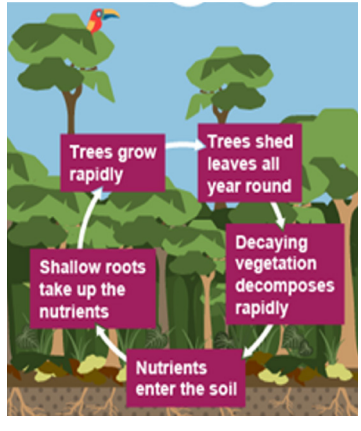
The Forest Floor: thin layer of dead leaves and animals. Tree have few leaves as there is not enough sunlight.

Climate of a Tropical Rainforest



Water and Nutrient Cycles in a Tropical Rainforest





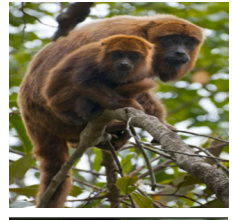
Key Adaptations

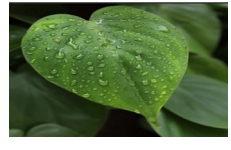
The main challenges of the rainforest for plants are:

1. High rainfall.
2. High temperatures.
3. Competition for sunlight.

Buttress Roots:

- Wide base = support emergent trees.
- Long lateral root system = maximize nutrient uptake over wider area.



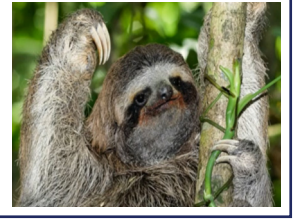


Drip Tip Leaves:

- Waxy coating = quick run off reducing damage to the leaf during heavy rain increasing photosynthesis.
- Funnel structure: encourage run off.

Howler Monkey:

- Large gripping tail = easier movement between branches in the canopy.
- Oversized larynx = warn fellow monkeys of predators and identify mates.



Sloth:

- Curved claws = can hang on branches with little effort.
- Slow moving = less likely to be identified by predators.

The Living World

Application: The Amazon Case Study

Location of the Amazon Rainforest

The Amazon is the largest rainforest on Earth. It covers an area of around 8 million km²?.

The Amazon River runs through the rainforest, and it is the largest river (by volume of water, not length in the world).

The Amazon Rainforest spreads over 8 different countries but 66% of it is found in Brazil.

Figure 2 – A map of the Amazon Rainforest in South America.

Deforestation is the chopping down and removal of plants and animals from an area.

Changing Rates of Deforestation

In 2010, Brazil was doing 24% less deforestation that they were in 2000. There were many reasons for this reduction including:

A) Companies can act to change their ways or put pressure on countries to reduce deforestation.	B) International agreements see countries pledging to reduce deforestation.	C) There is increased global awareness about deforestation. Consumers are more careful about where and who they buy goods from.
Example: In May 2021, Aldi, Tesco and other supermarkets threatened to boycott Brazilian products because of changes to deforestation laws in the Amazon Rainforest.	Example: At the Paris Agreement in 2016 Brazil pledged to cut their carbon emissions by 37% by 2025.	Example: The Forest Stewardship Council (FSC) was set up in 1993 and they certify products that come from sustainable sources. This means that goods can have a label to show they are sustainable on their packaging.

Causes of Deforestation in the Amazon Rainforest

Commercial Farming	Farming to sell produce for a profit. Cattle and crops. Responsible for 80% of Amazon deforestation. Ruins soil and nutrients.
Logging	The business of cutting down trees and transporting the logs to sawmills. Selective logging and clear felling. Teak and Mahogany worth the most.
Mineral Extraction	The removal of mineral resources from the earth. Gold, bauxite, oil and gas. Pollutes rivers and air. Trees above the mines and quarries are removed.
Subsistence Farming	A type of agriculture producing food and materials for the benefit only of the farmer and his family or community. Small scale, often slash and burn.
Hydro - Electricity	Dams have been built and large areas of rainforest destroyed by flooding.
Resettling	Since 1970, 1 million people have been encouraged to move away from shanty towns and into the rainforest. They have been given land which has been cleared to allow farming.
Roads	The 4,000 km long Trans-Amazonia Highway built 1970s. Opened up rainforest, but allowed loggers in.

Impacts of Deforestation in the Amazon Rainforest

Economic Development

- 2008 $6.9 billion from cattle.

Soil Erosion

- Land left unprotected from heavy rain leads to landslides and flooding.
- Nutrients are washed away decreasing nutrients in the soil.

Contribution to Climate Change

- Cutting down trees releases CO_2 into the atmosphere, thickening the greenhouse gas layer, trapping and re-reflecting long-wave radiation and increasing global temperatures.

Cultural Losses

- Loss of biodiversity - 137 species a day.
- Loss of indigenous tribes (90 since 1990).

Sustainable Management of Tropical Rainforests

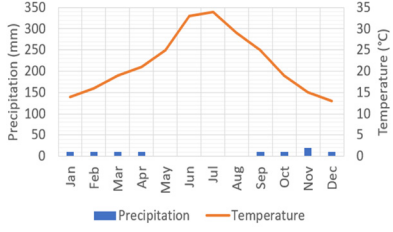
- **Selective logging.** Only fell fully grown trees. Mark sustainable trees for sale.
- **Conservation & education.** WWF (NGO) educate and train conservation workers. Buy threatened areas.
- **Ecotourism**. Minimises damage to the environment and benefits locals. This creates incentive to protect the forest.
- **International agreements.** International Tropical Trade Agreement restricts trade in hard woods.
- **Debt reduction.** In 2010 the USA converted $13.5 million from Brazil and used it to protect forest.

The Living World

Key Characteristics

Distribution of Hot Deserts

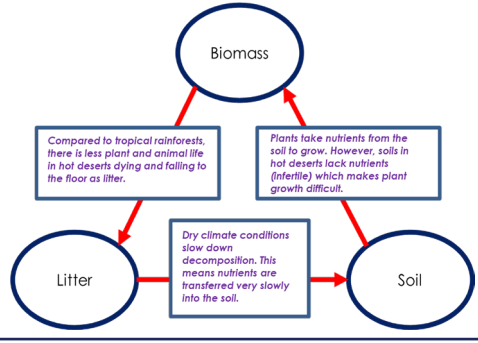
Climate of a Hot Desert



Deserts have **extreme climates**. They have:

- **High temperatures, up to 45°C during the day and low temperatures, below 0°C, at night.**
- **Low rainfall (less than 250mm each year). Areas that are always dry are called arid.**

Nutrient Cycle in a Hot Desert



Key Adaptations

The main challenges of hot deserts for plants and animals are:

1. **Low rainfall**
2. **High temperatures**

Cacti:

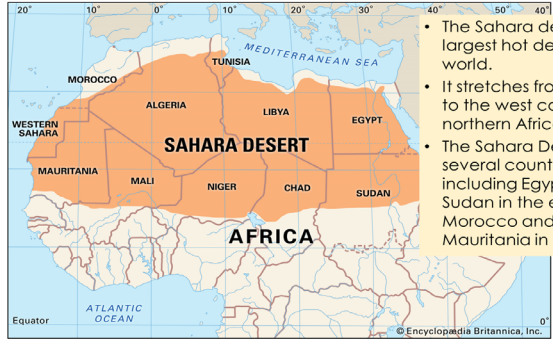
- Wide or very deep roots = reach deep water supplies and absorb as much water as possible when it rains.
- Being a succulent (plants with parts that are thickened) = large fleshy stems store water for large periods.
- Spines instead of leaves = reduces surface area and water loss.

Camel:

- Camels have humps which store fat = can be converted into energy when they don't have the resources to survive.
- Camels have thick syrupy urine and dry faeces = reduce water loss.
- Wide flat feet = distribute weight and stop camels sinking in the sand.

Application:

Location of the Sahara Desert



- The Sahara desert is the largest hot desert in the world.
- It stretches from the east to the west coast of northern Africa.
- The Sahara Desert spans several countries including Egypt and Sudan in the east and Morocco and Mauritania in the west.

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Opportunities and Challenges of the Sahara Desert

There are four main opportunities for development in deserts, despite the extreme climate.
They are:

1. Mineral extraction - **Morocco is the 3rd largest exporter of phosphate.**
2. Energy - **World's largest solar plant in Morocco.**
3. Farming - **Aswan Dam provides irrigation for farming in Egypt.**
4. Tourism - **In 2018, 12.3 million people visited Marrakesh, Morocco.**

There are three main challenges for development in deserts.
They are:

1. Extreme temperatures - **Daily temperatures range from 40°C in the day to below zero at night.**
2. Limited water supply - **The Sahara has less than 70mm of rainfall a year.**
3. Inaccessibility - **Flying goods in or using a pipeline is very expensive.**

Desertification

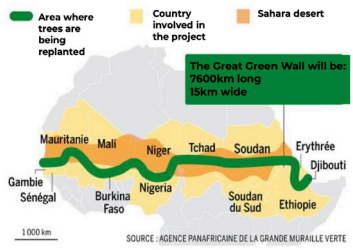
Desertification is the **degradation** of land so it becomes more desert like.
Key word: **Degradation**: The loss of productivity from soils.

The area will become:
- Drier
- Damaged
- Less productive

Causes of Desertification

Soil Erosion	Soil that is exposed (not covered by plants) can easily be removed by wind or water. Any nutrients in the soil (from fallen leaves and dead plants) are lost so the soil becomes unproductive.
Climate Change	Long-term alteration to temperature and rainfall = reduced rainfall and higher temperatures.
Population Growth	Greater pressure on limited resource for irrigation and cattle herding.
Removal of Fuelwood	Cutting down trees for heating and cooking increasing soil erosion and reducing rainfall.
Overgrazing	Too many animals in one area means all the vegetation will be eaten away, leaving the soil exposed to erosion.
Overcultivation	Too many plants in one area means the soil degrades and loses its nutrients.

Strategies to Reduce Desertification



Tree Planting: How to solve environmental problems in deserts.

Trees provide shade reducing temperatures and increasing precipitation.

Water and Soil Management: How to solve environmental problems in deserts.

Drip Irrigation: Small amounts of water released continuously to stop soil being eroded away by flooding it al in one go.

Rotating Crops: to stop the same nutrients being removed.

Appropriate Technology: How to solve environmental problems in deserts.

Solar Cookers: Reduce the need to deforest for fuelwood

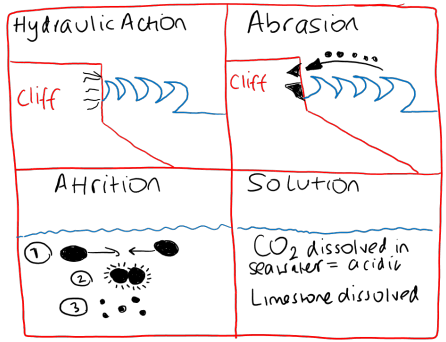
Credit: Wikimedia- NASA-African solar cookers

Bunds/Magic Stones: Stone walls built to stop soil being eroded.

Coasts (Physical Landscapes)

Key Processes:

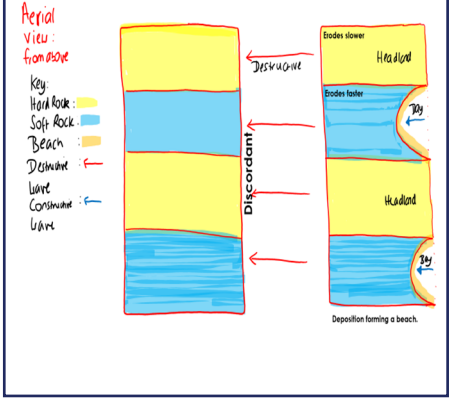
Erosion Types	
Abrasion	Eroded material is hurled at scrapes against the cliff, breaking off rock.
Hydraulic Action	Waves compress pockets of air in cracks in a cliff, causing the crack to widen, breaking off rock.
Solution	Cliffs e.g. chalk dissolve in seawater.
Attrition	Eroded material in the sea, hit into each other breaking down into smaller pieces.



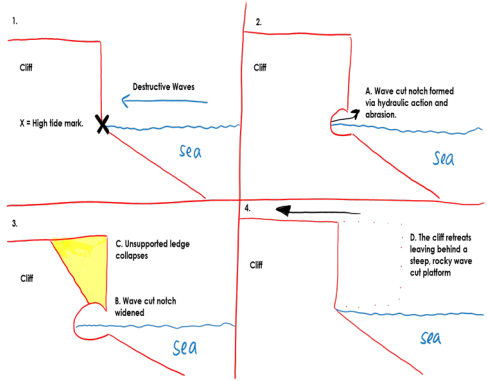
Weathering Types	
Freeze-Thaw Weathering (Mechanical)	Temperature changes causes water to freeze and then melt widening cracks in rocks until they break.
Root Action (Biological)	Seeds fall into cracks in rocks. These germinate and the roots crack the rocks open until they break.
Burrowing (Biological)	Animals widen cracks in rocks.
Acid Rain (Chemical Weathering)	Rainwater is slightly acidic due to dissolved CO_2. This reacts with limestone rock causing it to dissolve.

Key Erosional Diagrams:

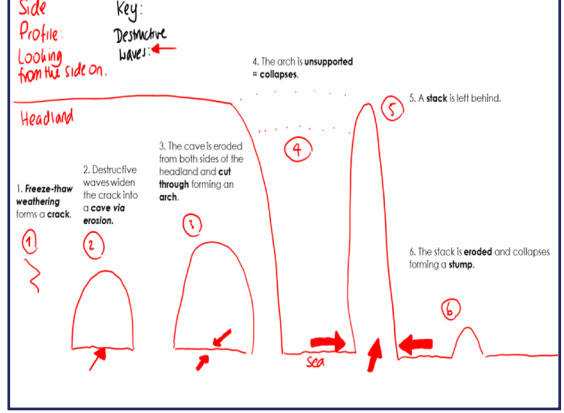
Headland and Bay Formation



Wave Cut Platform Formation



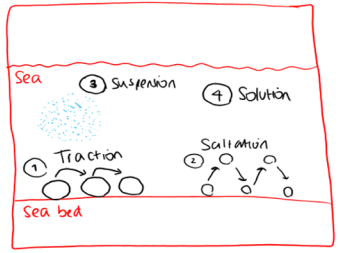
Cave, Arch, Stack, Stump Formation

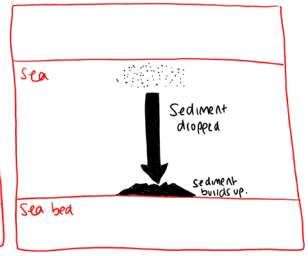


Coasts (Physical Landscapes)

Key Processes:

Transportation Types	
1. Traction	Large rocks are rolled along the seabed.
2. Saltation	Smaller rocks are bounced along the seabed.
3. Suspension	Smaller material/sediment is held in the water.
4. Solution	The smallest silt and sediment is dissolved into the water.

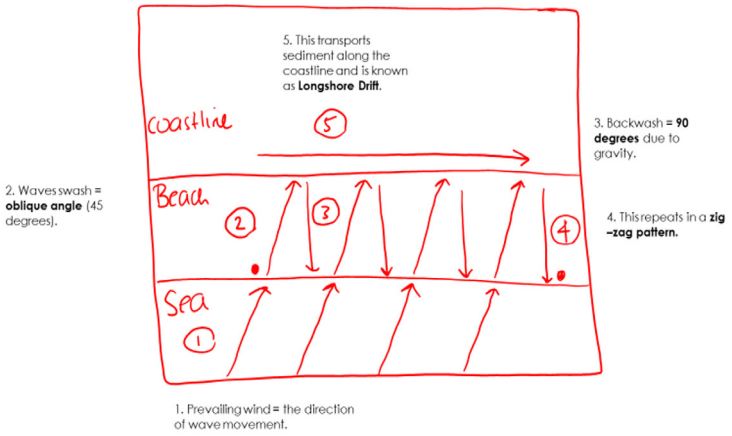




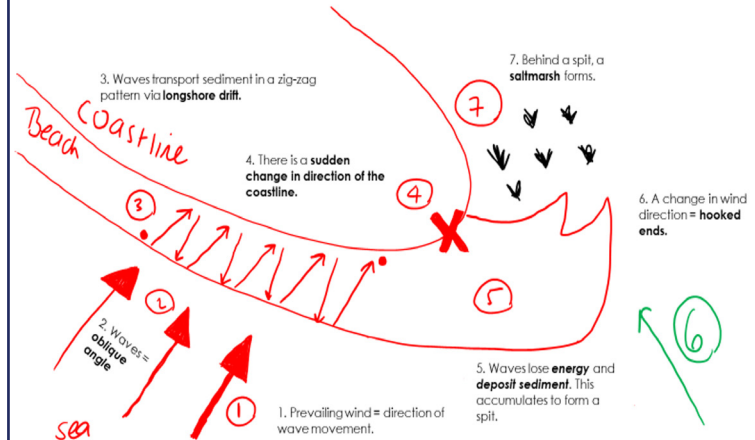
Deposition
Description
Material is dropped by the waves due to a loss of energy and velocity.

Key Depositional Diagrams:

Longshore Drift



Spit Formation



Coasts (Physical Landscapes)

Key Processes:

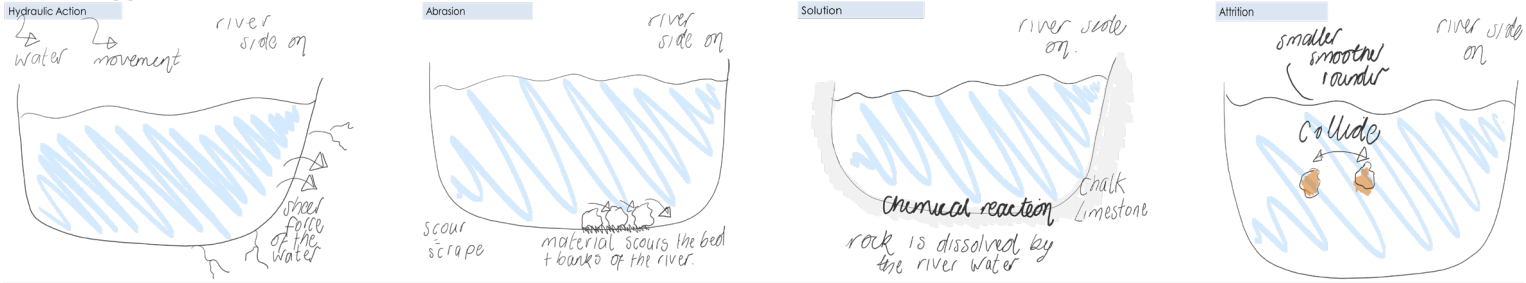
Hard Engineering Man-made structure built to control the sea. Reduces flooding and erosion.			
Strategy	**Explanation**	**Costs**	**Benefits**
Sea Walls	Concrete walls that reflect destructive waves back to sea.	Expensive. Life span of 75 years.	Protects tourist resorts.
Rock Armour	Hard rock boulders at the base of cliffs absorb the energy of destructive waves.	Boulders can be moved by waves.	Cheap. Dissipate energy of the waves reducing erosion.
Gabions	Wire cages filled with hard rocks at the base of cliffs.	Ugly.	Absorb wave energy. Cheap.
Groynes	Wooden fences at right angles to the coast trapping sediment preventing longshore drift.	Starve beaches down the coast of sediment.	Stop longshore drift.

Soft Engineering Schemes set up to use natural structures to manage the coast.			
Strategy	**Explanation**	**Costs**	**Benefits**
Beach Nourishment	Sand and shingle is added elsewhere to the beach.	Needs to be repeated every 5 years.	Wider beaches stop erosion and flooding.
Dune Regeneration	Creating or restoring sand dunes by nourishment or planting marram grass to stabilise the sand.	Protects only a small area. Area zoned off from public access.	Sand dunes create a barrier between the beach and land.

Application: Holderness Coastal Management Scheme		
Reasons to Protect	**Coastal Management Strategies**	**Successes and Failures**
1. Rocks are made of soft rock (boulder clay), eroding at 2 m per year. 2. The B1242 runs through Mappleton and would be expensive to re-route. 3. There is a natural gas plant at Easington which processes 25% of the UK's natural gas.	1. In 1991 = 2 rock groynes put in place at Mappleton to trap sediment being transported by longshore drift, creating a wider beach to absorb the power of the waves protecting 450 metres of coastline. 61,000 tonnes of rock armour was also placed at this time to absorb wave energy. The total cost was £2 million. 2. 1999 = a 1 km stretch of coast at Easington was protected by rock armour at a cost of £6.6 million. This was placed in front of the cliffs to absorb the wave energy.	1. Good – erosion in front of Mappleton has reduced, so the road has been saved. 2. Bad – beaches further south have been starved of sediment so erosion has increased e.g. at Great Cowden.

Rivers (Physical Landscapes)

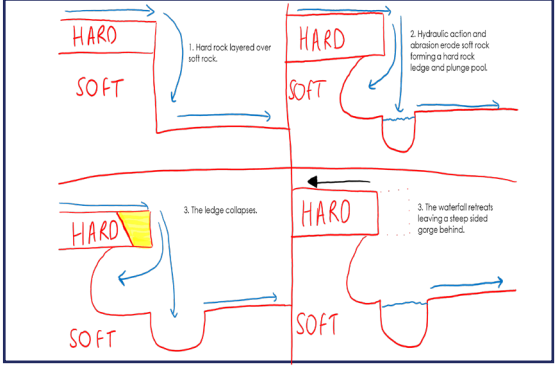
Key Processes: Erosion Types



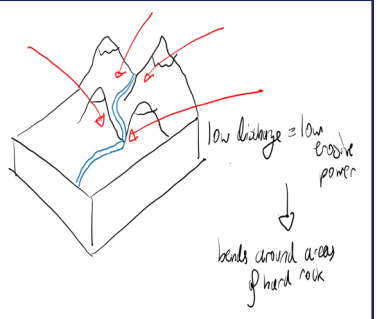
Weathering Types	
Freeze-Thaw Weathering (Mechanical)	Temperature changes causes water to freeze and then melt widening cracks in rocks until they break.
Root Action (Biological)	Seeds fall into cracks in rocks. These germinate and the roots crack the rocks open until they break.
Burrowing (Biological)	Animals widen cracks in rocks.
Acid Rain (Chemical Weathering)	Rainwater is slightly acidic due to dissolved CO_2. This reacts with limestone rock causing it to dissolve.

Key Upper Course Erosional Diagrams:

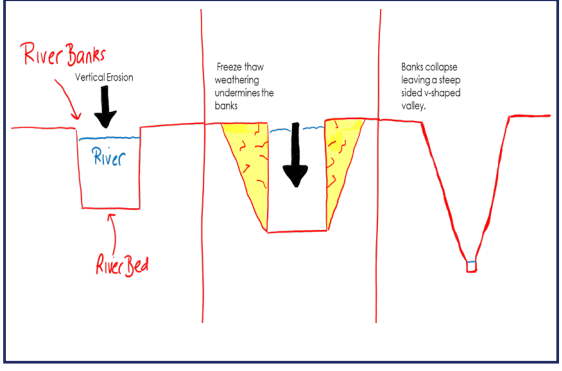
Waterfalls and Gorges



Interlocking Spurs



V-Shaped Valley



Rivers (Physical Landscapes)

Key Processes:

Transportation Types	
1. Traction	Large rocks are rolled along the seabed.
2. Saltation	Smaller rocks are bounced along the seabed.
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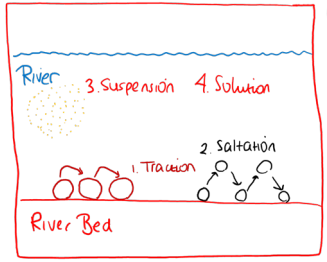
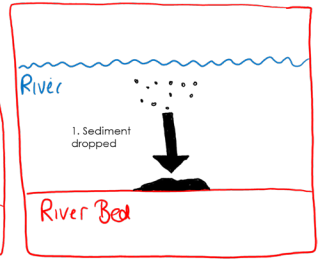
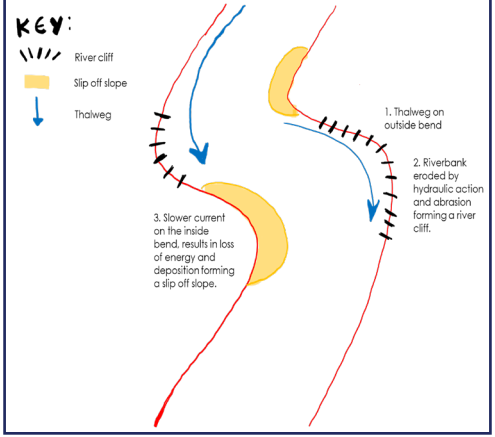




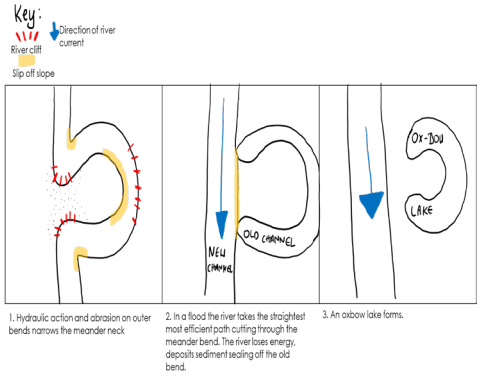
Deposition
Description
Material is dropped by the waves due to a loss of energy and velocity.

Key Middle and Lower Course Diagrams:

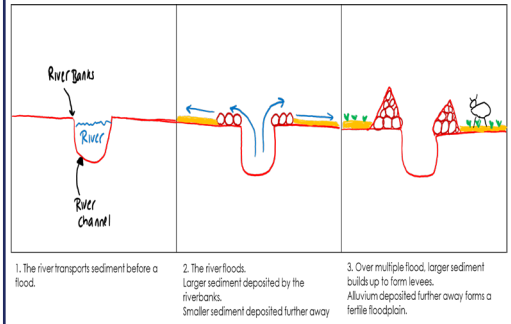
Meanders



Ox-Bow Lakes



Floodplains and Levees



Rivers (Physical Landscapes)

Key Causes of Flooding

Human Causes	Description
Prolonged Rainfall	Water saturates soil increasing surface run off and flood risk.
Relief	Steep land means quicker surface run off and greater flood risk.
Physical Causes	
Urbanisation	More impermeable surfaces means greater surface run off and higher flood risk.
Deforestation	Fewer trees means more quick soil saturation, greater surface run off and higher flood risk.

Application
Oxford Flood Alleviation Scheme

Flood Risk Factors

1. Confluence of River Thames and River Cherwell.
2. Oxford is a city.
3. Flash flood in 2005 causes 250 homes to be evacuated and the A420 to flood for 450 metres.

Strategies Implemented

1. Excess bypass channel increased in size to remove 400,000 m^3 of material to store excess discharge.
2. 20,000 trees planted to increase interception and reduce surface run off.
3. Embankments built to make the river deeper increasing capacity.

Successes and Failures

1. Compulsory Purchase Order was issued to landowners to force them to sell their land angering locals.
2. Locals feel safer knowing the risk of flooding is reduced.

Key River Management Strategies

Hard Engineering
Man-made structures built to control the flow of rivers and reduce flooding.

Strategy	Explanation	Costs	Benefits
Channel Straightening	Meanders are removed. Artificial channels make the river straighter increasing the velocity.	Cause more flooding and erosion down stream.	Faster water leaves the area quicker reducing the chance of flooding.
Flood Relief Channels	Channels built to divert water around built-up channels, to divert excess water that would flood.	Increased discharge when it re-joins the river increasing flood risk.	Removes excess water from the river channel to reduce flooding.

Soft Engineering
Schemes set up using knowledge of a river and its processes to reduce the effects of flooding.

Strategy	Explanation	Costs	Benefits
Floodplain Zoning	Restrictions prevent buildings on parts of the floodplain.	Not possible to change existing land uses.	Less impermeable surfaces reducing surface run off and flood risk.
Afforestation	Trees increase interception rates reducing surface run off.	Less land available for farming.	Discharge and flood risk are reduced.

Topic 1: Migrants in Britain C.800-PRESENT

Medieval Migration

Vikings	
Reasons for migration	• Desire for wealth • Opportunities for trade • Previous knowledge of England e.g. trade, wealthy monasteries • Problems at home
Experience	• New earldoms created • Anglo-Saxons and Vikings living in Jorvik together • Keeping connections to Scandinavian gods • Establishment of Danelaw • Attacks between Vikings and Anglo-Saxons
Impact	• Language e.g. days of the weeks, names of towns • Scandinavian fashion of dress • Freedom to follow Christianity or worship Scandinavian gods • Viking assemblies established "Things"

Normans	
Reasons for migration	• Succession crisis • William's claim to the throne • Opportunity to increase wealth and power • The Pope supported William's claim
Experience	• Winning Battle of Hastings • Eventually taking land away from English lords • The Harrying of the North • Building castles • French made the language of government • Building churches and cathedrals
Impact	• Establishing fashion for names • Replacing English bishops with Norman bishops • New laws • Feudal system • Domesday book • Craft guilds introduced • Towns growing through trade with France

Jews	
Reasons for migration	• Royal invitation in order to lend money • Jewish communities were established
Experience	• The Charter of Liberties, which gave Jews royal protection. • Some Jews were well respected in communities • Jewish communities were established • In 1280, all Jewish people were ordered to convert to Christianity or leave England
Impact	• Religion was important • Money lent was used to build castles and cathedrals • Businesses benefiting from money lent

European Craftsmen And Merchants	
Reasons for migration	• England was a centre of trade • Royal invitation • The English wool trade was prominent • London's trades and craft industries were organised into guilds • The Black Death killed 30-40% of England's population between 1348-51
Experience	• Given royal privileges • Craft guilds believed migrants were taking their jobs • Some were welcomed due to the needed skills • Establishment of the Steelyard
Impact	• Ports grew • Money made was invested e.g. into buildings, banks • Change of the economy from being based on raw materials to manufactured goods • Growth of cloth trade

Topic 1: Migrants in Britain C.800-PRESENT

Early Modern Migration

Huguenot Migrants	
Reasons for migration	• Persecution by Catholic authorities in France • Safety in England – religious tolerance; charters & letters of denization (e.g. 1681) • Opportunities for merchants in growing towns • Settled in areas with relatives
Experience	• Generally positive relations with English • Granted denizen status 1681 • Most joined relatives and friends • Most had successful businesses, although some were very poor, so churches gave aid • Churches protected parts of Huguenot culture
Impact	• Developed industries, provided jobs, and helped transform England into an industrial economy –Sheffield steel; silver; silk in Spitalfields; started paper industry; skilled in metals and wood • Wealth & financial skills – helped found Bank of England and financed British trade & expansion • 'Protestant work ethic' • Contributed to fashion industry • Improved religious tolerance

African Migrants	
Reasons for migration	• Some came from Spain with Catherine of Aragon (c. 1501) – in royal court or ordinary households • Slave trade developed (Royal African Company founded 1660) –some Africans came to England enslaved and escaped or got out of slavery, or came as ships' crews
Experience	• Relatively integrated in 1500s, married local people, and seen as equals. Some worked as weavers, servants and sailors • Growing racism in 1600s due to slavery • In late 1600s, it became "fashionable" to have a black person as a servant
Impact	• Impact on economy • Development of community

Palatine Migrants	
Reasons for migration	• 1709 – Foreign Protestants Naturalisation Act • Bad harvests, famine, poverty and war in Germany • Opportunity for a better life in Britain, or had ambitions to go to America
Experience	• Public initially generous to them • Difficult to get jobs (poor harvest); most in a refugee camp. Did not have skills or connections in England like the Huguenots. • Public support fell quickly due to competition for jobs and food • 3000 deported to Ireland; 3000 others sailed to New York; most others returned to Germany
Impact	• Government settled 3000 Palatines in Ireland • Most didn't stay longer than a couple of years – little long-term impact

Indian Migrants	
Reasons for migration	• East India Company (EIC) created in 1600 to increase trade between England and India • Some Indians came back to England with EIC officials as new family, servants, ayahs (nannies) or lascars (sailors)
Experience	• Some sailors settled in port cities or worked as labourers • Some servants treated with respect • Some servants abandoned by employers or replaced with English servants • Indian children used as servants and viewed as a "status symbol"
Impact	• Impact on economy • Development of community

Topic 1: Migrants in Britain C.800-PRESENT

Early Modern Migration

Jews	
Reasons for migration	• Persecution of Jews in Europe, while England was increasingly tolerant • Cromwell reversed the royal ban on Jews in 1656 • Jews had skills, experience and networks of trade across Europe – England wanted Jews to help their weak economy
Experience	• Charles II allowed Jews to practise their religion • Legal restrictions (e.g. banned from universities, army, being lawyers) and popular antisemitism • Some were well-off merchants and bankers, but many needed support from Jewish relief networks • Founded synagogues, schools and community institutions. Some tried to integrate (Moses Hart)
Impact	• Creation of synagogues & schools – community • Development of business and trade – helped London become a financial centre and helped British expansion and trade

Flemish And Walloon Migrants	
Reasons for migration	• Need for business, skills and labour to benefit Sandwich economy • Persecution of Protestants in the Netherlands in 1560s • 1561 – royal warrant to establish a 'stranger' community in Sandwich – Flemish came, then Walloons in 1568 • 1575 – Canterbury invited Walloons to come to boost their economy
Experience	• Both groups initially welcomed (1/2 of population of Sandwich) • Resentment in Sandwich grew – laws 1570 & 1581 banning them from jobs outside textile or ordering them to leave • After wars and plague in the late 1500s, and the decline of the baize industry, many Flemings left the community in Sandwich. • Little opposition to Walloons in Canterbury due to their benefits. • French-speaking church became part of Canterbury Cathedral
Impact	• Revived local economies of Sandwich and Canterbury through business & textile techniques – improved trade; provided jobs etc. • New crops (e.g. celery) • Establishment of communities • Influenced architecture – e.g. rounded gables

18th and 19th Century Migration

Irish Migrants	
Reasons for migration	• Problems of poverty in Ireland • Liverpool was a close port • Planned to go to Liverpool en route to America
Experience	• Work linked to the Industrial Revolution • Facing prejudice from English Protestants
Impact	• Role in building infrastructure e.g. railways • Development of Irish communities in Britain

European Migrants	
Reasons for migration	• Aristocrats and clergy migrated from France due to the French Revolution • German migrants interested in political thought in Britain • Italians were attracted by opportunity to continue working in agriculture
Experience	• Setting up businesses • Italians continued with similar work e.g. labouring on roads • Italians developed new skills e.g. selling ice cream
Impact	• Growth of economy • Establishment of communities

Topic 1: Migrants in Britain C.800-PRESENT

18th and 19th Century Migration

Asian Migrants	
Reasons for migration	• Servants being brought to England • Going to England to study • Consequence of India being colonised by Britain • Sailors (lascars) worked on ships of the East India Company
Experience	• Ayahs (nannies) often stayed with families they had moved to England with • Some Ayahs were abandoned by their English employers • Some sailors (lascars) were abandoned by their shipping companies • Some sailors (lascars) found work in ports
Impact	• Impact on the economy • First Indian restaurant opened by Sake Dean Mahomed

African	
Reasons for migration	• Transatlantic slave trade • Some Africans settled in Britain after gaining their freedom
Experience	• Lack of clarity on legal status • The "Committee for the Relief of the Black Poor" was established
Impact	• Involvement in abolition campaigns • Growth of black population in cities e.g. London, Liverpool

Jewish	
Reasons for migration	• Fleeing persecution in the Russian Empire • Links to established Jewish communities
Experience	• Urged by the authorities to assimilate • Existing Jewish community helped to support new migrants • Antisemitism • Some Jewish people worked in illegal sweatshops
Impact	• Establishment of Jewish communities in Spitalfields and Whitechapel • From 1858, Jewish people could become Members of Parliament

Topic 1: Migrants in Britain C.800-PRESENT

20th Century Migration

Refugees And Asylum Seekers	
Reasons for migration	• Belgium migrants seeking safety post German invasion of Belgium in WW1 • Jewish refugees fleeing persecution in Nazi Germany • Refugees from Communist regimes in Eastern Europe • Membership of UN
Experience	• Antisemitism • Some children via Kindertransport were welcomed • Anti-immigration rhetoric • Growing racial tension in some communities
Impact	• Building religious buildings • Development of migrant communities

Migrants From The British Empire And The Commonwealth	
Reasons for migration	• Fighting for Britain during WW1 and WW2 • Rebuilding Britain post WW2 • "Windrush Generation" • Legislation e.g. Commonwealth Immigrants Act • Indian migrants seeking safety in Britain after partition • Availability of housing e.g. Leicester
Experience	• Facing racism and discrimination • Anti-immigration rhetoric • Organising Bristol Bus Boycott • Growing racial tension in some communities
Impact	• Champions of civil rights in Britain e.g. Harold Moody • Development of NHS • Development of transport systems • Growth of migrant communities • Building religious buildings • Impact on culture e.g. Notting Hill Carnival

European Migrants	
Reasons for migration	• Rebuilding Britain post WW2 • Joining the EEC (then EU)
Experience	• Belgians welcomed and set up small businesses • Germans (1914) were declared "enemy aliens" • Anti-immigration rhetoric • Division over EU
Impact	• Impact on the economy

Topic 1: The Development of the Civil Rights Movement, 1954-60

Timeline			
1. Brown v. Topeka case **1954**	3. Beginning of the Montgomery Bus Boycott **December 1955**	5. Southern Christian Leadership Conference (SCLC) formed by Martin Luther King Jr **January 1957**	7. Civil Rights Act passed **September 1957**
August 1955 2. Emmett Till murdered	**1956** 4. Bus Boycott successful, segregation on buses ended	**September 1957** 6. Little Rock High School	

Key People	
8. Martin Luther King Jr	An American Baptist minister and activist who became a key leader in the civil rights movement from 1954-68.
9. President Dwight Eisenhower	US President from 1953 to 1961.
10. Rosa Parks	A civil rights activist who became a nationally recognised symbol of strength.
11. Thurgood Marshall	A civil rights advocate and later US Supreme Court Justice.

Key Words	
12. Congress	The US equivalent of parliament, split into two parts – the Senate and the House of Representatives.
13. Jim Crow Laws	State and local laws, enacted from 1876-1965, that enforced racial segregation in Southern USA.
14. Ku Klux Klan	Racial supremacy group, based in the South, who used violence against black Americans.
15. Lynching	Punishing a person without legal process or authority, often with brutality.
16. Non-violent direct action	Rejecting violence in favour of peaceful tactics as a means of gaining political objectives.
17. Sharecroppers	A type of farming in which families rent small plots of land from a landowner in return for a portion of their crop.
18. Supreme Court	The highest federal court of the USA.

Topic 2: Protest, Progress and Radicalism 1960-75

Timeline

1. Greensboro sit-in	3. Anniston bomb attack	5. James Meredith case began	7. Birmingham march	9. Mississippi murders	11. Assassination of Malcolm X	13. Kerner Report published	15. Protest at the Mexico Olympics
February 1960	**May 1961**	**June 1962**	**August 1963**	**June 1964**	**February 1965**	**February 1968**	**October 1968**

May 1961	**April 1962**	**June 1963**	**June 1964**	**July 1964**	**August 1965**	**April 1968**
2. First Freedom Ride	4. Voter Education Project set up	6. Medgar Evers shot	8. Freedom Summer	10. Civil Rights Act passed	12. Voting Rights Act passed	14. Assassination of Martin Luther King Jr

Key People

16. James Farmer	Civil rights leader, National Director of CORE and organiser of the 1961 Freedom Rides.
17. James Meredith	Became the first black American student at the University of Mississippi.
18. John Carlos	Bronze medal winner in the 1968 Olympic Games, who saluted during the medal ceremony to show black unity.
19. Tommie Smith	Gold medal winner in the 1968 Olympic Games, who saluted during the medal ceremony to show black unity.

Key Words

20. Communist	Someone who promotes a classless society where power is shared and private ownership is abolished.
21. Executive order	A directive issued by the President of the USA that manages operations of the federal government and has the force of law.
22. Federalise	To put under the direct control and authority of a federal government.
23. Freedom Riders	Civil rights activists who rode interstate buses into the Southern states in 1961 to challenge segregated bus terminals.
24. Freedom Schools	Temporary, alternative free schools for black Americans which aimed to encourage them to become more politically active.
25. 'Great Society'	A series of programmes with a focus on ending poverty and racial injustice, which were set up on the initiative of President Johnson.
26. Nation of Islam	They believed in separatism from white society, pride in their heritage and armed self-defence.
27. Separatism	Keeping races apart.

Topic 3: US Involvement In the Vietnam War, 1954-75

Timeline

1. The defeat of the French at Dien Bien Phu **1954**	3. Ho Chi Minh set up the Vietcong to oppose Diem **1960**	5. Diem overthrown **1963**	7. Beginning of 'Operation Rolling Thunder' **1965**	9. Introduction of Vietnamisation **1969**	11. The bombing of North Vietnam **1972**

1955 2. Diem elected president of South Vietnam	**1962** 4. The introduction of the Strategic Hamlet policy	**1964** 6. The Gulf of Tonkin incident	**1968** 8. The Tet Offensive and My Lai massacre	**1970-71** 10. Attacks on Cambodia and Laos

Key People

12. General William Westmoreland	United States Army general, who commanded US forces during the Vietnam War from 1964 to 1968.
13. Ho Chi Minh	Joint founder of the Vietminh and President of North Vietnam from 1954 until his death.
14. John F Kennedy	US President from 1961 until his assassination in 1963.
15. Lyndon B Johnson	President Kennedy's vice-president, who succeeded him as President of the USA from 1963 to 1969.
16. Ngo Dinh Diem	Leader of South Vietnam from 1955 until his assassination in 1963.
17. Richard Nixon	US President from 1969 until his resignation in 1974.

Key Words

18. Ambush	A surprise attack.
19. ARVN	The army of the Republic of South Vietnam.
20. Booby trap	A device that is intended to kill, harm or surprise a person.
21. Ceasefire	A temporary stoppage of a war.
22. Cold War	An ideological conflict from 1945 between the USA and the Soviet Union.
23. Containment	Prevention of communism spreading to non-communist nations.
24. Guerrilla campaign	Fighting in small groups against conventional forces.
25. Gulf of Tonkin	A body of water located off the coast of Northern Vietnam and southern China.
26. Napalm	A highly flammable sticky jelly used in incendiary bombs.
27. Strategic Hamlet Programme	US attempt to win over the peasants by moving them into new villages in areas under the control of the South Vietnamese army.
28. Vietcong	Communist-led guerrilla army and political movement.
29. Vietminh	A nationalist movement set up in 1941 originally to fight for Vietnamese independence from French rule.
30. Vietnamisation	Nixon's policy to train and equip the South Vietnamese soldiers to take the place of US troops.

Topic 4: Reactions To, and the End of, US Involvement In Vietnam, 1964-75

Timeline				
1. Johnson decided not to stand for re-election as President. **1968**	3. Nixon began secret peace talks with North Vietnam **1969**	5. Nixon visited China **1972**	7. Ceasefire was agreed. Paris Peace Agreement was signed **January 1973**	9. North Vietnamese captured Saigon. A year later, Vietnam was reunited **April 1975**
1968 2. The My Lai Massacre	**1970** 4. The Kent State University shootings	**1972** 6. The October Agreement was reached with North Vietnam	**March 1975** 8. After breaking the ceasefire in December 1974, the North Vietnamese won a key victory	

Key People	
10. Henry Kissinger	US National Security Advisor and later Secretary of State.
11. Mao Zedong	Founding father of the People's Republic of China from 1949.
12. Walter Cronkite	Respected TV journalist from CBS News who reported from Vietnam.

Key Words	
13. Draft	US name for conscription, which made military service compulsory for men over the age of 18.
14. Détente	A period in the 1970s when Cold War relations between the USA and the USSR appeared to be more relaxed.
15. Red Scare	Term used in the USA involving promotion of a widespread fear of Communism.
16. Sovereignty	The authority of a state to govern itself.

Topic 1: The Origins of The Cold War, 1941–58

Timeline

1. Grand Alliance formed **1941**	3. Truman Doctrine – USA committed to containment **12 Mar 1947**	5. Stalin began the Berlin blockade. The West began the airlift within two days. **24 June 1948**	7. NATO formed – anti-Soviet alliance between the USA and several European countries **April 1949**	9. Warsaw Pact formed – USSR dominating Eastern Europe militarily **14 May 1955**	11. Hungarian uprising **Oct-Nov 1956**
16 July 1945 2. US tested first atomic bomb	**Sep 1947** 4. Cominform – USSR controlling Eastern European countries politically	**12 May 1949** 6. Germany divided by the end of 1949 (FRG & GDR)	**March 1955** 8. Khrushchev became leader of the Soviet Union	**July 1955** 10. Geneva Summit - part of the 'era of peaceful coexistence'.	**1957** 12. USA developed ICBMs, followed by the USSR within a few months

Key People

13. Eisenhower	US President from 1953 – 1961, who was an anti-communist but recognised the importance of reducing tensions.
14. Khrushchev	The leader of the USSR that emerged after the death of Stalin.
15. Nagy	The Hungarian Prime Minister, who believed, even in a communist country, people should have some personal freedoms.
16. Stalin	The leader of the USSR from 1929 - 1953.
17. Truman	US President from 1945 – 1953, who pursued a policy of "containment".

Key Words

18. Alliance	An agreement between two countries to protect each other and work together.	**23. Cominform**	A political organisation set up by Stalin, which gave the USSR a lot of political control over countries in Eastern Europe.
19. Buffer Zone	A group of countries between Germany and the USSR that Stalin wanted influence over to protect the USSR.	**24. Communism**	An economic system where property is collectively owned.
20. Cause	A reason why an event occurs.	**25. Consequence**	The result of an event, which can be positive, neutral or negative.
21. Capitalism	An economic system that focuses on private ownership and profit.	**26. NATO**	The North Atlantic Treaty Organisation (NATO), whose members agreed to protect one another if threatened by the Soviet Union.
22. Comecon	An economic organisation of communist countries in Eastern Europe, which aimed to support economic growth.	**27. ICBMs**	Intercontinental ballistic missiles.

Topic 2: Cold War Crises, 1958–70

Timeline					
1. Khrushchev gave the Berlin Ultimatum **Nov 1958**	3. JFK became president **20 Jan 1961**	5. Berlin Wall began being built **12 Aug 1961**	7. JFK assassinated; replaced by his vice-president LBJ **22 Nov 1963**	9. Prague Spring reforms introduced by Dubcek **April 1968**	11. Invasion of Czechoslovakia **20 Aug 1968**
Jan 1959 2. Cuban Revolution	**17 Apr 1961** 4. Bay of Pigs invasion	**16-28 Oct 1962** 6. Cuban Missile Crisis	**March 1965** 8. US troops invaded Vietnam	**3 Aug 1968** 10. Brezhnev Doctrine introduced	**20 Jan 1969** 12. Nixon became president

Key People	
13. Brezhnev	Leader of the USSR, who introduced his doctrine which prevented countries leaving the Warsaw Pact.
14. Castro	A Cuban revolutionary, who was the leader of Cuba from 1959 - 2008.
15. Dubcek	Leader of Czechoslovakia, who was a committed communist but believed it should not make people's lives miserable.
16. Kennedy	US President from 1961 – 1963, who was assassinated.

Key Words			
17. Censorship	Limiting the spread of ideas through the media.	**21. Reform**	To make changes.
18. Conference	A formal meeting between the representatives of different countries.	**22. Revolution**	A dramatic and wide-reaching change.
19. Crisis	A moment of intense danger or very high tension.	**23. Ultimatum**	A final set of demands that if refused with result in retaliation.
20. Export	A product or goods sold abroad.	**24. Warsaw Pact**	A military agreement of communist countries, who agreed to protect each other.

Topic 3: The End of The Cold War, 1970–91

Timeline					
1. SALT I limited ICBMs, SLBMs and ABMs, but the arms race continued **May 1972**	3. Helsinki Agreements **Aug 1975**	5. USSR invaded Afghanistan **24 Dec 1979**	7. Reagan became president **20 Jan 1981**	9. Gorbachev became Soviet leader **March 1985**	11. Fall of the Berlin Wall after mass protests **9 Nov 1989**
29 Mar 1973 2. Last US troops left Vietnam	**June 1979** 4. SALT II signed (but never ratified)	**Jan 1980** 6. Carter Doctrine promised US would intervene to protect its interests in the Middle East & Persian Gulf	**23 Mar 1983** 8. Reagan proposed the Strategic Defense Initiative (SDI) (Star Wars)	**May 1989** 10. Hungary began opening its border with Austria – hole in the 'Iron Curtain'	**31 Dec 1991** 12. Soviet Union officially ended

Key People	
13. Carter	US President from 1977 – 1981, who promised that the US would intervene to protect its interests in the Middle East & Persian Gulf.
14. Gorbachev	Leader of the USSR, who was communist but was committed to making reforms.
15. Nixon	US President from 1969 – 1974.
16. Reagan	US President from 1981 – 1989, who was committed to taking a strong stance against communism and "the evil empire".

Key Words			
17. Boycott	To stop doing something as a form of protest.	**21. Perestroika ('reconstruction')**	Reforming the Soviet economy and introducing some practices that made capitalism successful.
18. Détente	A period of time when there was a relaxation of tensions.	**22. Rollback**	Refers to Reagan's desire to push back communism rather than just contain it.
19. Glasnost ('openness')	Gorbachev believed people should not fear expressing their opinions and so allowed opposition to the government.	**23. Sanctions**	Penalties placed on a country as a result of an action taken.
20. 'New Thinking'	Refers to the changes Gorbachev wanted to make to help improve the USSR's position.	**24. Shah**	King or emperor.

Topic 1: Queen, Government and Religion (1558 – 69)

Timeline			
1. Henry VIII decided to Break with Rome, making himself Head of the Church of England **1533**	3. Mary I became queen and made England a Catholic country. **1553**	5. England, France and Scotland signed the Treaty of Edinburgh which agreed that all military forces will withdraw from Scotland and acknowledged Elizabeth I as queen of England and Ireland **1560**	7. Phillip II banned the important of English cloth to the Netherlands. **1563**
1547 2. Edward VI became king and made England a Protestant country	**1558** 4. Elizabeth I became queen and made England a Protestant country but adopted a 'middle way'	**1561** 6. Mary, Queen of Scots, returned to Scotland	**1569** 8. The Revolt of the Northern Earls – Northern Catholics rebelled against Elizabeth and tried to make Mary Queen of England.

Key People	
9. Henry VIII	Elizabeth's father, who broke from Rome, which made England a Protestant country.
10. Elizabeth I	A Protestant, who ruled England for 44 years.
11. Mary, Queen of Scots	Elizabeth's cousin, who was Queen of Scotland, and had a strong claim to the English throne.
12. Mary I	Elizabeth's older, half-sister, who was a Catholic.
13. Philip II of Spain	The King of Spain, who was Catholic, and had been married to Mary I.

Key Words			
14. Catholic	A Christian who believes the Pope should be the head of the Church.	**19. Invasion**	Attacking another country.
15. Domestic	At home / in your own country.	**20. Legitimate**	Right / proper. Also somebody whose parents were married when they were conceived.
16. Excommunicated	When someone is expelled from the Catholic church.	**21. Protestant**	A Christian who does not believe the Pope should be the head of the Church and rejected some Catholic beliefs.
17. Hierarchy	A system in society that organises people in relation to power, wealth or status.	**22. Puritan**	An extreme Protestant who wanted a simpler Church.
18. Illegitimate	Did not have the right to rule.	**23. Recusant**	A Catholic who was unwilling to attend church, as required by Elizabeth's religious settlement.

Topic 2: Challenges To Elizabeth At Home And Abroad (1569 – 88)

Timeline					
1. Spain had agreed to let the Netherlands govern themselves	3. Spanish troops attacked the Dutch provinces (the Spanish Fury) leading to the Pacification of Ghent	5. Philip II sent the Duke of Parma to be Governor-General of the Netherlands	7. Elizabeth I signed the Treaty of Nonsuch, agreeing to support the Dutch Protestants	9. Spain started preparing an Armada to invade England	11. Sir Francis Drake attacked Spain's navy in Cadiz, in an event known as the 'singeing of the King of Spain's beard'
1548	**1576**	**1579**	**1585**	**1586**	**1587**
1566	**1576**	**1584**	**1585**	**1587**	**1588**
2. The Dutch Revolt began because Philip II of Spain was not letting the Netherlands govern themselves	4. Pacification of Ghent – a peace agreement between Span and the 17 Dutch provinces	6. Deaths of the Duke of Alençon and William of Orange	8. Elizabeth I sent Sir Francis Drake to raid Spanish New World settlements	10. Execution of Mary, Queen of Scots	12. Philip II launched the Spanish Armada

Key People	
13. Anthony Babington	A Catholic with links to France who was heavily involved in the Babington plot (1586).
14. Roberto Ridolfi	An Italian banker from Florence living in England who was also one of the Pope's spies.
15. Sir Francis Throckmorton	A young Catholic Englishman who acted as the go-between with Mary, the Duke of Guise, Philip II and the Pope in the Throckmorton plot (1583).
16. Duke of Alba	The Spanish Governor-General of the Netherlands from 1567-73.
17. William of Orange	The leader of the Dutch Protestant rebels.

Key Words			
18. Armada	A fleet of ships.	**23. Plot**	A secret, illegal plan.
19. Cargo	Goods carried by a ship.	**24. Privateer**	Individual merchants and explorers who captured ships from rival countries to steal their cargo.
20. Fireships	Empty ships set on fire.	**25. Propaganda**	Biased information used to promote a point of view.
21. Heresy	A religious belief that goes against the Catholic Church.	**26. Sacking**	To rob a town or city using violence, causing a lot of damage.
22. Foreign policy	A country's aims that guides its relations with other countries.	**27. Treaty**	An agreement between countries.

Topic 3: Elizabethan Society In The Age of Exploration (1558 – 92)

Timeline					
1. Parliament passed the Statute of Artificers **1563**	3. Elizabeth I founded Jesus College in Oxford **1571**	5. Parliament passed the Poor Relief Act **1576**	7. Sir Walter Mildmay founded Emmanuel College in Cambridge **1584**	9. Five ships set sail, and arrived on Roanoke Island later that year **April 1585**	11. The first colonists arrived back in England, having abandoned their settlement in Virginia **July 1586**
1567 2. The Red Lion Theatre was built in Whitechapel, London	**1572** 4. Parliament passed the Vagabonds Act	**1577** 6. Francis Drake set off on his three year circumnavigation of the globe	**1584** 8. Queen Elizabeth I gave Walter Raleigh permission to explore and settle lands in North America	**Spring 1586** 10. Wingina asked other chiefs to join him in attacking the English settlers	**1587** 12. The Rose theatre was built in London

Key People	
13. Francis Drake	An English privateer.
14. John Hawkins	English Treasurer of the Navy from 1577-95, who became involved in the slave trade.
15. Walter Raleigh	A wealthy explorer and a member of Elizabeth I's court. He is often seen as helping to make tobacco popular in England.
16. Wingina	The local chief of Roanoke Island.

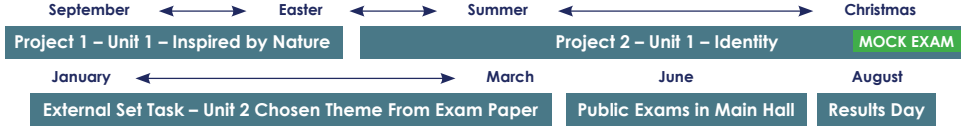
Key Words			
15. Colonise	Send settlers to a place and gain control over the area.	**19. Impotent poor**	Those who were unable to work because of age or illness (also known as the deserving poor).
16. Astrolabe	A circular instrument used by sailors to help them navigate at sea.	**20. Poor relief**	Financial help given to the poor from a local fund.
17. Export	To send goods to another country to sell.	**21. Vagabonds / vagrants**	Homeless people without jobs who moved around the countryside begging for money or stealing.
18. Idle poor	Those who were seen as able to work but didn't (also known as the able-bodied poor).	**22. Quadrant**	An instrument the shape of a quarter circle, to help with navigation.

GCSE Art

The four assessment objectives for both components (Unit 1 and Unit 2)

1. I will develop ideas through investigations, demonstrating critical understanding of sources.
2. I will refine my work by exploring ideas, selecting, and experimenting with appropriate media, materials, techniques and processes.
3. I will record ideas, observations, and insights relevant to intentions as work progresses.
4. I will present a personal and meaningful response that realises intentions and demonstrates understanding of visual language.

Timeline and Deadlines



AQA Assessment Objective CHECKLIST

A01 Develop	• I have researched **a wide range** of artists, craftsmen and designers • I have worked **IN THE STYLE** of the artists using my own photographs • I have written about the artist and how they have informed and influenced my practice
A02 Refine	• I have experimented with **a wide range of relevant** media and techniques • All my work has been **well refined** • I have pushed my ideas to their **full limitations** to show the process and development of my ideas
A03 Record	• I have **drawn from observation** using a range of different media • I have worked from my **own photographs** • I have used **annotation to explain the development** of my research and ideas
A04 Final Piece	• I have responded in my own personal way • I have been influenced by my research • I have concluded my project with a final response

AO1: How do I research artists?

You will be given a list of artists whose style of work suit the chosen theme. You will need to introduce them with dates, places, what kind of work they are known for, and how relevant their work is to your project. You MUST include at least 2 images of the artist's work and point out the key features.

AO2: What kinds of media, materials, techniques and processes can I use?

You will need to show a wide variety of different media. Drawing, painting, sewing, printing etc – but only if the artist's work you are researching requires that kind of response.

AO3: How do I record my ideas?

Drawing and written annotation are more important because it shows you have observed closely and noted key features that link with the theme.

Key words to learn for GCSE art annotation:

SPACE:	positive; negative; open; closed; deep; foreground; composition; position; perspective
COLOUR:	primary; secondary; tertiary; bright; bold; radiant; dull; vivid; contrasting; monochrome; harmonious; analogous; complimentary; tints; tones; warm; cool
SHAPE:	regular; irregular; circle; triangle; square; angular; asymmetrical; bent; bulbous; chunky
FORM:	3-Dimentional; model; construct; mould;
VALUE:	tone; graduation; dark; light; mid; bright; faded; smooth;
TEXTURE:	smooth; rough; course; bumpy; spiky; silky; broken; serrated;
LINE:	fluent; free; controlled; powerful; geometric; angular; thick; thin; horizontal; vertical; overlapping; inferred; continuous

What you need to do to achieve the best grades:

1. Present your work as neatly as possible – clean lines, clear presentation, and beautiful lettering.
2. Draw as much as possible – to show you have clearly observed the artist's work.
3. Write about what you intend to do – and reflect on what you have already done.
4. Be as independent as you can – by researching other artists besides those that have been suggested.
5. Take photographs of images that are relevant to the project theme.
6. Meet all the deadlines set – if you fall behind, it is difficult to catch up on missing work.

GCSE Art

GCSE ART Annotation

Shape, form, space	Tone	Pattern and Texture	Line	Colour
Closed	Bright	Repeated	Fluent	Bright
Open	Dark	Uniform	Free	Bold
Distorted	Faded	Geometric	Rough	Primary
Flat	Smooth	Random	Controlled	Secondary
Organic	Harsh	Symmetrical	Powerful	Tertiary
Deep	Contrasting	Soft	Strong	Radiant
Positive	Intense	Irregular	Geometric	Dull
Negative	Sombre	Coarse	Angular	Vivid
Foreground	Grey	Bold	Light	Contrasting
Background	Strong	Uneven	Delicate	Deep
Composition	Powerful	Bumpy	Flowing	Monochrome
Curvaceous	Feint	Rough	Simple	Harmonious
Elongated	Light	Smooth	Thick	Complementary
Large	Medium	Uneven	Thin	Natural
Small	Dark	Spiky	Horizontal	Earthy
2D	Dramatic	Broken	Broken	Subtle
3D	Large	Furry	Interrupted	Pale
	Small	Fine	Rounded	Cool
		Flat	Overlapping	Warm
		Grid	Faint	Saturated
				Luminous
				Strong

Basic, simple, solid, loud, quiet, bright, realistic, stylised, observed, busy, vibrant, strange, interesting, balanced, lively, negative, recognisable, abstract, tactile, meaningful, symbolic, depressing, unique, emotive, hidden, textural, dynamic, disturbed, sophisticated, puzzling, optimistic, powerful, intentional, conceded, subtle.

Example

I have created this piece using watercolours, coloured pencil and oil pastel. I have learnt how to blend the watercolours to show different tones and add texture. The piece shows strong shapes and vivid colours. I have added coloured pencils to show some areas in more detail and focus. The artist Georgia O'Keeffe has inspired my piece. In her work she uses bright, bold colours to show close up views of flowers with a range of dark to light tones. I aim to now further develop my piece by using other materials. I could do this by experimenting with block prints on watercolour backgrounds or possibly try painting onto fabric and then stitch into to show more detail.

REMEMBER to check your…
Spellings, Grammar and Punctuation

Sentence Starter Help
Try thinking of our own too

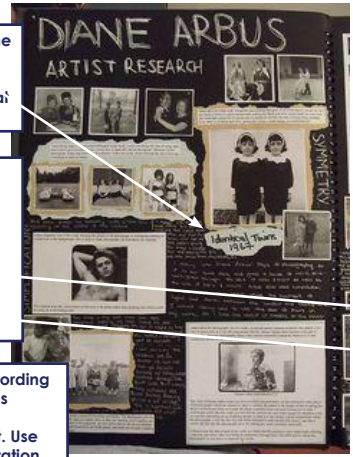
- In this piece I have…
- The materials I have used are…
- The technique I have used is…
- Through working in this way I have learnt how to…
- I have shown… in the style of…
- This piece could develop further by including…
- The artist… has influenced my designs because…
- To develop this piece further I could…
- I think using… worked really well because…
- I am particularly pleased with… and I now aim to…

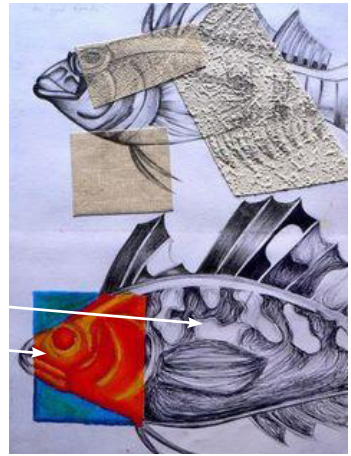
AO1: Look at the way this artist's work has been presented. What do you notice?

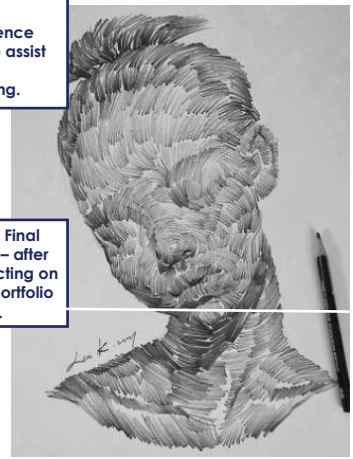
AO2: Look at the way this study has been constructed. A variety of materials have been explored for greater impact.

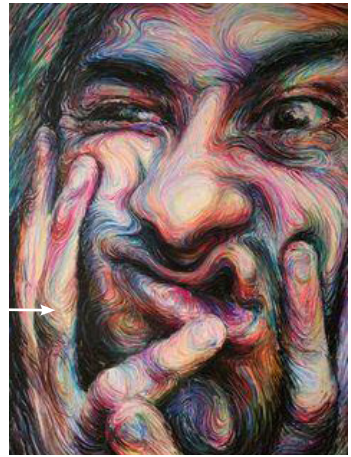
AO3: Recording your ideas are very important. Use the annotation guide and sentence starters to assist you with your writing.

AO4: Final idea – after reflecting on the portfolio work.









Assessment Objectives

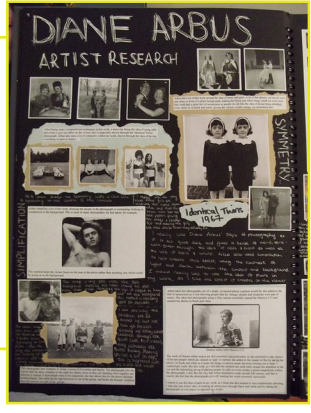
AO1 – EXPLORE - DEVELOP IDEAS

AO1 – ANALYSE, ANNOTATE

AO1 – INVESTIGATE AND RESEARCH

AO1: DEVELOP

- Artist research pages
- Exhibition visits
- Own response in the style of artist
- Interviews with artists/photographers
- Annotate/analyse what you have found out



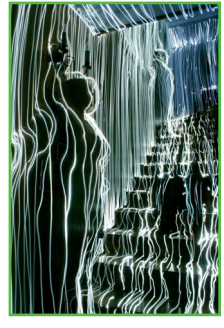
AO2 – TECHNIQUES AND PROCESSES

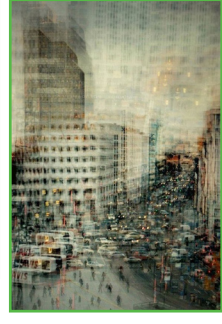
AO2 – REFINE, REVIEW, IMPROVE

AO2 – EXPERIMENT DIFFERENT IDEAS/MEDIA

AO2: REFINE

- Experimenting with a range of different materials
- Photoshoots exploring different techniques
- Selecting best photographs
- Photoshop to edit





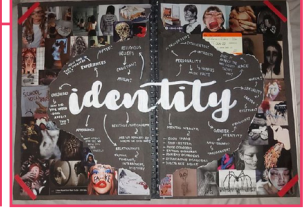
AO3 – EVIDENCE, RECORD, PRESENT

AO3 – PRIMARY RESEARCH

A03 – DRAWING, PRINTING, ANNOTATE

AO3: RECORD

- Title page
- Mind map
- Mood boards
- Planning photoshoots
- Photographs
- Contact sheets of photoshoots



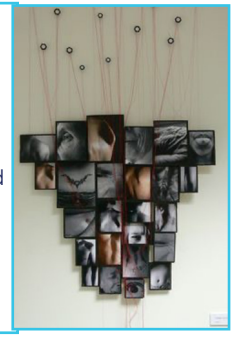
AO4 – DEVELOPED AS PLANNED

AO4 – OUTCOME, PRESENT FINAL IDEAS

AO4 – CONNECTION TO ARTIST, CONCLUSION

AO4: PRESENT

- Plans of final pieces
- Mini mock-ups and experiments of final piece
- Creating an original final piece, that is clearly inspired by your research and creative journey
- Evaluation of final piece – how does your piece link to the overall theme?



Camera Settings

Shutter Speed

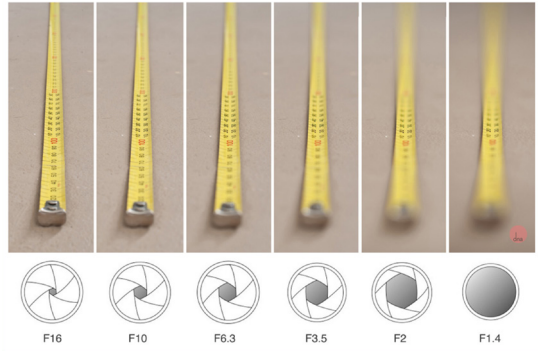
SHUTTER SPEED is the amount of time you allow the camera to capture your image. It controls the amount of light entering your lens. Shutter speed is measured in seconds, The bigger the denominator the faster the speed, for example: 1/1000 is much faster than 1/30.

SLOW SHUTTER

FAST SHUTTER

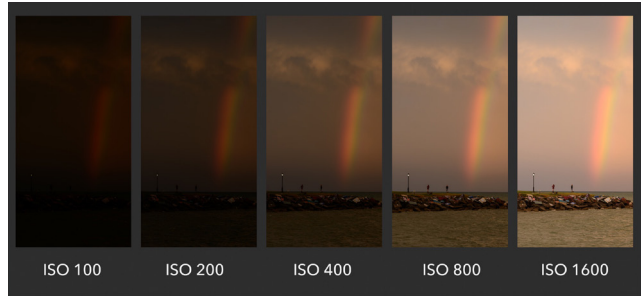
Aperture

APERTURE can be defined as the opening in a lens through which light passes to enter the camera. Aperture is measured in f-stops. The larger the f-stop the more light enters the lens.



ISO

ISO is how much light is let into the camera. This can affect the photograph by making it grainy the higher the setting. The higher the ISO, the more light is being let into the camera therefore, the brighter your image will be.



The Formal Elements

To be able to make your own photographs successful you need to learn more about the formal elements in photography, how they change a photograph and how they can be used to enhance your photographs.

Light

What areas of the photograph are most highlighted? Are there any shadows? Does the photograph allow you to guess the time of day? Is the light natural or artificial? Harsh or soft? Reflected or direct?



Bright, cold, warm, dappled, streaked, natural

Line

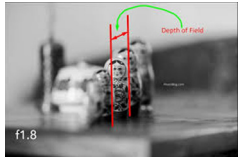
Are there objects in the photograph that act as lines? Are they straight, curvy, thin, thick? Do the lines create direction in the photograph? Do they outline? Do the lines show movement or energy?



Leading lines, hard, soft, direction, repeated

Space

Is there depth to the photograph or does it seem shallow? What creates this appearance? Are there important negative spaces in addition to positive spaces? Is there depth created by spatial illusions?




Value

Is there a range of tones from dark to light? Where is the darkest value? Where is the lightest?




Grey scale, harsh, contrasting, soft, edgy

The Formal Elements

Composition

The arrangement or structure of the formal elements that make up an image. (rule of thirds)

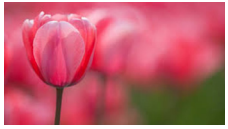
Texture

If you could touch the surface of the photograph how would it feel? How do the objects in the picture look like they would feel? (macro)

Soft, hard, smooth, rough, rippled, organic, harsh

Focus

What areas appear clearest or sharpest in the photograph? What do not? (depth of field)



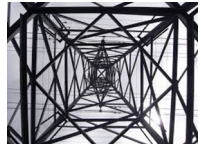
Repetition

Are there any objects, shapes or lines which repeat and create a pattern?

Shape

Do you see geometric or organic shapes? What are they?

Angular, geometric, organic, abstracted



Core Knowledge

Key Terms	
1. Automation	The use of machinery to complete manufacturing tasks.
2. Crowdfunding	Raising money from large numbers of people.
3. Cooperatives	Businesses owned, governed and self-managed by its workers.
4. Non-Renewable	Resources that will eventually run out (cannot be replaced).
5. Renewable	Resources that can be replaced/regrown (will not run out).
6. Technology Push	New technologies or materials that lead to designers using these to design new products.
7. Market Pull	Products made/improved in response to customer needs.
8. Flexible Manufacturing Systems	A system in which production is organised into cells of machines performing different tasks.
9. Just in Time Manufacturing	Ensuring materials and components are ordered to arrive at the product assembly point just in time for production.
10. Lean Manufacturing	Production focusing on reduction of waste to minimise costs and maximise efficiency.
11. Photochromic	Changes colour in relation to light levels.
12. Thermochromic	Changes colour in relation to heat.
13. Shape-memory Alloys	Can be bent/deformed and returns to original shape when heated.
14. Glass-Reinforced Plastic	A lightweight, chemical and heat resistant and waterproof composite material.
15. Carbon Fibre Reinforced Plastic	A carbon fibre mesh set with adhesive which has an extremely high strength-to-weight ratio.
16. Kevlar	Woven fabric with excellent impact resistance.
17. Gore-Tex	Waterproof and breathable textile.
18. Microfibres	Very fine synthetic textile which is breathable and durable.
19. Conductive Fabrics	A textile that allows a small electrical current to pass through them.

Key Terms	
20. First-Class Lever	A lever that has the fulcrum in the middle.
21. Second-Class Lever	A lever that has the load in the middle.
22. Third-Class Lever	A lever that has the force in the middle.
23. Linear Motion	Movement in a straight line.
24. Reciprocating Motion	Movement backwards and forwards in a straight line.
25. Rotary Motion	Movement around a circle.
26. Oscillating Motion	Movement swinging from side to side.
27. Physical Properties	Traits/characteristics that a material has before it is used.
28. Fusibility	Ability to be heated and joined to another material.
29. Electrical Conductivity	Ability to conduct electricity.
30. Thermal Conductivity	Ability to conduct heat.
31. Resistance to Moisture	Ability to prevent liquid and moisture from permeating the surface.
32. Absorbency	Ability to soak up and retain liquid, heat or light.
33. Mechanical or Working Properties	How a material behaves when it is manipulated.
34. Strength	Ability to withstand a constant force without breaking.
35. Hardness	Ability to withstand scratching, cutting and abrasion.
36. Density	How solid a material is.
37. Toughness	Ability to withstand impact from a dynamic force.
38. Malleability	Ability to be bent or shaped easily.
39. Ductility	Ability to be drawn or pulled into a length or wire without breaking.
40. Elasticity	Ability to be stretched and return to its original shape.

Specialist Material

Specialist Material - Tools and Materials

	**41. Marking Gauge**	Used to make a parallel line to an edge.
	**42. Planes**	Used to create a smooth surface by slicing away thin shavings of waste wood.
	**43. Chisels**	Used to produce a variety of wood joints.
	**44. Tenon Saw**	Used to cut accurate and straight lines in wood.
	**45. Coping Saw**	Used to cut curved lines in wood. Can be used to cut fine and intricate cuts.

Specialist Material (timber)

46. Air Seasoning	A natural method of reducing the moisture content of wood by letting air flow around it in a controlled way.
47. Kiln Seasoning	A quick method of reducing the moisture content of wood. A kiln is filled with steam and then gradually reduced which slowly dries out the wood.

48. Timber Conversion


Baulk Cut


Through and Through


Tangential Cut


Quarter Cut

49. Wood Finishes


Stains (enhances/ changes colour)


Preservatives (repels water/ moisture and insects)


Varnish (clear finish and adds protection)


Oils (enhances the wood's natural oils)

Material Categories

50. Timber and Board	51. Metals	52. Plastics	53. Textiles	54. Paper and Board
Hardwoods Oak, ash, mahogany. **Softwoods** Larch, pine, spruce. **Manufactured Boards** MDF (medium density fibreboard), plywood, chipboard.	**Ferrous Metals** Low-carbon steel (mild steel), high-carbon steel (tool steel), cast iron. **Non-Ferrous Metals** Aluminium, copper, silver/gold. **Alloys** Brass, bronze, stainless steel.	**Thermoforming Polymers** Acrylic (PMMA), high-impact polystyrene (HIPS), polypropylene (PP). **Thermosetting Polymers** Epoxy resin, urea formaldehyde, melamine formaldehyde.	**Natural Fibres** Cotton, wool, silk. **Synthetic Fibres** Polyester, polyamide, elastane. **Blended Textiles** Polycotton.	**Papers** Bleed proof paper, layout paper, tracing paper. **Boards** Corrugated cardboard, foam-core board, duplex board.

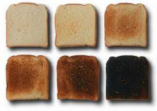
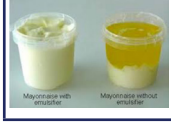
Food Preparation and Nutrition – GCSE

Key Terms	
1. Environment	The impact of food production on the natural environment, e.g. water, wildlife, soil.
2. Food Miles	The distance a food has travelled to reach the customer, e.g. tea coming from Africa.
3. Food Availability	The ability to produce enough food to feed everyone.
4. Food Source	Where the food comes from, e.g. food that's caught, such as fish.
5. Food Marketing	The methods companies use to promote a product, e.g. TV adverts, coloured packaging, logos.
6. Best Before Dates	A date that the food tastes the best and has the best nutritional value before but is not harmful to eat after, e.g. flour.
7. Use By Dates	A date that the food must be used by to ensure safety for the customer, e.g. milk or meat.
8. Macronutrient – Carbohydrates	Required by all mammals, these are the nutrients required for energy. Produced in plants during photosynthesis.
9. Monosaccharide	A simple carbohydrate, made up of one sugar molecule. Fast-release carbohydrates – sugary cereal.
10. Disaccharide	A carbohydrate made of two sugar molecules. Still fast-release carbohydrates.
11. Polysaccharide	A complex carbohydrate with multiple sugars joined together. They do not taste sweet.
12. Macronutrient – Protein	A macronutrient made up of chains of amino acids. Essential for building muscle. Proteins can be Low Biological Value and High Biological Value – do or don't contain all essential amino acids.
13. Macronutrient – Fats	Macronutrient that supplies the body with energy, cushion the organs and help break down fat-soluble vitamins.
14. Micronutrient – Vitamins	A, D and E, fat-soluble and found in fruits and vegetables (also antioxidant). K is also fat-soluble. B group vitamins. All needed for body function.

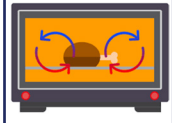
Key Terms	
15. Micronutrient – Minerals	Chemical substances – such as calcium and potassium – needed for body functions; they're found in most foods.
16. Excess/ Deficiency	Eating too many or too few macro or micronutrients, which can lead to health problems.
17. Microorganisms	Pathogenic (causing disease) microorganisms, such as bacteria and mould.
18. Raising Agents	Mechanical: Whisking, beating, sieving, creaming, rubbing in or folding to trap air. Chemical: Bicarbonate of soda or baking powder to release CO_2. Biological: Yeast to release CO_2. All help foods to rise, such as bread or cakes.
19. Fortification	Adding vitamins and minerals to food during its manufacture, e.g. calcium to flour.
20. Additives	Natural or synthetic added to food during manufacture to improve quality, flavour, texture, etc.
21. Flavourings	Added to food to improve or modify the natural flavours and odours of food.
22. Nutritional Needs	Amount of nutrients a person needs (macro and micro), determined by age and health needs.
23. Food Choices	The choice a person makes about what they eat, e.g. being vegetarian.
24. BMR (Base Metabolic Rate)	The amount of energy kilojoules (KJ) a body needs to live.
25. PAL (Physical Activity Level)	The amount of energy the body uses for movement and physical activity.
26. Nutritional Analysis	The nutrient breakdown in different foods.
27. Danger Zone	Range of temperatures between 5-63 degrees at which bacteria begin to multiply rapidly.
28. Cutting Technique	The different methods used to cut vegetables and meat to help cook and garnish foods.
29. Sensory Analysis	Analysing how food looks, smells, tastes and feels so we can select what we like to eat.
30. High-Risk Foods	Foods that are high in moisture and protein that enable pathogenic microorganisms to grow, e.g. bacteria on cream.

Food Preparation and Nutrition – GCSE

Food Science

	**31. Gelatinisation**	Gelatinisation is a chemical reaction involving starch. When heat and moisture are applied to starch, it starts to thicken. For instance, adding flour to a roux (cheese sauce) helps to thicken the sauce.
	**32. Dextrinisation**	Dextrinization is the process involving the browning (breakdown) of starch foods when subjected to dry heat, such as toasting. It is defined as breakdown of starch (polysaccharides) into dextrins (disaccharides – simple sugars).
	**33. Gluten**	Gluten is a group of proteins that occur in various cereal grains (wheat = flour).
	**34. Plasticity**	Plasticity means the ability to be spread, manipulated or shaped, which occurs at different temperatures for different types of fats.
	**35. Aeration**	The process of allowing air to be combined into ingredients to make them lighter and/or create more volume, such as whisking.
	**36. Denaturation**	Denaturation refers to the physical changes that take place in a protein. Marinating or tenderising can denature – break down the bonds – of a protein.
	**37. Emulsification**	Emulsifying something means you're dispersing fat into water (mayonnaise) or water into fat (butter). Remember hydrophilic and hydrophobic.

38. Heat Transfer

	**Radiation**	Energy is transferred to cook the food by waves of heat or light striking the food. Two types – infrared or microwave.
	**Convection**	Transfer of heat through a liquid or air circulation into food, e.g. boiling.
	**Conduction**	Transfer of heat through a solid object into food, e.g. frying pan.

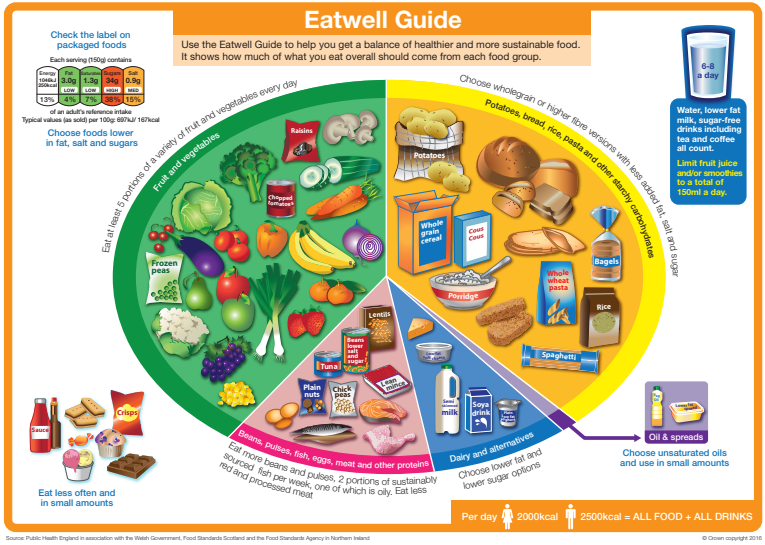
39. Food Provenance

Red Tractor	Red Lion	Organic
Fairtrade	Marine Council	Eatwell Guide

Food Preparation and Nutrition – GCSE

40. Nutritional Needs and Health

Eatwell Guide and Government Guidelines:

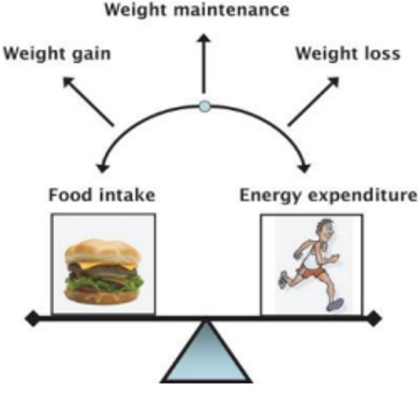


Source: Public Health England in association with the Welsh Government, Food Standards Scotland and the Food Standards Agency in Northern Ireland

The Eatwell Guide shows the proportions of food groups that should be eaten daily in a well-balanced diet. There are 8 main government guidelines for a healthy diet.

- Base your meals on starchy carbohydrates.
- Eat lots of fruit and veg (5-7 portions a day).
- Eat plenty of fish, including oily fish.
- Cut down on saturated fat and sugars.
- Eat less salt - no more than 6g a day.
- Get active and maintain a healthy weight.
- Drink 6-8 glasses of water a day.
- Always eat a healthy breakfast.

Energy Balance:



- Energy balance is when you use the same amount of energy that you intake through food. This results in weight maintenance.
- Too much energy intake can result in weight gain.
- Too little energy intake can result in weight loss and lethargy.
- You can work out how much you should be eating: BMR × PAL = EAR.
- Guidelines suggest at least 60 minutes of activity a day.

Food Preparation and Nutrition – GCSE

40. Nutritional Needs and Health

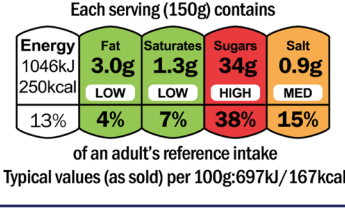
Nutritional Age Needs:

- **Babies:** Newborn babies only drink milk for the first 4-6 months before being weaned. First milk is called colostrum. Human milk provides all nutrients except iron, babies are born with an iron store in their liver.
- **Children:** 1-3 yrs grow quickly so needs a well-balanced diet for development. Toddlers are very active and need a good supply of fat for energy, this also helps with brain and nervous system development. New foods should be introduced in an attractive and appealing way. They should avoid sweets, fizzy drinks, sugary foods.
- **Teenagers:** Rapid growth and puberty occurs. They need a higher amount of nutrients and energy. Boys need protein for muscle growth. Girls need more iron to replace blood loss during menstruation, they are prone to iron-deficiency anaemia.
- **Adults and Older People:** Adults need to maintain a healthy balanced diet to keep the body working properly and prevent diet-related problems. In older people, energy requirements decrease so they need smaller portions and less calories. They must keep hydrated and drink plenty of fluids. Osteoporosis may occur and so a diet high in calcium and vitamin D is needed to strengthen bones.

Religious Needs

Judaism	• No Shellfish or pork • No dairy food eaten in the same meal as meat • Only Kosher meat can be eaten
Hinduism	• No beef or beef products & will avoid pork • Some Hindus practice fasting • Foods such as onion, garlic and alcohol, thought to "excite" the body are forbidden • Many Hindus are vegetarian
Islam	• No pork • Only Halal meat can be eaten • Haram foods cannot be eaten • Ramadan is a fasting month, at the end of Ramadan, Eid-ul-Fitr takes place
Sikhism	• No beef • Many Sikhs are vegetarian or ovo-lacto vegetarian
Christianty	• No particular dietary requirements, though some foods are associated with celebrations e.g. pancakes on Shrove Tuesday and hot cross buns at Easter
Buddhism	• Vegetarian
Rastafarianism	• Vegetarian or Vegan • White fish are sometimes eaten (but no shellfish)

41. Food Labelling



Blood Brothers by Willy Russell (1982)

Genre – Musical and Tragedy (Elements of Comedy)		
Question areas	Proxemics; Semiotics; Context - social/cultural/historical; Props; Character traits (movement/voice); Set design; Lighting; Costume; Staging; Performance exam. Actor; Director; Designer.	**Key pages**
Key words	1. **Proxemics -** space/distance between actors. 2. **Semiotics -** everything on stage that conveys or symbolises a message or meaning to the audience. 3. **Social/cultural/historical: the play's context –** the play was written in the 1980s. The play is set in Liverpool during the 1960s to the 1980s. It is a play that explores the injustice of class divide between middle class (rich) and working class (poor). 4. **Props -** objects on stage (e.g. bible; locket; toy gun; gun; £50 note; mop/tea towel; new shoes; shopping bags from expensive shops; dictionary etc). 5. **Character traits/Aspects of character -** persona; what the character is like and their background. Status in life. A character might change during the plot. 6. **Characterisation -** the act of changing voice, body language, movement, gesture etc when in role. The actor must use their skills to portray a character consistently throughout their performance. 7. **Movement -** gesture; gait; pace; posture; facial expression; body language; stance; eye contact; quality of movement; level (exaggerated). 8. **Voice -** pace and rhythm; pause; tone; volume; accent; emphasis; quality; resonance (exaggerated). 9. **Set design -** style; colour; position; stage furniture; stage flats; wings; cyclorama; backdrop: legs; ground row; tabs; borders; levels; symbolism; location - the set should represent the context of the play. 10. **Lighting -** automated or moving heads; flood light; follow spot; Fresnel; gel; lighting desk; Parcan; practical; profile spot; rigging; strobe; ultraviolet; spotlight; side lights; up light; down light; warm wash; cold wash; flood light; fade-up; fade-down; cross fade (speed of fades can be slow, middle pace, fast) gobo; blackout. 11. **Costume -** period costumes; culture; colour; fabric; style; condition; symbolism; element; item (e.g. shirt; hat; shawl; cane; umbrella); movement. 12. **Staging -** the process of selecting, designing, adapting to, or modifying the performance space for a play. This includes stagecraft elements as well as the structure of the stage and its components. 13. **Performance space -** thrust; in the round; traverse; proscenium arch; end on; apron; black box; promenade; site specific. 14. **Sound design -** sound effects; diegetic or non-diegetic; live or recorded; sourcing; underscoring; mixing; amplification; direction; pre-set; transitions; volume.	
Key Themes and scenes	15. **Theme - Social class** this issue is explored in the police scene when the police officer treats Mrs J differently from Mr Lyons. The Dole-ites scene highlights the differences between Edward - in this scene he comes back from university for the Christmas holiday and wants to have fun. In contrast Mickey has been given his cards (been made redundant), is married to Linda and they have a baby on the way.	47-48 90-93
	16. **Theme - Nurture Vs Nature** this issue is explored in Act 1 the Blood Brothers scene when the boys are 7 years old, it highlights how similar that are to each other at this age and they become firm friends. During the play the brothers take different paths, and we see them become completely different people from each other and they are no longer close. In final scene - the gap between them is stark and Mickey is bitter about the differences in the life that he has led in comparison to Edward's. He says 'Well, how come you got everything... an' I got nothin'.	27-31 104
	17. **Theme - Superstition** this issue is explored in Act 1 the shoes on the table scene when Mrs J starts working for Mrs L – Mrs Johnstone panics when Mrs Lyons puts the new shoes on the table highlighting her superstitious nature. Mrs Lyons uses Mrs Johnstone's superstitious nature to control her and stop her revealing the truth.	9-15 22-23

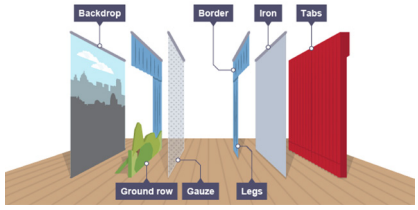
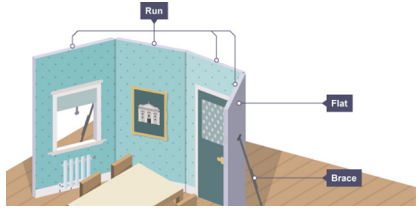
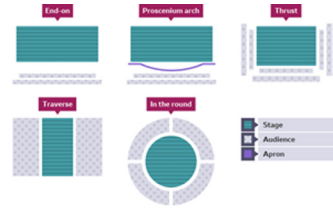
Blood Brothers by Willy Russell (1982)

Key Character – Characterisation - Examples of Movement and Voice		
Working Class Characters:	18. Mrs Johnstone	Working class (**voice** - Liverpudlian/scouse working class **accent. Posture** - hunched shoulders to show that she is downtrodden). At 25 years old she has 7 children; suggests she is a maternal character (**proxemics** - always very close to Mickey and Edward, smiling **facial expression** and soft **tone of voice**). Caring, impulsive, makes rash decisions (**voice pace** – quick, saying certain lines quickly and sudden **movements** for example when telling Mrs Lyons in Act 1 to take one of the babies). Generous and values people over money (Open **body language/posture** and enthusiastic **tone of voice**). Uneducated and does not value education. Superstitious. Lively. She is poor and trapped by poverty.
	19. Mickey Johnstone	Working Class (**voice** - Liverpudlian/scouse working class **accent**). Friendly, excitable boy in Act 1. Looks up to his older brother Sammy (**movement - pace** fast movements with lots of jumping. **Voice - pace** saying all his lines as quickly as possible). He is energetic, bright and witty, but not very well educated. He likes Edward's generosity and, in turn, enjoys being able to show him new things. Edward gives Mickey a chance to shine and be a leader and escape the oppression he feels from his brother, school and general poverty. Shy about his emotions (**eye line** looking down when Linda says she loves him. **Gesture** - fidgeting with his top) Becomes withdrawn after becoming unemployed in Act 2. Later he is influenced by Sammy to commit a crime and goes to prison where he becomes dependent on antidepressants.
	20. Linda	Working Class (**voice** - Liverpudlian/scouse working class **accent**). Kind and compassionate character. Loves Mickey and comes to Mickey's aid both when he is suspended from school and when he is mocked by the other children (**proxemics** - always very close to Mickey, smiling **facial expression** and soft **tone of voice**). Feisty and humorous. Strong-willed. Her lack of education and money allows her no real chance of happiness once Mickey becomes a depressed drug addict. As a last resort, she asks Edward for help before having an affair with him. Her betrayal of Mickey suggests that she is in some ways untrustworthy; but this is also her only chance to escape from the circumstances that have trapped her.
	21. Sammy Johnstone	Working Class (**voice** - Liverpudlian/scouse working class **accent**). He is an aggressive and threatening character. From the start of the play he is shown to enjoy making fun of others, especially Mickey. He is presented as anti-social and criminal, threatening a bus conductor with a knife and killing a filling station worker. As an adult he has no job or money.
	22. Minor characters	Catalogue man, finance man and milkman, these are created for various dramatic purposes. They either lack sympathy or are unfair and two-faced when dealing with others.
Middle Class Characters:	23. Mrs Lyons	Upper/Middle class (**Accent** - received pronunciation). A lonely housewife, finds it difficult to be affectionate towards others. Wealthy, self-centred, an over-protective mother, who is always anxious. Suspicions in later scenes due to loneliness. She becomes unreasonable and is possibly mad when she attacks Mrs Johnstone (**Movement - Pace** sudden moves toward Mrs J. **Voice** – **Pitch** high and harsh **tone**).
	24. Edward	Friendly, generous character (**Facial expression** – smiling and calm **tone**). Naively offers him sweets in an attempt to impress Mickey. He joins in with Mickey and Linda's games and unselfishly tries to get Mickey to express his love for Linda. Raised in a middle-class home and is educated at a private school (**Accent** - received pronunciation). Feels restricted as a child/teenager. An impulsive character. Act 2 - He seems to lack compassion and does not sympathise with Mickey's plight as he doesn't understand. Instead, he tells Mickey to use his dole money to live like a 'Bohemian' (Carefree **tone of voice** and open **body language/posture**).
	25. Mr Lyons	Upper/Middle class (**Accent** - received pronunciation). He is a wealthy businessman who spends long periods of time away from his family. He is the managing director of the factory where Mickey worked before Mickey was made redundant. He is a distant figure to his wife and son, preferring not to get involved in their affairs (professional **tone of voice** even when talking to his family. **Gait** stiff and controlled). Instead he provides money and homes in wealthy areas as well as expensive schooling for Edward. He sends Mickey a heartless redundancy letter.
	26. Minor characters	Policeman, judge, teacher. These characters are created for various dramatic purposes. They either lack sympathy or are unfair and two-faced when dealing with others.
Neutral character	27. Narrator	Russell creates a 'character' of the narrator, who acts like the Greek 'Chorus' from ancient tragedy whose role is to explain some of the key action on stage. The narrator also involves the audience by asking them directly to judge what they see (**eye line** look directly at the audience and into the eyes of characters he wants them to judge). He helps to make sure that the audience stay a little 'detached' from the events of the play (cold **tone of voice** and controlled **movement**). He also helps them remember that this is a 'story'. He reveals that the brothers die at the very start of the play and from then on constantly reminds the audience of the twins' fate. He presents the themes of fate, destiny and superstition throughout the play, but at the end he asks the audience to consider if it was social forces rather than 'fate' that caused the tragedy.

Blood Brothers by Willy Russell (1982)

Key Relationships	**28. Mickey and Edward (Eddie)**	Enthusiastic friends at the start. Want to be friends with each other. Do not understand why they cannot be friends, they do not react to the barriers of class and background. There is a change in their relationship when Eddie goes off to university; Mickey loses his job and after Mickey comes out of prison.
	29. Mickey and Linda	Mickey's best friend, she always protects him when he is picked on. There is a change in their relationship when Mickey goes to prison and he becomes addicted to drugs.
	30. Linda and Edward (Eddie)	Eddie and Linda are friends as children. There is a change in their relationship when she asks him to get Mickey a job and a house.
	31. Mrs Johnstone and Mickey	As a mother she loves him completely and blames herself for Mickey's life choices.
	32. Mrs Johnstone and Edward (Eddie)	Mrs Johnstone loves Edward and feels guilty about her child growing up never knowing that he is her child. She watches him become successful. Edward likes Mrs Johnstone and it is clear they have a bond even though they are from completely different worlds.
	33. Mrs Lyons and Edward (Eddie)	Mrs Lyons loves Edward but is constantly torn apart with the guilt she feels. They do not have an honest relationship as she is keeping a secret that could cost her Edward's love.

Design key words

34. Themes/ symbols	The set design can also communicate abstract concepts, such as themes and symbols. As an example, a design could include a large, dead tree to suggest the themes of death in the play.	
35. Style	Set design is also important in supporting the style of the production. For example, a play in a naturalistic style would aim to create the impression of reality through realistic-looking props and set items. A play performed in a minimalistic style would use just a few, simple props to represent a setting, such as a large, suspended window frame to suggest the performer is standing inside a grand manor house.	
36. Colour	Colour can be used within set design to symbolise various ideas on stage. For example, the set designer for this play could include dull greys and a monochromatic palette (single colour) this could enhance the sad atmosphere and dark themes in the play.	
37. Condition	The condition of a design can reveal important information about the setting or a character's circumstances. For example, shabby, ragged and decaying piles of rubbish might suggest that the area is run down and a waste ground.	
38. Levels	A set designer can vary levels using a rostra, ramps and/or steps. Blocks, staging units, scaffolding and planks can be used to create levels. Levels are often used in productions to portray a character's status, power or situation.	
40. Position	Where you put the items of set on the stage. Use the correct language - upstage, downstage, centre stage, stage left, stage right, upstage centre or left or right, downstage centre or left or right.	
41. Stage furniture	Items of set that can be moved on stage but are not props.	  
42. Location	The set can tell the audience where and when the scene takes place.	
43. Symbolism	Items that represent a message on stage.	

Component 01/02: Devising Drama

Key question areas	Artistic vision – your intention; social/cultural/historical context; genre and style, aspects of the character; actors' movement and voice; staging; set design, structure
Key words	1. **Context/social/cultural/historical:** Date – Place - Issue 2. **Character traits/Aspects of character -** persona; what the character is like and their background; their status in life (remember a character might change during the plot) 3. **Set design -** style; colour; position; stage furniture; stage flats; wings; cyclorama; backdrop: legs; ground row; tabs; borders; levels; symbolism; location. The set should represent the context of the play 4. **Lighting -** flood light; follow spot; gel; strobe; ultraviolet; spotlight; side lights; up light; down light; warm wash; cold wash; flood light; fade-up; fade-down; cross fade (speed of fades can be slow, middle pace, fast pace); gobo; blackout 5. **Costume -** period costumes; cultural costumes; colour; fabric; style; condition; symbolism; element; item (e.g. shirt; hat; shawl; cane; umbrella) 6. **Staging -** the process of sg, designing, adapting to, or modifying the performance space for a play. This includes stagecraft elements as well as the structure of the stage and its components 7. **Performance space -** thrust; in the round; traverse; end on; proscenium arch; black box; white blank canvas; promenade; site specific 8. **Sound design -** sound effects; live or recorded; underscoring; direction; transitions; volume

Performance Spaces Defined	
9. Proscenium Arch	Audience looks at the stage from the same direction as each other. The picture frame through which the audience sees the play - the "fourth wall".
10. End on	Audience looks at the stage from the same direction as each other. Similar to Proscenium Arch.
11. Black box	Flexible studio like D1 & D2. Audience & actors are in same room, surrounded by black tabs (curtains).
12. Thrust	Stage projects into the auditorium so that the audience is seated on three sides of the extended piece.
13. Traverse	The audience is on either side of the acting area like a fashion show.
14. In the round	The acting area is surrounded on all sides by seating. Often a number of entrances through the seating. Special consideration needs to be given to onstage furniture and scenery as audience sightlines can easily be blocked.
15. Promenade	The audience moves around the performance space and sees the play at a variety of different locations.
16. Site Specific	A piece of performance which has been designed to work only in a particular non-theatre space.

Component 01/02: Devising Drama

Key genre/styles and practitioners – your play may be categorised using multiple genre types and various styles	
17. Naturalism – Stanislavski	Attempts to hold up a mirror to real life. To give the illusion of characters as actual people in real-life situations using everyday language.
18. Epic Theatre – Brecht	Episodic scenes, a lack of tension, breaking the theatrical illusion through devices such as direct address, use of songs, projections and narration.
19. Physical Theatre - Frantic Assembly	Incorporates dance elements into a dramatic theatre performance and symbolic movement.
20. Rudolph Laban	Laban's Eight Efforts help actors to come up with new ways to move as a character.
21. Theatre of Cruelty	Artaud thought that theatre should provoke a primal, emotional response from the audience. Various techniques are used to evoke a real reaction such as harsh lighting, complete darkness, disorientating sounds.
22. Metatheatre	Comedy and tragedy, at the same time, where the audience can laugh at the protagonist while feeling empathetic simultaneously.
23. Forum Theatre	Actors or audience members can stop a performance, often a short scene in which a character was being oppressed in some way. The audience can suggest different actions for the actors to carry out on stage in an attempt to change the outcome of what they were seeing.
24. Comedy	There is a happy ending. Intention: amusing and entertaining the audience.
25. Melodrama	Exaggerated plot and/or characters in order to appeal to the emotions.
26. Realism	Intentionally presents the audience with an accurate depiction of the real world, rather than a stylised interpretation.
27. Stylised	Emphasising and often exaggerating elements of the design or characteristics of a role.
28. Theatre in Education (T.I.E)	The use of theatrical techniques to educate, covering social issues or topics on the school's syllabus.

Key Areas for Devising	
29. The semiotics of drama	The signs and symbols you choose to put on stage for your audience to "read" - Nothing on stage is an accident - Lighting, sound, props, costume The actor is also a sign – the way you use your voice and movement is a sign for the audience.
30. Social, cultural, historical contexts	When and where your play is set and performed / What real-life events and/or issues influence your performance / DATE-PLACE-ISSUE.
31. Structure	You should constantly evaluate the structure and create tension graphs to reflect the changes you make along the way **Linear** - when scenes run in a chronological order from beginning to end. Naturalistic. Builds tension to a natural climax **Episodic** - the action unfolds as a series of episodes all connected but usually out of chronological sequence. Most scenes are of equal significance. Scenes can jump about in time and place and do not necessarily build to a natural climax as a result.

Component 01/02: Devising Drama

Evaluation – Thinking about what's working/not working in order to develop your performance.

You MUST record these evaluations like this:

We / I have been working on... [choose an area to evaluate: Structure/tension; characterisation; performance space/ performance style/genre; semiotics]

At first we... [say how you did it at first/what you tried out]

But it didn't... [link this sentence to your intention for your performance – will doing it like that help you fulfil your intention?]

So we... [say how you did things differently to make it better]

This works better because / This still doesn't...so we will… [write your ideas for making it even better]

TIPS FOR SUCCESS:

- Give a lot of detail in each evaluation you write
- Use key words for voice/movement when evaluating characterisation
- Refer to practitioners where appropriate when evaluating the style of your performance

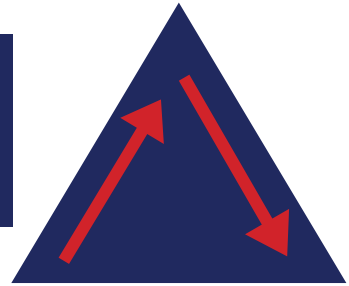
Key Terms and Information - Dramatic Structure

Some might start with a **prologue**. This is a short which gives the audience some background details.

Act Two: RISING ACTION AND CLIMAX
Develops characters and builds up to a climax.

Some performances may end with an **epilogue**. Epilogues can be used to summarise or comment on the ending.

Act One: EXPOSITION
Introduction of main characters and hints at a conflict they may face.



Act Three: FALLING ACTION AND RESOLUTION
Conflict is resolved and settled, loose ends tied up. Play ends.

Theatrical Conventions

Monologue:
A character makes a speech to another character or the audience.

Duologue:
When 2 characters have a conversation together

Dialogue:
This is the term given to lines that are spoken between the characters.

Aside:
When a character makes a comment to another character or to the audience and the other characters onstage do not hear it. Can be done for comic effect.

Soliloquy:
A character speaks to themselves to express their feelings. Gets the audience emotionally involved, as the character is expressing their innermost thoughts and feelings.

Stage Directions:
Instructions written in a script to explain how a play should be performed.

The scenery, props and furniture

The way characters say their lines

The characters' movements

Some plays have very limited stage directions. This gives the freedom to adapt the play to suit their own ideas.

- The audience might witness an important event that some of the characters aren't on stage to see.
- A character could reveal hidden thoughts and feelings to the audience in an aside or soliloquy.
- Disguises allow the characters to hide their true identity but the audience can see through them.

Dramatic Irony

When the audience knows something the other characters don't.

Cross-Cutting

When 2 or more scenes that take place in different times or places are performed on stage at the same time..

Marking The Moment	Some moments are so important they need to be emphasised.
Freeze Frame	Action freezes, a character steps out to talk to the audience.
Slow Motion	The physical action slows down for emphasis.
Tableau	Frozen picture.

Narrators:

- Some plays use narrators to give the audience extra information.
- Also a common way of breaking the fourth wall.
- If someone comments on the action without taking part, they are omniscient and are able to tell the audience what the characters are thinking. BLOOD BROTHERS
- Always consider where a narrator is placed on stage.

Theatrical Conventions & Character Development

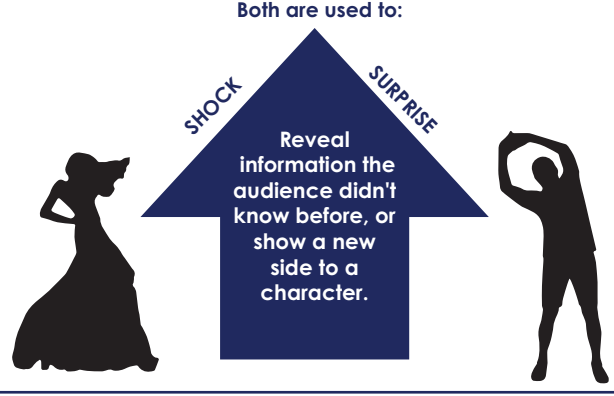
Flashback and Flashforward: These conventions play around with time.

Flashback

- Scenes that go **back in time**
- **Create a non-linear plot** without causing the audience too much confusion.

Flashforward

- Scenes that go forward in time to show the audience events that will happen in the future.
- Provides audience with clues about what will happen later and creates **dramatic irony**.



Character development

Constantin Stanislavski felt that actors should understand their character's backstory, as it gives them motivation and makes for a more convincing performance. (Naturalism)

How to create a backstory:

1. Decide what **age** your character is.
2. Decide where your play is set, as the **social and historical context** of the play will determine how your character behaves.
3. Are there any **significant events** that have happened in your character's past?

Key steps to character creation:

- Backstory
- Social/historical Context - this affects how the character will behave and react to situations.
- Role on the wall - what you think of yourself as the character and what others think of the character.
- Hot seating -audience can ask the character questions to get more information from them about their history etc.

Character Creation: Always ask yourself:

- Is my character believable?
- Am I using vocal and physical skills that show the appropriate **age** and **social class** of the character?
- Are my **actions and reactions** appropriate in the **historical context** of the play?

Rehearsal Techniques & Physical Skills

Method acting: when a performer fully immerses themselves in their role and aims to become their character both on and off stage.

Hot-seating: an actor in the 'hot seat' is asked questions by the rest of the cast and they must answer in role as their character. This can help the actor to imagine how their character would react in different situations.

Status games: it's important for a performer to understand their relationships with other characters. Arranging the cast into a tableau, using levels and space to indicate high and low status characters and their relationships with each other. Can also show how different characters might treat each other.

Defend a character: this involves being a character's lawyer and defending them against some of the things they have done - justifying the character's actions.

Conscience alley: group splits in to 2 lines. A character walks between the lines and each member (in character or not) gives them advice about a decision they have to make. This helps the group understand this character better.

Vocal Skills

Performers need to express themselves.

- Vocal performance is the way a performer **speaks their lines**.
- Voice can tell the audience so much about a character's **emotional state, status, background and personality**.
- Vocal performance adds **meaning** to a character's words (sarcasm, persuasion, insincerity.)
- The way characters speak to each other tells the audience a lot about **their relationship with one another**.
- Vocal performance can also show **how a character changes** throughout a performance.

Accent	A way of pronouncing a language (country, area or social class)
Volume	How loud or quietly someone speaks
Pitch	How high or low someone speaks
Tone	How something is said - sarcastic tone, happy tone, sad tone
Timing	Use of pause or silence. The rhythm of the way you speak
Pace	How fast or slow someone speaks
Intonation	The rise and fall of the voice
Phrasing	How something is said for dramatic effect (pause, emphasise words)
Emotional Range	Happy, sad, scared, shy, nervous (linked with tone)
Delivery of Lines	Working with other actors (linked with timing) action - reaction

Physical Skills

Posture	How someone stands and/or sits (slouched, upright)
Gesture	How someone uses their hands and arms when they are speaking
Facial Expression	How the face is used to communicate feeling. (E.G. - open mouthed, scrunched eyes, pouted lips.)
Movement	How someone moves around the stage space. This also includes physical theatre movement (dance, unison movement.)
Gait	How someone walks (stride, leap, shuffle.)

Eye contact **Location on stage**

Reacting to others

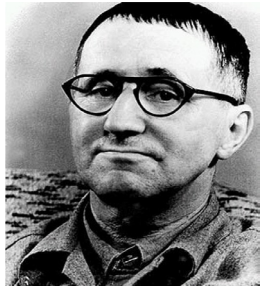
Body language:

Body language is a type of non- verbal communication. A performer can use movements, facial expression and posture to communicate how a character is feeling.

Movement and stillness can be very effective

Practitioners - Bertolt Brecht – 1898-1956

Influences	
1	Erwin Piscator's Epic Theatre
2	Karl Marx's Philosophy
3	Buchner's Woyzeck German Expressionism
4	Mei Lan(fang) (Chinese theatre)



Background Information	
Born - Died	1898-1956.
Nationality	German
Aim of Work	Aimed to appeal to less privileged classes, treating contemporary issues such as war, stock-markets, poverty, unemployment and corruption in high places.
Bio	• Born in 1898 in Augsburg, Germany. • Medical orderly during first world war - • Deeply affected. • Fled Germany when Nazis came to power. • Became 'stateless' and in exile. • In USA was put in front of the 'House UnAmerican Activities Committee' where he denied being a communist. • Returned to East Germany after war and • Ran 'Berliner Ensemble' • Died 1956. (Buried with stiletto in his heart

Brecht's Theory and Style	
Epic Theatre:	This is the term used to describe Brecht's theory and technique.
'Verfremdungseffekt':	This means 'alienation' or 'distancing' effect. The familiar is made strange so the audience think about the issues in the piece clearly rather than getting too emotional.
Didactic Theatre:	This means theatre that teaches the audience a moral message.
The Street scene	Makes use of a simple, "natural" incident, such as could be seen on any street corner: an eyewitness demonstrating to a collection of people how a traffic accident took place. The bystanders may not have observed what happened, or they may simply not agree with him, may see things a different way'; the point is that the demonstrator acts the behaviour of driver or victim both in such a way that the bystanders are able to form an opinion about the incident
Lehrstucke (Learning plays)	Shorter, parable pieces - a simple story used to illustrate a moral lesson)
Dialectical Theatre	Brecht's goal or the spectator to be involved in the theatrical event—to observe objectively, ponder, develop critical detachment leading to social action
Smokers Theatre	Brecht believed that the theatre should be enjoyed by everyone, not just the upper class. He created what he called a "smokers theatre" where the members of the audience could smoke and drink, thereby relaxing them and opening their minds to be inspired to act.
The Boxing Ring (Sport analogy)	Brecht wanted the theatre to have the "same fascinating reality" as a boxing ring. This is created by keeping the spectators aware of the fact that they are only watching a play – it is not real. The use of placards encouraging the spectators to think about what they are seeing emphasises this.

Practitioners - Bertolt Brecht – 1898-1956

Key Techniques in Epic Theatre	
1. Montage	A montage is a series of freeze frames, images, projections or scenes put together in no particular order. Often music is played over the top.
2. Narration	The actor tells the story out loud. Sometimes the narrator will tell us what happens in the story before it has happened. This is a good way of making sure that we don't become emotionally involved in the action to come as we already know the outcome.
3. Direct Address	Speaking directly to the audience breaks the fourth wall and destroys any illusion of reality.
4. Gestus	A clear gesture or movement used by the actor which captures the attitude of a character or situation.
5. Figures (not characters)	Brecht didn't want the actors to play a character onstage, only to show them as a 'type' of person in society.
6. Third Person Narration	Commenting upon a character as an actor is a clear way of reminding the audience they are watching a play. It means they don't get emotionally attached to characters and think more about the message.
7. Speaking stage direction	This device was used by Brecht more frequently in rehearsal than performance. It helps distance the actor from the character they're playing. It also reminds the audience that they're watching a play and forces them to study the actions of a character in objective detail.
8. Multi-role	Multi-roling is when an actor plays more than one character onstage. The differences in character are marked by changing voice, movement, gesture and body language but the audience can clearly see that the same actor has taken on more than one role.
9. Split-role	This is where more than one actor plays the same character. For instance, the actor playing the main character might rotate from scene to scene.
10. Placards / Projection	A placard is a sign or additional piece of written information presented onstage. Using placards might be as simple as holding up a card or banner. Multimedia or a PowerPoint slideshow can also be used for this effect. What's important is that the information doesn't just comment upon the action but deepens our understanding of it.
11. Spass	Spass literally translates as 'fun'. By presenting a serious subject in a funny way, it makes the audience laugh, and then question why they laughed. This makes them think about the message of the piece.
12. Song and Dance	This is a good way to ensure that the audience sees the theatre and are reminded of the fact they are watching a play. Often in Brechtian theatre the style of the music and the lyrics contrast each other e.g. serious lyrics with jolly music. This makes create a sinister feel and emphasises the message.
13. Visible stage Mechanics	Stagehands visible when changing sets, lighting units visible etc.
14. Haltung	A figure in a play might start off with a 'Gestus' but then a figure would alter their 'Haltung' (attitude) at a turning point in the play.

Marxism and Brecht	
1. Karl Marx	German philosopher, economist, historian, sociologist, political theorist, journalist and socialist revolutionary. The belief of Marxism is that the victory of the proletariat (THE WORKERS) over the bourgeoisie (THE UPPER CLASSES) will eventually heal the division that has split humanity and which has existed since the division of labour.
2. Marxism	A type of economic system proposed by Karl Marx in which there are no classes. The government would control all resources and means of production to, in theory, ensure equality (the stepping stone to communism).
3. Capitalism	An economic system based on the private ownership of the means of production and their operation for profit (Marx was against this).
4. Brecht's theories linked to Marxism	In his theories Brecht was against: • The fourth wall • Anything that reinforces Capitalist thought • Bourgeois theatre • Plot • Spectator sharing feeling of actors on stage. In his creation of Epic Theatre, Brecht was rebelling against all of the constrictions of the bourgeoisie theatre, or dramatic theatre, as it was commonly known. He shows his loathing of the Capitalist society through most of his plays, persuading the audience that only Marxism could truly rule in a just civilization.

Practitioners - Bertolt Brecht – 1898-1956

Design Features in Brecht's Work	
1. Minimal design	Set, costume and props are all kept simple and representational. Although the stage setting was usually minimal, there was always a sense of authenticity to production elements (this means real, accurate props from the time period, for example).
2. Costumes	Archetypical Or authentic/distressed/worn/ Actors get into costumes on stage/ apply makeup
3. Set Design	Caspar Neher - Set Designer - unfinished set, placards, projections… - realistic stage properties, distressed, 'authentic'. Characters often seen 'working/doing'…
4. Lighting	Brecht believed in keeping lighting simple as he didn't want the production values to overshadow the message of the work. He believed in using harsh white light as this illuminates the truth. Harsh White Light Audience lights on (3p Opera - use of 'cabaret lights') Music: (major collaborator: Kurt Weill) Musicians on stage. Songs commenting on action and separate from story
5. Props	Often one item can be used in a variety of ways. They are representational
6. Visible stage Mechanics	Stagehands visible when changing sets, lighting units visible etc.

Key Brecht Quotes	
1	"Art is not a mirror held up to reality but a hammer with which to shape it."
2	Audience "hang up their brains with their hats in the cloakroom."
3	"What is the robbing of a bank compared to the founding of a bank?" (3p Opera)
4	"If in art an appeal is made to the emotions it means reason has to be switched off."

Plays & Productions

Mother Courage and Her Children
1938–39/1941

The Threepenny Opera
1928

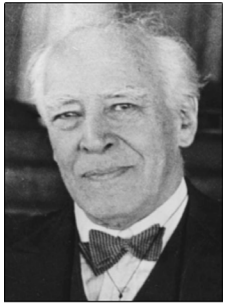
Life of Galileo
1937–39/1943

The Caucasian Chalk Circle
1943–45/1948

The Good Person of Szechwan
1939–42/1943

Practitioners - Constantin Stanislavski 1863-1938

Biographical Info



Influenced by:
Anton Chekhov
Henrik Ibsen
Vladimir Nemirovich-Danchenko

- Birth name: Constantin Sergeyevich Alexeyev
- Born 1863 in Moscow to a wealthy Russian family.
- Died 1938
- Co-founder of the Moscow Art Theatre in 1898
- Developed a 'system' of acting called the Stanislavski Method.

- Constantin Stanislavski was born Konstantin Sergeyevich Alekseyev in Moscow, Russia, in January 1863.
- He was part of a wealthy family who loved theater: His maternal grandmother was a French actress and his father constructed a stage on the family's estate.
- He started acting at the age of 14, joining the family drama circle. He developed his theatrical skills considerably over time, performing with other acting groups.
- In 1885, he gave himself the stage moniker of Stanislavski—the name of a fellow actor he'd met. He married teacher Maria Perevoshchikova three years later, and she would join her husband in the serious study and pursuit of acting.

Beliefs & Early Years

- Believed that the theatre should project important thoughts and affect the spectators, he reflected, there must be living characters on stage.
- To seek knowledge about human behaviour, Stanislavsky turned to science and psychology.
- Insisted on the integrity and authenticity of performance on stage, repeating for hours during rehearsal his dreaded criticism, "I do not believe you."
- He believed that actors needed to inhabit authentic emotion while on stage and, to do so, they could draw upon feelings they'd experienced in their own lives.
- He developed exercises that encouraged actors to explore character motivations, giving performances depth and realism while still paying attention to the parameters of the production. This technique would come to be known as the **"Stanislavski method" or "the Method."**

Legacy

The Moscow Art Theatre undertook a world tour between 1922 and 1924; the company travelled to various parts of Europe and the United States.

Several actors stayed in the USA and became instructors of 'the method'. These actors in turn helped to form the Group Theatre, which would later lead to the creation of the Actors Studio.

Method acting became a highly influential, revolutionary technique in theatrical and Hollywood communities during the mid-20th century, as evidenced with actors like Marlon Brando and Maureen Stapleton.

Practitioners - Constantin Stanislavski 1863-1938

Key Vocab Relating to Stanislavski	
Realism	Incorporates the concept of the 'fourth wall' – the idea that the audience is outside the fiction, peering in on the 'real' events. Settings, too, are true to life, often containing period details. Plays tend to concern the lives of middle or working-class characters in contemporary contexts, and often address topical social issues. Dialogue is based on conversational prose that reflects everyday life.
Action	What we do, as the character, to fulfil our objective.
Active analysis	A rehearsal technique where actors analyse a bit of the play 'on their feet'. The actors decide on the main event, an action for each character then improvise that bit.
Before-time	The events leading up to the start of the play or before each new entrance your character makes. Your character's life imagined actively from your first memory up to the start of the play.
Bit	A play is divided up into manageable sections or units by the actors and director. A bit starts when there is an event on stage; the character's objectives change or a character enters / exits.
Event	Something that happens that affects what you are thinking and doing.
Experiencing	The state where you leave the actor behind and find the character, with everything you do being the product of your character's thoughts and actions.
Free body	The desired state for an actor, a body free from tension that can be used to create and experience a role.
Germ	The essence or seed of a character.
Imagination	The ability to treat fictional circumstances as if they were real.
Inner monologue	The thoughts going through our character's mind.
Psychophysical	The combination of what we are thinking and doing that works across the system. What we think and do working together in harmony.
Rays	An invisible current that flows between us all the time.
Relationships	The thoughts we have about others.
Sub conscience	The part of the mind that influences our thoughts and actions without us being aware of it.
Truthful	Acting is truthful when based on a set of given circumstances, you are thinking and doing as the character, imagining actively with a free body and a clearly walked through before time.
Passive imagination	Seeing ourselves from the audiences point of view while on stage – In Realism we want ACTIVE imagination

Practitioners - Constantin Stanislavski 1863-1938

Key Techniques in Realism/Naturalism	
Visualisation	The actors can picture their surrounding and the environment accurately, considering every detail. This include sight, sound, taste, smell and touch.
Active imagination	When the actors see things through our character's eyes using the senses rather than thinking about what they look like from the view of the audience.
Units & Objectives	Each scene of a play can be broken down into the character's aim or goal. The objective is what the character wants. The Unit is the smaller sections of the scene where the character has a smaller objective, which will lead them to their main objective.
Through line of Action & Super Objective	What the character wants to achieve by the end of the play. It is usually linked to the main theme of the play. An over-reaching objective, probably linked to the overall outcome in the play. It characterises the essential idea, the core, which provided the impetus for the writing of the play. A character's objectives are likely to be stages in the journey towards the super-objective. If that journey is perceived as a clear path to the super objective, then you have your through line
'Magic IF'	Where the actor puts themselves in the character's shoes, asking 'What would I do IF I was in this situation'. Used to get actors to open up their imaginations to discover new and interesting things about the character they are playing. An actor simply asks themselves a 'what if' question about their character.
Given Circumstances	Information about the character and their history. It also includes the time period and location.
Seven questions	A set of questions an actor can use to learn more about their character – who they are, where they are, what time it is, what they want, why they want it, how they will get it and what they need to overcome to get it.
Subtext	The hidden meaning behind the text. It is usually communicated through the way that an actor delivers the line. Driven by the underlying meaning in the play, as opposed to the words declared on stage. This can be communicated to the audience through the actor's use of intonation, gesture, pauses or stillness. 'Keep in mind that a person says only ten per cent of what lies in his head, ninety per cent remains unspoken'.
Motivation	The reason why the character wants what they want in the play.
Circles / Concentration of Attention	A set of circles which start inside the head of the characters and slowly move outwards. The actors imagine every detail inside these circles to help with their concentration and to make their visualisation more detailed and realistic.
Relaxation	Getting rid of any tension I the body so the actor is able to move freely in the performance and control their body and mind.
Tempo & Rhythm	Is our pace, both mental and physical, the pace of everything around us and everything we do..
Emotional Memory	When the actor finds a real past experience where they felt a similar emotion to that demanded by the role they are playing. They then 'borrow' those feelings to bring the role to life.
Role-on-the-wall	Using an outline of a person and writing out the character's thoughts and feelings on the inside and what they show and say on the outside.

Practitioners - Constantin Stanislavski 1863-1938

Plays & Productions

1891: The Fruits of Enlightenment by Leo Tolstoy
1894: Light Without Heat by Alexander Ostrovsky
1896: Othelo by William Shakespeare
1898: The Seagull by Anton Chekhov
1902: The Philistines by Maxim Gorky
1911: The Living Corpse by Leo Tolstoy
1926: Merchants of Glory by Marcel Pagnol
1932: Dead Souls by Nikolai Gogol

Acting Methods

Using your imagination to create real emotions on stage:

Magic if: Actors also use their imagination to create their character by asking themselves questions like:

"Where do I come from?"

"What do I want?"

"Where am I going?"

"What will I do when I get there?"

Action versus Emotion

Super-objective: what is the driving force of the play?

Objectives: what the character wants to accomplish.

Obstacles: what's in his or her way?

Actions: what are the different things the character can do to try to reach his objective?

The *Through-Line* links all the units together into the super-objective. Using these acting methods helps you concentrate on the action rather then the emotion.

Emotional Memory

Actors access their own memories to call upon emotions needed to play certain scenes and acting roles, but unlike Method Actors, Stanislavsky actors also work "from the outside in", accessing emotions through physical actions.

Relaxation and Concentration

* Actors learn to relax their muscles and not use any extra muscles then the ones needed to perform a particular action.

* Actors work on concentration to reach a state of solitude in public and not feel tense when performing on stage: They concentrate on a very small area at first and then widen the circle of concentration until it includes the entire stage.

Character-building techniques

* Actors find their characters' inner motives.

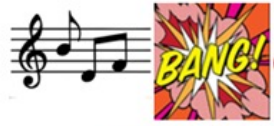
* Build a character "from the outside in" through physicality and voice. For example, explore the character's rhythm through repetition. (by rehearsing his lines over and over until he discovered the right tempo).

Production Elements

Special effects

Lighting

Design



Special effects

Sound

Design

Production elements

Design

Hair

Make-up

Costumes

Masks

Vocal skills

Physical skills

Use of stage space

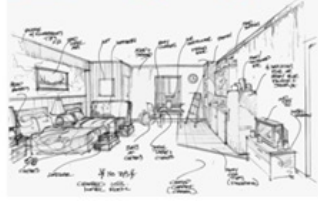
Characterisation

Acting

Design

Set

Props



Production Elements

Costume	**48. Headwear**	Hat, cap, scarf, headband, ribbon, clasp etc.	**53. Fabric**	Silk, cotton, wool, chiffon, rubber, fur
	49. Wigs/facial hair	Colour, length, style/ moustache, sideburns, beards	**54. Decorations/trim**	Sequins, rhinestones, lace/ buttons, braid, embroidery, fur
	50. Make-up/ mask	Natural, character, stylised or fantasy	**55. Padding/ silhouette/fit**	Character padding, tight, loose, high waisted
	51. Accessories	Jewellery, ties	**56. Colour**	Palette=range of colour and/or coding= might be significant to the character
	52. Style	Victorian, modern, comfy, fancy, Unique, 2000's, 1900's etc.	**57. Condition**	Distressed, worn out, old, clean, pressed, soiled, ripped, mended, faded

Physical Skills and Vocal Skills	**28. Movement**	Changing positions or moving across the space	**38. Pitch**	The vocal register -high or low
	29. Posture	The way they stand and hold themselves	**39. Pace**	How quickly or slowly something is done
	30. Gesture	Movements of hands, head, leg usually convey a message/meaning	**40. Pause**	A hesitation or silence
	31. Facial expressions	The feelings (or lack of them) shown on the face	**41. Emphasis**	Stressing or highlighting something
	32. Use of stage space	How an actor moves around the space, using levels, direction.	**42. Inflection**	Saying a word in a particular way to stress its meaning
	33. Interaction/ Proxemics	How a character reacts to other characters. Proxemics moving towards or away from another character distance between the characters	**43. Accent**	A way of pronouncing words associated with a country, region or social class
	34. Handling of props	How a prop is handled during a performance	**44. Volume**	Degree of loudness
	35. Choreography/ stage fights	Setting movements to create meaning/blocking movements to create the impression of violence	**45. Delivery**	How dialogue is said to convey meaning
	36. Stage business	Minor movements or blocking that an actor does to establish a situation (reading a book/closing a window)	**46. Emotional range/ tone**	Feelings are expressed by the way the line is said
	37. Pace and pause of movement	The speed of the movement and use of stillness to convey a meaning, feeling or atmosphere	**47. Phrasing**	Use of hesitation, metre and/or grouping

Production Elements

Using Key Terms Design

Sound	**60. Backlight**	Light projected from upstage	**75. Fogger**	Creates smoke
	61. Barndoors	Metal flaps used to shape the light	**76. Gobos**	Creates patterns of light
	62. Flood/wash	Unfocused was of light/ light covers the whole stage	**77. Pyrotechnics**	Creates fire effect
	63. Floor lighting	Light on a low stand (creates shadows)	**78. Smoke and haze machine**	Creates mist or fog
	64. Follow spot	Powerful lantern that follows the actor around the stage	**79. strobe**	Short bursts of bright light
	65. footlights	Low lights downstage	**Sound**	
	66. Fresnel	A lantern with a soft beam	**80. Abstract**	Not realistic
	67. General cover	Light on the acting areas	**81. Motivational sound/ sound effects**	Effect require by the script- gunshots
	68. Pin spot	Tightly focused on a small area	**82. Musical theme or motif**	Recurring section of music
	69. Profile	Creates clear outlines	**83. Naturalistic**	Realistic sounds
	70. Blackout	No lighting	**84. Recorded or live sound**	Pre-record or happens during the performance
	71. Crossfade	Change from one state to another	**85. Acoustics**	Quality of sound
	72. Fade/snap	Light slowly on and off/quickly on and off	**86. Fade/snap**	Gradual/sudden off or on
	73. Colour filter	Plastic used to alter the colour	**87. Soundscape**	Build up of sounds to create an atmosphere or environment
	74. Focus	How sharp or defined the light is	**88. Reverb**	Echoing
Set	**89. Box set**	A setting of a complete room often naturalistic	**94. Furnishings/stage furniture**	Chairs, tables, (Set dressings -cushion, paintings etc)
	90. Backcloth/ drop	Hangs at the rear of the scene	**95. Fly**	Raise and lower scenery from above the stage
	91. Cyclorama	Curved screen filling the rear of the stage	**96. Gauze or Scrims**	Curtains that go transparent when lit a certain way
	92. Trap/trapdoor	Door in the floor of the stage	**97. Symbolic**	Representing something usually non-naturalistic

Ensemble Music

A. Genres

1.	**Chamber Music**	The Baroque Era	Sonata, Trio Sonata	**1.** Basso Continuo **2.** Figured Bass	**3.** Ornaments **4.** Terraced dynamics	**5.** Complex contrapuntal/polyphonic textures **6.** Harpsichord	
		The Classical Era	String Quartet	String quartet movements **1.** Fast, usually in sonata form **2.** Slow, often in ABA or Theme & Variation form **3.** Moderate dance movement, e.g. minuet & trio **4.** Fast, either in sonata form or rondo form		**5.** Sonata form **6.** Arpeggios **7.** Alberti bass **8.** Scalic patterns **9.** Sequences **10.** Canon **11.** Accidentals	**12.** Piano invented **13.** Pedal notes **14.** Regular phrases **15.** Functional harmony **16.** Tutti **17.** Cadenza
		The Romantic Era	String Quartet Piano Quintet	**1.** Extended harmony **2.** Chromaticism **3.** Frequent Modulation **4.** Complex textures	**5.** Contrasting timbres **6.** Virtuoso performers **7.** Leitmotif	**8.** Lyricism **9.** Expression **10.** Expanded orchestra	
2.	**Musical Theatre**	**1.** Libretto **2.** Lyrics numbers/finales **3.** Through-composed		**4.** 32-bar song form **5.** Word-painting **6.** Ballad	**7.** 'Ensemble' numbers/choruses **8.** Opening **9.** Recitative		
3.	**Jazz and Blues**	Jazz trio Rhythm section	**1.** Blues scale **2.** 'Blue' notes **3.** Improvisation **4.** Melisma **5.** Scat singing	**6.** Call and response **7.** 12-bar blues **8.** Simple quadruple time **9.** Syncopation **10.** Swung rhythms	**11.** Brass mutes used **12.** Walking bass **13.** Extended chords **14.** Standard **15.** Head	**16.** Chorus **17.** Break **18.** Back-ups **19.** Kicks **20.** Licks	**21.** Turnaround **22.** Lead sheet **23.** Shout chorus **24.** Front line

B. Textures

4.	**Monophonic**	Single melodic line for an instrumental or vocal soloist, with no accompaniment, or when parts are in unison	9.	**Layered**	When more parts are added (layered) on top of each other, producing a richer texture
5.	**Homophonic**	One main melody is heard with a harmonic accompaniment of chords (or perhaps broken chords)	10.	**Melody and Accompaniment**	When the tune is the main focus of interest and is accompanied by another part
6.	**Polyphonic**	A number of melodic lines heard independently of each other. Imitation and counterpoint are devices used in this texture	11.	**Canon**	Device where the melody is repeated exactly in another part while the initial melody continues
7.	**Unison**	When two or more musical parts sound the same (pitches) at the same time	12.	**Round**	Type of canon where different voices sing exactly the same melody, beginning at different times
8.	**Chordal**	When the parts move together producing a series or progression of chords	13.	**Countermelody**	A new melody that is played at the same time as a previous melody

C. Ensembles

14.	**Basso Continuo**	Keyboard (harpsichord/organ) + Bassline (cello/bassoon/bass gamba)	**1.** Provides the harmonic and rhythmic accompaniment in Baroque music **2.** Uses figured bass to indicate the chords							
15.	**Sonatas**	Sonata – small instrumental piece, Trio Sonata – 2 instruments + basso continuo	**1.** A small instrumental piece **2.** Sonata da chiesa is Italian for 'church sonata' and had four movements						**3.** George Frideric Handel	
16.	**String Quartet**	Violin 1, Violin 2, Viola, Cello	**1.** Varied musical textures used		**2.** Joseph Haydn					
17.	**Jazz/Blues trio**	Piano/Guitar, Double Bass, Drum kit	**1.** Walking bass **2.** The groove	**3.** The beat **4.** Chordal accompaniment		**5.** Lead sheet **6.** Fills	**7.** Stop chords **8.** Dave Brubeck Quartet		**9.** Bill Evans Trio	
18.	**Rhythm Section**	Drum Kit, Piano and/or guitar, Double Bass								
19.	**Vocal Ensembles**	Duet, Trio, SATB choir, Backing Vocals	**1.** A cappella **2.** Ballad	**3.** Chest voice **4.** Choral music	**5.** Chorale **6.** Colla voce	**7.** Declamatory writing **8.** Falsetto		**9.** Head voice **10.** Recitative		**11.** Phrase

Film Music

A. Terminology

1.	**Diegetic**	Music contained in the action
2.	**Non-diegetic**	Background music
3.	**Fanfares**	Short musical flourish based on notes of a chord, using dotted rhythms and played by brass instruments
4.	**Theme**	Short musical phrase that is used and repeated
5.	**Leitmotif**	Short musical theme linked with a character, object, place or idea
6.	**Mickey-Mousing**	When the music is precisely synchronised with events on screen
7.	**Minimalism**	Musical ideas are based on small cells which are repeated and evolve gradually
8.	**Layering**	Building up musical ideas
9.	**Ostinato**	Repeated melodic, rhythmic or harmonic musical pattern
10.	**Riff**	Repeated musical phrase
11.	**Click track**	Metronome heard by musicians through headphones as they record
12.	**Cues**	The parts of the film that require music
13.	**Syncing/ sync point**	A precise moment where the timing of the music needs to fit with the action

B. Tempo, Rhythm & Metre

14.	**Allegro/Vivace**	Fast/ lively
15.	**Moderato/ Andante**	Moderate pace / at a walking pace
16.	**Adagio/Lento**	Slow
17.	**Accelerando**	Getting faster
18.	**Ritardando/ Rallentando**	Getting slower
19.	**Pause**	A rest in the music
20.	**Rubato**	Not sticking strictly to time
21.	**Dotted rhythms**	
22.	**Syncopation**	Music that is off beat
23.	**Augmentation**	Note values are replaced with longer ones
24.	**Diminution**	Note values are replaced with shorter ones
25.	**Cross rhythms/ Polyrhythms**	Different rhythms are played simultaneously

C. Tonality

26.	**Atonality**	When there is no sense of home key
27.	**Polytonality**	Two or more keys at the same time
28.	**Bitonality**	Two keys at the same time
29.	**Modes**	Scales system that existed before major/ minor

D. Dynamics

30.	**Piano**	Quiet
31.	**Forte**	Loud
32.	**Crescendo**	Getting louder
33.	**Diminuendo**	Getting quieter

E. Instrumentation

34.	**Instrumentation**	The instruments playing
35.	**Low pitched instruments**	Representing dark and sombre atmospheres, large and slow-moving
36.	**Orchestration**	The arrangement of the instruments
37.	**Historical instruments**	Suggest a time period/ the idea of the past
38.	**National instruments**	Suggest a country (e.g. bagpipes)
39.	**Loud Brass**	Triumphant, war, royalty
40.	**Quiet Brass**	Sinister
41.	**Solo instrument**	Loneliness/isolation
42.	**Strings**	Emotion, passion, grief
43.	**Glissando**	A slide between two pitches
44.	**Very high pitch**	Creates suspense
45.	**Very low pitch**	Creates sense of danger
46.	**Lots of percussion**	Fast action sequence/ dramatic
47.	**Tremolo strings**	Tension, fear, drama
48.	**Glockenspiel**	Magic, fairy tales
49.	**Timpani**	Large orchestral drums
50.	**Timbre**	The 'sound quality' or 'tonal colour' of a particular instrument or voice

F. Harmony

51.	**Diatonic**	All the notes in the chords are in the key (also called 'consonant' harmony)
52.	**Chromatic**	Chords that use notes not in the key
53.	**Arpeggio**	Each note of a chord played separately

Musical Forms and Devices

A. The Western Classical Tradition

1.	**The Baroque Era**	1600-1750	**1.** Ornaments **2.** Terraced dynamics **3.** Different types of texture (homophonic and polyphonic)	**4.** Major/minor key system **5.** Small orchestras **6.** Use of harpsichord, basso continuo and figured bass	**7.** Binary, ternary, rondeau
2.	**The Classical Era**	1750-1810	**1.** Balanced phrases **2.** Functional harmony **3.** Alberti bass	**4.** Larger orchestra **5.** Frequent use of homophony **6.** Contrasts in dynamics and mood	**7.** Minuet and trio form, variations, rondo, sonata, ternary
3.	**The Romantic Era**	1810-1910	**1.** Lyrical melodies and themes **2.** Leitmotifs **3.** More expressive	**4.** Chromaticism **5.** Unexpected key changes **6.** Even larger orchestra	**7.** Developments in form: music often linked to other art forms

B. Musical Forms

4.	**Binary**	A, B	Two contrasting sections: both are usually repeated	Bach: March in D major
5.	**Ternary**	A, B, A	Three sections: the outer two are the same, the middle one contrasts	Mozart: Lacrymosa
6.	**Rondo**	A, B, A, C, A	The opening section keeps returning, with contrasting sections in between	Purcell: Rondaeu
7.	**Variation**	T, V1, V2, V3	A theme is followed by sections in which it is developed in imaginative ways	Mozart: Ah, vous dirai-je, Maman'
8.	**Strophic**	A, A, A	Same music repeated in every section	Brahms: 'Weigenlied'
9.	**Minuet and Trio**	M, T, M	Both use binary form. The trio is like a second minuet but contrasting in some way	Haydn: Minuet-Trio (Symphony 94)

C. Musical Devices

10.	**Repetition**	The exact repeat of a musical idea or phrase, without variation	19.	**Pedal**	A held or repeated note against which changing harmonies are heard
11.	**Contrast**	A change in the musical content. Often achieved through dynamics, key, tempo or instruments	20.	**Canon**	When a melody is repeated in another part while the initial melody is still being played
12.	**Anacrusis**	A note or notes which are played before the first strong beat	21.	**Conjunct**	When the melody moves by steps (next-door notes)
13.	**Imitation**	When a musical idea is copied in another part. This can be used in polyphony	22.	**Disjunct**	When the melody leaps between notes that are not next to each other
14.	**Sequence**	The repetition of a melodic phrase, but at a higher or lower pitch	23.	**Broken Chord/ Arpeggio**	When the notes of a chord are separated and played in succession, either up or down
15.	**Ostinato**	A musical pattern which is repeated many times. Known as a riff in modern music	24.	**Alberti bass**	A type of broken chord accompaniment, which was common in the Classical period
16.	**Syncopation**	Same as 'off beat'. When accented notes are played on the weaker beats of the bar	25.	**Motifs**	A short melodic or rhythmic idea that has a distinctive character
17.	**Dotted rhythms**	A dot after a note increases its value by half again. This gives a 'jagged' effect to the rhythm	26.	**Chord Progressions**	A series of chords related to each other in a particular key
18.	**Drone**	A repeated note or notes held throughout a passage of music	27.	**Modulation**	The process of changing key
			28.	**Regular phrases**	The balanced parts of a melody

Pop Music

A. Structure		
1.	**32-bar song form**	32 bars long, presents two ideas (A and B)
2.	**Strophic**	Intro – Verse 1 – Verse 2 – Verse 3 – Verse 4 – etc. – Outro
3.	**12 bar blues**	12 bars arranged in harmony: I – I – I – I – IV – IV – I – I – V – IV – I – I
4.	**Verse-chorus form**	Intro-Verse-Chorus-Verse-Chorus-Outro
5.	**Riffs**	Repeated musical pattern
6.	**Middle 8 / Bridge**	Contrasting section towards the end of a song
7.	**Instrumental Break**	Instrumental section during a song
8.	**Fill**	Short instrumental passage between two vocal phrases

B. Melody		
9.	**Range**	The span of notes the vocalist covers
10.	**Blue notes**	Flattened 3rd, 5th or 7th
11.	**Hooks**	Catchy melody which returns during a song
12.	**Diatonic**	All the notes are in the piece's key
13.	**Chromatic**	Melody includes notes that aren't in the piece's key
14.	**Melismatic**	More than one note per syllable
15.	**Syllabic**	One note per syllable
16.	**Conjunct**	Melody moves by step
17.	**Disjunct**	Melody includes large leaps

C. Instrumentation		
18.	**Rhythm Guitar**	Ordinary electric guitar which supports the rhythm by strumming the chords
19.	**Lead Guitar**	Electric guitar that plays the melody / harmonises with vocals / has a solo
20.	**Bass Guitar**	Usually has four strings and provides the low notes (the bass line)
21.	**Drum Kit**	3-5 drums, some cymbals and a high hat
22.	**Keyboards**	Electric pianos, synthesisers, Hammond organs
23.	**Lead and Backing vocals**	Main soloist and other voices which join to support the main singer / provide harmonies / countermelodies
24.	**Falsetto**	A vocal technique used by male singers to reach notes outside of their range

Pop Music

D. Techniques		
25.	**Looping**	Repeating a part of the music
26.	**Sampling**	Taking a sample of one sound recording and using it in another song
27.	**Panning**	A studio technique for adjusting sound levels between the left and right speakers
28.	**Phasing**	An electronic delay effect
29.	**Balance**	Relative of volume of the individual performers in a group
30.	**Remixing**	Changing a piece through electronic manipulation
31.	**Delay**	Electronically produced repeated, decaying echo
32.	**Reverb**	Effect which creates a sense of depth
33.	**Distortion/ Overdrive**	Both refer to ways of increasing the gain of amplified instruments, producing a growly/fuzzy tone
34.	**Wah-wah**	Pedal that mimics sound of human voice
35.	**Auto Tune**	Alters the pitch in recorded vocals

E. Harmony		
36.	**Notes of the triad**	Root, Third, Fifth
37.	**Primary Chords**	Tonic, Subdominant, Dominant. Sometimes these are written in Roman Numerals (I, IV, V)
38.	**Secondary Chords**	Chords borrowed from another key
39.	**Chord Progression**	The order of chords in a song, changes for different sections
40.	**Cadences**	Perfect (V-I), Plagal (IV-I), Imperfect (?-V), Interrupted (V-?)
41.	**Harmonic Rhythm**	The rate at which the chords change in a song

F. Tempo, Rhythm & Metre		
42.	**Syncopation**	The off-beats are emphasized
43.	**Driving rhythms**	Rhythms which drive the music forward

G. Genres		
44.	**Pop**	A general term covering the many different styles and genres of music around since the late 18th Century that are considered to be part of modern everyday culture
45.	**Rock**	A general term that covers many different genres of music which have developed since rock and roll in the 1950s. There have been many stylistic changes in this period
46.	**Fusion**	When musical styles are combined together to make something new
47.	**Bhangra**	A fusion of Indian and Western music, combined to make a new style

Algorithms

Computational Thinking

Abstraction	The process of removing unnecessary details and including only the relevant details. It is a method of computational thinking that focusses on what is important in problem solving
Decomposition	The process of breaking a complex problem down into smaller more manageable parts. Dealing with many different stages of a problem at once is much more difficult than breaking a problem down into several smaller problems and solving each, one at time.
Advantages of Program Decomposition	• Makes problems easier to solve. Different people can work on different parts of a problem at the same time… • …reducing development time. • Program components developed in one program can easily be used in other programs
Algorithmic Thinking	A way of getting to a solution by identifying the individual steps needed. By creating a set of rules, an algorithm that is followed precisely, leads to an answer. Algorithmic thinking allows solutions to be automated.

Input, Processes and Output

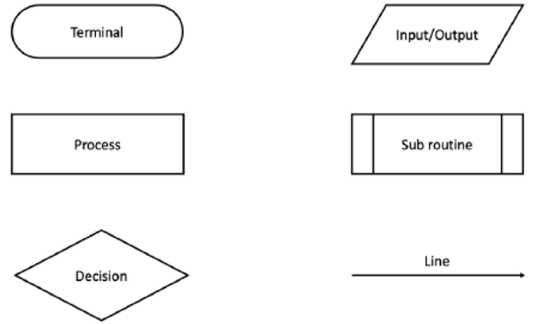
Input	• Anything which needs to be supplied to the program so it can meet its goals. • Often input by the user. • Consider an appropriate variable name and data type for the input.
Processes	• Consider what calculations need to be performed while the program is running. • Does data need to change formats or data types
Output	• Consider what your program need to output. • Consider what form this output need to take. • Consider an appropriate variable name and data type for any output

Structure Diagrams

- Structure diagrams illustrate problem decomposition.
- They can be used for developers to understand a problem to code and to share with users during systems analysis.
- They are produced using a method known as step-wise refinement.
- Break problem down using decomposition into ever smaller components.
- Some areas of the program will needed breaking down more than others.
- The lowest level nodes should achieve a single task.
- These can then be coded as a single module or sub-program.

Flowcharts and Pseudocode

Flowchart	A method of representing the sequences of steps in an algorithm in the form of a diagram. Sometimes called a Flow diagram
Structure Diagram	A diagram showing a top-down breakdown of a complex problem
Pseudocode	A text-based alternative of representing the sequences of steps in an algorithm. Pseudo-code can be thought of as a simplified form of programming code.



Types of Errors

Syntax Error	Syntax errors are errors which break the grammatical rules of the programming language. They stop it from being run/translated
Logic Errors	Logic errors are errors which produce unexpected output. On their own they won't stop the program running

Trace Tables

- A vital skill for understanding program flow and testing the accuracy of an algorithm for logic is called "Tracing Execution".
- Examine a printed extract of program code and running through the program.
- Take each line at a time and write out in a trace table the current state of each variable.
- Noting down any output the program produces.
- Each variable present in the program should have its own column in the trace table.
- A new row should be added under any column if the state of a variable changes.
- Trace tables are an excellent way to track down logic errors in a problem.

Programming Fundamentals 1

Key Terms

Variable	A value stored in memory that can change while the program is running
Constant	A value that does not change while the program is running, and is assigned when the program is designed
Operator	A character that represents an action, e.g. "+" is a mathematical Operator
Assignment	Giving or changing a variable or constant a value
Casting	Converting a variable from one data type to another
Input	A value that is entered into the program after the program has started running
Output	A value that produced by the program and either saved or displayed to the user

Data Types

Integer	A positive or negative whole number used when arithmetic will be required
Real/Float	A positive or negative decimal number
Character	A single alphanumeric e.g, A , a, 1, : etc.
String	Multiple characters joined together [n.b. use this for credit card numbers]
Others	Some languages have others, e.g. date, picture…

Integrated Development Environments

Debugging Tools	• Breakpoints – stopping at a line of code during execution. • Stepping through lines of code one at a time. • Tracing through a program to output the values of variables
Run Time Environment	• Output window. • Simulating different devices the program can run on.
Usability Functions	• Navigation, showing/hiding sections of code. • Formatting source code often in different colours. • Text-editor functions • Illustrating keyword syntax and auto-completing command entry
Translator	Some IDEs have an inbuilt translator to test the program and make small alterations before compiling the final program into an executable file for distribution

Basic String Manipulation (general)

string.length()	Obtains the length of the string in characters
string.upper()	Converts the string to uppercase
string.lower()	Converts the string to lowercase
string.left(n)	Gets the left-most n characters of the string
string.right(n)	Gets the right-most n characters of the string
string.substring(a,b)	Gets b characters of the string starting at position a
ASC(char)	Returns the numerical ASCII value of char

Note : this is NOT the way things are done in any particular programming language. In particular Python does things differently

Arithmetic Operations

+	Addition
-	Subtraction
*****	Multiplication
/	Division
DIV	Integer division – Only gives the whole number answer
MOD	Modulus Division – Only gives the remainder as the answer
^	Exponentiation – raises the number on the left to the power on the right

Basic File Handling Operations

myFile=open("…")	Open a file
myFile.close()	Close a file
myFile.readLine()	Read a line from a file
myFile.writeLine()	Write a line to a file
myFile=("…")	Create a new file
A Workflow	myFile = open ("sample.txt") while NOT myFile.endOfFile() print (myFile.readLine()) endwhile myFile.write("Hello") myFile.close()

Note : this is NOT the way things are done in any particular programming language. In particular Python does things differently

Relational/Comparison operators

==	Is equal to
!=	Not equal to
<	Less than
>	Greater than
>=	Grater than or equal to
<=	Less than or equal to

Boolean Operators

	When is it True	Chant
NOT	Turns false to true	**FLIP**
AND	Both terms must be true	**ALL**
OR	At lest one must be true	**AT LEAST ONE**

The three Basic Programming Constructs

Sequence	Executing one instruction after another
Selection	Program branching depending on a condition
Iteration	Sometimes called looping, is repeating sections of code. Condition controlled or count controlled

Programming Fundamentals 2

Storing Data in Records

In Text Files	• Stored on the secondary storage (hard disk/SSD/flash). • Used to store data when the application is closed. • Useful for small volumes of data. E.g. configuration files. • Each entry is stored on a new line or separated with an identifier such as a comma or tab. • Can require a linear search to find/read data which is slow (if there is no order to the data or record structure). • Structured text files E.g. CSV, XML & JSON are popular for storing and exchanging data between applications
In Arrays and lists	• Stored in RAM. • Used to store data when a program is running. • Useful for small volumes of data an algorithm is using. • Can be single or multi-dimensional allowing for tables of data to be stored. • Uses indexes to refer to data items. • Efficient algorithms or linear searches can be used to find data
In Databases	• Often stored on remote servers. • Often used to store data shared by many users, e.g. ticket booking system. • Data is stored in records and fields. • Uses advanced data structures to store data efficiently. • Uses very efficient algorithms to search and sort data executed on the servers. • More secure than text files. • The order of the fields in the database in independent of the code
Record Structure	• A collection of related fields. • A field is a variable. • Each field in a record can have a different data type. Note the dot syntax when using records: record<dot>Field e.g. car1.Make

Maintainability

Comments	These explain the purpose of the program, or a section of code. They may also explain any unusual approaches or temporary 'fixes'
White Space	Make each section of the code stand out. Use spaces so code is not cramped up and hard to read
Indentation	Mandatory in Python but use indentation to show the flow of the program
Variable Names	Use sensible variable names that have some meaning as to what they are being used for
Sub Programs	Use Procedures and functions to structure the code and eliminate duplicating portions of it
Constants	Declare constants at the top of the program

Arrays

Definition	An array is a series of memory locations – or 'boxes' – each of which holds a single item of data, but with each box sharing the same name. All data in an array must be of the same data type
Use	• Indexes usually start at 0 for the first data item (known zero indexed). • Arrays may be single or multiple dimensions. • Visualise dimensions as a column (single dimension) or table (two dimension) • In Memory two dimensional arrays are still stored in a linear fashion

Sub Programs

Why use them	• Larger programs are developed as a set of sub-programs called subroutines. • Structuring code into sub-programs makes the code easier to read and debug. • Each sub-program can easily be tested. • Sub-programs can be saved into libraries and reused in other programs
Functions	Functions return values and create reusable program components.
Procedures	Procedures create a modular structure to a program making it easier to read. They do not return values

Random Numbers

Deterministic	Programs that run on computer systems are deterministic – with exactly the same inputs they should produce exactly the same outputs.
Real World	Randomness is easy to produce in the real world – spinning a wheel,
Computer	• Computers do not produce random numbers at all • They use complex mathematical techniques to produce a series of numbers that may appear random but are really only an approximation to randomness (called pseudo-random numbers) • We refer to them as random numbers anyway
Programming	myVariable = random (1,6) will produce a random number between 1 and 6

Refining Algorithms

What do we mean by refining?	• Code should anticipate all inputs and it should deal with 'bad' data, or missing data, and not crash. • It should ensure prompts to the user are helpful and that the input can only be of the correct type
How to refine	Many languages have exception handling commands. In Python we use Try and Catch

Programming Fundamentals 3

Input Validation

Validation	Does not ensure that the data entered is correct, just that it is possible and sensible
Type Check	The input is in the correct data type. E.g. Integer, Real, String
Range Check	The input is within a correct range. E.g. Between 1 and 2
Presence Check	Some data has been entered. E.g. Reject blank inputs
Format check	The input is in the correct format. E.g. dd/mm/yyyy
Length Check	The input has the correct number of characters. E.g. 8 or more chars
Why we use input validation	• The program is more robust • The program is more user friendly • To prevent further errors occurring later in the algorithm

Anticipate Misuse

Division by Zero	In mathematics, there is no number which when multiplied by zero returns a non-zero number. Therefore, the arithmetic logic unit cannot compute a division by zero.
Communication Error	Online systems require connections to host servers. If this connection is dropped, unable to be established or the server is overloaded, it could potentially cause a program to crash or hang when loading/saving data.
Peripheral Error	Any peripheral may be in an error mode (e.g. paper jam)
Disk Error	Programs that read and write to files must handle exceptions, including: • The file/folder not being found. • The disk being out of space. • The data in the file being corrupt. • The end of the file being reached
Authentication	• Username and password to access systems. • Password recovery by e-mailing to an authenticated e-mail address. • Encryption of data files. • Check for human and not bot attempting access (e.g. reCAPTCHA)

Suitable Test Data

Normal	Data which should be accepted by a program without causing errors
Boundary	Data of correct type on the edge of accepted validation boundaries
Invalid	Data of the correct type but outside accepted validation checks
Erroneous	Data of the incorrect type which should be rejected by a computer system. This includes no input being given when one is expected

Testing

Reason for Testing	• To ensure there are no errors (bugs) in the code. • To check that the program has an acceptable performance and usability. • To ensure that unauthorised access is prevented. • To check the program meets the requirements
Iterative Testing	• Each new module is tested as it is written. • Program branches are checked for functionality. • Checking new modules do not introduce new errors I not existing code. • Tests to ensure the program handles erroneous data and exceptional situations.
Final/ Terminal Testing	• Testing that all modules work together (integration testing) • Testing the program produces the require results with normal, boundary, invalid and erroneous data. • Checking the program meetings the requirements with real data.

Iteration – For Loops

For Loop = Repeat Fixed Number of Times	#prints the numbers #1 to 10 FOR i = 1 to 10 print i NEXT	Code indented after the for and before the next is repeated the number of times specified from the start number to the end number. The variable, in the example I, counts how many times it has been repeated
Iteration – While loops **While Loops** = **Repeat as Long as Condition is True**	#prints the numbers #1 to 10 i = 0 WHILE i <= 10 print i i = i + 1 ENDWHILE	While loops repeat while a condition is true. The condition comes straight after the while. The code to repeat is indented underneath and before the end while statement

Selection - IF THEN

Python
`if condition:`
`  # code`
	Pseudocode
	age = Input()
	IF age > 17 THEN
	PRINT "ADULT
	ENDIF
		If followed by a condition and :
		Code to run if the condition is true is indented after the IF. If the conditions false the indented code is skipped. You end the statement with an ENDIF

Selection - IF THEN ELSE

Python
`if condition:`
`  # code if condition is true`
`else:`
`  # code to run otherwise`
	Pseudocode
	age = input()
	IF age >=18 THEN
	PRINT "Adult"
	ELSE
	PRINT "Child"
	ENDIF
		Same as if then but if the condition is false the code indented after the else is run.

Sorting and Searching Algorithms

Searches

Binary Search	
The Algorithm	• Calculate a mid-point in the data set. • Check if that is the item to be found. • If not… • If the item to be found is lower than the mid-point, repeat on the left half of the data set. • If the item to be found is greater than the mid-point, repeat on the right half of the data set. • Repeat until the item is found or there are no items left to check.
Requirements / Efficiency	• Requires the data set to be in order of a key field. • Can be done with letters as well as numbers—use alphabetical order • More efficient than a linear search on average

Linear Search	
The Algorithm	• Starting from the beginning of a data set, each item is checked in turn to see if it is the one being searched for
Requirements / Efficiency	• Doesn't require the data set to be in order. • Will work on any type of storage device. • Can be efficient for smaller data sets. • Is very inefficient for large data sets

For the exam

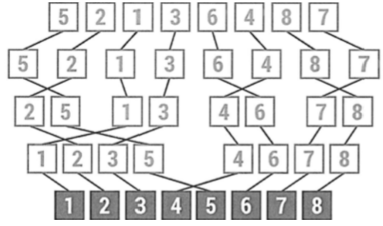
✓ Understand the main steps of each algorithm
✓ Understand any pre-requisites of an algorithm
✓ Apply the algorithm to a data set
✓ Identify an algorithm if given the code for it
✓ Show all your steps in detail
X To remember the code for these algorithms

Sorts

Merge Sort	
The Algorithm	• A very efficient method of performing a sort. • Uses a divide and conquer method. • Creates two or more identical sub-problems from the largest problem, solving them individually. • Combines their solutions to solve the bigger program. • Data set is repeatedly split in half until each item is in its own list. • Adjacent lists are then merged back together.
Requirements / Efficiency	• Works very well for large data sets.

Bubble Sort	
The Algorithm	• Sorts an unordered list of items. • It compares each item with the next one and swaps them if they are out of order. • The algorithm finishes when no more swaps need to be made. • In effect it "bubbles" up the largest (or smallest) item to the end of the list in successive passes.
Requirements / Efficiency	• Works very well for large data sets.

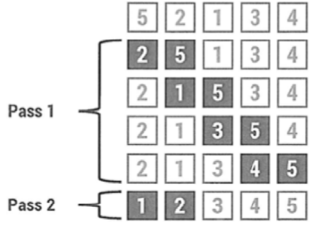
The **merge sort** algorithm works by splitting a list into individual elements and gradually merging them into larger and larger sorted lists until they are in one sorted list.



Very efficient when used with both large and small lists.

The **bubble sort** algorithm works through a list, comparing pairs of values and swapping them if necessary.

It keeps on passing through the list comparing values and making swaps until the list is sorted.



Easy to implement; however, it isn't very efficient.

Systems Architecture

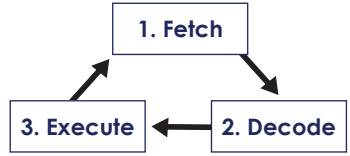
Key Knowledge	
CPU/ Processor	Fetches instructions from memory, decodes them, and executes them to perform a task.
General Purpose Device	A computer device that software can be installed to to change what it does, for example a general-purpose computer can run a word processor to write a letter and then run a game for entertainment
Fetch, Decode, Execute (FDE) cycle	The cycle the CPU continuously carries out to process instructions. Fetch data from main memory and brings it via buses to the CPU; decodes the instruction; and carries out the instruction, which may mean fetching data from memory if the instruction needs it.
Von Neumann architecture	The stored program concept, where program instructions and the data to be processed can be stored in the same memory.
The purpose of the CPU	To manage basic operations of the computer. To fetch decode and execute instructions. To send control signals to all other components that make up the computer to tell them what and when to do things.
Binary	The number system used to store instructions and data in the computer
The main components of the CPU	Control Unit. Arithmetic Logic Unit. Registers. Cache, Program counter, Memory Address register, Memory Data register
The role of a register in the CPU	Memory inside the CPU that holds one piece of data or instruction temporarily. There are specific purpose registers that have a specific function and general-purpose registers which store data or instructions for future FDE cycles.
An Address	This is a location in a storage device that a single instruction or data can be found. When talking about the FDE cycle we normally mean an address in Main Memory (RAM).

Components in the CPU and their functions	
The Control Unit	(1) Sending signals to control the flow of data and instructions, and (2) decoding instructions into opcode (the instruction like add or store) and the operand (the data to use with the instruction)
Cache memory	A small section of extremely fast memory used to store commonly used instructions and data. It is useful as the CPU can access the (fast) cache directly. L1 cache is closest to the CPU, L3 cache furthest
The ALU	It carries out mathematical operations / logical operations / shifting operations on data; for example, multiplication, division, logical comparisons
The PC	The Program Counter keeps the address of the next instruction to be processed
Bus	Wires through which data and instructions are transferred between computer components. There are three buses. The address bus sends addresses to memory. The data bus, which sends data and instructions to and from memory. The third bus is the control bus which sends control signals to peripherals outside of the CPU
The MAR	The Memory Address Register is used to tell the CPU where to locate data in Main Memory
The MDR	The Memory Data Register is used to store data that is fetched from Main Memory
The ACC	The Accumulator stores results of logic operations and calculations used during processing
System Clock	Keeps all the CPU components synchronised. Controls the speed at which instructions are fetched, decoded and executed (FDE). Measured in Hertz (Hz) which is how many FDE cycles happen per second
Core	A complete set of registers needed to complete one FDE cycle found in the CPU. CPUs can have many cores
Peripherals	A device, like a hard disk, keyboard, or speaker, that is part of the computer device and is connected via buses to the CPU.

Systems Architecture

Affecting the Performance of the CPU	
Clock speed	The number of cycles that a processor carries out per second. Each cycle of the CPU allows a single action (instruction) to be carried out. The greater the clock speed, the greater the number of operations and the faster the computer will run.
Increasing the number of cores	Nowadays most CPUs have multiple cores. Having multiple cores allows instructions to be carried out concurrently (at the same time), whereas a single core will only allow carry out instructions in serial (one at a time). Not all computer programs can make use of multiple cores.
Increasing cache size	The more data that can be held in the cache, the shorter the trips the electric pulses need to make so this speeds up the processing time of each of those billions of electrical signals, making the computer noticeable faster overall.

Embedded Systems	
Definition	A computer system which forms part of an electronic device or larger mechanical device and that has a specific purpose
Re-programmable	Not for different purposes but firmware can sometimes be upgraded
Reasons	They are cheaper to make and smaller than a General Purpose Computer
Examples	Examples Washing machine, Smart Oven, Car Engine, Pacemaker

The F-D-E (Fetch Decode Execute) Cycle	
The F-D-E Cycle repeatedly cycles	
The Fetch Stage	The address is generated by the Program Counter (PC) and is carried to the Memory Address Register (MAR) using the Address Bus. The PC then updates and stores the next memory address, ready for the next round of the cycle. The data or instruction that is in that memory location is placed on the data bus and carried to the processor and is stored in the Memory Data Register (MDR)
The Decode Stage	The data or instruction is then the Memory Data Register (MDR). decoded to find out if it is a piece of data or if it is an instruction to do something such as ADD, STORE, SWITCH, REPEAT etc.
The Execute Stage	The CPU performs the actions required by the instruction. If it is an instruction to control input or output devices the Control Unit will execute the instruction. If it is a calculation, then the Arithmetic and Logic Unit (ALU) will execute the instruction. The results of any calculations are recorded in the Accumulator. Data required to complete the instruction may be fetched from memory or the results of instructions may be stored in memory for future use.

Computer Systems – Types of memory and storage

The purpose of RAM and ROM in a Computer System

The purpose of RAM	RAM is the main memory (also called primary storage) for storing data and programs while they are running
The purpose of ROM	ROM stores the boot sequence (BIOS), which is a set of instructions that the computer executes every time it is switched on. ROM is essential since if loads the operating system
We use RAM rather than Secondary Storage	The RAM can be accessed at a much higher speed than the secondary storage. If the CPU was having to communicate directly with secondary storage for the F-D-E cycle the computer would be incredibly slow
Primary Storage Devices	Primary storage devices are internal to the system and are the fastest of the memory/storage device category. Typically, primary storage devices have an instance of all the data and applications currently in use or being processed. The computer fetches and keeps the data and files it in the primary storage device until the process is completed or data is no longer required. RAM, ROM, Graphics Card RAM, cache and registers are common examples of primary storage devices
Secondary Storage	A long-term non-volatile storage for data and instruction that allows data to be transferred between devices
Loading a program	When a user or the computer loads a program or app the instructions and data that make that program are copied from secondary storage to main memory. Main memory is much quicker at copying instructions and data to the CPU than secondary storage
Increasing RAM	This can speed the computer upas more instructions can be loaded into fast RAM from secondary storage, which is slow
Read Only (ROM)	When memory or storage can only be read from by the computer. The data instructions on it cannot normally be written over
Read Write (RW)	When the data or instructions on a storage device or memory can be changed by the computer

Types of Secondary Storage

Optical	The surface of a CD is covered in microscopic dots. A laser would skim across the surface reading these. As the laser passes over, the pattern on the surface is picked up. If the laser hits a dot it is reflected differently to if there were no dot present. Examples : CD/CDR/ CDRW/DVD/BluRay
Magnetic	Magnetic hard drives use silver coloured disks which are covered on both sides with a magnetic film divided into billions of tiny areas. Each one of those areas can be independently magnetised (to store a 1) or demagnetised (to store a 0). The read/write heads would flicker quickly over the surface as it reads and writes the data. Several platters would be installed in one hard drive to give greater storage capacity. Examples : Hard Disk Drive / DAT / Tape Drive / Cassette
Solid State	Solid-state secondary storage does not have any moving parts. Solid state secondary storage stores data using circuit chips. They are sometimes called flash drives. Examples : USB storage / SD Cards / SSD Drives
Cloud Storage	Can store data and files on a server elsewhere that can be accessed via the internet.

Hardware and software

A computer system has both hardware and software.	
Hardware	The physical components that make up a device or computer system like a screen, hard disk, CPU etc.
Software	The programs that give instructions to the hardware to make it perform the desired task.

Volatility

Memory and storage is either volatile or non-volatile	
Volatile	When the computer is turned off the contents of volatile memory is lost.
Non-Volatile	When the computer is turned off the contents of non-volatile memory is kept

Types of Secondary Storage

Optical	Read only distribution on a large scale (CD/DVD). Relatively small capacity
Magnetic	High data capacity. Reasonably fast. Low cost. Cloud storage on server farms
Solid State	Low power. Small. Rugged. Silent. Very fast. Medium data capacity

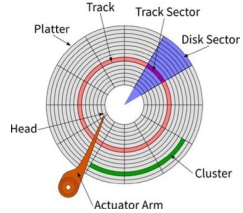
Picking the most suitable type of storage

When picking the best type of secondary storage for a situation you should consider the following five point	
Capacity	How much data needs to be stored
Speed	How quickly can the data be stored. How quickly does it need to be read
Portability	Does the device need to be transported? Are weight and size important
Reliability	How easy is it to break the storage device? Will it be used over and over again? Will it always work?
Cost	How expensive is the media per byte of storage

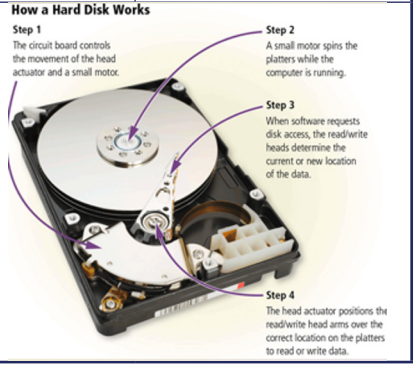
Computer Systems – How Secondary Storage works

Magnetic Hard Disk

- Tracks on the disk platters contain tiny magnets, each holding 1 bit of data.
- The polarity (negative or positive) of the magnets determines whether the bits are 0 or 1.
- The write head modifies the polarity of the magnet as appropriate.
- The read head identifies whether each magnet is negative or positive.
- The tracks are laid out as a series of concentric rings.



Advantages	Disadvantages
• Cheap form of storage • Can store large amounts of data	• Less reliable because it contains moving parts that can break as it has moving parts • Electromagnetic surge can corrupt the data held • Slow speed of read/write access



Cloud Computing

Cloud Storage	Can store data and files on a server elsewhere that can be accessed via the internet.	
Cloud Application	Using applications over the internet.	
Cloud Management	Accessing, syncing, backing up, and sharing files over the internet	
	Advantages	**Disadvantages**
Cloud Computing	• Only pay for storage that you use • Data and files available from anywhere in the world where there is an internet connection • Data automatically backed up	• Need a reliable network connection • Files are hosted elsewhere so a security concern • The most recent versions of software is often not available • Transfer of data over the internet will slow down performance.
Local secondary storage	• Files can be accessed even when there is no internet connection • More secure as files to not need to be transferred over the network and the user has more control	• Users need to organise their backup solutions • Not so easy to share documents • Can only access the files locally

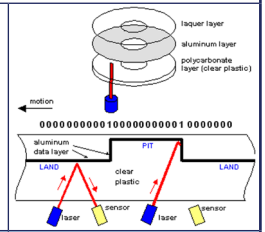
Solid State

- Use millions of switches called floating gate transistors on microchips to store data.
- Electrons are stored in gates and this is encoded as 0 when there is an electron present and encoded a 1 when there is no electron present.
- The electros remain trapped even when there is no flow of electricity.
- Contain no moving parts and are therefore more robust that optical and magnetic storage.

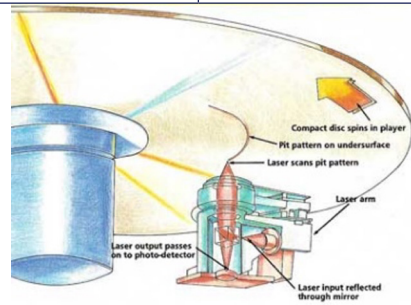
Advantages	Disadvantages
• Much faster than other means of storage • More reliable than other means if you are only reading data • Quiet	• More expensive per volume of storage • Reliability might be an issue if you write a lot of data to it

Optical Disks

- Tracks on the disk contain pits and lands
- The track is a spiral.
- A laser is emitted, and the laser light is reflected when it hits the lands, but is scattered when it hits the pits.
- Depending on whether the light is scattered light is encoded as a binary value of 0 and reflected light is encoded as a 1.
- The sensor is able to detect light reflected, but not scattered.
- Example: Blu-Ray (25 Gb) DVD (4.7 Gb), CD (700 Mb).



Advantages	Disadvantages
• Can transfer easily between computers • Cheap for low amounts of data storage	• Can scratch easily • Not much storage compared with other methods.



Computer Systems – Software

System Software - system software manages the computer system resources and acts as a platform to run application software

Application Software - application software is software that performs end-user tasks.

System software

Operating system (OS)

System software is the unsung hero behind the scenes. It's like the stage crew making sure the show runs smoothly. Here's what it does:

Booting up: When you turn on your computer, system software talks to the hardware, waking it up and getting it ready for action.

Device management: Ever wondered how your keyboard, printer, and mouse all play nicely together? System software manages these external hardware devices.

Security: It's the bouncer at the digital nightclub, preventing malware from crashing the party.

Utility software

Software that works with your OS to keep your device running correctly and efficiently. It's designed to perform specific tasks that help maintain, enhance, and troubleshoot your computer. Exampes include Anti-virus, Firewalls, Disk Defragmentation, Compression, Encryption etc.

Application Software

The software that the use uses to complete the tasks they want. For example:

Keywords

High level languages	Closer to human language and is therefore easier to understand. A translator is used to convert the instructions into code that the computer understand.
Low level languages	Refer to machine code and assembly language. Is close to the language understood by the computer. However, it is difficult for humans to understand.
Assembly language	Provides basic computer instructions for programs to run. There is a one-to-one relationship between machine code and assembly code instructions. One assembly language instruction maps to one machine code instruction. Assembly languages are different for different types of computers
Machine code	Expressed in binary values 0 and 1. This is the language that computers understand. All programming languages need to be translated into machine code. Machine code is specific to a processor.

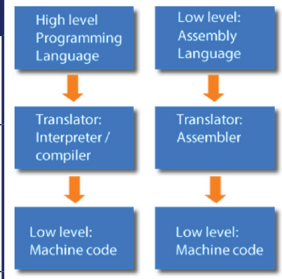
Low Level v High level Languages

	Advantages	Disadvantages
Low level	Produce code that is faster and better optimised than high level languages. Appropriate for developing new operating systems, embedded systems and hardware device drivers.	Difficult to understand and modify. Assembly code is written for a specific processor architecture, and so is not portable to other computer architectures.
High level	High level programming languages allow code to be written that is more portable. Thus code can be run on different of the types of computer system with different processor architecture. Easier to understand Easier to modify.	Needs a translator. Runs slower because of the layers of abstraction and there is inefficiency in translator.

Types of Translators

Convert programs written in high level languages and low-level languages machine code so then programs can be run on a computer.

Interpreter	Converts high level languages into machine code one instruction at a time on-the-fly while the program is running. Each instruction is converted to machine code once the previous instruction has been executed.
Compiler	A program that converts high level languages into machine code before the program is run. A compiler saves the machine code, so the source code is no longer needed. A compiler allows a program to be run faster than interpreted code.
Assembler	Converts assembly language instructions into machine code.

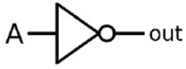
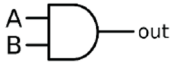
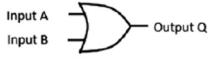


Examples of Application software – *Be careful don't mention brands in the exam like Chrome*

Word Processing: Think Microsoft Word or Google Docs. Perfect for writing essays, letters, or that secret novel you're working on.	Spreadsheets: Excel or Google Sheets. Crunch numbers, create budgets, and track your Pokémon collection.	Web Browsers: Chrome, Firefox, or Safari. Surf the web, watch cat videos, and pretend you're researching.	Photo Editing Tools: Adobe Photoshop or GIMP. Turn your selfies into masterpieces (or memes).	Communication Apps: WhatsApp, Messenger, or good ol' email. Stay connected with friends, family, and the occasional robot.	Entertainment: Music players, video streaming apps, and games. Because life needs a soundtrack and a boss battle now and then.

Data representation – Using Binary for numbers and logic

Boolean logic

	Logic Gate	Chant	Truth Table
NOT		FLIP IT	Input / Output 0 / 1 1 / 0 The output is the opposite of the input
AND		ALL	Input - A / Input - B / Output 0 / 0 / 0 1 / 0 / 0 0 / 1 / 0 1 / 1 / 1 Has two inputs and will have a true output if the two inputs are true otherwise the output will be false
OR		AT LEAST ONE	Input - A / Input - B / Output 0 / 0 / 0 1 / 0 / 1 0 / 1 / 1 1 / 1 / 1 Has two inputs and will have a true output if either or both the inputs are true
XOR		ONLY ONE	Input - A / Input - B / Output 0 / 0 / 0 1 / 0 / 1 0 / 1 / 1 1 / 1 / 0 Has two inputs and will have a true output if either the inputs are true but not both

Binary and Hex

Bit - The smallest unit of data storage consists of a single 1 or 0. This can be represented by a single transistor.

Nibble - a group of four bits (half a byte).

Byte - a group of 8 bits.

Binary - A base 2 number system that computers understand. Uses digits 0 and 1. Place Value headings: 128, 64, 32, 16, 8, 4, 2 and 1 (2 times bigger each time).

Use of Binary - Matches the computers on/off values used to store and send data. Al-lows us to program computers with machine code.

Denary/Deciaml - A base 10 number system (10 times bigger each time) Place Value headings: 1000 100 10 1 Uses digits 0 1 2 3 4 5 6 7 8 9 Use of Denary - used by humans for maths. Also, called the decimal system.

Hexadecimal (Hex) - A base 16 system used by humans to help remember and read binary code. Place Value headings: 256, 16, 1 etc (16 times bigger each time). Uses digits 0 1 2 3 4 5 6 7 8 9 & A B C D E F 10 = A 11 = B 12 = C 13 = D 14 = E 15 = F -

Use of Hex - shorthand version of binary. Easier for humans to understand and faster to enter than binary. 4 binary digit converts to 1 hex digit.

Place Value (PV) - the numerical value that a digit has by virtue of its position in a number. In Binary PV doubles as you go from right to left. In Decimal (normal maths) it goes up by powers of 10

CHANT - **Teacher**: The most importing thing about Hex **Students**: 10 is A
If you know 10 is A we can work out 11 is B and so on

Boolean Expression Operators

Operator		Example	
AND	.	Q = A AND B	Q = A . B
OR	+	Q = A OR B	Q = A + B
NOT	¯	Q = NOT A	Q = Ā
XOR	⊕	Q = A XOR B	Q = A ⊕ B

NOT (T AND S)

T	S	T AND S	NOT(T AND S)
0	0	0	1
1	0	0	1
0	1	0	1
1	1	1	1

Evaluating Boolean expressions

Using BNAXO in a similar way to BIDMAS in maths

- Brackets
- Nots
- AND/ XOR / OR

An example is shown on the left

Data representation – Using Binary for numbers and logic

Number Conversion

Hexadecimal to Binary (F5)

Use the top **place value headings** to convert each digit of **hexadecimal** number to **binary**.

Make sure you keep them on the correct side (left to left and right to right)

Once both sides have been converted to binary

Add together the PV headings where there is a 1 underneath

F = 15 5

8	4	2	1		8	4	2	1
128	64	32	16		8	4	2	1
1	1	1	1		0	1	0	1

128 + 64 + 32 + 16 + 4 + 1 = 245

Binary to denary (01001101)

Place the binary numbers under the binary place value (PV) numbers starting from right to left

Add together the PV headings where there is a 1 underneath

128	64	32	16	8	4	2	1
0	1	0	0	1	1	0	1

64 + 8 + 4 + 1 = 77

Denary to binary (56)

Work from the left and attempt to subtract the PV numbers from your number

If you can do it without a negative number then put a 1 under the PV number and use the answer in the next column

If you can't put a 0 under the PV number then move to the next column

128	64	32	16	8	4	2	1
0	0	1	1	1	0	0	0

56 – 32 = 22

22 – 16 = 8

8 – 8 – 0 you can stop here

Binary to Hexadecimal (01001101)

Split the **byte** in half, this time use the top place values to convert each half (**nibble**) into **denary**

If the number is more than 9 use the letters A to F instead.

8	4	2	1		8	4	2	1
128	64	32	16		8	4	2	1
0	1	0	0		1	1	0	1

the left nibble would be 4 and the right nibble would be 8 + 4 + 1 = 13

13 = D - Final answer = 4D

Data representation – Arithmetic and calculations in Binary

Units of Information

A bit is the fundamental unit of binary numbers. A bit is a binary digit that can be either 0 or 1.

Unit	Symbol	Number of bits (Bytes)	Converting from unit above	Converting to unit below
Bit	B	1 (1/8th)	÷ 8	
A nibble is 4 bytes or half a byte. It is called this because a nibble is a bit of a byte				
Byte	B	8 (1)	÷ 1000	x8
Kilobyte	KB	8,000 (1000)	÷ 1000	x1000
Megabyte	MB	8,000,000 (1,000,000)	÷ 1000	x1000
Gigabyte	GB	8,000,000,000 (1,000,000,000)	÷ 1000	x1000
Terabyte	TB	8,000,000,000,000 (1,000,000,000,000)	÷ 1000	x1000
Petabyte	PB	8,000,000,000,000,000 (1,000,000,000,000,000)	÷ 1000	

Binary Addition

Binary addition rules

$0_2 + 0_2 = 0_2$

$0_2 + 1_2 = 1_2$

$1_2 + 0_2 = 1_2$

$1_2 + 1_2 = 10_2$ (carry 1)

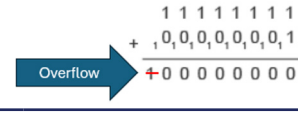
$1_2 + 1_2 + 1_2 = 11_2$ (carry 1)

Example

$$\begin{array}{rl} & 10101001_2 \\ & 00001001_2 \\ + & 00010101_2 \\ \hline & 11000111_2 \\ \text{carry} & 111 \quad 1 \end{array}$$

Overflow – If you get a carry bit on the 8th bit that would create a ninth bit, this is called an overflow. It creates an error called an overflow error.

You should cross the overflow bit out in your answer and label it overflow.



Example units of conversion

1. **How many Kilobytes are there in 3 gigabytes?**
   3 GB x 1,000 = 3,000 MB
   3,000 MB x 1,000 = 3,000,000 KB
2. **How many bits are there in 6 Megabytes?**
   6 MB x 1,000 = 6,000 KB
   6,000 KB x1000 = 6,000,000 B
   6,000,000 B x 8 = 48,000,000b
3. **How many Kilobytes would be needed to store 32,000 bits?**
   32,000 bits ÷ 8 = 4,000B
   4,000 ÷ 1000 = 4KB

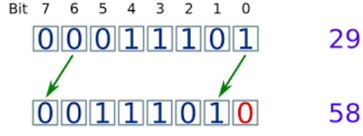
Binary Shift

The binary shift operator is used to perform multiplication and division of numbers by powers of 2.

Note: Binary shift sometimes gives an approximate answer if it shifts right or left and you get an overflow.

multiply/divide	x 16	x 8	x 4	x 2	/ 2	/ 4	/ 8
shift	<<4	<<3	<<2	<<1	>>1	>>2	>>3

Example how to do a binary shift one shift left



Resultant shifts: Many shifts can be applied to the same binary number one after each other. The final answer of all the shifts is the resultant shift. For example. A shift left three followed by a shift right by 5 spaces would result in a shift right of 2 spaces. The equivalent arithmetic operation is divide by 4

Data representation – Character, Images and Sound

Character Encoding

Character coding schemes allows text to be represented in the computer. One such coding scheme is ASCII. ASCII uses 7 bits to represent each character which means that a total of 128 characters can be represented.

Lower case letters	26
Upper case letters	26
Numbers	10
Symbols (e.g. comma, colon)	33
Control characters	33

ASCII encoded values for some characters.

A	1000001_2	65_{10}
B	1000010_2	66_{10}
a	1100001_2	97_{10}
b	1100010_2	98_{10}
"0"	0110000_2	48_{10}
"1"	0110001_2	49_{10}

ASCII has a limited character set (7 bits, 128 characters), but Unicode has 16 bits and allows many more (65K) characters.

Unicode provides a unique character for different languages and different platforms.

It allows us to represent different alphabets for instance Greek, Mandarin, Japanese, Emojis etc.

Unicode and ASCII are the same up to 127.

The first 256 characters in Unicode and ASCII are the same.

If you know that A is 65 in a character set you can work out B as it is the next letter it will be the next value in the character set, so 66 and so on

Working out Ascii file size

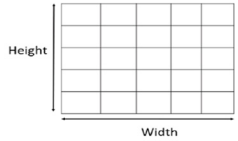
Given that there are 7 bits per ASCII character, the uncompressed size of an ASCII phrase is:

Size in bits = number of characters (including spaces) x 7

Images

Bitmap images are made up from tiny dots called pixels. Each pixel will have a colour associated with it. An image can then be constructed from many of pixels which will have different colours arranged in rows and columns.

Resolution = width (pixels) x height (pixels)



Colour depth is the number of bits used to represent each pixel in an image. If we have a black and white image it has two colours. Each pixel can be represented by a single pixel because a bit value of 0 is black and 1 is white.

Image and corresponding binary encoding

0111010001111111000101110

To represent more colours we can use more bits. For instance if we have 2-bits per pixel we can represent 4 colours because we know have 4 binary code combinations (00, 01, 10, 11) where each code represents a different colour.

Calculating the size of a bitmap image

File size (bits) = width (pixels) x height (pixels) x colour depth (bits)

File size in bytes = (width x height x colour depth) / 8

Sound

Sample - Measure of the analogue signal at a given point in time.

Sample rate - number of samples taken per second and is measured in Hertz.

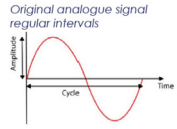
Sample resolution - number of bits used to represent each sample.

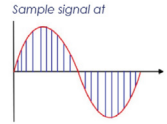
The size of sound files can be calculated using:

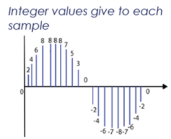
Size of file = length (seconds) x sample rate x sampling resolution.

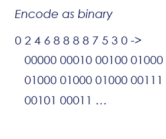
For sound to be stored digitally on a computer it needs to be converted from its continuous analogue form into a discrete binary values. The steps are:

1. Microphone detects the sound wave and converts it into an electrical (analogue) signal
2. The analogue signal is sampled at regular intervals
3. The samples are approximated to the nearest integer (quantised)
4. Each integer is encoded in binary with a fixed number of bits









To calculate file size

file size in bits =

Sample resolution x Sample rate x seconds of audio

Representing Data – Compression

Why Do We Use Compression

The purpose of data compression is to make the files smaller which means that:

- Less time / less bandwidth to transfer data
- Take up less space on the disk

Given that there are 7 bits per ASCII character, the uncompressed size of an ASCII phrase is:

Size in bits = number of characters (including spaces) x 7

Run Length Encoding (RLE)

RLE is a compression method where sequences of the same values are stored in pairs of the value and the number of those values. For instance, the sequence:

0 0 0 1 1 0 1 1 1 1 1 0 1 1 1 1

Would be represented as:

3 0 2 1 1 0 4 1 1 0 4 1

RLE only works if there are lots of repeating characters next to each other otherwise it can make the file bigger!

Huffman Coding

Huffman coding is a form of compression that allows us to use fewer bits for higher frequency data. More common letters are represented using fewer bits than less common letters. For instance, "a" and "e", which occur in many words would be represented with fewer bit than "z" which occurs rarely.

This allows for much more effective compression than RLE.

Creating a Huffman Tree

First, gather the characters you want to compress (let's call them "symbols"). Count how many times each symbol appears in your data.

Arrange the symbols in ascending order of frequency (from least to most frequent).

Create a Binary Tree:

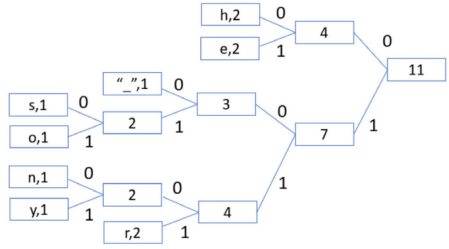
- Start by combining the two least frequent symbols into a new node. Add their frequencies together.
- Repeat this process until all symbols are combined into a single tree. Each node represents a symbol, and the tree branches out accordingly.

Assign Binary Codes:

- Traverse the tree from the root to each leaf (symbol). As you move left, assign a 0; as you move right, assign a 1.
- The resulting binary codes for each symbol become your compressed representation.

Worked Example: How much smaller is the phrase 'henry horse' encoded using Huffman encoding compared with its uncompressed size.

Huffman tree



Huffman table

The left branch is always Zero and the right branch is always 1. We travers the tree to find the Huffman code for each character. Remember for every piece of text the Huffman tree and code will be different

Letter	encoding
e	01
h	00
r	111
<space>	100
o	1011
s	1000
n	1100
y	1101

Encode message

00 01 1100 111 1101 100 00 1011 111 1000 01 = 33 bits

Calculate the uncompressed size

In the phrase henry horse there are 11 characters (including the space). Therefore the uncompressed size is 11 x 7 = 77 bits

Therefore, by using compression we have reduced the size from 77 bits to 33 bits a saving of 44 bits.

Letter	code	Bits	Freq	Total bits Bits x freq
E	01	2	2	4
h	00	2	2	4
r	111	3	2	6
<Space>	100	3	1	3
o	1011	4	1	4
s	1000	4	1	4
n	1100	4	1	4
y	1101	4	1	4
Add up the total bits =				33

Fundamentals of Computer Networks - Why we use networks, Types and Topologies

A computer network is two or more devices connected together to communicate and share data/information

Why We Use Networks

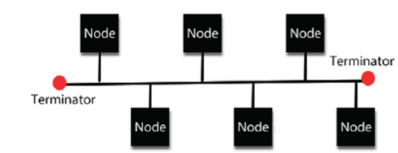
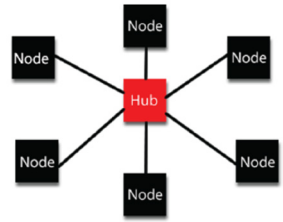
Advantages	Disadvantages
• Share resources, such as software applications, files and hardware (e.g. printers). • Allows communication (e.g. email) and can transfer files easily. • Easier network management (e.g. can backup data onto a central file server; updates can be sent to all computers; users on a network can login to any computer).	• Greater security risk as computers can be hacked if they are connected to the internet. • Worms can spread from one computer to another. • A problem with any shared resource, (e.g. file server goes down) can impact the whole network.

Types of Network

Personal Area Network (PAN)	Set up around an individual person, usually using Bluetooth.
Local Area Network (LAN)	Covers a relatively small geographical area typically extends over the range of a single organisation such as a university campus, school site. LANs are usually owned and managed by a single organisation.
Wide Area Network (WAN)	Spread over a large geographical area like a city or country. The internet is the ultimate WAN. It is a network of networks with billions of interconnected devices. The infrastructure is normally owned by governments or large companies and user pay to have access, like a phone contract

Network Topologies

A topology describes how a set of computers are arranged within a network.

Bus Topology	All devices including clients, servers, printers and so on are connected to a cable called a bus/backbone cable. All communication is via the shared bus. At either ends of the bus is a terminator.	
Star Topology	All devices including clients, servers, printers and so on are connected to a central hub or switch. All communication is via the hub.	

	Advantages	Disadvantages
Bus Topology	• Easy and cheap to install and does not require much cable. • Easy to add more computers.	• If the main cable fails then the whole network fails. • Less secure as data are broadcast to all devices on the network. • Can be slow as there are collisions between data along the shared bus. • Will get slower as more computers are added.
Star Topology	• Greater security as data is only sent to the intended recipient. • If any of the connections fail only a single node will be affected. • Fewer collisions between data information being sent on the network, which makes it appear slower	• If the central hub fails, then every computer on the network is affected. • Expensive as extra cable and hardware (hubs) are needed.

Fundamentals of Computer Networks - Wired or Wireless Connection

What is the difference between wired and wireless networks

Wired	Use cables to communicate, like copper or fibre optic cables.	
Wireless	Use radio waves communicate (e.g. Wi-Fi or Bluetooth).	
	Advantages	**Disadvantages**
Wired	• Allows more control, security, and reliability. • Can restrict who has access to the network. • Wired methods have greater speeds than wireless methods.	• Cables can be difficult to maintain in big organisations. • Having many cables can get expensive. • Worse for the environment. • Less portability
Wireless	• Can use computer anywhere and not constrained by cables. • Not as much hardware needed.	• Security is a much more difficult challenge. • Slower than wired methods. • Signal can be interfered with by obstacles and other electronic devices.

Types of Wired Connection

Copper cables use electrical signals to transmit data. Three main types:

Coaxial cable	Like the cablet that connects a tv to a satellite, cable company or ariel. The signal loses strength over long distances
Twisted pair	Often known as Ethernet cable it is a pair of copper cables are twisted together and allows data to be transmitted over longer distances

Fibre Optic cables are glass or plastic and use pulses of light to transmit data

	Advantages	**Disadvantages**
Copper	• Cheaper than fibre optic • Reliable because a telephone is powered from the copper cable and does not rely on a separate electrical power supply	• Slow • Low capacity • Can only be used over short distances • Interference can occur
Fibre Optic	• Higher bandwidth than copper so can transmit more data • Less attenuation (degrading) of the signal so fibre optic is more suitable over long distances • Less "cross talk" interference between fibres compared with copper so the quality of the signal is better	• Expensive • Difficult to install • Require more expertise to install

Network Security

Why do we need network security?

- ☐ To prevent unauthorised access to a network.
- ☐ To protect our data e.g. to prevent sensitive data being stolen.
- ☐ Prevent cyberattacks.

Methods of Network Security

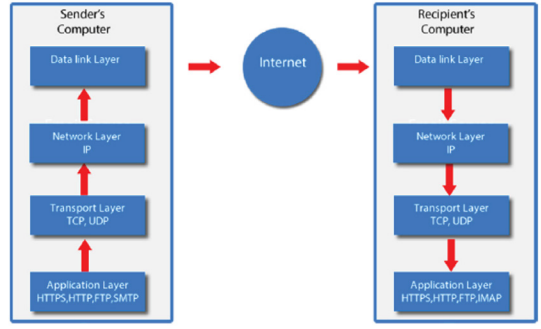
Authentication	Confirming that a user or a device is allowed to access/join a network. Can be done by username and/or password
Encryption	The message is garbled so if it gets intercepted during transmission it will be almost impossible for anyone without the key to read the original message.
Firewall	a network security device that monitors incoming and outgoing network traffic and decides whether to allow or block specific traffic based on a defined set of security rules.
MAC address filtering	MAC address filtering allows devices to access, or be blocked from accessing a network based on their physical address embedded within the device's network adapter.

Fundamentals of Computer Networks – How networks work (Protocols)

Network protocols	
Network protocol	A set of rules that allow computers to communicate and exchange information over a network. There are many types of protocols depending on the application.
HTTP	Hyper Text Transfer Protocol. The protocol used for the World Wide Web. Used for accessing web pages.
HTTPS	Secure version of HTTP. The data is encrypted during transfer. Used for e-commerce and online banking.
FTP	File Transfer Protocol. Used to download or upload large files from a server to a client.
Ethernet	Not a single protocol but a collection of related protocols. LANs most commonly use ethernet.
Wi-Fi	A collection of protocols that use radio waves to transmit data between devices. Wi-Fi is a trademark and WLAN (Wireless LAN) is the generic term.
SMTP	Simple Mail Transfer Protocol. Sends emails from the user onto the email server.
IMAP	Internet Message Access Protocol. Retrieves the email from the email server to the client (user) and allows access from anywhere on any device because the email remains on the server.
TCP	When files are sent over the internet, they are broken up into small chunks called packets. When they arrive at the destination computer they are reassembled back into the original format.
UDP	Used as an alternative to TCP. It is used in video conferencing and online gaming when speed is necessary as huge volumes of data are transferred in real time. It improves speed by not checking for lost packets, so they do not get re-sent.
IP	Internet Protocol. A set of rules that govern the transmission of data across the internet.

TCP/IP	
The TCP and IP protocol work closely together and are referred to as TCP/IP. The TCP/IP model consists of four layers that pass data between each layer.	
Application layer	Contains protocols related to the application such as HTTP, HTTPS for web browsers, FTP for file transfer and SMTP and IMAP for email. Allows the user to interact with network
Transport layer	Establishes the end-to-end connection. It splits the data into packets and passes the data onto the network layer. On the recipient's computer the transport layer reassembles the packets into the original form. TCP and UDP are the main protocols used in this layer.
Network layer	Adds the source and destination IP address and route the packets over the network. At the destination the network layer strips out the IP addresses. The IP operates on this layer. Can also be called the Internet layer.
Link layer	Has a network card and deals with the physical connection and adds the physical addresses (MAC address) of the hardware to the packets that it receives from the network layer.

Use the following mnemonic to remember the 4 layers:
- All (Application)
- TTA (Transport)
- Needs (Network/Internet)
- Love (Link)



Fundamental of Computer Networks – Cyber Security

Cyber security consists of the processes, practices and technologies designed to protect networks, computers, programs and data from attack, damage or unauthorised access.

Forms of Attack and weakness

Malware	Software written in order to infect computers and commit crimes e.g. fraud or identify theft. Malware exploits vulnerabilities in software
Types Of Malware	Malware is term that covers (among other things) viruses, trojans, worms, ransomware, spyware and adware
Virus	A type of malware that infects a computer system and then replicates itself to spread to other computers. Viruses can harm or corrupt data and disrupt normal system operations.
Trojan	A Trojan (named after the Greek myth of the Trojan horse) appears as harmless software but contains hidden malicious code. Users unwittingly install Trojans, thinking they are harmless. Once installed, Trojans can create backdoors, modify or delete data, or disrupt system performance.
Spyware	A type of malware that secretly collects information about a computer user's activities and sends it to another party without the user's knowledge. Spyware can record keystrokes (known as keyloggers), track visited websites, and monitor clicks on the screen.
Social Engineering	The art of manipulating people so they give up confidential information.
Phishing	A technique of fraudulently obtaining private information, often using email or SMS.
Blagging	The act of creating and using an invented scenario to engage a targeted victim in a manner that increases the chance the victim will divulge information or perform actions that would be unlikely in ordinary circumstances.
Shouldering	Observing a person's private information over their shoulder eg cashpoint machine PIN numbers.
Pharming	Malicious code redirects a user from a genuine website to a fake one without their knowledge. The fake website often looks like the genuine one. When a person logs in, it sends their username and password to someone who can then access their real account.
Weak Passwords	These are passwords with fewer than 8-12 characters and lacking a combination of uppercase letters, lowercase letters, numbers, and special characters. Predictable patterns (such as using birthdays, names, or keyboard sequences like "qwerty") make passwords weak and easier to guess.
Default Passwords	These are the initial passwords set by manufacturers or system administrators for devices or software. They are often generic and widely known, making them vulnerable to unauthorized access.
Misconfigured Access Rights	Misconfigured access rights occur when user accounts have incorrect permissions. This can lead to users having access to information they should not see. For example, if an email server is misconfigured, someone might be able to view another person's emails or sensitive data they are not authorized to access.
Removable Media	Refers to storage devices that can be easily disconnected from a computer system. Examples include USB memory sticks, CD-ROMs, DVDs, and external hard drives. These devices allow data to be moved between different computers or systems.
Unpatched Software	Software that has not been updated with the latest patches or fixes. Patching involves updating software to address vulnerabilities or add new features. Failure to patch software can allow hackers to exploit flaws and gain unauthorized access.
Outdated Software	This refers to using older versions of software that may lack security updates or compatibility with newer systems. Outdated software can pose security risks and may not function optimally.

How To Protect a Network

Penetration Testing	The process of attempting to gain access to resources without knowledge of usernames, passwords and other normal means of access. There are two types: • When the person or team testing the system has knowledge of and possibly basic credentials for the target system, simulating an attack from inside the system (a malicious insider) • When the person or team testing the system has no knowledge of any credentials for the target system, simulating an attack from outside the system (an external attack).
Biometrics	Biometric security uses unique physical characteristics (such as fingerprints or facial features) to identify individuals when they interact with a computer system. For mobile devices, this might involve fingerprint scans using built-in sensors or facial recognition to unlock the device.
Password Systems	Passwords are essential for secure access to computer systems. They act as a form of authentication. Some password systems enhance security by asking for only specific characters of a password (instead of the entire password), which helps prevent spyware like keyloggers from stealing passwords.
CAPTCHA	CAPTCHA (Completely Automated Public Turing test to tell Computers and Humans Apart) challenges users to prove they are human. Basic CAPTCHA forms often ask users to type in words or solve puzzles based on images. For example, identifying all images containing cats in a gallery of animals.
Two Factor Authentication	When users sign up for a new account, they often receive an email asking them to confirm their request by clicking a specific link. This email confirmation serves as a security feature, alerting users that their email is being used to create an account and allowing them to prove their identity.
Automatic Software Updates	Regularly updating software on a computer ensures better protection. Automatic updates mean the system will attempt to install patches or fixes as soon as they are available. This proactive approach helps prevent vulnerabilities and ensures the system stays secure.

Relational Databases

What is a database?

A database is a way of storing information in an organised, logical way. Data is organised into tables, records and fields.

What is a Relational Database?

A relational database has more than one table and the tables are linked using key fields

Key Parts

Table	a table is a structured collection of related data. It's like a spreadsheet with rows and columns. Each row represents a record, and each column represents a field (attribute). Tables are used to organize and store data efficiently. For example, you might have a table called "Students" that stores information about students, such as their names, ages, and grades.
Record	A record is a single entry in a table. It contains a set of related data values. For instance, if you have a "Customers" table, each row (record) in that table represents information about a specific customer, including details like their name, address, and phone number.
Field	A field (also known as an attribute) is a specific piece of data within a record. For example, in a "Books" table, fields might include "Title," "Author," and "Publication Year." Each field corresponds to a column in the table
Data type	Data types define the kind of data that can be stored in a field. Common data types include: Integer String; Boolean; Float/Double/Real; Date; Char; and Varchar.
Primary key or Key Field (PK)	A unique identifier for each record in a table. It ensures that no two records have the same value for this key. For example, in a "Students" table, the student ID could be the primary key. It allows efficient retrieval and linking of data across tables. Think of it as the student's "ID card number" within the database.
Foreign key (FK)	A foreign key is a field in one table that refers to the primary key in another related table. It establishes a relationship between the tables. For instance, if you have a "Courses" table and a "Students" table, the student ID (foreign key) in the "Courses" table would link to the primary key (student ID) in the "Students" table. This helps maintain data integrity and enables queries that involve multiple tables.

Why Do We Use Relational Databases?

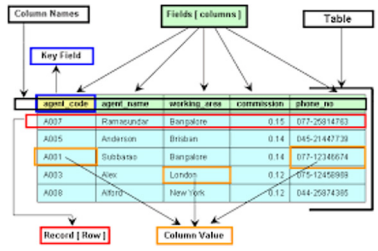
- Relational databases reduce data inconsistency as each item should be entered only once rather than needing to be repeated in many different records
- Relational databases reduce data redundancy as

Structured Query Language (SQL)

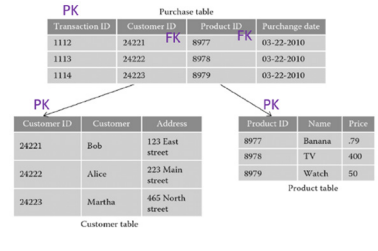
SQL is a language that allows us to search, change and delete data from a database quickly.

Type of Query	What is used for	How it is structured
SELECT	For searching for records from one or more table	SELECT [List fields you want to be displayed or put * for all of them] FROM [Name the table you want to look in] WHERE [Add any logical conditions] ORDERBY [List fields you want to sort by and put ASC or DSC next to each field for ascending or descending]
INSERT	To insert a new record into a table	INSERT INTO [Table name] ([List the field names you want to add to the new record separated by commas]) VALUES ([List the values, in the same order as the fields you want to set the record to])
UPDATE	To change the values of one or more records already in a table	UPDATE [Table name] SET [List the fields and the you want them to be changed to. Eg fieldName1 = new value 1, fieldName2 = new Value 2 ...] WHERE [The criteria the computer will use to choose the records to update]
DELETE	To delete one or more records in a table	DELETE FROM [Table name] WHERE [The criteria the computer will use to choose the records to delete] If you don't specify WHERE criteria all the data in the table will be deleted

Key parts of a database table



An example of a relational database



Ethical, Legal, Cultural and Environmental Concerns

Privacy Issues

Implications	• Implications for personal privacy have arisen due to the vast array of cameras and surveillance systems around. • The amount of data that we share and that is recorded about us is growing hugely • Free speech / freedom of expression / right to personal privacy vs. Law and Order / Public security / government's role

Cultural Issues

Implications	• Implications for personal privacy have arisen due to the vast array of cameras and surveillance systems around. • The amount of data that we share and that is recorded about us is growing hugely • Free speech / freedom of expression / right to personal privacy vs. Law and Order / Public security / government's role
Positive Effects	• In the developing world, the rapid spread of technology, fuelled by the Internet has led to positive cultural changes in developing countries. • Easier, faster communication has contributed to the rise of democracy, as well as working towards the alleviation of poverty. • Globalisation can also increase cultural awareness and promote diversity
Negative Effects	• Diffusion of technology must be carefully controlled to prevent negative cultural consequences. • Developing countries risk losing their cultural identities and assimilating themselves into an increasingly westernised world. • Challenges of inequality from the uneven distribution of technology within a country also still remain • Traditionally, most computer applications are designed by developers in North America. These designers unintentionally apply their cultural values and systems of thought whilst developing computer applications

Environmental Impact

Fossil Fuels	Fossil fuels are consumed in the manufacturing of computer devices
Energy	2% of global energy consumption is used by data centres
E-Waste	Old computing equipment is often shipped to countries with lower standards for disposal. People trawl through waste looking for metals to be recycled and sold, exposing themselves to danger.

Legal Issues

Open Source vs Proprietary Source	
Open Source	Users can modify and distribute the software. Can be installed on any number of computers. Support provided by the community. May not be fully tested. Users have access to the source code
Proprietary Source	Users cannot modify the software. Protected by CD&P Act. Usually paid for and licensed per user or per computer. Supported by developers. Users do not have access to the source code. Tested by developers prior to release. Although they may run beta programmes.

Impacts of Digital Technology on Wider Society

Customers	Customers can do more from home with less travelling involved. They can do things 24/7. They can access their data on many devices. Computers can make instant decisions without human involvement. Potentially open to hacking. Less personal
Staff	Job losses as things become more automated, particularly as Artificial intelligence are making computers able to do more human tasks quicker and more accurately than humans. New types of jobs created that didn't previously exist. Up-skilling required
Companies	Less overheads (salary, rent, utility bills) if fewer staff and buildings required. More ways to target potential customers. Increased importance of data protection and security
Local Communities	Local shops may suffer is town centres are emptier. Elderly and vulnerable customers may have nowhere local to go as local services are scaled back
Privacy	In our tech-driven world, privacy faces both challenges and opportunities. Data vulnerability looms large—once information enters digital systems, it's at risk. Legislation attempts to protect us, but the Investigatory Powers Act raises eyebrows. Surveillance is everywhere: from CCTV cameras to online cookies. Ethical dilemmas emerge—how much privacy are we willing to trade for convenience? So, let's guard our digital selves and ponder the balance between data sharing and personal space!

Legislation and laws

Data Protection Act (2018) [implementing GDPR]	• Data must be processed lawfully, fairly and in a transparent manner. • Data must only be collected for specified, explicit and legitimate. • Data must be adequate, relevant and limited to what is necessary. • Data you collect must be accurate and kept up to date. • Data you hold must be kept for no longer than is necessary. • Data you hold must be processed in a manner that ensures appropriate security of the personal data. • Data controllers must be able to prove that their data protection measures are sufficient
Computer Misuse Act (1990)	It is illegal to make any unauthorised access to data… …with the intent to commit further offences …with the intent to modify data, e.g. viruses
Copyright Designs and Patents Act (1998)	It is illegal to copy, modify or distribute software, music, videos or other intellectual property without permission from the author

1: Identity and Culture - Me, my family and friends

Parle-moi de ta famille – tell me about your family	J'ai une grande / petite famille – I have a big / small family Je vis dans une famille monoparentale – I live in a single-parent family
	Nous sommes trois dans ma famille – there are three of us in our family
	J'ai deux frères et une soeur – I have two brothers and one sister
	Je suis fils unique / Je suis fille unique (f) – I am an only child
	Mes parents sont divorcés, j'habite avec ma mère et mon beau-père – My parents are divorced, I live with my mother and my step-father
	J'ai…Il / elle a les yeux bleus / verts / marron et les cheveux blonds / noirs / bruns / roux – I have…he / she has blue / green / brown eyes and blonde / black / brown / red hair
	Je m'entends bien avec mon frère / mes frères / ma soeur / mes soeurs / mon père / ma mère / mes parents – I get on well with…
	Je ne m'entends pas bien avec / Je m'entends mal avec mes frères / soeurs / parents – I don't get on well with my brothers / sisters / parents
	Je me dispute avec / je me fâche contre – I argue with / I get angry with…
	Mon frère est sympa / mes frères sont sympas – my brother is nice / my brothers are nice
	Ma soeur est généreuse / mes seours sont généreuses – my sister is generous / my sisters are generous
	Il (elle) m'énerve / ils (elles) m'énervent – he (she) / they get on my nerves
Décris ton/ ta meilleur(e) ami(e) - describe your best friend	Nous nous disputons rarement – we rarely argue (with each other)
	Ma meilleure amie est intelligente, compréhensive et vraiment sympa – my best friend (f) is intelligent understanding and really nice
	Mon meilleur ami est drôle, compréhensif mais des fois un peu egoïste – my best friend (m) is funny, understanding but sometimes a bit selfish

Tu veux te marier et avoir des enfants? – do you want to marry and have children?	Ma partenaire idéale est / serait gentille (f) / Mon partenaire idéal est / serait gentil (m) - my ideal partner is/would be kind
	Je vais me marier / Je me marierai car le marriage est tès important pour moi - I am going to get married / will marry as marriage is very important to me
	Je ne veux pas me marier car cinquante pour cent des mariages finissent en divorce – I don't want to marry as 50% of marriages end in divorce
	Je ne vais pas me marier avant l'âge de trente ans – I'm not going to marry before I'm 30
	J'espère avoir deux enfants – I hope to have 2 children Je ne veux pas d'enfants – I don't want children

ma famille	my family
mon père / mon beau-père	my father / my step father
ma mère / ma belle-mère	my mother / my step mother
mes parents / mes grand-parents	my parents / my grandparents
mon grand-père	my grandpa
ma grand-mère	my grandma
mon frère / mon demi-frère	my brother / my half or step brother
ma soeur / ma demi-soeur	my sister / my half or step sister
ma tante / mon oncle	my auntie / my uncle
mon cousin (m) / ma cousine (f)	my cousin
mes cousin(e)s	my cousins
un (mon) chien / un (mon) chat	a (my) dog / a (my) cat

Je le / la / les trouve … I find he / she (is) / they (are)	**sympa(s) / agréable(s)**	nice
	adorable(s) / mignon(ne)(s)	adorable / cute
	amusant(e)(s) / drôle(s)	funny
	intelligent(e)(s)	intelligent
	compréhensif(s) / -ive(s)	understanding
	créatif (-ive)(s)	creative
	travailleur(s) / euse(s)	hard-working
	timide(s)	shy
	gentil(le)(s)	kind
	généreux / -euse(s)	generous
	egoïst(e)(s)	selfish
	casse-pieds / agaçant(e)(s)	a pain in the neck
	jaloux / jalouse(s)	jealous
	méchant(e)(s)	mean
	strict(e)(s) / sévère(s)	strict
	paresseux / paresseuse (s)	lazy
	désagréable (s)	unpleasant

1: Identity and Culture - Technology in everyday life

Comment utilises-tu / utilisez-vous la technologie? – how do you use technology?	J'ai un portable / une tablette / un ordinateur – I have a phone / tablet (or laptop) / a computer
	J'envoie des textos / des mails – I send texts / emails
	Je lis / poste des messages – I read / post messages
	Je tchatte avec mes copains / copines – I chat with friends
	Je reste en contact avec mes amis et ma famille – I stay in contact with my friends and family
	Je regarde des films en streaming – I stream films
	Je prends des photos / réalise des vidéos – I take photos / make videos
	Je regarde / partage des photo et vidéos (sur YouTube, Instagram…) – I watch / share photos and videos (on…)
	Je télècharche des films et de la musique – I download films and music
	Je joue aux jeux vidéo en ligne avec mes amis – I play video games online with my friends
On peut… you can	envoyer / tchatter / rester en contact / regarder / prendre des photos / réaliser des vidéos / partager des liens vers / commenter / télècharger / jouer – send / chat online / stay in contact / watch / take photos / make videos / share / share links for / comment on / download / play
J'aime / Je préfère… I like to / prefer	
Je n'aime pas… I don't like to…	

parce que…	c'est plus facile / plus vite / pratique – it is easier / quicker / handy (practical)
	c'est divertissant / amusant / marrant / drôle / rigolo – it's fun / funny
	c'est créatif / ça me donne de l'inspiration - it's creative / it gives me inspiration
	c'est la meilleure façon de / c'est important de… rester en contact – it's the best way to / it's important to… stay in contact
	c'est une grande partie de ma vie quotidienne – it's a big part of my daily life
	J'ai peur d'être manipulé(e) / de passer trop de temps sur mon portable – I'm afraid of being manipulated / of spending too much time on my phone
	J'ai peur de perdre mes données / que mes données soient volées / partager trop d'infos personnelles – I'm afraid of losing my data / of my data being stolen / of sharing too much personal information
	les portables / les trolls sont gênants - phones / trolls are annoying

tous les jours	every day
souvent	often
deux heures par jour	two hours a day
quelquefois	sometimes
rarement	rarely
Je ne (partage) jamais	I never (share)
Je passe des heures sur…	I spend hours on…
une demande d'amitié	a friend request
valider la demande d'amitié	to accept the friend request
ajouter à mes amis	add friend
taguer	to tag
une notification	an alert
les médias sociaux	social media

le réseau	the network
en ligne	on line
un smartphone / portable	(smart)phone
une tablette	a tablet / laptop
un ordinateur	a computer
l'agenda	calendar
l'application	app
le GPS	GPS
un site / une page web	a website / page
ma page perso / mon profil	my profile page
des messages	messages
des posts	posts
des liens	links
un like / j'ai liké…	a like / I liked…

Je l'utilise pour… I use it in order to…	faire des recherches / googler / faire mes devoirs – do research / google / do my homework
	organiser des sorties et des rendez-vous / me faire de nouveaux amis – organise outings and meet-ups / make new friends
Hier, je l'ai utilisé pour… yesterday I used it to…	lire ou écouter les actualités – read or listen to the news
	trouver un resto / des emplois / de l'inspiration – find a restaurant / jobs / inspiration
	faire une réservation / des réservations pour des vacances – make a reservation / book a holiday
	garder le contact / trouver de nouveaux contacts – keep in contact / find new contacts
	tchatter / partager des photos / partager des infos… sur Snapchat, TikTok, Twitter, Facebook, Instagram… – chat online / share photos / share information…on Snapchat, TikTok, Twitter, Facebook, Instagram

1: Identity and Culture - Free Time Activities

Que fais-tu pendant ton temps libre? / Que faites-vous pendant votre temps libre? – how do you spend your free time?	Je fais du sport / J'écoute de la musique / Je chante / Je lis – I do sport / I listen to music / I sing / I read
	Je fais du jogging / de l'athlétisme / du judo / du yoga – I jog / do athletics / judo / yoga
	Je joue de la guitare / du piano – I play guitar / piano
	Je regarde la télé / des films / des vidéo – I watch tv / films / videos
	Je joue aux jeux vidéo, des fois en ligne avec mes amis – I play video games sometimes online with my friends
	Après avoir fait mes devoirs j'aime jouer / lire / faire… – after having done my homework I like to play / read / do…

Qu'est-ce que tu vas / vous allez faire le weekend prochain? **Je vais / on va / nous allons… – I'm going to / we're going to…**	au bowling / à la piscine / chez mon ami(e) / au musée / au resto / au centre sportif / aller au centre commercial / au parc / au cinéma - the bowling alley / swimming pool / my friend's house / the museum / restaurant / the sport centre / the shopping centre / the park / the cinema
	rester chez moi / écouter de la musique / jouer de la guitar / jouer du piano / chanter – stay home / listen to music / play guitar / play piano / sing
	regarder un film / voir un match de foot / jouer aux jeux vidéo / lire un roman / faire de la cuisine – watch a movie / see a football match / play video games / read a novel / cook
	acheter des vêtements / des gadgets / une tenue de sport / de l'équipement sportif – to buy clothes / gadgets / sports wear / sports gear
	jouer au foot / basket / au tennis / au rugby – play football / basketball / tennis / rugby
	faire de la natation / du bowling / du skate / de l'équitation / du vélo – go swimming / bowling / skateboarding / horse-riding / cycling

Qu'est-ce que tu as fait le weekend dernier? – what did you do last weekend?	Le samedi dernier je suis sorti(e) avec mes amis – last Saturday I went out with my friends
	Je suis allé(e) / on est allés au parc… – I / we went to the park
	J'a regardé un film / j'ai lu un livre / j'ai joué … – I watched a film / read a book / played
	J'ai fait mes tâches / j'ai fait de la cuisine – I did my chores / I did some cooking

Quel est le dernier film que tu as vu? / Quel est le dernier film que vous avez vu? - What's the latest film you saw?	Le weekend dernier je suis allé(e) au cinéma, j'ai vu /regardé … – Last weekend I went to the cinema, I saw/watched…
	J'ai vu un film d'horreur / d'action / de science-fiction / d'arts martiaux / romantique / comique / à suspense – I saw a horror film / an action film / a sci-fi film / a martial arts film / a romantic film / a funny film / a thriller
	J'ai regardé […] en streaming / sur Netflix / sur YouTube – I streamed […] / I watched […] on Netflix / on YouTube
	Je l'ai adoré parce que c'était drôle / passionant / triste / émouvant / éducatif – I loved it because it was funny / exciting / sad / moving / educational

Quel est le dernier livre que tu as lu? (informal) / Quel est le dernier livre que vous avez lu? - What's the latest book you read?
J'ai lu un roman d'aventure / un roman de guerre / un roman historique / une (auto)biographie / la littérature non-romanesque - I read an adventure novel / a war novel / a historical novel / an (auto)biography / non-fiction

Quel type de musique aimes-tu? / aimez-vous? – What music do you like?
J'aime le rock / le pop / le classique / le rap / le hip-hop / le reggae – I like rock / pop / classical / rap / hip-hop / reggae

Quel type d'émissions aimes-tu? / aimez-vous? – What TV progs do you like?
J'aime les comédies [f] / les émissions musicales [f] / les séries de drame / les émissions policières / les émissions de télé-réalité [f] / les émissions de sport [f] / les dessins animés [m] / les jeux télévisés [m] / les documentaires [m] – I like comedies / music progs / drama series / detective progs / tv reality shows / sport progs / animés / game shows / documentaries cependant / part contre je n'aime pas….parce que… – however / on the other hand I don't like….because…

1: Identity and Culture - Customs and Festivals

Quelle est votre fête préférée? – what is your favourite festival / custom / celebration?

Je préfère // Ma célébration / fête préférée, c'est - I prefer // My favourite celebration / festival is…	Noël / Pâques / Aïd al-Fitr / La Saint-Valentin / Mardi Gras / Hanoukka / le Saint-Sylvestre (Le Jour de l'An) / mon anniversaire – Christmas / Easter / Eid al-Fitr / Valentine's day / Mardi Gras / Hanukkha / New Year's Eve / my birthday	**parce que**	j'ai les cadeaux / j'adore le chocolat / on ne travaille pas / on se déguise / on mange / on offre… c'est une fête réligieuse / historique/ romantique // il y a des feux d'artifices – I have presents / I love chocolate / you don't go to work / you wear costumes / you eat / you give gifts… it's a religious / historical / romantic festival // there are fireworks

Où es-tu allé(e) / Où êtes-vous allé(e)(s) pour célébrer / fêter…?	Where did you go to celebrate…?
Qu'est-ce que tu as / vous avez mangé et bu?	What did you eat and drink?
C'étail comment?	How was it?

Je suis / On est allé(e)(s) - I / we went **manger – to eat**	dans un restaurant chinois / indien / au fast food / dans un café – to a Chinese / Indian / fast food restaurant / café avec ma famille / mes amis – with my family / friends
C'était – it was **Il y avait – there was**	très bon / délicieux – very good / delicious trop salé / trop cuit / trop froid - too salty / over cooked / too cold un insecte dans la salade / trop de monde – an insect in the salad / too many people
Je suis / On est allé(e)(s) à / en[…] - to… **chez […]**	avec mes parents / copains - with my parents / mates pour Noël / Aïd al-Fitr… - for Christmas…
J'ai / On a … vu / regardé / eu / fait / mangé / écouté – I / we… saw / watched / had / made / ate / listened to	un défilé / un feu d'artifice / le père Noël / des cadeaux / beaucoup de bons plats / des chocolats / de la musique – a parade / a firework display / Santa / presents / a lot of good food / chocolates / music

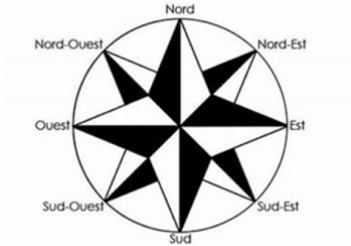
à l'église	to church
à la mosquée	to the mosque
à la synagogue	to the synagogue

J'ai aimé / adoré - I liked **regarder – looking at** **faire – making** **donner – giving** **recevoir – receiving**	le défilé / la fête / les feux d'artifice / les chocolats / les gâteaux / les cadeaux – the parade / fireworks / chocolates / cakes / presents

2: Local, national, international and global areas of interest - Home, town, neighbourhood and region

Où habites-tu / Où habitez-vous? – where do you live?	J'habite à Barnet, Londres dans le sud-est de l'Angleterre - I live in Barnet, London in the south east of England J'habitais… - I used to live…
Qu'est-ce qu'on peut faire dans ta / votre région – what can you do in your neighbourhood?	J'habite avec ma famille dans un appartement / une maison jumelle / une maison mitoyenne – we live in London in an apartment / semi-detatched house / terraced house
	Il y a / On a trois chambres – there are / we have three bedrooms
	Dans ma chambre il y a – in my bedroom there is / there are Par contre je n'ai pas de / il n'y a pas de – however, I don't have / there isn't / aren't any…
	La chambre de mon frère est plus petite / grande que la mienne – my brother's bedroom is smaller / bigger than mine
	Il y a / Il n'y a pas beaucoup à faire dans ma région – there is / there isn't a lot to do in my area
	Il y a un centre commercial / une gare / un parc / un centre sportif / un cinéma / des magasins / des restaurants et cafés – there is a shopping centre / a station / a sports centre / a cinema / there are shops / restaurants and cafés
	Il y avait plus de / moins de – there used to be more… / less…
	On peut / On pouvait s'amuser au centre ville – you can / you used to be able to enjoy yourself in the town centre
On peut / On pouvait – you can / you used to be able to …	sortir avec des amis / voir un film / manger dans un bon restaurant / jouer au foot dans le parc / fair du shopping – go out with friends / see a film / eat in a good restaurant / play football in the park / go shopping
Où amerais-tu / aimeriez-vous habiter à l'avenir? – where would you like to live in the future?	J'aimerais habiter un appartement de luxe / une grande maison / un château / sur un bateau – I would love to live in a luxury apartment / a big house / a castle / on a boat

Pourquoi?	parce que je rêve d'une vie calme / passionante // je voudrais avoir une grande famille / je tiens à mon indépendance // j'adore la mer / la campagne – because I dream of a calm / exciting life // I would like to have a big family / I value [my independence] / I love the sea / the countryside



une cuisine	a kitchen
une salle à manger	a dining room
un salon	a living room
une salle de bains	a bathroom
une chambre	a bedroom

le canapé	sofa
un fauteuil	an armchair
le lit	bed
le bureau	desk
les rideaux (m)	curtains
l'armoire (f)	wardrobe
la commode	chest of drawers
la bibliothèque	bookcase
la chaise (en bois)	(wooden) chair
la table	table
la fenêtre	window
l'étagère (f)	shelf

the adjectives that come **before** the noun	
une bonne région	a good area
une mauvaise région	a bad area
une belle maison	a beautiful house
une vieille / ancienne maison	an old house
une nouvelle maison	a new house
une grande maison	a big house
une petite maison	a small house

2: Local, national, international and global areas of interest - Social issues

Que fais-tu / faites-vous pour aider dans ta région ? – what do you do to help your area?	Je suis bénévole pour l'Armé du Salut depuis deux ans – I've been at volunteer at the Salvation Army for 2 years
	Je distribue de la soupe et du pain aux gens qui n'ont pas assez d'argent pour acheter à manger – I give out soup and bread to people who don't have enough money to buy food
	J'accompagne le camion-soupe dans les rue de ma ville – I go with the soup van around my town
	Je fais des carton alimentaires – I make up food parcels
	Je donne de l'argent aux associations caritatives – I give money to charity
	J'aide la collection de l'argent – I help raise money
	Je donne des vêtements aux magasins caritatifs – I give clothes to charity shops
À l'avenir, qu'est-ce que tu voudrais / vous voudriez faire pour aider? – in the future what would you like to do to help?	Je visite les personnes âgées dans ma communauté – I visit the elderly in my community
	Je voudrais faire du travail bénévole – I would like to do charity work
	J'aimerais aider les gens / les enfants / les animaux – I would like to help people / children / animals
	Je voudrais voyager autour du monde en travaillant pour des associations internationales – I would like to travel the world working for international charities

tous les weekends	every weekend
deux / trois fois par semaine	twice / three times a week
lundi et mercredi matin	Monday and Wednesday morning
depuis un an / trois mois	(since) for a year / three months

masculine: bon / mauvais / beau / vieux / ancien / nouveau / grand / petit
plural (m): bons / mauvais / beaux / vieux / anciens / nouveaux / grands / petits

C'est une association caritative – it's a charity	qui s'appelle / appelée – called	Médecins Sans Frontières Les Resto du Coeur…
qui veut aider les malades – which wants to help sick people qui combat / organise des campagnes contre / lutte contre la faim et la pauvreté – which combats / organises campaigns against / fights against hunger and poverty		
Elle a été fondée / Elle a été crée – it was founded / created	en 1971 – in 1971 dans les années quatre-vingts – in the '80s	par des médecins – by doctors par un comédien – by an actor
Son objectif principal est d'aider – its main objective is to help	les malades même dans les zones de guerre – the sick even in war zones	
	les pauvres / les sans-abri / les sans-emploi / les faims – the poor / the homeless / the unemployed / the hungry	
Elle veut donner des médicaments / des vêtements / de la nourriture / un abri – It wants to give medicine / clothing / food / shelter		
Parles-moi de ton regime – tell me about your diet		
J'ai un régime [assez / très] sain / équilibré / malsain – I have a [fairly / very] healthy / balanced / unhealthy diet		

normalement - normally généralement - generally	je mange / je prends – I eat / have	des fruits et des légumes – fruit and vegetables des produits laitiers – dairy de la viande – meat du poisson – fish		tous les jours - every day assez régulièment - quite regularly de temps en temps - from time to time rarement - rarely
aussi / en plus - also souvent – often	j'évite de – I avoid j'essaie de ne pas - I try not to	manger – eat boire – drink	de la viande – meat de(s) sucreries – sweet things de(s) boissons sucrées – sugary drinks de(s) matières grasses – fatty foods	parce que je suis végétarien(ne) – because I'm vegetarian car ça peut mener à l'obésité – because it can lead to obesity parce que c'est dangereux pour le cœur – because it's dangerous for your heart car c'est mauvais pour les dents – because it's bad for your teeth

Je dois – I must Je devrais – I should J'ai besoin de – I need to Il faut – it is necessary to	manger – eat boire – drink	trois repas par jour – three meals a day beaucoup d'eau – a lot of water le petit déjeuner – breakfast		pour rester en bonne santé - to stay healthy pour être en forme - to stay in shape
	faire - do	de l'exercice - exercise du sport - sport	de temps en temps – from time to time régulièrement – regularly au moins trois fois par semaine – at least three times a week	
	dormir - sleep	huit heures par nuit – eight hours a night		

2: Local, national, international and global areas of interest - Global issues

Que fais-tu pour aider l'environnement? – what do you do to help the environment?	J'utilise les transports en commun – I use public transport
	J'économise l'eau et l'électricité – I economise water and electricity
	Je prends une douche au lieu d'un bain – I take a shower instead of a bath
	Je recycle le plastique – I recycle plastic
	Pour aider l'enivronnement il faut réduire la pollution – to help the environment you must reduce pollution
	On doit recycler plus – we must recycle more
Quelles sont les plus grands problèmes de l'environnement ? – what are the biggest problems of the environment?	Les problèmes graves de l'environnement sont la circulation / les déchets - the most serious environmental problems are traffic/waste
	Ce que m'inquiète c'est le réchauffement/la pollution – what worries me is global warming/pollution
	Si on protège les forêts on peut sauver les animaux – if we protect forests we can save animals

le verre	glass
le papier	paper
le plastique	plastic
les boîtes	tin
le carton	cardboard
le métal	metal
les déchets alimentaires	food waste

les SDF	the homeless
la pauvrété	poverty
le logement	accomodation
le sac de couchage	sleeping bag
le trottoir	the pavement
une pièce de monnaie	a coin
un emploi	a job

Est-ce qu'il y a beaucoup de chômage dans ta région? - is there a lot of unemployment in your region?	Il y a beaucoup de chômage car il n'y a pas assez d'emplois – there's lots of unemployment as there aren't enough jobs
Qu'est-ce qu'il faut faire pour combattre le chômage? – what must we do to fight against unemployment?	Pour combattre le chômage il faut créer plus d'emplois – to fight against unemployment we must create more jobs
Il y a beaucoup de personnes sans logement dans ta ville? – are there lots of homeless people in your town?	Il y a beaucoup de personnes sans domicile car il n'y a pas assez de logements – there are lots of homeless people because there aren't enough houses
Qu'est-ce qu'il faut faire pour aider les personnes sans logement? – what must we do to help the homeless?	Pour aider les gens sans logement on peut donner de l'argent à une association caritative – to help the homeless we can give money to a charity

2: Local, national, international and global areas of interest - Travel and tourism

Que fais-tu en vacances normalement? - what do you normally do on holiday?	J'aime aller en Espagne car il fait chaud – I like going to Spain because it's hot
	Normalement je vais en vacances en Italie parce que la nourriture est délicieuse – normally I go on holiday in Italy because the food is delicious
	D'habitude je voyage en avion car c'est plus rapide - usually I travel by plane because it's faster
	J'adore bronzer sur la plage parce que c'est relaxant – I love sunbathing on the beach because it's relaxing
	Je préfère loger dans un hôtel parce que c'est plus confortable – I prefer staying in a hotel beacuase it's more comfortable
Qu'est-ce que tu as fait pendant les vacances l'année dernière? – What did you do on your holiday last year?	J'ai visité beaucoup de monuments historiques – I visited lots of historic sites
	J'ai passé deux semaines au bord de la mer avec ma famille – I spent two weeks by the sea with my family
	C'était très intéressant – it was very interesting
Quelles sont tes vacances de rêve? - what's your dream holiday?	Je voudrais aller aux États-unis pour faire du shopping – I would like to go to the United States to go shopping
	Je voudrais aller avec ma famille car ils paient tout – I would like to go with my family because they pay for everything

en voiture	by car
en avion	by plane
en train	by train
en car	by coach
en bateau	by boat
à velo	by bike
à pied	on foot

un château	a castle
un appartement	an apartment
un hôtel	a hotel
un chambre d'hôte	a bed and breakfast
un camping	a campsite
une auberge de jeunesse	a youth hostel
au bord de la mer	by the sea
à la montage	in the mountains
à la campagne	in the countryside
en ville	in town

Relaciones Con Familia y Amigos – Relationships with Family and Friends

¿Cómo es tu familia? – what is your family like?

En mi familia hay **In my family, there is/are**	mi my	padre madre hermano/a abuelo/a tío/a primo/a	father mother brother/sister grandfather/grandmother uncle/aunt m/f cousin
Tengo **I have**	mis My (for plural nouns)	padres abuelos hermanos primos	parents grandparents siblings cousins

Tengo	I have	los ojos verdes/azules/grises/marrones green/blue/grey/brown eyes
Tiene	s/he has	el pelo rubio/castaño/negro/pelirrojo blond/brown/dark/ginger hair
Tenemos	we have	
Tienen	they have	el pelo corto/largo/liso/ondulado/rizado short/long/straight/wavy/frizzy hair

Soy	I am	un poco	a bit
Es	s/he is	bastante	quite
Sería	I / s/he would be	muy	very
		demasiado	too

Adjective agreement rule

Adj end	Masc sing	Masc plur	Fem sing	Fem plur
- O	- O	- OS	- A	- AS
- A	- A	- AS	- A	- AS
- R	- R	- RES	- RA	- RAS
- L	- L	- LES	- L	- LES
- Z	- Z	- CES	- Z	- CES
- E	- E	- ES	- E	- ES

divertido	fun
travieso	silly
generoso	generous
cariñoso	caring
abierto	open
serio	serious
honrado	honest
perezoso	lazy
orgulloso	proud
egoísta	selfish
optimista	optimistic
feliz	happy
hablador	talkative
trabajador	hard-working
amable	nice/kind
triste	sad
alegre	happy

¿Cómo te llevas con familia? – How do you get on with your family?

Ahora Now Normalmente Normally Por lo general In general	me llevo bien I get on well me llevo mal I get on badly me peleo I fight/argue	con with + family member	porque es because s/he is	+ personality adjective
En el pasado In the past Hace X años X years ago El año pasado Last year	me llevaba bien/mal I used to get on well me llevaba mal I used to get on badly me peleaba I used to argue/fight		porque era because s/he was	

Relaciones y planes para el futuro – Relationships and plans for the future

Mi novia ideal **Mi novio ideal**	My ideal gif My ideal bf	sería – would be	+ personality adjectives
		Tendría - would have	+ physical description
		viviría - would live	en un piso/ una casa lujoso/a in a luxurious flat/ house
Mi pareja ideal	Mi ideal partner	estudiaría - would study	a la universidad/ ciencias/ idiomas/ comercio at university/ science/ languages/ business
		le gustaría - would like	viajar/ leer/ ver películas (to) trave / read/ watch movies

Creo/pienso que I believe/think that	me gustaría I would like	casarme - to get married enamorarme – to fall in love
En el futuro In the future		tener una familia - to have a family
Cuando sea mayor When I am older	me encantaría I would love	tener hijos – to have children encontrar el amor de mi vida to meet the love of my life
Cuando tenga 20 años When I am 20	quisiera I would love (=wish)	vivir con mi novio/a to live with my boyfriend/girlfriend
Después de mis estudios After my studies		vivir juntos to live together

1: La tecnología

¿Cómo usas la tecnología? – How do you use technology?

Uso I use	Instagram Whatsapp Skype	para in order to	descargar música pasar el tiempo compartir fotos colgar fotos contactar con mi familia conocer a gente nueva subir y ver videos chatear en línea mandar mensajes estar en contacto navegar por Internet	download music pass the time share photos post photos get in touch with my family know new people upload and watch video chat online send messages keep in touch surf the net
	mi móvil my mobile			
	mi tableta my tablet			
	mi portátil my laptop			

¿Qué piensas del Internet – What do you think of the Internet?

Lo bueno The good thing Lo mejor The best thing	es que is that	no) es it is (not)	un poco bastante muy demasiado	adictivo amplio/a cómodo/a divertido/a interactivo necesario/a peligroso/a práctico/a rápido/a fácil de usar popular útil gratis	addictive extensive convenient fun interactive necessary dangerous practical quick easy to use popular useful free
Lo malo The bad thing Lo peor The worst thing		puede ser it can be			

Lo único malo es que The only bad thing is that Lo negative es que The negative thing is that	soy adicto/a a…	I am addicted to…
	es adicto/a a…	s/he is addicted to…
	estoy enganchado/a … enganchado/a …	I am hooked on…
	está enganchado/a…	s/he is hooked on…
	es una perdida de tiempo	it is a waste of time

¿Cuáles son las ventajas/los peligrosos? – What are the advantages/dangers?

Es possible It is possible to	hacer los deberes	do your homework
	ser útil para los deberes	be useful for homework
	aprender mucho	learn a lot
	buscar muchísima información	find a ton of information
	hacer amigos	make friends
	hablar con el extranjero	talk with foreigners
	ser bueno para el comercio	be good for trade
	jugar a los video-juegos	play videogames
Se puede One/you can	comprar en línea	buy online
	ser peligroso hablar con desconocidos	be dangerous talking to strangers
	sufrir del acoso en línea	suffer from online bullying
	tener efectos negativos en los estudios	have a negative effect on studies

The perfect

to say what you have just done

Use the present tense of the verb ***haber*** + **past participle**.

(yo)	**he**	escuch**ado**
(tú)	**has**	beb**ido**
(él/ella/usted)	**ha**	compart**ido**

To form the past participle, remove the ***–ar***, ***–er*** or ***–ir*** from the infinitive and add:

–ado (***–ar*** verbs)
–ido (***–er*** / ***–ir*** verbs)

Some past participles are irregular, including:

hacer (to do / make) → ***hecho***
ver (to see / watch) → ***visto***

The present continuous

to say what you are doing at the moment

	estar (to be)	**present participle**
(yo)	estoy	
(tú)	estás	mir**ando**
(él/ella/usted)	está	beb**iendo**
(nosotros/as)	estamos	escrib**iendo**
(vosotros/as)	estáis	
(ellos/ellas/ustedes)	están	

To form the present participle, take the infinitive, remove the ***–ar***, ***–er*** or ***–ir*** and add the endings: ***–ando***, ***–iendo***, ***–iendo***.

Estoy buscando *canciones.* — **I am looking** for songs.
Está jugando *al fútbol.* — **He/She is playing** football.

Irregular present participles include: *leer* → ***leyendo***, *dormir* → ***durmiendo***

1: Las actividades del tiempo libre

¿Qué haces en tu tiempo libre? – What do you do during your free time?

Normalmente Normally Por lo general In general	me gusta I like me encanta I love me apasiona I am passionate about me interesa en I am interested in prefiero I prefer suelo I usually (+infinitive)	tocar la guitarra/el piano to play the guitar/piano cantar en un coro to sing in a choir practicar un deporte to practise a sport bailar/dar un paseo to dance/go for a walk descansar/escuchar música to rest/listen to music ver la televisión to watch tv leer una novela/una revista to read a book/a magazine ir al cine/un concierto to go to the cinema/ a concert salir a comer to go out to eat
En el futuro In the future El fin de semana próximo Next weekend	voy a - I am going to pienso - I am thinking of intento - I plan to quiero - I want me gustaría - I would like	

¿Qué ves en la tele o en el cine? – What do you watch on TV or at the cinema?

Me gusta Me encanta Normalmente Normally Por lo general In general	el telediario - the news	porque es because it is	adictivo/a/os/as addictive educativo/a/os/as educational estupendo/a/os/as brilliant tonto/a/os/as silly informativo/a/os/as informative emocionante(s) exciting interesante(s) interesting
Me gustan I like Me encantan I love Me interesan I am interested in	los dibujos animados - cartoons los documentales - documentaries los concursos - game shows los realitys - reality tv programmes los programas de música/ deportes - music/sports programmes	porque son because they are	
	las noticias - the news las comedias - comedies las telenovelas - soap operas las películas de amor/acción/ ciencia ficción - love/action/ science fiction films		

¿Qué deporte haces? – What sport do you do?

Jugaba - I used to play Juego - I play Jugaré - I will play	al fútbol al baloncesto al balonmano al hockey/tenis	football basketball handball hockey/tennis	porque because era - it was es - it is será - it will be +adjective
Iba - I used to go Voy - I go Iré - I will go	al polideportivo al gimnasio a la piscina de paseo	to the sports centre to the gymnasium to the swimming pool for a walk	
Hacía - I used to do Hago - I do Haré - I will do	gimnasia/ escalada atletismo/ciclismo equitación natación	gymnastics/rock-climbing athletics/cycling horse-riding swimming	

¿Qué comes y bebes? – What do you eat and drink?

Comí Como Voy a comer Comeré	I ate I eat I am going to eat I will eat	arroz / pan pollo / pescado	rice / bread chicken / fish
		carne / ensalada pasta / pizza	meat / salad pasta / pizza
		caramelos/pasteles huevos	sweets / cakes eggs
		galletas verduras	biscuits vegetables
Bebí Bebo Voy a beber Beberé	I drank I drink I am going to drink I will drink	agua / vino	water / wine
		té / café zumo de naranja	tea / coffee orange juice
		limonada cerveza	lemonade beer

Porque Because Ya que As/since	(no) es it is (not) (no) son they are (not)	sano/a/o/as rico/a/o/as delicioso/a/o/as sabroso/a/o/as grasiento/a/o/as asqueroso/a/o/as dulce(s) picante(s)	healthy tasty/rich delicious tasty greasy/fatty disgusting sweet spicy

Las Fiestas Y Las Tradiciones – Festivals and Traditions

Hablando de las fiestas – Talking about festivals

El Día de los muertos	se celebra is celebrated	el primero de noviembre	en Mexíco
Las Fallas		durante el mes de marzo	en Valencia
La Tomatina		el último día de agosto	en Buñol
San Fermín		del 6 al 14 de julio	en Pamplona
La Feria de Abril		en abril	en Sevilla
La Semana Santa		durante Pascua	en Valladolid

Durante esta fiesta During this festival	se llevan trajes de colores	colourful costumes are worn
	se queman figuras de madera	wooden figures are burnt
	se lanzan huevos/tomates	eggs/tomatoes are thrown
	se construyen hogueras	bonfires are built
	se disparan fuegos artificiales	fireworks are set off
	se celebran los santos	saints are celebrated
	se ven batallas y desfiles	battles and processions are seen
	se come comida típica	typical food is eaten
	se decoran las tumbas	tombs are decorated

Ir a una fiesta – Going to a festival

En mi opinión In my opinión				emocionante	exciting
				interesante	interesting
				peligroso	dangerous
Pienso que I think that				raro/extraño	strange
		era	used to be	impresionante	impressive
	assistir a + festival			guay	cool
Creo que I believe that		fue	was	tonto	stupid/silly
				hermoso	beautiful
	attending + festival	es	is	entretenido	entertaining
Desde mi punto de vista From my point of view		sería	would be	único	unique
				fascinante	fascinating
		será	will be	increíble	amazing
				estupendo	marvellous

¿Cómo se celebra Navidad? – How is Christmas celebrated?

Durante Navidad During Christmas	la gente people	come uvas a medianoche	eat grapes at midnight
		canta villancicos	sing carols
	la familia the family	va a la iglesia	go to church
		prepara platos típicos	prepare typical dishes
	Visitamos familia y amigos		We visit family and friends
	Llevamos ropa especial		We wear special clothes
	Decoramos la casa		We decorate the house
	Decoramos el árbol de Navidad		We decorate the Christmas tree
	Pasamos tiempo con la familia		We spend time with the family
	Comemos comida deliciosa		We eat delicious food
	Bebimos champán		We drink Champagne
	Recibimos regalos		We receive presents

¿Qué hiciste durante las vacaciones de Navidad?

The preterite tense

Use the **preterite tense** to talk about completed actions in the past.

visit**ar** (to visit)	beb**er** (to drink)	sal**ir** (to leave / to go out)	**irregular verbs** **ir** (to go) **ser** (to be)
visit**é**	beb**í**	sal**í**	**fui**
visit**aste**	beb**iste**	sal**iste**	**fuiste**
visit**ó**	beb**ió**	sal**ió**	**fue**
visit**amos**	beb**imos**	sal**imos**	**fuimos**
visit**asteis**	beb**isteis**	sal**isteis**	**fuisteis**
visit**aron**	beb**ieron**	sal**ieron**	**fueron**

Other irregular verbs in the preterite include:

tener (e.g. ***tuve*** – I had), ***hacer*** (e.g. ***hice*** – I did / made) and ***ver*** (e.g. ***vi*** – I saw / watched).

Some verbs have a spelling change in the 'I' form only:

jugar → *jugué* *llegar* → *llegué* *sacar* → *saqué*

2: Current And Future – La Vida Escolar - Life At School

Las reglas – the rules	Tenemos que hacer una hora de deberes cada noche - we have to do an hour of homework per evening
	Hay que prestar atención en clase - we have to pay attention in lessons
	No se debe olvidar el boligrafo - we shouldn't forget our pens
	Se debe llevar uniforme - we must wear a uniform
	Se puede llevar maquillaje - we can wear make-up
	Los móviles están prohibidos - mobile phones are forbidden
Los problemas – problems	No comprendo/ No entiendo - I don't understand
	Siempre tengo demasiados deberes - I always have too much homework
	Mis notas son malos - my grades are bad
Décris- moi ton école – Describe your school	Las aulas son modernas - the classrooms are modern
	No me gusta la comida en el comedor - I don't like the food in the canteen
	Hay 1100 alumnos en mi instituto - there are 1,100 students in my school
	Hay un campo de deporte - there is a big sports field

un blázer	a blazer
los zapatos	shoes
una falda	a skirt
un jersey	a jumper
una camisa	a shirt
unos pantalones	trousers
una corbata	a tie

estoy de acuerdo	I agree
tienes razón	you're right
no estoy de acuerdo	I disagree
es mentira	it's false
es verdad	it's true

¿Qué opinas de la vida escolar en Inglaterra? – What do you think of school life in England?	En mi opinion – in my opinion Pienso que – I think that Según… – According to…	El día escolar es demasiado largo/corto – the school day is too long/short
		El día escolar empieza demasiado temprano – the school day begins too early
		Las reglas son muy estrictas – the rules are very strict
		Hay demasiada presión – there is too much pressure
		El uniforme es una buena/mala idea – uniform is a good/bad idea
		Los profesores son severos/simpáticos – the teachers are strict/nice

2: Current and Future

2: Current and future – la educación después de los 16 años - education post-16	
¿Qué planes tienes para el año que viene? – What plans do you have for next year?	Quiero continuar con mis estudios – I want to continue my studies
	Me gustaría hacer un aprendizaje – I would like to do an apprenticeship
Tengo la intención de - I intend Podría - I could Quisiera - I would like Tengo ganas de - I feel like	estudiar- to study buscar trabajo – to find a job hacer un aprendizaje - to do an apprenticeship ir a la universidad - to go to university
¿Cuales son tus puntos fuertes/flacos? – What are your strong/weak points?	Soy bueno/a / malo/a en ciencias – I am good at/bad at science
	Creo que soy trabajador/a – I think I am hardworking
¿Cuál empleo te interesa? Which career are you interested in?	Me gustaría ser contable/profesor – I'd like to be an accountant/a teacher
	Me gustaría trabajar en un banco – I'd like to work in a bank
¿Te gustaría continuar a estudiar? Would you like to continue studying?	Quiero hacer mi bachillerato y voy a estudiar las lenguas – I want to pass my A levels and I'm going to study languages
	No quiero continuar a estudiar porque estoy harto de los examenes – I don't want to continue studying because I'm fed up of exams

2: Current and future – jobs, career choices and ambitions									
¿Qué te gustaría hacer en el futuro ? – What would you like to do in the future?		Me gustaría trabajar – I'd like to work Quiero trabajar – I want to work Tengo ganas de trabajar – I wish to work			como médico – as a doctor en un despacho – in an office al extranjero – abroad con los niños – with children				
¿Porque quieres hacer esto trabajo? – Why do you want to do this job?		Escogé el trabajo porque paga bien – I chose this career because it pays well							
		Una ventaja de ser camarero es trabajar con mucha gente – an advantage of being a waiter is working with many people							
¿Que profesión no te interesa y por que? – Which career doesn't interest you and why?		No quiero ser policía porque es demasiado peligroso – I don't want to be a police officer because it's too dangerous							
		Una desventaja de ser músico es el riesgo del paro – One disadvantage of becoming a musician is the risk of unemployment							
Háblame de ti mismo – Tell me about yourself		Soy una persona… - I'm a person who is... Creo que soy – I think I am			organizado/a – organised generoso/a – generous simpático/a – kind un poco impaciente – a bit impatient bastante perezoso – quite lazy				
		En cinco años me gustaría – In five years time I would like to			ser jefe – become a boss tener mi propia empresa – have my own business trabajar al extranjero – work abroad				
policía - police officer	panadero/a - baker	peluquero/a - hairdresser	granjero/a - farmer	cartero/a - postman/woman	electricista - electrician	cantante - singer	albañil - bricklayer	ingeniero/a - engineer	
profesor/ profesora - teacher	veterinario/a - vet	médico/a - doctor	abogado/a - lawyer	camarero/a - waiter/waitress	dependiente/ dependienta - sales assistant	enfermero/a - nurse	plomero/a - plumber		

GCSE PE

1A	**What is a joint?**
	• A place where two or more bones meet
1B	**What is cartilage?**
	• Tissue which covers the end of bones providing a smooth, friction-free surface
1C	**What is a synovial fluid?**
	• A substance produced by the synovial membrane to lubricate the joint
1D	**What are ligaments?**
	• Attaches bone to bone
1E	**What are tendons?**
	• Attaches muscle to bone
1F	**What are bursae?**
	• Fluid-filled bag which helps to reduce friction at a joint
1G	**Define flexion.**
	• A decrease in the angle at a joint
1H	**Define extension.**
	• An increase in the angle at a joint
1I	**Define abduction.**
	• Movement away from the midline of the body
1J	**Define adduction.**
	• Movement towards the midline of the body
1K	**Define rotation.**
	• Turning the limb along its long axis
1L	**Define circumduction.**
	• Movement in a circular motion
1M	**Define plantar flexion.**
	• Movement where the toes are pointed down towards the ground

1N	**Define dorsi flexion.**
	• Movement where the toes are pointed up towards the knee
2A	**What are alveoli?**
	• Tiny air sacs in the lungs which allow for rapid gaseous exchange
2B	**Define tidal volume.**
	• The volume of air breathed in (or out) during a normal breath at rest
2C	**Define expiratory reserve volume.**
	• The volume of air which can be exhaled after normal tidal expiration
2D	**Define inspiratory reserve volume.**
	• The volume of air which can be inhaled after normal tidal inspiration
2E	**Define residual volume.**
	• The volume of air that remains in the lungs after maximal expiration
2F	**Define vasoconstriction.**
	• A tightening of the blood vessels
2G	**Define vasodilation.**
	• A widening of the blood vessels
2H	**What are the two phases of the cardiac cycle?**
	• Diastole and systole
2I	**Define diastole.**
	• Where cardiac muscle relaxes allowing the heart to fill with blood
2J	**What are veins?**
	• Blood vessels which transport blood towards the heart
2K	**What are arteries?**
	• Blood vessels which transport blood away from the heart
2L	**What are capillaries?**
	• Tiny blood vessels which allow gaseous exchange to occur

GCSE PE

3A	**Define aerobic.**
	• In the presence of oxygen
3B	**Define anaerobic.**
	• In the absence of oxygen
3C	**What is lactic acid?**
	• Waste product produced during anaerobic exercise
3D	**Define oxygen debt.**
	• Temporary shortage of oxygen in the body due to strenuous exercise
3E	**Define EPOC.**
	• Excess Post Exercise Oxygen Consumption
3F	**Define DOMS.**
	• Delayed Onset of Muscle Soreness
3G	**Define hypertrophy.**
	• Increased size of muscles/heart due to long-term exercise
3H	**Define bradycardia.**
	• Lowered resting heart rate due to long-term exercise
3I	**What is a cool down?**
	• Recovery method involving light aerobic work and a sequence of stretches
3J	**What is an ice bath?**
	• Recovery method where the body is immersed in cold water to speed up recovery
3K	**What is a sports massage?**
	• Recovery method where pressure is applied through rubbing and kneading to areas of tension
3L	**What is an adapted diet?**
	• Recovery method where additional nutrients and fluids are taken on to support recovery

4A	**Summarise the arrangement of lever systems**
	• 1, 2, 3 – F, R, E
4B	**Identify where a 1st class lever can be found.**
	• Elbow and head/neck
4C	**Identify where a 2nd class lever can be found.**
	• Ankle
4D	**Identify where a 3rd class lever can be found.**
	• Elbow (movement below head height)
4E	**Define mechanical advantage.**
	• The benefit of a lever system
4F	**How is mechanical advantage calculated?**
	• Effort arm ÷ resistance arm
4G	**Summarise the combination of planes and axes.**
	• S-T / F-S / T-L
4H	**Which plane and axis are involved in forwards/backwards movement?**
	• Sagittal plane, transverse axis
4I	**Which plane and axis are involved in sideways movement?**
	• Frontal plane, sagittal axis
4J	**Which plane and axis are involved in rotational movement?**
	• Transverse plane, longitudinal axis
4K	**Define isotonic.**
	• Contraction involving change in muscle length causing movement
4L	**Define isometric.**
	• Contraction involving no change in muscle length causing no movement
4M	**Identify the two types of isotonic contraction.**
	• Concentric (shortening) and eccentric (lengthening)

GCSE PE

5A	**Define health.** • A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity
5B	**Define fitness.** • The ability to meet/cope with the demands of the environment
5C	**Define agility.** • The ability to move and change direction quickly whilst maintaining control
5D	**Define balance.** • Maintaining the centre of mass over a base of support
5E	**Define cardiovascular endurance.** • The ability of the heart and lungs to supply oxygen to the working muscles
5F	**Define coordination.** • The ability to use two or more parts of the body together smoothly and efficiently
5G	**Define flexibility.** • The range of movement possible at a joint
5H	**Define muscular endurance.** • The ability of a muscle or muscle group to repeat contractions without fatigue
5I	**Define power.** • Strength x speed
5J	**Define reaction time.** • The time taken to initiate response to a stimulus
5K	**Define speed.** • The maximum rate at which you can perform a movement or cover a distance
5L	**Define maximal strength.** • The largest force possible in a single contraction

5M	**Define static strength.** • The maximum force applied to an immovable object
6A	**Identify the test for agility.** • Illinois agility test
6B	**Identify the test for balance.** • Stork stand test
6C	**Identify the test for cardiovascular endurance.** • Multi-stage fitness test
6D	**Identify the test for coordination.** • Wall toss test
6E	**Identify the test for flexibility.** • Sit and reach test
6F	**Identify the test for muscular endurance.** • Sit-up bleep test
6G	**Identify the test for power.** • Vertical jump test
6H	**Identify the test for reaction time.** • Ruler drop test
6I	**Identify the test for maximal strength.** • 1 rep max test
6J	**Identify the test for speed.** • 30m sprint test
6K	**Identify three reasons for completing fitness testing.** • Identify strengths and weaknesses • Inform training requirements • Set goals • Monitor improvement
6L	**Identify three limitations of fitness testing.** • Tests are not sport specific • Tests do not replicate competitive conditions • Test results lack reliability • Tests may be invalid

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6M	**What is quantitative data?**
	• Measurement based on facts/statistics
6N	**What is qualitative data?**
	• Measurement based on opinion
7A	**What are the five principles of training?**
	• Specificity • Progression • Overload • Reversibility • Tedium
7B	**What are the four principles of overload?**
	• Frequency • Intensity • Time • Type
8A	**What is circuit training?**
	• A series of exercises performed one after the other with a rest in between • Used to improve muscular endurance
8B	**Identify two advantages of circuit training.**
	• Easily adjusted to suit different sports • Easily adjusted to suit ability
8C	**Identify two disadvantages of circuit training.**
	• May require specialist equipment • Difficult to gauge work/rest ratio at the start
8D	**What is continuous training?**
	• Exercise for an extended period of time without rest • Also known as 'steady state' training • Used to improve cardiovascular endurance
8E	**Identify two advantages of continuous training.**
	• No equipment required • Can be completed anywhere
8F	**Identify two disadvantages of continuous training.**
	• It can be tedious/boring • It can be time-consuming
8G	**What is fartlek training?**
	• Training which involves repeated changes to intensity and terrain • Also known as 'speed-play' • Used to improve cardiovascular endurance
8H	**Identify two advantages of fartlek training.**
	• Replicates changing intensity of games • More interesting than continuous training
8I	**Identify two disadvantages of fartlek training.**
	• Difficult to gauge work/rest ratio at the start • Complex to make required adjustments
8J	**What is interval training?**
	• Training which involves periods of work and rest • Used to improve speed
8K	**What is HIIT?**
	• High Intensity Interval Training
8L	**Identify two advantages of interval training.**
	• Burns body fat quickly • Can be completed quickly
8M	**Identify two disadvantages of interval training.**
	• Requires high level of motivation • Extreme work can lead to injury
8N	**What is plyometric training?**
	• Training which involves explosive movements such as jumping, hopping and bounding • Used to improve power
8O	**Identify two advantages of plyometric training.**
	• Develops explosive movement • Adds variety and 'fun' to training

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8P	**Identify two disadvantages of plyometric training.** • Requires knowledge of safe techniques • Requires expensive equipment
8Q	**What is weight training?** • Training which involves using free weights or resistance machines • Used to improve strength, power and muscular endurance
8R	**Identify two advantages of weight training.** • Used to improve different fitness components • Can be used to recover from injury
8S	**Identify two disadvantages of weight training.** • Requires knowledge of safe techniques • Requires expensive equipment
8T	**Identify key features of muscular endurance training.** • Lifting >70% of 1 rep max • Approx. 3 sets of 4-8 reps
8U	**Identify key features of muscular endurance training.** • Lifting <70% of 1 rep max • Approx. 3 sets of 12-15 reps
8V	**What is static stretching?** • Stretching to the limit and holding the stretch isometrically • Used to improve flexibility
8W	**Identify two advantages of static stretching.** • Relatively safe • Can be completed by anyone
8X	**Identify two disadvantages of static stretching.** • Can be time consuming to stretch whole body • Over stretching can cause injury
8Y	**What is altitude training?** • Training high above sea level (>2,000m) • Used to improve cardiovascular endurance

9A	**Identify three safety principles to follow during fitness training.** • Complete suitable warm-up and cool-down • Wear suitable clothing/footwear • Maintain hydration levels • Use correct techniques
9B	**Identify the three training seasons.** • Pre-season (preparation) • Peak-season (competition) • Post-season (transition)
9C	**Identify the key purpose of pre-season.** • Improve general/aerobic fitness
9D	**Identify the key purpose of peak-season.** • Maintain fitness levels
9E	**Identify the key purpose of post-season.** • Rest and recovery
9F	**Identify key parts of a warm-up.** • Gradual pulse raiser • Stretches • Skill-based activity • Mental preparation
9G	**Identify three benefits of a warm-up.** • Increased body temperature • Increased range of movement • Psychological preparation • Reduce risk of injury
9H	**Identify key parts of a cool-down.** • Light aerobic exercise • Stretches
9I	**Identify three benefits of a cool-down.** • Maintain elevated heart rate / breathing rate • Removal of lactic acid • Prevents DOMS

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1A	**Identify three user groups who may participate in sport.** • Ethnic minorities • Retired people / over 50s • Single parents • Children/teenagers • Disabled • Unemployed
1B	**Identify three barriers to participation in sport.** • Lack of time • Family commitments • Lack of disposable income • Lack of suitable facilities/equipment • Lack of role models • Limited provision of suitable activities • Lack of awareness • Impact of stereotypes
1C	**Identify three solutions to barriers to participation in sport.** • Improved promotion/range of activities • Initiatives to target key groups • Improved access (e.g. ramps and lifts) • Using alternative equipment • Reduction on costs • Specialist coaching • Use of role models
1D	**Identify three factors which can influence the popularity of sport in the UK.** • Level of participation • Provision • Media coverage • Level of success for both teams and individuals • Role models • Acceptability

1E	**Identify three sports which are increasing in popularity in the UK.** • Walking • Yoga • Zumba • Fitness training • Football
1F	**Identify two sports which are becoming less popular in the UK.** • Swimming • Cycling
1G	**Identify three new/emerging sports in the UK.** • Ultimate Frisbee • Footgolf • Triathlon • American Football • Lacrosse • Korfball • Handball
2A	**Identify three different values which can be promoted through sport.** • Team spirit • Fair play • Citizenship • Tolerance and respect • Inclusion • National pride • Excellence
2B	**Identify three key elements of the Olympic and Paralympic movement** • The creed • The symbol • The Olympic and Paralympic values

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2C	**Identify three of the Olympic/Paralympic values.** • Respect • Excellence • Friendship • Courage • Determination • Inspiration • Equality
2D	**Identify three initiatives which promote values through sport.** • FIFA's 'Football for Hope' campaign • ECB's 'Chance to Shine' programme • Sport Relief
2E	**Identify three reasons why it is important for sports performers to demonstrate good behaviour.** • To ensure the game is played fairly • To promote the values of the sport • To ensure the safety of participants • To demonstrate good sportsmanship • To avoid gamesmanship (e.g. time wasting)
2F	**Identify three reasons why it is important for spectators to demonstrate good behaviour.** • To ensure suitable playing atmosphere • To help combat social issues (e.g. racism)
2G	**What are PEDs?** • Performance Enhancing Drugs
2H	**Identify two reasons why athletes may use PEDs.** • Pressure to succeed as an individual • Pressure to succeed as a nation
2I	**Identify three reasons why athletes should not use PEDs.** • Long term ill health • Consequences when found guilty • Unfair advantage
2J	**Identify the full name for the group known as 'WADA'.** • World Anti-Doping Agency
2K	**What is the 'whereabouts rule'?** • Athletes are required to select one hour per day, seven days a week to be available for no-notice drugs tests
2L	**Identify three different testing methods used by WADA.** • Blood sample collection • Urine sample collection • Hair sample collection • Nail sample collection
2M	**Identify the main sanction used by WADA.** • Specifics
2N	**Identify three examples of elite performers who have used performance enhancing drugs.** • Dwain Chambers • Lance Armstrong • Marion Jones • Ben Johnson
2O	**Identify one impact drug taking can have on the reputation of sport.** • Mistrust of results/events due to repeated scandals
3A	**Identify three different features of major sporting events.** • The regularity • Range of countries involved • Level of investment
3B	**Identify an example of a 'one off' event.** • The Olympics
3C	**Identify an example of a 'regular' event.** • The Champions League final
3D	**Identify an example of a 'regular and recurring' event.** • The World Tennis Finals

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3E	**Identify the three key areas related to the legacy of a major sporting event.** • Sporting • Social • Economic
3F	**Identify three potential benefits of hosting major sporting events.** • Increased tourism • Commercial benefits • Increased participation in some sports • Improved infrastructure/facilities • Increased status of the country • Improved morale of the country
3G	**Identify three potential drawbacks of hosting major sporting events.** • Expensive to bid for/host the event • Facilities may not be used after the event • Poor reputation if event is disorganised • Financial benefits may not be spread evenly across the country
4A	**What is an NGB?** • National Governing Body
4B	**Identify three different areas of focus for NGBs.** • Promotion • Development • Infrastructure • Policies and initiatives • Funding • Support
4C	**Identify three ways NGBs promote their sport.** • Promoting participation • Increasing the popularity of the sport • Exposure in the media

4D	**Identify three ways NGBs develop their sport.** • Elite training and development • Coaching awards • Training of officials
4E	**Identify three ways NGBs improve infrastructure in their sport.** • Organise competitions and tournaments • Organise rule-making and disciplinary procedures • Providing a national directive and vision • Providing guidance, support and insurance • Assist with facility developments
4F	**Identify three ways NGBs organise policies and initiatives in their sport.** • Organise anti-doping policies • Promoting etiquette and fair play • Community programmes • Provide information and guidance on safeguarding
4G	**Identify three ways NGBs distribute funding in their sport.** • Grants • Government initiatives • Lottery funding • Private investment and donations • Merchandising Fundraising events
4H	**Identify two ways NGBs offer support in their sport.** • Providing technical advice • Providing location/contact details for local club

Notes

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