



Year
9

**HIGHDOWN
SCHOOL**



Knowledge Organiser 2026 - 2027



Name	
Mentor Group	

Subject	Teacher
Art	
D&T	
Drama	
English	
Ethics	
Geography	
History	
ICT	
Maths	
MFL	
Music	
PE	
Science	



THE HIGHDOWN APPROACH

TO MULTIPLE-CHOICE QUIZZING

OUR BELIEF: We learn more when we actively retrieve knowledge. Regular quizzing helps you remember more and achieve more.

WHY ARE MULTIPLE-CHOICE QUIZZES SO EFFECTIVE?



STRENGTHEN MEMORY
Each question is retrieval practice. The more you retrieve, the stronger your memory becomes.



IDENTIFY GAPS
Quizzes show you what you know well and what you need to focus on next.



EFFICIENT REVISION
You can test lots of knowledge in a short amount of time.



BUILD CONFIDENCE
Regular success builds confidence and reduces stress before assessments.



CORRECT MISCONCEPTIONS
Reviewing wrong answers helps you fix mistakes and avoid them in the future.

THE HIGHDOWN APPROACH A simple cycle for powerful learning

LEARN
Use knowledge organisers, notes and lessons to build strong understanding.

RETRIEVE
Answer questions from memory. Make your brain work!

REVIEW
Check your answers. Understand the feedback and fix any gaps.

REPEAT
Return to difficult topics and quiz again. Repetition leads to retention.

WHAT MAKES IT A HIGHDOWN QUIZ?

- Regular, low-stakes quizzing in lessons.
- Built around knowledge organisers and the curriculum.
- Instant feedback used to close gaps.
- Helping every student improve, every day.

HOW CAN YOU USE THIS APPROACH?

1 PREPARE BEFORE THE QUIZ
Review your knowledge organiser, notes or textbook. Focus on key facts, dates, vocabulary and concepts. Revise little and often.
EXAMPLE: Spend 15 minutes each evening revising key terms and definitions.

2 TEST YOURSELF DURING REVISION
Attempt questions without looking at your notes. Make your brain work to recall information. Treat every quiz as a learning opportunity.
EXAMPLE: Complete a short quiz on the Rivers topic from memory.

3 REVIEW YOUR MISTAKES AFTER THE QUIZ
Check every incorrect answer. Find out why the correct answer is right. Identify topics that need more revision.
EXAMPLE: If you missed questions on river landforms, revisit that section of your notes.

4 IMPROVE BEFORE THE NEXT QUIZ
Revisit weak topics. Complete another quiz. Track your improvement over time.
EXAMPLE: Retest yourself in a few days to see how much you've remembered.

QUIZ-DAY STRATEGIES

READ CAREFULLY
Read the whole question and every answer option.

ELIMINATE
Cross out answers you know are incorrect.

LOOK FOR KEYWORDS
Watch for words such as:
MOST BEST MAIN FIRST LAST ALWAYS NEVER

THINK BEFORE YOU GUESS
Reduce the options first, then make your best choice.

EXAMPLE QUESTION

Who was the first Tudor king?

☐ A Henry VIII

☒ B Henry VII

☐ C Edward VI

☐ D Richard III

Take your time, use the strategies and choose the best answer!

THE HIGHDOWN SUCCESS CYCLE

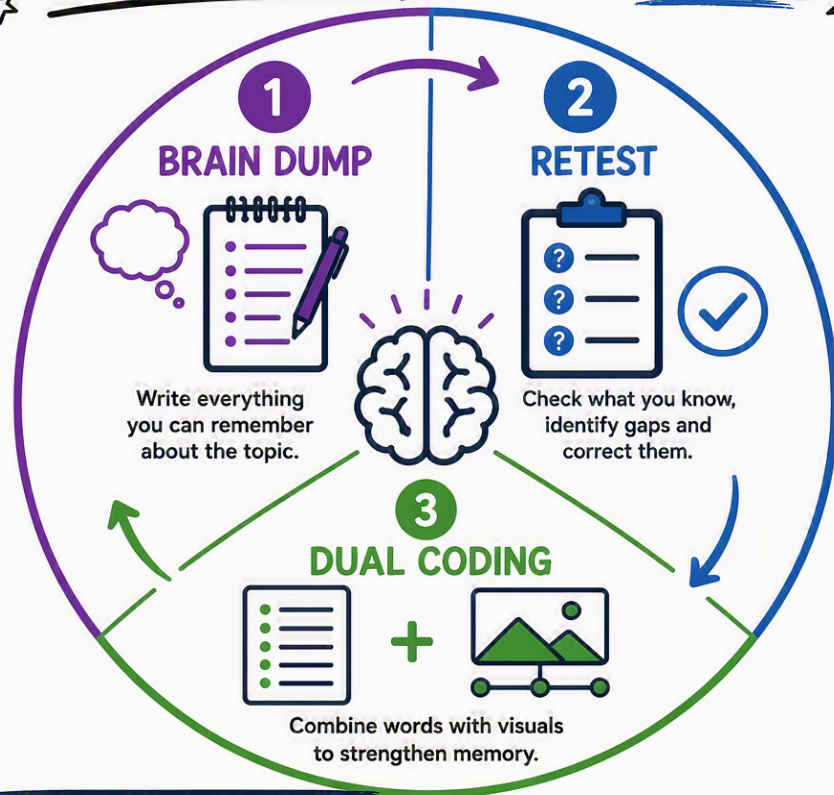
LEARN → RETRIEVE → REVIEW → REPEAT → SUCCEED

REMEMBER
Multiple-choice quizzes are not just a test of learning - they are a powerful way of learning!

HIGHDOWN SCHOOL | RETRIEVE • REVIEW • REPEAT • SUCCEED

A little practice often creates a lifetime of success.

RETRIEVAL OPTIONS



HOW CAN YOU USE THESE?



1. BRAIN DUMP

Pick a topic you've been learning. Write down everything you can remember about it – facts, dates, keywords, events, people, ideas – don't look at your notes!

Example:

Write everything you can remember about the causes of the First World War.



2. RETEST

Check your notes or textbook. Tick what you got right, add what you missed, and correct any mistakes. Focus on the gaps and brain dump again tomorrow!

Example:

Check your answers to find out what you forgot about the alliance system.



3. DUAL CODING

Turn your information into a visual (mind map, diagram, timeline, chart, sketch) and pair it with keywords or short notes. This helps your brain remember it better!

Example:

Create a timeline of events and add key words and images to help you remember.



RETRIEVE • SPACE IT • MIX IT UP • EXPLAIN IT • CHECK IT

Do a little bit often and keep testing yourself – your future self will thank you!



HIGHDOWN SCHOOL

THE HIGHDOWN APPROACH TO LOOK • COVER • WRITE • CHECK

A simple retrieval strategy for powerful learning

OUR BELIEF



At Highdown, we believe that learning becomes stronger when students actively retrieve information from memory.

Look • Cover • Write • Check is a simple but powerful strategy that helps students remember more, identify gaps in knowledge and improve long-term retention.



Study the information carefully.

Focus on:

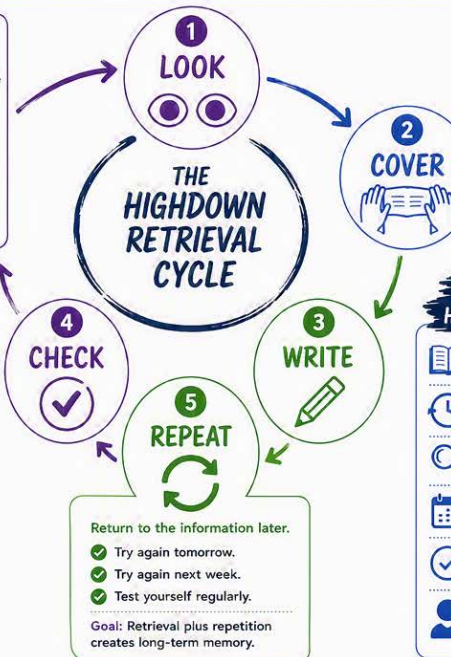
- Keywords
- Definitions
- Facts
- Dates
- Processes
- Subject vocabulary



EXAMPLE

Read a knowledge organiser about the causes of the First World War.

Goal: Understand exactly what you are trying to remember.



Hide the information.

Close the book, fold over the sheet or cover your notes.

EXAMPLE

Cover the list of causes completely.

Goal: Force your brain to recall information rather than copy it.

WHY DOES IT WORK?



STRENGTHENS MEMORY
Every retrieval strengthens neural pathways.



IDENTIFIES GAPS
You quickly discover what you know and what needs further revision.



BUILDS KNOWLEDGE
Regular recall helps information move into long-term memory.



BUILDS CONFIDENCE
Success grows with repeated practice.



IMPROVES ASSESSMENT PERFORMANCE
Students remember more and retrieve information more easily.

Return to the information later.

- ✓ Try again tomorrow.
- ✓ Try again next week.
- ✓ Test yourself regularly.

Goal: Retrieval plus repetition creates long-term memory.

WHAT DOES A HIGHDOWN STUDENT DO?



Uses knowledge organisers regularly



Revisits learning from previous lessons



Learns from mistakes



Practices retrieval little and often



Reviews and improves answers



Takes responsibility for their own learning

TOP TIPS FOR SUCCESS



DO

- ✓ Keep revision sessions short and regular
- ✓ Focus on key knowledge
- ✓ Use subject vocabulary accurately
- ✓ Check every mistake carefully
- ✓ Repeat the process regularly



DON'T

- ✗ Copy information while writing
- ✗ Ignore mistakes
- ✗ Give up when you forget something
- ✗ Leave revision until the last minute

EXAMPLE

Topic: The Norman Conquest

LOOK Study the key events of 1066.

COVER Close your knowledge organiser.

WRITE Record everything you remember.

CHECK Compare with the original and correct errors.

REPEAT Try the same task again in a few days.

REMEMBER



The aim isn't to get everything right first time.

The aim is to make your memory stronger every time you practise.



Regular use of Look • Cover • Write • Check helps you learn more, remember more and achieve more.

Small steps. Big impact. Every day.



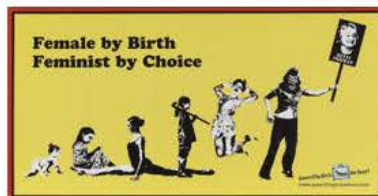
HIGHDOWN SCHOOL | RETRIEVE • REVIEW • REPEAT • SUCCEED

Small amounts of retrieval practice today create powerful learning tomorrow.

Term 1

Political Art 1950 - 2025

- Political art is **art that communicates ideas** about politics or society
- Artists create political art to express opinions and influence change
- A common theme in political art is social justice
- Political art aims to challenge ideas and raise awareness
- Propaganda is art used to persuade people to support a viewpoint
- Banksy is an anonymous artist known for political street art
- Banksy's work is usually found in **public spaces like walls and streets**
- Guernica* was created by **Pablo Picasso**
- Guernica* was inspired by a **war bombing in Spain**
- Frida Kahlo explored **identity, politics, and gender**



- The "HOPE" poster was designed by Shepard Fairey
- Shepard Fairey is influenced by propaganda posters and graphic design
- Hannah Höch created work criticising society and Nazi Germany
- Hannah Höch used photomontage (collage)
- Ai Weiwei is a Chinese artist who critiques government control
- Political art can be found in streets, galleries, and online
- Street art is political because it reaches a wide public audience
- Political art can make people question ideas and think differently
- An example of political art is a protest poster about climate change
- Political art is still important because it helps express opinions and discuss important issues



KEY VOCAB
Meaning & understanding.

Formal elements in Art, Line Tone, Colour, Composition, Shape, Form, Pattern, Colour, Texture,

H/W's

MCQs, Contextual research pages

Research, Design, Develop, Experiment, Explore, Reflect, Improve, Refine, Compose, Present.
Sketch, draw, apply, create, mix, blend, pressure, mark make, cross hatch, gesture, layer, mix, brush, charcoal, chalk, graduate, measure.



Highdown School

Term 2	Architecture	
	<ul style="list-style-type: none"> Architecture is the design and construction of buildings Architecture is important because it provides shelter and reflects culture The Parthenon was built by the Ancient Greeks The Parthenon is located in Athens The Pyramids of Giza are found in Egypt Roman architecture is known for arches and concrete Gothic architecture features pointed arches and stained glass Notre-Dame Cathedral is a famous Gothic building in Paris Michelangelo helped design St Peter's Basilica (dome) Renaissance architecture was inspired by Ancient Greek and Roman design Steel became important during the Industrial Revolution      	<ul style="list-style-type: none"> The Eiffel Tower was designed by Gustave Eiffel The Eiffel Tower is in France Le Corbusier is known for modernist architecture and simple forms The Guggenheim Museum Bilbao was designed by Frank Gehry Zaha Hadid is known for curved, futuristic designs The Gherkin in London was designed by Norman Foster Antoni Gaudí was inspired by nature and organic shapes Architecture is linked to art because it expresses creative ideas through design Michelangelo is an example of both an artist and an architect.         
H/W's	MCQs, Contextual research page.	
KEY VOCAB Meaning & understanding	Formal elements in Art, Line Tone, Colour, Composition, Shape, Form, Pattern, Colour, Texture	Research, Design, Develop, Experiment, Explore, Reflect, Improve, Refine, Compose, Present.

Term 3	Skills Workshops	
	<ul style="list-style-type: none"> Experimenting in art means trying new materials and techniques Artists experiment to discover new ideas and outcomes Mixed media means combining different materials in one artwork Collage is cutting and sticking images or materials together Printmaking creates repeated images from a surface Ink blowing is blowing ink across paper using a straw Mark-making is creating different types of marks and textures Glazing is layering transparent colour Yayoi Kusama is known for using repeated dots Kusama creates immersive installations with patterns Creative risk-taking means trying new techniques even if they might fail 	<ul style="list-style-type: none"> Jackson Pollock used splattering paint Pollock's technique is called drip painting Tracey Emin uses neon text in her artwork Tracey Emin explores personal experiences and emotions Damien Hirst uses everyday objects in experimental ways Experimenting helps develop creativity and ideas An outcome is the final piece of artwork Artists can experiment with any materials (e.g. fabric, ink, plastic) Experimental art involves trying unusual tools like sponges or string Experimenting includes using different materials like ink and fabric Texture can be explored by adding layers and different surfaces
H/W's	MCQs, Contextual research page,	
KEY VOCAB Meaning & understanding.	Formal elements in Art, Line Tone, Colour, Composition, Shape, Form, Pattern, Colour, Texture	Research, Design, Develop, Experiment, Explore, Reflect, Improve, Refine, Compose, Present. Technique, Process, Skill, Apply, Amend, Solve, Stain, Incorporate, Layer Recreate.
	<p>Art and Design Process Terms: Definitions</p> <p>Research The process of gathering information, references, and inspiration to inform and support your artistic ideas and decisions.</p> <p>Design The act of planning and organising visual elements in a composition, considering both aesthetics and functionality.</p> <p>Develop To expand and improve initial ideas through sketches, studies, trials, and feedback, moving towards a final outcome.</p> <p>Experiment Trying out different materials, techniques, or styles in a creative and open-minded way to discover new possibilities.</p> <p>Explore Investigating different approaches, themes, and ideas in depth to better understand and define your artistic direction.</p> <p>Reflect Thinking critically about your own work or process to identify strengths, weaknesses, and areas for growth.</p> <p>Refine Polishing and adjusting elements of your artwork to achieve greater clarity, cohesion, and precision. narrative elements.</p>	<p>Improve Making changes based on evaluation and reflection to enhance the quality or impact of your artwork.</p> <p>Compose Arranging elements such as line, shape, colour, and space in a deliberate way to create a balanced and effective artwork.</p> <p>Present The final display or sharing of artwork, considering presentation methods, context, and audience.</p> <p>Context The background, setting, or circumstances in which an artwork was created or is being viewed, including historical, cultural, or personal influences.</p> <p>Form (in context) The visible shape or configuration of something, often referring to how an artwork is constructed or its three-dimensional aspects.</p> <p>Process The series of actions or steps taken from concept to final artwork, including planning, experimentation, and refinement.</p> <p>Mood The atmosphere or emotional tone conveyed by an artwork, often created through choices in colour, lighting, and subject matter.</p> <p>Content The subject matter, meaning, or message conveyed by an artwork, including symbolic elements.</p>

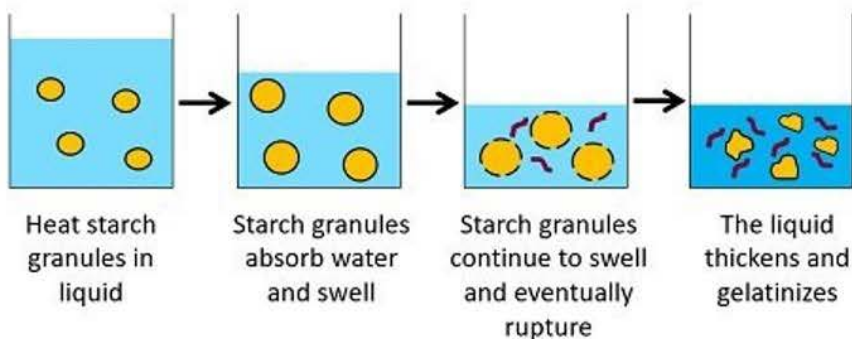


FN Year 9 Food and Nutrition Theory

What are Ultra-Processed Foods? (UPF'S)

- Foods that are highly processed with lots of added ingredients, made in factories not kitchens
- **Examples:** fizzy drinks, crisps, sweets, ready meals, instant noodles, chicken nuggets
- **How to spot them** Long ingredient list, ingredients you don't recognise, additives/E numbers
- **Often high in sugar, fat and salt**

Gelatinisation of Starch in sauce



Feature	Caramelisation	Maillard Reaction
Main ingredients	Sugars only	Sugars and proteins (amino acids)
Temperature needed	~160°C and above	~140°C and above
Flavour produced	Sweet, nutty, caramel	Savoury, roasted, meaty
Colour change	Golden to brown	Brown crust or surface
Food examples	Caramel sauce, crème brûlée	Toast, steak, roasted chicken

Vegetarian and Vegan

A **vegetarian** is someone who does not eat **meat or fish** but may still eat animal products like **milk, cheese and eggs**

A **vegan** does not eat any animal products at all, including **meat, fish, dairy, eggs, honey and gelatine**. People may choose these diets for **health, environmental, or ethical reasons**, and they need to make sure they eat a balanced diet to get all the nutrients their bodies need.

KEY POINTS



CONDUCTION

Through solids.
Direct contact.
e.g. frying, grilling on a hot plate.



CONVECTION

Through liquids or gases.
Movement of the fluid.
e.g. boiling, stewing, baking with hot air.



RADIATION

Through waves.
No medium needed.
e.g. baking, grilling under a heat lamp.



REMEMBER: In real cooking, more than one type of heat transfer is usually happening at the same time!

Lacto-vegetarian - **does not eat meat, animal by-products, or eggs.** **Does eat milk products.**

Ovo-vegetarian - **does not eat meat, animal by-products, or milk.** **Does eat eggs.**

Pescatarian - **does not eat meat.** **Does eat fish, seafood, eggs and dairy**



Year 9 Food and Nutrition Practical Skills and Techniques

Presenting - plating up requires thinking about how colours, shapes, textures and tastes will work together. When plating, use odd numbers, different heights and flavours that complement each other and make the plate appealing.



Writing a time plan - A time plan is essential when cooking your own recipe. It is not just following the method of the recipe. It should include the time the task needs to start, the equipment needed for the task and any health and safety considerations. Planning your time means you can fit as many processes and skills to ensure your dish is as successful as possible

Time	Task	Equipment	Health, Safety and Hygiene	Skills
9.05	Mise en place – julienne carrots, peppers	Green chopping board pairing knife	Apron, hair up, wash hands, wipe down table	Knife skills
9:15	Cook rice – rinse first	Saucepan, colander	hob safety – pan handle over work top	Using the hob.

Food Preparation and Nutrition Key Skills

Low

Preparation Techniques:

blending
beating
grating
hydrating
juicing
marinating
mashing
melting
proving
shredding
sieving
tenderising
zesting

Knife techniques:

chopping
peeling
trimming

Cooking techniques:

basting
boiling
chilling
cooling
dehydrating
freezing
grilling
skimming
toasting

Medium

Preparation Techniques:

creaming
dehydrating
folding
kneading
measuring
mixing
puréeing
rub-in
rolling
skinning
toasting (nuts/seeds)
weighing

Knife techniques:

bâton
chiffonade
dicing
slicing
deseeding
spatchcock

Cooking techniques:

baking
blanching
braising
deglaing
frying
griddling
pickling
reduction
roasting
sautéing
setting
steaming
stir-frying
water-bath (sous-vide)

High

Preparation Techniques:

crimping
laminating (pastry)
melting using bain-marie
piping
shaping
unmoulding
whisking (aeration)

Knife techniques:

brunoise
julienne
mincing
deboning
filleting
segmenting

Cooking techniques:

baking blind
caramelising
deep fat frying
emulsifying
poaching
tempering



FN Year 9 Food and Nutrition Practical Skills and Techniques



Cookies

Modifying a recipe, caramelisation of sugar, testing for readiness



Tofu noodles

Vegan diets, temperature control, stir fry



Mini Quiche

Shortcrust pastry chiffonade, coagulation, using the oven



Béchamel

Dovetailing, using the hob, blended sauce, testing for readiness, seasoning



Fakeaway

Nutritional analysis, modifying a recipe, presentation, working independently

Evaluating dishes

Sensory analysis, nutritional analysis of dishes: how well have the skills been executed? Presentation.

What changes could be made to better meet success criteria?

Comparing dishes to recipe picture

Food & Nutrition Glossary (KS3)

Caramelisation

A process where sugar is heated and turns brown, creating a sweet, nutty flavour (e.g. caramel or browned onions).

Maillard Reaction

A chemical reaction between protein and sugar when food is cooked, giving browned foods flavour and colour (e.g. toast, cooked meat).

Gelatinisation

When starch is heated with liquid, it absorbs the liquid and thickens (e.g. making sauces or custard).

Gluten

A protein found in wheat, barley and rye that gives dough its elasticity and helps bread rise.

Coagulation

When proteins change from liquid to solid when heated (e.g. egg cooking and becoming firm).

Shortcrust Pastry

A type of pastry made with flour, fat and water, with a crumbly texture used for pies and tarts.

Modify a Recipe

To change a recipe to suit different needs, such as dietary requirements, available ingredients, or healthier options.

Dovetailing

A method of organising work so that different tasks fit together smoothly and efficiently, with no time wasted

Roux Sauce

A thick sauce made by cooking equal amounts of fat (butter) and flour together, then adding milk.

Béchamel Sauce

A type of roux sauce made with milk, often used as a white sauce in dishes like lasagne.



Year 9 Design & Technology Storage Solution Theory

Recall from year 7 & 8

- Health and Safety in the workshop
- The Design Process
- Types of timber



ACCESSFM – Used to write a design specification, analyse existing products or evaluate a final product

Aesthetics

What does the product look like? Describe the shapes, colour, style

Cost

How much would the product cost? Consider material and manufacturing costs

Customer

Who would buy the product? What requirements are needed to make sure the product suits its user?

Environment

Where would the product be used?

What environmental impacts are there either during manufacture, use or after use?

Safety

What safety considerations have been made in the design?

Size

How big is the product? Use mm

Function

What does the product do? Does it have any additional functions?

Materials

What is the product made from? Why?

The Design Process

- Design brief: A statement summarising the intended purpose of the product.
- Task analysis: Initial thoughts on the processes needed to complete the project.
- Research: Gathering information on relevant aspects of the project e.g. the materials.
- Design ideas: Creating a range of possible solutions to the brief.
- Product manufacture: Making the chosen design.
- Testing: Using the product to see if it works or needs modification.
- Evaluation: Reflecting upon the process as a whole to determine what has been successful and what could be improved and how.

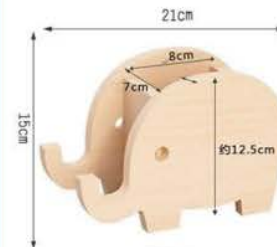
Writing your design brief

I am going to design and make...

- **What?** What is the problem you are solving?
- **Who?** Who is going to use the product?
- **Why?** Why is there a need for the product?

Cutting list

The cutting list is the list of materials needed to make the project. See the example below:



Name of piece	Material	Measurements (h x w x d) mm	Number
Elephant	MDF	210 x 150 x 12	2
Front & back	MDF	70 x 125 x 9	2
Base	MDF	70 x 80 x 9	1





Year 9 Design & Technology Storage Solution Practical

Recall from year 7 & 8

Developing practical skill - demonstrating safe and independent use of all tools and equipment from year 7 & 8



For marking out:		For shaping and smoothing (wasting and finishing) materials:	
Try square	 For marking out right angles	Coping saw	For cutting curves <ul style="list-style-type: none"> • Only hold the handle • Twist your wrist whilst cutting • Slow and steady pace –don't press too hard 
Steel rule	 For measuring and marking out Starts at zero	Tenon saw	For cutting straight lines <ul style="list-style-type: none"> • Point your finger to steady the blade • Use the whole length of the blade • Slow and steady pace –don't press too hard 
For holding work securely:		Surform file	For shaping your work Used for concave curves 
Bench vice	 Holds your work securely on the table	Surform plane	For shaping your work Used for flat surfaces and convex curves 
G clamp	 Holds the clamp in place whilst drilling	Rasp	To start shaping your work 
Hand clamp	 To hold your work whilst drilling	Flat file	To smooth your work For flat edges and convex curves 
Bench hook	 Helps to hold material whilst cutting Can be used in a vice or on the side of a bench	Half round file	To smooth your work Flat on one side, curved on the other 
Machinery:		Sandpaper	Comes in different grits Used to create a high-quality finish 
Safety goggles	 Must be worn when using machinery to protect your eyes		
Pillar drill	 For drilling holes <ul style="list-style-type: none"> • Work must be clamped • Wear goggles • Slow and steady 		
Laser cutter	 Computer Aided Manufacture - Cuts materials accurately using a laser		
Additionally available for year 9:			
Hot wire strip heater	 Bends plastic along a line by heating over hot wire		

Year 9 Textile Design Tote Bag Theory

- Design brief: A statement summarising the intended purpose of the product.
- Research: Gathering information on relevant aspects of the project e.g. the artist.
- Design ideas: Creating a range of possible solutions to the brief.
- Product manufacture: Making the chosen design.
- Evaluation: Reflecting upon the process as a whole to determine what has been successful and what could be improved and how.

Personal identity is the combination of qualities, experiences, beliefs, and characteristics that make you who you are. It includes things like your personality, values, interests, culture, memories, and the way you see yourself and the world.

Personal identity is what makes each person unique, and it can grow and change as you learn more about yourself and your life.



- Resist: Techniques used to block, 'resist', dye from touching fabric.
- Dying fabric: Using colourful dyes and resist methods to change the colour of fabric.
- Sewing: Using a needle and thread to fasten fabric together and add decoration.
- Pattern/Template: Using paper as a guide when cutting out fabric.
- Stencil: A thin sheet with a shape or pattern cut out of it
- Accuracy: Being precise with measurements e.g. when drawing paper templates and cutting fabric.

Material	Description
Cotton	Cotton fabric is a natural fabric, derived from the fibres surrounding the seeds of cotton plants, which emerge in a round, fluffy formation
Felt	Felt is a textile that is produced by matting, condensing, and pressing fibres together. It does not fray when cut
Thread	A thread is a fine, string-like strand of material used to join fabrics together. It's typically made from fibres like cotton, silk, or synthetic materials, twisted together to form a strong, durable strand
Dye	A natural or synthetic substance used to add a colour to or change the colour of something

TD Year 9 Textile Design Tote Bag Practical

Equipment	Use
Elastic band 	To create the resist when doing tie dye – the band should be secured tightly to stop the dye getting underneath
Craft Knife 	A small, sharp cutting tool used for precision work. It has a thin, replaceable blade that can cut materials like paper and card with accuracy.
Shears 	Fabric scissors – For cutting fabric only
Pin 	For securing materials together
Needle 	Used for sewing. The thread goes through the eye of the needle
Iron 	For flattening or pressing fabrics to remove creases. Also sets dye
Sewing machine 	A machine that is used for joining together pieces of cloth, with a needle that is operated either by turning a handle or by electricity

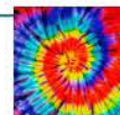
Creating a stencil



- Draw your design onto paper and cut away the area you want to paint onto your bag.
- You **MUST** leave bridges, so your stencil does not fall through.

Technique

Tie Dye



Dying fabric to create a pattern – e.g Spiral, stripes, sunburst, random.

Applique



Attaching pieces of fabric to a larger piece, using stitching (decorative).

Running stitch



A dashed line of stitching

Back stitch



A solid line of stitching

Stencil



A stencil is a thin sheet with a shape or pattern cut out of it. Using a stencil to paint means placing a cut-out design on a surface, applying paint over it, and lifting it off to leave a clean, neat shape behind.

Core Glossary CORE CONCEPTS

Stimulus: The starting point, idea or inspiration to create a piece of theatre

Context: Background to the play; when and where the play is set

Audience: People who watch a performance

Devising: A collaborative process of creating original theatre from a stimulus

Improvisation – Spontaneous performance used to explore ideas

Structure: The way a play is organised, including the order of scenes, events, and how the story unfolds from beginning to end.

Blocking: Planned positioning and movement of actors on stage

Corpsing: Laughing or breaking character on stage.

Characterisation: how an actor creates and presents a character on stage using voice, movement, facial expressions, gestures, and personality traits.

Form – The type of drama (e.g. devised, scripted, physical theatre)

Genre – The category of the play (e.g. comedy, tragedy)

Style – The specific theatrical approach (e.g. naturalism, Brechtian, physical theatre)

Roles & Theatre Makers

Actor – Uses vocal and physical skills to communicate character

Character – A constructed role with motivations, status, and relationships

Playwright – Crafts narrative, dialogue and structure

Director – Interprets text and shapes performance through staging and actor guidance



Year 9 Knowledge Organiser

Drama

Stage Directions

• From the point of view of the ACTOR •

Stage positions are often abbreviated eg. CS = centre stage, DSL = downstage left



□ Upstage

□ Downstage

Dramatic Techniques

Still-image: A frozen picture which communicates meaning

Hot-seating: Where a character is questioned by the group about their background, behaviour and motivation

Thought-track: When a character steps out of a scene to address the audience about how they are feeling

Split-stage: When two different scenes are performed/present at the same time, side by side on stage

Soundscape: A series of sounds that create a setting or suggest a scene

Improvisation: Invent and create content on your feet/making it up as you go along

Flashback: Interrupting the chronological order of the main narrative to take the audience back in time to past events in a character's life

Flash-forward: Takes the narrative forward in time from the current point in the story

Narration: Spoken commentary for the audience about the action onstage (storyteller)

Marking the moment: Highlighting the most important moment to draw the audience's attention to its significance

Mime: Suggesting action, character, emotion without words using only gesture, expression and movement to play out a role.

5Ws WHO? WHAT? WHERE?
WHY? WHEN?





Year 9 Knowledge Organiser

VOCAL SKILLS

Breath Control: The ability to regulate breathing for speech.

Articulation: The clarity and precision of speech.

Projection: The strength of speaking or singing whereby the voice is used loudly and clearly.

Pitch: The highness or lowness of the voice.

Pace: The speed at which someone speaks.

Pause: A temporary stop in speech for effect.

Tone: The quality or character of sound.

Volume: The loudness or softness of the voice.

Emphasis: Special importance or significance given to a word or phrase.

Intonation: The rise and fall of the voice in speaking

PHYSICAL SKILLS

Posture: The way in which someone holds their body.

Gesture: A movement of part of the body to express an idea or meaning.

Facial Expression: The use of the face to show mood, feeling or character.

Eye Contact: The act of looking directly into another's eyes.

Movement: The act or process of moving.

Body Language: The use of physical behavior to communicate.

Proximity: The physical closeness between characters.

Stance: The way in which someone stands.

LIVE THEATRE EVALUATION

Describe – Clearly and concisely describe the moment as it happened on stage so the examiner can visualise it in their mind

Analyse – Identify the techniques that were used and explain their intended impact on the audience (using drama key terms)

Evaluate – Good and bad. Say whether the production element you are writing about was successful in communicating the intended effect/impact or not

Semiotics – The acting and/or design can communicate abstract concepts, themes and symbols. As an example, a design could include a large, dead tree to suggest the themes of death in a play

Design elements – Set/props, lighting, costume, sound (music and sound effects, live and/or recorded)

Character traits/aspects – Characterisation, physical skills/movement, vocal skills/voice, use of space/proxemics

Staging – Selecting a performance space, adapting/modifying the performance space designing ideas for a play. Includes ideas for all design elements

Performance space – Thrust, in the round, traverse, proscenium arch, end on, apron, black box, promenade, site specific

Acting – Vocal skills, physical skills, characterisation, use of stage space/proxemics, interaction with other characters, handling of props. Using all the key terms write notes on three key moments

Costume – Type, period, fabric, colour, fit and condition, accessories, hair, make-up, masks

Set – Type, period, size and scale, colours, entrances and exits, levels, ramps, revolves, drapes, curtains, flats, backdrops, projections/multimedia

Lighting – Types, colours, angles and positions, special effects, transitions, blackouts, fades

Sound – Types, music, volume/amplification/intensity, direction, live or recorded, positioning, sound effects

JOHN GODBER

Born: 18 September 1956

From: West Yorkshire, England

Career: Playwright, director, former drama teacher

One of the most performed playwrights in the UK

Physical Theatre – Strong use of body and movement to create characters and settings

Multi-roling – Actors play several characters

Minimal Set – Few props; actors create locations through performance

Episodic Structure – Short, fast-moving scenes

Direct Address – Characters speak directly to the audience

Narration – Actors describe action as well as perform it

Breaking the Fourth Wall –

Acknowledging the audience

Characters often based on

recognisable **stereotypes**

Strong focus on **status and relationships**

Themes

Working-class life

Education and authority

Social behaviour (especially nightlife)

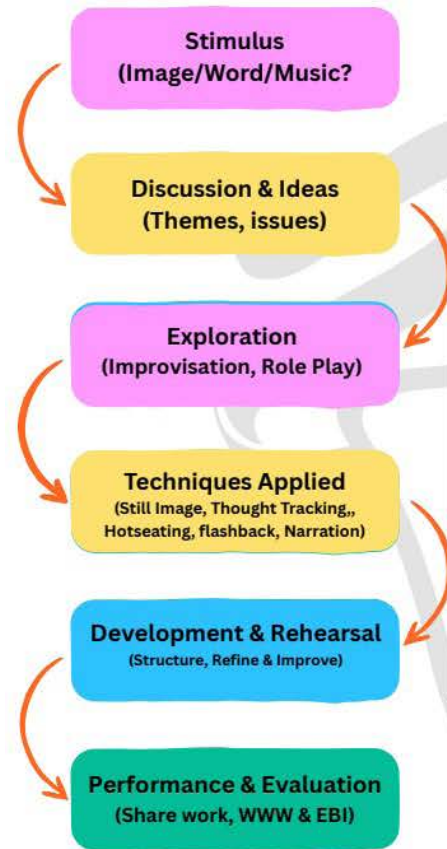
Gender roles

Youth and identity

Humour + social commentary



The Devising Process



Year 9 Knowledge Organiser

THE WORLD OF PUPPETRY

Puppet – An object brought to life by a puppeteer to create a character and tell a story.

Puppeteer – The performer who controls and operates the puppet.

Manipulation – The skill of controlling the puppet to make it appear alive (movement, focus, timing).

Focus – Where the puppet directs its attention (usually through head or eye line) to guide the audience.

Neutral Position – A resting position where the puppet is still but ready to move, helping maintain control and clarity.

Breath – Small, subtle movements that make the puppet seem alive, as if it is breathing or thinking.

PAGE TO STAGE

UNDERSTANDING THE TEXT

Beat – A change in thought, emotion, or action.

Structure – How the play is organised (acts, scenes, tension).

Themes – Big ideas in the play (e.g. power, love, conflict).

Context – When and where the play was written and set.

Dramatic Tension – The feeling of suspense or conflict.

CHARACTERISATION

Motivation – Why your character does something.

Objective – What your character wants in a scene.

Obstacles – What stops the character getting what they want.

Emotion – How your character feels.

Status – Your character's power or importance compared to others.

TOP 10 DEVISING TECHNIQUES

Still Image (Freeze Frame)

Creating a frozen picture to show a key moment, relationship, or emotion clearly and visually.

Thought-Tracking

Characters speak their inner thoughts aloud while in a still image to reveal feelings and motivations.

Hot Seating

Answering questions in role to develop a deeper, believable character.

Improvisation

Creating dialogue and action spontaneously to explore ideas and make scenes feel natural.

Physical Theatre

Using exaggerated movement, gesture, and body language to communicate meaning beyond words.

Mime

Performing without speech to focus on clarity of action, expression, and storytelling.

Cross-Cutting

Switching between different scenes or storylines to build tension and maintain audience interest.

Flashback

Showing past events to give important backstory and deepen the audience's understanding.

Narration

Speaking directly to the audience to explain, comment on, or guide the story

Conscience Alley

A character walks between two lines of actors giving opposing advice, helping show inner conflict.



Autumn Term – Non-Fiction – Gender

The non-fiction focus on gender in this unit encourages you to reflect critically on issues surrounding this topic. You will create your own non-fiction on gender, as well as developing your ability to evaluate texts.

Key term	Definition
Subsidiary	Less important than something else; something that supports the main idea.
Gender	The roles, behaviours, and expectations that society connects with being male, female, or other identities.
Perpetuate	To continue or keep something going over time.
Stereotype	A fixed, oversimplified idea about a group of people.
Stance	The position or point of view a writer or speaker has about an issue.
Subvert	To challenge or go against usual expectations or norms.
Adhere	To stick to or follow rules, beliefs, or expectations.
Representation	How people, groups, or ideas are shown in a text.
Ideology	A set of beliefs or ideas about the world, often about how society should work.
Omniscient	A narrator who knows everything about all characters and events, including thoughts and feelings.

Society is saturated with media. Why not use the knowledge from this unit to create a balanced resource promoting the benefits of and dangers of the different forms you have explored for your wider community?



Autumn Term – Shakespeare

In this unit, you will study Shakespeare's Romeo and Juliet, exploring how the playwright presents themes of love, conflict, and fate. You will analyse language and structure, building interpretations of characters and choices.

Key term	Definition
Tragedy	A type of play where a main character suffers a downfall, often ending in death.
Prologue	An introduction at the start of a play that gives important background information.
Patriarchy	A society where men hold most of the power and authority.
Satire	Using humour or exaggeration to criticise people, behaviour, or society.
Melodrama	A style of drama with exaggerated emotions, conflicts, and characters.
Dramatic irony	When the audience knows something that the characters do not.
Fate	The idea that events are controlled by a force beyond human control.
Religious imagery	Language that relates to religion (e.g. heaven, angels, sin) to create meaning or emotion.
Iambic pentameter	A line of poetry with ten syllables, following a pattern of unstressed then stressed beats (e.g. da-DUM da-DUM da-DUM da-DUM da-DUM).
Blank verse	Poetry written in iambic pentameter but without rhyme.

You will study William Shakespeare's 'Romeo and Juliet' in this unit, but other writers have used the story as a springboard for their own writing. Why not challenge yourself to read one of these adaptations?



Spring Term – American Literature

Through studying 'Of Mice and Men' and 'Roll of Thunder', you will explore themes of friendship, injustice, and inequality. You will examine how writers present ideas, while forming responses to the social issues raised.

Key term	Definition
Censorship	The control or removal of ideas, information, or books that are seen as unacceptable or controversial.
Ally	A person or group that supports and stands up for others, especially those facing unfair treatment.
Comparison	Examining two or more texts to explore their similarities and differences.
Marginalised	Describes people or groups who are pushed to the edge of society and have less power or opportunity.
Feminism	The belief that women and men should have equal rights and opportunities.
Literary criticism	The study and analysis of literature to understand its meanings, themes, and ideas.
Post colonialism	The study of the effects of colonialism on people and cultures, often exploring identity and power.
Realism	A style of writing that presents life as it is, focusing on believable characters and everyday experiences.
Episodic	A structure made up of separate events or episodes, rather than one continuous storyline.
Adaptation	A new version of a text that has been changed to suit a different form, audience, or time period (e.g. a novel turned into a film).

You will explore two novels from American authors in this unit, but there are so many more novels out there! Why not challenge yourself to listen to a podcast about different novels and take yourself out of your comfort zone with books? 'Hey YA' is a great place to start



Summer Term – Spoken Language

In this unit, you will explore how spoken language is used to inform, persuade, and engage an audience through a range of speeches. You will develop your ability to make deliberate choices about language, tone, and performance.

Key term	Definition
Ethos	A persuasive technique that builds trust and credibility. The speaker shows they are reliable or knowledgeable.
Pathos	A persuasive technique that appeals to the audience's emotions (e.g. sadness, anger, sympathy).
Logos	A persuasive technique that uses facts, statistics, or logical arguments to convince the audience.
Rhetoric	The art of using language effectively to persuade or influence an audience, especially in speeches.
Emphasis	When a speaker gives extra importance to certain words or ideas to make them stand out.
Pace	The speed at which a speaker talks. It can be slow (for seriousness or clarity) or fast (for excitement or urgency).
Hyperbole	An exaggerated statement used for effect, not meant to be taken literally.
Imperative	A command or instruction telling the audience to do something.
Direct Address	Speaking straight to the audience by using "you" or naming them.
Tricolon	A group of three words, phrases, or ideas used together for effect.

Are you passionate about public speaking, or perhaps this unit has given you the confidence to share your voice further afield? Why not investigate the Youth Speaks competition and encourage your peers to enter a team?



Summer Term – The Art of Being Human - Poetry

In this unit, you will explore what it means to be human through a range of poems that examine love, relationships, and the complexities of human experience, developing both your analytical and creative prowess.

Key term	Definition
Anaphora	The repetition of a word or phrase at the start of consecutive lines or sentences to create emphasis.
Auditory imagery	Language that helps the reader picture sounds.
Stanza	A group of lines in a poem, similar to a paragraph in prose.
Nostalgia	A feeling of longing or sadness for the past, often for happy memories.
Annotate	To make notes on a text (e.g. a poem) to explain or analyse meaning, language, or structure.
Conflict	A struggle or tension between opposing forces (e.g. person vs person, person vs nature, or inner conflict within a character).
Assonance	The repetition of vowel sounds within nearby words.
Antithesis	When two opposite ideas are placed close together to highlight contrast.
Romanticism	A literary movement that focuses on emotion, nature, imagination, and individual experience, often valuing feelings over reason.
Trope	A common theme, image, or idea used repeatedly in literature.

Why not share your creativity beyond the classroom by entering the Foyle Young Poets Award? This competition is run by The Poetry Society, and prizes include some fantastic talent development opportunities!



THEPOETRYSOCIETY

Writing Focus: Crafting and Sophistication

Throughout all the units you study in year 9, we want you to focus on crafting your writing and developing a sophisticated style.

Key term	Definition
Precision	Using exact and specific words to express ideas clearly.
Concision	Writing in a clear and brief way, without unnecessary words.
Tone	The writer's attitude or feeling towards the subject or reader.
Register	The level of formality or style of language used (e.g. formal or informal).
Language Patterns	
Anaphora	Repeating a word or phrase at the start of successive sentences or clauses.
Epistrophe	Repeating a word or phrase at the end of successive sentences or clauses.
Semantic Field	A group of words linked by a common theme or idea.
Structural Patterns	
Cyclical Structure	A structure where the ending links back to the beginning.
Structural Contrast	Placing opposite ideas or sections next to each other to highlight differences.
Gradation	A gradual increase or decrease in intensity, importance, or emotion.
Idea Patterns	
Extended Metaphor	A comparison that is developed and sustained throughout a piece of writing.
Refrain	A repeated word, phrase, or line, often used for emphasis or rhythm.

Reading Focus: Refining What/How/Why Paragraphs

In year 9, we want you to continue to focus on developing your analytical skills in every English unit, so that you can confidently analyse a range of texts using the What/How/Why paragraph structure and six skills of analysis. In year 9, we develop this focus further by focusing specifically on comparison and how to write comparative analytical paragraphs and essays.

What/How/Why Paragraph Structure	
What – What is your point? (The Main Idea)	This is your topic sentence. Clearly state what you are analysing — a specific idea, technique, or moment in the text. It should be a focused point that sets up the rest of the paragraph.
How – How is your point shown in the text? (The Evidence & Technique)	Provide specific evidence: a quote, event, or moment in the text. Explain how the writer conveys the idea — e.g. through language features, literary devices, structure, or style. Break down the technique being used
Why – Why is this important? (The Effect or Deeper Meaning)	Analyse the significance of the technique and evidence. Explain the impact on the reader, character, and/or theme. Connect back to your argument or a bigger idea

Six Skills of Analysis	
Tentative Language	Using the language of uncertainty to recognise that texts are open to different interpretations and explanations. For example, perhaps' or 'maybe'.
Three Part Explanation	An interpretation that contains three ideas in the format of a triadic list.
Zooming In	Choosing an important word or phrase from within a larger quote to explore more deeply.
Multiple Interpretations	Presenting or discussing more than one opinion or viewpoint.
Embedding Quotations	Smoothly incorporating a quote into your own sentence to support your point without disrupting the flow of writing.
Links Across Text	Using different ideas from across a text to support the same point or analytical idea.

Key term	Definition
Comparative Language	Similarly... In contrast... On the other hand... Whereas... Both texts show... but... While Text A..., Text B...
Areas for Comparative Analysis	Themes Tone Language choices Structure Writer's purpose/message Context
Evaluative Comparison - judging how and why texts are similar or different. This involves explaining which is more effective and why. You are weighing texts up, rather than spotting similarities and/or differences	Text A is more effective because... This is more/less impactful as... Arguably... This highlights... Ultimately...



Religion & Nature

Many religions teach humans have responsibilities to the natural world. This may influence attitudes towards conservation & the treatment of life. Stewardship is the belief humans have a duty to look after the world, not simply use it. In Christianity, stewardship comes from the idea that God created the world, & humans are responsible for caring for creation. It is often linked to passages from Genesis, the 1st book of the Bible. In Islam, the concept of khalifah means humans are guardians of Earth. Expectations include avoiding waste, & examples of care even for ants. God may be seen through nature, & spiritual connection form there.

Religious Views on Animals

Different religions have differing, yet related, views on how humans should treat animals. In Hinduism, many animals are treated with great respect because of beliefs about reincarnation and the connection between all life. Buddhism teaches compassion and the interconnectivity for all living beings and encourages people to avoid causing unnecessary suffering. Sikhism teaches equality and respect for creation. Judaism and Islam include teachings about kindness towards animals and avoiding cruelty. Christianity has quotes about care, such as to not yoke (link together) different animals, where their differing strength may cause suffering).

The Sanctity of Life

This is the belief human life is valuable, should be protected. Christianity, Judaism and Islam generally teach that humans have special value through their roles or status given by God – in Christianity ‘in the image of God’ or ‘children of God’ in reference to human higher awareness. There are related rules for peaceful living (ahimsa) in faiths such as Hinduism & Sikhism, & the reduction of harm and suffering in Buddhism connected to similar concepts. Humanists may argue that life is valuable because people experience relationships, emotions and meaning. Views still vary regarding matters like capital punishment, & how it compares humans & animals.

Religious Law: Religious laws provide guidance about how followers should live. They often cover worship, relationships, food, celebrations and moral behaviour. In Judaism, the 613 mitzvot are commandments found in religious teachings that guide Jewish life. In Islam, Sharia is a system of guidance based on the Qur’an and Hadith. In Hinduism, dharma describes duties and responsibilities. Buddhism teaches moral behaviour through teachings such as the Five Precepts, while Sikhism follows the teachings of the Gurus.

Religious Requirements and Daily Life: Religious requirements help believers express commitment. Muslims follow practices such as daily prayer, fasting during Ramadan and giving charity. Jews follow dietary laws such as keeping kosher, and observing festivals. Sikhs may follow the Five Ks as symbols of commitment to the Khalsa. Christians may follow teachings & examples from Jesus, such as loving others & forgiving people. These all are often seen as tying back to core beliefs such as “What is hateful to you, do not do to your neighbour. That is the whole Torah; the rest is the commentary.” (Hillel – Judaism) or “Love the Lord your God with all your heart and with all your soul and with all your mind and with all your strength ... The second is this: ‘Love your neighbour as yourself.’ There is no commandment greater than these.” (Gospels, Christianity). This core, or elements of it, is often referred to as the ‘Golden Rule’.



The Holocaust and Human Suffering: The Holocaust was the systematic murder of around six million Jewish people by Nazi Germany during the Second World War. Other groups were also targeted by the Nazis. The Holocaust raises important questions about prejudice, hatred, human responsibility and the problem of suffering. Many people study the Holocaust to understand the dangers of racism, discrimination and the failure to protect human rights. Religious communities have responded to the Holocaust in different ways. Many Jewish thinkers have reflected on questions about suffering, faith and survival. Christian responses included examining the role of churches and individuals during Nazi persecution, as well as promoting justice and reconciliation.

Memorials & Remembrance: Memorials are created to remember victims of atrocities and to educate future generations. They help societies acknowledge suffering and encourage people to prevent similar events happening again. Religious and non-religious approaches to remembrance often focus on respect, learning and challenging prejudice. Remembrance is not only about looking back at history but also about deciding how people should behave today.

War, Peace and Conflict: Religions have different views about war and peace. Some religious traditions allow violence only in certain circumstances, with specific rules for when war may be permitted, if never encouraged. An example of this is 'Just War Theory/Doctrine', with rules such as avoiding unneeded casualties, fighting as a last resort, a positive end result, & the fighting is unlikely to be in vain (without purpose). Some groups strongly support non-violence, such as certain monastic groups or denominations such as Quakers. Many religions focus on forgiveness and reconciliation, with some prominent influences of Christianity including the Corrymeela Community in Northern Ireland, and the Truth & Reconciliation Commission in South Africa.



Branches of Philosophy: Philosophy is the study of ideas and questions about existence, knowledge and morality. Ethics explores questions about right and wrong. Metaphysics explores reality and existence. Epistemology studies knowledge and how people know what is true. The philosophy of religion examines questions about God, belief, suffering and the meaning of life.

The Cosmological Argument: The cosmological argument is an argument for the existence of God based on the idea of cause and explanation. It suggests that everything that begins to exist has a cause, and because the universe exists there must be an ultimate first cause and that cause must have no beginning (be eternal). Some believers argue this first cause is God. Critics argue that the universe may not need a cause, or that the argument does not prove the first cause must be a personal God.

The Teleological (Design) Argument: The teleological argument claims that the order and complexity of the universe suggest design. Some believers argue that the natural world appears too organised to have happened by chance. Critics argue that scientific explanations, such as evolution, or even the multiverse, can explain complexity without requiring a designer. Others argue that even if the universe appears designed, this does not necessarily prove a particular God exists.

The Problem of Evil: The problem of evil asks why suffering exists if God is all-powerful and perfectly good. Some argue that the existence of evil challenges belief in such a God. Religious responses include the idea of free will, secondary good – that is good responses to suffering, and soul-making or the claim challenges can help people develop qualities like courage and compassion.

MAJOR BRANCHES OF PHILOSOPHY



Christian Beliefs and Festivals: Christianity teaches belief in one God and the importance of Jesus Christ. Christmas celebrates the birth of Jesus, while Good Friday at the end of Holy Week remembers his death and resurrection. Christians believe the resurrection is central because it represents victory over death and the possibility of salvation.

Islamic Beliefs and Festivals: Eid al-Fitr marks the end of Ramadan, a month of fasting and spiritual reflection. Eid al-Adha remembers the willingness of Ibrahim to obey Allah, even to the point of sacrificing his son (& other focuses of his life).

Jewish Beliefs and Festivals: Passover remembers the Exodus from Egypt and the escape from slavery. Yom Kippur is a day of reflection and seeking forgiveness, while Hanukkah celebrates the survival of Jewish identity and tradition.

Hindu Beliefs and Festivals: Hinduism includes many traditions and beliefs. Diwali, the Festival of Light, celebrates the victory of good over evil and light over darkness. Holi is a festival of colour and community.

Buddhist Beliefs and Festivals: Vesak celebrates the life and enlightenment of the Buddha.

Sikh Beliefs and Festivals: Sikhs remember the Gurus and teachings through festivals called Gurpurbs. Vaisakhi is especially important because it celebrates the creation of the Khalsa.

<u>Sanctity of Life</u> : The belief that human life is precious and should be protected.
<u>Ahimsa</u> : The belief in avoiding violence and causing as little harm as possible.
<u>Sharia</u> : Islamic guidance based on the Qur'an and Hadith that helps Muslims live according to their faith.
<u>Hadith</u> : Records of the words and actions of the Prophet Muhammad.
<u>Five Precepts</u> : Five basic moral rules that guide how Buddhists should live.
<u>Kosher</u> : Food that follows Jewish dietary laws.
<u>Five Ks</u> : Five special symbols worn by many Sikhs to show commitment to their faith.
<u>Holocaust</u> : The murder of around six million Jewish people and millions of others by Nazi Germany during the Second World War.
<u>Persecution</u> : Treating people unfairly or cruelly because of their beliefs, identity or background.
<u>Reconciliation</u> : Restoring peace and rebuilding relationships after conflict or wrongdoing.
<u>Just War Theory</u> : A set of rules about when going to war can be morally justified.
<u>Philosophy</u> : The study of big questions about life, knowledge, reality and right and wrong.
<u>Metaphysics</u> : The branch of philosophy that studies reality and existence.
<u>Epistemology</u> : The branch of philosophy that studies knowledge and how we know things.
<u>Cosmological Argument</u> : An argument that says the universe must have a first cause, which some believe is God.
<u>Teleological Argument</u> : An argument says order and design of the universe suggest it's created by a designer, believed to be God.
<u>Free Will</u> : The ability to make your own choices.
<u>Soul-making</u> : The idea that suffering can help people develop good qualities such as courage and compassion.
<u>Passover</u> : A Jewish festival remembering the escape of the Israelites from slavery in Egypt.
<u>Yom Kippur</u> : The holiest day in Judaism, focused on asking for forgiveness and making a fresh start.
<u>Hanukkah</u> : A Jewish festival celebrating the rededication of the Temple in Jerusalem.
<u>Diwali</u> : A Hindu festival of light celebrating the victory of good over evil.
<u>Holi</u> : A Hindu festival of colours celebrating spring, joy and community.
<u>Vesak</u> : The main Buddhist festival celebrating the birth, enlightenment and death of the Buddha.
<u>Vaisakhi</u> : An important Sikh festival celebrating the creation of the Khalsa.
<u>Eid al-Fitr</u> : The Muslim festival celebrating the end of Ramadan.
<u>Eid al-Adha</u> : The Muslim festival remembering Ibrahim's willingness to obey Allah.

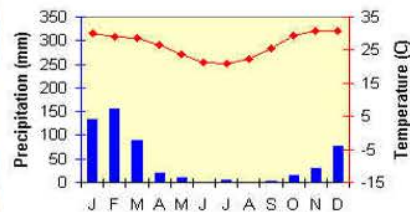
Climate: average weather conditions of a place over a year. Includes **precipitation** in mm & **temperature** in °C.
Weather: Daily conditions in the atmosphere

Weather includes:



Climate graphs

They show the average **monthly precipitation** as a **bar chart** and the average **monthly temperature** as a **line graph**.



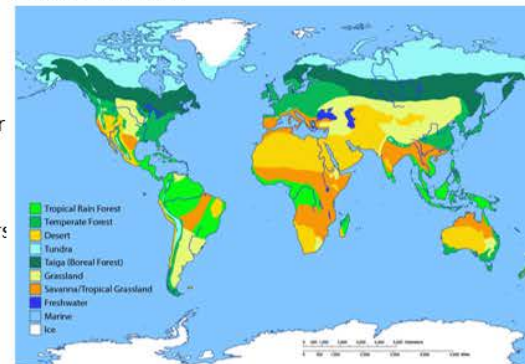
This climate graph shows a hot desert.

The wettest month is February (160 mm) and the hottest months are November and December (31°C)

Latitude: A measurement of location **north or south** of the Equator
Longitude: A measurement of location **east or west** of the prime meridian
Altitude: The **height** above sea level

Destination 1: Life In A Furnace Focus: Hot deserts

Global biomes:



Hot desert location and characteristics

Most hot deserts are found **near the Tropics of Cancer and Capricorn**, between 15-30° north and south of the Equator. The largest hot desert is the **Sahara** in Africa which spans the whole width of the continent.

The climate is very **hot**. Summer daytime temperatures can exceed 40°C. However, at **night** the temperature can drop **below 0°C** due to lack of cloud cover.

Hot deserts are very dry with **less than 250 mm of rainfall a year**.

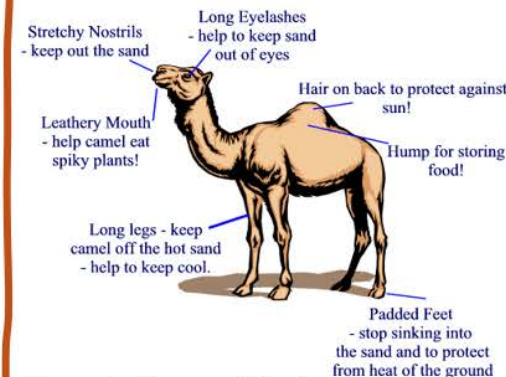
Desert soils are thin, sandy, rocky and generally grey in colour. **Desert soils are very dry**; the surface of the soil may appear crusty.



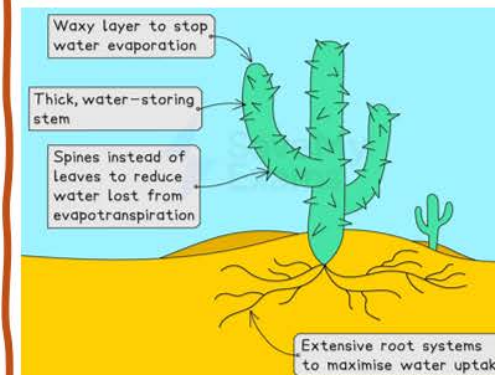
Adaptations

Hot deserts have distinct characteristics that allow certain species with **adaptations** to thrive in such an extreme environment.

Animal adaptations: A Camel



Plant adaptations: A Cactus



Desalination: Removing salt from seawater to make fresh water
Traffic congestion: Traffic jams caused by too many vehicles on the road
Air pollution: Poor air quality from car exhaust fumes
Urban sprawl: The growth of towns and cities into surrounding land

Challenges in Dubai

Encroaching Sands: The city's urban expansion constantly threatens to be swallowed by **shifting dunes**.

Water Scarcity: Receiving **less than 100 mm of rainfall** annually, Dubai lacks natural rivers or freshwater.

Extreme Heat: Summer temperatures routinely exceed 40°C to 50°C.

Opportunities in Dubai

Employment: Dubai is a **tax-free haven** with a rapidly growing population, creating **jobs**.

Tourism: With millions of international visitors, **desert safaris** remain one of the most sought-after experiences

Renewable energy: Dubai has the worlds largest **solar powered desalination plant** and is installing solar powered **air-conditioned bus stops**.

What is globalisation?

Globalisation is the way in which companies, ideas and lifestyles are being spread around the world with increasing ease.

This includes:



Global Trade: the exchange of goods, services, and money across international borders.

Communication: the process of sending and receiving information and ideas.

Culture: shared beliefs, values, customs or behaviours.

Causes of globalisation

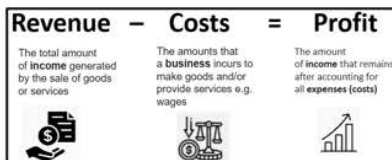
1. Improvements in **transportation** through container ships and cargo planes
2. **Communication** has got easier via the internet and mobile phones
3. International **migration**
4. Faster ways to transfer and store money through **online banking**
5. Reduced **taxes and tariffs** in some countries

Transnational Corporations (TNCs)

They are a **large, profit-seeking business** that has its headquarters in one country but operates production, sales, or facilities in multiple other countries.



TNCs make money by selling their product for higher than it costs to produce/create



Destination 2: Going Global! Focus: Globalisation

The positives and negatives of globalisation

Negatives

- ✗ Globalisation is viewed by many as a **threat to the world's cultural diversity**.
- ✗ There are no guarantees that the wealth from inward investment will benefit the local community.
- ✗ Globalisation operates mostly in the **interests of the richest countries**, which continue to dominate world trade at the expense of developing countries.

Positives

- ✓ The sharing of **ideas, experiences and lifestyles** of people and cultures.
- ✓ Globalisation **increases awareness** of events in faraway parts of the world. For example, the UK was quickly made aware of the 2004 tsunami and sent help rapidly in response.
- ✓ Inward investment by TNCs helps countries by providing **new jobs and skills for local people**.

Sweatshop: a factory with long hours and unpleasant working conditions

Ethical: doing the right thing.

Fast Fashion: mass-producing cheap, trendy clothing to quickly replicate the latest styles



The ethics of sweatshops

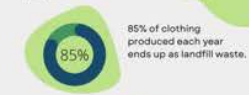
Fast fashion TNCs such as **Primark** and **Shein** use sweatshops to manufacture their clothes at low cost however this is not always ethical. This is because of:

1. **Long working hours** (some shifts are over 10 hours)
2. **Poor conditions**
3. **Low pay** (many workers are paid per item rather than per hour)
4. **Lack of working rights** in place so the workers do not have a say
5. **Pay** not always being awarded on time especially in the first month of employment
6. **High pressure** to produce as much as possible

Environmental Impact of the Fashion Industry

Landfill Waste

On average, every American produces 80lbs. of textile waste per year.



Water

Approximately 1,800 gallons of water are used to produce a pair of jeans, 400 gallons for a cotton shirt.



Pollution

An estimated 8-10% of global carbon emissions are produced by the fashion industry.



Microplastics

35% of ocean microplastic pollution is caused by fibers shed from synthetic fabrics.



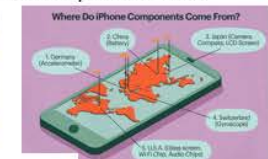
Manufacturing:

the processing of raw materials or parts into finished goods.

Carbon footprint: the amount of carbon dioxide released into the atmosphere because of the activities of a particular individual, organisation, or community.

Manufacturing

Many companies such as Apple **source their materials from multiple countries** so that they can find the cheapest options. Apple also manufacture the components of their iPhones in multiple locations



The impact on the UK

De-industrialisation: The decline of manufacturing industries.



Deindustrialisation in the UK has caused a **change from traditional industries** (coal mining, engineering and manufacturing) to **tertiary and quaternary industry**.

Globalisation has caused manufacturing to **shift to lower income countries** such as Asia because it's cheaper.

Areas in the UK that were previously used for manufacturing started to go into **urban decline** because **people lost their jobs** when the factories closed.

Global environmental issues include:

Climate change - The long-term, large-scale shifts in the Earth's average temperatures and weather patterns.

Air pollution - The contamination of air from the presence of harmful substances.

Water pollution - The contamination of water bodies (like rivers, lakes, oceans, and groundwater) by harmful substances.

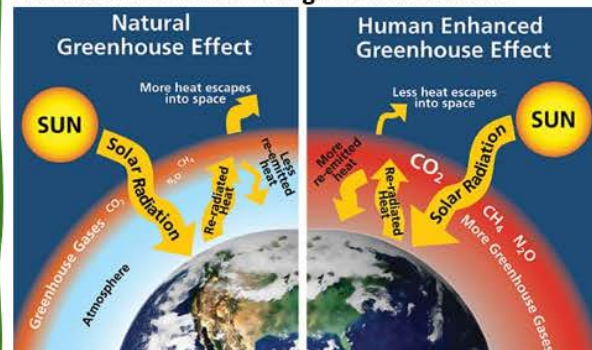
Resource depletion - The consumption of natural resources faster than they can naturally be replenished.

Habitat loss - The destruction, degradation, or fragmentation of a natural environment.

Causes of climate change

Human use of fossil fuels (coal, oil, gas) are increasing the amount of greenhouse gases (CO₂ Methane, Nitrous Oxide etc.) in the atmosphere.

This causes the enhanced greenhouse effect:

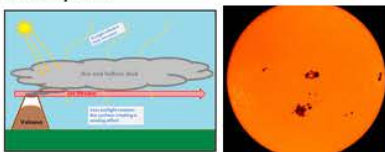


Natural climate change can also be caused by:

1) **Variations in the Earth's orbit** – Orbital/Milankovitch cycles

2) **Volcanoes**

3) **Sunspot activity**



Destination 3: An Amazon Adventure Focus: Tropical Rainforests

Ecosystems and environmental issues

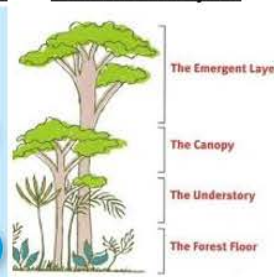
Ecosystems are very delicate because many of the plants and animals are **interdependent**. For example, if a farmer uses pesticides to kill all the grasshoppers in this food web the frogs and birds will also die.



The location of the Amazon

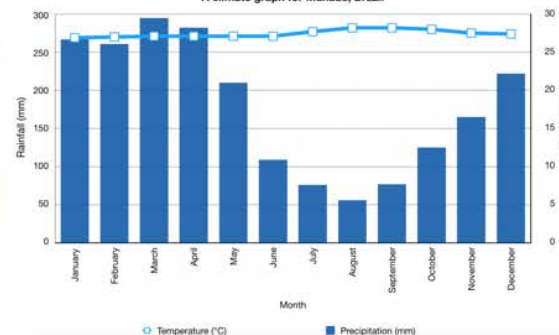


Rainforest layers



The climate of the Amazon

A climate graph for Manaus, Brazil



The importance of Tropical Rainforests

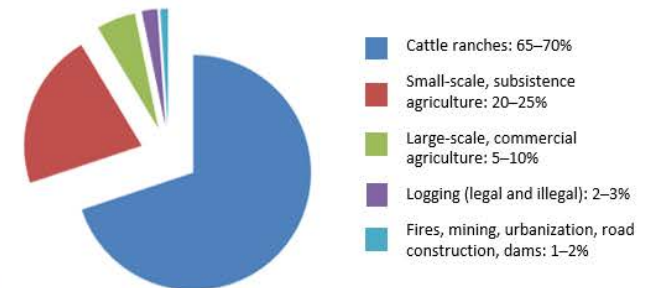
Climate Regulation: Rainforests act as massive carbon sinks.

Oxygen Production: They generate a significant proportion (over 25%) of the world's oxygen through photosynthesis.

Biodiversity: They house over half of all the world's plant and animal species.

Medicine: About 25% of modern medicines originate from tropical forest plants.

Causes of deforestation in the Amazon rainforest



Stakeholders in favour of deforestation in the Amazon

The rural poor – They need to use the land to generate an income.

Foreign companies – They provide jobs and want to make a profit from the land.

The World Bank – They support the economic development of countries and growth of businesses.

Stakeholders against deforestation in the Amazon

Indigenous people – They want to protect the land because they live there.

Environmental groups – They want to protect local habitats.

Ecotourism: Responsible travel to natural areas that conserves the environment

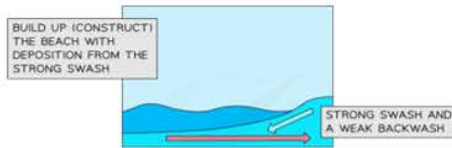
Selective logging: Loggers carefully select and cut only individual trees

Waves and Tides

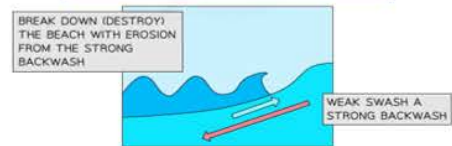
- Waves** form due to wind blowing over water
- Fetch** = distance wind blows over water. Stronger winds + longer fetch = bigger waves
- Swash** = water moves up beach
- Backwash** = water moves down beach
- Spring tide** = largest tidal range
- Neap tide** = smallest tidal range

WAVE TYPES

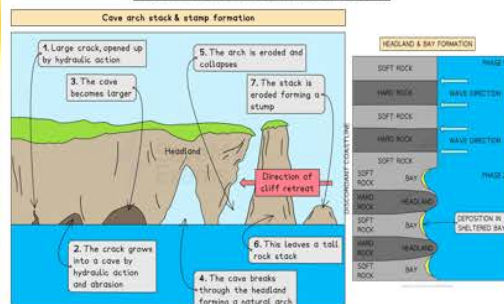
CONSTRUCTIVE WAVES HAVE A LOWER WAVE HEIGHT



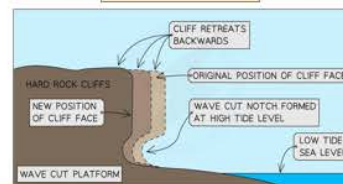
DESTRUCTIVE WAVES HAVE A HIGHER WAVE HEIGHT



Coastal landforms (Erosional)



CLIFF AND WAVE CUT PLATFORM



- Headlands & bays** = alternating hard/soft rock
- Wave-cut platform** = flat rock at base of cliff
- Caves** → **arches** → **stacks** → **stumps** (erosion sequence)

Destination 4: Off to the Coast!

Key terms: Coast, fetch, swash, backwash, erosion, deposition, longshore drift, headland, bay, stack, arch, cave, stump, spit, geology, tides, constructive, destructive, groynes, sea wall, sustainable, stakeholder

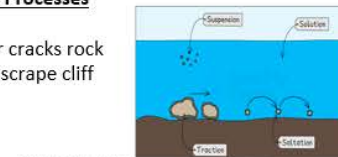
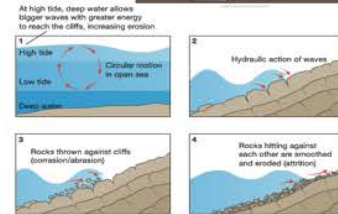
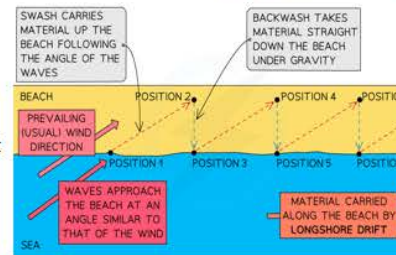
Coastal Processes

Erosion (wearing away):

- Hydraulic action** = force of water/air cracks rock
- Abrasion/Corrasion** = rock particles scrape cliff
- Attrition** = rocks collide and break
- Solution** = rock dissolves in water

Transportation:

- Suspension** = lighter material floats within the water
- Traction** = larger rocks roll along the sea-bed
- Solution** = some material, such as chalk, gets dissolved into the water
- Saltation** = smaller rocks, if they are too heavy to be suspended, hop along the sea-bed
- Longshore Drift (LSD)** = Sediment moves along coast in zig-zag

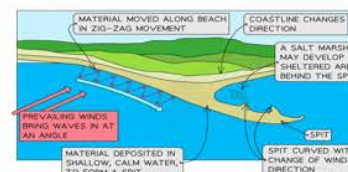


Deposition:

- Occurs when waves lose **energy** → Creates beaches, spits

Coastal landforms (Depositional)

- Spit** – narrow ridge of sand (e.g. Spurn Head)
- Bar / tombolo** – connects land areas
- Beach** – zone of deposited material, formed by constructive wave



Case Study: Holderness Coast



Location: East Yorkshire (North Sea)
One of fastest eroding coastlines in Europe

Why erosion is rapid: Soft boulder clay, strong waves (long fetch across North Sea), little protection

Impacts:

Social: homes at risk
Economic: property & land loss
Environmental: habitat loss
Example: Mableton - coastal defences protect village BUT increase erosion further down coast (conflict)

Case Study: Jurassic Coast

Location: South coast of England.
Named due to geological history (rock layers)



Key features:

- Old Harry Rocks (**stack**)
- Durdle Door (**arch**)
- Lulworth Cove (**cove**)

Why unique: Different rock types → varied landforms

Coastal Management: Hard vs. soft engineering

(HE) Sea Walls: (+) sense of security, last for many years (-) £5,000 a metre, ugly to look at
(HE) Groynes: (+) act as windbreaks, stops long-shore drift, £5,000 per groyne (-) restrict sediment supply down the coast and can increase erosion rates
(HE) Gabions: (+) £110 a metre, last 20 to 25 years (-) dangerous when damaged, damages sea birds' feet
(HE) Rock Armor: (+) £1,000 a metre, quick and easy to complete (-) makes access to the beach difficult, rocks imported and inflates the costs.
(SE) Beach nourishment: (+) wider beach means more room for users protects coastal properties, (-) costs £300,000 to hire a dredger, needs to be repeated
(SE) Beach profiling: (+) protects a large area of land (-) bulldozers restrict access to the beach, £200,000 a year
(SE) Sand Dune Regeneration: (+) sand dunes protect land, small planting projects use volunteer labour (-) has to be checked using twice a year, sand dunes change naturally
Sustainable management = Balance between: environment; economy; people.

Key Issues & Conflict: Different stakeholders (residents, government, tourists) Protection in one area can increase erosion elsewhere → Last groyne syndrome. **Debate:** Should all coasts be protected?



War and Revolution in the 20th Century

Terms 1 and 2: How did Europe go to war in 1914?

Key term	Definition
Standing army	A permanent, full-time military force.
Cavalry	Soldiers who fight while riding horses.
Coalition	When two or more different people, groups, or countries team up temporarily to achieve a shared goal
Treaty	A written agreement between two or more countries commonly to end a war.
Militarism	When a country believes its military should be powerful and always prepared to fight.
Triple Alliance	Alliance made up of Germany, Austria-Hungary and Italy.
Entente	Alliance made up of Britain, France and Russia.
Imperialism	When a powerful nation takes control of other lands or countries to build a larger empire.
Nationalism	A strong feeling of pride, love, and loyalty to one's country.
Balkans	A large region in southeastern Europe largely controlled by Austria-Hungary up to 1918.
Ultimatum	A final warning/demand
July crisis	A tense, month-long period of panic and threats between countries after the assassination of Archduke Franz Ferdinand, ultimately pulling all of Europe into a massive war.
Schlieffen Plan	German war plan to invade France through Belgium.
World War One	A global war that lasted from 1914 to 1918.
Propaganda	Information that is specially designed to persuade you to feel, believe, or act a certain way.
Trenches	Long, narrow ditches dug into the ground for soldiers to live and fight in during WWI.
No man's land	The dangerous land in between two enemy trenches.
Chemical warfare	The use of poisonous or harmful chemical compounds as weapons to hurt or kill people e.g. poisonous gas.
Tanks	A heavy, armoured combat vehicle.
Armistice	An agreement between two fighting sides to stop fighting.

Napoleonic Wars 1803-15			The First World War (1914-18)								
1805	1815	1870-71	July 1914	4 August 1914	April-May 1915	July-November 1916	6 April 1917	November 1917	March 1918	August-November 1918	11 November 1918
The Battle of Trafalgar	The Battle of Waterloo	The Franco-Prussian War	The Assassination of Archduke Franz Ferdinand	Germany invades Belgium	The Second Battle of Ypres	The Battle of the Somme	The USA enters the War	The November Revolution	The Treaty of Brest-Litovsk	One Hundred days Offensive	Armistice

Term 3 and 4: Why did the Second World War happen?

Key term	Definition
Tsar	The Russian Emperor before the Russian Revolution of 1917
Communism	Political system where everything is owned and controlled by the government.
Bolsheviks	Communist revolutionary party led by Lenin.
Vladimir Lenin	Leader of the Bolsheviks
Dictatorship	Form of government where all the power is held by a single person or small group of people
The Treaty of Brest-Litovsk	A harsh peace agreement that officially ended Russia's involvement in World War I.
The Treaty of Versailles	Treaty imposed on Germany in June 1919 that heavily weakened Germany's economy and military power. It was created by Britain, France and the USA.
Reparations	Money losing side in a war has to pay to the victorious side.
Adolf Hitler	The Fuhrer (leader) of Germany from 1933 to 1945.
The Great Depression	A massive economic crisis in 1929 that led to businesses closing and millions losing jobs. Germany was hit the worst.
Fascism	A strict system of government where one powerful leader has total control.
Nazis	Group in Germany who believed that the Germans were the superior race and Jews were inferior.
Benito Mussolini	Fascist leader of Italy 1922-43.
Joseph Stalin	Communist leader of the USSR (Russia) 1924-53.
Anschluss	Unification of Germany and Austria.
Nazi-Soviet Pact	Agreement signed between Germany and the USSR to (secretly) divide up Poland.
The League of Nations	Organised founded in 1919 to deal with international disputes and prevent war.
Abyssinian Crisis	Italian invasion of Abyssinia (modern-day Ethiopia) that exposed the weakness of the League of Nations.
Manchurian Crisis	Japanese invasion of Manchuria that exposed the weaknesses of the League of Nations.
Appeasement	British policy of giving into German demands to avoid a potential conflict.
Munich Conference	British agreement, led by Neville Chamberlain, to agree to give the Sudetenland (part of Czechoslovakia) to the Germans

Causes of the Second World War (1919-39)

Jun 1919	October 1922	1924	October 1929	September 1931 – March 1933	30 January 1933	October 1935 – July 1936	March 1936	March 1938	30 September 1938	23 August 1939	1 September 1939	3 September 1939
The Treaty of Versailles	Mussolini becomes leader of Italy.	Stalin becomes leader of the USSR.	The Great Depression	Manchurian Crisis	Hitler becomes Chancellor of Germany	Abyssinian Crisis	Remilitarisation of the Rhineland	Anschluss	Munich Conference	Nazi-Soviet Pact	Germany invades Poland	Britain declares war on Germany.



Term 5 and 6: How did the Second World War change the world?

Key term	Definition
Allied powers	Initially alliance between Britain and France but expanded by the USA and the USSR
Axis powers	Alliance of Germany, Italy and Japan.
Blitzkrieg	German military tactic designed to achieve quick, decisive victory through overwhelming, sudden force.
Battle of Britain	Battle between British and German air forces that resulted in a British victory.
Operation Barbarossa	German invasion of the USSR.
Lebensraum	German idea of expanding into Eastern Europe.
Stalingrad	Russian city that was a turning point in the war.
Pearl Harbour	US navy base attacked by the Japanese that resulted in USA entry into WWII.
Operation Overlord (D-Day)	Allied invasion of France to get allied troops back into Europe.
The Atomic Bomb	The most powerful and destructive type of bomb ever created. It was dropped on Japan and ended the Second World War.
The Holocaust	Means a destruction or slaughter on a mass scale. This is used to describe the murder of 6 million Jews during WWII by the Nazis.
Antisemitism	Hatred towards Jews.
Kristallnacht	A mass attack on Jewish businesses and Synagogues in 1938 ordered by the Nazi leadership.

Key term	Definition
Final Solution	How the Nazis referred to the elimination of Jews in Europe.
Wannsee Conference	Meeting between leading Nazi officials where they decided to murder Europe's Jews.
Concentration Camps	A camp where Jews were held during WWII. They would commonly be murdered in these camps.
Ghettos	Closed off parts of a city/town where Jews were sent to.
Passive resistance	non-violent opposition to authority, especially a refusal to cooperate
Active resistance	The use of actions, sometimes including violence, to show that you oppose something.
Perpetrator	Someone who carries out an illegal or harmful act.
Bystander	Someone who is present but not taking part in a situation.
SS	A major paramilitary organization in Nazi Germany led by Heinrich Himmler.
Armenian Genocide	The campaign of deportation and mass extermination of Armenian subjects of the Ottoman Empire during World War I.
Cambodian Genocide	Persecution and mass murder of Cambodian citizens by the Khmer Rouge regime, led by Pol Pot, between 1975 and 1979.
Shah of Iran	Title given to the monarch of Iran.
Iranian Revolution	A widespread 1978–1979 popular uprising that overthrew the Western-backed, autocratic monarchy of Shah Mohammad Reza Pahlavi.
Iranian Hostage Crisis	A 444-day international standoff where a group of militant Iranian students seized the U.S. Embassy in Tehran

The Second World War and the Holocaust (1939-45)

22 June 1940	May-June 1940	July-October 1940	22 June 1941	07 December 1941	30 January 1942	01 April 1942	Jul 1942-Feb 1943	06 June 1944	April-May 1945	08 May 1945	6-9 August 1945	14 August 1945	20 November 1945 - 1 October 1946
Surrender of France	Dunkirk evacuation	The Battle of Britain	Operation Barbarossa	Pearl Harbour	Wannsee Conference	Auschwitz-Birkenau begins mass murder of Jews	The Battle of Stalingrad	D-Day landings	The Battle of Berlin	German surrender (VE Day)	Dropping of the atomic bomb	Japanese surrender	Nuremberg trial – many leader Nazis are convicted for crimes against humanity

Historical skills terminology

Key term	Definition
Primary source	Account or object produced by someone who experienced the event or era being studied
Interpretations	Different ways in which history has been understood and presented
Significance	The evaluation of the importance of events and people in history
Chronology	The order in which events took place
Inference	'Reading between the lines' of evidence to draw a conclusion

The Iranian Revolution (1941-81)

01 September 1941	January-February 1979	November 1979-January 1981	03 December 1979
Muhammad Reza Pahlavi becomes the Shah of Iran	The Iranian Revolution	The Iranian Hostage Crisis	Ayatollah Ruhollah Khomeini becomes the Supreme leader of Iran

Take it further

Read	Watch
<i>Times History of the Twentieth Century</i> by R J Overy	<i>Horrible Histories</i>
<i>The Diary of a Young Girl</i> by Anne Frank	<i>War Horse</i> (2011) 12A
<i>The Book Thief</i> by Markus Zusak	<i>Dunkirk</i> (2017) 12A
<i>Bomb: The Race to Build—and Steal—the World's Most Dangerous Weapon</i> by Steve Sheinkin	<i>The Boy in the Striped Pyjamas</i> (2008) 12A
	<i>Imitation Game</i> (2014) 12A
	<i>Life Is Beautiful</i> (1997) 12A
Listen	Do
History Hit podcast	Join History Club
Homeschool History Podcast (BBC)	Visit the Imperial War Museum



Animation using Blender

Model → Keyframe → Render

Aim: create simple 3D animations by controlling objects, cameras, lighting and movement over time.

Key vocabulary

Blender: 3D modelling and animation software.

Object: Item in a 3D scene.

Mesh: Shape made from vertices, edges and faces.

Vertex: Point in 3D space.

Axis: X, Y or Z direction.

Transform: Move, rotate or scale.

Timeline: Shows frames in an animation.

Frame: Single still image in a sequence.

Keyframe: Saved value at a chosen frame.

Interpolation: How movement changes between keyframes.

Camera: View used for the final render.

Render: Exported image or animation.

Core knowledge

- Animation creates the illusion of movement by showing many frames quickly.
- Blender uses 3D coordinates: X, Y and Z.
- Keyframes store properties such as location, rotation and scale.
- Blender calculates movement between keyframes using interpolation.
- Materials, lighting and camera position affect how professional the final render looks.

Watch out for...

- Forgetting to insert a keyframe after changing an object.
- Moving objects on the wrong axis.
- Objects hidden from the camera or outside the frame.
- Too many unnecessary objects can make scenes slow.
- A good animation needs timing and clarity, not just movement.

Use these skills

- Navigate the viewport using orbit, pan and zoom.
- Use move, rotate and scale accurately on the correct axis.
- Insert keyframes to animate location, rotation or scale.
- Preview animation on the timeline and refine timing.
- Set camera view, lighting and render settings before exporting.

Retrieval check

1. What is a keyframe?
2. Name the three 3D axes.
3. What does render mean?
4. Why is the camera important?
5. What does interpolation control?

Essential takeaway: Effective Blender animation depends on precise transforms, clear keyframes and purposeful timing.

Digital Image Manipulation with Photoshop

Edit non-destructively

Aim: manipulate raster images for a clear purpose while preserving quality, meaning and originality.

Key vocabulary

Raster image: Image made from pixels.

Pixel: Smallest unit of a bitmap image.

Resolution: Pixel detail in an image.

Layer: Separate editable part of an image.

Mask: Hides or reveals part of a layer.

Selection: Area chosen for editing.

Crop: Remove unwanted edges.

Transform: Resize, rotate, skew or distort.

Adjustment: Changes colour, brightness or contrast.

Opacity: How transparent a layer is.

Clone/heal: Copy or repair parts of an image.

Export: Save in a suitable final format.

Core knowledge

- Photoshop edits raster images, so quality depends on pixels and resolution.
- Layers let you combine and edit image parts separately.
- Masks and adjustment layers support non-destructive editing.
- File types matter: PSD keeps layers; PNG supports transparency; JPG is compressed.
- Image manipulation should consider audience, purpose and ethics.

Watch out for...

- Stretching images changes proportions and looks unprofessional.
- Low-resolution images become pixelated when enlarged.
- Over-editing can make images unrealistic or misleading.
- Flattening too early removes future editing options.
- Copyright still applies to images found online.

Use these skills

- Use layers with clear names and order.
- Select, crop, transform and align image elements accurately.
- Use masks instead of permanently deleting pixels.
- Adjust brightness, contrast, colour and saturation carefully.
- Export in the correct file type, size and resolution for the task.

Retrieval check

1. What is a pixel?
2. Why are layers useful?
3. What is the benefit of a mask?
4. Which file type keeps Photoshop layers?
5. Why can image manipulation be an ethical issue?

Essential takeaway: Strong image editing is accurate, purposeful and non-destructive, with attention to quality and ethics.



Programming with Python

Think → Code → Test

Aim: solve problems using readable Python programs with variables, data types, selection and iteration.

Key vocabulary

Program: Instructions a computer follows.

Algorithm: Step-by-step solution.

Variable: Named storage for a value.

Data type: Kind of value, e.g. int, float, str, bool.

Input: Data entered by the user.

Output: Data displayed by the program.

Operator: Symbol such as +, -, *, / or ==.

Selection: Decision using if / elif / else.

Iteration: Repetition using for or while.

Condition: True/false test.

Syntax error: Code breaks language rules.

Logic error: Code runs but gives the wrong result.

Core knowledge

- Python instructions run in sequence unless controlled by selection or iteration.
- Variables store data that can change while a program runs.
- Input from a user is usually a string until it is converted.
- Selection uses conditions to choose different paths.
- Iteration repeats code efficiently and reduces duplication.

Watch out for...

- Indentation is part of Python syntax.
- = assigns a value; == checks equality.
- input() returns text, even when the user types a number.
- Infinite loops happen when a while condition never becomes false.
- A working program still needs testing and explanation.

Use these skills

- Write clear variable names and readable code.
- Use print() and input() for basic interaction.
- Convert data types using int(), float() or str() when needed.
- Use if, elif and else for decisions.
- Test with normal, boundary and unusual values, then debug systematically.

Retrieval check

1. What is a variable?
2. What does input() return?
3. What is the difference between = and ==?
4. Name two types of loop.
5. What is a logic error?

Essential takeaway: Good Python programming starts with a clear algorithm and improves through testing and debugging.

Data Analytics and Manipulation through Access

Store → Query → Report

Aim: organise data in a database and use queries to find, sort, filter and present useful information.

Key vocabulary

Database: Organised collection of data.
 Table: Data stored in rows and columns.
 Record: One row about one item.
 Field: One column/category of data.
 Data type: Format such as text, number, date/time or yes/no.
 Primary key: Unique identifier for a record.
 Query: Search or manipulation of data.
 Criteria: Rules used to filter results.
 Sort: Put data into an order.
 Form: User-friendly way to enter data.
 Report: Formatted output for presentation.
 Validation: Rules that reduce incorrect data.

Core knowledge

- Access stores structured data in tables.
- Accurate fields, data types and primary keys make data easier to analyse.
- Queries can select fields, filter records, sort results and calculate values.
- Forms improve data entry; reports help present findings.
- Poor data quality leads to unreliable conclusions.

Watch out for...

- A database is not just a spreadsheet; it is structured for storage and querying.
- Inconsistent spelling or formats can ruin analysis.
- Text and number fields behave differently in criteria.
- Sorting changes display order, not the original meaning of the data.
- Findings need evidence from the query results.

Use these skills

- Create tables with appropriate field names and data types.
- Set a primary key to identify each record uniquely.
- Use query design to choose fields, add criteria and sort data.
- Use comparison operators such as =, >, < and Like.
- Present results clearly using forms, reports, charts or summaries.

Retrieval check

1. What is a record?
2. What is a field?
3. Why is a primary key useful?
4. What does a query do?
5. Give one example of a data validation rule.

Essential takeaway: Useful data analysis depends on accurate data structure, sensible queries and clear interpretation.



The Impact of Technology in Society

Benefits, risks & choices

Aim: evaluate how technology affects people, organisations, communities and the environment.

Key vocabulary

Stakeholder: Person or group affected by a decision.

Automation: Technology carrying out tasks with little human input.

Artificial intelligence: Systems that appear to make intelligent decisions.

Privacy: Control over personal information.

Surveillance: Monitoring people or activity.

Misinformation: False or misleading information.

Digital divide: Gap in access to technology.

Accessibility: Technology usable by people with different needs.

E-waste: Discarded electronic devices.

Carbon footprint: Greenhouse gas impact.

Intellectual property: Legal rights over creations.

Cyberbullying: Online harassment or abuse.

Core knowledge

- Technology can improve communication, learning, creativity, healthcare and productivity.
- It can also create risks around privacy, wellbeing, misinformation, inequality and the environment.
- Impacts differ between stakeholders, so answers should be balanced.
- AI and automation can change jobs, skills and decision-making.
- Responsible technology use includes legal, ethical and environmental choices.

Watch out for...

- New technology is not automatically good or bad.
- Online content can spread quickly even when it is wrong.
- Convenience may come at the cost of privacy.
- Not everyone has equal access to devices, connectivity or support.
- Environmental impact includes manufacture, energy use and disposal.

Use these skills

- Identify stakeholders affected by a technology.
- Explain both positive and negative impacts with examples.
- Separate fact, opinion and misinformation.
- Suggest ways to reduce harm, such as privacy settings, reporting, accessibility and recycling.
- Evaluate: give a justified judgement rather than a one-sided description.

Retrieval check

1. What is a stakeholder?
2. Give one positive impact of automation.
3. Give one risk linked to AI or social media.
4. What is the digital divide?
5. Name one way to reduce e-waste.

Essential takeaway: Strong digital citizens consider evidence, stakeholders and consequences before judging technology.

Developing Comics using Canva

Story + layout + design

Aim: create a clear comic by combining narrative structure, visual hierarchy, typography and copyright-aware assets.

Key vocabulary

Comic: Story told through sequential images and text.

Panel: Individual box or scene.

Gutter: Space between panels.

Storyboard: Plan showing scenes in order.

Caption: Text box giving narration or context.

Speech bubble: Shape showing dialogue.

Thought bubble: Shape showing internal thought.

Visual hierarchy: Design that guides attention.

Typography: Design and choice of text.

Template: Pre-made layout.

Asset: Image, icon, shape or graphic used in a design.

Export: Save or download the finished product.

Core knowledge

- Comics use panels in sequence to control pace and meaning.
- Canva supports layout, image placement, typography, colour and export.
- Good design choices make the story easy to follow.
- Audience and purpose influence tone, style and content.
- Assets should be appropriate, credited where needed and used legally.

Watch out for...

- Too much text makes a comic hard to read.
- Inconsistent fonts and colours weaken the design.
- Crowded panels reduce clarity.
- Templates are starting points, not finished work.
- Images found online may be protected by copyright.

Use these skills

- Plan a beginning, middle and end using a storyboard.
- Arrange panels so the reader follows the story in the correct order.
- Use consistent colours, fonts and character style.
- Use speech bubbles, captions and images to show action clearly.
- Export in a suitable format such as PNG, JPG or PDF.

Retrieval check

1. What is a storyboard?
2. What is a panel?
3. Why is the gutter useful?
4. What does visual hierarchy mean?
5. Why should you check the rights of images?

Essential takeaway: A successful Canva comic combines clear storytelling with controlled layout, readable text and legal use of assets.

Fractions, Decimals and Percentages Review

Key Terms	Fraction	A part of a whole number, written as one integer on top of another separated by a line
	Percentage	A proportion or fraction expressed as a number of parts per hundred
	Numerator	The top number in a fraction
	Denominator	The bottom number in a fraction
	Improper fraction	A fraction where the numerator is larger than or equal to the denominator
	Mixed number	A value made up of a whole number and a proper fraction combined
	Equivalent	Having the exact same value or size, even if written in a different way

Key Skills	Convert between fractions, decimals and percentages
	Calculate with fractions, decimals and percentages
	Compare values
	Multiply and divide using fractions, decimals and percentages
	Add and subtract with fractions, decimals and percentages

Probability

Key Terms	Probability	Chance from 0 to 1
	Outcome	Result
	Event	A subset of outcomes
	Sample Space	All possible outcomes
	Relative Frequency	The proportion of times a specific event happens during a real-life trial or experiment
	Experimental Probability	Another name for relative frequency
	Theoretical Probability	The mathematical chance of an event happening. What we expect to happen without actually doing the experiment.

Key Skills	Calculate probabilities of single and combined events
	Construct and interpret probability trees
	Construct and interpret sample space diagrams
	Construct and interpret two way tables
	Compare experimental and theoretical probabilities

Sets and Venn Diagrams

Key Terms	Union	Values that are in set A or B or both A and B
	Intersection	Values that are in set A and B
	Complement	Not in the set
	Universal set	All values
	$\cap$	Intersection
	$\cup$	Union

Key Skills	Construct and interpret Venn diagrams
	Calculate probabilities from set notation and Venn Diagrams
	Solve problems using sets and Venn Diagrams

Simultaneous Equations

Key Terms	Elimination	Remove variable by adding or subtracting equations
	Substitution	Replace one variable with a different one
	Solution	Values that satisfy an equation
	Intersection	Where two or more lines meet
	Parallel	Lines that are a fixed distance apart and will never meet

Key Skills	Solve linear equations
	Find equivalent equations by manipulating equations
	Solve simultaneous equations by elimination
	Solve simultaneous equations by substitution
	Solve simultaneous equations by rearranging first
	Plot graphs from the form $y=mx+c$
	Find intersections of two lines
	Find the area of enclosed regions



Angle Facts

Key Terms	Angle	Measure of turn
	Acute angle	Angles smaller than 90 degrees
	Right angle	90 degree angle
	Obtuse angle	Angles that are larger than 90 degrees and less than 180 degrees
	Reflex angle	Angles that are larger than 180 degrees and less than 360 degrees
	Polygon	Closed 2D shape with only straight edges
	Regular polygon	A polygon with all sides and angles equal

Key Facts	Corresponding angles	Are equal
	Alternate angles	Are equal
	Co-interior angles	Sum to 180°
	Vertically opposite angles	Are equal
	Angles on a straight line	Sum to 180°
	Angles around a point	Sum to 360°
	Interior angles in a polygon	Sum to $(n-2) \times 180^\circ$
	Exterior angles	Sum to 360°

Key Skills	Find missing angles in polygons
	Explain and justify your reasoning using mathematical notation
	Find missing angles on parallel lines
	Solve problems involving angles

Construction, Congruence and Loci

Key Terms	Perpendicular	At right angles
	Bisector	To cut in half
	Congruence	Identical (the same shape and size)
	Loci	The position of points that satisfy a condition
	Equidistant	An equal distance from a point

Key Skills	Accurate use of compasses for drawing circles and arcs
	Construct perpendicular bisectors
	Construct angle bisectors
	Construct triangles
	Construct angles
	Use congruence in geometric proofs

Pythagoras' Theorem

Key Terms	Hypotenuse	The longest side of a right angled triangle
	Right angle	90°

Key Facts	Pythagoras' Theorem	$a^2 + b^2 = c^2$ where c is the hypotenuse
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Key Skills	Use Pythagoras' Theorem to find missing sides of triangles	
	Use Pythagoras' Theorem in non-right angles triangles	
	Use Pythagoras' Theorem to prove that a triangle is right angled	
	Solve problems using Pythagoras' Theorem in 2D and 3D	

Ratio

Key Terms	Ratio	A way to compare the sizes of two or more quantities showing how many times larger one value is than another
	Proportionality	The relationship between two variables where they change at a constant rate relative to each other
	Equivalent ratio	Ratios that look different but express the exact same relationship between the quantities
	Unit ratio	A ratio written in the form 1 to n or n to 1 where one of the values is exactly 1

Key Skills	Solve problems with ratios	
	Use ratio tables	
	Share in a ratio	
	Use proportional reasoning to solve problems	

Similarity and Enlargement

Key Terms	Similar	Same shape but different size or orientation
	Congruent	Same shape and size
	Scale factor	How many times larger one object is than another
	Centre of Enlargement	The point from which an object is enlarged

Key Skills	Carry out enlargements	
	Identify similar shapes	
	Calculate scale factors	
	Solve problems involving similarity	
	Find an area scale factor from a length scale factor	



Surds and Indices

Key Terms	Rational Number	Any number that can be written as a fraction
	Irrational Number	Any number that cannot be written as a fraction. A non-repeating, non-recurring decimal
	Surd	A number expressed as a square root that cannot be written as a whole number
	Index	A power (plural is indices)
	Base	The number that is raised to a power

Key Skills	Use laws of indices
	Understand 0 and negative indices
	Understand roots as the inverse of indices
	Simplify expressions using laws of indices
	Simplify surds
	Express numbers in standard form

Growth and Decay

Key Skills	Use decimal multipliers to increase and decrease values
	Apply repeated percentage changes
	Understand compound interest
	Represent growth and decay graphically
	Solve reverse percentage change problems

Trigonometry

Key Terms	Hypotenuse	The longest side of a right angles triangle
	Opposite	The side opposite a given angle
	Adjacent	The side next to a given angle
	Sine	$\text{opposite} \div \text{hypotenuse}$
	Cosine	$\text{adjacent} \div \text{hypotenuse}$
	Tangent	$\text{opposite} \div \text{adjacent}$

Key Skills	Use trigonometry to find missing sides
	Use trigonometry to find missing angles
	Choose between trigonometry and Pythagoras when solving problems
	Solve problems involving triangles

Quadratics

Key Terms	Quadratic	An expression or equation where the highest power is squared
	Parabola	A smooth, symmetrical U-shaped curve that you get when you graph a quadratic equation like $y = x^2$
	Rearrange	To change the subject of an equation
	Substitute	To replace a variable with a known value
	Expand	Multiply out brackets
	Factorise	To reverse the process of expanding brackets

Key Skills	Substitute values into quadratic expressions
	Plot quadratic graphs
	Read from quadratic graphs
	Expand double and triple brackets

KEY VERBS — present · near future · perfect · Les verbes

MANGER · to eat

regular -ER verb (+ avoir)

Présent	Futur proche	Passé composé
je mange	je vais manger	j'ai mangé
tu manges	tu vas manger	tu as mangé
il/elle mange	il/elle va manger	il/elle a mangé
nous mangeons	nous allons manger	nous avons mangé
vous mangez	vous allez manger	vous avez mangé
ils/elles mangent	ils/elles vont manger	ils/elles ont mangé

AVOIR · to have

irregular (+ avoir, p.p. eu)

Présent	Futur proche	Passé composé
j'ai	je vais avoir	j'ai eu
tu as	tu vas avoir	tu as eu
il/elle a	il/elle va avoir	il/elle a eu
nous avons	nous allons avoir	nous avons eu
vous avez	vous allez avoir	vous avez eu
ils/elles ont	ils/elles vont avoir	ils/elles ont eu

ÉTUDIER · to study

regular -ER verb (+ avoir)

Présent	Futur proche	Passé composé
j'étudie	je vais étudier	j'ai étudié
tu étudies	tu vas étudier	tu as étudié
il/elle étudie	il/elle va étudier	il/elle a étudié
nous étudions	nous allons étudier	nous avons étudié
vous étudiez	vous allez étudier	vous avez étudié
ils/elles étudient	ils/elles vont étudier	ils/elles ont étudié

ALLER · to go

irregular — uses ÊTRE (agreement!)

Présent	Futur proche	Passé composé
je vais	je vais aller	je suis allé(e)
tu vas	tu vas aller	tu es allé(e)
il/elle va	il/elle va aller	il/elle est allé(e)
nous allons	nous allons aller	nous sommes allé(e)s
vous allez	vous allez aller	vous êtes allé(e)s
ils/elles vont	ils/elles vont aller	ils/elles sont allé(e)s

MRS VANDERTRAMP — verbs that take ÊTRE in the passé composé (read each column downwards)

M	monter to go up	E	entrer to enter
R	rester to stay	R	retourner to return
S	sortir to go out	T	tomber to fall
V	venir to come	R	rentrer to go back home
A	aller to go	A	arriver to arrive
N	naître to be born	M	mourir to die
D	descendre to go down	P	partir to leave

How it works: These (mostly movement) verbs use **être** not **avoir**. The past participle agrees with the subject: **il est allé · elle est allée · ils sont allés · elles sont allées**. All reflexive verbs (se laver, etc.) also use **être**.



SCHOOL · L'école / le collège

les maths maths	le français French	l'anglais English	les sciences science	l'histoire-géo history & geog.
l'EPS PE	la technologie DT	le dessin art	les devoirs homework	un(e) prof teacher
une matière subject	la cantine canteen	la récré break	l'emploi du temps timetable	la salle de classe classroom

TECHNOLOGY · La technologie

le portable mobile phone	l'ordinateur computer	la tablette tablet	Internet internet	les réseaux sociaux social media
une appli app	un jeu vidéo video game	un site web website	télécharger to download	en ligne online
un mot de passe password	un casque headphones	envoyer un texto to text	partager to share	surfer sur Internet to surf the net

HOLIDAYS · Les vacances

les vacances holidays	la plage beach	la mer sea	la montagne mountains	à l'étranger abroad
un hôtel hotel	un camping campsite	l'avion plane	le train train	la valise suitcase
le passeport passport	nager to swim	bronzer to sunbathe	visiter to visit	faire du tourisme to sightsee

THE ENVIRONMENT · L'environnement

l'environnement environment	la pollution pollution	recycler to recycle	le recyclage recycling	les déchets waste/rubbish
le réchauffement climatique global warming	trier to sort	gaspiller to waste	économiser to save	les transports en commun public transport
protéger to protect	la planète planet	une poubelle bin	le plastique plastic	durable sustainable

WHERE I LIVE · Où j'habite

j'habite à... I live in	une ville town/city	un village village	à la campagne in the countryside	au bord de la mer at the seaside
le centre-ville town centre	la banlieue suburbs	un quartier neighbourhood	une maison house	un appartement flat
la gare station	le marché market	un magasin shop	animé lively	tranquille quiet

OPINIONS · Les opinions

Opinion phrases	Opinion verbs	Opinion adjectives	
à mon avis — in my opinion	j'aime — I like	c'est génial — it's great	c'est nul — it's rubbish
je pense que — I think that	j'adore — I love	c'est intéressant — it's interesting	c'est ennuyeux — it's boring
je trouve que — I find that	je n'aime pas — I don't like	c'est amusant — it's fun	c'est fatigant — it's tiring
	je déteste — I hate	c'est super — it's great	c'est difficile — it's hard
	je préfère — I prefer	c'est facile — it's easy	

SUBJECTS & OPINIONS · 科目和意见

虽然 suīrán although	有用 yǒuyòng useful	交朋友 jiāo péngyou make friends
但是 dànshì but	没用 méiyòng useless	音乐 yīnyuè music
有意思 yǒu yìsi interesting	我最喜欢的 wǒ zuì xǐhuan de my favourite	电影 diànyǐng film
没意思 méi yìsi boring	外国 wàiguó foreign	老师 lǎoshī teacher
容易 róngyì easy	文化 wénhuà culture	亲切 qīnqiè kind
难 nán difficult	书 shū book	严格 yángé strict
轻松 qīngsōng relaxing	历史 lìshǐ history	好笑 hǎoxiào funny
累 lèi tiring	小说 xiǎoshuō novel	好玩 hǎowán fun
洗澡 xǐzǎo take a shower	昨天 yèjiān night	昨天 zuótiān yesterday

SCHOOL BUILDINGS & FACILITIES · 学校设施

体育馆 tǐyùguǎn sports hall	停车场 tíngchēchǎng car park	又大又干净 yòu dà yòu gānjìng big & clean
操场 cāochǎng playground	游泳池 yóuyóngchí swimming pool	干净 gānjìng clean
食堂 shítáng canteen	走廊 zǒuláng corridor	脏 zāng dirty
礼堂 lǐtáng assembly hall	在对面 zài duìmiàn opposite	漂亮 piàoliang beautiful
办公室 bàngōngshì office	左边 zuǒbiān on the left	丑 chǒu ugly
教室 jiàoshì classroom	在右边 zài yòubiān on the right	安全 ānquán safe
卫生间 wèishēngjiān toilet	在旁边 zài pángbiān next to	新 xīn new
图书馆 túshūguǎn library	还有 hái yǒu also has	旧 jiù old

SCHOOL RULES & RESPONSIBILITIES · 学校规则

觉得 juéde think	和...有关 hé ... yǒuguān related to	应该 yīnggāi should
认为 rènwéi believe	努力学习 nǔlì xuéxí study hard	不应该 bù yīnggāi shouldn't
做作业 zuò zuòyè do homework	集中 jízhōng concentrate	一定要 yídìng yào must
帮助 bāngzhù help	用手机 yòng shǒujī use phone	不一定要 bù yídìng yào don't have to
学生 xuésheng student	在学校 zài xuéxiào at school	卫生间 wèishēngjiān toilet
学习 xuéxí study	吃东西 chī dōngxi eat	走廊 zǒuláng corridor
考试 kǎoshì exam	教室 jiàoshì classroom	禁止 jìnzhǐ forbid
穿校服 chuān xiàofú wear uniform	守规定 shǒu guīdìng follow rules	认真 rènzhēn diligent

HOBBIES & ACTIVITIES · 爱好和活动

做作业 zuò zuòyè do homework	玩滑板 wán huábǎn skate-board	做饭 zuòfàn cook
空闲时间 kòngxián shíjiān free time	钓鱼 diàoyú go fishing	跳舞 tiàowǔ dance
压力 yālì pressure	爬山 páshān go hiking	说汉语 shuō Hànyǔ speak Chinese
比较多的 bǐjiào duō de more	发邮件 fā yóujiàn send emails	写汉字 xiě Hànzì write characters
比较少的 bǐjiào shǎo de less	弹吉他 tán jítā play guitar	快 kuài fast
练体操 liàn tǐcāo gymnastics	看小说 kàn xiǎoshuō read novels	慢 màn slow
打太极拳 dǎ tàijíquán Tai Chi	唱歌 chànggē sing	好吃 hǎochī tasty
打羽毛球 dǎ yǔmáoqiú badminton	打篮球 dǎ lánqiú basketball	难吃 nánchī not tasty

FUTURE PLANS AFTER GCSE · 会考后的计划

打算 dǎsuàn plan to	庆祝成功 qīngzhù chénggōng celebrate success	交流活动 jiāoliú huódòng exchange
想要 xiǎng yào would like to	挣钱 zhèng qián earn money	夏令营 xiàlìngyíng summer camp
计划 jìhuà plan	出国旅游 chūguó lǚyóu travel abroad	比赛 bǐsài competition
想 xiǎng want	上大学 shàng dàxué go to university	做志愿者工作 zuò zhìyuànzhě gōngzuò volunteer
希望 xīwàng hope	上高中 shàng gāozhōng senior high	看表演 kàn biǎoyǎn watch a show
要 yào want to/will	做兼职工作 zuò jiānzhí gōngzuò part-time job	朋友 péngyou friend
什么 shénme what	出国留学 chūguó liúxué study abroad	一起 yìqǐ together
为了 wèile in order to	参加 cānjiā take part in	饭馆 fànguǎn restaurant
散步 sànbù go for a walk	看电影 kàn diànyǐng watch films	好玩 hǎowán fun



SCHOOL COMPARISON & STRESS · 学校对比

比较喜欢 bǐjiào xǐhuan prefer	课外活动 kèwài huódòng extracurricular	有意思 yǒu yìsi interesting	很大压力 hěn dà yālì lots of pressure
英国 Yīngguó UK	压力 yālì pressure	健康 jiànkāng healthy	竞争激烈 jìngzhēng jīliè fierce competition
英国的学校 Yīngguó de xuéxiào UK schools	做完作业以后 zuò wán zuòyè yǐhòu after homework	打得很好 dǎ de hěn hǎo play well	重视考试 zhòngshì kǎoshì emphasize exams
英国的学生 Yīngguó de xuésheng British students	有空的时候 yǒu kòng de shíhou when free	又...又... yòu ... yòu ... both...and	学生 xuésheng student
比较少的作业 bǐjiào shǎo de zuòyè less homework	相当喜欢 xiāngdāng xǐhuan quite like	中国的学校 Zhōngguó de xuéxiào Chinese schools	父母 fùmǔ parents
空闲时间 kòngxián shíjiān free time	最喜欢 zuì xǐhuan like the most	太多作业 tài duō zuòyè too much homework	成功 chénggōng success

SHOPPING & POSSESSIONS · 购物和物品

衣服 yīfu clothes	鞋子 xiézi shoes	给...买了 gěi ... mǎi le bought for
上衣 shàngyī top	运动鞋 yùndòngxié trainers	超市 chāoshì supermarket
大衣 dàyī coat	筷子 kuàizi chopsticks	购物中心 gòuwù zhōngxīn shopping centre
衬衣 chènnyī shirt	礼物 lǐwù gift	绿色的 lǜsè de green
裙子 qúnzi skirt	笔 bǐ pen	蓝色的 lánsè de blue
袜子 wàzi socks	书包 shūbāo school bag	黑色的 hēisè de black
帽子 màozi hat	本子 běnzi exercise book	红色的 hóngsè de red
裤子 kùzi trousers	手机 shǒujī mobile phone	昨天 zuótiān yesterday

CONNECTIVES & INTENSIFIERS · 连接词

虽然 suīrán although	特别 tèbié especially	有时候 yǒu shíhou sometimes
但是 dànshì but	很 hěn very	很少 hěn shǎo rarely
因为 yīnwèi because	有点 yǒudiǎn a bit	奇怪 qíguài strange
所以 suǒyǐ so	最 zuì the most	此外 cǐwài in addition
非常 fēicháng very	总是 zǒngshì always	不仅 bùjǐn not only
相当 xiāngdāng quite	常常 chángcháng often	而且 érqiě but also

KEY SENTENCE PATTERNS · 关键句型

不仅 A 而且 B

= Not only A but also B

虽然 ... 但是 ...

= Although ..., (but) ...

为了 + purpose, + subject + verb

= In order to ..., subject does ...

除了 ... 以外, 还 ...

= Apart from ..., also ...

Subject + 打算/计划/想 + verb

= Subject plans / wants to + verb

Subject + 觉得/认为 + object + adj.

= Subject thinks object is + adj.

Subject + 给 + person + 买了 + item

= Subject bought item for person

Verb + 得 + adjective

= to do something + adverb (e.g. well)

WEATHER & ENVIRONMENT · 天气和环境

冷 lěng cold	有雨 yǒu yǔ rainy	有云 yǒu yún cloudy	下雪 xiàxuě snowing	环境 huánjìng environment	干净 gānjìng clean
热 rè hot	有雪 yǒu xuě snowy	有雾 yǒu wù foggy	天气 tiānqì weather	污染 wūrǎn pollution	脏 zāng dirty
有风 yǒu fēng windy	晴天 qíngtiān sunny	下雨 xià yǔ raining	温度 wēndù temperature	绿色 lǜsè green	城市 chéngshì city

KEY VERBS — present · near future · preterite · Los verbos

COMER · to eat regular -ER verb

Presente	Futuro próximo	Pretérito
como	voy a comer	comí
comes	vas a comer	comiste
come	va a comer	comió
comemos	vamos a comer	comimos
coméis	vais a comer	comisteis
comen	van a comer	comieron

TENER · to have irregular (tengo, tienes...)

Presente	Futuro próximo	Pretérito
tengo	voy a tener	tuve
tienes	vas a tener	tuviste
tiene	va a tener	tuvo
tenemos	vamos a tener	tuvimos
tenéis	vais a tener	tuvisteis
tienen	van a tener	tuvieron

ESTUDIAR · to study regular -AR verb

Presente	Futuro próximo	Pretérito
estudio	voy a estudiar	estudié
estudias	vas a estudiar	estudiaste
estudia	va a estudiar	estudió
estudiamos	vamos a estudiar	estudiamos
estudiáis	vais a estudiar	estudiasteis
estudian	van a estudiar	estudiaron

IR · to go irregular — preterite = ser (fui...)

Presente	Futuro próximo	Pretérito
voy	voy a ir	fui
vas	vas a ir	fuiste
va	va a ir	fue
vamos	vamos a ir	fuiamos
vais	vais a ir	fuisteis
van	van a ir	fueron

Reminder: Futuro próximo = ir a + infinitive. Pretérito (indefinido) = the simple past ("I ate", "I went"). Regular endings: -AR → -é, -aste, -ó, -amos, -asteis, -aron · -ER/-IR → -í, -iste, -ió, -imos, -isteis, -ieron. Common irregulars: hacer → hice, ir/ser → fui, estar → estuve, ver → vi, decir → dije, poder → pude

SER vs ESTAR — two verbs that both mean "to be"

Present: **ser** → soy · eres · es · somos · sois · son **estar** → estoy · estás · está · estamos · estáis · están

SER → DOCTOR permanent / identity

D	Descriptions es alto, soy simpático
O	Occupations soy profesora
C	Characteristics es inteligente
T	Time & dates son las dos, es lunes
O	Origin soy de España
R	Relationships es mi hermana

ESTAR → PLACE temporary / location & mood

P	Position está sentado
L	Location estoy en casa
A	Action (-ing) estoy comiendo
C	Condition estoy cansado
E	Emotion estoy feliz / triste



SCHOOL · El instituto

las matemáticas maths	el español Spanish	el inglés English	las ciencias science	la historia history
la geografía geography	la educación física PE	la informática ICT	el dibujo art	los deberes homework
el/la profesor(a) teacher	una asignatura subject	el comedor canteen	el recreo break	el horario timetable

TECHNOLOGY · La tecnología

el móvil mobile phone	el ordenador computer	la tableta tablet	Internet internet	las redes sociales social media
una app app	un videojuego video game	una página web website	descargar to download	en línea online
una contraseña password	los auriculares headphones	enviar un mensaje to text	compartir to share	navegar por Internet to surf the net

HOLIDAYS · Las vacaciones

las vacaciones holidays	la playa beach	el mar sea	la montaña mountains	en el extranjero abroad
un hotel hotel	un camping campsite	el avión plane	el tren train	la maleta suitcase
el pasaporte passport	nadar to swim	tomar el sol to sunbathe	visitar to visit	hacer turismo to sightsee

THE ENVIRONMENT · El medio ambiente

el medio ambiente environment	la contaminación pollution	reciclar to recycle	el reciclaje recycling	la basura rubbish/waste
el calentamiento global global warming	separar to sort	malgastar to waste	ahorrar to save	el transporte público public transport
proteger to protect	el planeta planet	una papelera bin	el plástico plastic	sostenible sustainable

WHERE I LIVE · Dónde vivo

vivo en... I live in	una ciudad city	un pueblo town/village	en el campo in the countryside	en la costa on the coast
el centro town centre	las afueras outskirts	un barrio neighbourhood	una casa house	un piso flat
la estación station	el mercado market	una tienda shop	animado lively	tranquilo quiet

Musical Element	Meaning	NEW! Key Terms
Pitch	the highness or lowness of a sound	Stepwise movement - moving to the next note in the scale either up or down Disjunct movement - moving in leaps
Tempo	the speed of a sound or piece of music	Adagio slow Andante a walking pace Moderato moderately Allegro quick and lively Metronome Device used to stay in time
Dynamics	the volume of a sound or piece of music.	
Tonality	Tonality is what makes a piece of music feel like it belongs in a particular key	Major - the use of major scales and chords in a piece of music, creating a happy, bright, and positive mood Minor - the use of minor scales and chords in a piece of music, creating sadder, darker or more serious mood
Texture	how layers of sound within a piece of music interact	Monophonic One melody and no accompaniment Melody and accompaniment melody and backing part
Timbre	the unique sound or tone quality of different instruments voices or sounds	Synthesizer Electronic keyboard instrument that turns electricity into sounds
Articulation	how individual notes or sounds are played	Legato played smoothly Staccato played short & detached
Structure	The order in which a piece of music is arranged	ABA ternary form Verse-Chorus Pop music structure Theme & variation Ground bass Bass part repeated throughout the song

YEAR 9 KNOWLEDGE ORGANISER

MUSIC



BLUES & JAZZ

12 Bar Blues typical structure used in blues and jazz music

12-BAR BLUES IN C			
C (I)	C (I)	C (I)	C (I)
F (IV)	F (IV)	C (I)	C (I)
G (V)	F (IV)	C (I)	C (I)

Blues scale - a six note scale used to improvise a melody

Walking bassline - a note played on every beat with the bass walking up and down in stepwise movement

Improvisation - creating music on the spot

Swung rhythm - Common rhythm found in jazz music



"Straight Eighths"



the way it's written

"Swing Eighths"



the way it's played



HOOKS & RIFFS

Riff - a series of notes, a chord pattern or a musical phrase that is repeated.

Hook - a musical idea, often a short riff, passage, or phrase, that is used in popular music to make a song appealing and to "catch the ear of the listener"

Repeat Symbol



shown at the end of a phrase to go back to the beginning and repeat it.

Bass clef



Used for lower pitched notes which would be played with the left hand

Treble clef



Used for higher pitched notes which would be played with the right hand

Remix - a new version of a piece of music which has been created by putting together the individual instrumental and vocal parts in a different way



FILM MUSIC

Leitmotif - a short musical theme which represents a character, a place, an object, or a situation in a film

Ostinato - a short musical idea that repeats

Note cluster - a chord played where the notes are all located very close to each other which produces dissonance

Dissonance - clashing notes produced by using notes outside of a piece's key signature

Drone - a long held low note

POP MUSIC

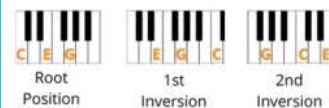
Riff - a series of notes, a chord pattern or a musical phrase that is repeated.

Dotted notes - Adding a dot extends a note's duration by exactly 50%

	Note	Rest	Value
Dotted Crotchet			1 and 1/2

Chord Inversion - this happens when you rearrange the notes of a chord so that a note other than the root (the note the chord is named after) is the lowest note

C Chord Inversions



Accompaniment chord styles: -

Block - notes played all together

Broken chord - notes of the chord played separately

Arpeggio - a type of broken chord usually played going up and or down

SONGWRITING



Rock and Roll Music Features

- Fast, driving tempo
- 4/4 time signature
- Walking Bassline
- Solo singer sometimes with backing vocals
- Major key with primary chords
- Loud Dynamic and Electric instruments

BASSLINE has a low pitch and is the lowest part of the music. It creates **rhythm**, as well as **harmony** with the chords. This adds to the **texture** of the music. Only one note played at a time.

Verse usually comes before a chorus. They often repeat but with different lyrics for each verse.

Chorus usually a catchy section repeated throughout the song. Every time we get to the chorus, typically the lyrics are the same making it easy to sing along to.

Term 1 & 2 Outdoor Sports

T1 Rugby

Skills

Passing

- Pass at speed with minimal handling time
- Use passing to manipulate defenders and create overlaps

Running with the Ball

- Adjust running lines to break defensive lines
- Carry ball in a way that allows quick passing or evasion
- Use speed and timing to exploit space

Touch Tackle (Defending)

- Anticipate movement to intercept or tag early
- Apply pressure while maintaining defensive shape

Evasion

- Combine multiple moves to outplay defenders and use certain people for set plays depending on their skills.
- Make quick decisions about when to pass or run

Key Vocabulary

- **Overlap:** Having more attackers than defenders in an area
- **Anticipation:** Predicting what will happen next
- **Phase:** A period of play between tags
- **Decision-making:** Choosing the best action in play



Rules

- **Offside Rule:** Defenders must stay behind the offside line after each touch tackle
- **Advantage Rule:** Play continues if it benefits the non-offending team
- **Turnovers:** Understanding all situations that result in loss of possession
- **Tactical Use of 5 Tags:** Managing phases to maximise attacking opportunities

Netball

Skills

Passing

- Use quick, accurate passes under pressure
- Disguise passes using body positioning
- Use passing to draw out defenders

Footwork

- Running pass to maintain flow of play
- Correct footwork after an interception
- Use correct footwork consistently

Shooting

- Shoot accurately under pressure and fatigue
- Adjust shooting technique based on distance and angle
- Quick decision making - shoot or pass

Defending

- Anticipate passes to intercept early
- Work as a defensive unit to force errors
- Apply pressure without conceding penalties

Key Vocabulary

- **Incorrect playing of the ball:** You are not allowed to **dribble, kick or self-pass**
- **Incorrect positioning:** Not in the correct position for a centre pass
- **Contact:** Interfere with opponents play



Rules

- **Advantage Rule:** Play continues if stopping would disadvantage the non-offending team
- **Centre pass:** All players must be in the correct position on the whistle; the ball must be caught in the centre third
- **Penalty:** Contacting player must stand next to player and is out of the game until pass/shot is made

Term 1 & 2 Indoor Sports

Health Related Fitness

Skills

Using Cardio Equipment (Treadmill, Bike, Rower)

- Adjust machine settings for speed, resistance, and incline
- Maintain correct posture and efficient technique
- Monitor performance using time, distance, or heart rate

FITT Principles

- Frequency (how often)
- Intensity (how hard)
- Time (how long)
- Type (what kind)

Free Weights & Functional Training

- Use correct lifting technique (neutral spine, controlled motion)
- Engage core for stability
- Perform exercises with control and balance

Personal Exercise Plan (PEP)

- Select exercises to target specific fitness goals
- Structure sessions with warm-up, main activity, and cool down
- Monitor and adapt programme based on progress

Rules

- **Equipment Rules:** Machines must be set correctly for the individual
- **Safe Lifting:** Use correct technique and appropriate weight to avoid injury
- **Supervision Rule:** Follow gym rules and use equipment as instructed
- **Programme Design Rule:** Plan balanced sessions including all components of fitness

Key Vocabulary

- **Heart Rate:** Number of beats per minute during exercise
- **Resistance:** Force that muscles must work against
- **Progression:** Gradual increase of workload to improve fitness



Trampolining

Skills

Straight Bounce

- Keep body fully extended and tight
- Use arms to control height and balance
- Keep bounces on the cross

Shape Jumps (Tuck, Pike, Straddle)

- Warm up jump to get height
- Hold shape clearly at the highest point of the bounce
- Straight body position before landing

Seat / Front / Back Landings

- Hold body in position when landing
- Support the landing and push back up with hands
- Return smoothly to standing position

Linking Skills into Routines

- Land on both feet with knees bent
- Keep balance and chest upright
- Stick landing with control and no extra steps

Rules

- **One Performer Rule:** Only one person on the trampoline at a time
- **Control Rule:** Perform a controlled stop safely if control is lost
- **Skill Progression Rule:** Only perform skills you have been safely taught
- **Spotting & Safety:** Always follow instructions and use spotters

Key Vocabulary

- **Bounce Height:** The vertical distance reached during a jump
- **Control:** Maintaining balance and stability during movement
- **Routine:** A planned sequence of skills performed continuously
- **Body Tension:** Keeping muscles tight to maintain shape and control



Term 3 & 4 Outdoor Sports

Football

Skills

Signature Moves & 1v1 Mastery

- Select skills based on game situation (time, space, defender)

Advanced Shooting

- Perform volleys and half-volleys
- Curled shots to bend around defence
- Apply driven low shots for accuracy and speed

Game Intelligence

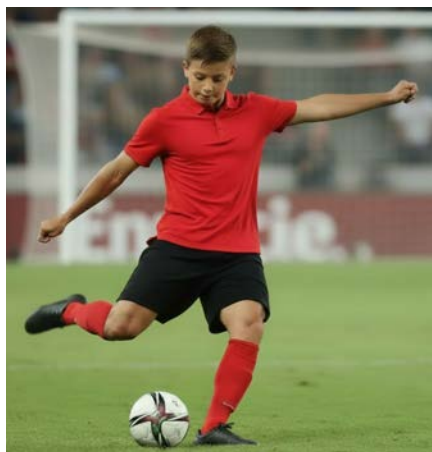
- Decide when to dribble vs when to pass
- Recognise space, width, and depth in attack
- Understand pressing triggers and defensive shape

Performance Analysis

- Evaluate performance using technical, tactical, physical, mental aspects

Key Vocabulary

- **Game Intelligence:** Understanding when and why to act
- **Width & Depth:** Using the full pitch to create space
- **Pressing:** Applying pressure to win the ball back
- **Transition:** switching quickly between attack and defence



Rules

- **Offside Rule:** Understanding positioning and timing of runs
- **Advantage Rule:** Play may continue if it benefits the attacking team
- **Game Management:** Understanding roles (captain, positions, formations)
- **Competition Rules:** Apply rules in tournament-style games

Flag Football

Skills

Passing (Quarterback)

- Step forward with opposite foot to throwing arm
- Generate power using hips and torso rotation
- Place little finger and ring finger in the stitches closest to you

Receiving (Catching)

- Keep eyes on the ball into hands
- Use soft hands to secure the catch
- Adjust body position to catch on the move or under pressure

Running with the Ball

- Hold ball securely tucked into you away from the defender.
- Scan for space and teammates while moving

Defending (Flag Pulling & Positioning)

- Stay balanced and approach at a controlled angle
- Remove the flag cleanly

Key Vocabulary

- **Touchdown:** Scoring by carrying or catching the ball in the end zone
- **Quarterback:** Player who throws the ball to start attacking plays
- **Wide Receivers:** Player who catches the ball from the Quarterback
- **Down:** Each attempt the attacking team has to progress



Rules

- **Downs System:** Team has 4 downs to get halfway or score a touchdown
- **Flag Rule:** Play stops when the flag is removed; no physical tackling allowed
- **Forward Pass Rule:** Only one forward pass allowed per play from behind the line
- **Turnovers:** Possession changes after 4 unsuccessful downs or interceptions



Term 3 & 4 Indoor Sports

Personal Survival

Skills

Approach

- Straddle entry into the pool
- Swimming head above water
- Surface dive and feet first dive

In water

- Treading water, egg beater/ breaststroke
- H.E.L.P position
- Huddle

Tows

- With equipment
- Conscious casualty tow
- Unconscious casualty tow

Getting casualty out of water

- Recovery position
- Scenarios

Key Vocabulary

- **Straddle Entry:** A safe way to enter water while staying in control and upright
- **Tow:** Supporting and moving a person through water to safety
- **Rescue Aid:** An object used to help someone without direct contact
- **Casualty:** A person in need of help in the water
- **Risk Assessment:** Checking for dangers before taking action



Rules

- **Assess Before Action:** Always check for danger before attempting a rescue
- **Non-Contact Rescue Rule:** Prioritise reach or throw rescues over direct contact
- **Safe Entry Rule:** Use controlled entries (e.g. straddle) in unknown or shallow water
- **Call for Help:** Alert others or emergency services before and during a rescue

Table Tennis

Skills

Forehand

- Generate power using body rotation
- Adjust bat angle for spin and placement
- Maintain consistency under pressure

Backhand

- Execute quick, controlled shots in tight spaces
- Use backhand for both attack and defence
- Maintain balance when playing at speed

Serving

- Use spin (topspin/backspin) to challenge opponent
- Vary serve placement (short/long, wide/body)
- Keep serve low over the net for accuracy

Forehand Drive

- Identify that the ball is bouncing high
- Go from low to high to strike the ball downwards with power
- Apply top spin to outwit the opponent

Rules

- **Service Rotation:** Players alternate serves every 2 points
- **Service Rule:** The ball must be thrown in the air at least 15cm before hitting it
- **Deuce:** At 10–10, players must win by 2 points

Key Vocabulary

- **Topspin:** Forward spin causing the ball to dip quickly
- **Backspin:** Spin that slows the ball and keeps it low
- **Slice:** spin that moves the ball to the side depending on the direction of the slice shot
- **Anticipation:** Reading opponent's shot early



Term 5 & 6 Outdoor Sports

Athletics

Skills

Sprinting (100m)

- Explode out of start with fast reaction time
- Maintain maximum velocity with efficient technique
- Relax upper body while running at speed

Middle Distance (800m)

- Use race strategy (negative/positive splits)
- Adjust pace based on competitors
- Execute a strong sprint finish

Long Jump

- Maintain maximum speed into take-off
- Use effective arm drive for lift
- Control landing to maximise distance

Throwing (Shot & Javelin)

- Use full-body coordination for maximum force production
- Control angle of release for distance
- Perform technique consistently under pressure

Rules

- **Race Strategy Rules:** Understanding pacing and positioning within races
- **Measurement Rules:** Jumps and throws measured from correct point
- **Disqualification:** Understanding fouls (false starts, illegal throws, fouls in jumps)
- **Relay Tactics:** Using speed and timing to maximise baton changes

Key Vocabulary

- **Acceleration:** Increasing speed quickly
- **Velocity:** Speed in a given direction
- **Trajectory:** The path of a thrown object
- **Split Time:** Time taken for part of a race
- **Technique:** The way a skill is performed



Striking and Fielding

Skills

Striking / Batting

- Adapt shots based on game situation and field
- Use a variety of techniques to score under pressure

Bowling/Pitching

- Apply spin, variation, and tactical delivery
- Bowl/pitch with a clear plan to restrict scoring

Pressure Fielding

- Perform run-outs and accurate throws under pressure
- Use relay fielding and backing up
- React quickly to game scenario

Game Management

- Make decisions based on score, time, and opposition
- Plan how to attack or defend a total
- Take on leadership roles (captaincy, organisation)
- Give and receive peer feedback

Rules

- **Tactical Field Placements:** Positioning fielders to limit scoring opportunities
- **Over and Innings (Cricket):** Structured sets of deliveries and team roles
- **Strategic Running:** Deciding when to take risks for additional runs
- **Game Management:** Applying rules to control tempo and outcome

Key Vocabulary

- **Game Management:** Controlling the game situation
- **Tactics:** Planned approach to succeed
- **Pressure:** Performing under challenge
- **Decision Making:** Choosing the best option
- **Analysis:** Reviewing performance



Term 5 & 6 Indoor & Outdoor Sports

Basketball

Skills

Passing

- Use a variety of passes (bounce, overhead) for different situations
- Pass quickly under pressure with accuracy
- Use passing to create space and attacking opportunities

Dribbling

- Change speed and direction to beat defenders
- Protect the ball using body positioning
- Use controlled dribbling in tight spaces

Shooting

- Shoot accurately under pressure and from distance
- Adjust technique for different shots (lay-up, jump shot)
- Maintain consistent shooting form at speed

Lay Up

- Two steps are allowed
- Jump up towards the hoop with shooting hand leading
- Aim for the top corner of the square on the backboard

Rules

- **Shot Clock Rule:** Teams must attempt a shot within 24 seconds
- **Fouls:** Understanding personal and team fouls leading to free throws
- **Out of Bounds:** Ball is out when it touches outside the court lines
- **Tactical Play:** Using rules (e.g. fouls, possession) strategically

Key Vocabulary

- **Lay-up:** A close-range shot taken while moving
- **Interception:** Stealing the ball from a pass
- **Transition:** Changing from defence to attack



Tennis

Skills

Forehand

- Vary shot with topspin or flat hit
- Control depth and angle of shot
- Aim to move opponent and create space

Backhand

- Use either one or two hands effectively
- Generate power using body rotation and the hips
- Place shots to move opponent around the court

Serving

- Use consistent ball toss and fluid motion
- Aim serves wide, body, or centre into service box
- Add power and accuracy and aim at different points

Movement and Positioning

- Anticipate opponent's shot early
- Adjust positioning based on game situation (control by the baseline, attacking near the net)
- Move efficiently to maintain court coverage

Rules

- **Tie-break:** Played at 6–6, first to 7 points (win by 2)
- **Deuce & Advantage:** At 40–40, player must win two consecutive points
- **Doubles Rules:** Understanding positioning and serving order
- **Tactical Use of Serve:** Using serve placement to gain advantage

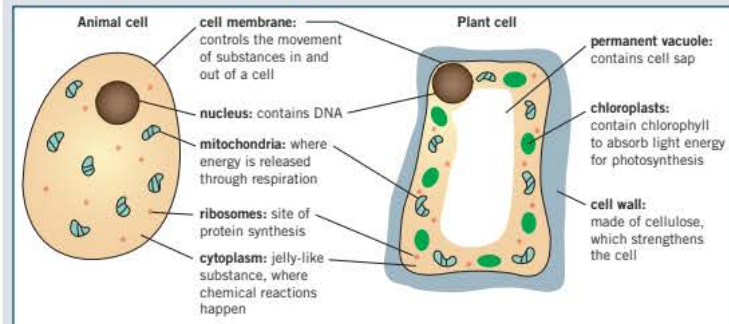
Key Vocabulary

- **Deuce:** Score of 40–40
- **Advantage:** Point scored after deuce
- **Tie-break:** Game used to decide a set at 6–6
- **Anticipation:** Reading opponent's play early



Eukaryotic cells

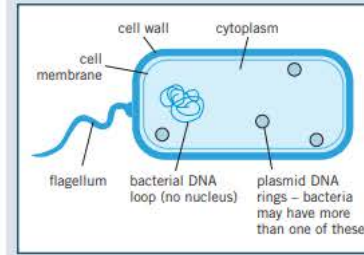
Animal and plant cells are eukaryotic. They have genetic material (DNA) that forms **chromosomes** and is contained in a **nucleus**.



Prokaryotic cells

Bacteria have the following characteristics:

- single-celled
- no nucleus – have a single loop of DNA
- have small rings of DNA called **plasmids**
- smaller than eukaryotic cells.



Microscopes

Light microscope	Electron microscope
uses light to form images	uses a beam of electrons to form images
living samples can be viewed	samples cannot be living
relatively cheap	expensive
low magnification	high magnification
low resolution	high resolution

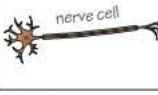
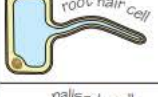
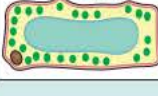
Electron microscopes allow you to see sub-cellular structures, such as ribosomes, that are too small to be seen with a light microscope.

L To calculate the **magnification** of an image:

$$\text{magnification} = \frac{\text{image size}}{\text{actual size}}$$

Specialised cells

Cells in animals and plants differentiate to form different types of cells. Most animal cells differentiate at an early stage of development, whereas a plant's cells differentiate throughout its lifetime.

Specialised cell	Function	Adaptations
	fertilise an ovum (egg)	<ul style="list-style-type: none"> • tail to swim to the ovum and fertilise it • lots of mitochondria to release energy from respiration, enabling the sperm to swim to the ovum
	transport oxygen around the body	<ul style="list-style-type: none"> • no nucleus so more room to carry oxygen • contains a red pigment called haemoglobin that binds to oxygen molecules • flat bi-concave disc shape to increase surface area-to-volume ratio
	contract and relax to allow movement	<ul style="list-style-type: none"> • contains protein fibres, which can contract to make the cells shorter • contains lots of mitochondria to release energy from respiration, allowing the muscles to contract
	carry electrical impulses around the body	<ul style="list-style-type: none"> • branched endings, called dendrites, to make connections with other neurones or effectors • myelin sheath insulates the axon to increase the transmission speed of the electrical impulses
	absorb mineral ions and water from the soil	<ul style="list-style-type: none"> • long projection speeds up the absorption of water and mineral ions by increasing the surface area of the cell • lots of mitochondria to release energy for the active transport of mineral ions from the soil
	enable photosynthesis in the leaf	<ul style="list-style-type: none"> • lots of chloroplasts containing chlorophyll to absorb light energy • located at the top surface of the leaf where it can absorb the most light energy

Comparing diffusion, osmosis, and active transport

	Diffusion	Osmosis	Active transport
Definition	The spreading out of particles, resulting in a net movement from an area of higher concentration to an area of lower concentration. Factors which affect the rate of diffusion: difference in concentration, temperature, and surface area of the membrane.	The diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane .	The movement of particles from a more dilute solution to a more concentrated solution using energy from respiration.
Movement of particles	Particles move down the concentration gradient – from an area of high concentration to an area of low concentration.	Water moves from an area of lower solute concentration to an area of higher solute concentration.	Particles move against the concentration gradient – from an area of low concentration to an area of high concentration.
Energy required?	no – passive process	no – passive process	yes – energy released by respiration
Examples	Humans <ul style="list-style-type: none"> • Nutrients in the small intestine diffuse into the capillaries through the villi. • Oxygen diffuses from the air in the alveoli into the blood in the capillaries. Carbon dioxide diffuses from the blood in the capillaries into the air in the alveoli. • Urea diffuses from cells into the blood for excretion in the kidney. Fish <ul style="list-style-type: none"> • Oxygen from water passing over the gills diffuses into the blood in the gill filaments. • Carbon dioxide diffuses from the blood in the gill filaments into the water. Plants <ul style="list-style-type: none"> • Carbon dioxide used for photosynthesis diffuses into leaves through the stomata. • Oxygen produced during photosynthesis diffuses out of the leaves through the stomata. 	Plants <ul style="list-style-type: none"> • Water moves by osmosis from a dilute solution in the soil to a concentrated solution in the root hair cell. 	Humans <ul style="list-style-type: none"> • Active transport allows sugar molecules to be absorbed from the small intestine when the sugar concentration is higher in the blood than in the small intestine. Plants <ul style="list-style-type: none"> • Active transport is used to absorb mineral ions into the root hair cells from more dilute solutions in the soil.



Key terms

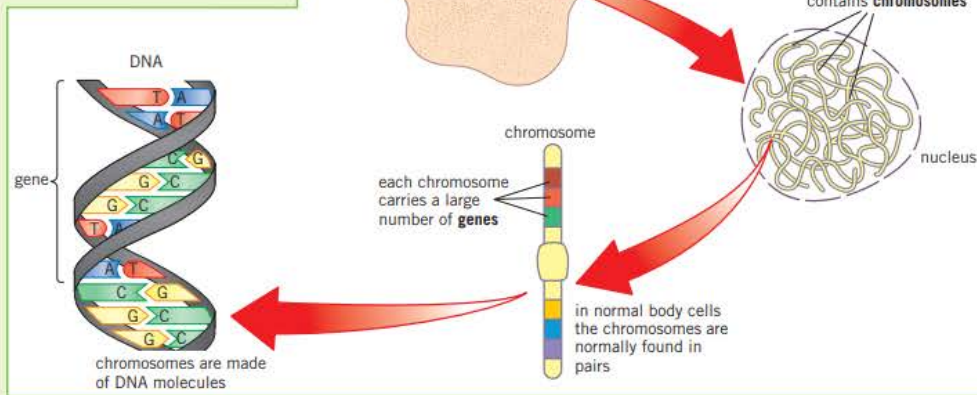
Make sure you can write a definition for these key terms.

cell membrane cell wall chloroplast chromosome
concentration cytoplasm dilute DNA eukaryotic
gill filaments gradient magnification mitochondria
nucleus partially permeable membrane passive process
permanent vacuole plasmid prokaryotic resolution
ribosome root hair cell stomata



Chromosomes

The nucleus of a cell contains chromosomes.
Each chromosome carries a large number of genes made of DNA molecules.

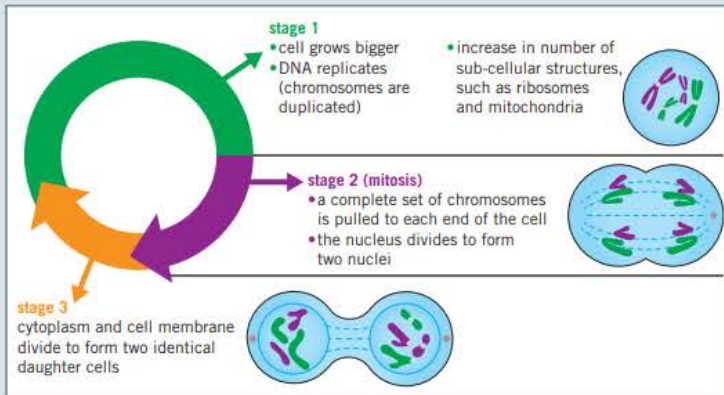


The cell cycle

Body cells divide to form two identical **daughter cells** by going through a series of stages known as the **cell cycle**.

Cell division by **mitosis** is important for the growth and repair of cells, for example, the replacement of skin cells. Mitosis is also used for asexual reproduction.

There are **three** main stages in the cell cycle:



Stem cells in medicine

A stem cell is an undifferentiated cell that can develop into one or more types of specialised cell.

There are two types of stem cell in mammals: **adult stem cells** and **embryonic stem cells**.

Stem cells can be **cloned** to produce large numbers of identical cells.

Type of stem cell	Where are they found?	What can they differentiate into?	Advantages	Disadvantages
adult stem cells	specific parts of the body in adults and children – for example, bone marrow	can only differentiate to form certain types of cells – for example, stem cells in bone marrow can only differentiate into types of blood cell	<ul style="list-style-type: none"> fewer ethical issues – adults can consent to have their stem cells removed and used an already established technique for treating diseases such as leukaemia relatively safe to use as a treatment and donors recover quickly 	<ul style="list-style-type: none"> requires a donor; potentially meaning a long wait time to find someone suitable can only differentiate into certain types of specialised cells, so can be used to treat fewer diseases
embryonic stem cells	early human embryos (often taken from spare embryos from fertility clinics)	can differentiate into any type of specialised cell in the body – for example, a nerve cell or a muscle cell	<ul style="list-style-type: none"> can treat a wide range of diseases as can form any specialised cell may be possible to grow whole replacement organs usually no donor needed as they are obtained from spare embryos from fertility clinics 	<ul style="list-style-type: none"> ethical issues as the embryo is destroyed and each embryo is a potential human life risk of transferring viral infections to the patient newer treatment so relatively under-researched – not yet clear if they can cure as many diseases as thought
plant meristem	meristem regions in the roots and shoots of plants	can differentiate into all cell types – they can be used to create clones of whole plants	<ul style="list-style-type: none"> rare species of plants can be cloned to prevent extinction plants with desirable traits, such as disease resistance, can be cloned to produce large numbers of identical plants fast and low-cost production of large numbers of plants 	<ul style="list-style-type: none"> cloned plants are genetically identical, so a whole crop is at risk of being destroyed by a single disease or genetic defect

Binary fission

Cell division in bacteria is called binary fission. In optimum temperature and nutrients, bacteria can multiply as often as every 20 minutes. In a lab, bacteria can be grown in sterile conditions on an agar gel plate or in a nutrient broth.

The lid of the petri dish must be sealed but not all the way so that oxygen can still get in. This is so that harmful bacteria that do not need oxygen aren't able to grow.



Therapeutic cloning

In therapeutic cloning

- cells from a patient's own body are used to create a cloned early embryo of themselves
- stem cells from this embryo can be used for medical treatments and growing new organs
- these stem cells have the same genes as the patient, so are less likely to be rejected when transplanted.



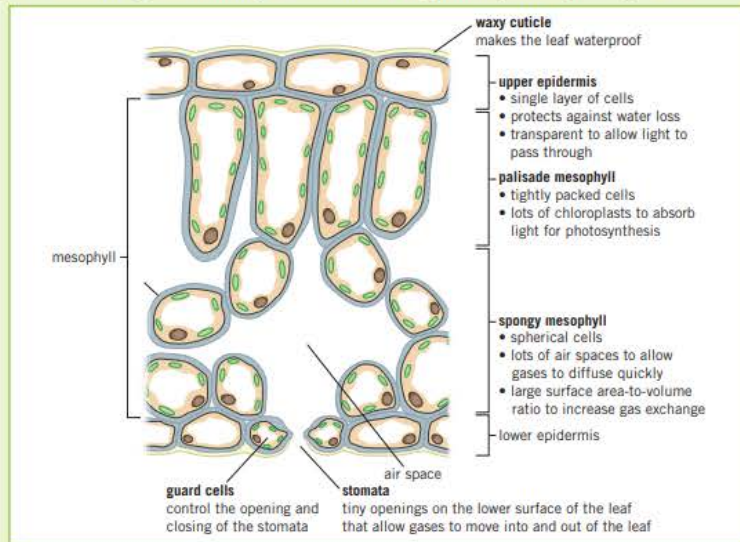
Key terms

Make sure you can write a definition for these key terms.

adult stem cell	binary fission	cell cycle
chromosome	clone	daughter cells
gene	meristem	nucleus
	mitosis	embryonic stem cell
		therapeutic cloning

Tissues in leaves

Leaves are organs because they contain many tissues that work together to perform photosynthesis.



Stomata

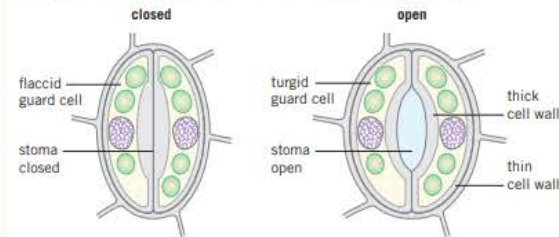
Stomata are tiny openings in the undersides of leaves – this placement reduces water loss through evaporation.

They control gas exchange and water loss from leaves by:

- allowing diffusion of carbon dioxide into the plant for photosynthesis
- allowing diffusion of oxygen out of the plant.

Guard cells are used to open and close the stomata.

When a plant has plenty of water, the guard cells become turgid. The cell wall on the inner surface is very thick, so it cannot stretch as much as the outer surface. So as the guard cells swell up, they curve away from each other, opening the stoma.



Transpiration

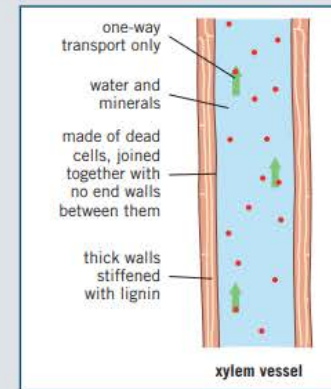
Description

Water is lost through the stomata by evaporation. This pulls water up from the roots through the **xylem** and is called transpiration. The constant movement of water up the plant is called the **transpiration stream**.

Importance

- provides water to cells to keep them **turgid**
- provides water to cells for photosynthesis
- transports mineral ions to leaves

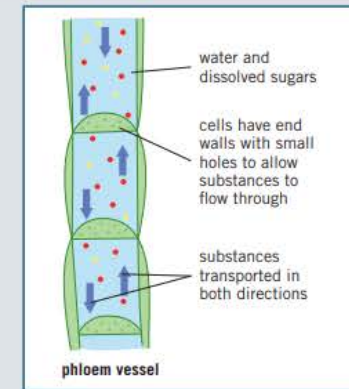
Specialised tissues



Translocation

The movement of dissolved sugars from the leaves to the rest of the plant through the **phloem**.

- moves dissolved sugars made in the leaves during photosynthesis to other parts of the plant
- this allows for respiration, growth, and glucose storage



Factors affecting the rate of transpiration

Factor	Effect on transpiration	Because...
temperature	higher temperatures <i>increase</i> the rate of transpiration	water evaporates faster in higher temperatures
humidity	lower humidity <i>increases</i> the rate of transpiration	the drier the air, the steeper the concentration gradient of water molecules between the air and leaf
wind speed	more wind <i>increases</i> the rate of transpiration	wind removes the water vapour quickly, maintaining a steeper concentration gradient
light intensity	higher light intensity <i>increases</i> the rate of transpiration	stomata open wider to let more carbon dioxide into the leaf for photosynthesis

Key terms

Make sure you can write a definition for these key terms.

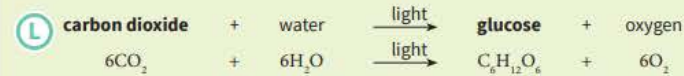
photosynthesis stomata guard cells transpiration translocation
light intensity temperature humidity wind speed phloem xylem



Photosynthetic reaction

Photosynthesis is a chemical reaction in which energy is transferred from the environment as light from the Sun to the leaves of a plant. This is an **endothermic** reaction.

Chlorophyll, the green pigment in **chloroplasts** in the leaves, absorbs the light energy. Leaves are well-adapted to increase the rate of photosynthesis when needed.



Rate of photosynthesis

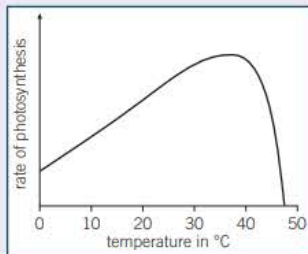
A **limiting factor** is anything that limits the rate of a reaction when it is in short supply.

The limiting factors for photosynthesis are

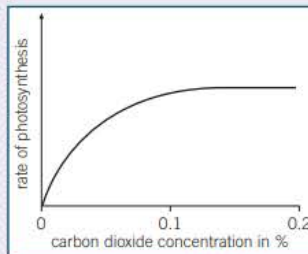
- temperature
- carbon dioxide concentration
- light intensity
- amount of chlorophyll.

Less chlorophyll in the leaves reduces the rate of photosynthesis. More chlorophyll may be produced by plants in well-lit areas to increase the photosynthesis rate.

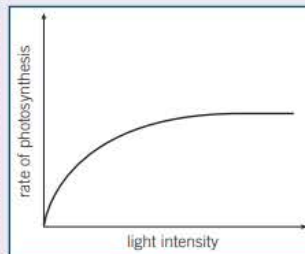
Limiting factors and photosynthesis rate (HT only)



- At low temperatures the rate of photosynthesis is low because the reactant molecules have less kinetic energy.
- Photosynthesis is an enzyme-controlled reaction, so at high temperatures the enzymes are denatured and the rate quickly decreases.



- Carbon dioxide is used up in photosynthesis, so increasing carbon dioxide concentration increases the rate of photosynthesis.
- At a certain point, another factor becomes limiting.
- Carbon dioxide is often the limiting factor for photosynthesis.

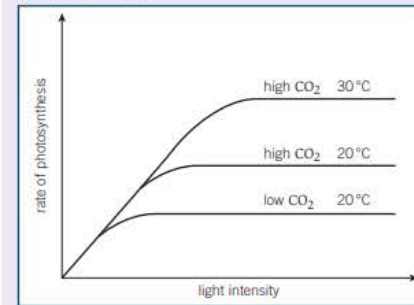


- Light energy is needed for photosynthesis, so increasing light intensity increases the rate of photosynthesis.
- At a certain point, another factor becomes limiting.
- Photosynthesis will stop if there is little or no light.

Interaction of limiting factors (HT only)

Limiting factors often interact, and any one may be limiting photosynthesis.

For example, on the graph the lowest curve has both carbon dioxide and temperature limiting photosynthesis. Temperature is limiting for the middle curve, and the highest curve shows photosynthesis rate increases when both temperature and carbon dioxide are increased until another factor becomes limiting.



Inverse square law (HT only)

As the distance of a light source from a plant increases, the light intensity decreases – this is called an inverse relationship. This relationship is not linear, as light intensity varies in inverse proportion to the square of the distance:

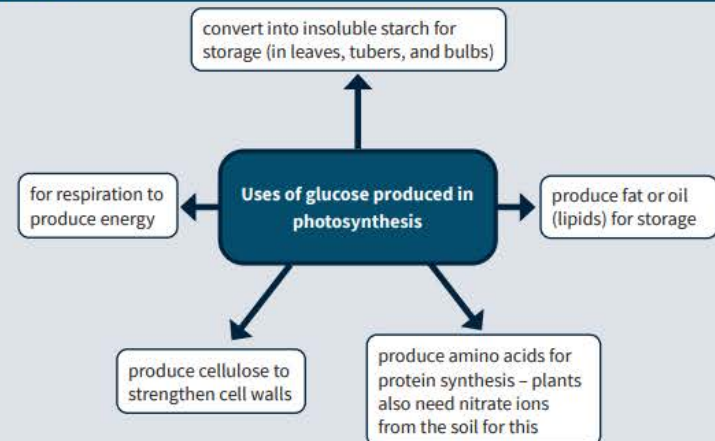
$$\text{light intensity} \propto \frac{1}{\text{distance}^2}$$

For example, if you double the distance between a light source and a plant, light intensity falls by three-quarters.

Greenhouse economics

Commercial greenhouses control limiting factors to get the highest possible rates of photosynthesis so they can grow plants as quickly as possible or produce the highest yields, whilst still making a profit.

Uses of glucose



Key terms

Make sure you can write a definition for these key terms.

carbon dioxide chlorophyll chloroplast concentration endothermic glucose greenhouse gases light intensity inverse square law limiting factor photosynthesis protein synthesis

Cellular respiration

Cellular **respiration** is an **exothermic** reaction that occurs continuously in the **mitochondria** of living cells to supply the cells with energy.

The energy released during respiration is needed for all living processes, including

- chemical reactions to build larger molecules, for example, making proteins from amino acids
- muscle contraction for movement
- keeping warm.

Respiration in cells can take place aerobically (using oxygen) or anaerobically (without oxygen).

Type of respiration	Oxygen required?	Relative amount of energy transferred
aerobic	✓	complete oxidation of glucose – large amount of energy is released
anaerobic	✗	incomplete oxidation of glucose – much less energy is released per glucose molecule than in aerobic respiration

Aerobic respiration

glucose + oxygen → carbon dioxide + water



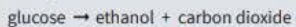
Anaerobic respiration in muscles

glucose → lactic acid



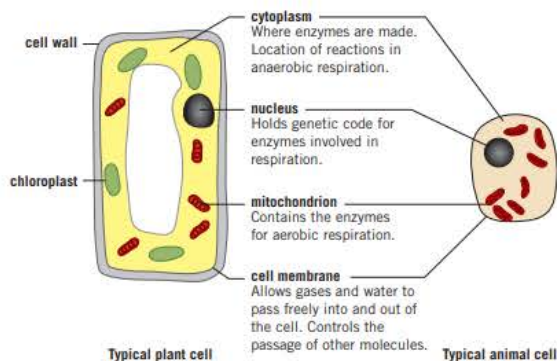
Fermentation

Anaerobic respiration in plant and yeast cells is represented by the equation



Anaerobic respiration in yeast cells is called **fermentation**.

The products of fermentation are important in the manufacturing of bread and alcoholic drinks.



Key terms

Make sure you can write a definition for these key terms.

aerobic amino acids anaerobic carbohydrates cellulose exothermic fermentation
fatty acid glycerol glycogen lactic acid lipids metabolism mitochondria
oxidation oxygen debt proteins respiration starch

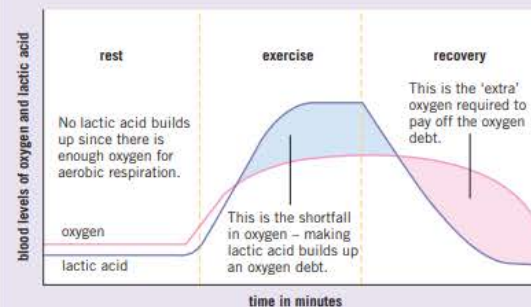
Response to exercise

During exercise the human body reacts to the increased demand for energy.

To supply the muscles with more oxygenated blood, heart rate, breathing rate, and breath volume all increase.

If insufficient oxygen is supplied, anaerobic respiration takes place instead, leading to the build-up of **lactic acid**.

During long periods of vigorous exercise, muscles become fatigued and stop contracting efficiently.



Oxygen debt (HT only)

After exercise, the lactic acid accumulated during anaerobic respiration needs to be removed. **Oxygen debt** is the amount of oxygen needed to react with the lactic acid to remove it from cells.

Removal of lactic acid

lactic acid in the muscles
↓
transported to the liver in the blood
↓
lactic acid is converted back to glucose

Metabolism

Metabolism is the sum of all the reactions in a cell or the body.

The energy released by respiration in cells is used for the continual enzyme-controlled processes of metabolism that produce new molecules.

Metabolic processes include the synthesis and breakdown of:

Carbohydrates

- synthesis of larger carbohydrates from sugars (starch, glycogen, and cellulose)
- breakdown of glucose in respiration to release energy

Lipids

- synthesis of lipids from one molecule of glycerol and three molecules of fatty acid

Proteins

- synthesis of amino acids from glucose and nitrate ions
- amino acids used to form proteins
- excess proteins broken down to form urea for excretion



Development of the model of the atom

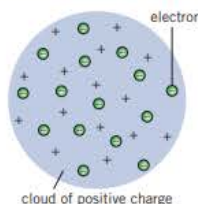
Dalton's model

John Dalton thought of the **atom** as a solid sphere that could not be divided into smaller parts. His model did not include **protons**, **neutrons**, or **electrons**.

The plum pudding model

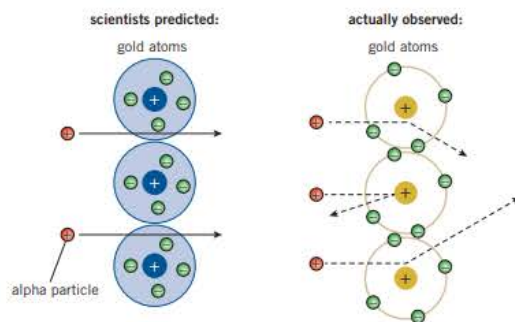
Scientists' experiments resulted in the discovery of sub-atomic charged particles. The first to be discovered were electrons – tiny, negatively charged particles.

The discovery of electrons led to the plum pudding model of the atom – a cloud of positive charge, with negative electrons embedded in it. Protons and neutrons had not yet been discovered.



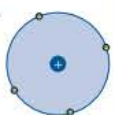
Alpha scattering experiment

- 1 Scientists fired small, positively charged particles (called alpha particles) at a piece of gold foil only a few atoms thick.
- 2 They expected the alpha particles to travel straight through the gold.
- 3 They were surprised that some of the alpha particles bounced back and many were deflected (alpha scattering).
- 4 To explain why the alpha particles were repelled the scientists suggested that the positive charge and mass of an atom must be concentrated in a small space at its centre. They called this space the **nucleus**.



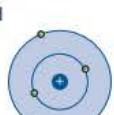
Nuclear model

Scientists replaced the plum pudding model with the nuclear model and suggested that the electrons **orbit** the nucleus, but not at set distances.



Electron shell (Bohr) model

Niels Bohr calculated that electrons must orbit the nucleus at fixed distances. These orbits are called **shells** or **energy levels**.



The proton

Further experiments provided evidence that the nucleus contained smaller particles called protons. A proton has an opposite charge to an electron.

Size

The atom has a radius of 1×10^{-10} m. Nuclei (plural of nucleus) are around 10000 times smaller than atoms and have a radius of around 1×10^{-14} m.

Relative mass

One property of protons, neutrons, and electrons is **relative mass** – their masses compared to each other. Protons and neutrons have the same mass, so are given a relative mass of 1. It takes almost 2000 electrons to equal the mass of a single proton – their relative mass is so small that we can consider it as 0.

The neutron

James Chadwick carried out experiments that gave evidence for a particle with no charge. Scientists called this the neutron and concluded that the protons and neutrons are in the nucleus, and the electrons orbit the nucleus in shells.

Elements and compounds

Elements are substances made of one type of atom. Each atom of an element will have the same number of protons.

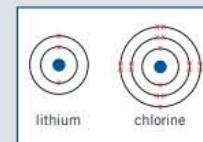
Compounds are made of different types of atoms chemically bonded together. The atoms in a compound have different numbers of protons.

Drawing atoms

Electrons in an atom are placed in fixed shells. You can put

- up to two electrons in the first shell
- eight electrons each in the second and third shells.

You must fill up a shell before moving on to the next one.



Mixtures

- A mixture consists of two or more elements or compounds that are not chemically combined together.
- The substances in a mixture can be separated using physical processes.
- These processes do not use chemical reactions.

Separating mixtures

- filtration – insoluble solids and a liquid
- crystallisation – soluble solid from a solution
- simple distillation – solvent from a solution
- fractional distillation – two liquids with similar boiling points
- paper chromatography – identify substances from a mixture in solution

Atoms and particles

	Relative charge	Relative mass	
Proton	+1	1	= atomic number
Neutron	0	1	= mass number – atomic number
Electron	-1	0 (very small)	= same as the number of protons

All atoms have equal numbers of protons and electrons, meaning they have no overall charge:

$$\text{total negative charge from electrons} = \text{total positive charge from protons}$$

Isotopes

Atoms of the same element can have a different number of neutrons, giving them a different overall mass number. Atoms of the same element with different numbers of neutrons are called **isotopes**.

The **relative atomic mass** is the average mass of all the atoms of an element:

$$\text{relative atomic mass} = \frac{(\text{abundance of isotope 1} \times \text{mass of isotope 1}) + (\text{abundance of isotope 2} \times \text{mass of isotope 2})}{100}$$

Key terms

Make sure you can write a definition for these key terms.

abundance	atom	atomic number	aqueous	compound	electron
element	energy level	isotope	neutron	nucleus	orbit
product	proton	reactant	relative atomic mass		
relative charge		relative mass	shell		

Development of the Periodic Table

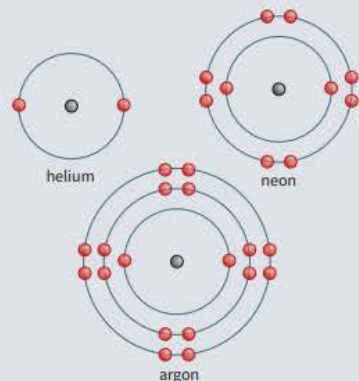
The Periodic Table has changed over time as scientists have organised it differently. Mendeleev was able to accurately predict the properties of undiscovered elements based on the gaps in the table.

	First lists of elements	Mendeleev's Periodic Table	Modern Periodic Table
How are elements ordered?	by atomic mass	normally by atomic mass but some elements were swapped around	by atomic number
Are there gaps?	no gaps	gaps left for undiscovered elements	no gaps – all elements up to a certain atomic number have been discovered
How are elements grouped?	not grouped	grouped by chemical properties	grouped by the number of electrons in the outer shells
Metals and non-metals	no clear distinction	no clear distinction	metals to the left, non-metals to the right
Problems	some elements grouped inappropriately	incomplete, with no explanation for why some elements had to be swapped to fit in the appropriate groups	—

Group 0

Elements in **Group 0** are called the **noble gases**. Noble gases have the following properties:

- full outer shells with eight electrons, so do not need to lose or gain electrons
- are very unreactive (**inert**) so exist as single atoms as they do not bond to form molecules
- boiling points that increase down the group.



Key terms

Make sure you can write a definition for these key terms.

alkali metals chemical properties displacement groups halogens inert isotopes
noble gas organised Periodic Table reactivity undiscovered unreactive

Group 1 elements

Group 1 elements react with oxygen, chlorine, and water, for example:

lithium + oxygen → lithium oxide
lithium + chlorine → lithium chloride
lithium + water → lithium hydroxide + hydrogen

Group 1 elements are called **alkali metals** because they react with water to form an alkali (a solution of their metal hydroxide).

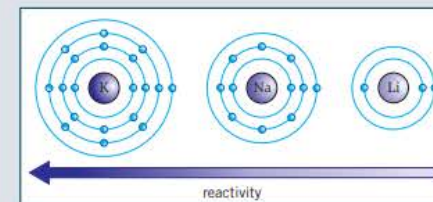
Group 1 the alkali metals

Group 1 properties

Group 1 elements all have one electron in their outer shell.

Reactivity increases down Group 1 because as you move down the group:

- the atoms increase in size
- the outer electron is further away from the nucleus, and there are more shells shielding the outer electron from the nucleus
- the electrostatic attraction between the nucleus and the outer electron is weaker so it is easier to lose the one outer electron
- the melting point and boiling point decreases down Group 1.



Group 7 elements

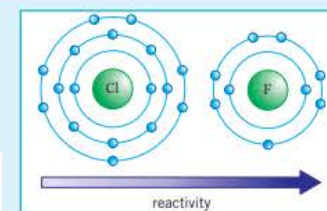
Group 7 elements are called the **halogens**. They are non-metals that exist as molecules made up of pairs of atoms.

Name	Formula	State at room temperature	Melting point and boiling point	Reactivity
fluorine	F ₂	gas	increases down the group	decreases down the group
chlorine	Cl ₂	gas		
bromine	Br ₂	liquid		
iodine	I ₂	solid		

Group 7 reactivity

Reactivity decreases down Group 7 because as you move down the group:

- the atoms increase in size
- the outer shell is further away from the nucleus, and there are more shells between the nucleus and the outer shell
- the electrostatic attraction from the nucleus to the outer shell is weaker so it is harder to gain one electron to fill the outer shell.



Group 7 displacement

More reactive Group 7 elements can take the place of less reactive ones in a compound. This is called **displacement**.

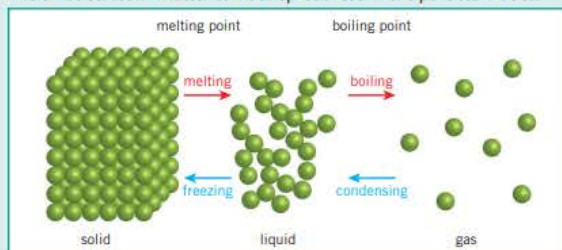
For example, fluorine displaces chlorine as it is more reactive:

fluorine + potassium chloride → potassium fluoride + chlorine



Particle model

The three states of matter can be represented in the particle model.



(HT only) This model assumes that:

- there are no forces between the particles
- that all particles in a substance are spherical
- that the spheres are solid.

The amount of energy needed to change the state of a substance depends on the forces between the particles. The stronger the forces between the particles, the higher the melting or boiling point of the substance.

Covalent bonding

Atoms can share or transfer electrons to form strong chemical bonds.

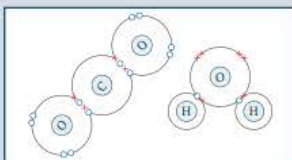
A **covalent bond** is when electrons are *shared* between **non-metal** atoms.

The number of electrons shared depends on how many extra electrons an atom needs to make a full outer shell.

If you include electrons that are shared between atoms, each atom has a full outer shell.

Single bond = each atom shares one pair of electrons.

Double bond = each atom shares two pairs of electrons.



Covalent structures

There are three main types of covalent structure:

Structure and bonding

Giant covalent

Many billions of atoms, each one with a strong covalent bond to a number of others.

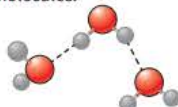
An example of a giant covalent structure is diamond.



Small molecules

Each molecule contains only a few atoms with strong covalent bonds between these atoms. Different molecules are held together by weak **intermolecular forces**.

For example, water is made of small molecules.



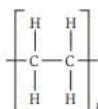
Large molecules

Many repeating units joined by covalent bonds to form a chain.

The small section is bonded to many identical sections to the left and right. The 'n' represents a large number.

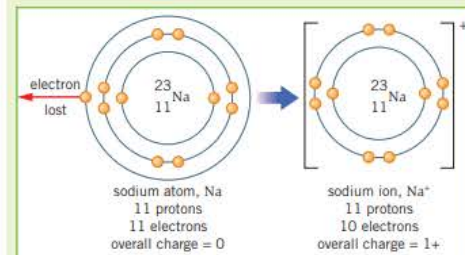
Separate chains are held together by intermolecular forces that are stronger than in small molecules.

Polymers are examples of long molecules.



Ions

Atoms can gain or lose electrons to give them a full outer shell. The number of protons is then different from the number of electrons. The resulting particle has a charge and is called an **ion**.



Conductivity

Solid ionic substances do not conduct electricity because the ions are fixed in position and not free to carry charge.

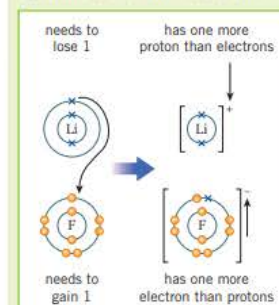
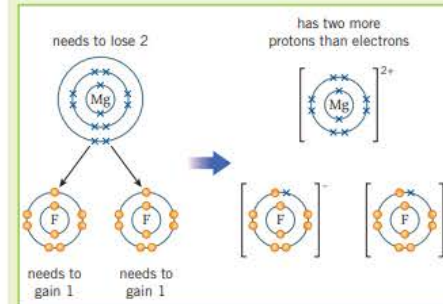
When melted or dissolved in water, ionic substances do conduct electricity because the ions are free to move and carry charge.

Melting points

Ionic substances have high melting points because the electrostatic force of attraction between oppositely charged ions is strong and so requires lots of energy to break.

Ionic bonding

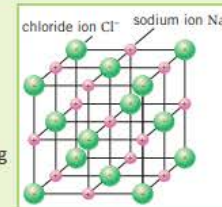
When metal atoms react with non-metal atoms they **transfer** electrons to the non-metal atom.



Metal atoms lose electrons to become positive ions. Non-metal atoms gain electrons to become negative ions.

Giant ionic lattice

When metal atoms transfer electrons to non-metal atoms you end up with positive and negative ions. These are attracted to each other by the strong **electrostatic force of attraction**. This is called ionic bonding.



The electrostatic force of attraction works in all directions, so many billions of ions can be bonded together in a 3D structure.

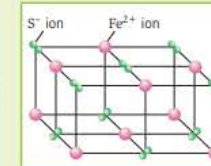
Formulae

The formula of an ionic substance can be worked out 1 from its bonding diagram:

for every one magnesium ion there are two fluoride ions – so the formula for magnesium fluoride is MgF_2

2 from a lattice diagram:

there are nine Fe^{2+} ions and 18 S^{2-} ions – simplifying this ratio gives a formula of FeS_2



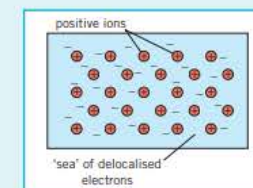
Metals: structure and properties

The atoms that make up metals form layers. The electrons in the outer shells of the atoms are **delocalised** – this means they are free to move through the whole structure.

The positive metal ions are then attracted to these delocalised electrons by the electrostatic force of attraction.

Some important properties of metals are:

- pure metals are **malleable** because the layers can slide over each other
- they are good **conductors** of electricity and of thermal energy because delocalised electrons are free to move through the whole structure
- they have high melting and boiling points because the electrostatic force of attraction between metal ions and delocalised electrons is strong so lots of energy is needed to break it.



Properties

High melting and boiling points because the strong covalent bonds between the atoms must be broken to melt or boil the substances.

This requires a lot of energy.
Solid at room temperature.

Low melting and boiling points because only the intermolecular forces need to be overcome to melt or boil the substances, not the bonds between the atoms.

This does not require a lot of energy as the intermolecular forces are weak.

Normally gaseous or liquid at room temperature.

Melting and boiling points are low compared to giant covalent substances but higher than for small molecules.

Large molecules have stronger intermolecular forces than small molecules, which require more energy to overcome.

Normally solid at room temperature.

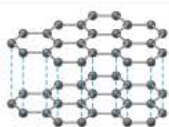
Most covalent structures do not conduct electricity because they do not have **delocalised electrons** or ions that are free to move to carry charge.

Graphite

Graphite is a giant covalent structure, but is different to other giant covalent substances.

Structure

Made only of carbon – each carbon atom bonds to three others, and forms hexagonal rings in layers. Each carbon atom has one spare electron, which is delocalised and therefore free to move around the structure.



Hardness

The layers can slide over each other because they are not covalently bonded. Graphite is therefore softer than diamond, even though both are made only of carbon, as each atom in diamond has four strong covalent bonds.

Conductivity

The delocalised electrons are free to move through graphite, so can carry charges and allow an electrical current to flow. Graphite is therefore a conductor of electricity.

Graphene

Graphene consists of only a single layer of graphite. Its strong covalent bonds make it a strong material that can also conduct electricity. It could be used in composites and high-tech electronics.

Fullerenes

- hollow cages of carbon atoms bonded together in one molecule
- can be arranged as a sphere or a tube (called a **nanotube**)
- molecules held together by weak intermolecular forces, so can slide over each other
- conduct electricity

Spheres

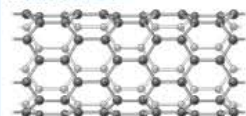
Buckminsterfullerene was the first fullerene to be discovered, and has 60 carbon atoms.

Other fullerenes exist with different numbers of carbon atoms arranged in rings that form hollow shapes.

Fullerenes like this can be used as lubricants and in drug delivery.



Nanotubes

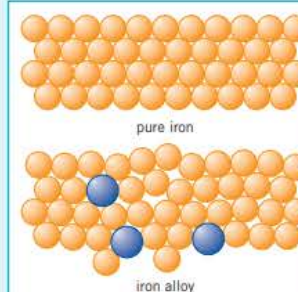


The carbon atoms in nanotubes are arranged in cylindrical tubes.

Their high **tensile strength** (they are difficult to break when pulled) makes them useful in electronics.

Alloys

Pure metals are often too soft to use as they are. Adding atoms of a different element can make the resulting mixture harder because the new atoms will be a different size to the pure metal's atoms. This will disturb the regular arrangement of the layers, preventing them from sliding over each other. The harder mixture is called an **alloy**.



Key terms

Make sure you can write a definition for these key terms.

conductivity	conductor	delocalised electron	electrostatic force of attraction
ion	lattice	layer	malleable
			surface area to volume ratio
			transfer

Reactions of metals

The **reactivity** of a metal is how chemically reactive it is. When added to water, some metals react very vigorously – these metals have *high* reactivity. Other metals will barely react with water or acid, or won't react at all – these metals have *low* reactivity.

Reactivity series

The reactivity series places metals in order of their reactivity. Sometimes, for example in the table below, hydrogen and carbon are included in the series, even though they are non-metals.

Reaction with water	Reaction with acid	Reactivity series		Extraction method
		Metal	Reactivity	
fizzes, gives off hydrogen gas	explodes	potassium	<div style="text-align: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Decreasing reactivity</div> <div style="text-align: center;"> <div style="font-size: 2em;">↓</div> </div> </div>	electrolysis
		sodium		
		lithium		
		calcium		
reacts very slowly	fizzes, gives off hydrogen gas	magnesium		reduction with carbon
		aluminium		
		(carbon)		
		zinc		
no reaction	reacts slowly with warm acid	iron		mined from the Earth's crust
		tin		
		lead (hydrogen)		
		copper		
no reaction	no reaction	silver		
		gold		

Metal extraction

Some metals, like gold, are so unreactive that they are found as pure metals in the Earth's crust and can be mined.

Most metals exist as compounds in rock and have to be extracted from the rock. If there is enough metal compound in the rock to be worth extracting it is called an **ore**.

Metals that are less reactive than carbon can be extracted by reduction with carbon. For example:



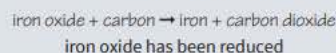
Metals that are more reactive than carbon can be extracted using a process called **electrolysis**.

Reduction and oxidation

If a substance gains oxygen in a reaction, it has been **oxidised**.

If a substance loses oxygen in a reaction, it has been **reduced**.

For example:



Salts

When acids react with metals or metal compounds, they form salts. A salt is a compound where the hydrogen from an acid has been replaced by a metal. For example nitric acid, HNO_3 , reacts with sodium to form NaNO_3 . The H in nitric acid is replaced with Na.

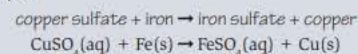
The table shows how to name salts.

Acid	hydrochloric acid	sulfuric acid	nitric acid
Formula	HCl	H_2SO_4	HNO_3
Ions formed in solution	H^+ and Cl^-	2H^+ and SO_4^{2-}	H^+ and NO_3^-
Type of salt formed	metal chloride	metal sulfate	metal nitrate
Sodium salt example	sodium chloride, NaCl	sodium sulfate, Na_2SO_4	sodium nitrate, NaNO_3

Displacement reactions

In a **displacement** reaction a *more* reactive element takes the place of a *less* reactive element in a compound.

For example:

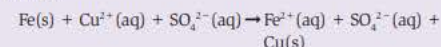


Iron is more reactive than copper, so iron displaces the copper in copper sulfate.

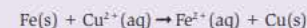
Ionic equations (HT only)

When an ionic compound is dissolved in a solution, we can write the compound as its separate ions. For example, $\text{CuSO}_4(\text{aq})$ can be written as $\text{Cu}^{2+}(\text{aq})$ and $\text{SO}_4^{2-}(\text{aq})$.

The displacement reaction of copper sulfate and iron can be written as:



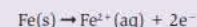
The SO_4^{2-} is unchanged in the reaction – it is a **spectator ion**. Spectator ions are removed from the equation to give an **ionic equation**:



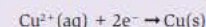
Metals, covalent substances, and solid ionic substances do not split into ions in the ionic equation.

Half equations (HT only)

In the displacement reaction, an iron atom loses two electrons to form a iron ion:



A copper ion gains two electrons to form a copper atom:



These two equations are called **half equations** – they each show half of the ionic equation.

Reactivity and ions

A metal's reactivity depends on how readily it forms an **ion** by losing electrons.

In the displacement reaction of copper sulfate and iron, iron forms an ion more easily than copper.

At the end of the reaction you are left with iron ions, not copper ions.

Steps for writing an ionic equation (HT only)

- 1 check symbol equation is balanced
- 2 identify all aqueous ionic compounds
- 3 write those compounds out as ions
- 4 remove spectator ions.

Reduction and oxidation: electrons (HT only)

Oxidation and reduction (**redox** reactions) can be defined in terms of oxygen, but can also be defined as the loss or gain of electrons.

Oxidation is the *loss* of electrons, and reduction is the *gain* of electrons.

In the example displacement reaction:

- iron atoms have been oxidised
- copper ions have been reduced.

Acids and alkalis

Acids are compounds that, when dissolved in water, release H^+ ions. There are three main acids: sulfuric acid H_2SO_4 , nitric acid HNO_3 , and hydrochloric acid HCl .

Alkalis are compounds that, when dissolved in water, release OH^- ions.

The **pH** scale is a measure of acidity and alkalinity. It runs from 1 to 14.

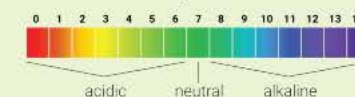
- Aqueous solutions with $\text{pH} < 7$ are acidic.
- Aqueous solutions with $\text{pH} > 7$ are alkaline.
- Aqueous solutions with $\text{pH} = 7$ are neutral.

Indicators

Indicators can show if something is an acid or an alkali.

- **Universal indicator** can also tell us the approximate pH of a solution.
- Electronic pH probes can give us the exact pH of a solution.

The pH scale



Reactions of acids

Reactions of acids with metals

Acids react with some metals to form salts and hydrogen gas.



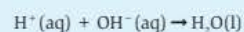
Neutralisation reactions

Reactions of acids with metal hydroxides

Acids react with metal hydroxides to form salts and water.



The ionic equation for this reaction is always:



Reactions of acids with metal oxides

Acids react with metal oxides to form salts and water.



Reactions of acids with metal carbonates

Acids react with metal carbonates to form a salt, water, and carbon dioxide.



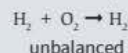
Alkalis and bases

Bases neutralise acids to form water in **neutralisation** reactions. Some metal hydroxides dissolve in water to form alkaline solutions, called **alkalis**.

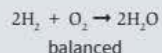
Some metal oxides and metal hydroxides do not dissolve in water. They are **bases**, but are not **alkalis**.

Balancing symbol equations

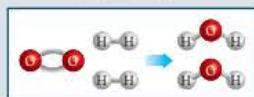
When writing symbol equations you need to ensure that the number of each atom on each side is equal.



there are 2 hydrogen atoms on each side, but 2 oxygen atoms in the reactants and 1 in the product



there are 4 hydrogen atoms on each side, and 2 oxygen atoms on each side



State symbols

A balanced symbol equation should also include state symbols.

State	Symbol
solid	(s)
liquid	(l)
gas	(g)
aqueous or dissolved in water	(aq)



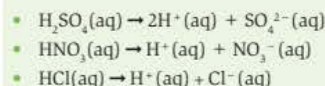
Key terms

Make sure you can write a definition for these key terms.

displacement electrolysis extraction half equation ion ionic equation
metal ore oxidation reactivity reactivity series redox reduction
spectator ion state symbols

Strong and weak acids

Sulfuric acid, nitric acid, and hydrochloric acid, are all **strong acids**. This means that, when dissolved in water, every molecule splits up into ions – they are completely ionised:



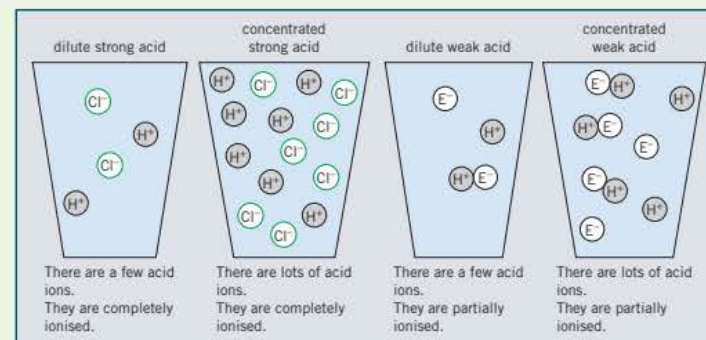
Ethanoic acid, citric acid, and carbonic acid are **weak acids**. This means that only a percentage of their molecules split up into ions when dissolved in water – they are partially ionised.

For a given concentration, the **stronger** the acid, the **lower** the pH.

Concentrated and dilute acids

Concentration tells us how much of a substance there is dissolved in water:

- more concentrated acids have lots of acid in a small volume of water
- less concentrated acids (dilute acids) have little acid in a large volume of water.

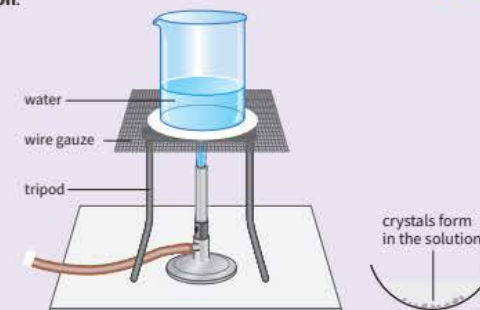


Crystallisation

You can produce a solid salt from an insoluble base by **crystallisation**.

The experimental method is:

- Choose the correct acid and base to produce the salt.
- Put some of the dilute acid into a flask. Heat gently with a Bunsen burner.
- Add a small amount of the base and stir.
- Keep adding the base until no more reacts – the base is now in excess.
- Filter to remove the unreacted base.
- Add the remaining solution to an evaporating dish.
- Use a water bath or electric heater to evaporate the water. The salt crystals will be left behind.



Systems

A **system** is an object or group of objects.

Whenever anything changes in a system, energy is transferred between its stores or to the surroundings.

A **closed system** is one where no energy can escape to or enter from the surroundings. The total energy in a closed system never changes.

Energy stores

kinetic	energy an object has because it is moving
gravitational potential	energy an object has because of its height above the ground
elastic potential	energy an elastic object has when it is stretched or compressed
thermal (or internal)	energy an object has because of its temperature (the total kinetic and potential energy of the particles in the object)
chemical	energy that can be transferred by chemical reactions involving foods, fuels, and the chemicals in batteries
nuclear	energy stored in the nucleus of an atom
magnetic	energy a magnetic object has when it is near a magnet or in a magnetic field
electrostatic	energy a charged object has when near another charged object

Energy transfers

Energy can be transferred to and from different stores by:

Heating

Energy is transferred from one object to another object with a lower temperature.

Waves

Waves (e.g., light and sound) can transfer energy.

Electricity

An electric current transfers energy.

Forces (mechanical work)

Energy is transferred when a force moves or changes the shape of an object.

Examples of energy transfers

When you stretch a rubber band, energy from your chemical store is mechanically transferred to the rubber band's elastic potential store.

When a block is dropped from a height, energy is mechanically transferred (by the force of gravity) from the block's gravitational potential store to its kinetic store.

When this block hits the ground, energy from its kinetic energy store is transferred mechanically and by sound waves to the thermal energy store of the surroundings.

The electric current in a kettle transfers energy to the heating element's thermal energy store. Energy is then transferred by heating from the heating element's thermal energy store to the thermal energy store of the water.

When an object slows down due to friction, energy is mechanically transferred from the object's kinetic store to its thermal store, the thermal store of the object it is rubbing against, and to the surroundings.

Work done

When an object is moved by a force **work** is done on the object. The force transfers energy to the object. The amount of energy transferred is equal to the work done. You can calculate the work done (and the energy transferred) using the equation:

$$\text{work done (J)} = \text{force (N)} \times \text{distance moved along the line of action of the force (m)}$$

Calculating the energy in an energy store

An object's gravitational potential energy store depends on its height above the ground, the gravitational field strength, and its mass.

gravitational potential energy (J) = mass (kg) × gravitational field strength (N/kg) × height (m)

$$E_p = m g h$$

An object's kinetic energy store depends only on its mass and speed.

kinetic energy (J) = 0.5 × mass (kg) × (speed)² (m/s)²

$$E_k = \frac{1}{2} m v^2$$

The elastic potential energy store of a stretched spring can be calculated using:

elastic potential energy (J) = 0.5 × spring constant (N/m) × (extension)² (m)

$$E_e = \frac{1}{2} k e^2$$
 (assuming the limit of proportionality has not been exceeded)

Power is how much work is done (or how much energy is transferred) per second. The unit of power is the watt (W).

1 watt = 1 joule of energy transferred per second

power (W) = $\frac{\text{energy transferred (J)}}{\text{time (s)}}$



$$P = \frac{E}{t}$$

or

power (W) = $\frac{\text{work done (J)}}{\text{time (s)}}$

$$P = \frac{W}{t}$$



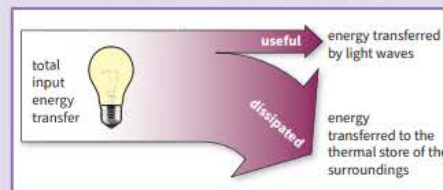
Key terms

Make sure you can write a definition for these key terms.

chemical	closed system	dissipated	efficiency	elastic potential	electrostatic
gravitational potential	kinetic	lubrication	magnetic	nuclear	power
streamlining	system	thermal	work done		

Useful and dissipated energy

Energy cannot be created or destroyed – it can only be transferred usefully, stored, or dissipated (wasted).



Energy is never entirely transferred usefully – some energy is always dissipated, meaning it is transferred to less useful stores.

All energy eventually ends up transferred to the thermal energy store of the surroundings.

In machines, work done against the force of friction usually causes energy to be wasted because energy is transferred to the thermal store of the machine and its surroundings.

Lubrication is a way of reducing unwanted energy transfer due to friction.

Streamlining is a way of reducing energy wasted due to air resistance or drag in water.

Use of thermal insulation is a way of reducing energy wasted due to heat dissipated to the surroundings.

Efficiency is a measure of how much energy is transferred usefully. You must know the equation to calculate efficiency as a decimal:

efficiency = $\frac{\text{useful output energy transfer (J)}}{\text{total input energy transfer (J)}}$



or
efficiency = $\frac{\text{useful power output (W)}}{\text{total power input (W)}}$

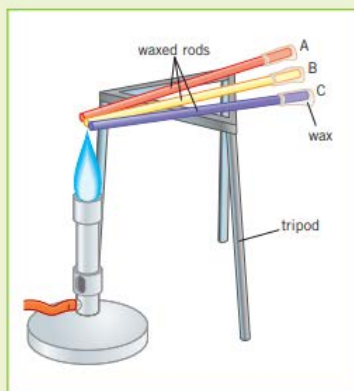
To give efficiency as a **percentage**, just multiply the result from the above calculation by 100 and add the % sign to the answer.

Thermal conductivity

The **thermal conductivity** of a material tells you how quickly energy is transmitted through it by thermal conduction.

You can test the thermal conductivity of rods made of different metals using this experimental set-up. Each rod must have the same diameter and length, and the same temperature difference between its ends.

One end of each rod is covered in wax and the other ends are heated equally. The faster the wax melts, the higher the thermal conductivity of the metal.



Insulating buildings

Heating bills can be expensive so it is important to reduce the rate of heat loss from buildings.

Some factors that affect the rate of heat loss from a building include:

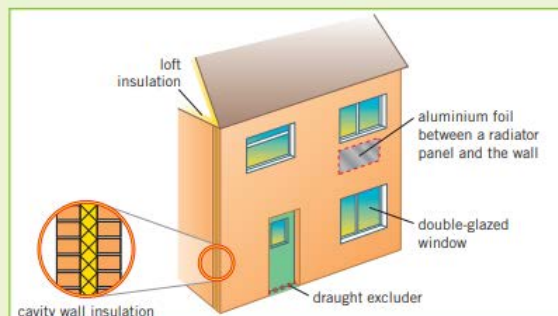
- 1 the thickness of its walls and roof
- 2 the thermal conductivity of its walls and roof.
lower thermal conductivity = lower rate of heat loss

The thermal conductivity of the walls and roof can be reduced by using **thermal insulators**.

A thermal insulator is a material which has a low thermal conductivity. The rate of energy transfer through an insulator is low.

The energy transfer per second through a material depends on:

- 1 the material's thermal conductivity
- 2 the temperature difference between the two sides of the material
- 3 the thickness of the material.



Specific heat capacity

When a substance is heated or cooled the temperature change depends on:

- the substance's mass
- the type of material
- how much energy is transferred to it.

Every type of material has a **specific heat capacity** – the amount of energy needed to raise the temperature of 1 kg of the substance by 1°C.

The energy transferred to the thermal store of a substance can be calculated from the substance's mass, specific heat capacity, and temperature change:

$$\text{change in thermal energy (J)} = \text{mass (kg)} \times \text{specific heat capacity (J/kg}^\circ\text{C)} \times \text{temperature change (}^\circ\text{C)}$$

$$\Delta E = m c \Delta \theta$$

This equation will be given to you on the equation sheet, but you need to be able to select and apply it to the correct questions.



Key terms

Make sure you can write a definition for these key terms.

absorb

specific heat capacity

thermal conductivity

thermal insulator



Energy resources

The main ways in which we use the Earth's energy resources are:

- generating electricity
- heating
- transport.

Most of our energy currently comes from **fossil fuels** – coal, oil, and natural gas.

Reliability and environmental impact

Some energy resources are more reliable than others. **Reliable** energy resources are ones that are available all the time (or at predictable times) and in sufficient quantities.

Both **renewable** and **non-renewable** energy resources have some kind of **environmental impact** when we use them.

Non-renewable energy resources

- not replaced as quickly as they are used
 - will eventually run out
- For example, fossil fuels and nuclear fission.

Renewable energy resources

- can be replaced at the same rate as they are used
 - will not run out
- For example, solar, tidal, wave, wind, geothermal, biofuel, and hydroelectric energies.

Non-renewable energy resources				
Resource	Main uses	Source	Advantages	Disadvantages
coal	generating electricity	extracted from underground	<ul style="list-style-type: none"> • enough available to meet current energy demands • reliable – supply can be controlled to meet demand • relatively cheap to extract and use 	<ul style="list-style-type: none"> • will eventually run out • release carbon dioxide when burned – one of the main causes of climate change • release other polluting gases, such as sulfur dioxide (from coal and oil) which causes acid rain • oil spills in the oceans kill marine life
oil	generating electricity transport heating			
natural gas	generating electricity heating			
nuclear fission	generating electricity	mining naturally occurring elements, such as uranium and plutonium	<ul style="list-style-type: none"> • no polluting gases or greenhouse gases produced • enough available to meet current energy demands • large amount of energy transferred from a very small mass of fuel • reliable – supply can be controlled to meet demand 	<p>produces nuclear waste, which is:</p> <ul style="list-style-type: none"> • dangerous • difficult and expensive to dispose of • stored for centuries before it is safe to dispose of. <p>nuclear power plants are expensive to:</p> <ul style="list-style-type: none"> • build and run • decommission (shut down).



Key terms

Make sure you can write a definition for these key terms.

biofuel carbon neutral environmental impact fossil fuel geothermal
hydroelectric non-renewable reliability renewable

Resource	Main uses	Source	Advantages	Disadvantages
solar energy	generating electricity	sunlight transfers energy to solar cells	can be used in remote places very cheap to run once installed	supply depends on weather expensive to buy and install cannot supply large scale demand
	heating	sunlight transfers energy to solar heating panels	no pollution/greenhouse gases produced	
hydroelectric energy	generating electricity	water flowing downhill turns generators	low running cost no fuel costs reliable and supply can be controlled to meet demand	expensive to build hydroelectric dams flood a large area behind the dam, destroying habitats and resulting in greenhouse gas production from rotting vegetation
tidal energy	generating electricity	turbines on tidal barrages turned by water as the tide comes in and out	predictable supply as there are always tides can produce large amounts of electricity no fuel costs no pollution/greenhouse gases produced	tidal barrages: – change marine habitats and can harm animals – restrict access and can be dangerous for boats – are expensive to build and maintain cannot control supply supply varies depending on time of month
wave energy	generating electricity	floating generators powered by waves moving up and down	low running cost no fuel costs no pollution/greenhouse gases produced	floating generators: – change marine habitats and can harm animals – restrict access and can be dangerous for boats – are expensive to build, install, and maintain dependent on weather cannot supply large scale demand
wind energy	generating electricity	turbines turned by the wind	low running cost no fuel costs no pollution/greenhouse gases produced	supply depends on weather large amounts of land needed to generate enough electricity for large scale demand can produce noise pollution for nearby residents
geothermal energy	generating electricity heating	radioactive substances deep within the Earth transfer heat energy to the surface	low running cost no fuel costs no pollution/greenhouse gases produced	expensive to set up only possible in a few suitable locations around the world
biofuels	generating electricity transport	fuel produced from living or recently living organisms, for example, plants and animal waste	can be carbon neutral – the amount of carbon dioxide released when the fuel is burnt is equal to the amount of carbon dioxide absorbed when the fuel is grown reliable and supply can be controlled to meet demand	expensive to produce biofuels growing biofuels requires a lot of land and water that could be used for food production can lead to deforestation – forests are cleared for growing biofuel crops

Changes of state

Changes of state and conservation of mass

Changes of state are physical changes because no new substances are produced. The mass always stays the same because the number of particles does not change.

Particles and kinetic energy

When the temperature of a substance is increased, the kinetic energy store of its particles increases and the particles vibrate or move faster.

If the kinetic store of a substance's particles increases or decreases enough, the substance may change state.

Density

You can calculate the density of an object if you know its mass and volume:

$$\text{density (kg/m}^3\text{)} = \frac{\text{mass (kg)}}{\text{volume (m}^3\text{)}}$$

$$\rho = \frac{m}{V}$$

Internal energy

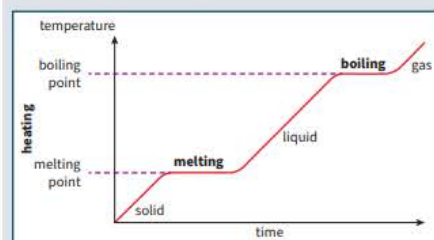
Heating a substance increases its **internal energy**.

Internal energy is the sum of the total kinetic energy the particles have due to their motion and the total potential energy the particles have due to their positions relative to each other.

Latent heat

In a graph showing the change in temperature of a substance being heated or cooled, the flat horizontal sections show when the substance is changing state.

The energy transfers taking place during a change in state do not cause a change in temperature, but do change the internal energy of the substance.



States of matter

Gas	Arrangement	<ul style="list-style-type: none"> particles are spread out almost no forces of attraction between particles large distance between particles on average
	Movement	<ul style="list-style-type: none"> particles move randomly at high speed
	Properties	<ul style="list-style-type: none"> low density no fixed volume or shape can be compressed and can flow spread out to fill all available space
Liquid	Arrangement	<ul style="list-style-type: none"> particles are in contact with each other forces of attraction between particles are weaker than in solids
	Movement	<ul style="list-style-type: none"> particles are free to move randomly around each other
	Properties	<ul style="list-style-type: none"> usually lower density than solids fixed volume shape is not fixed so they can flow
Solid	Arrangement	<ul style="list-style-type: none"> particles held next to each other in fixed positions by strong forces of attraction
	Movement	<ul style="list-style-type: none"> particles vibrate about fixed positions
	Properties	<ul style="list-style-type: none"> high density fixed volume fixed shape (unless deformed by an external force)

The relationship between temperature and pressure in gases

Gas temperature

The particles in a gas are constantly moving in random directions and with random speeds. The temperature of a gas is related to the average kinetic energy of its particles. When a gas is heated, the particles gain kinetic energy and move faster, so the temperature of the gas increases.

If the temperature of a gas in a sealed container is increased, the pressure increases because

- the particles move faster so they hit the surfaces with more force
- the number of these impacts per second increases, exerting more force overall.

Gas pressure

The pressure a gas exerts on a surface, such as the walls of a container, is caused by the force of the gas particles hitting the surface. The pressure of a gas produces a net force at right angles to the walls of a container or any surface.

If a gas is compressed quickly, for example, in a bicycle pump, its temperature can rise. This is because

- compressing the gas requires a force to be applied to the gas – this results in work being done to the gas, since work done = force × distance
- the energy gained by the gas is not transferred quickly enough to its surroundings.

Key terms

Write a definition for these key terms.

boiling condensation conservation of mass density evaporation freezing fusion
internal energy latent heat melting specific latent heat sublimation vaporisation

$$\text{thermal energy for a change in state (J)} = \text{mass (kg)} \times \text{specific latent heat (J/kg)}$$

$$E = m \times l$$

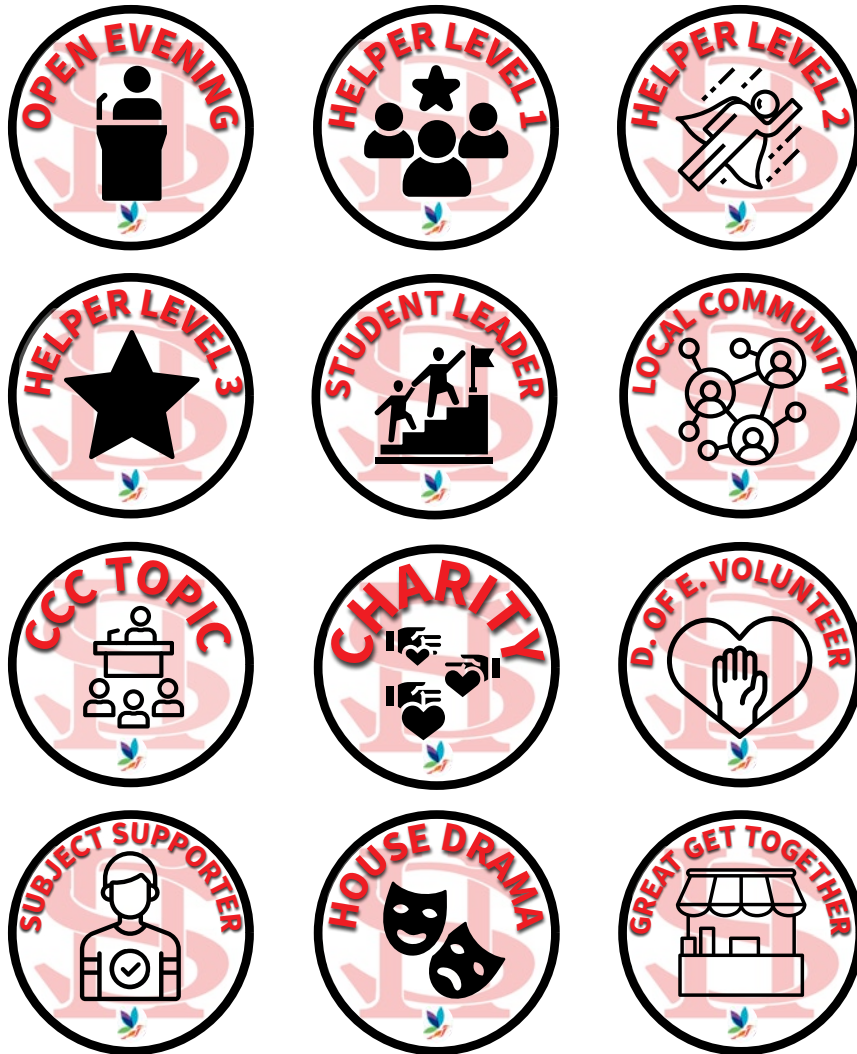


At Highdown we CARE

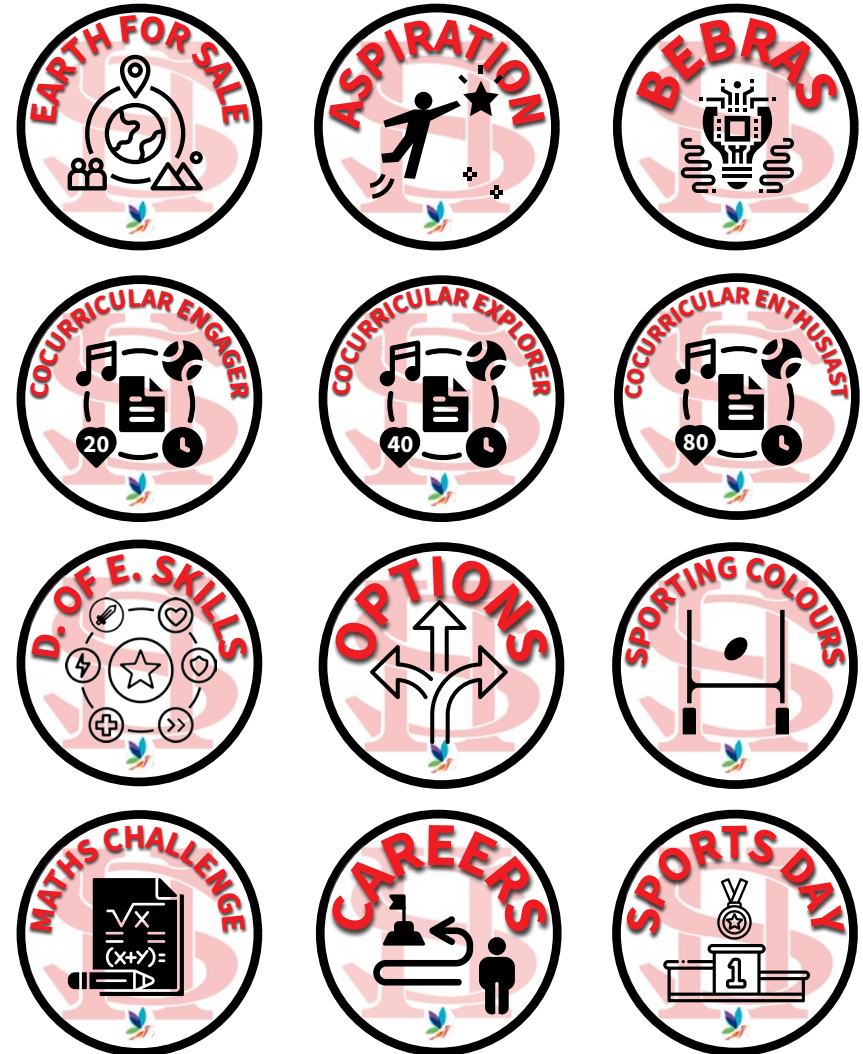
The CARE programme is designed to celebrate your engagement with co-curricular opportunities at Highdown. Across the academic year we are challenging you to complete as many of the activities from the following lists as possible. Once you have completed 20 challenges you will be awarded with a physical bronze badge. You will receive a silver badge for 30 challenges and a gold badge for 40.

Community	Aspiration	Respect	Excellence
Open Evening Badge – Support with Y6 Open Evening	Planet Earth For Sale Badge – Enter the Geography poster competition	Club Stalwart - Attend one club 20 times or more	Reader Badge - Write a book report and present it to a member of staff
Helper Level 1 Badge – Receive 15 P1s for being helpful	Aspiration Badge – Achieve all Ms and Es for Aspiration in a report	Classroom Helper – become a classroom helper in one subject for 3 weeks	Excellence Badge - Achieve all Ms and Es for excellence in report
Helper Level 2 Badge – Receive 4 P2s for significant community contribution	Bebras Badge – Enter the Bebras competition	Reliability Badge - Demonstrate completing a chore at home for at least 6 weeks to your mentor	Independent Study Badge - Receive 10 P2s for excellence In independent study
Helper Level 3 Badge – Receive 2 P3s for being a Community Star	Cocurricular Engager Badge – Attend clubs 20 times	Goals Badge - Write 5 improvement goals for the academic year share them with your mentor	Praise Points Bronze Badge - Achieve 300 P points
Helper Level 3 Badge – Receive a P3 for being a Community Star	Cocurricular Explorer Badge – Attend clubs 40 times	Gratitude Badge - Write 4 thank you notes to members of staff	Praise Points Silver Badge - Achieve 600 P points
Student Leader Badge – Become a KS3 House ambassador	Cocurricular Enthusiast Badge – Attend clubs 80 times	House Star – Receive a P3 for being a House Star	Praise Points Gold Badge - Achieve 900 P points
Local Community Badge - Demonstrate you have completed an activity that that has benefited the local community	DofE Skills- Complete Bronze DofE skills section	Lesson Star - Receive 3 positive emails home from your teachers	Performance Badge - Take part in a school show
CCC Badge – Present a CCC topic to your mentor group	Options Badge – Go to Options Evening and speak to a teacher about your GCSE options	Mentor Star - Receive a positive email home from your mentor	MCQ Badge - Get an average of 12 or more in the end of term knowledge checks in all your subjects
Charity Badge – Raise money for a charity of your choice	Sporting Colours Badge – Attend one sports club for a whole term (separate badges for each sport)	Department Star – Receive 3 P3s for being a Department Star	Knowledge Badge - Improve your end of term knowledge quiz score in 3 subjects
DofE Volunteering - Complete Bronze DofE volunteering section	Maths Challenge – Enter the Maths Challenge	Ready For The Day - Receive Ready for the day 40 times	DIRT Badge – Provide evidence of at least 5 completed DIRT tasks
House Drama Badge – Take part in the House Drama competition	Careers Badge - Build your digital profile on Unifrog	Respect Badge - Achieve all Ms and Es for respect in a report	HEP Badge - Achieve 5 targets on Highdown Excellence Plan across the school year
Great Get Together Badge – Run an activity at the Great Get Together	Sports Day Badge – Take part in Sports Day	Punctuality Badge – Be on time to mentor every day for a term	Headteachers Award Badge - Achieve a P4 Headteachers award

COMMUNITY



ASPIRATION



RESPECT



EXCELLENCE



WEEK A					
Period	Monday	Tuesday	Wednesday	Thursday	Friday
1					
2					
BREAK					
3					
4					
LUNCH					
5					

WEEK B					
Period	Monday	Tuesday	Wednesday	Thursday	Friday
1					
2					
BREAK					
3					
4					
LUNCH					
5					



Highdown School and Sixth Form Centre

Year 9 Knowledge Organiser

2026-2027