Name and Tutor group:

Year 9 Knowledge Organiser

Term 5

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

PROPAGANDA

Images that are used to persuade and encourage

EXAMPLES OF FINAL OUTCOMES:

YOU WILL LEARN:

Skills to produce a propaganda poster using text, and your chosen theme in the style of a contemporary artist.
You will make use of composition and layering with different materials to develop our art and design skills

Why am I learning this?

To know & understand the way posters were created and used.
You will build on your knowledge and skills with each project as they increase in difficulty, enabling you to express yourself in a confident way.

Propaganda Art
https://www.youtube.com/watch?v=kQHImN068S

Homework Tasks:

Tick when complete ✓

1. Research a theme
2. Research WW1 and WW2 propaganda
3. Create a Shepard Fairey Poster
4. Research Andrea Bowers
5. Redesign a historic poster

CONTEXTUAL KNOWLEDGE:

Shepard Fairey

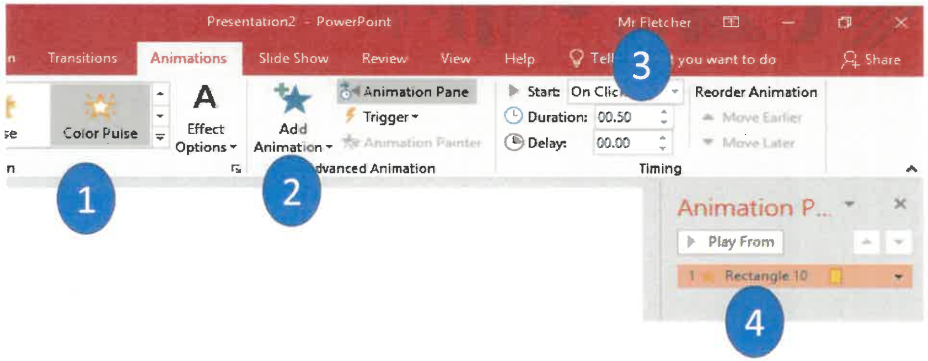
Cecil Touchon

Andrea Bowers

Keywords

Propaganda	Images that are used to persuade and encourage
Symbol	A material object representing something abstract.
Composition	The arrangement of elements within a work of art.
Political	Relating to the government or public affairs of a country.
Typographic	Typography is the art and technique of arranging type to make written language legible, readable and appealing when displayed
Protest Art	Protest art involves creative works grounded in the act of addressing political or social issues

Year 9 Computing - Interactive media



Animation in powerpoint

1. Use these to quickly add just one animation to a shape. They wont let you add more than one.
2. This button lets you add any animation to a shape. You can add more than one. Green means entrance effects, yellow is emphasis, red means exit effects and dotted lines are for movement
3. Choose when to start the animation
4. Shows all the animations on the slide in the order they will happen

Key vocabulary

Animation Visual effects used on objects such as text boxes or pictures. They allow these objects to be bought on and off the slide in a certain way

Audio Any type of sound, such as music or voiceover

Design Templates A variety of ready-made templates with custom formatting (font, colour scheme etc.) which gives a certain look and feel

Entrance Animation The animation used to bring an object (such as a picture or text box) onto the slide

Font A set of type which shows words and numbers in a particular style and size

Media Images, videos or sounds which can be added to a presentation

Presentation A visual way of displaying information to an audience that is clear and engaging. It can contain text, images and videos

Presentation Program A computer program, such as PowerPoint, which is used to create apresentation

Slide A single page within a presentation

Slideshow A collection of pages arranged in sequence that contains text and images to present to an audience. Often referred to as a PowerPoint presentation

Stock image Existing photos and images which are available and free to use

Text box A box in which text can be inputted and formatted

Text formatting When you change the format of text on a page, including the font, the size and whether it is bold, underlined or in italics

Transition The interesting effect used when one slide moves onto the next

WordArt A way to treat text as a graphic so that you can add special effects to text

Drama – Year 9 Term 5

THE CORSHAM SCHOOL ACADEMY GROUP

Skills development

You will be developing your skills from KS3 and applying them to different styles of drama, working towards a performance to an audience.

Performance Skills

Characterisation: Using a range of performance skills to create a character different from yourself

Posture : The way that you sit or stand. The alignment of your spine

Facial Expressions : Using your face to show how a character is feeling

Gesture: A movement (usually of the arm / hand) that communicates a specific meaning

Levels: Using different heights to communicate meaning or to add visual interest

Vocal skills- Pace, pause, pitch, volume, accent etc – How you use your voice to create different characters and communicate meaning.

What makes a good performance?
Which is the most important vocal skill? Why?
Which is the most important physical skill? Why?
What style and techniques would you use to create a performance about the pandemic? Why?

Drama Techniques

Narration: Normally spoken to the audience . Performers tell the story, give information or comment on the actions.

Freeze frame / Still image : A picture of a moment in time, as thought the pause button has been pr

Thought tracking: A character reveals their inner thoughts to the audience. This information should tell the audience something new.

Marking the moment: Highlighting / drawing the audience's attention to an important moment in a piece. This can be done by using drama techniques.

Slow motion: Moving at a least 2/3 slower than normal speed, allowing the audience to see the detail of a moment.

Flashback: Where you start at the end of a story and return to the important details that have happened previously. This allows an audience to understand the backstory.

Performance Styles

Improvisation- performances that are made up on the spot with or without a stimulus or starting point.

Naturalism- Stanislavski, performances looked real and character development is based on using your own experiences and working out exactly what your character is trying to achieve in each section.

Physical theatre: A type of performance where physical movement is the primary method of storytelling. It may incorporate other techniques such as mime, gesture and modern dance to create performance pieces.

Year 9 Food Knowledge Organiser.

Key Practical Skills

- **Flaky Pastry – Lamination.** The dough is rolled and folded to produce layers. Fat is placed in between the layers and this melts, leaving a space that is filled with steam from the water and fat added to the pastry. Trapped expand between the causing light crisp layers of pastry to develop. **(Sausage rolls)**
- **Short Crust pastry – Shortening.** The fat is rubbed into the flour with fingertips. It coats flour to prevent the long gluten strands from forming. This is called shortening. **(Cheese and Onion Pasties)**
- **Whisking Method – Mechanical Raising Agents.** When the eggs and sugar are whisked together this traps air bubbles as the protein from the egg stretches and surrounds the air bubbles to form an air-in-liquid foam. This is a mechanical raising agent. **(Swiss Roll)**
- **Fruit and Vegetable preparation** – Water soluble vitamins (B group &C) are easily damaged or lost during preparation and cooking. Correct preparation and cooking will minimise these losses. **(Thai Curry, Bolognaise/chilli, Carrot Cake)**
- **Presentation skills** – presenting and styling food is very important at GCSE. Decorations on savoury food are called garnish and decoration on sweet foods. (Samosas, Cheesecake)

Key Topics

Food and the environment :

Food waste – Manufacturers, retailers and consumers waste millions of tonnes of food a year for a variety of reasons

food poverty -defined as the inability to acquire or consume an adequate or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so

Food provenance – food that is grown, food that is caught, food that is reared. E.g. organic

Food miles – how far food has travelled from farm to fork

Food and Nutrition:

Nutrition – main nutrients , functions and sources

Food Choices – There are many reasons why we choose the food we eat, but they can often be related to religion and culture, ethical and moral beliefs, medical conditions or personal preference. This affects the diets they eat

Food intolerance – a reaction to a specific food

Allergen – A substance in food that may cause an allergic reaction

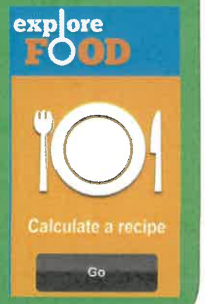
Personal Skills

- Confidence
- Organisation
- Teamwork
- Time management

Nutrient	Functions	Examples
Carbohydrates & Fibre	• Energy • Aids Digestion • Fills us up	• Pasta, Rice, Bread, Cereals, potatoes
Vitamins & Minerals	• Keeps us healthy • Protect from illness • Each vitamin and mineral has a specific job	• Most foods we eat contain at least one vitamin and/ a mineral. • Such as - Meat, fish, alternatives, fruit, vegetables, dairy, cereals, bread pasta
Proteins	• Repairs and replaces worn and old cells and tissues. • Builds muscle and makes us strong • growth	• **Meat** – lamb, pork, beef • **Fish** – cod, tuna, sardines • **Pulses and beans** – lentils, chick peas, beans, peas • **Alternatives** – soya, tofu, Quorn • **Dairy products** – milk, cheese, yoghurt
Fats	• Give us energy • Protect our bodies • Insulate • Needed to use fat soluble vitamins	Saturated fats –meat, lard, cheese, cream, eggs Unsaturated – oily fish, avocado's, oils such as sunflower, olive, rapeseed vegetable

Nutritional Analysis

Evaluate the nutritional content of some of our practical outcomes using explore food which is an online nutritional analysis tool. Adapt recipes and compare.



Keywords

- Nutrients
- Carbohydrate
- Protein
- Lamination
- Shortening
- Garnish
- Food miles
- Food Provenance
- Saturated and unsaturated fats
- vegetarian

KS3 YEAR 9

Tools and Equipment

Measuring and marking

Steel rule		An accurate tool for measuring and marking out
Template		A template is a tool used to mark out shapes repeatedly

What is good design?

- Clear ideas
- Annotations
- Measurements
- Content
- Presentation
- Balance

Maths in DT:

- Multiplication
- Divide
- Add / Subtract
- Measurement conversion
- Ratios
- Percentages
- Surface area

Vegetarian sources of iron?

Vegetarians are more likely to have lower iron stores than people who eat meat.

Good sources of iron for vegetarians include:

- pulses, such as kidney beans, chickpeas and lentils
- dried fruit, such as apricots
- dark green vegetables, such as watercress, broccoli and spring greens
- wholemeal bread and flour
- fortified cereals (with added iron)
- nuts

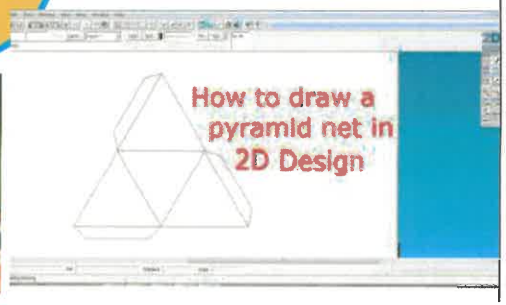
Food labels

- **Nutrition information labels can help you choose between products and keep a check on the amount of foods you're eating that are high in fat, salt and added sugars.**
- Most pre-packed foods have a nutrition information label on the back or side of the packaging.
- You can use nutrition information labels to help you eat a balanced diet.
- If you're choosing foods and drinks that are high in fat, salt and sugar, have these less often and in small amounts.
- Most people in the UK eat and drink too many calories, too much fat, sugar and salt, and not enough fruit, vegetables, oily fish or fibre.

D&T CAD AND CAM

Keywords

- Design
- Product analysis
- Research
- Evaluation
- Food Packaging
- Paper
- Board
- Corrugated board
- Duplex board
- Foil lined board
- Pulp
- Sizing
- Die-cutting
- Colour printing
- Offset lithography
- Bar code
- Nutritional information
- Printing
- Lamination



Year 9 Electronics

DESIGN AND TECHNOLOGY

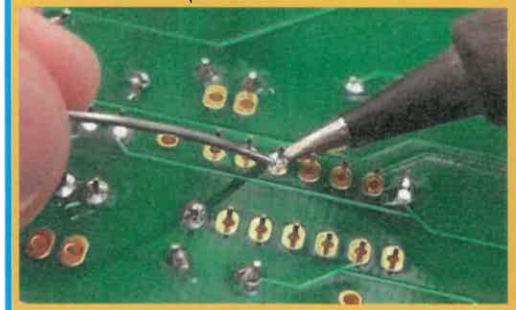
Tools and Equipment

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.

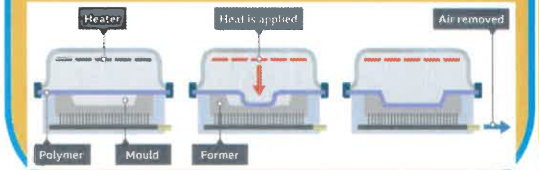
Soldering

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.

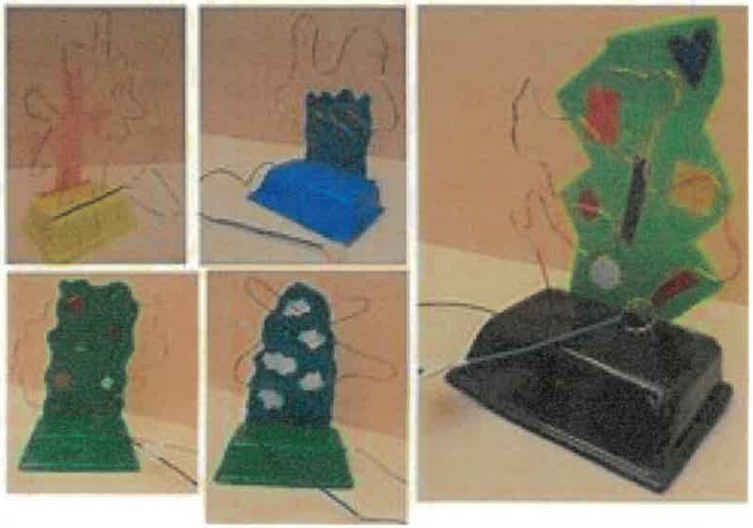


Keywords

- 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.

 Cell	 Battery	 Push-to-make (PTM) switch	 Push-to-break (PTB) switch	 Diode	 Light-emitting diode (LED)
 Buzzer	 Loudspeaker	 Lamp	 Single pole single throw (SPST) switch	 Single pole double throw (SPDT) switch	 Thyristor
 Resistor	 Variable resistor	 Thermistor	 Light dependent resistor (LDR)	 Motor	 Voltage rails



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 9 D&T RESISTANT MATERIALS

Tools and Equipment

Measuring and marking

Steel rule		An accurate tool for measuring and marking out
Try square		A tool used to check right angles on wood or plastic
Template		A template is a tool used to mark out shapes repeatedly

Shaping and finishing

Metal file		Used to shape or smooth wood, metal or plastic
Wet and Dry Paper		An abrasive paper used to smooth the surface or edges of plastic
Disc sander		A machine used to smooth the edges of materials

Polymers

Thermoform Polymer

A polymer which can be reheated and moulded.

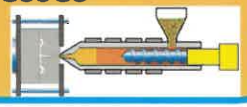
Acrylic
High impact polystyrene (HIPS)
Polypropylene (PP)

Thermosetting Polymer

A polymer which cannot be re moulded.

Epoxy resin (ER)
Melamine Formaldehyde (MF)
Urea Formaldehyde (UF)

Polymer processes

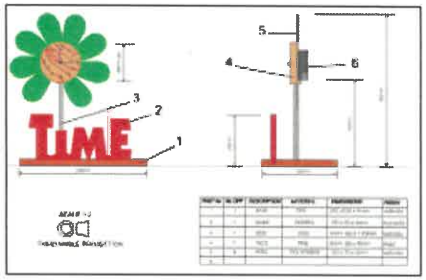


Injection moulded
Extrusion
Vacuum formed

Memphis Design Movement

Ettore Sottsass

Orthographic Drawing



Cutting

Coping saw		A hand saw used to cut complex shapes in wood and plastic
Scroll saw		A machine saw used to cut complex shapes in wood and plastic
Vice		Supports work whilst cutting or finishing
Pillar drill		A machine used to make holes in materials
Laser cutter		CAM: Laser cutting is the use of a high-powered laser to cut, etch and engrave your material

What is good design?

Clear ideas
Annotations
Measurements
Content
Presentation
Balance

Maths in DT:

Multiplication
Divide
Add / Subtract
Measurement conversion
Ratios
Percentages
Surface area

Keywords

Template
Polymer
Tensol Cement
Modelling
Acrylic
Specification
Research
Design
Evaluation
6Rs
Sustainable
Manufacture

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POLYMERS

KS3 YEAR 9

DT TEXTILES

Tools and Equipment

Measuring and marking

Measuring Tape		Fabric tape measure used to measure
Tailor's chalk		A temporary mark on fabric
Template / Pattern		A template / pattern is a tool used to mark out shapes repeatedly

Constructing

Sewing needle		Helps to sew fabric together
Embroidery needle		A needle with a larger eye to accommodate embroidery thread
Sewing machine		Machine sews fabric together
Pins		A temporary method to hold fabric in place
Tacking stitch		A temporary stitch to hold fabric together

Stencils

What?

- A stencil is a template used to transfer patterns
- It can be used multiple times
- It is one way of adding decoration to fabric

How?

- You can create a stencil by hand or using CAD
- You can use card, paper or thin, sturdy plastic to make it
- You can use a craft knife to cut by hand or CAM; laser cutter
- You need to think about islands/bridges
- Gently dab the paint using a sponge – too much paint might bleed under the stencil.
- Gently remove and wait to dry.

Keywords

Design
Product analysis
Research
Evaluation
Stitch
Scissors
Sewing machine
Customer
Environment
Function
Material
Seam allowance
UCD
Fastener
Stencil

Cutting

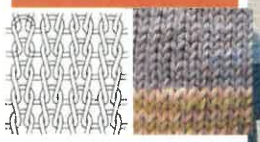
Fabric shears		Scissors used for cutting fabric
Thread scissors		Scissors used for cutting thread
Stitch ripper		Used for removing sewn stitches from fabric
Pinking shears		Creates a zig zag cut edge for decoration to prevent fraying

Fasteners

Buttons		Decorative fasteners used in conjunction with a button hole
Zip		Tape with zipper teeth which interlock
Poppers / press studs		A pair of interlocking disks, usually made from metal or plastic

Woven Fabric

Knitted Fabric



Types of Seams:

Plain
French
Flat felled
Bound
Lapped

Maths in DT:

Multiplication
Divide
Add / Subtract
Measurement conversion
Ratios
Percentages
Surface area

What is good design?

Clear ideas
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A is for **Aesthetics**
C is for **Cost**
C is for **Customer**
E is for **Environment**
S is for **Size**
S is for **Safety**
F is for **Function**
M is for **Material**

What is explicit and implicit meaning?

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.

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. All of these affect the purpose and effect of the text.

Terminology	Definition
Symbolism	Use of symbols to represent ideas or qualities.
Imagery	Visually descriptive language.
Hyperbole	An exaggeration.
Allegory	Extended metaphor in which a symbolic story is told.
Onomatopoeia	A word that imitate the sound it represents.
Personification	A figure of speech in which an object is given human feelings, thoughts or attitudes.
Metaphor	A metaphor is a figure of speech that describes an object or action in a way that isn't literally true.
Simile	A comparison that uses 'like' or 'as'.

Narrative Voice

A story has to be 'told' to the reader and a 'narrator' is needed to do this. A narrator's voice can be first, second or third person. Here is a quick summary:

- **First person** uses 'I' or 'we' to tell the story. In this case, the narrator is a character and you will read about events from their point of view. You are more likely to be able to relate to and sympathise with their feelings because of this.
- **Second person** uses 'you'. It is not often used in fiction texts and it's rare to find a story written entirely from this perspective (*try writing a piece in the second person to see how difficult it is*). However, some fiction texts, such as gamebooks (choose your own adventure) use this perspective.
- **Third person** uses 'he', 'she', 'it' or 'they'. The narrator of the story will usually be the writer. Some texts will give many different characters' viewpoints, but others will focus on one character, the hero or heroine, and the reader will usually relate to and sympathise with them more than others.

Performance Glossary	
Word	Definition
Antagonist	The opponent or adversary of the hero or main character of a drama
Catharsis	Emotional release felt by the audience at the end of a tragedy; the audience is set free from the emotional hold of the action, after sharing in the protagonist's troubles.
Character	A person portrayed in a play.
Characterisation	How a performer uses body, voice, and thought to develop and portray a character.
Climax	The point of greatest intensity in a series or progression of events in a play, often forming the turning point of the plot and leading to some kind of resolution.
Conflict	The internal or external struggle between opposing forces, ideas, or interests that creates dramatic tension.
Dénouement	The moment in a drama when the essential plot point is unravelled or explained.
Dialogue	Spoken conversation used by two or more characters to express thoughts, feelings, and actions.
Dynamic	The energetic range of or variations within physical movement or the difference between levels of sound.
Exposition	The part of a play that introduces the theme, main characters, and current circumstances.
Genre	A French word meaning 'category' or 'type', e.g. comedy, tragedy, docudrama, farce, or melodrama.
Monologue	A long speech made by one performer; a monologue may be delivered alone or in the presence of others.
Plot	The events and sequences of action within a play, sometimes known known as narrative or storyline.
Protagonist	The main character or hero in a play or other literary work.
Scene	A small section or portion of the play.
Stage directions	Instructions given by the playwright about how a play should be staged, when actors should make their entrances and exits and how lines should be delivered.
Staging	The use of the stage as a design element, considering: choice of stage; positioning of entrances/exits, set items, stage furniture, levels; awareness of audience; creating an appropriate space for performers/audience
Tragedy	A form of drama based on human suffering that invokes in its audience an accompanying catharsis.

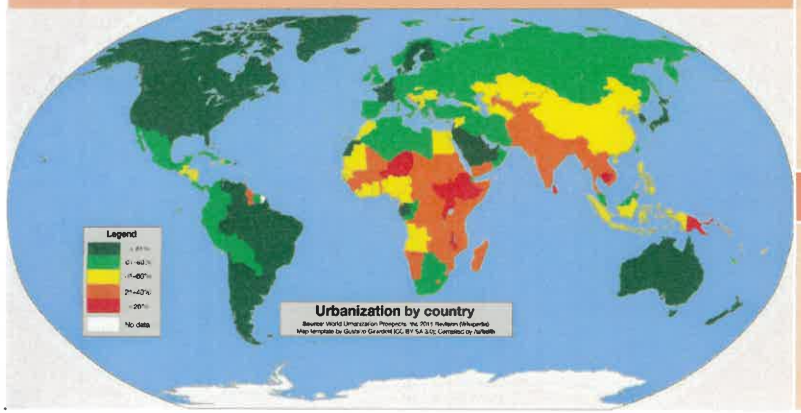
Year 9 Geography – Living in an urban world

What is Urbanisation?

This is an increase in the amount of people living in urban areas such as towns or cities. In 2007, the UN announced that for the first time, more than 50 % of the world's population live in urban areas. Generally, if a country is rich and developed it is likely to be more urbanised.

Where is urbanisation happening today?

Urbanisation is happening fastest in sub-Saharan Africa, and southern Asia this is because of the rural to urban migration in these regions. Red and orange countries represent the fasted urbanising countries. The green countries are already urbanised.



Causes of Urbanisation

The movement (migration) of people from rural to urban areas. This happens because of a combination of push and pull factors

Push factors	Pull factors
• Natural disasters • War and Conflict • Mechanisation • Drought	• More Jobs • Better education & healthcare • Increased quality of life. • Following family members

Consequences of urbanisation in LIDCs

Slums: Why are they built

Due to rapid rural to urban migration, there is not enough housing for all the migrants. Consequently migrants often build their own informal housing. These "informal settlements" are known as slums or shanty towns. You find slums in most LIDC major cities. The largest and most famous are Kerela slum (Nairobi) and Dharavi slum (Mumbai)

Life in the slums

Social	Economic	Environmental
• Many live without electricity. • High diseases rate and life expectancy low.	• High rate of corruption to officials. • Most jobs are informal and low paid.	• Large scale traffic issues. • Slums are heavily polluted with poor sanitation.

Management

- Authorities removed many dwellings in slums and have upgraded them with more "planned buildings"
- Slums can be "upgraded" with electricity and water supply.
- New ideas such as the 'floating homes and school' have been suggested.

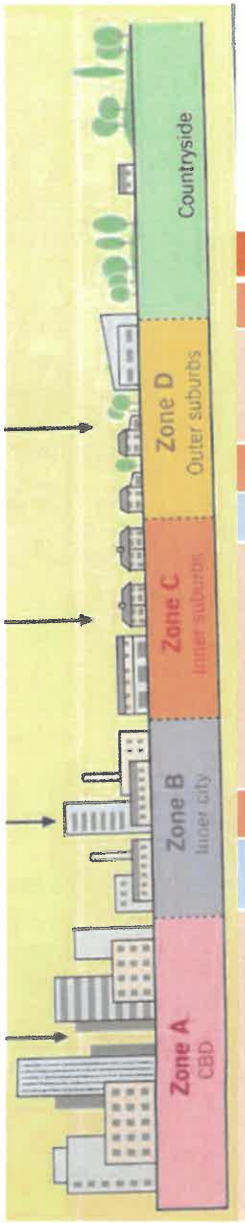
Types of Cities

Mega city — An urban area with over 10 million people living there.

More than two thirds of current megacities are located in either EDCs and LIDCs. The amount of megacities are predicted to increase from 28 to 41 by 2030.

World City — Cities that are centres for trade and business. They hold global influence.

Key 'world cities' include London, New York, Tokyo and Paris. Most are located within ACs but are now gradually expanding into EDCs, for example Moscow.



Year 9 Geography – Living in an urban world

Life in a city in the UK

Issues

All major UK cities have issues, (see the table below). Life in cities is always changing, the ethnicity of UK cities is increasing, the age of people living in cities is getting younger as older people move out

Problems of living in a city

Waste	Traffic	Inequality
The high density housing produces a lot of waste that the council has to collect and dispose of. A lot of household waste ends up in landfill sites.	High volumes of cars and inadequate public transport systems often result in congestion which can result in lateness and road rage. 	The inner city terraced housing is often home to lower income families whereas the suburbs and semi-detached housing is often home to higher income families.

Solutions

Waste	Traffic	Inequality
Increasing and encouraging recycling will reduce waste to landfill but this costs the council money. 	Bus lanes and park and ride should reduce the number of cars on the road but people still prefer to use their car. Electric scooters are being trialled in UK cities but hospitals are worried about accidents.	Providing more green spaces and services in the inner city plus spending on schools in the local area can help those living in the low income areas.

Sustainable cities

What does being sustainable mean?

Being sustainable means that people live in a way where they can meet their needs (heating/food/transport) but at the same time have a minimal impact on the environment and also help create jobs. Most cities are unsustainable. Some countries are rising to the challenge and are trying to build sustainable cities from scratch others are just tring to make their cities more sustainable.

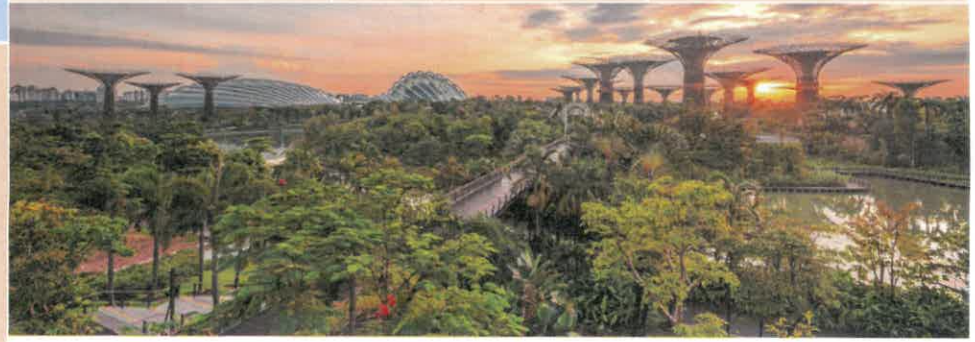
An example of a city trying to be sustainable

Copenhagen in Denmark is aiming to be the "Worlds most sustainable city". It has

- 500km of wide and safe cycle lanes in and around the city.
- The routes have air pumps, safe intersections and café's lining the routes.
- Air pollution in Copenhagen has reduced dramatically.

What makes cities sustainable?

Social	Economic	Environmental
There are enough doctors and schools. People have a say in how their city is run. People encouraged to walk and cycle.	Lots of well paid jobs available. Good quality and affordable homes are built.	Solar or wind energy creates electricity so reducing carbon emissions. There is a lot of green space. People use electric cars to reduce carbon emissions.



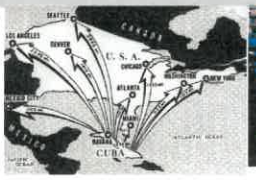
Enquiry: How similar are 20th century assassinations?

Outline: Assassinations have been used for centuries as a tactic by political groups to undermine their enemies through the murder of their leaders. The 20th century saw a spate of high profile murders which caused fundamental changes to politics and society, especially in the USA.

Date	Event	Summary
1962	Cuban Missile Crisis	When the USA and USSR almost began a nuclear war over Soviet missiles stored on Cuba.
1963	Assassination of John F. Kennedy	Assassinated in Texas whilst visiting the state to support the civil rights movement there.
1965	Assassination of Malcolm X	Assassinated in New York whilst giving a speech to a civil rights group.
1968	Assassination of Martin Luther King	Assassinated in Tennessee whilst on a tour for his work in the civil rights movement.
1968	Assassination of Robert Kennedy	Assassinated in California whilst campaigning to become the Democrat nominee for the 1968 election.
2011	Assassination of Osama bin Laden	Targeted in Pakistan by US special forces. He was on a most wanted list as he was held responsible for the terrorist attack, 9/11.
2017	Assassination of Kim Jong-nam	Targeted at an airport and killed by a nerve agent. His half-brother, Kim Jong-un, the leader of North Korea is suspected of ordering this.

Furthering learning

Want to find out more about Kennedy and Cuba?



History – Year 9
Knowledge Organiser
Topic 4

Key individuals

Jackie Kennedy. First lady to President Kennedy. After his assassination she helped to create the ideal image of his presidency as a "Camelot"

Robert Kennedy. Younger brother of JFK, he worked in the president's government and then ran for president on a platform to end poverty.

Coretta Scott King. Wife to Dr King, she tirelessly supported his work in the Civil rights movement and continued this after King's murder.

Malcolm X. A human rights activist who was a controversial in the Civil rights movement Born with the surname Little. he changed this to an X to remember those who lost their names when they were enslaved.

Key vocabulary:

Assassin: someone who carries out an assassination.
Assassination: a murder of someone who is important in politics.
Civil rights movement: a campaign to achieve equal rights for people of colour and to address the disadvantages suffered due to the legacy of slavery in the USA.
Camelot: an ideal society. The original Camelot was the legend of King Arthur and the so-called ideal country that he ruled.
Cold War: when the USA and the USSR competed to be the top superpower in the world.
Communism: an ideology which concerns sharing wealth and property in a society. The USSR claimed to follow these ideas.
Conspiracy theory: a belief that there has been a cover-up over an extremely shocking or unexplained event.
Democrat: a political party in the USA. They favour a big government which raises taxes to pay for more support for the vulnerable.
Politics: how a country is ruled and organised. This often concerns who has the power in a country.
Republican: a political party in the USA. They favour a small government which lowers taxes so that people rely on themselves.
Segregation: Black Americans living in the south of the USA were kept separately from white Americans in areas like education, transport....
Terrorism: violent actions which hurt and scare People to achieve political goals.

Prior learning:

Slavery
Assassination
Ideology

Enquiry: How similar are 20th century assassinations?

History – Year 9
Knowledge Organiser
Topic 4

Historical skill focus: similarity & difference

- How is the past similar to life now?
- How does the past differ to life now?

Remember to mention:	Areas you could mention include:	Starting sentences...
Similarities AND differences	Reasons for assassinations Key events during assassinations The assassins The consequences of the assassination	The key similarities between assassinations are... However, the main differences include...

Point = A key similarity was...
Evidence = This is shown by...
Explain = This is similar because...

Section B: Using similarity and difference: Write at least two paragraphs to answer this question:

How similar were the key assassinations in the 20th and 21st centuries?

Developing	Secure	Exceeding
I can explain key similarities and key differences between people's lives during two periods of time using PEE paragraphs.	I can explain key similarities and key differences between people's lives during two periods of time using PEEL paragraphs I can begin to judge the extent of the similarity or difference	I can explain key similarities and key differences between people's lives during two or more periods of time using PEEL paragraphs and detailed evidence. I can judge the extent of the similarity or difference and give reasons for these.

Enquiry: How similar are 20th century assassinations?

Historical skill focus: interpretations

- What does an interpretation tell us?
- How convincing is the interpretation?

History – Year 9
Knowledge Organiser
Topic 4

What to focus on:	Starting sentences
What does the interpretation show? Does this fit your own knowledge? What is the historian's opinion? Is he/she right? When was the historian writing – what does this tell us? Do any of the above make the interpretation convincing?	Interpretation A is convincing because... This is shown by... The interpretation is also convincing due to its purpose which was to...

Point = This interpretation is convincing because...
Evidence = This is shown by...
Explain = This is convincing because...

Section C: Using interpretations

How CONVINCING is Interpretation A to a historian studying the assassination of JFK?
Make sure you use your own knowledge to show why the Interpretation is or isn't convincing.

MICHAEL L. KURTZ*

ON November 22, 1963, at 12:30 p.m., President John Fitzgerald Kennedy was murdered in Dallas, Texas. Few events in recent American history have had such a traumatic impact upon the American people. Like the Japanese attack on Pearl Harbor, the Kennedy assassination etched itself forever in the national consciousness. Even today, almost two decades later, few people cannot recall precisely what they were doing when they heard the news of the fateful events in Dallas. Kennedy's death was so unexpected, so shocking, that it seemed like the enactment of a horrible fantasy. Reinforcing this initial trauma were the subsequent investigations into the assassination and the controversy which resulted from those investigations. Three official federal investigations, those of the Federal Bureau of Investigation (FBI), the President's Commission on the Assassination of President Kennedy (Warren Commission), and the Select Committee on Assassinations of the United States House of Representatives (House Select Committee), have yielded detailed public reports about the assassination, but the conclusions remain the subject of endless dispute.

Developing	Secure	Exceeding
I can decide whether an interpretation is convincing with some evidence. I can write a PEE paragraph. I can begin to explain the purpose of an interpretation	I can decide whether an interpretation is convincing with detailed evidence. I can write a PEE paragraph. I can explain the purpose of an interpretation. I can begin to think about why interpretations change.	I can decide whether an interpretation is convincing with detailed evidence. I can write a PEEL paragraph I can explain why interpretations change, linking this to purpose. I can explain how the TYPE of historian affects their interpretation.

YEAR 9 – REASONING WITH GEOMETRY...

Enlargement & Similarity

@whisto_maths

What do I need to be able to do?

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

- Recognise enlargement and similarity
- Enlarge a shape by a positive SF
- Enlarge a shape from a point
- Enlarge a shape by a fractional SF
- Work out missing sides and angles in a pair of similar shapes.

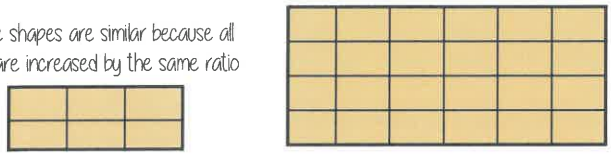
Keywords

Similar Shapes: shapes of different sizes that have corresponding sides in equal proportion and identical corresponding angles.
Scale Factor: the multiple describing how much a shape has been enlarged
Enlarge: to change the size of a shape (enlargement is not always making a shape bigger)
Corresponding: objects (or sides) that appear in the same place in two similar situations.
Image: the picture or visual representation of the shape

Recognise enlargement & similarity

Shapes are similar if all pairs of corresponding sides are in the same ratio

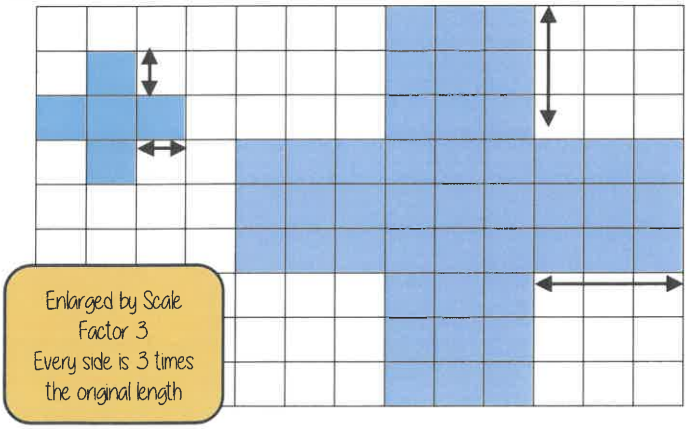
These shapes are similar because all sides are increased by the same ratio



Enlargements are similar shapes with a ratio other than 1

Enlarge by a positive scale factor

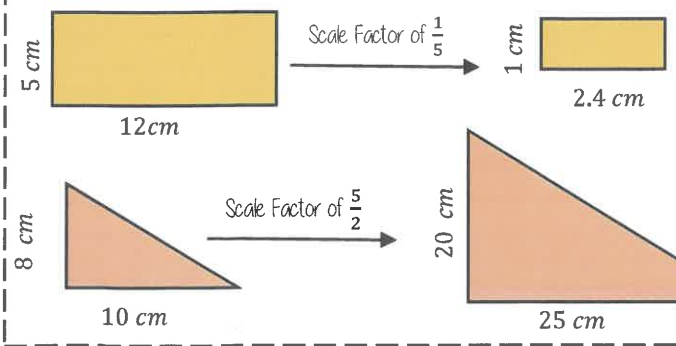
With a scale factor larger than 1 it makes the shape **bigger**



Enlarged by Scale Factor 3
Every side is 3 times the original length

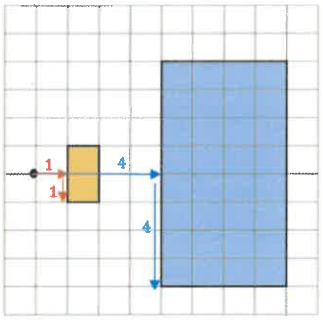
Positive fractional scale factor

With a scale factor between 0 and 1 it makes the shape **smaller**



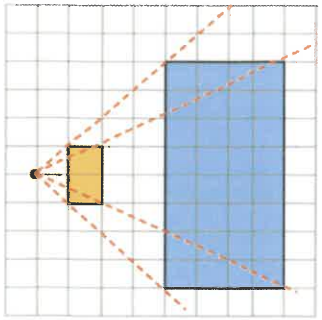
Enlarge a shape from a point

Scaled distances method



Scale the distance between the point of enlargement and each corresponding vertices

Rays method

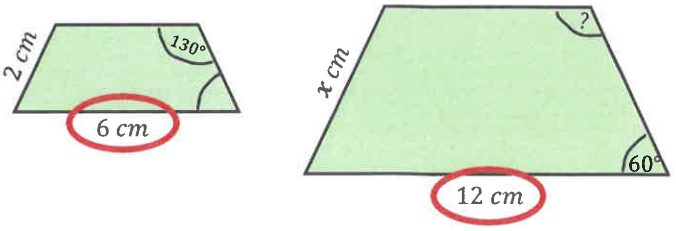


Multiply the distance from the centre of corresponding vertices by the scale factor along the ray

Calculations in similar shapes

Don't forget that properties of shapes don't change with enlargements or in similar shapes

The two trapezium are similar find the missing side and angle



Corresponding sides identify the scale factor $\frac{12}{6} = 2$ Scale Factor = **2**

Calculate the missing side Length (corresponding side) x scale factor

$2cm \times 2$
$x = 4cm$

Enlargement does not change angle size

Calculate the missing angle Corresponding angles remain the same
130°

YEAR 9 — REASONING WITH GEOMETRY...

Solving ratio & proportion problems

@whisto_maths

What do I need to be able to do?

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

- Solve problems with direct proportion
- Use conversion graphs
- Solve problems with inverse proportion
- Solve ratio problems
- Solve 'best buy' problems

Keywords

Proportion: a comparison between two numbers
Ratio: a ratio shows the relative size of two variables
Direct proportion: as one variable is multiplied by a scale factor the other variable is multiplied by the same scale factor.
Inverse proportion:: as one variable is multiplied by a scale factor the other is divided by the same scale factor.

Direct Proportion

As one variable changes the other changes at the same rate

R

4 cans of pop = £2.40

This is a multiplicative change

4 cans of pop = £2.40 → (x 0.5) → 2 cans of pop = £1.20

This multiplier is the same in the same way that this would be for ratio

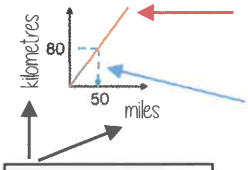
4 cans of pop = £2.40 → (x 3) → 12 cans of pop = £7.20

Sometimes this is easiest if you work out how much one unit is worth first
e.g. **1 can of pop = £0.60**

Conversion Graphs

Compare two variables

R



This is always a straight line because as one variable increases so does the other at the same rate

Labelling of both axes is vital

To make conversions between units you need to find the point to compare – then find the associated point by using your graph
Using a ruler helps for accuracy
Showing your conversion lines help as a "check" for solutions

Inverse Proportion

As one variable is multiplied by a scale factor the other is divided by the same scale factor

Examples of inversely proportional relationships

Time taken to fill a pool and the number of taps running

Time taken to paint a room and the number of workers

T is inversely proportional to G. When T=2 then G=20

		÷ 2	× 4
T	1	2	8
G	40	20	5
	× 2	÷ 4	

Best Buys

Have a directly proportional relationship

To calculate best buys you need to be able to compare the cost of one unit or units of equal amounts

	Shop A	Shop B
	4 cans for £1.20	3 cans for 93p
	£1.20 ÷ 4	£0.93 ÷ 3
Cost per item	1 can is £0.30 Or 30p	1 can is £0.31 Or 31p

Shop A is the best value as it is 1p cheaper per can of pop

	Shop A	
	4 cans for £1.20	3 cans for 93p
	4 ÷ £1.20	3 ÷ £0.93
Cost per pound	£1 buys 3.333 cans of pop	£1 buys 3.23 cans of pop

Shop A is still shown as being the best value but pay attention to the unit you are calculating, per item or per pound

Best value is the most product for the lowest price per unit

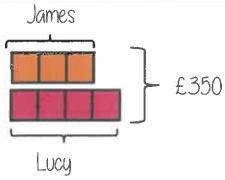
Sharing a whole into a given ratio

R

James and Lucy share £350 in the ratio 3:4
Work out how much each person earns

Model the Question

James : Lucy
3 : 4



Find the value of one part

Whole £350
7 parts to share between
(3 James, 4 Lucy)

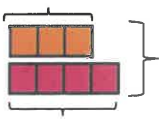
£350 ÷ 7 = £50

□ = one part
= £50

Put back into the question

James : Lucy
3 : 4 (x 50) → £150 : £200

James = 3 x £50 = £150
Lucy = 4 x £50 = £200



Finding a value given 1:n (or n:1)

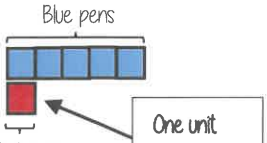
R

Inside a box are blue and red pens in the ratio 5:1
If there are 10 red pens how many blue pens are there?

Model the Question

Blue : Red
5 : 1

□ = one part
= 10 pens



One unit = 10 pens

Put back into the question

Blue : Red
5 : 1 (x 10) → 50 : 10

Blue pens = 5 x 10 = 50 pens
Red pens = 1 x 10 = 10 pens

There are 50 Blue Pens

YEAR 9 — REASONING WITH GEOMETRY...

Rates

@whisto_maths

What do I need to be able to do?

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

- Solve speed, distance, time questions
- Use distance time graphs
- Solve density, mass, volume problems
- Solve flow problems
- Use flow graphs
- Interpret rates of change and their units

Keywords

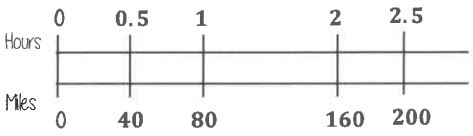
Convert: change
Mass: a measure of how much matter is in an object. Commonly measured by weight.
Origin: the coordinate (0, 0)
Volume: the amount of 3D space a shape takes up
Substitute: putting numbers where letters are — replacing numbers into a formula

Speed, Distance, Time

"per" for every
e.g. 80 miles per hour (mph)
Travel 80 miles every hour

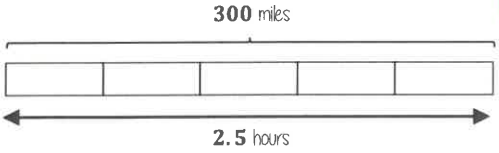
$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

You can use a double number line to help you calculate distance



e.g. A boat travels at a constant speed for 2.5 hours
It travels 300 miles.

Bar models can help to calculate mph



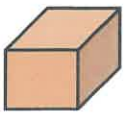
Each part is half an hour
Each part is 60 miles

Density, Mass, Volume

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{volume} = \frac{\text{mass}}{\text{density}}$$

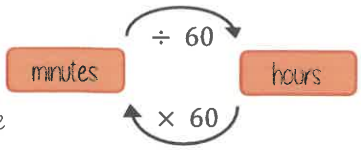
$$\text{mass} = \text{volume} \times \text{density}$$



volume of prism = Area of cross section × Depth

R

Speed, Distance, Time



Before calculations — make sure you are working in the same units as the speed

Learn or learn how to rearrange the formular for speed, distance and time

$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

$$\text{distance} = \text{speed} \times \text{time}$$

Substitute in the variables given

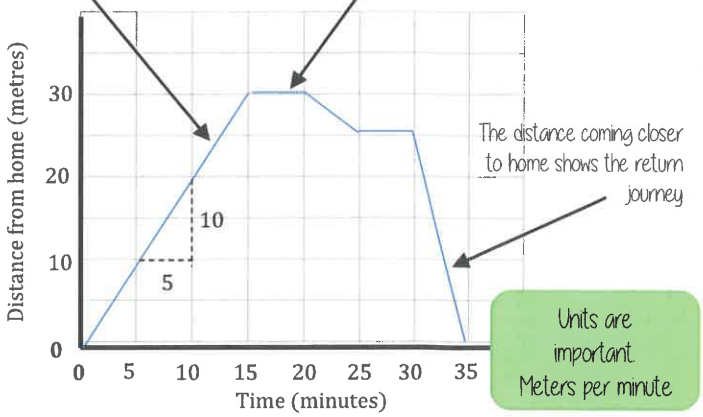
Distance – Time graphs

Gradient = speed

The steeper a gradient the faster the speed

$\frac{10}{5} = 2$ metres per min

Horizontal lines represent staying still



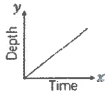
The distance coming closer to home shows the return journey

Units are important
Meters per minute

Flow problems & graphs

This will fill at a constant rate, then as the space decreases it will speed up and the neck of the bottle fill at a faster constant speed

The cylinder will fill at a constant speed



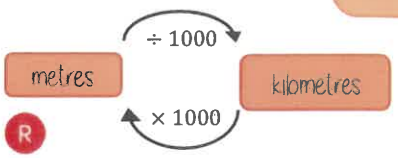
Units are important
Ensure any volume calculations are the same unit as the rate of flow

Rates of change & units

Common rates of change relationships

Revisit your conversions between units of length and capacity

Speed: miles **per** hour
Exchange rates: euros **per** pounds
Density: mass **per** volume



R

Popular music includes:

- **POP**
- **ROCK**
- **RAP**
- **HIP HOP**
- **REGGAE**

Plus many other genres, e.g. soul, ska, heavy metal, R&B, country, rock'n'roll.

FUSION: when two different styles are mixed together. This can be two styles of popular music e.g. 'rap metal', or could combine a popular music genre with other styles, folk-rock, gospel, world music, classical to create a new and interesting sound. **Jazz fusion** (jazz and pop) is a popular genre.

Instruments

ELECTRIC GUITAR:

- Lead guitar: plays the melody/ solos/riffs
- Rhythm guitar: plays the chords/ accompaniment.

BASS GUITAR: plays the bass line.
DRUM KIT: provides the beat.
LEAD SINGER: the main vocalist.
BACKING VOCALS: singers who provide harmony.

Pop/rock groups may also include **acoustic** (not electric) instruments e.g. trumpet, trombone, saxophone and/or electronic keyboards/synthesizers.

Features and techniques found in popular music

Riff	A short, repeated pattern.
Hammer on	Finger brought sharply down onto the string.
Pitch bend	Altering (bending) the pitch slightly.
Power chords	A guitar chord using the root and 5th note (no 3rd).
Distortion	An effect which distorts the sound (creates a 'grungy' sound).
Slap bass	A percussive sound on the bass guitar made by bouncin the strings on the fret board.
Fill	A short, improvised drum solo.
Rim shot	Rim and head of drum hit at same time.
Belt	A bright, powerful vocal sound, high in the chest voice.
Falsetto	Male voice in a higher than usual range.
Syllabic	One note sung per syllable.
Melismatic	Each syllable sung to a number of different notes.
A cappella	Voices singing without instrumental accompaniment.

The structure of a pop/rock song may include:

INTRO: short opening section, usually instrumental.
VERSE: same music but different lyrics each time.
CHORUS: repeated with the same lyrics each time (refrain).
MIDDLE EIGHT: a link section, often eight bars, with different musical ideas.
BRIDGE: a link/transition between two sections.
OUTRO: an ending to finish the song (coda).
*You may also hear a pre-chorus, instrumental interlude or instrumental solo.

***Strophic songs, 32 bar songs (AABA) and 12 bar blues are also found in popular music.**

A typical rock ballad in verse-chorus form could follow the pattern:

- Intro
- Verse 1
- Chorus
- Verse 2
- Chorus
- MiddleEight
- Chorus
- Outro

Technology

Amplified	Made louder (with an **amplifier**).
Synthesized	Sounds created electronically.
Panning	Moving the sound between left and right speakers.
Phasing	A delay effect.
Sample	A short section of music that is reused (e.g. looped, layered).
Reverb	An electronic **echo** effect.

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

RS Dept. Knowledge Organiser: Suffering **Name:** _____

1. Suffering and Evil

Evil is a cause of human suffering. There are two types of evil:

- **moral evil** - the acts of humans which are considered to be morally wrong
- **natural evil** - natural disasters, such as earthquakes or tsunamis

These two types of evil can work together, e.g. human evil can make natural evil worse. If natural evil, e.g. a drought brought on by lack of rainfall, causes crops to fail, the policies of a government can make the food shortages for the poorest people worse (moral evil).

2. Problem of Evil and Suffering.

For theists, the existence of evil and suffering creates a problem for God. As they believe that God is all-powerful and all-loving, God has the capability to stop all suffering, but either God can't or chooses not to. This is called the Inconsistent Triad.

- God has given people **free will** – the ability to choose between right and wrong for themselves. God has shown people how they should live (e.g. the Ten Commandments; Jesus' life and teaching), but it is up to them to decide whether or not to follow God's instructions.
- The story of humanity's battle with good and evil is told in the story of Adam and Eve in the Garden of Eden. Adam and Eve chose to disobey God by eating the fruit of the tree of knowledge of good and evil. This is called **the Fall**. Some people believe that as a result of Adam and Eve's first sins, each human is born with a tendency towards evil. This is called **Original Sin**.
- The belief in **karma** causes some people to believe that suffering is the consequence of our actions, either in this life, or the previous one. People who believe this believe that we are responsible for our actions and will be rewarded or punished, depending on how good or bad our actions are.
- For atheists, there is no problem of evil and suffering as they do not believe in an all-powerful being who could potentially intervene to stop all the evil and suffering on the earth.

3. Suffering of Jesus

The death of Jesus had a purpose and many Christians feel hope when they reflect on the suffering of Christ. It reminds them that Jesus can understand physical and mental suffering that all humans go through. It also shows that there can be a purpose to suffering. The death of Jesus on the cross wasn't the end of the story, as. Christians believe he rose again three days later. The Resurrection shows that God can triumph over evil. This helps give Christians hope, as they might think God has a plan, even if they don't know what it is. It can also give Christians hope that the suffering won't go on forever and good things will come to those who have faith in God.

Key Terms 1:

Agnostic: someone who believes it is impossible to prove or disprove the existence of God

Atheist: someone who does not believe in God

Crucifixion: the killing of Jesus on the cross, an ancient form of execution

Dukkha: The Buddhist concept of suffering, unsatisfactoriness

Evil: Something that is morally wrong or unjust, doing the wrong thing

Free will: The ability to act based on your own decisions

Karma: the sum of a person's actions, influencing the life you go into after death

Omnibenevolent: All loving

Omnipotent: All powerful

Omnipresent: Always present, present everywhere

Omniscient: All knowing

Original Sin: a consequence of the actions of Adam and Eve in the Garden of Eden as a result of their disobedience

Parable: a simple story that contains a moral or meaning, used by Jesus to teach

4. Suffering of Job. This story tells of a man, Job, who has his faith tested. Satan claims that Job only believes in God because he is successful and doesn't suffer. God gives Satan permission to test Job's faith by making him suffer. Satan does this by:

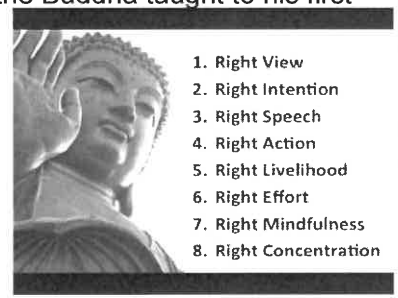
- Attacking his servants
- Stealing his animals
- Killing all his children
- Making Job sick

Despite all the different ways that Satan causes Job to suffer, Job's faith in God never waivers, despite never knowing why he went through the suffering. "I was born with nothing, and I will die with nothing. The Lord gave and now He has taken away. May his name be praised!" As a result of his continued faith, everything Job had lost is restored.

Some Christians believe suffering is a test of faith and won't expect to know why they have been caused to suffer.

5. Responding to Suffering - Parable of the Sheep and Goats. Jesus taught his followers to *'love your neighbour as yourself'* and this teaching is contained in the Parable of the Sheep and Goats. In the parable, Jesus explains that the righteous people (sheep) who helped those in need will be rewarded with spending eternity in heaven. Those who have ignored people in need will spend eternity in hell as a punishment. Jesus says that helping people in need is the same as helping Jesus himself. Ignoring people who are going through suffering is not an option. This is why many Christians support charities such as Christian Aid and aim to reduce the suffering of others as much as possible.

6. Suffering in Buddhism. Suffering is a natural part of life. When Siddhartha left the palace in which he lived, the three people he saw were an old man, an ill man and a dead person. This taught him that people suffer in life. The Four Noble Truths are a summary of the Buddha's teachings. It is these truths that the Buddha taught to his first disciples after he was enlightened.



1. All existence is dukkha (suffering)
2. The cause of dukkha is craving.
3. Stopping suffering comes with the stopping craving
4. Following the Eightfold Path can bring an end to suffering

The Buddha taught that craving is ultimately caused by greed, ignorance & hatred. The Buddha taught that the way to get rid of the desire that causes suffering is to free yourself from being attached to it. Buddhists believe that following the Eightfold Path will help them to reach enlightenment. This will end the cycle of suffering. Buddhists also believe in karma or 'intentional action'.

Buddhists try to perform good actions, e.g. based in generosity and compassion. They avoid performing bad actions, e.g. based on greed and hatred. Actions also determine where they will be reborn in the next life. Good actions with good intentions can mean being born as a human. Bad actions with bad intentions can mean rebirth as an animal, or into a hell realm. Buddhists believe that they should help those who are suffering and may work with charities to help bring an end to those going through suffering.

Key Terms 2:

Resurrection: Rising from the dead, being restored to life

Righteous: morally right or justifiable, doing the right thing

Sin: An immoral act, going against God's law

Suffering: Undergoing pain or distress

The Fall: The disobedience of Adam and Eve, which resulted in sin being in the world

Theist: Someone who believes in God

Key Quotes:

"The righteous person may have many troubles, but the LORD delivers him from them all."
Psalm 34:19

"Not only so, but we also glory in our sufferings, because we know that suffering produces perseverance."
Romans 5:3

"The root of suffering is attachment."
The Buddha

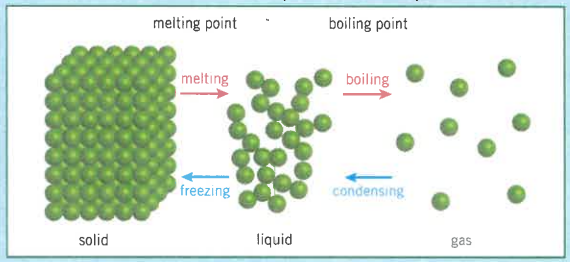
"All conditioned things are impermanent' — when one sees this with wisdom, one turns away from suffering." *The Buddha*

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.

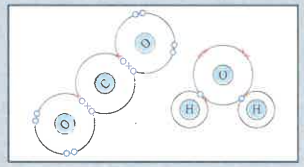
Covalent bonding

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

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

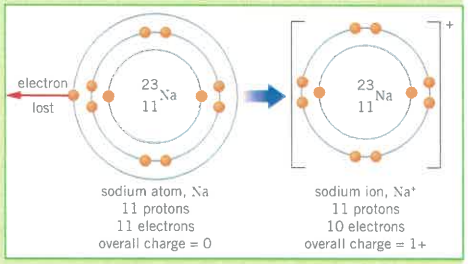
The number of electrons shared depends on how many extra electrons an atom needs to make a full outer shell.

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.

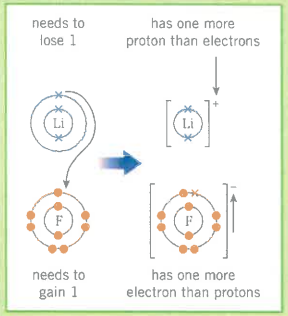
When melted or dissolved in water, ionic substances do conduct electricity because the ions are free to move and carry charge.

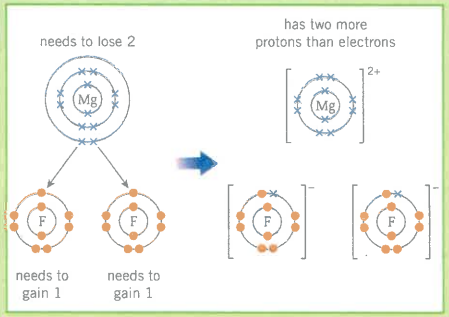
Melting points

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.

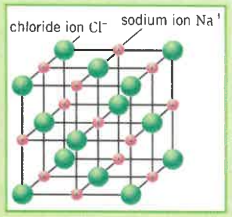




Metal atoms lose electrons to become positive ions. Non-metal atoms gain electrons to become negative ions.

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.

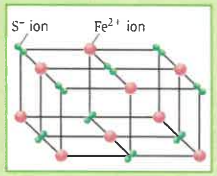


The electrostatic force of attraction works in all directions, so many billions of ions can be bonded together in a 3D structure.

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

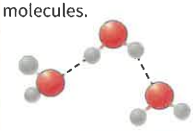
Many billions of atoms, each one with a strong covalent bond to a number of others.

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.



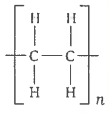
Large molecules

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.



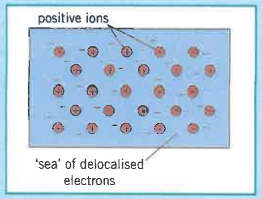
Metals: structure and properties

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

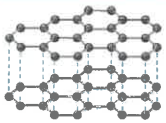
Properties			
	High melting and boiling points because the strong covalent bonds between the atoms must be broken to melt or boil the substances. This requires a lot of energy. Solid at room temperature.	Low melting and boiling points because only the intermolecular forces need to be overcome to melt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

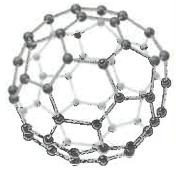
Graphene

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

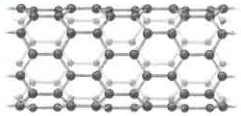


Buckminsterfullerene was the first fullerene to be discovered, and has 60 carbon atoms.

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

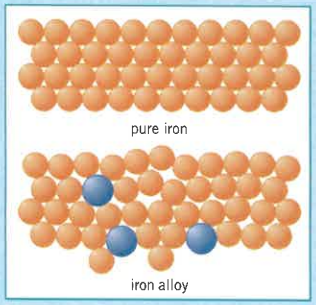


The carbon atoms in nanotubes are arranged in cylindrical tubes.
Their high **tensile strength** (they are difficult to break when pulled) makes them useful in electronics.

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?	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.	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.	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?	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?	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?	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?	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?	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?	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?	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?	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?	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.	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.	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?	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.	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?	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 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.

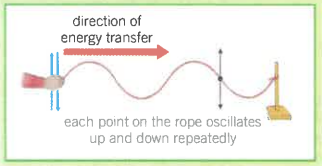
Examples of mechanical waves include sound waves, water waves, waves on springs and ropes, and seismic waves produced by earthquakes.

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.

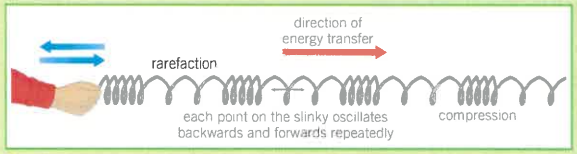


Longitudinal waves

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

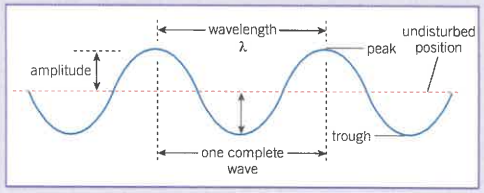
Frequency and period are related by the equation:

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

All waves obey the wave equation:

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

(L) $$v = f\lambda$$



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:

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

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

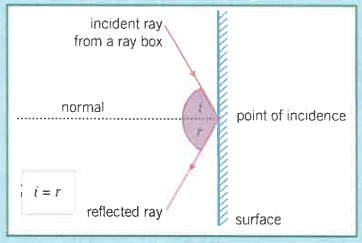
Ray diagrams can be used to show what happens when a wave is reflected at a surface.

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

Chapter 13: Electromagnetic waves

Knowledge organiser

The electromagnetic spectrum

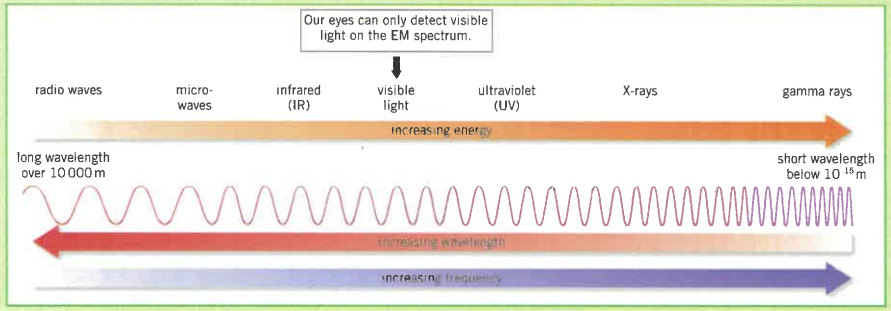
Electromagnetic (EM) waves are **transverse** waves that transfer energy from their source to an absorber. For example, infrared waves emitted from a hot object transfer thermal energy.

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.

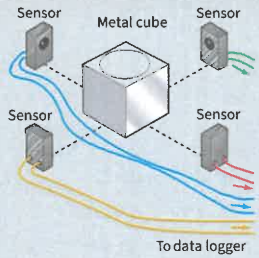
You should be able to plan a method to determine the rate of cooling due to emission of infrared radiation and evaluate your method.

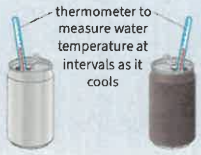
Using infrared detectors to measure the radiation emitted by different surfaces

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?	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?	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?	visible light
6	How can electromagnetic waves be produced?	changes inside an atom/atomic nucleus
7	How are gamma rays produced?	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?	transmitting television, mobile phone, and Bluetooth signals
11	What are microwaves used for?	satellite communications, cooking food
12	What is infrared radiation used for?	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?	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

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Chapter 16: Adaptations and interdependence

Knowledge organiser

Ecosystem organisation

Individual organisms

↓

Population
the total number of organisms of the same species that live in one specific geographical area

↓

Community
group of two or more populations of different species living in one specific geographical area

↓

Ecosystem
the interaction of a community of living organisms with the non-living parts of their environment

A stable community is one where all the species and environmental factors are in balance so that population sizes remain fairly constant.

An example of this is the interaction between predator and prey species, which rise and fall in a constant cycle so that each remains within a stable range.

Competition

To survive and reproduce, organisms require a supply of resources from their surroundings and from the other living organisms there.

This can create competition, where organisms within a community compete for resources.

There are two types of competition – **interspecific competition** is between organisms of different species and **intraspecific competition** is between organisms of the same species.

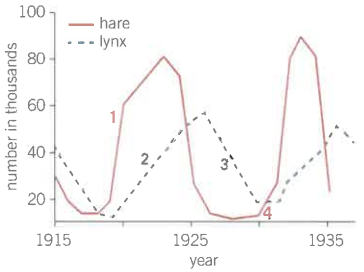
Animals often compete for:
- food
- mates
- territory.

Plants often compete for:
- light
- space
- water and mineral ions from the soil.

Interdependence

Within a community each species **interacts** with many others and may depend on other species for things like food, shelter, pollination, and seed dispersal.

If one species is removed it can affect the whole community – this is called **interdependence**.



1 If the population of hares increases there is a larger food supply for the lynx.

2 This can therefore support more lynx, so more offspring survive.

3 The growing numbers of lynx eventually reduce the food supply. The number of predators starts to decrease.

4 The prey population starts to increase once more – the cycle then begins again.

Abiotic factors

Abiotic factors are non-living factors in the ecosystem that can affect a community.

Too much or too little of the following abiotic factors can negatively affect the community in an ecosystem:
- carbon dioxide levels for plants
- light intensity
- moisture levels
- oxygen levels for animals that live in water
- soil pH and mineral content
- temperature
- wind intensity and direction.

Biotic factors

Biotic factors are living factors in the ecosystem that can affect a community.

For example, the following biotic factors would all negatively affect populations in a community:
- decreased availability of food
- new predators arriving
- new pathogens
- competition between species, for example, one species outcompeting another for food or shelter, causing a decline in the other species' population.

Adaptations of organisms

Organisms have features – **adaptations** – that enable them to survive in the conditions in which they live. The adaptations of an organism may allow it to outcompete others, and provide it with an evolutionary advantage.

Structural adaptations

The physical features that allow an organism to successfully compete:
- sharp teeth to hunt prey
- colouring that may provide camouflage to hide from predators or hunt prey
- a large or small body-surface-area-to-volume ratio.

Behavioural adaptations

The behaviour of an organism that gives it an advantage:
- making nests to attract a mate
- courtship dances to attract a mate
- use of tools to obtain food
- working together in packs.

Functional adaptations

Adaptations related to processes that allow an organism to survive:
- photosynthesis in plants
- production of poisons or venom to deter predators and kill prey
- changes in reproduction timings.

You can work out how an organism is adapted to where it lives when given information on its environment and what it looks like.

For example, without the following adaptations the organisms below would be at a disadvantage in their environment.

Organism	Example adaptations
	• white fur for camouflage when hunting prey • feet with large surface area to distribute weight on snow • small ears to reduce heat loss • thick fur for insulation
	• feet with large surface area to distribute weight on sand • hump stores fat to provide energy when food is scarce • tough mouth and tongue to allow camel to eat cacti • long eyelashes to keep sand out of eyes
	• spines instead of leaves to reduce surface area and therefore water loss, and to deter predators • long roots to reach water underground • large, fleshy stem to store water

Some organisms are **extremophiles**, which means they live in environments that are very extreme where most other organisms could not survive. For example, areas with:
- very high or low temperatures
- extreme pressures
- high salt concentrations
- highly acidic or alkaline conditions
- low levels of oxygen or water.

Bacteria that live in deep sea vents are extremophiles.

Deep sea vents are formed when seawater circulates through hot volcanic rocks on the seafloor. These environments have very high pressures and temperatures, no sunlight, and are strongly acidic.

Key terms

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

abiotic factor *adaptation* *biotic factor* *community* *ecosystem* *extremophile* *interaction* *interdependence* *interspecific competition* *intraspecific competition* *population*

Chapter 16: Adaptations and interdependence

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.

	B16 questions	Answers
1	What is a population?	total number of organisms of the same species that live in a specific geographical area
2	What is a community?	group of two or more populations of different species living in a specific geographical area
3	What is an ecosystem?	the interaction of a community of living organisms with the non-living parts of their environment
4	What is competition?	contest between organisms within a community for resources
5	What is interdependence?	when species in a community depend on others for resources and shelter
6	What do animals often compete for?	food, mates, and territory
7	What do plants often compete for?	light, space, water, and mineral ions
8	What is an abiotic factor?	non-living factor that can affect a community
9	List the abiotic factors that can affect a community.	• carbon dioxide levels for plants • light intensity • moisture levels • oxygen levels for animals that live in water • soil pH and mineral content • temperature • wind intensity and direction
10	What is a biotic factor?	living factor that can affect a community
11	List the biotic factors that can affect a community.	• availability of food • new predators • new pathogens • competition between species
12	What is a stable community?	when all species and environmental factors are in balance, so population sizes remain fairly constant
13	How do adaptations help an organism?	they enable the organism to survive in the conditions in which it lives
14	What are the three types of adaptations?	structural, behavioural, and functional
15	What is an extremophile?	an organism that lives in a very extreme environment
16	What makes an environment extreme?	• very high or low temperatures • extreme pressures • high salt concentrations • highly acidic or alkaline conditions • lack of oxygen or water

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