Name and Tutor group:

Year 9 Knowledge Organiser

Term 4

Contents

CORSHAM CHARACTER

INTELLECTUAL VALUES

The pursuit of truth, knowledge and understanding.

Be reflective. Be curious. Be open-minded. Be creative.

PERFORMANCE VALUES

Maximum effort, maximum focus.

Be resilient. Always Persevere. Contribute to Teamwork. Be ambitious.

DREAM BELIEVE ACHIEVE

Knowledge Organiser – Year 9 Art

FOOD ART TEXTILES

EXAMPLES OF FINAL OUTCOMES:

YOU WILL LEARN:

- Different types of hand-embroidery stitches
- How to make your own embroidered sweet-treat!

In this project you will explore hand-embroidery and look at artist Wayne Thiebaud's delicious paintings of sweet treats.

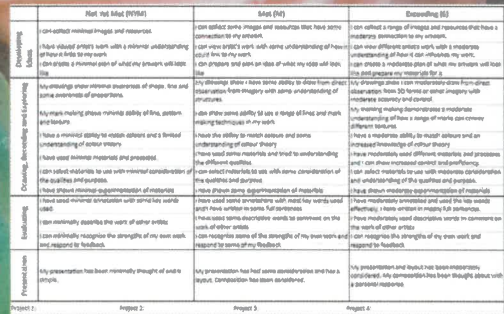
Why am I learning this?

The foundation skills in this project will enable you to experience a small project on Art Textiles and allow you to decide if it is what you would like to do for GCSE.
It will give you a small insight into what GCSE Textiles will entail.

Homework tasks:

Tick when complete

1. Create an artist research page all about Mary Corbet OR Laura McGarrity.
2. Re-create one of Wayne Thiebaud's paintings of a sweet treat.



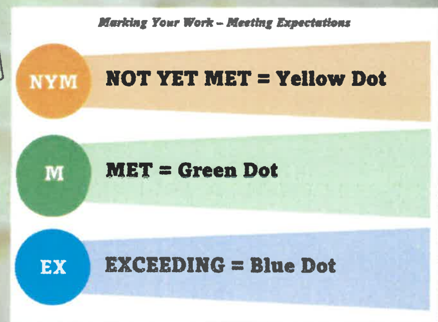
Keywords

Keywords	
Embroidery	The art of decorating a material with needle and thread.
Stitch	A loop of thread or yarn resulting from a single pass or movement of the needle.
Thread	A group of filaments twisted together, or a filamentous length formed by spinning and twisting short textile fibres into a continuous strand.
Cast On	To initially create stitches onto the needle to begin knitting or crocheting a new row.
Cast Off	To finish a row of stitches by essentially removing them from the needle, creating a neat edge.

HOW WELL AM I DOING?

Look out for coloured dots in your book by your teacher to show where you are at!

Check your curriculum expectations sheet!



Y9 Audacity Knowledge Organiser

To add a new sound go File -> Import -> Audio. Otherwise it will open it in a new Audacity window.

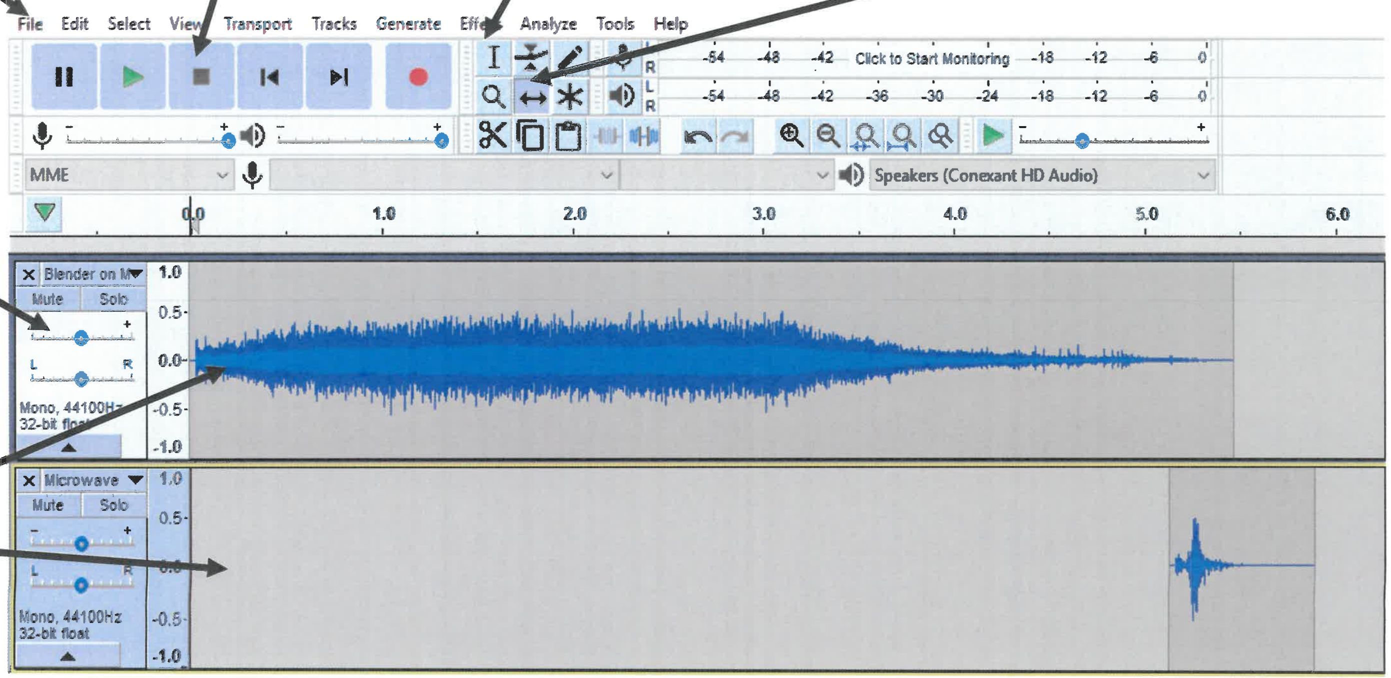
Make sure to press stop if you want to edit. If you just pause it wont let you change anything

Use the select tool to drag an area of a sound. Then you could delete it or apply an effect to that area

Use the time shift tool to move a sound so it starts earlier or later

To make one sound louder or quieter compared to the others use the + - slider

Each sound you use is shown on a different track. Tall parts of the sound are loud, thin parts are quiet.



Year 9

Drama Knowledge Organiser

Rehearsal Techniques:

- **Observation** - watching other, usually professional, actors performing your role, either on film or as a live performance. **OR** Watching real people who are similar to your character.
- **Research** - finding out more information about issues surrounding the character or about the time period in which they exist.
- **Role on the Wall** - a diagram used by actors to represent and explore the character they are playing. Around the outside you include information about the external facts about their life, on the inside of the diagram you include information about the character's personality, thoughts, feelings and emotions.
- **Analysing Subtext** - looking at the difference between what a character says and does and what they actually think and feel.
- **Hot-seating** - when an actor is questioned about their character's background, behaviour and motivation and they answer in role as that character would.
- **Off-text Improvisation** - taking the characters you already know and improvising scenes with them in unfamiliar places/scenarios, away from the existing scenes.
- **Role Swap** - swapping roles with another actor. Allows the actor to observe someone else perform their role, which may inspire new ideas as they gain a different perspective on how the role could be played.
- **Forum Theatre** - while acting out a scene, the group watching is encouraged to stop the performance when they think it necessary, to suggest a different action. At other times, the actors themselves can stop the action, and ask for help. Sometimes someone else can step in and take over a role - or even introduce a new one.
- **Emotion Memory** - an acting technique in which the actor summons up the memory of a particular emotional experience they have had and transfers those feelings to the character they are playing.
- **Voice Work** - experimenting with accent, pace, pitch, pause, volume, clarity, emphasis and tone to find a voice that is suitable for the character being played.
- **Movement Work** - experimenting with movement, gesture, facial expression and proxemics to find a way of moving that is suitable for the character being played.

Structuring a Performance:

- **Sequencing** - the order of events/scenes - this can be varied to create interest.
- **Linear Narrative** - when a story is told in chronological order (the order that the events happened in).
- **Non-linear Narrative** - when a story is told out of chronological order (not in the order that the events happened).
- **Exposition** - the opening scene of a play in which the characters/situation/context are introduced.
- **Flashback** - moving the action backwards in time to explain or reveal something.
- **Flash Forward** - moving the action forwards in time to suggest or foreshadow something.
- **Foreshadowing** - a warning/indication/hint of a future event.
- **Dramatic Tension** - a feeling the story is building up towards something exciting or important happening.
- **Dramatic Irony** - when the audience of a play knows something that the characters on stage **do not know**.
- **Montage** - a series of short scenes put together to show the passing of time.
- **Juxtaposition** - when two things are placed side by side for comparison or contrast.
- **Subplot** - smaller stories that allow the audience to follow the journey of different characters and events within the plot.
- **Cliffhanger** - an ending that leaves the audience in suspense.
- **Cyclical Structure** - repeating the same events or patterns at the beginning and the end of a play/scene/act.

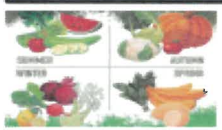
Creative Drama Techniques:

- **Freeze Frame** - when the actors freeze in position on stage creating a still image presenting a scene/moment as though someone has pressed pause.
- **Tableau** - when the actors freeze in position on stage creating a still image presenting an abstract idea.
- **Breaking the Fourth Wall** -when the audience are directly addressed by the actors on stage - this may be to ask the audience questions, present facts and figures, narrate the action or deliver thought tracking (when a character stops a scene and steps out of it to talk to the audience about how they're feeling).
- **Split Staging** - when the stage is split into two or more different locations.
- **Cross Cutting** - directing the audience's attention to action on the different sides of a split stage, perhaps by freezing one side.
- **Subtext** - a deeper, hidden meaning in things we say (underneath the words) - subtext often reveals the real feelings of those who are speaking.
- **Physical Theatre** - a form of theatre that emphasises the use of physical movement for expression, to create shapes/objects and tell a story.
- **Mime** - acting through body movement without the use of speech. Demonstrating an action with an object that doesn't exist - pretending.
- **Chorus/Unison** - a group of actors performing synchronised movement and/or speaking/singing together - the same thing at the same time.
- **Repetition** - when a movement, gesture or line is delivered more than once.
- **Canon** - when a group complete the same movement one after another, (e.g. Mexican Wave).
- **Soundscape** - a collection of sounds which are used together to set a scene and create an atmosphere.
- **Line Story** - when the characters perform their actions and dialogue out to the audience instead of facing each other.
- **Stage Combat** - a specialised technique in theatre, it is designed to create the illusion of physical combat without causing harm to the performers and is always choreographed.
- **Monologue** - a long speech delivered to other characters or directly to the audience.
- **Soliloquy** - a long speech where a character talks to themself or voices their thoughts aloud for the benefit of the audience - as though we are reading their thoughts.

Year 9 Food and Nutrition- Knowledge Organiser

Nutritional needs of people at different life stages	
Babies 0-1 year - Fast body growth and development. Energy needs increase with activity	All nutrients, especially protein, vitamins and minerals Avoid adding sugar and salt to foods
Pre-school children 1-4 years - Fast body growth and development. A lot of energy is used in play.	All nutrients, especially protein, vitamins and minerals but Limit sugar & salt.
Children 5-12 years - Growth continues in spurts. Physical activity most of the time to prevent becoming overweight.	All nutrients, especially protein, vitamins and minerals Limit the number of free sugars and salt in foods and drinks
Teenagers - Fast body growth and development from child to adult. Minerals are put into the bones and teeth; Females start to have periods. Lack of sleep and pressures of school may lead to lack of energy and poor concentration	All nutrients, especially protein, vitamins and minerals Limit the number of free sugars and salt in foods and drinks TEENAGER
Adults - Body stops growing at 21 years of age and needs to looked after to maintain health, prevent disease and be active Weight gain if the diet is unbalanced and not active	All nutrients, especially protein, vitamins and minerals 18+
Older adults The body needs to be looked after. Memory may become poor. Bones & teeth gradually start to lose minerals, and osteoporosis may develop.	All nutrients, especially protein, vitamins and minerals. Limit fatty and sugary foods to prevent weight gain.

Sustainable food – Sustainable food is food that is produced, processed, distributed, and disposed of in ways that are environmentally friendly and contribute to a healthy and nutritious food system. These food are unlikely to run out.



FAIRTRADE

CERTIFIED SUSTAINABLE SEAFOOD MSC www.msc.org

Nutrient	Functions - Why do we need it?	Sources
Carbs	Carbohydrates give us energy. Sugary ones give us quick release energy. Starchy ones give us slow release.	Bread, rice, pasta, potatoes
Protein	Needed for the growth and repair of our bodies and can also be used for energy.	Meat, fish, dairy products, tofu, soya, Quorn, nuts, sees, lentils
Fat	These keep us warm, protect us and provides our bodies with energy	Butter, oil, processed foods e.g. crisps, chips, chocolate, cake.
Water	Keeps us hydrated and keeps our body's working properly.	Fruit and vegetables, water, fruit juices, milk.
Vitamins	These are needed generally to keep us healthy. The allow all the chemical reactions in our body and protect us from diseases.	Fruit, vegetables, cereals, dairy products
Minerals	Helps build bones and teeth and allow muscles to work properly.	Green vegetables, dairy products and red meat
Fibre	These are needed to keep our digestive system working (help us go to the toilet) and helps to fill us up.	Wholegrain cereals, brown rice, pasta, bread, fruit, vegetables

Food Miles is the distance food travels from where it is grown to where it is purchased by the customer. The closer it is, the less damage to our environment.

Seasonality refers to the time of year when the food is at its peak, either in terms of harvest or flavour. This is usually when the product is cheapest and freshest.

Overfishing occurs when too many fish are caught at once, so the breeding population becomes too depleted to recover. It endangers ocean ecosystems and the billions of people who rely on seafood as a key source of protein. Buying fish with the blue **Marine Stewardship Council (MSC)** label, means the fish has been caught sustainably.

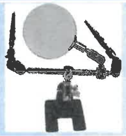
Fairtrade is a way of buying and selling products that ensure that the people who produce the goods receive a fair price. Fair trade brings a better standard of living for poor farmers in developing countries.

Keywords
Micronutrient, macro nutrient, sustainable food, seasonal food, food miles, fairtrade, overfishing, special diet.

Year 9 Electronics

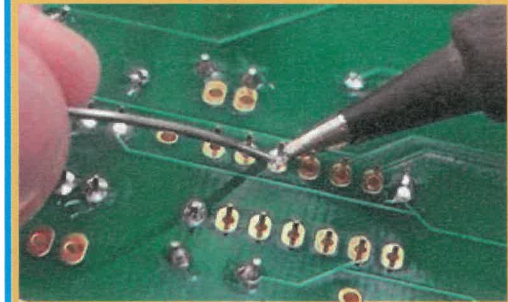
DESIGN AND TECHNOLOGY

Tools and Equipment

Tools used for Soldering		
Soldering iron, stand, sponge and heat mat		Electrically heated tip used to melt solder onto joint or PCB. Damp sponge used to clean the tip.
Side cutters		Cuts components or wire.
Helping hands tool		Holds wire, components or board whilst soldering.
Solder		Solder helps to connect components.
Wire Strippers		Used to remove the outer plastic layer of wires.

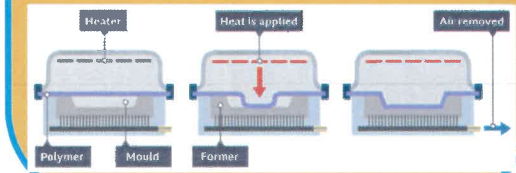
Soldering

Soldering is used to connect two or more contacts so that electricity can flow between components.



Vacuum Forming

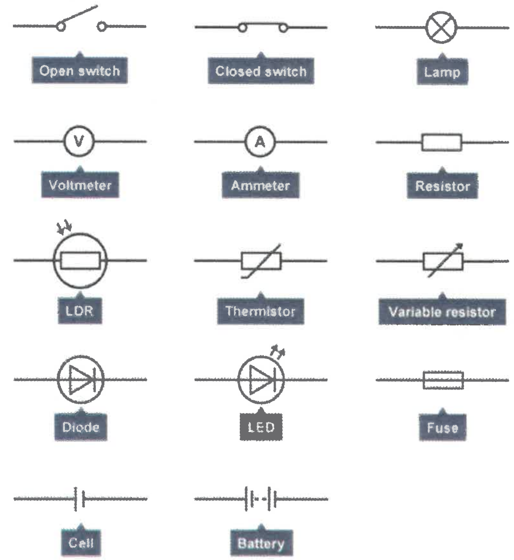
Vacuum forming is a polymer process. A sheet of thermoplastic is heated and pressed onto the former (mould) to create a shape.

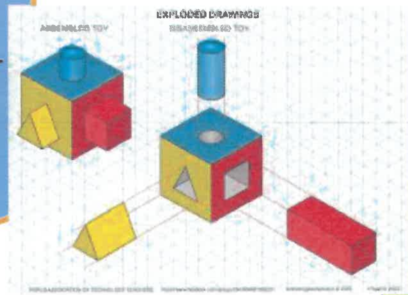


Keywords

Cell
Battery
Resistor
Lamp
Circuit
Buzzer
Systems
Input
Output
Switch
Solder
Wire Strippers
Side Cutters
Vacuum Former
Mould
Draft Angle
HIPs

Circuit diagrams use simplified universal symbols to represent the electronic circuit and its components. These are some of the symbols used.





Memphis design movement

Established in the 1980s. Composed of designers based in Italy. Memphis designers, regarded aesthetics as the most important aspect of a product, not its function. Memphis designs/products can be regarded as pieces of art or exhibition pieces, not useable, practical items.

Ettore Sotsass

Maths in DT:

Multiplication
Divide
Add / Subtract
Measurement conversion
Ratios
Percentages
Surface area

What is good design?

Clear ideas
Annotations
Measurements
Content
Presentation
Balance

Health and Safety in DT:

- Listen to your teacher's instructions
- Always wear an apron
- Long hair should be tied back
- Don't use equipment you are not trained on
- Always stand up during practical lessons
- When using machines, always wear safety glasses
- Only use the stop button in an emergency
- Work quietly and be sensible and careful at all times

KS3 Year 8/9 Design and Technology CAD CAM: Board Games

CAD: Computer Aided Design
CAM: Computer Aided Manufacture

Adobe Illustrator

Adobe Illustrator is the industry-leading graphic design tool that is a professional vector-based design and drawing program. Used as part of a larger design workflow, Illustrator allows for the creation of everything from single design elements to entire compositions.

TinkerCAD

Is a 3D modelling platform that has been launched by AutoDesk – a industry leading program. It allows you to create 3D models on the computer.

Key words

Vector	CAD/CAM	Automation
3D printing	Illustrator	Additive
Graphics	TinkerCAD	ACCESSFM

3D printing

3D printing is an additive technology used to manufacture parts. It is 'additive' in that it doesn't require a block of material or a mold to manufacture physical objects, it simply stacks and fuses layers of material. It's typically fast, with low fixed setup costs, and can create more complex geometries than 'traditional' technologies, with an ever-expanding list of materials. It is used extensively in the engineering industry, particularly for prototyping and creating lightweight geometries.

Tools and Equipment		
CAD CAM		
3D printer		3D printing or additive manufacturing is the construction of a three-dimensional object from a CAD model or a digital 3D model.
Template		A template is a tool used to mark out shapes repeatedly

Maths in DT:
- Multiplication
- Divide
- Add / Subtract
- Measurement conversion
- Ratios
- Percentages
- Surface area

What is good design?
- Clear ideas
- Annotations
- Measurements
- Content
- Presentation
- Balance


ACCESS FM - Helpsheet

A - Aesthetics
C - Cost
C - Customer
E - Environment
S - Size
S - Safety
F - Function
M - Material

Year 7 / 9 D&T RESISTANT MATERIALS UCD &Modelling: Playgrounds

Tools and Equipment

Measuring and marking		
Steel rule		An accurate tool for measuring and marking out.
Set square		A ruler to ensure you measure and mark accurate 45 / 90 degree angles.
Template		A template is a tool used to mark out shapes repeatedly

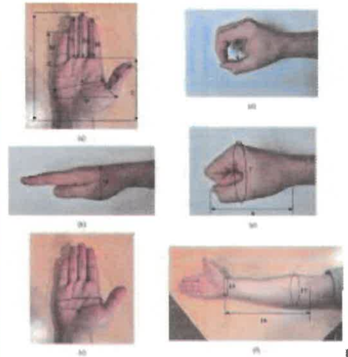
Card shaping and adhesives		
Slot		A joining technique to join card.
Curve cut		Kerf cutting (partial cuts) will ensure a smoother curve in the card.
Tabs		Tabs help to join the card components together.
Hot glue gun		An adhesive which joins card.
Masking tape		A temporary adhesive which joins card / paper.

Anthropometrics

Anthropometrics is the collection of maximum and minimum measurements of a target market. The data can be used to work out the dimensions of a product.

Ergonomics

Ergonomics Testing and analysing how a person interacts with the product can improve its ***functionality*** and how it fits into its surroundings.



Maths in DT:

Multiplication / Divide
Add / Subtract
Measurement conversion
Ratios /Percentages

Cutting		
Craft knife		A tool for precision cutting. This tool is used for accurate cutting of paper and card. Can cut in a straight or curved line.
Paper scissors		A tool for cutting paper or board.

Materials		
Single corrugated card		Corrugations make the card strong.
Card		A compliant material which comes in a variety of colours .

Keywords

Modelling Iterative designs UCD
User needs Reformulate Creativity
Functional Innovative Anthropometrics
Ergonomics Social Client Testing
Evaluation

We use **ACCESS FM** to help us write a **specification** - a list of requirements for a design - and to help us **analyse and describe** an already existing product.

ACCESS FM - Helpsh

A is for **Aesthetics**		**Aesthetics** means **what does the product look like?** What is the: Colour? Shape? Texture? Pattern? Appearance? Feel? Weight? Style?
C is for **Cost**	£	**Cost** means **how much does the product cost to buy?** How much does it: Cost to buy? Cost to make? How much do the different materials cost? Is it good value?
C is for **Customer**		**Customer** means **who will buy or use your product?** Who will buy your product? Who will use your product? What is their: Age? Gender? What are their: Likes? Dislikes? Needs? Preferences?
E is for **Environment**		**Environment** means **will the product affect the environme** Is the product: Recyclable? Reuseable? Repairable? Sustainable? Environmentally friendly? Bad for the environment? **6R's of Design:** Recycle / Reuse / Repair / Rethink / Reduce / Re
S is for **Size**		**Size** means **how big or small is the product?** What is the size of the product in millimeters (mm)? Is this the same size as similar products? Is it comfortable to use? Does it fit? Would it be improved if it was bigger or smaller?
S is for **Safety**		**Safety** means **how safe is the product when it is used?** Will it be safe for the customer to use? Could they hurt themselves? What's the correct and safest way to use the product? What are the ri
F is for **Function**		**Function** means **how does the product work?** What is the products job and role? What is it needed for? How well does it work? How could it be improved? Why is it used this way?
M is for **Material**		**Material** means **what is the product made out of?** What materials is the product made from? Why were these materials used? Would a different material be better? How was the product made? What manufacturing techniques were used?

Health and Safety in DT:

- Listen to your teacher's instructions
- Always wear an apron
- Long hair should be tied back
- Don't use equipment you are not trained on
- Always stand up during practical lessons
- When using machines, always wear safety glasses
- Only use the stop button in an emergency
- Work quietly and be sensible and careful at all times

Y9 ENGISH K.O. – EXTRACT ANALYSIS

THE CORSHAM SCHOOL

ANALYSING A TEXT

Word choices:

- What do the words mean?
- What do they make you think of (connotations)?
- What word class do they belong to?

Techniques/linguistic devices:

- Identify them
- Consider their purpose, use and effect

Punctuation and sentence structures –

- Do they change the way you read the piece?
- Does it tell us about the tone in which something is communicated?
- Does it make us read the text faster or slower?

EXPLICIT V's IMPLICIT

Explicit meaning describes something that is very clear and without vagueness or ambiguity.

Implicit meaning often functions as the opposite, referring to something that is understood, but not described clearly or directly, and often using implication or assumption.

SENSORY IMAGERY

USEFUL DEFINITIONS

Connotation: the meaning created by association.

Hyperbole: exaggeration to emphasise a point.

Imagery: visually descriptive or figurative language.

Inference: using observations to reach a conclusion.

Juxtaposition: two things being seen or placed close together with <u>contrasting</u> effect.

Metaphor: describing something as something else.

Motif: recurring theme or symbol.

Oxymoron: a figure of speech that juxtaposes concepts with opposite meanings

Pathetic Fallacy: giving human emotions and conduct to things found in nature.

Semantic field: a group of words related in meaning.

Sibilance: use of the 's' sounds in quick succession.

Simile: a comparison of two things that uses the words 'like' or 'as'.

Symbolism: Use of symbols to represent ideas or qualities.

CRITICAL RESPONSES

Suggests	Exaggerates	Clearly
Implies	Represents	Evokes
Indicates	Perhaps	Refers to
Highlights	Effectively	Connotes
Demonstrates	Successfully	Reveals
Conveys	Essentially	Possibly
Symbolises	Cleverly	Could

TERMINOLOGY	DEFINITION
CONTEXT	The context of a text is the place and time in which it was written, who it was written by, and where it was published.
NARRATIVE PERSPECTIVE	The point of view of a character in a text - "I crept cautiously towards the gate."
LITERARY GENRES	Categories of literature. Genres may be determined by literary technique, tone, content, or length (especially for fiction).
OMNISCIENT NARRATOR	A narrator who knows what is happening at all points of the story at all times - 'The young woman was very intelligent; she knew exactly what was going to happen.'
SPEECH	Words spoken sit inside speech marks, along with punctuation - "What time is it?" the boy asked.'

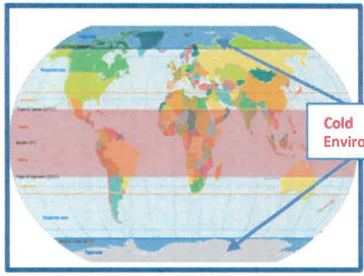
Year 9 Geography Term 4 Polar regions

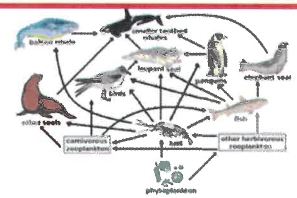
Cold environments include the polar and tundra biomes. They are the coldest environments on Earth. Polar regions are found at the poles. In the north, it is the sea ice that forms the Arctic, and in the south, it is the ice-capped continent of Antarctica.

Key Words

Climate, Temperate, Latitude, Longitude, Food chain, Antarctica, Adaptation, Glaciers, Landforms, Mountains, Lake District, Avalanche, Survival, Treaty, Conflict, Exploit, Environment, Tourist

Location of cold environments





Food Chain- a series of organisms each dependent on the next as a source of food.

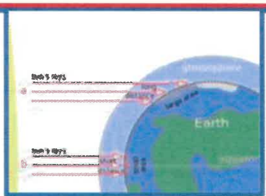
- What would happen if Krill ran out?
- What would happen if there were no penguins?

Big Questions:

1. What is the future for cold environments?
2. How will that impact us in the UK?
3. Why are cold environments important to protect?
4. How can we in the UK help to protect cold environments?

Three reasons why we get cold environments

1. **HIGH LATITUDE-** high latitudes are colder because they receive less solar radiation (the sun's energy that hits the earth) The solar radiation hits at more of an angle at the poles, so the sun's warmth is spread out more.
2. **HIGH ALTITUDE-** high altitudes are colder because the air temperature decreases with increasing altitude- Oxygen particles are further apart so there is less friction and warmth created.
3. **OCEAN CURRENTS-** places are cold if they have a cold ocean current running past them- this keeps the land much colder than those countries that have a warmer ocean current like the UK.



Case study: Antarctica

Background and location - Antarctica is the 5th largest **continent**, and covers an area of approximately 14 million sq. km. It is also the world's highest continent, with an average land height of 2,300 metres. During the winter, much of the water surrounding Antarctica freezes. This sea ice nearly doubles the size of Antarctica.

People:
No one lives in Antarctica permanently, though many scientists stay for long periods of time to carry out research. Countries have claimed ownership of parts of Antarctica.

Climate:
Antarctica can be called a desert because of its low levels of precipitation (rain/snow). In coastal regions, about 200 mm can fall **annually**. In mountainous regions and on the East Antarctica plateau, the amount is less than 50 mm annually. There are also strong winds, with recordings of up to 200 mph.

Ice in Antarctica:
The ice in Antarctica is on average 2.5 km thick. Nearly 99% of Antarctica is covered by an ice sheet.

Potential resources in Antarctica:
There are many resources in Antarctica, which include:

- mineral and energy resources - most is currently covered by snow, including the world's largest known coalfield
- fresh water extraction from icebergs (70 per cent of the world's fresh water is in Antarctica)
- resources from the sea life - e.g. farming of fish and **krill**
- scientific resources - scientists can study weather patterns, ecosystem adoptions and the past climatic and geological changes

Tourism also offers potential because of the attraction of this unique wilderness.

Mineral extraction:
Extracting oil from Antarctica has been too expensive to consider in the past. However, as more land is exposed, building pipelines on the land is becoming a more viable option. As the price of oil increases and the availability of oil decreases, countries look to Antarctica as a possible location for supply.
Extraction of oil and minerals is banned for 50 years through the Antarctic treaty which controls human activity in Antarctica.

Avalanches- rapid movement of snow or ice downhill

Causes

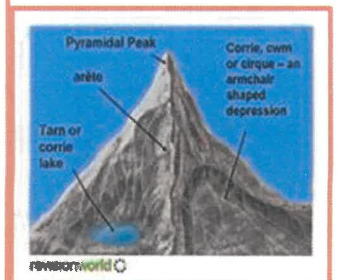
1. Heavy snowfall- adds to weight of earlier snowfalls.
2. Steep slopes- more than 30◦
3. Removal of trees- enables avalanches to move downhill without being stopped.
4. Temperate rise- which can cause a layer to melt and refreeze causing a slip zone.

Galtur- case study key facts

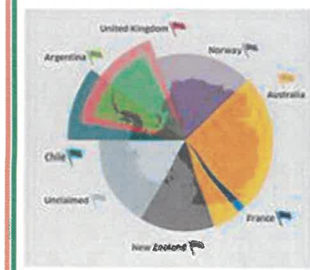
- Austrian ski resort
- February 1999
- 31 people died.
- Snow destroyed homes in the safe zone.

Glaciers- must have knowledge

1. Glaciers are huge masses of ice that "flow" like very slow rivers. They form over hundreds of years where fallen snow compresses and turns into ice.
2. Because glacial ice is so dense and compact, it often appears a bright blue colour!
3. Earth's two ice sheets cover most of Greenland and Antarctica and make up more than 99% of the world's glacial ice.
4. Glacial ice can be hundreds of thousands of years old, which makes it a valuable resource for assessing climate change. By extracting and analysing the ice, scientists can learn about what the climate was like on Earth thousands of years ago!



Countries territorial claims to Antarctica

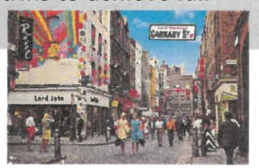


Enquiry: How far did life change in 20th century popular culture?

History – Year 9
Knowledge Organiser
Topic 3

Outline: After WW2, Britain went through a wide range of social and economic changes. In particular, people of colour, women and young people encountered many changes and these had a profound impact on their lives.

Date	Event	Description
1948	Windrush arrived	One of the first ships to arrive from the Caribbean with migrants invited to Britain to work.
1948	NHS set up	The Labour government, led by Clement Attlee set up the NHS as part of the Welfare State to help people after WW2.
1958	Notting Hill race riots	Racially motivated riots that took place in London when people of colour were targeted by gangs like the Teddy boys.
1962	First Beatles single	"Love me do" was released by this band from Liverpool and they started a teenage craze.
1963	Bristol Bus Boycott	When people stopped using the bus network in Bristol to end discrimination against people of colour.
1964	"Summer of violence"	When mods and rockers went to seaside towns and fought each other.
1968	Ford Strike	Women in Essex went on strike to achieve fair pay.



Key individuals

Kelso Cochrane. A young man who emigrated from Antigua and worked as a carpenter in London. He was murdered by a racist gang in 1959.

Paul Stephenson. Organised the Bristol Bus Boycott in 1963 when Black People were barred from Working as drivers

Eileen Pullen. One of leaders of the Ford strike by women asking for equal pay to the men.

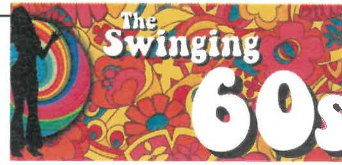
Mary Quant. A fashion designer who revolutionised fashion. She designed mini-skirts and made short hair fashionable.

Furthering learning

Want to find out more about life after WW2?

Key vocabulary:

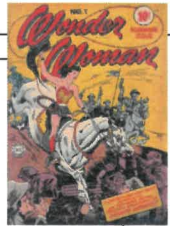
Boycott: when you stop using or buying something as a protest.
Colour bar: discrimination where people were barred from certain jobs or houses due to their skin colour.
Counter-culture: youth culture from the 1960s where young people were reacting against the values and culture of their parents.
Feminism: a campaigning protest movement to work towards equal right for women.
Marriage bar: when women automatically lost their job once they married.
Migration: when people move from one country to live in another.
Mods: youth gangs who rode mopeds and wore smart clothes. They fought against the rockers.
Notting Hill: area of west London where many people of colour lived, especially those who had migrated from the Caribbean.
Race riot: violence on the streets of a city, involving fighting between people from different ethnicities.
Rockers: youth gangs who rode motorbikes and wore leather jackets and jeans. They fought against the mods.
Swinging Sixties: a revolution in music, fashion and films, particularly for young people.
Teddy boys: gangs of young men who wore long coats and styled hair. They were often involved in attacks on immigrants.
Teenage culture: entertainment that targeted a young audience, especially films, tv, fashion and music.
Welfare State: set up after WW2 by the Labour government to create the NHS and support for the vulnerable in society.
Windrush: one of the first ships to arrive from the Caribbean carrying migrants who were invited by the government to work.



Prior learning:
Popular culture
Empire
Misogyny

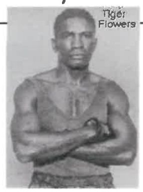
Enquiry: How far did life change in 20th century popular culture?

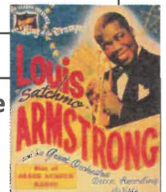
History – Year 9
Knowledge Organiser
Topic 3



Key facts on life for popular culture in the 1920s

In 1921 there was only one licensed radio station but by the end of 1922 there were 508.
By 1929 the new national network NBC was making $150 million a year.
Baseball became a big money sport with legendary teams like the New York Yankees or the Boston Red Sox.
There were popular players like Babe Ruth who hit 714 home runs in his career.
Boxing was popular with heroes like the world heavyweight champion Jack Dempsey and Theodore "Tiger" Flowers who was world middleweight champion.
Jazz became fashionable with musicians like Joe "king" Oliver, Louis Armstrong and Duke Ellington at the Cotton Club in NYC
The Jazz Age brought new dances like the Charleston and the Black Bottom. Bee Jackson was the world Charleston champion.
Hollywood in LA had stars like Charlie Chaplin (Gold Rush, The Kid), Buster Keaton in slapstick films and Rudolph Valentino (The Sheik) who was a sex symbol. There were female actors like Clara Bow, in her film "She's Got It" and Josephine Baker.
Fans flocked to the local Picture Palace to buy a ticket costing 25 cents. By 1929, 110 million were watching a film a week.
Older people disapproved of these "sex-obsessed movies like "Up in Mabel's Room" and "Her Purchase Price"
Wages were up 11% so there was more to spend whilst working hours were down by 3 hours per week.



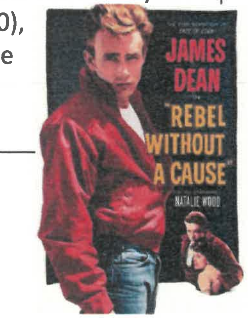


Key facts on life for popular culture in the 1930s and 1940s

Radios were still popular but people also owned gramophones and played vinyl records.
World heavyweight champion Joe Louis won the title in 1937 and retained it for 12 years.
Babe Ruth retired in 1935. New Baseball stars included Joe DiMaggio. The first night game in Cincinnati in 1935.
1930s new singers like Glenn Miller, Judy Garland, Bing Crosby and Billie Holiday.
1938 saw the first comic superhero with Superman, then followed by 1941 Captain America and 1942 Wonder Woman.
1935 invention of Monopoly
1940s saw crazes like marbles and the yoyo.
There were new actors like James Cagney, Judy Garland and Clark Gable.
Classic films like the Wizard of Oz and Casablanca.
1933 was the first drive-in movie.
60 million went to the cinema a week.

Key facts on life for popular culture in the 1950s and 1960s

Young people had more freedom and money after WW2 as they often stayed on at college or had higher pay. By 1959 their annual spending power was $25 billion, up from $10 billion in 1950.
Boxing was still very popular with heroes in the 1950s like Rocky Marciano and then Muhammad Ali in the 1960s.
Rock and Roll which blended Country and Western with Rhythm and Blues. New bands like Bill Haley and his Comets as well as singers like Jerry Lee Lewis, Eddie Cochrane and Elvis Presley. Presley's key songs included Hound Dog and Jailhouse Rock.
Comic books introduced new characters like Spider-man in 1962 and brought other characters together like The Avengers in 1963.
Key films include Rebel Without a Cause (1955), The Wild One (1953) and the Seven Year Itch (1955).
Actors like James Dean, Marlon Brando and Marilyn Monroe
By 1959, 9/10 homes had a television.
The most popular shows were comedies like I Love Lucy (1951), cartoons like the Flintstones (1960), the Jetsons (1962), family shows like Lassie (1954), The Addams Family (1964) and Star Trek (1966).



Furthering learning
Want to find out more about popular culture?

Enquiry: How far did life change in 20th century popular culture?

Historical skill focus: change & continuity

- How have people's lives changed over time?
- How have people's lives stayed the same over time?

Remember to mention:	Areas you could mention include:	Starting sentences
Changes AND Continuities	Entertainment/popular culture Experiences for migrants Life for women Life for young people	People's lives changed because... Life stayed the same in many ways such as...

History – Year 9
Knowledge Organiser
Topic 3

Can you explain change and continuity?
Answer the question below: You could **write one or two paragraphs** to explain fully.
How far did people's lives change in the USA and UK from 1920-1970?

Developing	Secure	Exceeding
I can explain the key changes/continuity areas in a PEE paragraph I can begin to think about the extent of change. I can use some historical knowledge to support my answer.	I can explain the key changes/continuity areas in a PEEL paragraph I can use detailed historical knowledge to support my answer. I can begin to use factors that affect change/continuity such as the economy, politics, religion...	I can explain the key changes/continuity areas in a PEEL paragraph I can use precisely detailed historical knowledge to support my answer. I can use factors that affect change/continuity such as the economy, politics, religion... I can explain the reasons for the extent of change and conclude on the extent of change by weighing up factors.

Point = A key change was...
Evidence = The important parts of this change included...
Explain = This was an important change because...

YEAR 9 – REASONING WITH GEOMETRY…

Deduction

@whisto_maths

What do I need to be able to do?

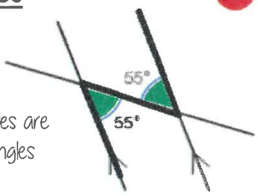
By the end of this unit you should be able to:

- Identify angles in parallel lines
- Solve angle problems
- Make conjectures with angles
- Make conjectures with shapes

Keywords

Parallel: two straight lines that never meet with the same gradient.
Perpendicular: two straight lines that meet at 90°
Transversal: a line that crosses at least two other lines.
Sum: the result of adding two or more numbers.
Conjecture: a statement that might be true but is not proven.
Equation: a statement that says two things are equal
Polygon: a 2D shape made from straight edges.
Counterexample: an example that disproves a statement

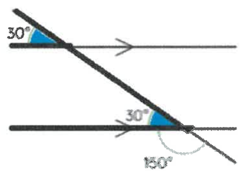
Alternate angles (R)



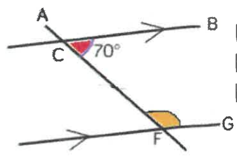
Because alternate angles are equal the highlighted angles are the same size

Corresponding angles (R)

Because corresponding angles are equal the highlighted angles are the same size



Co-interior angles (R)



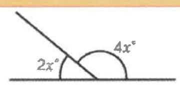
Because co-interior angles have a sum of 180° the highlighted angle is 110°

As angles on a line add up to 180° co-interior angles can also be calculated from applying alternate/ corresponding rules first

Solving angle problems

Angles on a straight Line
180°

Link angle facts to algebra



Form an equation

$$2x + 4x = 180°$$

State the reason

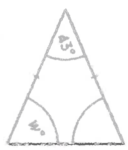
The sum of angles on a straight line is 180°

Solve

$$2x + 4x = 180°$$
$$6x = 180°$$
$$x = 30°$$

Vertically opposite angles
Equal

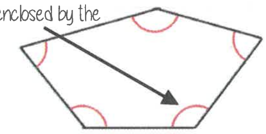
Angles around a point
360°



Triangles
Sum of angles is 180°

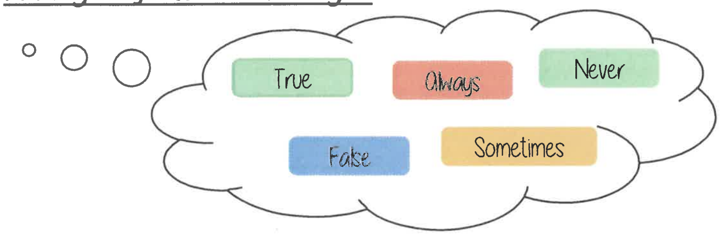
Isosceles have the same base angles

Interior Angles
The angles enclosed by the polygon



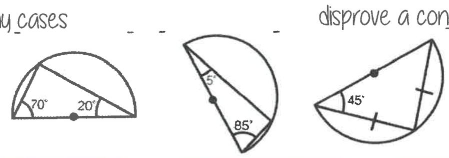
(number of sides – 2) x 180

Making conjectures with angles



Proving a conjecture
A pattern is noticed for many cases

Disproving a conjecture
Only one counterexample is needed to disprove a conjecture



Apply the angle rules → **Test the theory** → **Make conjecture**

The sum of angles in a triangle is 180°

$180 - 70 - 20 = 90$
$180 - 85 - 5 = 90$
$180 - 45 - 45 = 90$

The angle that meets the circumference in a semi circle is 90°

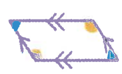
Making conjectures with shapes

Keywords and facts to recall with shape

Area: the amount of space inside a shape
Perimeter: the length around a shape
Regular Polygons: All sides and angles are equal

Quadrilateral Facts

Square
All sides equal size
All angles 90°
Opposite sides are parallel



Parallelogram
Opposite sides are parallel
Opposite angles are equal
Co-interior angles

Rectangle
All angles 90°
Opposite sides are parallel

Rhombus
All sides equal size
Opposite angles are equal

Kite
No parallel lines
Equal lengths on top sides
Equal lengths on bottom sides
One pair of equal angles

YEAR 9 — REASONING WITH GEOMETRY...

Rotation & Translation

@whisto_maths

What do I need to be able to do?

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

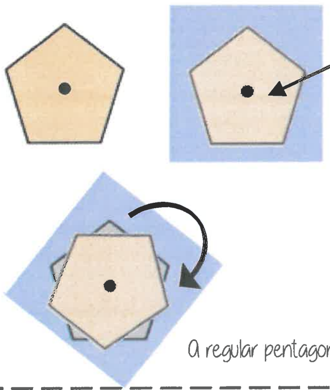
- Identify the order of rotational symmetry
- Rotate a shape about a point on the shape
- Rotate a shape about a point not on a shape
- Translate by a given vector
- Compare rotations and reflections

Keywords

Rotate: a rotation is a circular movement.
Symmetry: when two or more parts are identical after a transformation.
Regular: a regular shape has angles and sides of equal lengths.
Invariant: a point that does not move after a transformation.
Vertex: a point two edges meet.
Horizontal: from side to side
Vertical: from up to down

Rotational Symmetry

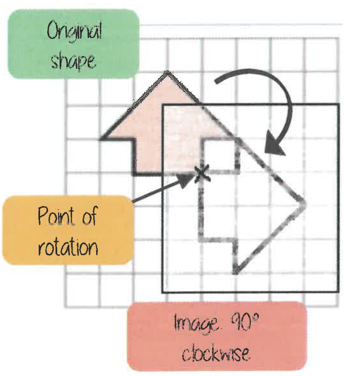
Tracing paper helps check rotational symmetry.



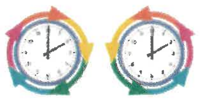
1. Trace your shape (mark the centre point)
2. Rotate your tracing paper on top of the original through 360°
3. Count the times it fits back into itself

A regular pentagon has rotational symmetry of order 5

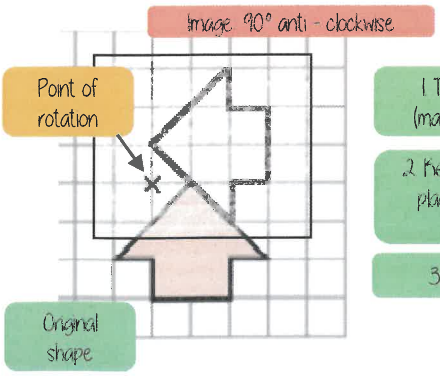
Rotate from a point (in a shape)



1. Trace the original shape (mark the point of rotation)
2. Keep the point in the same place and turn the tracing paper
3. Draw the new shape



Rotate from a point (outside a shape)



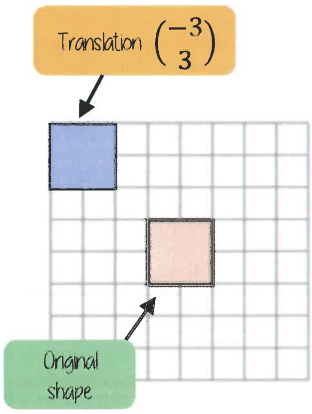
1. Trace the original shape (mark the point of rotation)
2. Keep the point in the same place and turn the tracing paper
3. Draw the new shape

Translation and vector notation

Vector Notation → $\begin{pmatrix} 1 \\ -2 \end{pmatrix}$

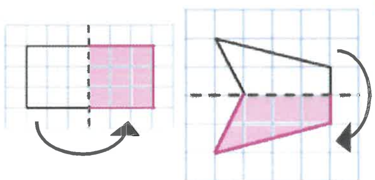
How far left or right to move
Negative value (left)
Positive value (right)

How far up or down to move
Negative value (down)
Positive value (up)



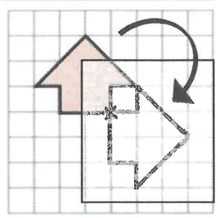
Every vertex has been translated by the same amount

Compare rotations and reflections



R Reflections are a mirror image of the original shape.

Information needed to perform a reflection:
- Line of reflection (Mirror line)



Rotations are the movement of a shape in a circular motion

Information needed to perform a rotation:
- Point of rotation
- Direction of rotation
- Degrees of rotation

YEAR 9 – REASONING WITH GEOMETRY…

Pythagoras' theorem

@whisto_maths

What do I need to be able to do?

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

- Use square and cube roots
- Identify the hypotenuse
- Calculate the hypotenuse
- Find a missing side in a Right angled triangle
- Use Pythagoras' theorem on axes
- Explore proofs of Pythagoras' theorem

Keywords

Square number: the output of a number multiplied by itself

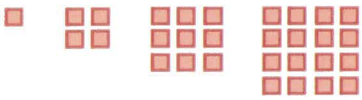
Square root: a value that can be multiplied by itself to give a square number

Hypotenuse: the largest side on a right angled triangle. Always opposite the right angle.

Opposite: the side opposite the angle of interest

Adjacent: the side next to the angle of interest

Squares and square roots (R)



This can also be written as 6^2

$\sqrt{\ }$ is the square root symbol

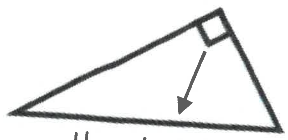
e.g. $\sqrt{64} = 8$

Because 8 × 8 = 64

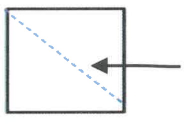
1 × 1	2 × 2	3 × 3	4 × 4	5 × 5	6 × 6	7 × 7	8 × 8	9 × 9	10 × 10
1	4	9	16	25	36	49	64	81	100

Square numbers

Identify the hypotenuse

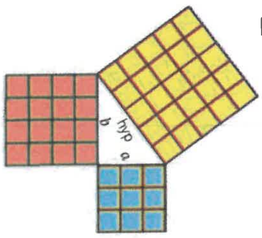


The hypotenuse is always the longest side on a triangle because it is opposite the biggest angle.



Polygons can still have a hypotenuse if it is split up into triangles and opposite a right angle

Determine if a triangle is right-angled



a = 3 b = 4 c = 5

If a triangle is right-angled, the sum of the squares of the shorter sides will equal the square of the hypotenuse.

$$a^2 + b^2 = \text{hypotenuse}^2$$

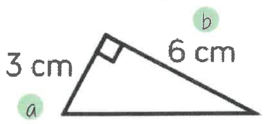
e.g. $a^2+b^2 = hypotenuse^2$

$3^2 + 4^2 = 5^2$

$9 + 16 = 25$

Substituting the numbers into the theorem shows that this is a right-angled triangle

Calculate the hypotenuse



Either of the short sides can be labelled a or b

$$a^2 + b^2 = \text{hypotenuse}^2$$

1. Substitute in the values for a and b

$3^2+6^2 = \text{hypotenuse}^2$

$9 + 36 = \text{hypotenuse}^2$

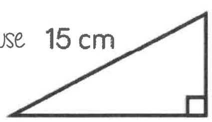
$45 = \text{hypotenuse}^2$

2. To find the hypotenuse square root the sum of the squares of the shorter sides

$\sqrt{45} = \text{hypotenuse}$

$6.71cm = \text{hypotenuse}$

Calculate missing sides



Either of the short sides can be labelled a or b

$$a^2 + b^2 = \text{hypotenuse}^2$$

$12^2+b^2 = 15^2$

1 Substitute in the values you are given

$144 + b^2 = 225$

$-144 \quad -144$

Rearrange the equation by subtracting the shorter square from the hypotenuse squared

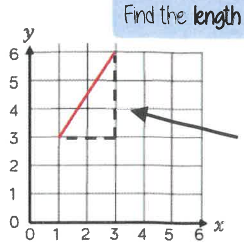
Square root to find the length of the side

$b^2 = 111$

$b = \sqrt{111} = 10.54\ cm$

Pythagoras' theorem on a coordinate axis

Find the **length** of the line segment



The segment can be made into a right-angled triangle by adding the sides on the diagram

The line segment is the **hypotenuse**

$$a^2 + b^2 = \text{hypotenuse}^2$$

The lengths of a and b are the sides of the triangle

Be careful to check the scale on the axes

Exploring Instruments of the Orchestra

A. Key Words, Terms and Facts about the Orchestra

ORCHESTRA – A large **ENSEMBLE** (group of musicians) of performers on various musical instruments who play music together. No set numbers of performers although a **SYMPHONY ORCHESTRA** (a large orchestra) can have between **80-100+** performers. Famous orchestras include: **THE LONDON SYMPHONY ORCHESTRA, THE BBC SYMPHONY ORCHESTRA** and the **HALLÉ ORCHESTRA** (Manchester).

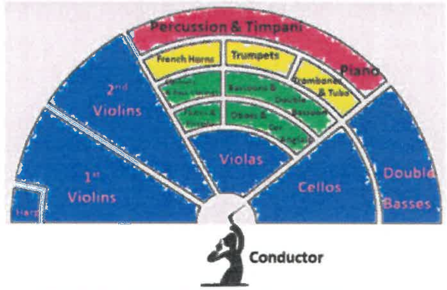
CONDUCTOR – Leads the orchestra with a **BATON** (white 'stick') and hand signals. Stands at the front so they can be seen my all performers. Sets the **TEMPO** and **BEATS TIME.** Brings different instruments 'in and out' when it is their turn to play. Keeps the performers together. Takes charge in rehearsals. In ultimate control of the performance of the music, adjusting **DYNAMICS, TEMPO,** and mood.

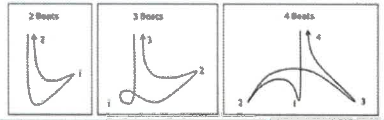
FAMILIES/SECTIONS – Instruments of the orchestra can be divided into 4 families or sections: **STRINGS, WOODWIND, BRASS** and **PERCUSSION.**

TUNING UP – Before the orchestra rehearses or plays, all instruments need to be **IN TUNE** with each other. The **OBOE** always sounds the note **'A'** which all other instruments **TUNE** to.

SONORITY (also called **TIMBRE)** – Describes the **UNIQUE SOUND OR TONE QUALITY** of different instruments and the way we can identify orchestral instruments as being distinct from each other –Sonority can be described by many different words including – ***velvety, screechy, throaty, rattling, mellow, chirpy, brassy, sharp, heavy, buzzing, crisp, metallic, wooden etc.***

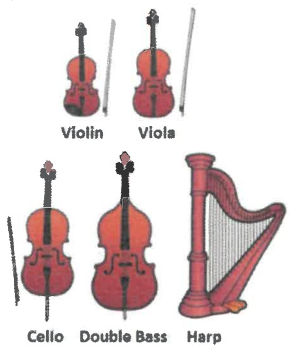
PITCH - The **HIGHNESS** or **LOWNESS** of a sound, a musical instrument or musical note (***high/low, getting higher/lower, step/leap***).





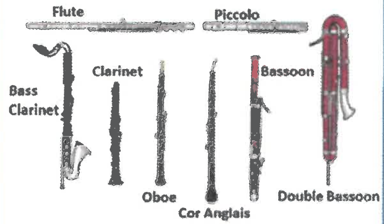
C. Strings Section/Family

Largest section of the orchestra who sit at the front, directly in front of the conductor. Usually played with a **BOW (ARCO)**, (not the **HARP)** but can be **PLUCKED (PIZZICATO).** **VIOLINS** split into two groups: **1st VIOLINS** (often have the main **MELODY** of the piece of music) and **2nd VIOLINS.**



D. Woodwind Section/Family

Originally (and some still are) made from wood (some now metal and plastic). All are **BLOWN.**
FLUTES: Flute and Piccolo – air blown over hole.
SINGLE REED (small piece of bamboo in the mouthpiece): Clarinet, Bass Clarinet & Saxophone (not traditionally in the orchestra, but some modern composers have used it)
DOUBLE REED (two reeds in the mouthpiece): Oboe, Cor Anglais, Bassoon, Double Bassoon.



E. Brass Section/Family

Four types of brass instruments in an orchestra, all made from metal – usually brass and **BLOWN** by the player 'buzzing their lips' into a **MOUTHPIECE** *(shown right).*
The Trumpet, French Horn and Tuba all have three **VALVES** which, along with altering the players mouth positions, adjust the length of the tubing allowing for different notes to be played. The Trombone has a **SLIDE** which adjusts the length of the tubing. Brass instruments (along with Percussion) have often been used to play **FANFARES:** a short, lively, loud piece of music usually warlike or victorious in character used to mark the arrival of someone important, give a signal *e.g., in battles,* of the opening of something *e.g., a sporting event or ceremony.*
Fanfares often use notes of the **HARMONIC SERIES** – a limited range of notes played by **BUGLES** (smaller trumpets with no valves) and valveless trumpets.

F. Percussion Section/Family

Always located at the very back of the orchestra (due to their very loud sounds!). Large number of instruments which produce their sound then ***hit, struck, scraped, or shaken.***
TUNED PERCUSSION (able to play different pitches/notes)

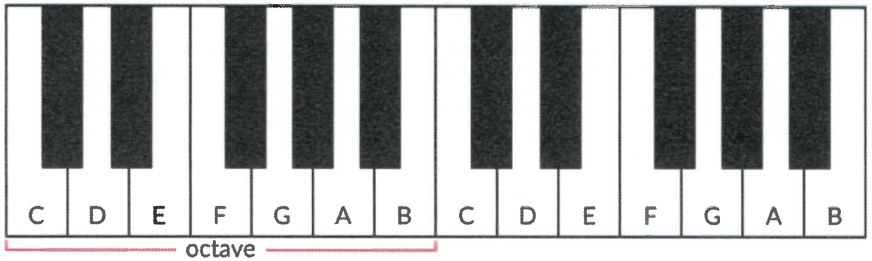
Piano Xylophone Glockenspiel Timpani Celesta Tubular Bells

UNTUNED PERCUSSION (only able to produce 'sounds').

Keyboard Skills

Exploring Treble Clef Reading and Notation

A. Layout of a Keyboard/Piano

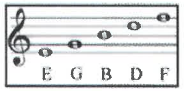


A piano or keyboard is laid out with **WHITE KEYS** and Black Keys (see section G). C is to the left of the two Black Keys and the notes continue to G then they go back to A again. Notes with the same letter name/pitch are said to be an **OCTAVE** apart. **MIDDLE C** is normally in the centre of a piano keyboard.

B. Treble Clef & Treble Clef Notation

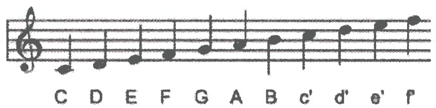
A **STAVE** or **STAFF** is the name given to the five lines where musical notes are written. The position of notes on the stave or staff shows their **PITCH** (how high or low a note is). The **TREBLE CLEF** is a symbol used to show high-pitched notes on the stave and is *usually* used for the right hand on a piano or keyboard to play the **MELODY** and also used by high pitched instruments such as the flute and violin. The stave or staff is made up of 5 **LINES** and 4 **SPACES**.

Every Green Bus Drives Fast.

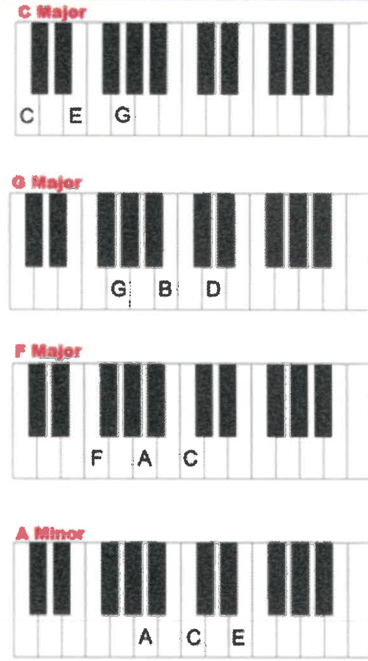


Notes in the SPACES spell "FACE"

Notes from **MIDDLE C** going up in pitch (all of the white notes) are called a **SCALE.**

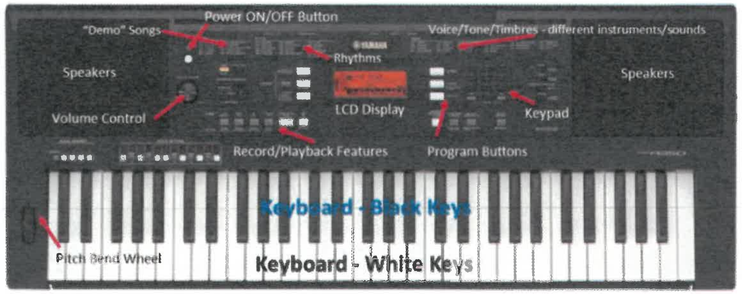


C. Keyboard Chords

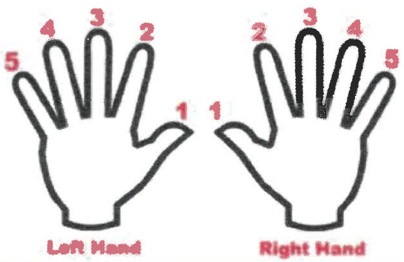


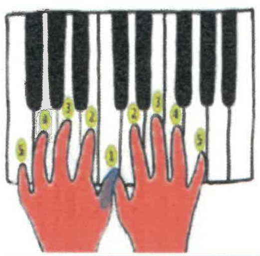
Play one – Miss one – play one – miss one – play one

D. Keyboard Functions



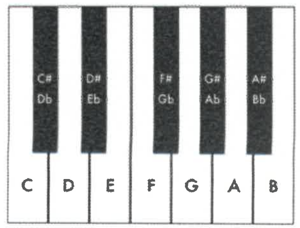
E. Left Hand/Right Hand (1-5)





F. Black Keys and Sharps and Flats

There are five different black notes or keys on a piano or keyboard. They occur in groups of two and three right up the keyboard in different pitches. Each one can be a **SHARP** or a **FLAT**. The # symbol means a **SHARP** which raises the pitch by a semitone *(e.g. C# is higher in pitch (to the right) than C)*. The *b* symbol means a **FLAT** which lowers the pitch by a semitone *(e.g. Bb is lower in pitch (to the left) than B)*. Each black key has 2 names – C# is the same as Db – there's just two different ways of looking at it! Remember, black notes or keys that are to the RIGHT of a white note are called SHARPS and black notes to the LEFT of a white note are called FLATS.



Year 9 Term 6 Life After Death Knowledge Organiser

Topic	
Life After Death	* There are lots of different beliefs about life after death. Theists believe in life after death because it involves an afterlife which links to faith in God. Some agnostics might be persuaded by arguments for life after death (for example paranormal). Atheists reject an afterlife completely. * Dawkins is a world famous evolutionary biologist and atheist. Some have called him an anti-theist – he rejects all religions and ideas of God, he has spent his life writing books and attempting to prove religions wrong. Dawkins does not believe in a life after death, for Dawkins life after death is something humans believe in, despite a lack of evidence that gives us comfort and meaning to our lives – nothing more, it is just mistaken belief that helps us to survive. Dawkins argues that our need for an afterlife is in our DNA not our souls. He argues that life exists for one reason: to pass along its genetic material to the next generation. Embedded in DNA is the genetic material of our ancestors. Our own genetic material will be added to the DNA of our children. In this way, we will live forever, though not in a personal way.
Paranormal Activity	Paranormal events are used as evidence for life after death by some people. Examples of paranormal events in this case might include: - Ghosts – the soul or spirit of a dead person believed to be sensed by the living. - Mediums – People who claim to be able to communicate to the dead. - Near death experiences – When someone who was close to death wakes up and claims to have had a temporary experience of the afterlife. * Scientists reject paranormal activity as confirmation of life after death and claim that there is no evidence-based proof. They claim that all experiences of the paranormal can be explained scientifically by infrasound (sound waves effecting our brains), waking dreams (psychological issues) or grief (wanting to believe as a comfort).
Humanist Views & Science	Humanists are non-religious people and so do not believe in a God, however they do believe in humanity and place great importance on human life. They: - Believe in scientific methods when it comes to understanding how the universe works - Make their ethical decisions based on reason, empathy, and a concern for human beings - Believe human beings should seek happiness in this life and helping others to do the same. * They reject ideas of life after death as they do not believe in a God / afterlife, they suggest that instead we should find meaning in our own lives and live it to the full, when we die our bodies will decompose but we will still be remembered by our family and loved ones. * During the 1980's Michael Persinger a neuro scientist created the 'God Helmet' which claimed to show that religious experiences can be created artificially by stimulating parts of the brain with electromagnetism. Persinger reports over 900 people who took part in his experiments claimed to experience "mystical experiences and altered states". Persinger reports that "at least" 80 percent of his participants experience a presence beside them in the room and about one percent report an experience of "God" and others report less evocative experiences of "another consciousness or sentient being". He used these experiments to claim that God was just a contraction of the human mind.
Buddhism & Reincarnation	Buddhists believe that when someone dies their energy passes into another form. Buddhists believe this is a continuous loop(samsara) and the goal is to ESCAPE! * Buddhists DO NOT believe in a permanent self or soul. A person is not reborn but the energy of that person gets reborn. * Buddhists believe that all life is suffering and therefore the goal for all Buddhists is to escape samsara. By following the teachings of the Buddha and living ethically Buddhists can reach enlightenment (The realisation of the truth about life) and achieve nirvana (indescribable state outside of samsara). * Rebirth is decided by karma. Good actions/ karma = good rebirth. When Buddhist follow the Eightfold Path and gain good karma they will have a better rebirth. They can be reborn as humans, animals, demigods and gods BUT being reborn as a human gives them the best opportunity to escape samsara
Christian Views	Christians believe that there is life after death. They think that the soul leaves the body after death and enters a new place. This place depends on how a person has lived their life. Most Christians believe that all persons are judged as to whether they lived a good or bad life. Depending on this they will be sent to either: * Heaven is a place of perfection (often described as paradise) and is where believers go if have lived a morally good life and who have accepted God and Jesus into their hearts. Jesus' resurrection inspires this. * Hell is a place of torture and eternal suffering. This is where non-believers go or anyone who has done wrong and not asked for forgiveness (or been forgiven). * Catholic Christians also believe that after judgement people enter purgatory and this is an opportunity for believers to ask for forgiveness and pay for their sins. This is often described as process rather than a place

Key Word	Meaning
Life after Death	The belief that when you die there is another life which a person can transfer to.
Paranormal	Events beyond scientific explanation, thought to have a spiritual cause.
Near Death Experience	A paranormal event which makes a person experience the afterlife without dying.
Mediums	A person who claims to be able to speak to the dead.
Humanism	People who do not believe in God but place great importance on human life
The God Helmet	A device created by Persinger to replicate religious experiences scientifically
Samsara	The cycle of death and rebirth
Enlightenment	The realisation of the truth about life
Nirvana	Indescribable state outside of samsara
Karma	Actions and the consequences of actions
Eightfold Path	The eight practises a Buddhist strives to live by
The Soul	The non-physical part of a person, believed to be a gift from God
Heaven	A place with God.
Hell	A place without God.
Purgatory	Believed by Catholics, where our souls go to be 'purified' before entering heaven
Akhirah	Life after death in Arabic (the Islamic view of life after death)
Bazarkh	The waiting place between death and judgement for Muslims.
Jannah	The Arabic word for Paradise – a heaven where you go when you die
Jahannam	The Muslim word for hell – a place of punishment
Izra'il	The angel that takes our soul from our bodies when we die

Quotes
'A delusion is something that people believe in spite of a total lack of evidence' Richard Dawkins
The horizon is not dominated by the past – but by what God can do. And God can raise the dead' Justin Welby
'Feeling something beyond yourself, bigger in space and time, can be stimulated' Michael Persinger
'Set your heart on doing good. Do it over and over again, And you will be filled with joy' Buddha
'The dust returns to the earth as it was, and the spirit returns to God who gave it' The Bible
'Who will bring us back? The one who created you the first time' The Qur'an
'Life is uncertain; death is certain' Buddha

Chapter 1: Atomic structure

Knowledge organiser

Development of the model of the atom

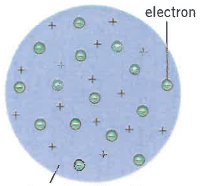
Dalton's model

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

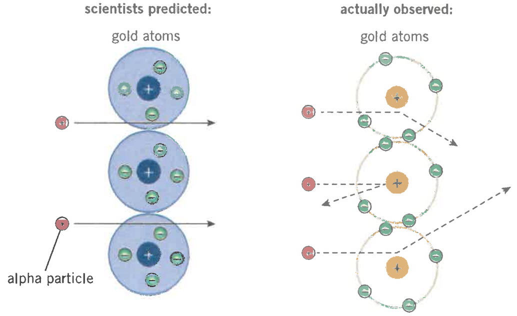
Scientists' experiments resulted in the discovery of sub-atomic charged particles. The first to be discovered were electrons – tiny, negatively charged particles.

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.



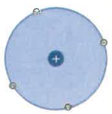
Alpha scattering experiment

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**.



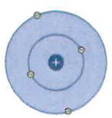
Nuclear model

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.

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.

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.

Size

The atom has a radius of 1×10^{-10} m. Nuclei (plural of nucleus) are around 10 000 times smaller than atoms and have a radius of around 1×10^{-14} m.

Elements and compounds

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

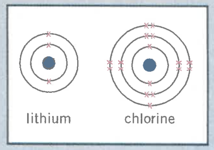
Compounds are made of different types of atoms chemically bonded together. The atoms in a compound have different numbers of protons.

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:

total negative charge from electrons = 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

Chapter 1: Atomic structure

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

	C1 questions	Answers
1	What is an atom?	smallest part of an element that can exist
2	What is Dalton's model of the atom?	atoms as solid spheres that could not be divided into smaller parts
3	What is the plum pudding model of the atom?	sphere of positive charge with negative electrons embedded in it
4	What did scientists discover in the alpha scattering experiment?	some alpha particles were deflected by the gold foil – this showed that an atom's mass and positive charge must be concentrated in one small space (the nucleus)
5	Describe the nuclear model of the atom.	dense nucleus with electrons orbiting it
6	What did Niels Bohr discover?	electrons orbit in fixed energy levels (shells)
7	What did James Chadwick discover?	uncharged particle called the neutron
8	Where are protons and neutrons?	in the nucleus
9	What is the relative mass of each sub-atomic particle?	proton: 1, neutron: 1, electron: 0 (very small)
10	What is the relative charge of each sub-atomic particle?	proton: +1, neutron: 0, electron: −1
11	How can you find out the number of protons in an atom?	the atomic number on the Periodic Table
12	How can you calculate the number of neutrons in an atom?	mass number – atomic number
13	Why do atoms have no overall charge?	equal numbers of positive protons and negative electrons
14	How many electrons would you place in the first, second, and third shells?	up to 2 in the first shell and up to 8 in the second and third shells
15	What is an element?	substance made of one type of atom
16	What is a compound?	substance made of more than one type of atom chemically joined together
17	What is a mixture?	two or more substances not chemically combined
18	What are isotopes?	atoms of the same element (same number of protons) with different numbers of neutrons
19	What are the four physical processes that can be used to separate mixtures?	filtration, crystallisation, distillation, fractional distillation, chromatography
20	What is relative mass?	the average mass of all the atoms of an element

Chapter 2: The Periodic Table
Knowledge organiser

Development of the Periodic Table

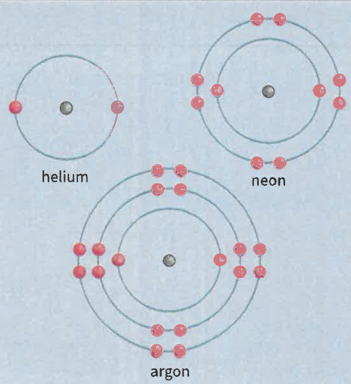
The Periodic Table has changed over time as scientists have organised it differently. Mendeleev was able to accurately predict the properties of undiscovered elements based on the gaps in the table.

	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.

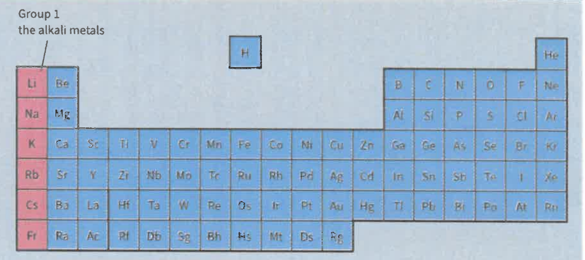
alkali metals, chemical properties, displacement, groups, halogens, inert, isotopes, noble gas, organised, Periodic Table, reactivity, undiscovered, unreactive

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

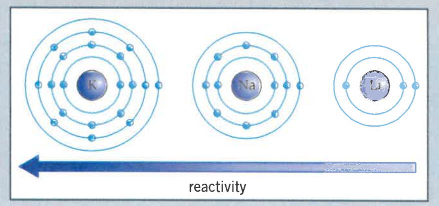
Group 1 elements are called **alkali metals** because they react with water to form an alkali (a solution of their metal hydroxide).



Group 1 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

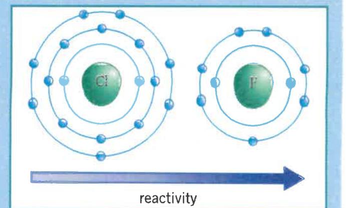
Group 7 elements are called the **halogens**. They are non-metals that exist as molecules made up of pairs of atoms.

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

Chapter 2: The Periodic Table

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

	C2 questions	Answers
1	How is the modern Periodic Table ordered?	by atomic number
2	How were the early lists of elements ordered?	by atomic mass
3	Why did Mendeleev swap the order of some elements?	to group them by their chemical properties
4	Why did Mendeleev leave gaps in his Periodic Table?	leave room for elements that had not yet been discovered
5	Why do elements in a group have similar chemical properties?	have the same number of electrons in their outer shell
6	Where are metals and non-metals located on the Periodic Table?	metals to the left, non-metals to the right
7	What name is given to the Group 1 elements?	alkali metals
8	Why are the alkali metals named this?	they are metals that react with water to form an alkali
9	Give the general equations for the reactions of alkali metals with oxygen, chlorine, and water.	metal + oxygen → metal oxide metal + chlorine → metal chloride metal + water → metal hydroxide + hydrogen
10	How does the reactivity of the alkali metals change down the group?	increases (more reactive)
11	Why does the reactivity of the alkali metals increase down the group?	they are larger atoms, so the outermost electron is further from the nucleus, meaning there are weaker electrostatic forces of attraction and more shielding between the nucleus and outer electron, and it is easier to lose the electron
12	What name is given to the Group 7 elements?	halogens
13	Give the formulae of the first four halogens.	F_2, Cl_2, Br_2, I_2
14	How do the melting points of the halogens change down the group?	increase (higher melting point)
15	How does the reactivity of the halogens change down the group?	decrease (less reactive)
16	Why does the reactivity of the halogens decrease down the group?	they are larger atoms, so the outermost shell is further from the nucleus, meaning there are weaker electrostatic forces of attraction and more shielding between the nucleus and outer shell, and it is harder to gain an electron
17	What is a displacement reaction?	when a more reactive element takes the place of a less reactive one in a compound
18	What name is given to the Group 0 elements?	noble gases
19	Why are the noble gases inert?	they have full outer shells so do not need to lose or gain electrons
20	How do the melting points of the noble gases change down the group?	increase (higher melting point)

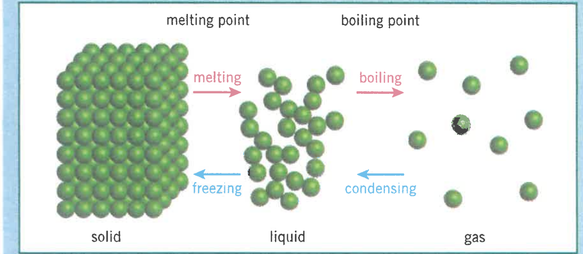
Put paper here

Chapter 3: Bonding 1

Knowledge organiser

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.

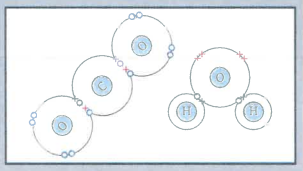
Covalent bonding

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

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

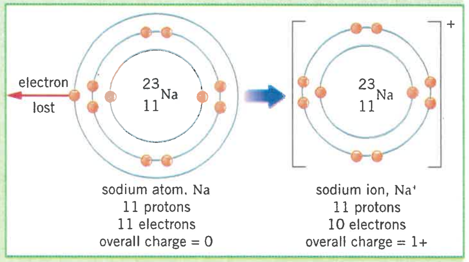
The number of electrons shared depends on how many extra electrons an atom needs to make a full outer shell.

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.



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.

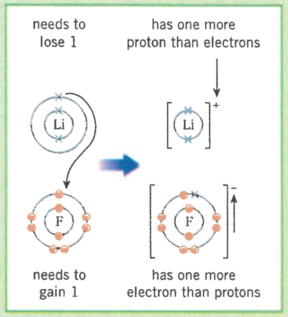
When melted or dissolved in water, ionic substances do conduct electricity because the ions are free to move and carry charge.

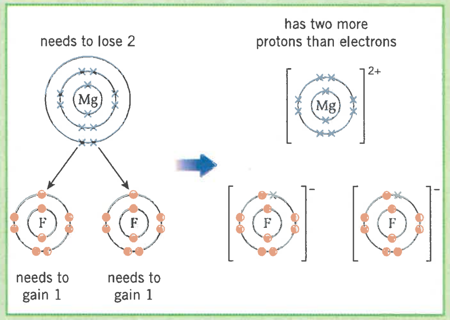
Melting points

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.

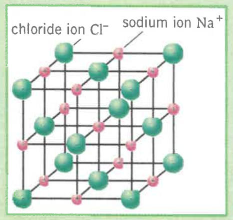




Metal atoms lose electrons to become positive ions. Non-metal atoms gain electrons to become negative ions.

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.



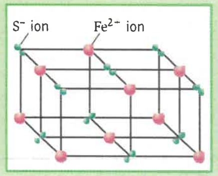
The electrostatic force of attraction works in all directions, so many billions of ions can be bonded together in a 3D structure.

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^- ions – simplifying this ratio gives a formula of FeS_2



Covalent structures

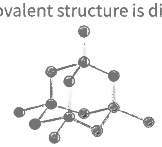
There are three main types of covalent structure:

Structure and bonding

Giant covalent

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

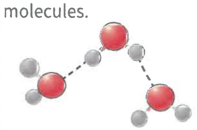
An example of a giant covalent structure is diamond.



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.



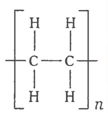
Large molecules

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.



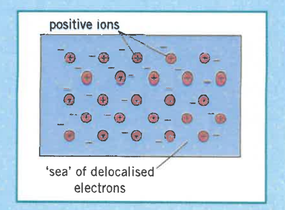
Metals: structure and properties

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.



Chapter 3: Bonding 2

Knowledge organiser

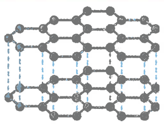
Properties		
High melting and boiling points because the strong covalent bonds between the atoms must be broken to melt or boil the substances. This requires a lot of energy. Solid at room temperature.	Low melting and boiling points because only the intermolecular forces need to be overcome to melt or 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.

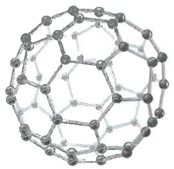
Graphene

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

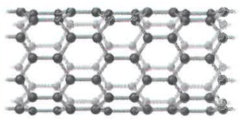


Buckminsterfullerene was the first fullerene to be discovered, and has 60 carbon atoms.

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.

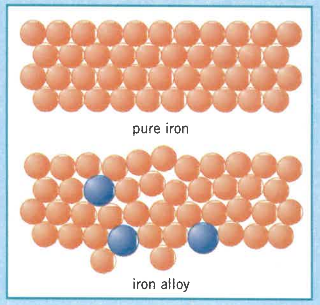
Nanotubes



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**.

Measuring particles

We use different units and scales to measure the size of particles.

Particle	Particulate matter	Size	Standard form	Full form
grain of sand	N/A	0.1 mm	1×10^{-4} m	0.0001 m
coarse particles (e.g., dust)	PM_{10}	10 µm	1×10^{-5} m	0.00001 m
fine particles	$PM_{2.5}$	100 nm	1×10^{-7} m	0.0000001 m
nanoparticles	$< PM_{2.5}$	1 to 100 nm	1×10^{-9} to 1×10^{-7} m	0.000000001 m to 0.0000001 m

PM stands for **particulate matter** and is another way of measuring very small particles.

Uses of nanoparticles

Nanoparticles often have very different properties to bulk materials of the same substance, caused by their high surface area-to-volume-ratio.

Nanoparticles have many uses and are an important area of research. They are used in healthcare, electronics, cosmetics, and as catalysts.

However, nanoparticles have the potential to be hazardous to health and to ecosystems, so it is important that they are researched further.

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, nanoparticle, particulate matter, surface area to volume ratio, transfer

Chapter 3: Bonding

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

	C3 questions		Answers
1	How are covalent bonds formed?	Put paper here	by atoms sharing electrons
2	Which type of atoms form covalent bonds between them?		non-metals
3	Describe the structure and bonding of a giant covalent substance.	Put paper here	billions of atoms bonded together by strong covalent bonds
4	Describe the structure and bonding of small molecules.		small numbers of atoms group together into molecules with strong covalent bonds between the atoms and weak intermolecular forces between the molecules
5	Describe the structure and bonding of polymers.	Put paper here	many identical molecules joined together by strong covalent bonds in a long chain, with weak intermolecular forces between the chains
6	Why do giant covalent substances have high melting points?		it takes a lot of energy to break the strong covalent bonds between the atoms
7	Why do small molecules have low melting points?	Put paper here	only a small amount of energy is needed to break the weak intermolecular forces
8	Why do large molecules have higher melting and boiling points than small molecules?		the intermolecular forces are stronger in large molecules
9	Why do most covalent substances not conduct electricity?	Put paper here	do not have delocalised electrons or ions
10	Describe the structure and bonding in graphite.		each carbon atom is bonded to three others in hexagonal rings arranged in layers – it has delocalised electrons and weak forces between the layers
11	Why can graphite conduct electricity?	Put paper here	the delocalised electrons can move through the graphite
12	Explain why graphite is soft.		layers are not bonded so can slide over each other
13	What is graphene?	Put paper here	one layer of graphite
14	Give two properties of graphene.		strong, conducts electricity
15	What is a fullerene?		hollow cage of carbon atoms arranged as a sphere or a tube
16	What is a nanotube?	Put paper here	hollow cylinder of carbon atoms
17	Give two properties of nanotubes.		high tensile strength, conduct electricity
18	Give three uses of fullerenes.		lubricants, drug delivery (spheres), high-tech electronics

19	What is an ion?	Put paper here	atom that has lost or gained electrons
20	Which kinds of elements form ionic bonds?		metals and non-metals
21	What charges do ions from Groups 1 and 2 form?		Group 1 forms 1+, Group 2 forms 2+
22	What charges do ions from Groups 6 and 7 form?	Put paper here	Group 6 forms 2–, Group 7 forms 1–
23	Name the force that holds oppositely charged ions together.		electrostatic force of attraction
24	Describe the structure of a giant ionic lattice.		regular structure of alternating positive and negative ions, held together by the electrostatic force of attraction
25	Why do ionic substances have high melting points?	Put paper here	electrostatic force of attraction between positive and negative ions is strong and requires lots of energy to break
26	Why don't ionic substances conduct electricity when solid?		ions are fixed in position so cannot move, and there are no delocalised electrons
27	When can ionic substances conduct electricity?	Put paper here	when melted or dissolved
28	Why do ionic substances conduct electricity when melted or dissolved?		ions are free to move and carry charge
29	Describe the structure of a pure metal.		layers of positive metal ions surrounded by delocalised electrons
30	Describe the bonding in a pure metal.	Put paper here	strong electrostatic forces of attraction between metal ions and delocalised electrons
31	What are four properties of pure metals?		malleable, high melting/boiling points, good conductors of electricity, good conductors of thermal energy
32	Explain why pure metals are malleable.	Put paper here	layers can slide over each other easily
33	Explain why metals have high melting and boiling points.		electrostatic force of attraction between positive metal ions and delocalised electrons is strong and requires a lot of energy to break
34	Why are metals good conductors of electricity and of thermal energy?	Put paper here	delocalised electrons are free to move through the metal
35	What is an alloy?		mixture of a metal with atoms of another element
36	Explain why alloys are harder than pure metals.	Put paper here	different sized atoms disturb the layers, preventing them from sliding over each other
37	How big are nanoparticles?		1–100 nm
38	How are nanomaterials different from bulk materials?		nanomaterials have a much higher surface area-to-volume ratio
39	What is the relationship between side length and surface area-to-volume ratio?	Put paper here	as side length decreases by a factor of ten, the surface-area-to-volume ratio increases by a factor of ten
40	What are nanoparticles used for?		used in healthcare, electronics, cosmetics, and catalysts

Chapter 3: Energy resources

Knowledge organiser

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	• enough available to meet current energy demands • reliable – supply can be controlled to meet demand • relatively cheap to extract and use	• 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	• 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	produces nuclear waste, which is: • dangerous • difficult and expensive to dispose of • stored for centuries before it is safe to dispose of. nuclear power plants are expensive to: • build and run • decommission (shut down).

Renewable energy resources

Resource	Main uses	Source	Advantages	Disadvantages
solar energy	generating electricity heating	sunlight transfers energy to solar cells sunlight transfers energy to solar heating panels	can be used in remote places very cheap to run once installed no pollution/greenhouse gases produced	supply depends on weather expensive to buy and install cannot supply large scale demand
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

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

Chapter 3: Energy resources

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

	P3 questions	Answers
1	What is a non-renewable energy resource?	will eventually run out, is not replaced at the same rate it is being used
2	What is a renewable energy resource?	will not run out, it is being (or can be) replaced at the same rate as which it is used
3	What are the main renewable and non-renewable resources available on Earth?	renewable: solar, tidal, wave, wind, geothermal, biofuel, hydroelectric non-renewable: coal, oil, gas, nuclear
4	What are the main advantages of using coal as an energy resource?	enough available to meet current demand, reliable, can control supply to match demand, cheap to extract and use
5	What are the main disadvantages of using coal as an energy resource?	will eventually run out, releases CO_2 which contributes to climate change, releases sulfur dioxide which causes acid rain
6	What are the main advantages of using nuclear fuel as an energy resource?	lot of energy released from a small mass, reliable, can control supply to match demand, enough fuel available to meet current demand, no polluting gases
7	What are the main disadvantages of using nuclear fuel as an energy resource?	waste is dangerous and difficult and expensive to deal with, expensive initial set up, expensive to shut down and to run
8	What are the main advantages of using solar energy?	can be used in remote places, no polluting gases, no waste products, very low running cost
9	What are the main disadvantages of using solar energy?	unreliable, cannot control supply, initial set up expensive, cannot be used on a large scale
10	What are the main advantages of using tidal power?	no polluting gases, no waste products, reliable, can produce large amounts of electricity, low running cost, no fuel costs
11	What are the main disadvantages of using tidal power?	can harm marine habitats, initial set up expensive, cannot increase supply when needed, amount of energy varies on time of month, hazard for boats
12	What are the main advantages of using wave turbines?	no polluting gases produced, no waste products, low running cost, no fuel costs
13	What are the main disadvantages of using wave turbines?	unreliable, dependent on weather, cannot control supply, initial set up expensive, can harm marine habitats, hazard for boats, cannot be used on a large scale
14	What are the main disadvantages of using wind turbines?	unreliable, dependent on weather, cannot control supply, take up lot of space, can produce noise pollution
15	What are the advantages and the disadvantages of using geothermal energy?	advantages: no polluting gases, low running cost disadvantages: initial set up expensive, available in few locations
16	What are the main advantages and disadvantages of using biofuels?	advantages: can be 'carbon neutral', reliable disadvantages: expensive to produce, use land/water that might be needed to grow food
17	What are the main advantages and disadvantages of using hydroelectric power?	advantages: no polluting gases, no waste products, low running cost, no fuel cost, reliable, can be controlled to meet demand disadvantages: initial set up expensive, dams can harm/destroy marine habitats

Put paper here

Chapter 12: Wave properties

Knowledge organiser

Waves in air, fluids, and solids

Waves transfer energy from one place to another without transferring matter. Waves may be **transverse** or **longitudinal**.

For waves in water and air, it is the wave and not the substance that moves.

- When a light object is dropped into still water, it produces ripples (waves) on the water which spread out, but neither the object nor the water moves with the ripples.
- When you speak, your voice box vibrates, making sound waves travel through the air. The air itself does not travel away from your throat, otherwise a vacuum would be created.

Mechanical waves require a substance (a medium) to travel through.

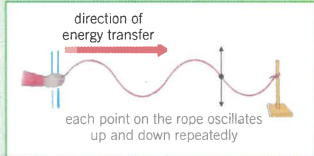
Examples of mechanical waves include sound waves, water waves, waves on springs and ropes, and seismic waves produced by earthquakes.

When waves travel through a substance, the particles in the substance **oscillate** (vibrate) and pass energy on to neighbouring particles.

Transverse waves

The oscillations of a transverse wave are *perpendicular* (at right angles) to the direction in which the waves transfer energy.

Ripples on the surface of water are an example of transverse waves.

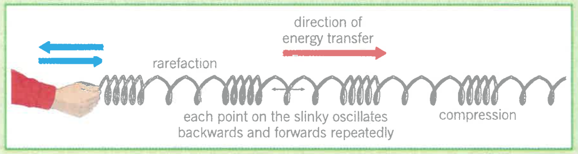


Longitudinal waves

The oscillations of a longitudinal wave are *parallel* to the direction in which the waves transfer energy.

Longitudinal waves cause particles in a substance to be squashed closer together and pulled further apart, producing areas of **compression** and **rarefaction** in the substance.

Sound waves in air are an example of longitudinal waves.



Wave motion is described by a number of properties.

Property	Description	Unit
amplitude A	maximum displacement of a point on a wave from its undisturbed position	metre (m)
frequency f	number of waves passing a fixed point per second	hertz (Hz)
period T	time taken for one complete wave to pass a fixed point	second (s)
wavelength λ	distance from one point on a wave to the equivalent point on the next wave	metre (m)
wave speed v	distance travelled by each wave per second, and the speed at which energy is transferred by the wave	metres per second (m/s)

Properties of waves

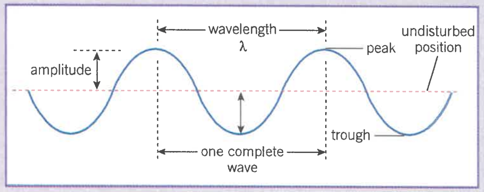
Frequency and period are related by the equation:

$$\text{period (s)} = \frac{1}{\text{frequency (Hz)}} \qquad T = \frac{1}{f}$$

All waves obey the wave equation:

$$\text{wave speed (m/s)} = \text{frequency (Hz)} \times \text{wavelength (m)}$$

$$v = f\lambda$$



When waves travel from one medium to another, their speed and wavelength may change but the frequency always stays the same.

The speed of ripples on water can be slow enough to measure using a stopwatch and ruler, and applying the equation:

$$\text{speed (m/s)} = \frac{\text{distance (m)}}{\text{time (s)}}$$

The speed of sound in air can be measured by using a stopwatch to measure the time taken for a sound to travel a known distance, and applying the same equation.

Reflection of waves

When waves arrive at the boundary between two different substances, one or more of the following things can happen:

Absorption – the energy of the waves is transferred to the energy stores of the substance they travel into (for example, when food is heated in a microwave)

Reflection – the waves bounce back

Refraction – the waves change speed and direction as they cross the boundary

Transmission – the waves carry on moving once they've crossed the boundary, but may be refracted

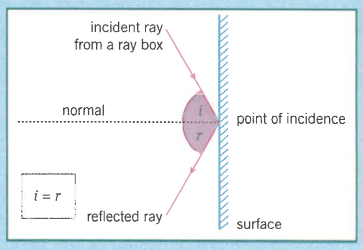
Ray diagrams can be used to show what happens when a wave is reflected at a surface.

To correctly draw a ray diagram for reflection:

1. use a ruler to draw all lines for the rays
2. draw a single arrow on the rays to show the direction the wave is travelling
3. draw a dotted line at right angles to the surface at the point of **incidence** (this line is normal to the surface)
4. label the normal, angle of incidence (i), and angle of reflection (r).

When reflection happens at a surface, the angle of incidence is always equal to the angle of reflection:

$$i = r$$



Key terms

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

absorption amplitude compression frequency incidence longitudinal mechanical wave oscillate period ray diagram reflection rarefaction transmission transverse wavelength wave speed

Chapter 12: Wave properties

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

	P12 questions	Answers
1	What is a transverse wave?	oscillations/vibrations are perpendicular (at right angles) to the direction of energy transfer
2	What is a longitudinal wave?	oscillations/vibrations are parallel to the direction of energy transfer
3	Give an example of a transverse wave.	electromagnetic waves
4	Give an example of a longitudinal wave.	sound waves
5	What is a compression?	area in longitudinal waves where the particles are squashed closer together
6	What is a rarefaction?	area in longitudinal waves where the particles are pulled further apart
7	What is the amplitude of a wave?	maximum displacement of a point on the wave from its undisturbed position
8	What is the wavelength of a wave?	distance from a point on one wave to the equivalent point on the adjacent wave
9	What is the frequency of a wave?	number of waves passing a fixed point per second
10	What unit is frequency measured in?	hertz (Hz)
11	What property of a wave always stays the same when it travels from one medium to another?	frequency
12	What rule do waves follow when they reflect off a surface?	angle of incidence = angle of reflection
13	What happens when waves are transmitted at a boundary between two substances?	they carry on moving at a different speed
14	What happens when waves are absorbed by a substance?	energy of the wave is transferred to energy stores of the substance

Put paper here

Chapter 13: Electromagnetic waves

Knowledge organiser

The electromagnetic spectrum

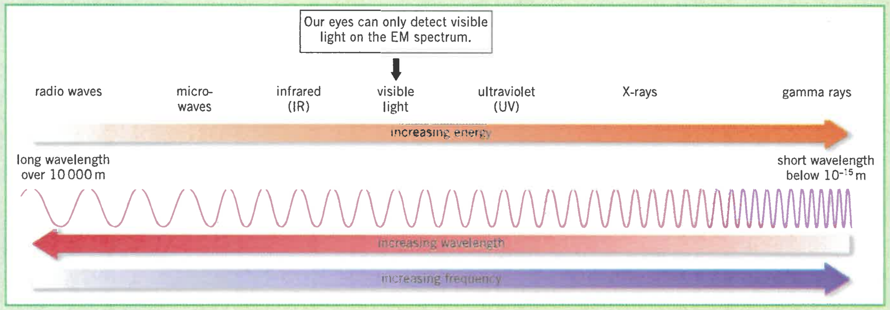
Electromagnetic (EM) waves are **transverse** waves that transfer energy from their source to an absorber. For example, infrared waves emitted from a hot object transfer thermal energy.

EM waves form a continuous **spectrum**, and are grouped by their wavelengths and frequencies.

EM waves all travel at the same velocity through air or a vacuum. They travel all at a speed of 3×10^8 m/s through a vacuum.

(HT only) Different substances may absorb, transmit, **refract**, or **reflect** EM waves in ways that vary with their wavelength.

Refraction occurs when there is a difference in the velocity of an EM wave in different substances.



Infrared radiation (required practical)

This practical investigates the rates of absorption and radiation of infrared radiation from different surfaces.

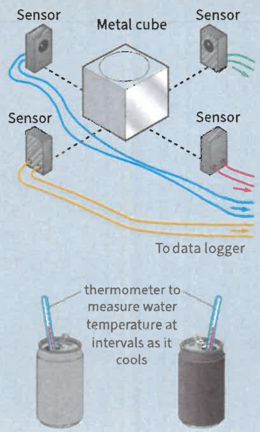
You should be able to plan a method to determine the rate of cooling due to emission of infrared radiation and evaluate your method.

Using infrared detectors to measure the radiation emitted by different surfaces

Monitoring the rate of cooling in cans with different surfaces

To be accurate and precise in your investigation you need to:

- use an infrared detector with a suitable meter, where possible
- ensure that you always put the detector the same distance from the surface
- repeat measurements and calculate an average.



Properties of EM waves

EM waves of a wide range of frequencies can be absorbed or produced by changes inside an atom or nucleus. For example, gamma rays are produced by changes in the nucleus of an atom.

When electrons in an atom move down between energy levels, they emit EM waves.

Properties of radio waves (HT only)

Radio waves can be produced by **oscillations** in an electrical circuit.

When radio waves are absorbed by a receiver aerial, they may create an **alternating current** with the same frequency as the radio waves.

Uses of EM waves

EM waves have many practical applications, but exposure to some EM waves (such as those that are forms of ionising radiation) can have hazardous effects.

Radiation dose (in sieverts) is the risk of harm from exposure of the body to a particular radiation.

Type of EM wave	Use	Why is it suitable for this use? (HT only)	Hazards
radio waves	television and radio signals	• can travel long distances through air • longer wavelengths can bend around obstructions to allow detection of signals when not in line of sight	can penetrate the body and cause internal heating
microwaves	satellite communications and cooking food	• can pass through Earth's atmosphere to reach satellites • can penetrate into food and are absorbed by water molecules in food, heating it	
infrared	electrical heaters, cooking food, and infrared cameras	• all hot objects emit infrared waves – sensors can detect these to turn them into an image • can transfer energy quickly to heat rooms and food	can damage or kill skin cells due to heating
visible light	fibre optic communications	• short wavelength means visible light carries more information	can damage the retina
ultraviolet (UV)	energy efficient lights and artificial sun tanning	• carries more energy than visible light • some chemicals used inside light bulbs can absorb UV and emit visible light	can damage skin cells, causing skin to age prematurely and increasing the risk of skin cancer, and can cause blindness
X-rays	medical imaging and treatments	• pass easily through flesh, but not denser materials like bone • high doses kill living cells, so can be used to kill cancer cells – gamma rays can also be used to kill harmful bacteria	form of ionising radiation – can damage or kill cells, cause mutation of genes, and lead to cancers
gamma rays			

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

alternating current *electromagnetic wave* *electromagnetic spectrum* *oscillation* *radiation dose* *reflection* *refraction* *transverse*

Chapter 13: Electromagnetic waves

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

	P13 questions		Answers
1	Are electromagnetic (EM) waves longitudinal or transverse waves?	Put paper here	transverse
2	Explain why EM waves are not mechanical waves.		they can travel through a vacuum (don't need a substance to travel through)
3	What do EM waves transfer from their source to an absorber?	Put paper here	energy
4	List the different types of waves in the EM spectrum in order of decreasing wavelength (increasing frequency).		radio, microwave, infrared, visible, ultraviolet, X-rays, gamma
5	Which part of the EM spectrum can humans see?	Put paper here	visible light
6	How can electromagnetic waves be produced?		changes inside an atom/atomic nucleus
7	How are gamma rays produced?	Put paper here	changes in the nucleus of an atom, for example during radioactive decay
8	How can radio waves be produced?		oscillations in an electrical circuit
9	How can we detect radio waves?		waves are absorbed and create an alternating current with the same frequency as the radio wave
10	What are radio waves used for?	Put paper here	transmitting television, mobile phone, and Bluetooth signals
11	What are microwaves used for?		satellite communications, cooking food
12	What is infrared radiation used for?	Put paper here	heating, remote controls, infrared cameras, cooking food
13	Which types of EM waves are harmful to the human body?		ultraviolet, X-rays, gamma rays
14	What are the hazards of being exposed to ultraviolet radiation?		damage skin cells, sunburn, increase risk of skin cancer, age skin prematurely, blindness
15	Why are X-rays used for medical imaging?	Put paper here	they pass through flesh but not bone
16	Why are gamma rays used for treating cancer and sterilising medical equipment?		high doses kill cells and bacteria

Chapter 5: Communicable diseases

Knowledge organiser

Communicable diseases

Communicable diseases can be spread from one organism to another.

Viruses live and reproduce rapidly inside an organism's cells. This can damage or destroy the cells.

Viruses	Spread by	Symptoms
measles	inhalation of droplets produced by infected people when sneezing and coughing	• fever • red skin rash • complications can be fatal – young children are vaccinated to immunise them against measles
HIV (human immunodeficiency virus)	• sexual contact • exchange of body fluids (e.g., blood when drug users share needles)	• flu-like symptoms at first • virus attacks the body's immune cells, which can lead to AIDS – where the immune system is so damaged that it cannot fight off infections or cancers
TMV (tobacco mosaic virus – plants)	• direct contact of plants with infected plant material • animal and plant vectors • soil: the pathogen can remain in soil for decades	• mosaic pattern of discolouration on the leaves – where chlorophyll is destroyed • reduces plant's ability to photosynthesise, affecting growth

Bacteria reproduce rapidly inside organisms and may produce **toxins** that damage tissues and cause illness.

Bacteria	Spread by	Symptoms	Prevention and treatment
Salmonella	bacteria in or on food that is being ingested	*Salmonella* bacteria and the toxins they produce cause • fever • abdominal cramps • vomiting • diarrhoea	poultry are vaccinated against *Salmonella* bacteria to control spread
gonorrhoea	direct sexual contact – gonorrhoea is a **sexually transmitted disease** (STD)	• thick yellow or green discharge from the vagina or penis • pain when urinating	• treatment with antibiotics (many antibiotic-resistant strains have appeared) • barrier methods of contraception, such as condoms

Fungi	Spread by	Symptoms	Prevention and treatment
rose black spot	water and wind	• purple or black spots on leaves, which turn yellow and drop early • reduces plant's ability to photosynthesise, affecting growth	• fungicides • affected leaves removed and destroyed

Protists	Spread by	Symptoms	Prevention and treatment
malaria	mosquitos feed on the blood of infected people and spread the protist pathogen when they feed on another person – organisms that spread disease by carrying pathogens between people are called **vectors**	• recurrent episodes of fever • can be fatal	• prevent mosquito vectors breeding • mosquito nets to prevent bites • anti-malarial medicine

Detection and identification of plant diseases

Signs that a plant is diseased

- stunted growth
- spots on leaves
- areas of rot or decay
- growths
- malformed stems or leaves
- discolouration
- pest infestation

Ways of identifying plant diseases

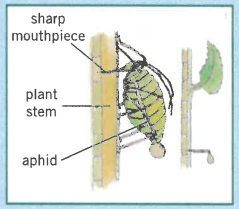
- gardening manuals and websites
- laboratory testing of infected plants
- testing kits containing monoclonal antibodies (Chapter 9 *Monoclonal antibodies*)

Plant diseases and insects

Plant diseases can also be directly caused by insects.

Aphids are insects that suck sap from the stems of plants. This results in

- reduced rate of growth
- wilting
- discolouration of leaves.



Ladybirds can be used to control aphid infestations as ladybird larvae eat aphids.

Plant defences

Physical barriers

- cellulose cell walls – provide a barrier to infection
- tough waxy cuticle on leaves
- bark on trees – a layer of dead cells that can fall off

Chemical barriers

- many plants produce antibacterial chemicals
- poison production stops animals eating plants

Mechanical adaptations

- thorns and hairs stop animals eating plants
- leaves that droop or curl when touched to scare herbivores or dislodge insects
- some plants **mimic** the appearance of unhealthy or poisonous plants to deter insects or herbivores

Controlling the spread of communicable disease

There are a number of ways to help prevent the spread of communicable diseases from one organism to another.

Hygiene
Hand washing, disinfecting surfaces and machinery, keeping raw meat separate, covering mouth when coughing/sneezing, etc.

Isolation
Isolation of infected individuals – people, animals, and plants can be isolated to stop the spread of disease.

Controlling vectors
If a vector spreads a disease destroying or controlling the population of the vector can limit the spread of disease.

Vaccination
Vaccination can protect large numbers of individuals against diseases.

Key terms

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

aphid, bacterium, communicable disease, fungicide, fungus, isolation, mimic, pathogen, protist, sexually transmitted disease (STD), toxin, vaccination, vector, virus

Chapter 5: Communicable diseases

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

	B5 questions	Answers
1	What is a communicable disease?	a disease that can be transmitted from one organism to another
2	What is a pathogen?	a microorganism that causes disease
3	Name four types of pathogen.	bacteria, fungi, protists, viruses
4	How can pathogens spread?	air, water, direct contact
5	How do bacteria make you ill?	produce toxins that damage tissues
6	How do viruses make you ill?	reproduce rapidly inside cells, damaging or destroying them
7	Name three examples of viral diseases.	measles, HIV, tobacco mosaic virus
8	Name two examples of bacterial diseases.	*Salmonella*, gonorrhoea
9	Name four methods of controlling the spread of communicable disease.	good hygiene, isolating infected individuals, controlling vectors, vaccination
10	Describe an example of a protist disease.	malaria – caused by a protist pathogen that is spread from person to person by mosquito bites, and causes recurrent fevers
11	Describe an example of a fungal disease in plants.	rose black spot – spread by water and wind, and affects plant growth by reducing a plant's ability to photosynthesise
12	How can the cause of a plant disease be identified?	gardening manuals and websites, laboratory testing, monoclonal antibody kits
13	What are three mechanical defences that protect plants?	thorns and hairs, leaves that droop or curl, mimicry to trick animals
14	Give three physical defences of plants.	cellulose cell walls, tough waxy cuticles, bark on trees
15	How can aphids be controlled by gardeners?	introduce ladybirds to eat the aphids
16	How can plant diseases be detected?	areas of decay, discolouration, growths, malformed stems or leaves, presence of pests, spots on leaves, and stunted growth

Put paper here

Chapter 6: Preventing and treating disease

Knowledge organiser

Non-specific defences

Non-specific defences of the human body against all pathogens include:

Skin
- physical barrier to infection
- produces antimicrobial secretions
- microorganisms that normally live on the skin prevent pathogens growing

Nose

Cilia and **mucus** trap particles in the air, preventing them from entering the lungs.

Trachea and bronchi produce mucus, which is moved away from the lungs to the back of the throat by cilia, where it is expelled.

Stomach

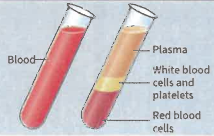
Produces strong acid (pH 2) that destroys pathogens in mucus, food, and drinks.

White blood cells

If a pathogen enters the body, the immune system tries to destroy the pathogen.

The function of **white blood cells** is to fight pathogens.

There are two main types of white blood cell – lymphocytes and phagocytes.



Lymphocytes

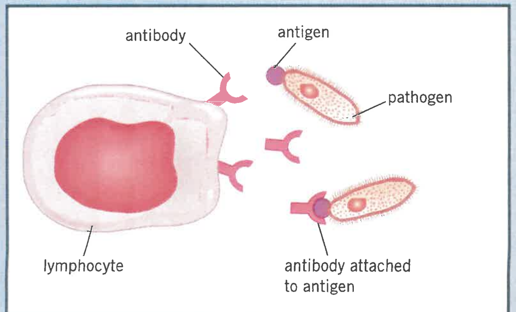
Lymphocytes fight pathogens in two ways:

Antitoxins

Lymphocytes produce **antitoxins** that bind to the toxins produced by some pathogens (usually bacteria). This *neutralises* the toxins.

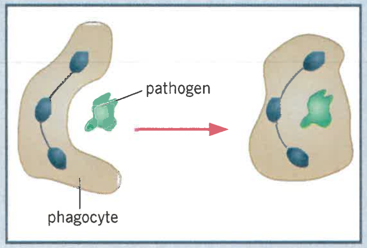
Antibodies

Lymphocytes produce **antibodies** that target and help to destroy specific pathogens by binding to **antigens** (proteins) on the pathogens' surfaces.



Phagocytes

1. Phagocytes are attracted to areas of infection.
2. The phagocyte surrounds the pathogen and engulfs it.
3. Enzymes that digest and destroy the pathogen are released.



Monoclonal antibodies (HT only)

Monoclonal antibodies are produced by mouse lymphocytes which are combined with a tumour cell to make a hybridoma cell. These can divide to make an antibody which can later be cloned and used to treat diseases such as cancer or used in pregnancy tests.

Key terms

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

antibiotic, antibody, antigen, antitoxin, dose, double-blind trial, efficacy, Herd immunity, monoclonal antibodies, mucus, peer review, placebo, toxicity, vaccination, white blood cell

Treating diseases

Antibiotics

- **Antibiotics** are medicines that can kill *bacteria* in the body.
- Specific bacteria need to be treated by specific antibiotics.
- Antibiotics have greatly reduced deaths from infectious bacterial diseases, but antibiotic-resistant strains of bacteria are emerging.

Treating viral diseases

- Antibiotics *do not* affect viruses.
- Drugs that kill viruses often damage the body's tissues.
- Painkillers treat the symptoms of viral diseases but do not kill pathogens.

Discovering and developing new drugs

Drugs were traditionally extracted from plants and microorganisms, for example

- the heart drug digitalis comes from foxglove plants
- the painkiller aspirin originates from willow trees
- penicillin was discovered by Alexander Fleming from *Penicillium* mould.

Most modern drugs are now synthesised by chemists in laboratories.

New drugs are extensively tested and trialled for

- **toxicity** – is it harmful?
- **efficacy** – does it work?
- **dose** – what amount is safe and effective to give?

Stages of clinical trials

Pre-clinical trials

Drug is tested in cells, tissues, and live animals.

Clinical trials

1. Healthy volunteers receive very low doses to test whether the drug is safe and effective.
2. If safe, larger numbers of healthy volunteers and patients receive the drug to find the optimum dose.

Peer review

Before being published, the results of clinical trials will be tested and checked by independent researchers. This is called **peer review**.

Double-blind trials

Some clinical trials give some of their patients a **placebo** drug – one that is known to have no effect.

Double-blind trials are when neither the patients nor the doctors know who has been given the real drug and who has been given the placebo. This reduces biases in the trial.

Vaccinations

Vaccinations involve injecting small quantities of dead or inactive forms of a pathogen into the body. This stimulates lymphocytes to produce the correct antibodies for that pathogen. If the same pathogen re-enters the body, the correct antibodies can be produced quickly to prevent infection. If a large proportion of the population is vaccinated against a disease, it is less likely to spread. This is called **herd immunity**.

Chapter 6: Preventing and treating disease

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

	B6 questions	Answers
1	What non-specific systems does the body use to prevent pathogens getting into it?	• skin • cilia and mucus in the nose, trachea, and bronchi • stomach acid
2	What three functions do white blood cells have?	phagocytosis, producing antibodies, producing antitoxins
3	What happens during phagocytosis?	phagocyte is attracted to the area of infection, engulfs a pathogen, and releases enzymes to digest the pathogen
4	What are antigens?	proteins on the surface of a pathogen
5	Why are antibodies a specific defence?	antibodies have to be the right shape for a pathogen's unique antigens, so they target a specific pathogen
6	What is the function of an antitoxin?	neutralise toxins produced by pathogens by binding to them
7	What does a vaccine contain?	small quantities of a dead or inactive form of a pathogen
8	How does vaccination protect against a specific pathogen?	vaccination stimulates the body to produce antibodies against a specific pathogen – if the same pathogen reenters the body, white blood cells rapidly produce the correct antibodies
9	What is herd immunity?	when most of a population is vaccinated against a disease, meaning it is less likely to spread
10	What is an antibiotic?	a drug that kills bacteria but not viruses
11	What do painkillers do?	treat some symptoms of diseases and relieve pain
12	What properties of new drugs are clinical trials designed to test?	toxicity, efficacy, and optimum dose
13	What happens in the pre-clinical stage of a drug trial?	drug is tested on cells, tissues, and live animals
14	What is a placebo?	medicine with no effect that is given to patients instead of the real drug in a trial
15	What is a double-blind trial?	a trial where neither patients nor doctors know who receives the real drug and who receives the placebo
16	What is a monoclonal antibody?	A monoclonal antibody is an antibody produced by a single clone of cells.
17	Give two examples in which monoclonal antibodies can be used for.	Treating cancer, in pregnancy tests

Put paper here

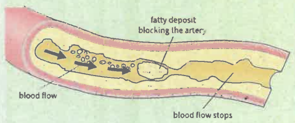
Chapter 7: Non-communicable diseases

Knowledge organiser

Coronary heart disease

Coronary heart disease (CHD) occurs when the coronary arteries become narrowed by the build-up of layers of fatty material within them.

This reduces the flow of blood, resulting in less oxygen for the heart muscle, which can lead to heart attacks.



Health issues

Health is the state of physical and mental well-being.

The following factors can affect health:

- communicable and non-communicable diseases
- diet
- stress
- exercise
- life situations.

Different types of disease may interact, for example:

- defects in the immune system make an individual more likely to suffer from infectious diseases
- viral infection can trigger cancers
- immune reactions initially caused by a pathogen can trigger allergies, for example skin rashes and asthma
- severe physical ill health can lead to depression and other mental illnesses.

Treating cardiovascular diseases

Treatment	Description	Advantages	Disadvantages
stent	inserted into blocked coronary arteries to keep them open	• widens the artery – allows more blood to flow, so more oxygen is supplied to the heart • less serious surgery	• can involve major surgery – risk of infection, blood loss, blood clots, and damage to blood vessels • risks from anaesthetic used during surgery
statins	drugs that reduce blood **cholesterol** levels, slowing down the deposit of fatty material in the arteries	• effective • no need for surgery • can prevent CHD from developing	• possible side effects such as muscle pain, headaches, and sickness • cannot cure CHD, so patient will have to take tablets for many years
replace faulty heart valves	heart valves that leak or do not open fully, preventing control of blood flow through the heart, can be replaced with biological or mechanical valves	• allows control of blood flow through the heart • long-term cure for faulty heart valves	• can involve major surgery – risk of infection, blood loss, blood clots, and damage to blood vessels • risks from anaesthetic used during surgery
transplants	if the heart fails a donor heart, or heart and lungs, can be transplanted **artificial hearts** can be used to keep patients alive whilst waiting for a heart transplant, or to allow the heart to rest during recovery	• long-term cure for the most serious heart conditions • treats problems that cannot be treated in other ways	• transplant may be rejected if there is not a match between donor and patient • lengthy process • major surgery – risk of infection, blood loss, blood clots, and damage to blood vessels • risks from anaesthetic used during surgery

Risk factors and non-communicable diseases

A **risk factor** is any aspect of your lifestyle or substance in your body that can increase the risk of a disease developing.

Some risk factors cause specific diseases. Other diseases are caused by factors interacting.

Risk factor	Disease	Effects of risk factor
diet (obesity) and amount of exercise	Type 2 diabetes	body does not respond properly to the production of insulin, so blood glucose levels cannot be controlled
	cardiovascular diseases	increased blood cholesterol can lead to CHD
alcohol	impaired liver function	long-term alcohol use causes liver cirrhosis (scarring), meaning the liver cannot remove toxins from the body or produce sufficient bile
	impaired brain function	damages the brain and can cause anxiety and depression
	affected development of unborn babies	alcohol can pass through the placenta, risking miscarriages, premature births, and birth defects
smoking	lung disease and cancers	cigarettes contain carcinogens, which can cause cancers
	affected development of unborn babies	chemicals can pass through the placenta, risking premature births and birth defects
carcinogens, such as ionising radiation, and genetic risk factors	cancers	for example, tar in cigarettes and ultraviolet rays from the Sun can cause cancers
		some genetic factors make an individual more likely to develop certain cancers

Cancer

Cancer is the result of changes in cells that lead to uncontrolled growth and division by mitosis.

Rapid division of abnormal cells can form a **tumour**.

Malignant tumours are cancerous tumours that invade neighbouring tissues and spread to other parts of the body in the blood, forming secondary tumours.

Benign tumours are non-cancerous tumours that do not spread in the body.

Treatment

Treatment of non-communicable diseases linked to lifestyle risk factors – such as poor diet, drinking alcohol, and smoking – can be very costly, both to individuals and to the Government.

A high incidence of these lifestyle risk factors can cause high rates of non-communicable diseases in a population.

Key terms

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

artificial heart, benign, carcinogen, cholesterol, coronary heart disease, health, malignant, risk factor, statin, stent, transplant, tumour

Chapter 7: Non-communicable diseases

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

	B7 questions	Answers
1	What is coronary heart disease?	layers of fatty material that build up inside the coronary arteries, narrowing them – resulting in a lack of oxygen for the heart
2	What is a stent?	a device inserted into a blocked artery to keep it open, allowing more blood and oxygen to the heart
3	What are statins?	drugs that reduce blood cholesterol levels, slowing the rate of fatty material deposit
4	What is a faulty heart valve?	heart valve that doesn't open properly or leaks
5	How can a faulty heart valve be treated?	replace with a biological or mechanical valve
6	When do heart transplants take place?	in cases of heart failure
7	What are artificial hearts used for?	keep patients alive whilst waiting for a transplant, or allow the heart to rest for recovery
8	Define health.	state of physical and mental well-being
9	What factors can affect health?	disease, diet, stress, exercise, life situations
10	What is a risk factor?	aspect of lifestyle or substance in the body that can increase the risk of a disease developing
11	Give five risk factors.	poor diet, smoking, lack of exercise, alcohol, carcinogens
12	What is cancer?	a result of changes in cells that lead to uncontrolled growth and cell division by mitosis
13	What are malignant tumours?	cancerous tumours that can spread to neighbouring tissues and other parts of the body in the blood, forming secondary tumours
14	What are benign tumours?	non-cancerous tumours that do not spread in the body
15	What two types of risk factor affect the development of cancers?	lifestyle and genetic risk factors
16	What is a carcinogen?	a substance that can cause cancers to develop

Put paper here