Year 8 Progress Booklet:

Name: _____ Class: _____

Science Teacher: _____ Pathway: _____

Progress Sheet:

In Science this year I would like to _____

_____

_____

Assessment	Date	Score	F / I / H	☺ 😐 ☹
Baseline assessment				
Waves marking task				
Waves assessment				
Matter Marking Task				
Respiration marking task				
Organisms assessment				
Hooke's Law marking task				
Combustion marking task				
Forces and reactions assessment				
Plants marking task				

In Science at Shelley College I am looking forward to _____

_____

Contents

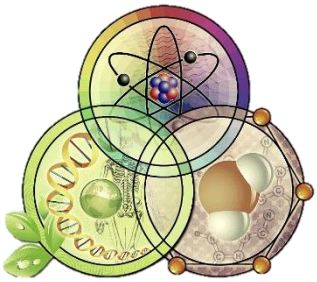
What is Science and why do we study it?

Science is the study of the natural world through observation and experiment.

In science we study a variety of different topics that relate to us and the world around this.

In science we learn knowledge and skills, we consider how we make observations, write predictions, develop inferences that we can make from our observations, how to communicate findings and improve our lives and the world around us.

Biology: the study of living organisms, their structure, adaptations and environment.



Chemistry: studies the properties of matter and how matter interacts with energy.

Physics: the study of matter and small parts that make up matter, its motion and behaviour through space and time, including energy and forces.

Where can science take us?

Whether you choose to continue to study science or use the skills it gives you, science opens a wide variety of doors, including doctor, engineer, material scientist, microbiologist, economist, meteorologist, accountant, analyst.







What will we learn this year?

1. Introduction to Science – how do we set up equipment? What standard units do we use and how do we draw successful graphs?

2. Waves – learn about different types of wave, using this information to explore sound and light waves.

3. Matter – learn about the elements in different groups of the periodic table.

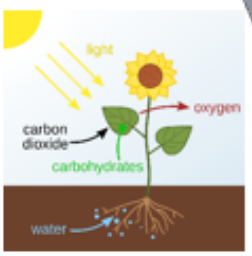
4. Organisms – explore in more detail the respiratory and digestive systems, including how to live a healthy lifestyle.

5. Forces – expand on knowledge of forces to look in more detail at Newton's first law of motion, terminal velocity and Hooke's law.

Explain and calculate pressure.

6. Reactions – using knowledge of chemical elements, learn more about a range of different chemical reactions, including combustion and displacement.

7. Ecosystems – exploring the wonderful world of plants including how they reproduce and photosynthesis.



8. Earth Science – what is the Earth's atmosphere made from? Learn about humans global impact and what we can do to make a positive difference.

Lab Rules:

The lab rules are designed to keep you and the people around you safe. Make sure you have read these carefully.

1. Only enter the lab when you are told to do so by a teacher.

2. Do not run or mess about in a lab.
3. Keep your bench and floor clear – put bags and coats in provided storage spaces or neatly under your chair.
4. Follow all instructions first time, every time.

5. Wear goggles from the start of the practical until the teacher tells you to take them off.
6. Replace lids on all chemical bottles and only touch them when instructed to do so.

7. When using a Bunsen burner – tie hair back and tuck in ties.
8. Stand up during practical work.

9. Do not eat or drink in the lab – never smell or taste anything that is in the lab – if you do, report it to the teacher.
10. Wash your hands carefully after every practical lesson.

11. If you are burnt or a chemical splashes on your skin – wash the area immediately and report it to the teacher.
12. Do not put solid waste down the sink – it goes in the bin unless instructed otherwise.

13. Wipe up all small spills and report bigger ones to your teacher.
14. Report any breakages to the teacher.

15. Enjoy your practical lessons – ask questions, be inquisitive and learn some amazing science!

I have read and understand the rules of the lab at SMS, signed: _____ Date: _____

Periodic Table:

The Periodic Table of Elements

1	2											3	4	5	6	7	0
							1 H hydrogen 1										4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	[285] Cn copernicium 112	[286] Nh nihonium 113	[289] Fl flerovium 114	[289] Mc moscovium 115	[293] Lv livermorium 116	[294] Ts tennessine 117	[294] Og oganesson 118

Key: relative atomic mass / **atomic symbol** / name / atomic (proton) number

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted.

Relative atomic masses for **Cu** and **Cl** have not been rounded to the nearest whole number.

Working Scientifically Learning Journey:

	KS2	Year 7	Year 8	GCSE
Using lab equipment	• Decide on appropriate equipment to carry out an investigation. • Measure temperature using a thermometer. • Filter paper and funnel for filtration. • Measure accurately and precisely - including the use of a protractor to measure angles. • Using a Newtonmeter to measure force.	• Chromatography paper and solvent tank. • Distillation equipped including round bottom flask, condenser, conical flask. • Quadrat for ecosystem sampling.		
Mathematical formula	Mean = (result 1 + result 2 + result 3) ÷ 3	• Weight = mass x gravitational field strength • Speed = distance / time • Efficiency = (useful energy output ÷ total energy input) x 100 • Calculating current in a series and parallel circuit	Pressure = force / area	Use an appropriate number of significant figures in calculation. • work done = force × distance • force applied to a spring = spring constant × extension • Acceleration = change in velocity ÷ time taken • resultant force = mass × acceleration • momentum = mass × velocity • kinetic energy = 0.5 × mass × speed 2 • gravitational potential energy = mass × gravitational field strength × height • Power = energy transferred ÷ time and Power = work done ÷ time • Efficiency = useful power output ÷ total power input • wave speed = frequency × wavelength • charge flow = current × time • potential difference = current × resistance • power = potential difference × current and power = current2 × resistance • energy transferred = power × time • energy transferred = charge flow × potential difference • Density = mass ÷ volume
Scientific method	• Ask questions and recognise they can be answered in different ways. • Observations can be used to suggest answers to questions. • Set up comparative and fair tests, explaining which variables need to be controlled and why. • Draw scientific, labelled diagrams • Gather and record data to answer questions. • Drawing conclusions from data. • Ask further questions based on data collected. • There are 5 types of scientific enquiry observing over time, fair testing, research, pattern seeking, sorting and classifying. • Identify and control variables. • Take repeat measurements when appropriate. • Write a prediction for a scientific enquiry. • Report and present findings from enquiries. • Identify relationships from data and comment on relationships.	• Identify independent, dependent and control variables. • Write a hypothesis. • Write a method. • Write conclusions based on data. • Write evaluation for scientific enquiry.		• Use a variety of models such as representational, spatial, descriptive, computational and mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts. • Evaluate risks both in practical science and the wider societal context, including perception of risk in relation to data and consequences. • Use scientific theories and explanations to develop hypotheses. • Carrying out and represent mathematical and statistical analysis. • Representing distributions of results and make estimations of uncertainty. • Being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error.

Graphs	Draw bar charts Draw a scatter graph Draw a line graph	Interpreting graphs		
Scientific theory	• Use relevant scientific language and illustrate, communicate and justify their scientific ideas. Scientific ideas have changed over time due to increased evidence.			Understand how scientific methods and theories develop over time. Appreciate the power and limitations of science and consider any ethical issues which may arise. Explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments.

Maths:
Using and manipulating mathematical formula, rounding to significant figures and decimal places, measuring angles, calculating means.

English:
Writing scientific reports.

Art:
Drawing accurate diagrams.

IT and Design Technology:
Following methods, using specialized equipment.

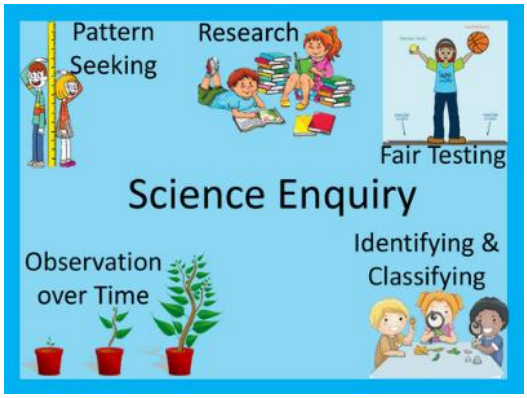
Working Scientifically Knowledge Organiser:

Keyword / Concept	Definition
Types of enquiry	Observing over time, research, classifying, fair testing, and pattern seeking.
Variable	A value that could be changed during an experiment.
Independent variable	The thing that you change
Dependent variable	The thing that you measure
Control variable	The thing that you keep the same
Prediction	What do you think will happen in an investigation and why?
Equipment	Special pieces of glassware and tools that allow you to carry out scientific investigations.
Risk assessment	A list of hazards, risks and how to reduce the chances of them.
Method	Step by step set of instructions on how to carry out an investigation
Conclusion	An explanation of what is found out during an investigation and why.
Evaluation	An explanation of what has gone well with an investigation and what can be done to improve it if carried out again.
Accuracy	An accurate measurement is considered to be close to the true value. Accurate readings are done by using suitable equipment.
Precision	How close together measurements are.
Anomaly	A result that does not fit the pattern.
Scale	A set of numbers that indicate certain intervals on a graph / measuring equipment used for measurement.
Axis	The horizontal (x axis) and vertical (y axis) lines on a graph that contain the scales.
Line of best fit	A line that follows the trend of data showing the correlation of results

Working Scientifically:

1. Aim:
   What are you investigating?
   In this investigation we are going to …..

2. Type of enquiry:



3. Identifying variables:
   - Independent variable
   - Dependent variable
   - Control variable
4. Prediction:
   - Can you predict what your results will show?
     I predict that if I change the (independent variable) it will *increase/decrease* the (dependent variable)
   - Can you use a scientific idea to support your prediction?

5. Risk Assessment:

What are the risks with your investigation?

- ❑ Identify the hazard.
- ❑ State what harm the hazard can do (risk).
- ❑ How could you stop any accidents from happening?
- ❑ If an accident occurred, what would you do?

Hazard	Risk	Preventing Risk	What to do if an accident happens.

6. Method:

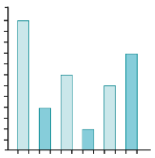
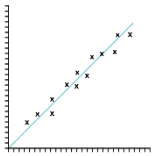
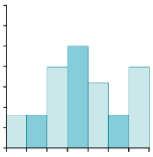
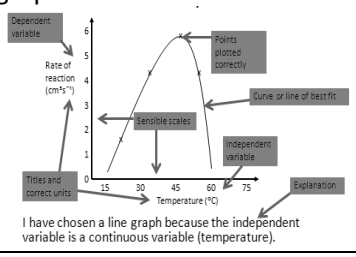
Make sure your method has:

- ☐ Numbered steps (step 1:…..)
- ☐ Written in a clear order
- ☐ Short, simple sentences
- ☐ Bossy verbs (Collect, Measure, Pour)
- ☐ Be specific – use amounts or timings
- ☐ Do not use I, we, you
- ☐ You may want to include a diagram

7. Collecting Results:

Independent variable (units)	Dependent variable (units)			
	Repeat 1	Repeat 2	Repeat 3	Mean Average

8. Representing data:

Types of Graph:	Graph Check List:
• Bar chart: When one of our variables is discrete, we draw a bar chart. 	☐ Drawn with a pencil and ruler ☐ Axes drawn using the lines on the graph paper ☐ X axis – independent variable (what you changed) ☐ Y axis – dependent variable (what you measured) ☐ Axes labelled – what do the numbers/words mean make sure you include units ☐ Scales are evenly spaced ☐ Bar chart – bars equal widths with spaces between them. ☐ Line graph – points drawn with small x, line of best fit. ☐ Histogram – bars equal without spaces between them. ☐ Title – This graph shows….
• Line graph: When both variables are continuous, we draw a line graph. 	
• Histogram: When continuous data is grouped into categories, we draw a histogram. 	

9. ***Conclusion:***

- When the (independent variable) increases / decreases, (dependent variable) ….
- We can see this from… (use your data).
- This happened because… (explain your results using science).
- Was your prediction correct? My prediction was correct/not correct because…

10. ***Evaluation:*** Answer these questions below in full sentences to evaluate your experiment.
    A measurement is repeatable if the same experimenter repeats the investigation using the same method and equipment and gets the same result.
    a. Were the range and number of readings you took sufficient to see whether you had repeatable results?
    b. Can you explain any anomalous results?

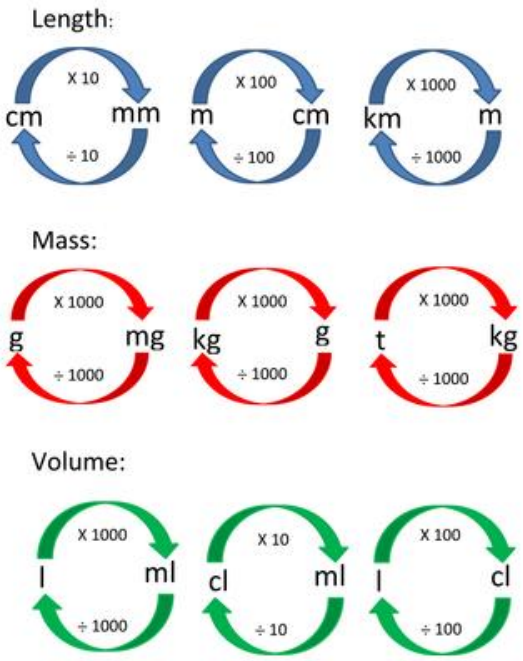
    An experiment gives valid results if it is a fair test and provides repeatable results. If a variable should be controlled but isn't, then the experiment will not be a fair test.
    c. How successful were you at keeping your control variables the same throughout your investigation?
    d. Were the results of your investigation valid? How do you know?
    e. How could you increase the validity of your results? (How could you overcome any weaknesses with your method?

Thing being measured	**Standard Units**	**Equipment if applicable**
Energy	Joules (J)	
Force	Newtons (N)	Newton meter
Length	Metres (m)	Ruler
Speed	Metres per second (m/s)	
Gravity	Newton per kilogram (N/kg)	
Volume	Centimetres cubed (cm^3)	Measuring cylinder
Current	Amps (A)	Ammeter
Temperature	Degrees celcius (°C)	Thermometer
Mass	Kilogram (kg)	Balance
Distance	Metres (m)	Trundle wheel / meter ruler / tape measure
Time	Seconds (s)	Stopwatch
Angle	Degrees (°)	Protractor

Careers:
Engineer, architecture, scientist, economist, technician, glass blower, microbiologist.







Scientific Skills

Big Picture: Science involves asking questions, investigating and observing the world around us. How do scientists carry out investigations and come to conclusions?

Circle how confident you feel at the start of the topic and the end of the topic.

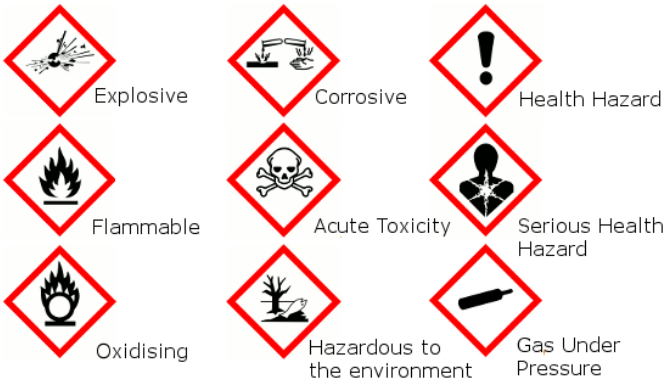
Red = I know nothing **Amber = I know something** **Green = I feel confident with this**

Key Knowledge	Confidence before topic RAG	Confidence after topic RAG
Risk assessments are written to identify risks with an activity and what procedures are needed to reduce the risk.		
Glassware - could break and cause cuts / bleeding. Put in the middle of the table, test / boiling tubes in a rack.		
Bunsen burner - open flame and hot equipment could cause burns - do not put hand in the flame, move when cooled, put on safety flame when not in use.		
Chemicals - could cause irritation / corrosion depending on chemical. Wear safety goggles, replace stoppers on bottles, pour carefully.		
Heavy equipment such as masses / clamp stands - falling off the desk and hurting feet / legs. Place in the middle of the table, move back from where being used.		
kilo = x 1000		
centi = / 100		
milli = / 1000		
Energy = joules		
Force = newtons		
Length = metres		
Volume = cm^3		
Temperature = Degrees celcius (°C)		
Mass = kilograms		
Time = seconds		
Angle = degrees (°)		
Graph success criteria: • Drawn with a pencil and ruler • Graph should take up at least 2/3 of the graph paper. • Evenly spaced scales on axes • Labelled axes including units • Independent variable on x axis • Dependent variable on y axis • Bar chart - bars equal widths • Bar chart - spaces between bars • Line / scatter graph - small crosses to show data points. • Line / scatter graph - line of best fit • Graph title		
A conclusion summarises how your results support or contradict your original hypothesis.		
Conclusion: as (independent variable) increases / decreases, the (dependent variable) increase / decreases. This happens because…		

Knowledge Organiser:

Accuracy	An accurate measurement is considered to be close to the true value. Accurate readings are done by using suitable equipment.
Anomaly	A result that does not fit the pattern.
Dependent variable	The thing that you measure (changes with the independent variable).
Equipment	Special pieces of glassware and tools that allow you to carry out scientific investigations.
Independent variable	The thing that you change.
Variable	A value that could be changed during an experiment.
Conclusion	Summarises how your results support or contradict your original hypothesis.
Hazard symbol	A symbol placed on chemicals that outlines the danger associated with the chemical.
Risk assessment	Recording of the risks and hazards associated with an activity and how to minimize the risk.
Scale	A set of numbers that indicate certain intervals on a graph / measuring equipment used for measurement.
Axis	The horizontal (x axis) and vertical (y axis) lines on a graph that contain the scales.
Line of best fit	A line that follows the trend of data showing the correlation of results

Hazard symbols are a way of identifying what hazards are associated with chemicals:



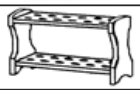
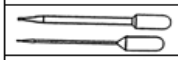
Measuring:

- Accuracy the value closest to the true value.
- Precision how close together measurements are.

Accurate and precise – accurate = the darts are all on bullseye, precise = the darts are all close together.

What are you measuring?	Equipment?	Units?
Mass	Balance	Grams
Length	Ruler	cm
Volume of a liquid	Measuring cylinder	cm^3
Angle	Protractor	°
Temperature	Thermometer	°C

Lab Equipment:

Equipment	Name	Equipment	Name
	Test tube		Measuring cylinder
	Boiling tube		Tripod
	Beaker		Gauze
	Conical flask (i.e. cone-shaped)		Bunsen burner
	Crucible		Filter funnel (with paper)
	Tongs		Test tube holders
	Mortar and pestle		Thermometer
	Pipe clay triangle		Test tube holder
	Stand boss and clamp		Balance
	Dropping pipette		Evaporating basin
	Glass rod		Spatula

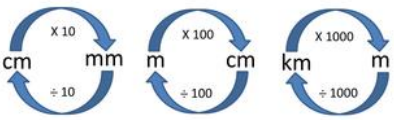
Units of measurement:

Thing being measured	Standard Units	Equipment if applicable
Energy	Joules (J)	
Force	Newtons (N)	Newton meter
Length	Metres (m)	Ruler
Speed	Metres per second (m/s)	
Gravity	Newton per kilogram (N/kg)	
Volume	Centimetres cubed (cm^3)	Measuring cylinder
Current	Amps (A)	Ammeter
Temperature	Degrees celcius (°C)	Thermometer
Mass	Kilogram (kg)	Balance
Distance	Metres (m)	Trundle wheel / meter ruler / tape measure
Time	Seconds (s)	Stopwatch
Angle	Degrees (°)	Protractor

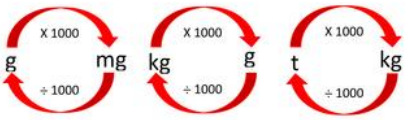
Sometimes the standard units are not a convenient size, so we use bigger or smaller versions. An extra part is added to the name of the unit to show when we are using bigger or smaller versions. This is called a prefix.

Prefix	Meaning	Example
kilo	1000	1 kilogram (kg) = 1000 grams
centi	1/100	100 centimetres (cm) = 1 metre
milli	1/1000	1000 milligrams (mg) = 1 gram
micro	1/1 000 000 (1 millionth)	1,000,000 micrometres (µm) = 1 metre

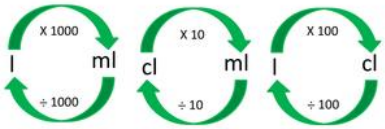
Length:



Mass:



Volume:



Risk assessment:

Hazard	Risk	Method of minimising risk.
What could cause harm.	The harm the hazard could cause.	What are you going to do to keep yourself and others safe?

Waves Learning Journey:

Big Picture: Waves can transfer information in many different ways, how do different types of wave transfer information?

Biology:

- The cells in the retina of the eye, detect changes in light allowing us to see.
- The structure of the ear allows vibrations to travel through the ear and along the auditory nerve to the brain.

Chemistry:

- Solid particles are touching each other, they vibrate. Gas particles are far apart.

	KS2	Year 7	Year 8	Year 9	GCSE
Light	• Light from the sun can be dangerous and there are ways to protect your eyes. • Shadows are formed when the light from a light source is blocked by an opaque object. • Shadows get bigger if the object moves closer to the light source. • Opaque objects let no light through. • Transparent objects let light through. • Translucent objects let some light through. • Light travels in straight lines. • Light is emitted from a luminous object. • Objects can be seen when light from a light source reflects off a surface, this can be shown using a ray diagram. • Reflection is when light bounces off a surface. • The direction of light can be shown on a ray diagram. • The law of reflection states that the angle of incidence is equal to the angle of reflection.		• Light is a transverse wave. • Speed of light is 300, 000, 000 m/s. • Light is reflected off a reflective surface. • Light refracts when it hits objects off a different density. White light Is made from the seven colours of the spectrum. • Objects can be seen when white light hits them, they absorb all the colours of light except for the colour of the object which is reflected. • Light travels in a straight line from a source to and object, it is reflected back to our eyes. • Light waves can travel through transparent and translucent substances. • Light cannot travel through an opaque material. The law of reflection states that the angle of incidence equals the angle of reflection. • The different parts of a rough surface, point in different directions, so the light reflects in different directions - this is diffuse scattering. • Refraction happens when light changes speed causing it to change direction. • A lens is a piece of glass or other transparent material with curved sides for concentrating or dispersing light rays. • Light is refracted when it enters the prism and each colour is refracted by a different amount. • When white light hits a surface, the colour of that surface is reflected, the other colours are absorbed.		

Sound	• Sounds are made when something vibrates. • Vibrations from sounds travel through a medium to the ear. • Different materials make a different pitch of sound. • The stronger the vibration, the louder the sound. • Noises get fainter as the distance from the source increases.		• Sound is a longitudinal wave. • Speed of sound in air is 343 m/s. • Sound waves must pass through a medium - it needs particles. • When an object or substance vibrates it produces sound. • In areas of compression the parts of a wave become closer together. In areas of rarefaction the parts of the wave become further apart. • Speed travels faster through solids because the particles are closer together so the particles pass along the vibrations faster. • Pitch is the degree of highness or lowness of a tone. • Volume is how quiet or loud a sound is. The greater the amplitude of a wave, the louder the sound. • The higher the frequency, the closer together the waves are and the higher the pitch. • Hard, smooth surfaces are good at reflecting sound. • Soft, rough surfaces are good at absorbing sound.		
Wave properties and effects			• Waves transfer energy and information from one location to another without the transfer of matter. • There are two types of wave: transverse and longitudinal. • Frequency is the number of waves per second. Frequency is measured in Hertz (Hz). • Amplitude is the maximum height of the wave from its resting position. • Wavelength is the distance between the crests of two waves next to each other.		• The amplitude of a wave is the maximum displacement of a point on a wave away from its undisturbed position. • The wavelength of a wave is the distance from a point on one wave to the equivalent point on the adjacent wave. • The frequency of a wave is the number of waves passing a point each second. • All waves obey the wave equation: wave speed = frequency x wavelength • Electromagnetic waves are transverse waves that transfer energy from the source of the waves to an absorber. • Electromagnetic waves form a continuous spectrum and all types of electromagnetic wave travel at the same velocity through a vacuum (space) or air.

Maths:
Reflection – using a protractor and measuring angles.

Art: Drawing diagrams to show wave forms, reflection and refraction.

PSHCE: Health – ensuring that sounds are not too loud and lights too bright that they will damage the ears and eyes.

Careers: Sound engineer, lighting engineer, health and safety officer, photographer, optometrist.

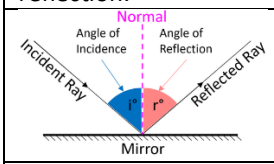
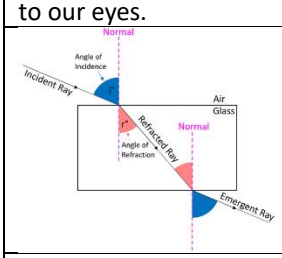




Waves Target Sheet:

Circle how confident you feel at the start of the topic and the end of the topic.

Red = I know nothing **Amber = I know something** **Green = I feel confident with this**

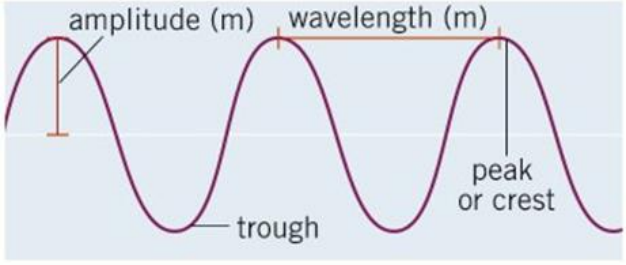
Key Knowledge	Confidence before topic RAG	Confidence after topic RAG
Waves transfer energy and information from location to another without the transfer of matter.		
Light is an example of a transverse wave.		
Sound is an example of a longitudinal wave.		
Sound waves are caused by vibrations and need particles to travel.		
Sound can be reflected (echoes) or absorbed.		
Frequency is the number of waves each second and is measured in hertz.		
Wavelength is the distance between the crests of two waves next to each other, measured in metres (m).		
The higher the frequency, the higher the pitch of the sound.		
Amplitude is half the total height of the wave, the bigger the amplitude, the louder the sound.		
The sense organ that detects sound is the ear.		
The law of reflection states that the angle of incidence is equal to the angle of reflection.		
		
Light travels in a straight line from a source to an object, it is then reflected back to our eyes.		
		
The sense organ that detects light are the eyes.		
Refraction happens when light changes speed causing it to change direction.		
White light can be split into a spectrum of seven colours using a prism. This spectrum is: red, orange, yellow, green, blue, indigo, violet.		
When white light hits a coloured object, all colours are absorbed except the colour of the object which is reflected.		

Knowledge Organiser:

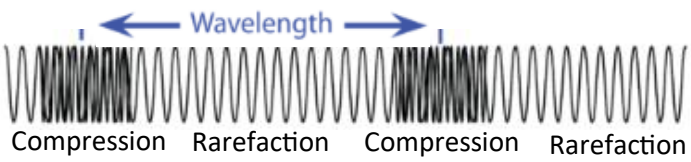
Absorption	When energy is transferred from light to a material.
Amplitude	The maximum amount of vibration, measures from the middle position of the wave, in metres.
Angle of incidence	Between the normal and incident ray
Angle of reflection	Between the normal and reflected ray.
Convex lens	A lens made from a transparent material, it bulges outwards in the middle at both sides.
Frequency	The number of waves produced in one second, in hertz,
Incident Ray	The incoming ray.
Longitudinal wave	Where the direction of the energy passing through the wave is the same as that of the wave.
Normal Line	The imaginary line from which angles are measured, at right angles to the surface.
Oscilloscope	Piece of equipment that can convert sounds into a visual transverse wave.
Pitch	How low or high a sound is. A low pitch sound has a low frequency.
Reflected ray	The outgoing ray.
Reflection	Light bounces off a reflective surface such as a mirror.
Refraction	Change in the direction of light going from one material into another.
Spectrum	Seven colours of light that white light is split up into.
Superposition	When two waves meet they overlap and interact.
Transverse wave	A wave in which the energy is perpendicular to the direction of travel.
Vacuum	A space without matter.
Vibration	A back and forth motion.
Volume	How loud or quiet a sound is.
Wavelength	Distance between two corresponding points on a wave, in metres

Types of wave:

Light is a transverse wave.

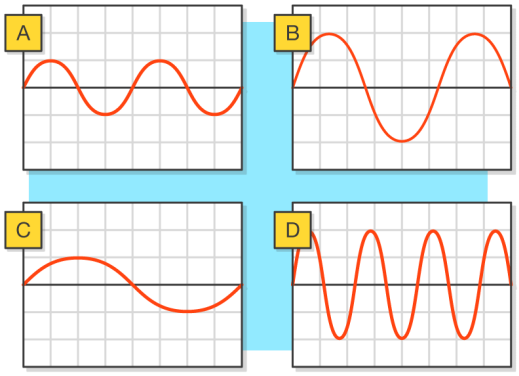


Sound is a longitudinal wave.



Sound waves:

- **Waves** are **oscillations** or vibrations that have an **amplitude** (height), **wavelength**, and **frequency**.
- Sound is a form of energy.
- Sound is caused by vibrations.
- Sounds travels at 340m/s. **Sound** travels fastest in solids and slowest in gases and cannot travel through a **vacuum**.
- The **loudness** of a sound depends on its amplitude, and the **pitch** depends on its frequency. Frequency is measures in **hertz** (**Hz**).



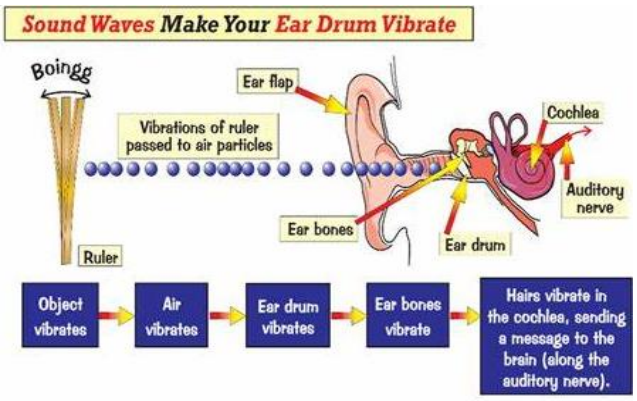
A - Quiet, higher pitch

B - Loud, low pitch,

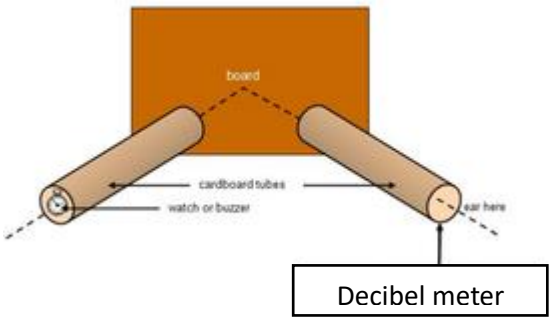
C - Quiet, low pitch,

D - Loud, high pitch,

How do we hear?



Investigating sound:



Decibel meter

Independent variable – type of material on the board.

Dependent variable – volume of the sound reflected.

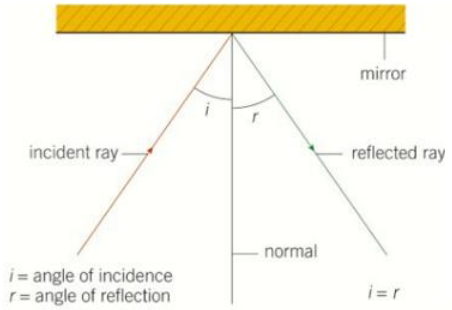
Control variables – length of the tube, position of the tube, position of the decibel meter, environmental sounds.

Soft, bumpy materials absorb more sound than flat, hard materials.

Light:

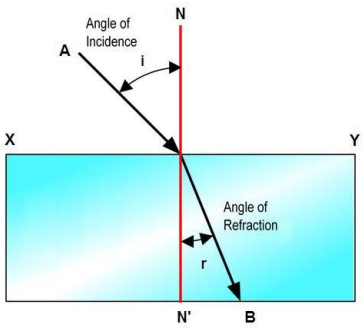
Light is emitted from luminous sources. It can be transmitted through, reflected, or absorbed by non-luminous objects.

Reflection:



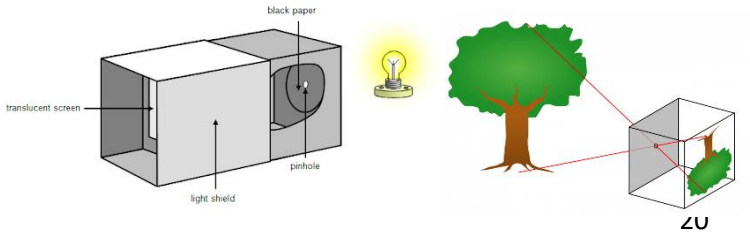
The law of reflection says that the angle of incidence equals the angle of reflection.

Refraction:

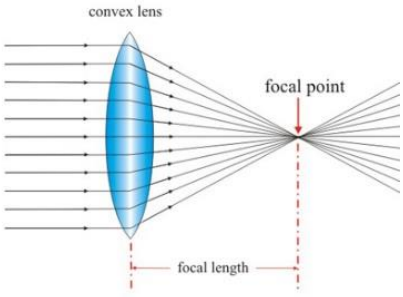


Light slows down when it moves into a thicker (more dense) material. When light slows down it is **refracted** towards the **normal** (an imaginary line at 90° to the surface).

Pin hole camera:



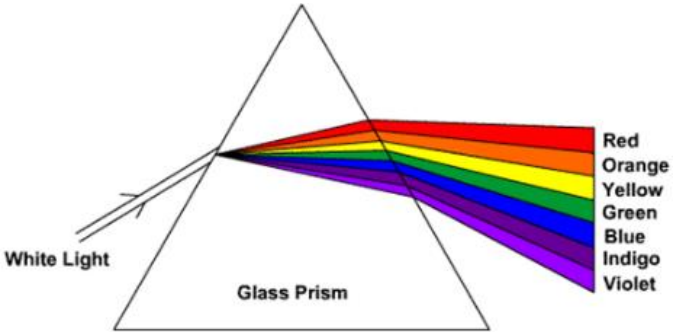
Lenses:

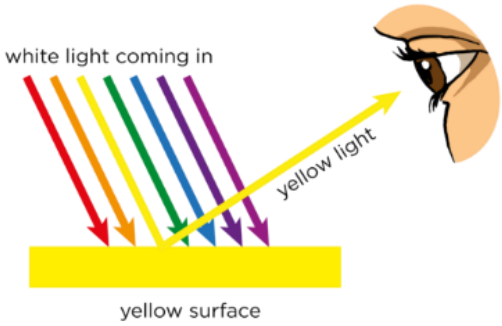


- Lenses use this property to focus light so that they meet at a specific point, called the focal point.
- Convex lenses (fat in the middle) work to focus light together.
- Convex lenses are used for magnifying glasses, spectacles for people with long-sight and telescopes.

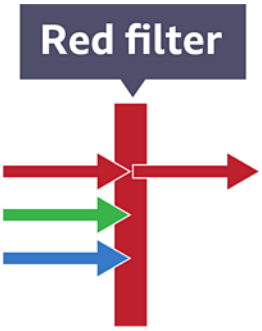
Colour:

Prisms disperse (split up) white light to produce a continuous **spectrum**.





When seeing an object, white light will hit the object and the colour of the object will be reflected. All other colours will be absorbed.



Filters:

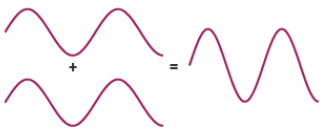
A filter will absorb all colours, except for the colour it is and let that colour light pass through.

Example: A red filter will absorb all colours of the spectrum except for red, red light will pass through the filter.

Interacting waves:

Where two waves meet, they affect each other. This is called superposition.

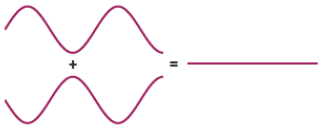
Adding: If two waves meet each other in step, they add together and reinforce each other. They produce a much higher wave, a wave with a greater amplitude.



Adding two waves together

Cancelling

If two waves meet each other out of step, they cancel out.



Cancelling out two waves

Waves Revision:

Types of wave:	*Reflection:*
Sound:	*Refraction:*
Hearing:	*Colour:*

Matter Learning Journey:

Big Picture: There are 118 known elements, their position on the periodic table depends on their chemical and physical properties. Where are elements found on the periodic table and why?

Periodic Table, Atomic Structure and Bonding Learning Journey:

Chemistry:
Atoms make up everything, the atomic structure will determine their reactivity.

Physics:
- Atoms make up everything, their arrangement leads to the properties of materials.
- Electrons are free to move in metals which allows them to conduct electricity.
- Electrostatic forces hold ions together in some compounds.

Year 7	Year 8	Year 9	GCSE
• The Periodic Table shows all 120 known elements. • Elements in the periodic table are shown with their name and chemical symbol. • Metals are found on the left side of the periodic table, non-metals are found on the right of the periodic table. • Group 1 - alkali metals, Group 7 - halogens, Group 0 - noble gases. • Naming compounds: metal first, non-metal second - non-metal on it's own the end of the word changes to -ide, the non-metal and an oxygen the end of the word changes to -ate.	• Elements in group 0 are known as noble gases and are very unreactive. • Elements in group 1 are known as the alkali metals, they are highly reactive. Their reactivity increases as you go down the group. • Elements in group 7 are known as the halogens, they are reactive. Their reactivity decreases as you go down the group. • A more reactive halogen will displace a less reactive halogen from a solution of its salt.	• The modern Periodic Table was devised by Mendeleev who used atoms atomic number and their properties to arrange them into groups and periods. • The atomic number on the periodic table shows the number of protons and electrons. • The number of neutrons = atomic mass - atomic number	• Elements in the same group in the periodic table have the same number of electrons in their outer shell (outer electrons) and this gives them similar chemical properties. • Group 0 are unreactive because their atoms have stable arrangements of electrons - they have a full outer shell. The boiling points of noble gases increase with increasing relative atomic mass. • Group 1 elements re very reactive because they have a single electron on their outer shell. • Group 7 elements are reactive because they have 7 electrons in their outer shell. • Group 7 elements are non-metals and consist of molecules made of pairs of atoms. • As you go down group 7, the melting and boiling points increase.
• All things are made of atoms. • Atoms are made of protons, electrons and neutrons. • Protons and neutrons are found in the nucleus of an atom. • Electrons are found on shells round the outside of the nucleus. • Protons have a + 1 charge. • Electrons have a -1 charge. • Neutrons have no charge.	• All substances are made of atoms, an atom is the smallest part of an element that can exist. • Conservation of mass states that no atoms are created or destroyed so the same number of atoms are in the reactants and products.	• Atoms are made of protons (+1), electrons (-1) and neutrons (0). • The number of protons and electrons are equal in an atom.	• Evidence of the structure of the atom, meant that theories have changed over time, from the sphere to plum pudding to the nuclear model. • The relative mass of an atom is the mass of the protons + mass of the neutrons. • An isotope is the same element with a different number of neutrons. • Electrons occupy energy levels (shells), and their arrangement can be represented by numbers, for example NA = 2, 8, 1. • There are three types of strong chemical bonds: ionic, covalent and metallic. For ionic bonding the particles are oppositely charged ions. • Some atomic nuclei are unstable. The nucleus gives out radiation as it changes to become more stable. This is a random process called radioactive decay.

Design Technology:
Materials are chosen based on their properties, the arrangement of elements on the periodic table is based on elemental characteristics.

History:
Evidence over time, causes the changes in theories.

Compounds and Mixtures Learning Journey:

Chemistry:
Periodic table allows atomic structure to be determined, therefore how reactive the elements are.

Biology:
Chemical formulations are used to make medicines.

Physics:
Atomic structure, electrostatic forces between ions hold compounds together.

KS2	Year 7	Year 8	Year 9	GCSE
• Some materials will dissolve in liquid to form a solution. • Dissolved substances can be recovered using evaporation. • Sieving separates solids of different sizes. • Evaporating separates a soluble (dissolved) solid from a liquid. • A mixture of soluble and insoluble materials can be separated by using filtration. • Evaporation works as a separation method as the liquid part (solvent) will evaporate leaving behind the dissolved solid part (solute). • Insoluble means that a substance will not dissolve in a solvent. • Soluble means that a substance can dissolve in a solvent.	• An element is a substance made of one type of atom. • A compound is a substance made of two or more types of atom that are chemically joined together. • A mixture is a substance made of two or more types of atom or compound that are not chemically joined together. • A molecule is two or more atoms that are chemically joined together. • A pure substance only contains one type of element or compound. • Solute is the substance that dissolves to make a solution. • Solvent is the substance that does the dissolving – it dissolves the solute. • Solution the mixture of a solute and solvent. • Dissolving is when particles of solvent collide with particles of solute. • They surround the particles of solute, gradually moving them away until the particles are evenly spread through the solvent. • Crystallisation is used to produce solid crystals from a solution. Filtration is used to separate an insoluble solid from a solvent. • Chromatography is a separating technique used to separate mixtures of soluble substances. These are often coloured substances such as food colourings, inks, dyes or plant pigments. • Distillation is a separating technique used to separate two or more liquids with different boiling points.	• Balanced equations show the number of atoms in the reactants and the products. • The number of atoms in the reactants is equal to the number of atoms in the products. • When balancing equations, only the big number at the front of a compound can be changed. The small numbers show the number of each type of atom in a compound. • Iron is an element, sulfur is an element, iron sulfide is a compound. Elements and compounds have got different properties.		• Compounds are formed from elements by chemical reactions. • Compounds contain two or more elements chemical combined in fixed proportions and can be represented by formulae using chemical symbols. • Compounds can only be separated into elements in chemical reactions. • A mixture consists of two or more elements or compounds not chemically combined together. The chemical properties of each substance in the mixture are unchanged. • Mixtures can be separated by physical processes such as filtration, crystallisation, simple distillation, fractional distillation and chromatography. • Pure elements and compounds melt and boil at specific temperatures. • Melting point and boiling point data can be used to distinguish pure substances from mixtures. • A formulation is a mixture that has been designed as a useful product. • Formulations are made by mixing the components in carefully measured quantities to ensure that the product has the required properties.

Careers: medical scientist, geochemist, jewellery designer, analytical chemist, food technologist, nantechnologist, forensic technician, perfume chemist.

Maths:
Balancing equations.





Matter Target Sheet:

Circle how confident you feel at the start of the topic and the end of the topic.

Red = I know nothing **Amber = I know something** **Green = I feel confident with this**

Key Knowledge	Confidence before topic RAG	Confidence after topic RAG
The Periodic Table is made of all of the known elements arranged in groups and periods based on their properties.		
Conservation of mass states that matter is not created or destroyed, therefore the mass of the reactants is equal to the mass of the products.		
Balancing equations makes sure the same number of atoms are present in the reactants and the products.		
The subscript numbers in a chemical formula show the number of each type of atom are in a molecule.		
The large number in front of an atom or molecule in a balanced equation shows the number of that type atom / element.		
When balancing equations only the large number at the front of an atom or molecule can be changed, the subscript numbers can't be changed.		
Iron sulfide is a compound, iron is a metallic element, sulfur is a non-metallic element.		
During the reaction of iron and sulfur, the reaction glows bright red, showing a chemical reaction is taking place.		
Group 1 elements are called the alkali metals.		
When a group 1 element reacts with water it makes a metal hydroxide + hydrogen.		
Reactivity increases as you go down group 1.		
Group 7 elements are called the halogens.		
Reactivity decreases as you go down group 7.		
A displacement reaction is when a more reactive element takes the place of an element in a less reactive element in a compound.		
Group 0 elements are called the noble gases.		
Group 0 elements are inert (unreactive).		

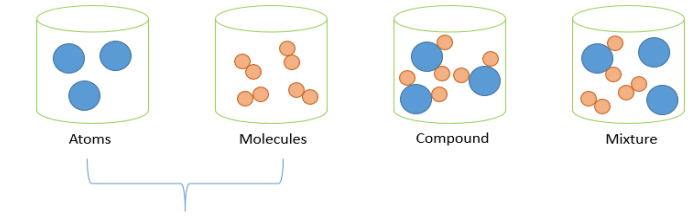
Knowledge Organiser:

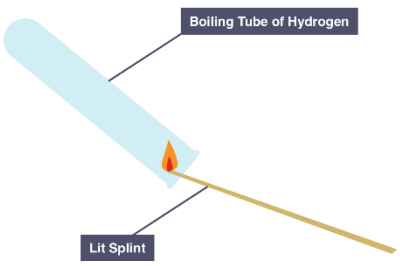
Reminder:

Naming simple compounds

What is the name of each compound formed by these metal and non-metal elements?

element 1	element 2	compound
iron (Fe)	sulfur (S)	iron sulfide (FeS)
magnesium (Mg)	nitrogen (N)	magnesium nitride (Mg_3N_2)
sodium (Na)	chlorine (Cl)	sodium chloride (NaCl)
tin (Sn)	oxygen (O)	tin oxide (SnO)
aluminium (Al)	bromine (Br)	aluminium bromide ($AlBr_3$)
nickel (Ni)	iodine (I)	nickel iodide (NiI_2)
zinc (Zn)	sulfur (S)	zinc sulfide (ZnS)
lithium (Li)	nitrogen (N)	lithium nitride (Li_3N)





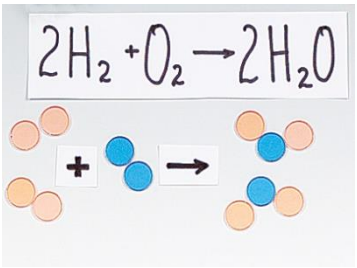
Test for hydrogen gas:

Place a lit splint into hydrogen gas and it will make a squeaky pop.

Alkali metal	Any element in group 1 in the periodic table.
Chemical Formula	Shows the elements present in a compound and their relative proportions.
Chemical properties	Features of the way a substance reacts with other substances.
Compound	Pure substances made up of two or more elements strongly joined together.
Element	What all substances are made up of, and which contain only one type of atom.
Group	A column going down on the periodic table
Halogen	Any element in group 7 in the periodic table.
Inert	Very unreactive
Mixture	Two or more molecules or atoms not chemically joined together.
Molecules	Two to thousands of atoms joined together. Most non-metals exist either as small or giant molecules.
Nobel gas	Any element in group 0 in the periodic table.
Period	Row going across on the periodic table
Periodic Table	Shows all the elements arranged in rows and columns.
Physical Properties	Features of a substance that can be observed without changing the substance itself.
Sonorous	When hit will produce a deep, ringing sound.

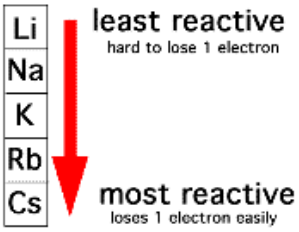
Balancing Equations:

Conservation of mass states that no atoms can be created or destroyed. Therefore all the atoms that go in at the start of a reaction must come out at the end.



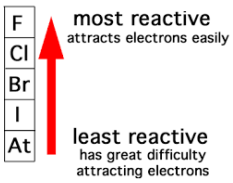
- The small numbers show the amount of that particular atom in the molecule.
- The big number shows the number of that type of atom / molecule in the reaction.
- Only the big numbers can be changed when balancing an equation.

Group 1:



- Group 1 elements are also known as the alkali metals.
- Group 1 elements have low melting and boiling points, and low densities. They are reactive.
- Group 1 elements react vigorously with water.
- Reactions with water: Group 1 metal + water → metal hydroxide + hydrogen.
- Metal hydroxides are basic and will turn universal indicator purple.

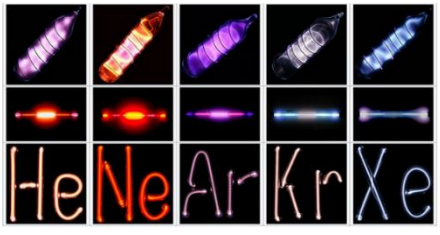
Group 7:



- Group 7 elements are also known as the halogens.
- Going down Group 7, melting and boiling points increase. The colours of the elements get darker. They are reactive.
- In a displacement reaction a more reactive element displaces a less reactive element from its compounds.

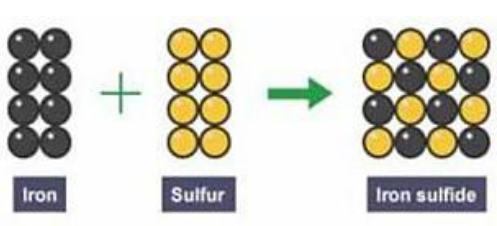
salt (aq) / halogen	potassium chloride	potassium bromide	potassium iodide
chlorine	X	$2KCl + Br_2$	$2KCl + I_2$
bromine	no reaction	X	$2KBr + I_2$
iodine	no reaction	no reaction	X

Group 0:



- Group 0 elements are called the noble gases. They are highly unreactive.
- The noble gases glow brightly when high-voltage electricity passes through them which is why many advertising signs use letters containing neon gas.
- Argon is a better insulator than air, so it is used in the gap between the two panes of glass in double glazing. Helium has a lower density than the air and so it is used in helium balloons.

Matter Revision:

Periodic Table:	*Group 1:*
Balancing Equations:	*Group 7:*
Iron sulfide:  	*Group 0:*

Organisms Learning Journey:

Big Picture: The human body is made up of organ systems, these systems allow us to carry out everyday tasks and they are adapted to allow our body to work efficiently and effectively. How are the respiratory and digestive systems adapted for efficiency?

Biology:	**Chemistry:**	**Physics:**
Circulatory system transports oxygen and glucose round the body. Health (balanced diet) and reproduction (having a healthy pregnancy).	• Respiration is an exothermic reaction. • Bile neutralises stomach acid in a neutralisation reaction.	Diffusion happens in the alveoli during gas exchange and in the villi allowing small molecules to move from inside the small intestine to the blood stream.

	Year 6	Year 7	Year 8	Year 9	GCSE
Respiratory system	• Lungs are an organ in the body. • Respiration is one of the seven life processes. • When we exercise, we need more oxygen so we breath faster.	• Respiration happens in the mitochondria. • The lungs are an example of an organ.	• Breathing is the mechanical process of the body taking in oxygen (inhalation) and giving out carbon dioxide (exhalation). • The respiratory system starts at the mouth, into the trachea, then to the two bronchus, into the bronchioles and into the alveoli. • The lungs have alveoli - these increase the surface area of the lungs to allow for efficient gas exchange. • Alveoli are small air sacks that have thin walls and are surrounded by capillaries allowing for gas exchange. • Respiration is the chemical reaction that all living things do that converts oxygen and glucose into carbon dioxide and water to release energy. • Aerobic respiration occurs when the body has a sufficient supply of oxygen. • Aerobic respiration: glucose + oxygen --> carbon dioxide + water • Anaerobic respiration happens when the body does not have a sufficient supply of oxygen - normally during exercise. • Anaerobic respiration: glucose --> lactic acid • Anaerobic respiration develops an oxygen debt - this is the amount of oxygen needed to break down the lactic acid that has been developed.		• Cellular respiration is an exothermic reaction which is continuously occurring in living cells. • If insufficient oxygen is supplied anaerobic respiration takes place in muscles. The incomplete oxidation of glucose causes a build up of lactic acid and creates an oxygen debt. • During long periods of vigorous activity muscles become fatigued and stop contracting efficiently. • Blood flowing through the muscles transports the lactic acid to the liver where it is converted back into glucose.
Digestive system	• Teeth are used to break down food. • Humans have different types of teeth. • The digestive system breaks down large molecules into smaller molecules. • Humans need to have a balanced diet to be healthy.	The organs in the digestive system are the mouth, oesophagus, stomach, small intestine, large intestine, pancreas, gall bladder.	• Digestion is the break down of large insoluble molecules into smaller soluble ones for absorption. • The organs in the digestive system are the mouth, oesophagus, stomach, small intestine, large intestine, pancreas, gall bladder. • The organs of the digestive system are adapted to allow for efficient absorption of nutrients, this includes villi to increase the surface area of the small intestine. • Villi are small finger like projections in the small intestine that have a large capillary network, to allow for the diffusion of small molecules. • Peristalsis is the contraction and relaxation of muscle to move food along. • Bile emulsifies fats increasing their surface area of digestion. • Enzymes are biological catalysts that are found in the digestive system to speed up the break down of large insoluble molecules into smaller soluble ones for absorption.	• Bacteria are important in the human digestive system. • Enzymes are affected by different factors including temperature, pH and substrate concentration.	• Enzymes catalyse specific reactions in living organisms due to the shape of their active site, this is explained through the lock and key theory. • Rate of reaction = quantity of product formed ÷ time taken • Carbohydrates, lipids and proteins can be tested for using a range of experimental techniques. • Homeostasis is the regulation of internal conditions of a cell or organism. • Automatic control systems may involve nervous responses or chemical responses.

Health Learning Journey:

Biology:
Digestive system, circulatory system, reproduction.

Chemistry:
The chemical compounds in cigarettes, drugs and some food substances can diffuse from the mothers blood to the foetus.

Year 6	Year 7	Year 8	Year 9	GCSE
• Hygiene, nutrition and exercise are important for human survival. • Humans get nutrition from the food that they eat and need the right amounts and types of nutrition. • Diet, exercise, drugs and lifestyle can have negative effects on the body. • A balanced diet contains a variety of food, with all food groups present in appropriate proportions. • A drug is a chemical that has an effect on the body. Drugs that are used to treat an illness are called medicines. • Medicines can be addictive this means feeling you can't stop even when it might be bad for you. • Alcohol is a legal drug but there are restrictions and recommended limits on its use. • Smoking can have long term health effects, is expensive and is extremely addictive. • Exercise can help us to: control our weight, reduce the risk of heart disease, improve mood and mental health, improve balance, strengthen muscles and bones, improve sleep	Alcohol and drugs can pass through the mother's blood to a foetus through the umbilical cord and placenta.	• A balanced diet is needed for a healthy body. • A balanced diet involves getting the right proportions of each food group. • A balanced diet should contain carbohydrates, protein, lipids, vitamins and minerals, fibre, water. • Too little food can cause starvation. • Too much food, particularly fatty food, may cause obesity and coronary heart disease. • Malnutrition happens when people do not eat the right amounts of nutrition. • Smoking is addictive due to the presence of nicotine; it also causes the build-up of tar in the lungs which reduces the amount of gas exchange that can happen as it coats the walls of the alveoli. • Asthma is a respiratory disease that when an asthma attack is triggered it causes the restriction of the airways.		• Health is the state of physical and mental well-being. • Diseases both communicable and non-communicable are major causes of ill health. • Diet, stress and life situations could have an effect on both physical and mental health. • Cancer is the result of changes in cells that lead to uncontrolled growth and division. • Pathogens are micro-organisms that cause infectious disease, they may be viruses, bacteria, protists or fungi. • Pathogens can infect plants or animals and can be spreads by direct contact, by water or by air. • Humans have non-specific defence mechanisms including the skin, nose, trachea, bronchi and stomach. • If a pathogen enters the body white blood cells help to defend the body. • Vaccines use a small quantity of dead or inactive forms of a pathogen to stimulate the white blood cells to produce antibodies. • Antibiotics are used to treat bacterial infections - they don't kill viral pathogens. • Painkillers treat the symptoms but don't kill the pathogens.

PSHCE:

- Maintaining a healthy mind and body.
- Asthma is a medical condition that needs to be managed to maintain a healthy life. Healthy diet is required to keep a healthy body – including maintaining a healthy weight and reducing the risk of cardiovascular disease.
- Understanding how to lead a healthy life style, knowing the impact of making healthy choices regarding diet, drugs, alcohol, smoking and exercise.

Food Technology:
Understanding how a balanced diet and food choices can impact on staying healthy.

PE:

- When exercising the body needs to respire and responds to exercise.
- The body needs to get enough oxygen and glucose to ensure aerobic respiration.

Careers: Dietician, personal trainer, sports engineer, bakery food technologist, winemaker, forestry technicians, technical brewer.





Organisms Target Sheet:

Circle how confident you feel at the start of the topic and the end of the topic.

Red = I know nothing **Amber = I know something** **Green = I feel confident with this**

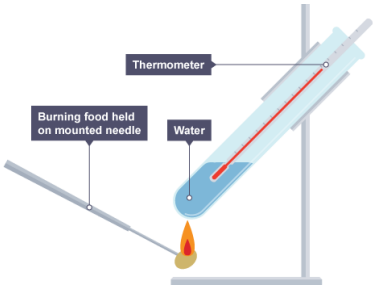
Key Knowledge	Confidence before topic RAG	Confidence after topic RAG
Breathing is the mechanical process of the lungs inflating and deflating to allow oxygen in and carbon dioxide out.		
The respiratory system has: two lungs, trachea, alveoli, bronchiole, bronchus, rubs, intercostal muscles and diaphragm.		
When we inhale: • Diaphragm contract and moves downwards • Intercostal muscles: contact, moving the ribs up and out • Volume of the ribcage: increases • Pressure in the chest decreases • Air moves into the lungs.		
When we exhale: • Diaphragm relaxes and moves upwards • Intercostal muscles: relax and the rubs move down and out. • Volume of the ribcage decreases • Pressure in the chest increases • Air moves out of the lungs.		
Gas exchange is the movement of oxygen from the lungs to the blood stream and carbon dioxide from the blood stream to the lungs.		
Alveoli are adapted to make gas exchange in lungs happen easily and efficiently. They have a large surface area, moist, thin walls and are surrounded by a large network of capillaries.		
The maximum amount of air you can breathe in and out is your vital lung capacity. Everybody's vital lung capacity is different depending on factors such as their age and fitness levels.		
Peak flow is a measure of how fast you breathe out.		
Blood oxygen is a measure of the amount of oxygen in the blood.		
Energy is needed for: growth and repair, movement, control of body temperature.		
Respiration is a chemical reaction that happens in all living cells that releases energy from glucose.		
Aerobic Respiration: glucose + oxygen --> carbon dioxide + water		
Anaerobic respiration: Glucose --> lactic acid. Respiration that happens without oxygen.		
Fermentation happens in microorganisms such as yeast, used for production of bread and alcohol: Glucose --> ethanol + carbon dioxide		
Asthma is the narrowing of airways and is treated by using an inhaler.		
Smoking can cause damage to the lungs as cigarettes release tar, carbon monoxide and nicotine.		
Good health involves getting enough of the seven food groups: carbohydrate, protein, lipid, vitamins, minerals, water and fibre.		
Too little food can cause starvation. Too much food may cause obesity and coronary heart disease.		
The amount of energy in food can be read from the food label and is measured in calories.		
Digestion is the breaking down of large insoluble molecules into smaller soluble molecules.		
Organs in the digestive system: mouth, oesophagus, liver, stomach, gall bladder, pancreas, small intestine, large intestine, rectum, anus.		
Enzymes are biological molecules that speed up chemical reactions.		
Peristalsis is the contraction and relaxation of muscle to move food along.		
The small intestine has many tiny villi that increase the surface area. Villi have thin walls to allow for molecules to diffuse quickly.		

Knowledge Organiser: Digestive System

Active site	Site of reactions on an enzyme
Anemia	A disease caused by an iron deficiency. The body is unable to produce hemoglobin found in red blood cells needed to transport oxygen round the body.
Balanced diet	Diet which contains all the components needed to maintain health in appropriate proportions.
Bile	Chemical made in the liver. Neutralises stomach acid and emulsifies fats.
BMI	Body mass index – uses the height and weight of a person to determine if someone is a healthy weight.
Calories	A unit used for measuring the amount of energy in food.
Carbohydrates	The body's main source of energy.
Digestion	The process of breaking down large insoluble molecules into small soluble molecules that can be absorbed into the blood stream.
Enzymes	A biological catalyst – it is a substance that speed up the chemical reactions in the body.
Joules	The unit for measuring energy
Large intestine	Lower part of the intestine from which water is absorbed and where faeces are formed.
Lipids	Also known as fats. Used as a source of energy and insulation.
Peristalsis	Contraction and relaxation of muscle to move food along. Happens in the oesophagus and intestine.
Protein	Nutrient your body uses to build new tissue for growth and repair.
Rickets	A disease caused by a deficiency of vitamin D. Causes the legs to bow out in children.
Scurvy	A disease caused by a deficiency of vitamin C. Causes bleeding and swelling of the gums, loss of teeth, tiredness and muscle and joint pain.
Small intestine	Upper part of the intestine where digestion is completed and nutrients are absorbed by the blood.
Stomach	A sac where food is mixed with acidic juices to start the digestion of protein and kill microorganisms
Substrate	The molecule an enzyme acts on.
Villi	Small finger like projections in the small intestine that increase surface area.

Energy Content of Food:

- The energy released by food substances can be measured by burning the food and measuring the temperature change.
- The amount of energy found in foods is usually found on food labels and has the unit calories.



Balanced diet:

- A balanced diet is a diet in which all the components needed to maintain health are present in appropriate proportions.
- The seven food groups needed for a balanced diet are carbohydrates, lipids, proteins, vitamins, minerals, water and fibre.

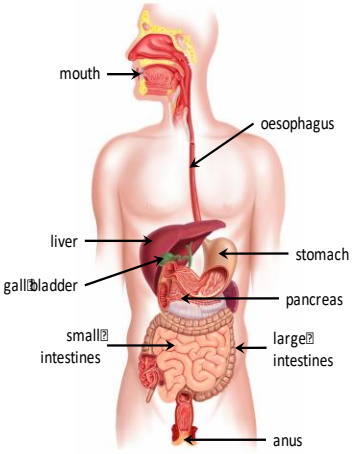
Nutrient	Use in the body	Good sources
Carbohydrate	To provide energy	Cereals, bread, pasta, rice and potatoes
Protein	For growth and repair	Fish, meat, eggs, beans, pulses and dairy products
Lipids (fats and oils)	To provide energy. Also to store energy in the body and insulate it against the cold.	Butter, oil and nuts
Minerals	Needed in small amounts to maintain health	Salt, milk (for calcium) and liver (for iron)
Vitamins	Needed in small amounts to maintain health	Fruit, vegetables, dairy foods
Dietary fibre	To provide roughage to help to keep the food moving through the gut	Vegetables, bran
Water	Needed for cells and body fluids	Water, fruit juice, milk

- An unbalanced diet includes too much or too little of the recommended food groups.
- An unbalanced diet can lead to many different diseases including:
    - Obesity – being very overweight and can lead to health complications such as heart disease.
    - Rickets – A condition caused by a lack of vitamin D (generally seen in children).
    - Scurvy – caused by a lack of vitamin C in the diet.
    - Anaemia – caused by a lack of iron in the diet, which reduces the production of haemoglobin found in red blood cells which reduces the transport of oxygen round the body.

Digestive System:

Digestion is the breaking down of large insoluble good molecules into smaller soluble molecules.
The digestive system contains organs that have specific roles in the digestion of food.

Organ	Role	Special adaptations
Mouth	Contains teeth to mechanically break down food and saliva to start chemically breaking down food.	Presence of amylase to start the chemical breakdown of carbohydrates.
Oesophagus	The tube that connects the mouth and stomach.	Contains muscle that relaxes and contracts to push food through in a process called peristalsis.
Liver	Produces bile which helps the digestion of lipids.	
Stomach	Contains hydrochloric acid to kill bacteria and start to breakdown food.	Thick muscular walls allowing for the mechanical churning of food.
Gall bladder	Where bile is stored.	
Pancreas	Produces enzymes to speed up digestion.	
Small intestine	Where most of the small molecules are absorbed into the blood steam.	Peristalsis, Villi, Presence of enzymes
Large intestine	Where most water is absorbed into the body.	Peristalsis
Anus	Where undigested food leaves the body as faeces.	



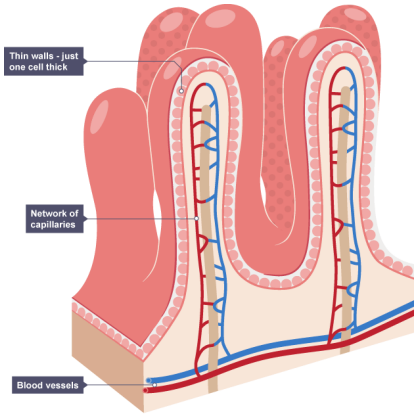
Villi:

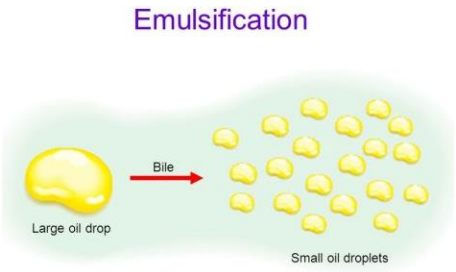
Small finger like projections that are found in the small intestine.

The villi increase the surface area of the small intestine allowing digested food molecules to be absorbed.

Villi have:

- Large surface area
- Thin, moist walls – to allow for diffusion
- Good supply of capillaries





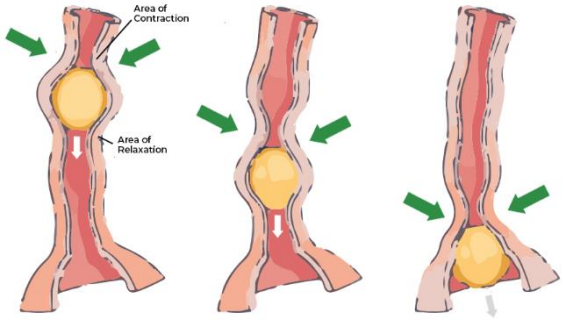
Bile:

Bile is an alkali made by the liver and stored in the gall baldder.

Bile emulsfies fats – breaking down large globules into smaller globules to increase the surface area for the enzymes to break them down.

Peristalsis:

Peristalsis is the contraction and relaxation of muscle to move food along. Peristalsis occurs in the oseophagus and intestines.



Enzymes:

Enzymes are biological catalysts that are made of proteins. Enzymes speed up the rate of reaction in the body. Different enzymes have different jobs.

Digestive Enzyme	Where released?	Breakdown what?
Amylase	Salivary glands and pancreas	Carbohydrates into simple sugars
Protease	Stomach and pancreas	Proteins into amino acids
Lipase	Pancreas	Fats and oils (lipids) into fatty acids and glycerol

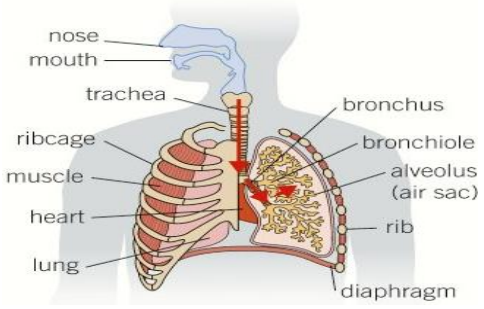
Breathing and Respiration Knowledge Organiser:

Aerobic respiration	The chemical process through which glucose is turned into energy with the use of oxygen.
Alveoli	Small air sacs found at the end of each bronchiole.
Anaerobic respiration	The chemical process through which glucose is turned into energy with out the use of oxygen, forming lactic acid.
Asthma	Respiratory condition that causes occasional breathing difficulties.
Breathing	The mechanical process of the lungs inflating and deflating to allow oxygen in and carbon dioxide out.
Bronchi	Two tubes which carry air to the lungs.
Bronchioles	Small tubes in the lung.
Capillaries	The smallest type of blood vessel, walls are one cell thick.
Diaphragm	A sheet of muscle found underneath the lungs.
Diffusion	The movement of a substance from an area of high concentration to an area of low concentration.
Emphysema	Alveoli become damaged and break down
Fermentation	Process of anaerobic respiration carried out by yeast to produce ethanol and carbon dioxide.
Gas exchange	The movement of oxygen from the lungs to the blood stream and carbon dioxide from the blood stream to the lungs.
Glucose	A simple sugar used for respiration.
Intercostal muscles	Sets of muscles between the ribs that raise and lower the rib cage.
Lactic acid	The waste product of anaerobic respiration.
Lung volume	Measure of the amount of air breathed in or out.
Mitochondria	The part of the cell where aerobic respiration occurs.
Passive smoking	Smoke from a lit cigarette is breathed in by someone who is not smoking
Respiration	A chemical process in which energy is released from food substances, such as glucose.
Ribs	Bones which surround the lungs to form the ribcage.
Trachea	Carries air from the mouth and nose to the lungs.

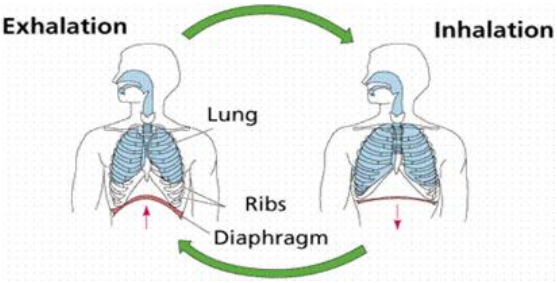
Respiratory System:

Breathing occurs through the action of muscles in the ribcage and diaphragm.

Oxygen travels from the mouth through;
windpipe → bronchus → bronchioles → alveoli → mouth



	Inhaling	Exhaling
Diaphragm	Contracts and moves downwards	Relaxes and moves upwards
Intercostal muscles	Contract, moving the ribs upwards and outwards	Relax, letting the ribs move downwards and inwards
Volume of ribcage	Increases	Decreases
Pressure inside the chest	Decreases below atmospheric pressure	Increases above atmospheric pressure
Movement of air	Moves into the lungs	Moves out of the lungs

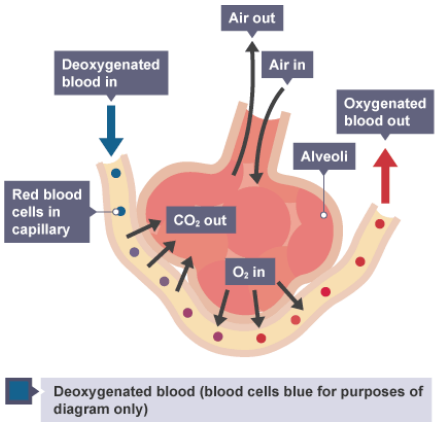


Gas Exchange:

Gas exchange is the movement of oxygen from the lungs to the blood stream and carbon dioxide from the blood stream to the lungs.

Adaptations of the alveoli:

- Large surface area
- Thin, moist walls
- Good blood supply



Measuring Breathing:

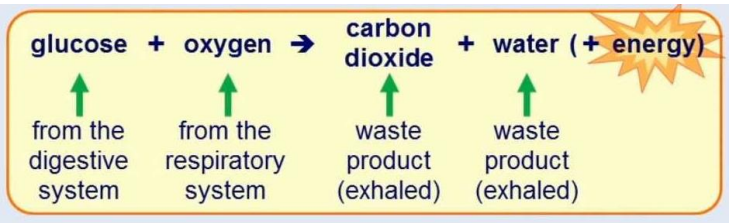
- A **lung volume** test is a way of measuring the total amount of air in your lungs, and how much air is left after you have breathed out as far as you can.

- Peak flow is **a simple measurement of how quickly you can blow air out of your lungs.**

- Pulse oximetry is a non-invasive test that measures the oxygen saturation level of your blood.

Aerobic Respiration:

Chemical reaction that happens in all living cells that releases energy from glucose.



Anaerobic respiration:

- Anaerobic respiration transfers energy from **glucose** to cells.
- It occurs when oxygen is **not** present.
- It transfers **large** amounts of energy **quickly**.
- Lactic acid builds up in muscles causing pain and tiredness.
- Lactic acid is broken down by oxygen.

Uses of anaerobic respiration:

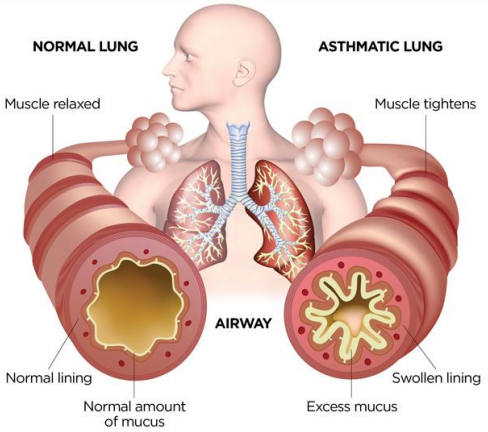
- Anaerobic respiration happens in microorganisms such as bacteria.
- Yeast carry out a type of anaerobic respiration called fermentation – this is used for making bread and alcoholic beverages.
- Fermentation: Glucose → ethanol + carbon dioxide.
- Bacteria are added to milk, they respire anaerobically producing lactic acid which sours the milk making yogurt.

Smoking and Asthma:

When you exercise your body needs more oxygen and glucose in the muscle cells for respiration.
When you exercise you can develop an oxygen debt, this happens when your body has to complete anaerobic exercise in order to get enough energy.

Asthma – respiratory condition, causes narrowing of the airways.

- Asthma attacks are triggered by infections, pollution, exercise and others.
- Asthma attacks can be treated and prevented using inhalers.



Smoking – cigarettes contain over 4000 chemicals, some of these are harmful.

- Tar coats the inside of the lungs, it can damage the alveoli and cilia cells.
- Nicotine is addictive.
- Carbon monoxide takes the place of oxygen on our red blood cells.

Organisms Revision:

Digestive system:	*Respiratory system:*
Adaptations of the digestive system:	*Adaptations of the respiratory system:*
Balanced diet:	*Smoking vs asthma:*

Forces Learning Journey:

Big Picture: A force is a push or a pull that acts on an object due to the interaction with another object. How can the size of force affect an object or it's characteristics?

Chemistry:
Electrostatic forces hold oppositely charged ions together in a bond.

Biology: Forces can impact the movement of an object – affecting how it behaves in an environment. When you breath in, the pressure in the lungs decreases, forcing air into the lungs. When you breathe out, the pressure in the lungs increases forcing the air out.

Physics: Forces impact on the movement of objects, the energy within a system and the movement of electrons in circuits.

KS2	Year 7	Year 8	Year 9	GCSE
• Some forces need contact between two objects, however magnetic forces can act at a distance. • Objects fall to Earth because of gravity. • Levers, pulleys and gears allow a smaller force to have a greater effect. • Forces are measured using a newton meter. • The units for measuring a force are Newtons. • Contact forces occur when two surfaces are touching. Examples of contact forces are: air resistance, friction, upthrust, normal contact force. • Frictional forces are created when two objects move against each other. • Air resistance is the force caused by particles in the air hitting an object. • Water resistance is the force caused by particles of water hitting an object as it moves through it. • The larger the surface airer, the more air resistance there is because there is more surface for the air particles to hit, leading to a greater force. • When an object floats the forces of upthrust and weight are equal or balanced. • When an object sinks the forces of upthrust and weight are not equal - unbalanced.	• A force is a push or pull that acts on an object due to the interaction with another object. All forces between objects are either: contact forces – the objects are physically touching or non-contact forces – the objects are physically separated. • Examples of contact forces include friction, air resistance, tension and normal contact force. • Examples of non-contact forces are gravitational force, electrostatic force and magnetic force. • Weight is the force acting on an object due to gravity. • The force of gravity close to the Earth is due to the gravitational field around the Earth. • The weight of an object can be calculated using the equation: weight = mass × gravitational field strength	• A number of forces acting on an object may be replaced by a single force that has the same effect as all the original forces acting together. This single force is called the resultant force. • Drag is a force that acts on object causing it to slow down as it moves through a liquid or gas. • Terminal velocity is the maximum speed a falling object can reach, as the forces become balanced. • An object with a larger surface area will experience more air resistance than an object with a smaller surface area, because more air particles come in contact with the surface. • The extension of an elastic object, such as a spring, is directly proportional to the force applied, provided that the limit of proportionality is not exceeded. • Directly proportional means as one variable increases, the other variable increases at the same rate. For example, if you double variable one, variable two will double.	Moment is the turning effect of a force. Moment = force x perpendicular distance	• Scalar quantities have magnitude only. • Vector quantities have magnitude and an associated direction. • Spring constant: force = spring constant × extension • A force that stretches (or compresses) a spring does work and elastic potential energy is stored in the spring. • Provided the spring is not inelastically deformed, the work done on the spring and the elastic potential energy stored are equal. • Newton's third law: whenever two objects interact the forces they exert on each other are equal and opposite.
		• Pressure is the force exerted over an area. • Pressure = force / area Units for pressure = N/m2 or Pa. • Pressure increases further down in a liquid you go. • Pressure in gases is caused by gas particles hitting the side of the container they are in, exerting a force.	•	• If the temperature of a gas is increased, but the volume remains constant, the pressure increases. • Chemistry: Increasing the pressure of a system will increase the rate of reaction as the particles are pushed closer together.

PE: Forces impact the movement of cars due to the forces between tires, friction between shoes and the ground.

Maths: Using and manipulating mathematical formula. Drawing a line graph.

Design Technology:
- Designing machines for specific purposes, the effects of forces needs to be considered for example vehicles, falling objects, cogs etc.
- Force required to apply pressure for using a hammer or saw.

Careers: Materials engineers, lorry drivers, mechanic, design and maintenance engineers, aircraft maintenance staff, sports engineers, F1 engineer.




Forces Target Sheet:

Circle how confident you feel at the start of the topic and the end of the topic.

Red = I know nothing **Amber = I know something** **Green = I feel confident with this**

Key Knowledge	Confidence before topic RAG	Confidence after topic RAG
Forces are pushes or pulls that arise from the interaction between two objects.		
If the forces on an object are balanced the object will with stay stationary or continue moving at a constant speed in the same direction.		
If the forces acting on an object are unbalanced the object can start moving, change speed or direction.		
Newton's First Law of Motion states that objects with balanced forces acting on them will stay at rest or stay in constant motion.		
The overall force acting on an object is the resultant force.		
To calculate resultant forces: Bigger force - smaller force = resultant force		
Drag is a force that acts on object causing it to slow down as it moves through a liquid or gas.		
Streamlined shapes are pointed and allow the fluid to pass around a moving object.		
Air resistance is caused by air particles hitting a falling object, causing it to slow down.		
An object with a larger surface area will experience more air resistance than an object with a smaller surface area, because more air particles come in contact with the surface.		
Terminal velocity is the maximum speed a falling object can reach.		
Elastic materials and objects such as springs, change shape when a force is exerted on them.		
Hooke's law describes that the extension of an object or material is directly proportional to the force applied.		
Directly proportional means as one variable increases, the other variable increases at the same rate. For example, if you double variable one, variable two will double.		
Pressure is the force exerted over an area.		
Pressure = force / area		
Atmospheric pressure changes with altitude. The higher you go: The lower the weight of the air above you The lower the atmospheric pressure		
The pressure in liquids changes on the depth. The deeper you go: The greater the weight of the liquid above The greater the liquid pressure.		

Forces Knowledge Organiser

Air resistance	The force that acts against gravity on a falling object, caused by air particles hitting the surface of the object.
Atmospheric pressure	The pressure exerted on everything caused by the atmosphere.
Balanced forces	When two forces are the same size and cause an object to move at a constant speed or remain stationary.
Compression	Happens when the material or object is squashed
Contact Force	A force that occurs when two objects touch each other to exert a force.
Deformation	Changing shape and/or size as a result of a force being applied.
Directly proportional	As one variable increases, the other variable increases at the same rate.
Drag	Drag is created by forces acting on an object moving through air or water that causes it to slow down.
Elastic materials	Change shape when a force is exerted on them.
Extension	The increase in length when pulled
Force	Push or pull that arise from the interaction between two objects.
Hooke's law	Law describing that the extension of an object or material is directly proportional to the force applied.
Newton	Unit for measuring forces (N).
Newton meter	Piece of equipment used to measure the force exerted.
Non-contact Force	A force that occurs when two objects do not have to touch to exert a force.
Pascals	Units for measuring pressure
Pressure	The force exerted over an area.
Resultant force	If forces are unbalanced, the difference in these forces is the resultant force – it is the overall force that would be acting on the object.
Stretching	Happens when the material or object is pulled
Terminal velocity	The speed reached when the forces on a balanced object become balanced.
Unbalanced forces	When two forces are different sizes and cause an object to speed up, slow down or change direction.

Reminder:

Force diagrams show the direction and size of the force.

The arrows need to be proportional to the size of the force – the larger the force, the larger the arrow should be.

When two objects or materials need to be touching for a force to have an effect, it is a **contact** force.

Examples:
- friction
- air resistance

When two objects or materials do not need to be touching for a force to have an effect, it is a **non-contact** force.

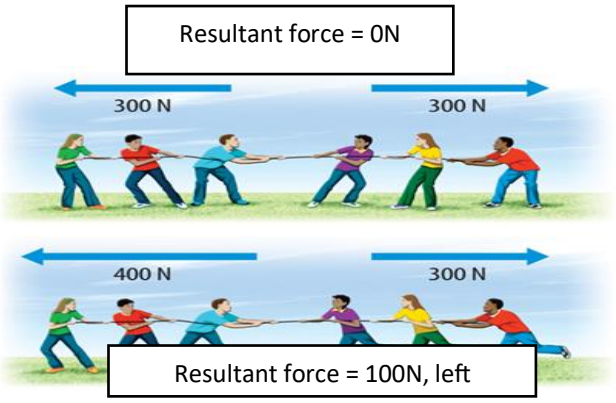
Examples:
- gravity
- electrostatic
- magnetic

Non-contact forces act over a distance.
Are these non-contact forces attractive, repulsive or both?

Resultant forces:

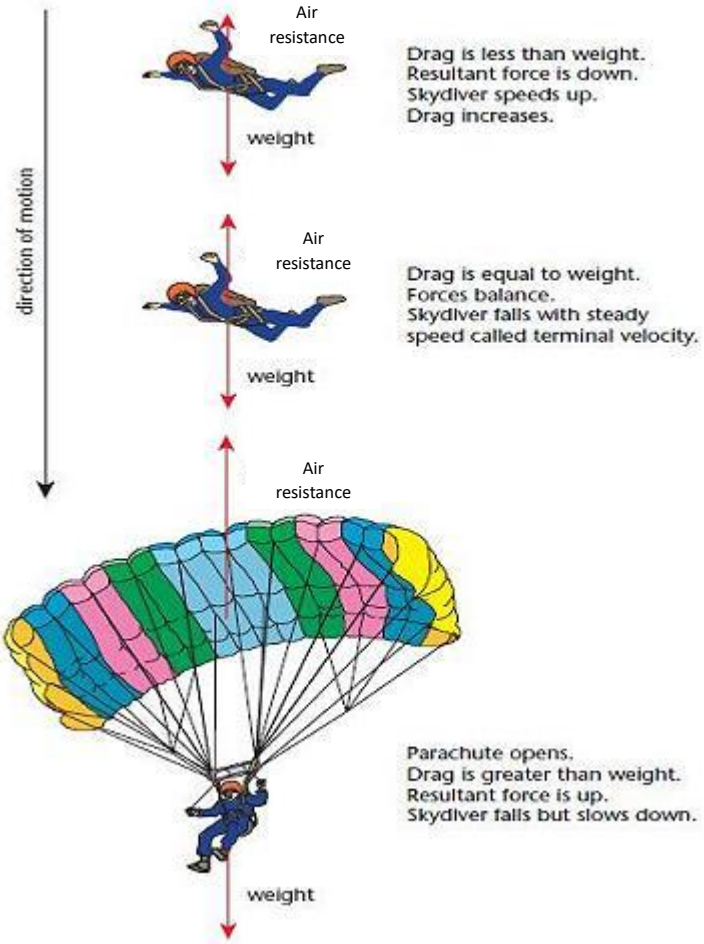
When the forces acting on an object are equal in size and acting in opposite direction they are **balanced**. The object is in **equilibrium**.

If the forces are unbalanced the object will **speed up**, **slow down**, or **change direction**.



Terminal Velocity:

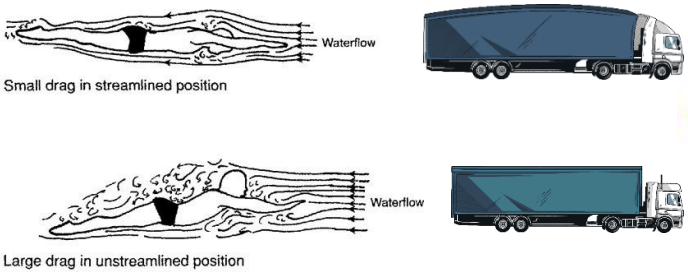
At terminal velocity, the object moves at a steady speed in a constant direction because the **resultant force** acting on it is zero.



Drag:

Drag is created by forces acting on an object **moving through air or water** that causes it to slow down.

Making objects streamlined reduces drag.



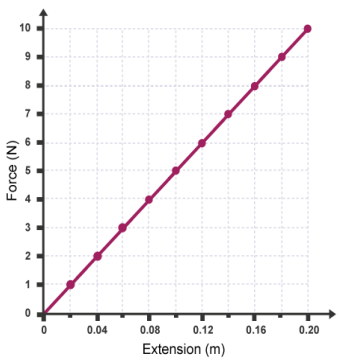
Hooke's law:

Elastic materials, and objects such as springs, change shape when a force is exerted on them:

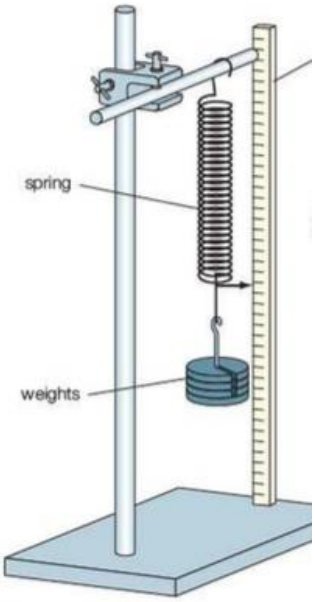
- stretching happens when the material or object is pulled
- compression happens when the material or object is squashed.

The extension of a material or a spring is its increase in length when pulled. Hooke's Law says that the extension of an elastic object is directly proportional to the force applied to it. In other words:

- if the force applied is doubled, the extension doubles
- if no force is applied, there is no extension



This graph shows that the material obeys Hook's law as it is directly proportional.

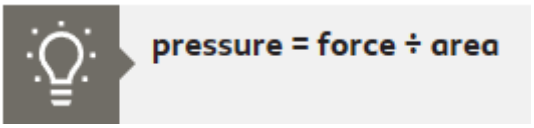


Calculating pressure

To calculate pressure, you need to know two things:

- the force or weight exerted
- the **surface area** over which the force or weight is spread

Pressure is calculated using this equation:

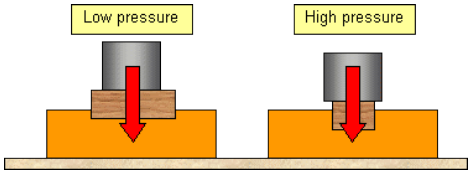


Example:

A force of 20 N acts over an area of 4 m^2. Calculate the pressure.

pressure = force ÷ area

= 20 N ÷ 4 m^2 = 5 N/m^2



Thinking about pressure:

The area that is contact with the surface makes a difference on the pressure exerted.

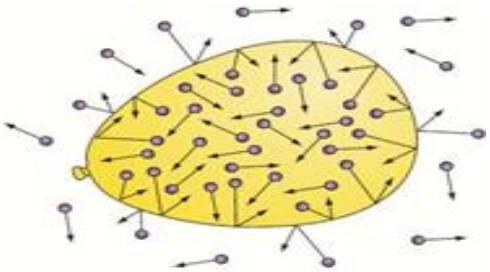
- The larger the surface area, the lower the pressure.
- The smaller the surface area, the greater the pressure.

Pressure in Liquids:

Liquids are incompressible. The pressure at a particular depth in a liquid depends on the weight of water above it. Pressure increases with depth.

Balloons:

- When you blow into a balloon, you increase the number of particles in the balloon.
- This increases the pressure inside the balloon and causes it to expand.
- When the pressure inside the balloon is the same as the air pressure, the balloon stops expanding.



Forces Revision:

Resultant Forces:	*Hooke's Law:*
Drag:	*Pressure:*
Terminal Velocity:	*Pressure in fluids:*

Reactions Learning Journey:

Big Picture: A chemical reaction can be observed in many ways and the reactivity of the reactants will impact on the speed the reaction takes place and the products of the reaction. What different types of chemical reaction occur in everyday activities?

Chemistry:
Chemical reactions happen when atoms are rearranged to form new compounds – this is based on their atomic structure.

Biology:
- Respiration is an exothermic reaction.
- Photosynthesis is an endothermic reaction.
- Enzymes are examples of catalysts and speed up biological catalysts.

Physics:
Fossil fuel combustion is used in electrical power stations. Chemical energy stores are found in substances which release energy during a chemical reaction.

KS2	Year 7	Year 8	Year 9	GCSE
• Some changes result in a new substance being made, this is an irreversible change, some changes do not made something new and can be changed back into it's original form, this change is reversible. • A solution is formed when a substance dissolves into a liquid. • When a material is heated it will return to how it was before being heated. • Heating is a reversible change, burning is an irreversible change.	A neutralisation reaction is a chemical reaction that happens if you mix an acid and a base together.	• Metal + acid --> salt + hydrogen • The reactivity series is a list of metals in order of their reactivity, the most reactive metal at the top, the least reactive metal at the bottom. • Displacement reactions a more reactive element will take the place of a less reactive element in its compound. • Combustion is another name for burning. • Complete combustion is the burning of a fuel in a plentiful supply of oxygen. • Complete combustion: Hydrocarbon + oxygen --> carbon dioxide + water • Incomplete combustion happens when there is not a plentiful supply of oxygen. • Incomplete combustion produces carbon monoxide and carbon particulates. • A fuel is a substance that releases energy when burnt. • In an oxidation reaction a substance gains oxygen. • Metal + oxygen --> metal oxide • Metal oxides dissolve in water to produce alkaline solutions. • Thermal decomposition is the break down of a compound using heat. • Catalysts speed up the rate of a reaction. • Test for carbon dioxide - limewater turns cloudy. • Test for oxygen - relight a glowing splint. • Test for hydrogen - squeaky pop.	• Chemical reactions occur when atoms are rearranged. • Reactions can be shown as word or symbol equations. • Symbol equations need to be balanced showing the number of each type of atom in the reactants and products. • Metals can be arranged into the reactivity series, with the most reactive at the top and the least reactive at the bottom. • The reactivity of a metal relative to carbon can be used to explain how it is extracted from it's ore via electrolysis or reduction with carbon.	• Reactions of elements is related to their arrangement of their electrons. • Oxidation is the loss of electrons, reduction is the gain of electrons. • Electrolysis is the breakdown of a compound by passing an electric current through it. • The rate of a chemical reaction can be found by measuring the quantity of a reactant used or the quantity of product formed divided by the time taken. • Catalysts increase the rate of reaction by providing a different pathway for the reaction that has a lower activation energy. • When a reversible reaction occurs in a sealed system, equilibrium is reached. • Test for chlorine - damp litmus paper bleaches and turns white.
		• An exothermic reaction is one that transfers energy to the surroundings so the temperature of the surroundings increases. • Exothermic reactions include combustion, many oxidation reactions and neutralisation. • An endothermic reaction is one that takes in energy from the surroundings so the temperature of the surroundings decreases. • Endothermic reactions include thermal decomposition.		• Energy is conserved in chemical reactions. • Chemical reactions can occur only when reacting particles collide with each other and with sufficient energy. • Reaction profiles can be used to show the relative energies of reactants and products, the activation energy and the overall energy change of a reaction.

Design and Food Technology:
Chemical changes happen when new substances are made – this could happen during cooking.

Maths:
Temperature change calculations – using scales.

PE: Respiration is needed to release more energy during exercise, respiration is an exothermic reaction.

Geography:
Combustion in the production of electricity – non-renewable energy resource.

Careers: Chef, soil scientist, builder, industrial cleaner, doctor, marine biologist, farmer.





Reactions Target Sheet:

Circle how confident you feel at the start of the topic and the end of the topic.

Red = I know nothing **Amber = I know something** **Green = I feel confident with this**

Key Knowledge	Confidence before topic RAG	Confidence after topic RAG
An exothermic reaction is one in which energy is released to the surroundings. The temperature will increase.		
Examples of exothermic reactions include combustion and neutralisation.		
An endothermic reaction takes in energy from the surroundings. The temperature will decrease.		
Examples of endothermic reactions include thermal decomposition.		
Metal + acid → salt + hydrogen		
The test for hydrogen is the squeaky pop test.		
The reactivity series is a list of metals from the most reactive to least reactive.		
Displacement reactions happen when a more reactive element takes the place of a less reactive element in a compound.		
Combustion is another name for burning.		
Combustion needs a fuel (a chemical store that releases energy when burnt), oxygen and heat.		
When a hydrocarbon fuel is burnt it releases carbon dioxide and water.		
Complete combustion is the burning of a fuel in a plentiful supply of oxygen.		
Hydrocarbon + oxygen → carbon dioxide + water		
Incomplete combustion happens when there is not a plentiful supply of oxygen – it produces carbon monoxide and carbon particulates (carbon particulates).		
Hydrocarbon + limited oxygen → water + carbon monoxide + carbon particulates		
Thermal decomposition is the break down of a compound using heat.		
Metal carbonate → metal oxide + carbon dioxide		
The test for carbon dioxide gas is to bubble the gas through limewater. If the limewater turns cloudy, carbon dioxide is present.		
A catalyst speeds up a reaction without being used up in the reaction itself.		
Catalytic converters are used in the exhaust systems of cars to reduce the toxic gases that are released from combustion engines.		

Reactions Knowledge Organiser:

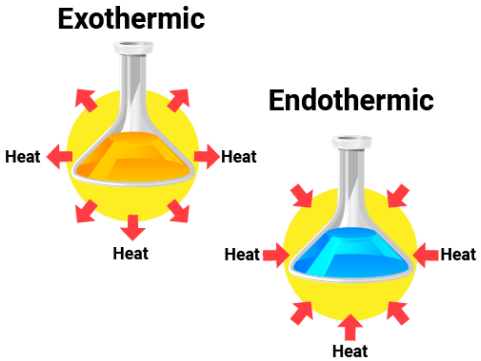
Acid rain	Acid rain is formed when sulfur dioxide produced from burning fuels dissolves in rain water.
Bond	A force that holds two atoms together in a compound.
Catalyst	A substance that speeds up a chemical reaction.
Chemical change	Atoms in substances rearrange to create new substances.
Combustion	Reaction when a substance reacts with **oxygen** from the air and transfers energy to the surroundings as light and heat. Also known as burning.
Complete combustion	Burning fuel with a plentiful supply of oxygen.
Conservation of energy	Energy cannot be created or destroyed, only transferred from one form to another.
Displacement reactions	A more reactive element will take the place of a less reactive element in a compound.
Endothermic Reaction	A reaction that absorbs energy from the surroundings. 
Exothermic Reaction	A reaction that releases energy to the surroundings. 
Fuel	A substance that can be burnt to produce energy (usually as heat).
Hydrocarbon	A compound made of carbon and hydrogen only
Incomplete combustion	Burning with an insufficient supply of oxygen.
Internal energy	Total amount of kinetic energy and potential energy of all the particles in the system.
Oxidation	A reaction in which a substance gains oxygen.
Physical change	The atoms in a substance have the same arrangement, the state will change. For example: solid → liquid.
Reactivity series	List of metals from the most reactive to the least reactive.
Reduction	The removal of oxygen from a compound.
Temperature	Measure of how hot or cold a substance is. Measured in °C.
Thermal Decomposition	The process by which a compound is broken down using heat.

Exothermic and Endothermic Reactions:

When a chemical reaction happens, energy is transferred to or from the surroundings.

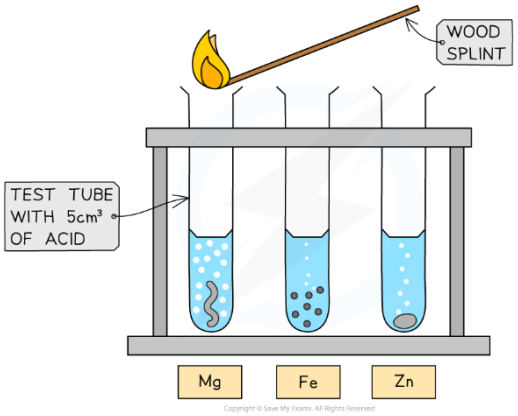
Exothermic reaction: the temperature increases, energy is taken in from the surroundings. Examples: combustion, neutralization.

Endothermic reaction: the temperature decreases, energy is taken in from the surroundings. Examples: thermal decomposition.



Metal + acid:

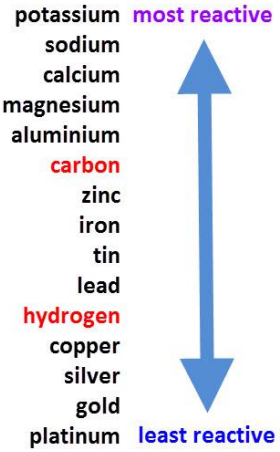
- Hydrogen released – seen as bubbles.
- More reactive metal = more bubbles produced.
- Metal + acid → salt + hydrogen
- Salt names:
    - Name of metal first (e.g. iron)
    - Convert the name of the acid:
        - Sulfuric acid = sulfate
        - Nitric acid = nitrate
        - Hydrochloric acid = chloride

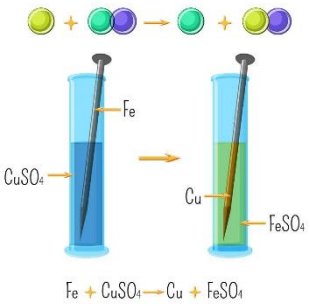


Reactivity series and displacement reactions:

The reactivity series is a list of metals from the most to least reactive. Carbon and hydrogen are the only two non-metals included.

The reactivity series can be used to predict displacement reactions.

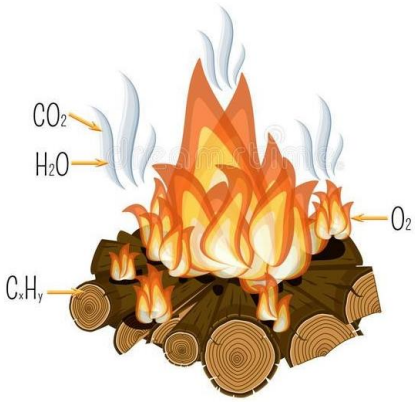




more reactive element takes the place of a less reactive element in a compound.

Combustion:

- Combustion is the scientific word for **burning**.
- In a combustion reaction a substance reacts with **oxygen** from the air and transfers energy to the surroundings as light and heat.
- The products of a combustion reaction are called **oxides**.



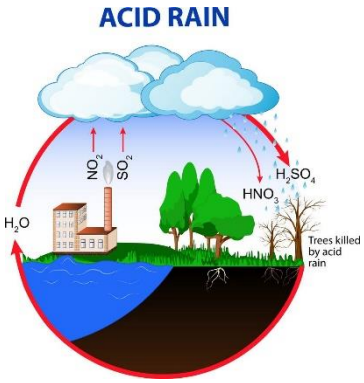
hydrocarbon + oxygen → carbon dioxide + water

$$C_xH_y + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(g)}$$

	Complete Combustion	Incomplete Combustion
Is there enough oxygen?	Yes	No
Energy released – high or low?	High	Low
Is carbon dioxide produced?	Yes	Limited
Problems with carbon dioxide:	Greenhouse gas, which contributes to global warming.	
Is carbon monoxide produced?	No	Yes
Problems with carbon monoxide:	Colourless, odorless gas, toxic to humans. Takes the place of oxygen on red blood cells.	
Is water produced?	Yes	Yes
Problems with water vapour:	Green house gas which contributes to global warming.	
Is soot produced?	No	Yes
Problems with soot:	When breathed in, can cause respiratory problems, it also leaves a layer over surrounding environments.	

Metal oxide formation:

- Metals react with oxygen from the air to produce metal oxides in an oxidation reaction.
- Metal + oxygen → metal oxide.
- Metal oxides are bases and react with acids in a neutralisation reaction.
- Metal oxides dissolve in water to produce alkaline solutions.



Non-metal oxides:

Non metals react with oxygen to form non-metal oxides such as carbon dioxide and sulfur dioxide.

Thermal decomposition:

- Thermal decomposition is the breaking down of a compound using heat.
- Thermal decomposition forms two or more products from one reactant.

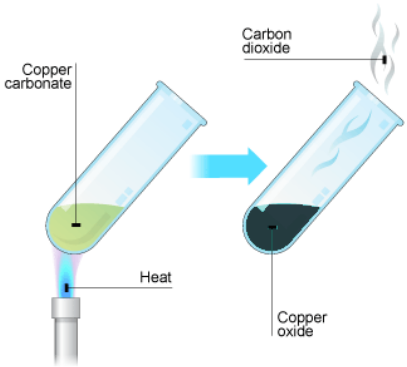
calcium carbonate $CaCO_3$ → calcium oxide CaO + carbon dioxide CO_2

Investigation:

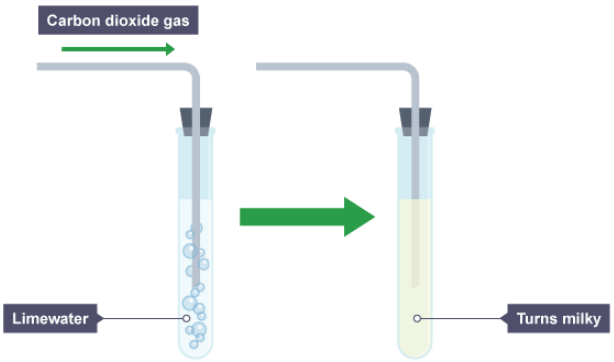
Independent variable: the type of carbonate used.

Dependent variable: the time it takes for limewater to go cloudy.

Control variables: height of boiling tube, mass of metal carbonate, volume of limewater, type of Bunsen burner flame.



Test for carbon dioxide:

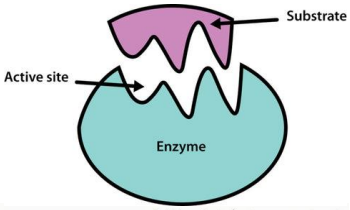


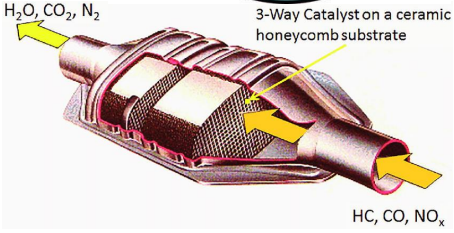
Role of a catalyst:

A catalyst speeds up a chemical reaction, whilst remaining chemically unchanged.

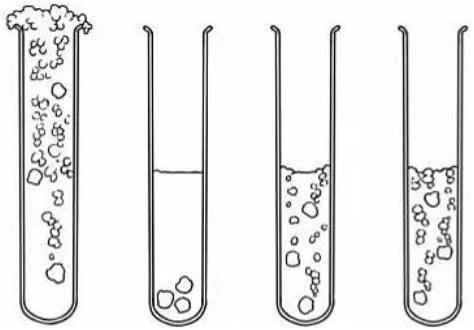
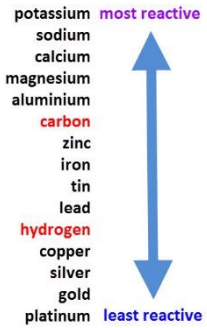
Examples of catalysts:

- Enzymes – found in the human body, particularly the digestive system to aid the break down of food.
- Rhodium and platinum in catalytic converters.





Reactions Revision:

Exothermic and Endothermic Reactions:	*Combustion:*
Metal + acid: 	*Thermal Decomposition:*
Reactivity Series and Displacement: 	*Catalysts:*

Organisms - Plants Learning Journey:

Big Picture: Plants are living things that reproduce and make their own food. How does this happen and what is photosynthesis?

Biology:
- Reproduction causes variation.
- Cells – plant cells and specialised cells.
- Interdependence – plants are the first organism in all food chains.

Chemistry:
Photosynthesis is an endothermic chemical reaction.

Physics:
Glucose is a chemical energy store in plants, it can be used by plants or humans for respiration.

KS2	Year 7	Year 8	Year 9	GCSE
• Plants make their own food. Plants need air, light, water, nutrients to grow. • Plants have leaves, flowers, petals, roots, stem, some have bulbs, seeds, fruit, trunk and branches. • Seeds and bulbs grow into mature plants. Plants need water, light, air, nutrients, room to grow and a suitable temperature to stay healthy. • Water is transported from the roots of the plants, via the stem to the leaves. • Germination is the process by which a plant grows from a seed. • Plant life cycle - pollination, seed formation and seed dispersal.	• Chloroplasts are where light is absorbed for photosynthesis. • Taught in organisms - Plant cells contain a nucleus (contains DNA), cytoplasm (site of chemical reactions), mitochondria (site of respiration), cell membrane (controls what goes in and out of the cell), chloroplasts (absorb light for photosynthesis), cell wall to give the cell structure and support), vacuole (contains cell sap).	• Photosynthesis happens inside the chloroplasts. • Carbon dioxide + water --> glucose + oxygen • Carbon dioxide is taken in through the stomata of the leaves. Water is absorbed through the roots of the plants. • Oxygen is released through the stomata of the leaves. • Glucose made in photosynthesis forms starch, starch can be tested for using iodine. A positive result for starch is iodine turning blue / black. • The leaf, stem, flower and roots are plant organs. • Parts of a plant include: petal, anther, stamen, filament, stigma, ovary, ovule, nectary and sepal. • Xylem is the vessel that transports water through the plant. • Phloem is the vessel that transports glucose through the plant. • For plants to reproduce they need to be pollinated, this can happen via insects or wind. • Pollination involves the movement of pollen grains from the anther of one flower to the stigma of another flower. • The female sex cells in a flower are the ovule, the male sex cell is the pollen grain. • Spearing seeds is called dispersal, this can happen through animals, wind, self-propelled.	• Stomata are found on the leaves of plants allowing for the exchange of carbon dioxide and oxygen. • Plant leaves are adapted for efficient photosynthesis, including a waxy cuticle to reduce water loss and air spaces to help with gas exchange.	• Photosynthesis is an endothermic reaction. • The rate of photosynthesis can be affected by temperature, light intensity, carbon dioxide concentration and the amount of chlorophyll. • Plant tissues include epidermal tissues, palisade mesophyll, spongy mesophyll, xylem and phloem, meristem tissue. • Transpiration is the loss of water from the leaves by evaporation through the stomata. • Root hair cells are adapted for efficient uptake of water by osmosis and mineral ions by active transport. • In sexual reproduction, there is a mixing of genetic information which leads to variation in the offspring. • Asexual reproduction involves only one parent and no fusion of gametes which leads to identically identical offspring.

PSHCE and History: Plants have been used over time as medicines – aspirin comes from the bark of a willow tree.

Geography: Understanding how a balanced diet and food choices can impact on staying healthy.

Careers: Bee keepers, environmental toxicologist, crop plant breeders, nature conservation officers, organic farmers, rare breed farmers, veterinary epidemiologist.





Organisms – Plants Target Sheet:

Circle how confident you feel at the start of the topic and the end of the topic.

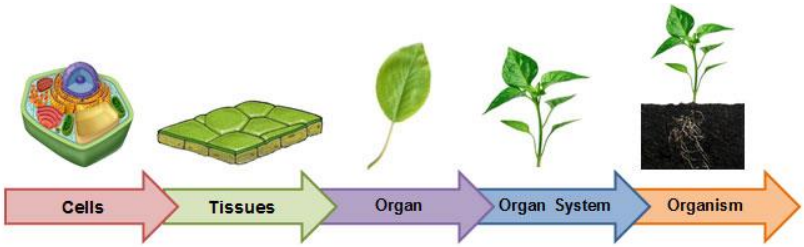
Red = I know nothing **Amber = I know something** **Green = I feel confident with this**

Key Knowledge	Confidence before topic RAG	Confidence after topic RAG
Organisation - cell--> tissue --> organ --> organ system --> organism		
Organs in a plant are the flower, roots and stem.		
Parts of a plant include: petal, anther, stamen, filament, stigma, ovary, ovule, nectary and sepal.		
Pollination involves the movement of of pollen grains from the anther of one flower to the stigma of another flower.		
Pollination can happen via insects or wind.		
The sex cells in the flower are: ovule (female) and pollen grain (male).		
Fertilisation occurs in a plant when the nucleus of the pollen grain joins with the nucleus of the ovule.		
A seed has three main parts: Embryo, food store and seed coat.		
Many crops depend on pollination by insects to survive.		
Without pollinators food security would be threatened and there would be a worldwide shortage of fruit.		
Plants compete with each other for light, water, space and minerals.		
Four methods of seed dispersal: wind, animal (inside), animal (outside) and self-propelled.		
Seed banks store seeds for plants to ensure they can be grown – maintaining biodiversity.		
Plants contain palisade cells in the leaves to absorb light for photosynthesis.		
Plants have root hair cells that absorb water and nutrients.		
Water moves into plants via diffusion through the root hair cells.		
Root hair cells have a large surface area for the absorption of water.		
Xylem tubes transport water through the leaf and plant.		
Phloem tubes carry food through the leaf and plant.		
Plant cells contain cell membrane, cytoplasm, nucleus, mitochondria, cell wall, vacuole and chloroplasts.		
Plants make their own food (glucose) in a process called photosynthesis.		
Photosynthesis is important for maintaining the levels of oxygen and carbon dioxide in the atmosphere.		
The word equation for photosynthesis is: carbon dioxide + water --> glucose + oxygen		
Photosynthesis happens inside chloroplasts.		
Chloroplasts contain chlorophyll which absorbs light for photosynthesis.		
Plants get carbon dioxide from the air it enters the leaf through stomata.		
Plants get water from the ground and is absorbed by the roots.		
Oxygen produced is released into the air from the leaves.		
Glucose can be turned into other substances such as starch or used in respiration.		
To test if a plant has been photosynthesising you can test the leaf with iodine to see if starch is present.		
If starch is present, iodine will turn black.		
Plants and trees remove carbon dioxide from the atmosphere.		
Plants are a source of food for many species on Earth.		
Plants can be used to make drugs including: aspirin comes from willow trees, caffeine comes from coffee beans, tea leaves and cacao pods, nicotine comes from tobacco plants		

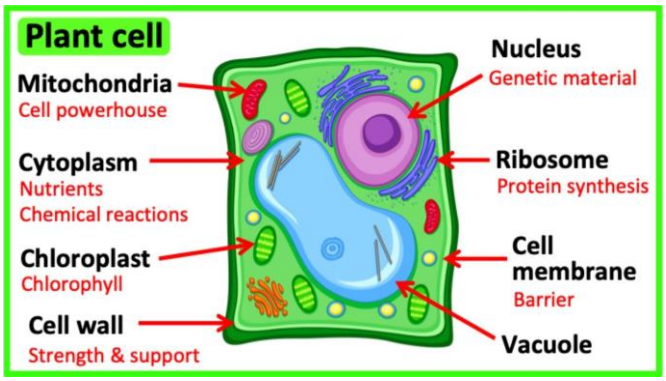
Organisms - Plants Knowledge Organiser:

Anthers	Produce male sex cells (pollen grains)
Biodiversity	he variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.
Carbohydrate	Long chain molecules containing lots of glucose molecules joined together
Chlorophyll	Green pigment in chloroplasts where sunlight is absorbed so photosynthesis can take place.
Chloroplast	Located in plant cells where photosynthesis takes place
Dispersed	Spread away from the source.
Ecosystem	a biological community of interacting organisms and their physical environment.
Embryo	The young root and shoot part of a seed that will become the adult plant.
Fertilisation	When the male and female reproductive cells fuse (join) together.
Germination	The growth of a plant from a seed or spore.
Glucose	Simple sugar which is an important energy source for living organisms
Hair Root Cell	Root hairs refer to the long and thin hairs that can penetrate between the soil particles.
Iodine Test	Iodine is orange and will turn blue/black in the presence of starch.
Nectary	Produce a sugary solution called nectar, which attracts insects
Nucleus	Part of the cell that contains genetic material.
Ovary	Produces the female sex cells (contained in the ovules)
Ovule	The female sex cell in plants.
Palisade Cell	Cell located in the leaf of plants what contains lot of chloroplasts
Petals	Colourful to attract the insects
Phloem	Tissue in the plant carries sugars and other dissolved nutrients around the plant
Photosynthesis	Chemical reaction within plants to produce glucose: Carbon dioxide + Water → Glucose + Oxygen
Pollen grain	Contains the male sex cell for plant reproduction
Pollination	The movement of pollen grains from the anther of one flower to the stigma of another flower.
Seed	The developing ovule after fertilization
Sepals	Protect the unopened flower
Stamen	The male parts of the flower (each consists of an anther held up on a filament).
Starch	Example of a carbohydrate which is found in plants.
Stigma	The top of the female part of the flower which collects pollen grains
Xylem	Tubular tissue in the plant carrying water from the roots to the leaves

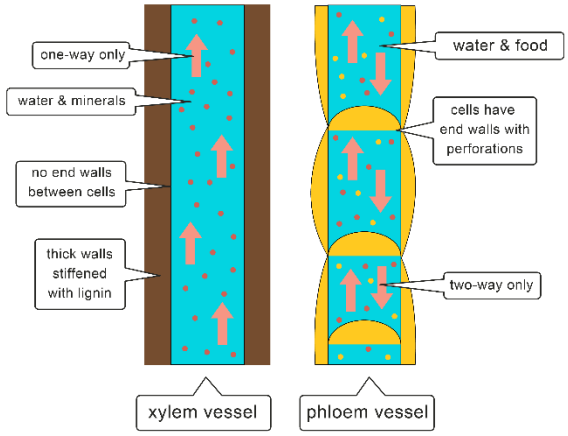
Organisation:



Cell Structure:

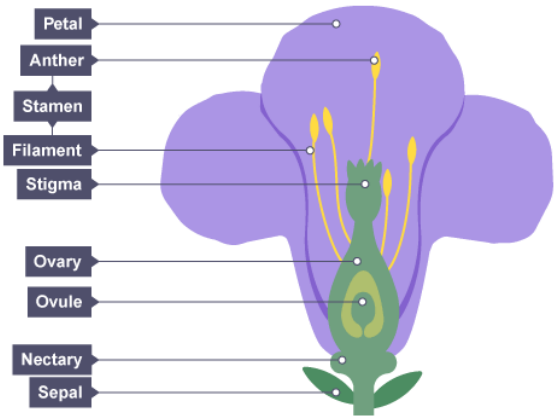


Transport in plants:



Structure of Flowers:

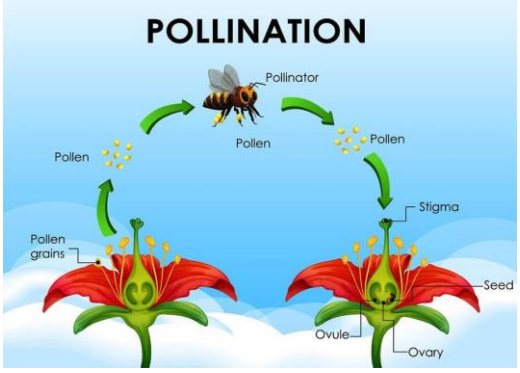
The flower is the reproductive organ of many plants.

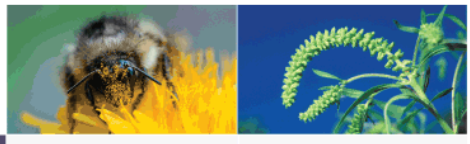


Structure	Function
Sepals	Protect the unopened flower
Petals	May be brightly coloured to attract insects
Stamens	The male parts of the flower (each consists of an anther held up on a filament)
Anthers	Produce male sex cells (pollen grains)
Stigma	The top of the female part of the flower which collects pollen grains
Ovary	Produces the female sex cells (contained in the ovules)
Nectary	Produce a sugary solution called nectar, which attracts insects

Pollination:

Insects can pollinate flowers, and so can the wind. Insect-pollinated flowers are different in structure from wind-pollinated flowers. This table describes some differences:



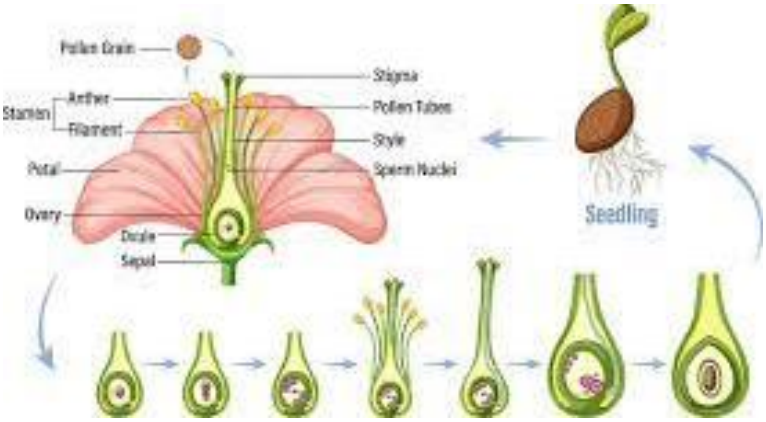


Feature	Insect-pollinated	Wind-pollinated
Petals	Large and brightly-coloured – to attract insects	Small, often dull green or brown – no need to attract insects
Scent and nectar	Usually scented and with nectar – to attract insects	No scent or nectar – no need to attract insects
Number of pollen grains	Moderate - insects transfer pollen grains efficiently	Large amounts – most pollen grains are not transferred to another flower
Pollen grains	Sticky or spiky - sticks to insects well	Smooth and light – easily carried by the wind without clumping together
Anthers	Inside flower, stiff and firmly attached - to brush against insects	Outside flower, loose on long filaments – to release pollen grains easily
Stigma	Inside flower, sticky - pollen grains stick to it when an insect brushes past	Outside flower, feathery – form a network to catch drifting pollen grains

Plant Pollination and Fertilisation:

A pollen grain starts to grow if it lands on the stigma of a flower of the correct species. A pollen tube grows through the tissues of the flower until it reaches an ovule

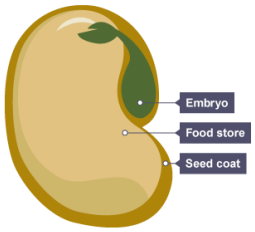
inside the ovary. The nucleus of the pollen grain (the male gamete) then passes along the pollen tube and joins with the nucleus of the ovule (the female gamete). This process is called fertilisation.



Seeds:

A seed has three main parts:

- embryo – the young root and shoot that will become the adult plant
- food store – starch for the young plant to use until it is able to carry out photosynthesis
- seed coat – a tough protective outer covering



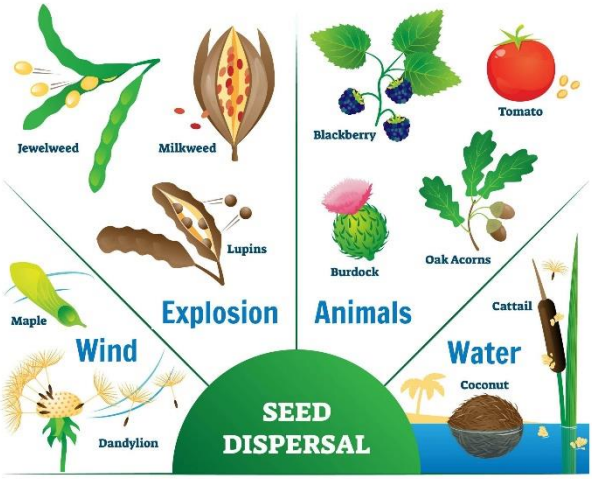
Seed dispersal:

Plants compete with each other for factors such as:

- light
- water
- space
- minerals in the soil

Seeds must be dispersed or spread away from each other and from the parent plant. This is to reduce between the parent plant and the new plants, and between the new plants.

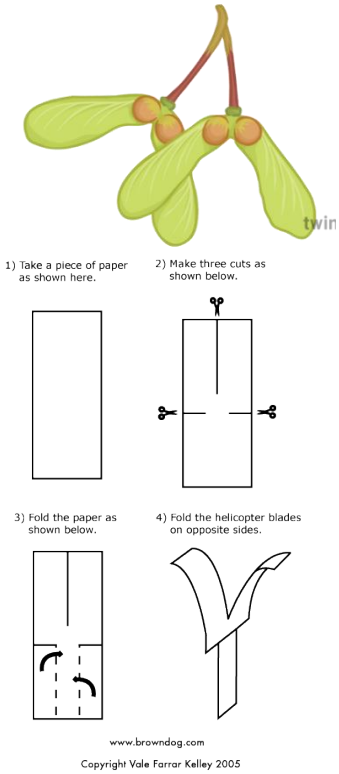
Method	Detail	Examples
Wind	Seeds have lightweight parts, wings or parachutes. 	Dandelion, sycamore
Animals (inside)	Brightly coloured and tasty fruits contain seeds with indigestible coats, so that the seeds pass through the animal's digestive system undamaged. 	Tomato, plum, raspberry, grape
Animals (outside)	Fruits have hooks that attach them to the fur of passing animals. 	Goose grass, burdock
Self-propelled	Have a pod that bursts open when ripe, throwing the seeds away from the plant. 	Pea pod



Investigating Seed Dispersal:

Seeds dispersed by the wind are easier to investigate than seeds dispersed by other methods. For example, you could release sycamore seeds and measure the distance they travel. Factors that could affect the distance travelled by a sycamore seed include:

- the height from which it is released
- the surface area of the wings
- the mass of the seed
- the wind speed

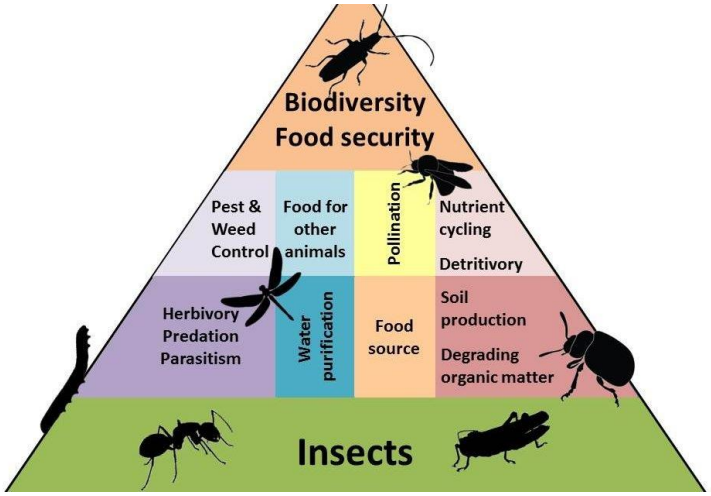


Investigation:

Independent variable – height seed is dropped from, surface area of the seed, mass of the seed.

Dependent variable – time taken to reach the floor

Importance of Insects:

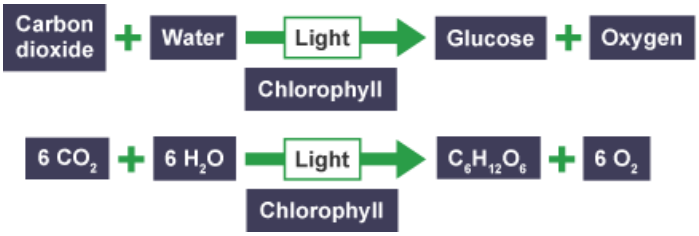


Seed Banks:

- Plant species can be endangered.
- Seed banks are used to store seeds of all plants to ensure that they can be gown.
- The storage of seeds helps maintain biodiversity.

Photosynthesis:

- Plants make their own food using photosynthesis. The food produced is the sugar called glucose. Food produced by plants is important, not only for the plants themselves, but for other organisms that feed on the plants.



- Photosynthesis is an endothermic reaction as it requires light energy to react carbon dioxide and water to produce glucose and oxygen.
- The light energy required is absorbed by a green pigment called chlorophyll in the leaves. Chlorophyll is located in chloroplasts in plant cells.
- Plant leaves are the main organ for photosynthesis.

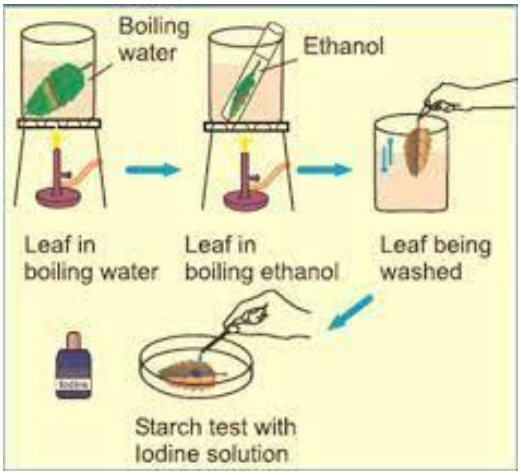
Proving Photosynthesis – Testing for Starch:

If a plant has **photosynthesised** it will test positive for starch.

Starch is made from individual glucose molecules going together.

Results:

- If starch is present the iodine will change from yellow-brown to blue-black.
- If starch is absent the iodine will remain yellow-brown.



Organisms - Plants Revision:

Structure of Plants:	*Photosynthesis:*
Plant Reproduction:	*Investigating Starch:*
Seed Dispersal Investigation:	*Importance of Plants and Insects:*

The Earth and Beyond Learning Journey:

Big Picture: Humans are having a large and possibly catastrophic impact on Earth, how do we live sustainably and put actions into place to allow future generations and the Earth to flourish?

Biology:
- Plants take in carbon dioxide and release carbon dioxide for photosynthesis.
- Respiration takes in oxygen and releases carbon dioxide.
- The remains of organisms are buried, over millions of years become crude oil.
- Biodiversity is a measure of the range of living organisms within a habitat.
- Trees are needed to absorb carbon dioxide from the atmosphere for photosynthesis.

Chemistry:
- The Earth's atmosphere is made of a variety of gases.
- All resources that humans used are found in the Earth or atmosphere.
- Reactions happen inside stars to produce larger chemical elements.
- Crude oil is made mainly of a variety hydrocarbons.
- Combustion of fuels releases carbon dioxide.
- Ceramics, polymers and composites are used as materials.

Physics:
- Gravity keeps the Earth in orbit around the Sun.
- Stars are made due to the forces acting on the gases inside the star in fusion reactions.
- Radiation from the sun is absorbed by the atmosphere.

	Year 6	Year 7	Year 8	Year 9	GCSE
Earth Structure and Atmosphere	• The Earth has four seasons - spring, summer, autumn, winter. • Fossils are formed when things that have evolved are trapped within the rock. • Soils are made from rocks and organic matter. • Fossils are formed from the dead remains of plants and animals. Fossils are evidence for evolution. • Soils are made from rocks and organic matter.	• A day is the time it takes for a planet to turn once on its axis. • A year is the length of time it takes for a plant to make one complete orbit around the Sun. • The seasons are caused by the tilt of the Earth on it's axis. • There are three main types of rock: igneous, sedimentary and metamorphic. • Rocks can all change into different forms depending on the conditions they are in, this is the rock cycle. • Fossils are the remains or traces of plants or animals that lived many years ago.	The three most abundant gases in the atmosphere are: nitrogen (78%), oxygen (21%) and argon (0.9%).		• The Earth's atmosphere has evolved over time - evidence suggest that the early atmosphere was mainly carbon dioxide and water vapour. • Over time, the Earth cooled forming liquid water, this dissolved the carbon dioxide. • Algae and plants produce oxygen.
Effects of Human Activity	• Humans are having positive and negative impacts on environments. • Positive impacts - nature resources, ecologically planned parks, garden ponds. • Negative impacts - increasing population, development, litter, deforestation.		• Deforestation is the cutting down forests or large area of trees. • As the human population increases the amount of resources needed and fuels that are burnt increases. • Greenhouse effect - the retention of heat in the atmosphere caused by the build up of greenhouse gases. • Greenhouse gases - are responsible for global warming and include: carbon dioxide, methane, nitrous oxide, water vapour and CFCs. • Global warming - the rise in the average temperature of the Earth's surface. • Sustainable development means that that future generations will have the resources available to survive.		• Carbon dioxide and methane are increasing and contributing to global warming. • Human activities are increasing the amounts of carbon dioxide and methane. • An increase in average global temperature is a major cause of climate change. • The carbon footprint is the total amount of carbon dioxide and other greenhouse gasses emitted over the full life cycle of a product, service or event.

Earth's Resources	• The water cycle involves the evaporation or condensation of water. The rate of evaporation depends on the temperature.	• Polymers are very long chain molecules made from small repeating units called monomers. • Composite materials are made from two or more different types of material. • Ceramics are made from soft substances, which when heated become hard and brittle.	• Seed banks are used as a conservation measure for plants, they carefully store seeds so that new plants may be grown in the future. • The storage of seeds in banks helps maintain biodiversity.	Earth has a limited amount of resources, we need to take measures to ensure these don't run out including reducing, reusing and recycling.	• The carbon cycle returns carbon from organisms to the atmosphere as carbon dioxide to be used by plants in photosynthesis. • Rapid growth in the human population and an increase in the standard of living means that more resources are being used and more waste is being produced. • Water that is safe to drink is called potable water. • Life cycle assessments (LCAs) are carried out to assess the environmental impact of products at each stage.

Maths:
- Earth is tilted at an angle of 23°.
- Interpreting graphs based on global temperature changes, Earth's resources.

History and RE:
Models of the solar system have changed over time due to changes in evidence and religious beliefs.

Design Technology:
Ceramics, composites and ceramics are used as materials.

Geography:
- Structure of the Earth and the atmosphere.
- Changes in population sizes, global warming and climate change.

Careers: Climate scientist, farm managers, environmental manager, palaeontologist, geotechnical engineer.





Earth Science Target Sheet:

Circle how confident you feel at the start of the topic and the end of the topic.

Red = I know nothing **Amber = I know something** **Green = I feel confident with this**

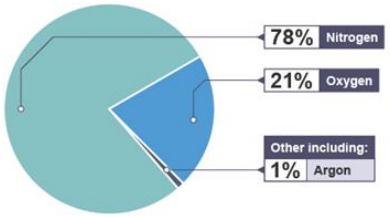
Key Knowledge	Confidence before topic RAG	Confidence after topic RAG
The atmosphere is made of: nitrogen (78%), oxygen (21%), argon (0.9%) and traces of other gases.		
Carbon is an essential element for every living organism. It is constantly being recycled, this is shown in the Carbon cycle.		
Carbon is removed from the atmosphere by plants during photosynthesis.		
Carbon is added to the atmosphere by respiration, combustion and decomposing.		
Deforestation happens when humans cut down trees for fuels or farming, building.		
Deforestation leads to less carbon dioxide being removed from the atmosphere.		
Human activities produce waste through rubbish, chemical pollutants from industry and by burning fuels.		
Greenhouse gases include: carbon dioxide, methane, CFCs and water vapour.		
The build up of greenhouse gases can trap more radiation in the atmosphere, this can lead to global warming.		
Climate describes weather patterns which happen over a period of time.		
Global warming is the rise in the average temperature of the Earth's surface and can lead to climate change.		
Effects of global warming: ice melting faster than it can be replaced in the Arctic and Antarctic, oceans are warming up, sea levels are rising, changes in plant and animal habitats. Deserts getting larger. More extreme weather events e.g. storms.		
Sustainable development means that that future generations will have the resources available to survive.		
Many groups of people that play an important role in the development of a sustainable future, they include: activists, UK Government, energy companies, transport companies and agriculture.		

Earth Science Knowledge Organiser:

Atmosphere	Relatively thin layer of gases that surround a planet.
Climate	Type of weather experienced over a period of time.
Climate change	A change in the state of the climate that can be identified by changes its properties, which persists for an extended period, typically decades or longer.
Combustion	Burning in oxygen
Decomposers	Break down dead organisms and return carbon to the atmosphere via respiration.
Decomposition	Breaking down of a substance
Deforestation	Cutting down forests or large areas of trees.
Fossil fuels	Remains of dead plants and animals over millions of years are converted into coal, oil or natural gas (fossil fuels).
Global warming	The rise in the average temperature of the Earth's surface.
Greenhouse effect	The retention of heat in the atmosphere caused by the build up of greenhouse gases.
Greenhouse gases	Gases that are responsible for global warming and include: carbon dioxide, methane, nitrous oxide, water vapour and CFCs.
Landfill site	Place where rubbish that can not be recycled is put, usually a large hole in the ground.
Photosynthesis	The chemical reaction in plants that converts water and carbon dioxide into glucose and oxygen.
Pollution	A substance that is harmful or poisonous to the environment it is in.
Population	The number of organisms in a particular place.
Recycle	Using materials from waste and turning them into something new.
Reduce	Limiting the amount of waste we produce
Respiration	The chemical reaction in all living things that converts glucose and oxygen into carbon dioxide and water to release energy.
Reuse	Using items that are not useable in their current condition for new uses.
Sustainable development	Future generations will have the resources available to survive.

Earth's Atmosphere:

The Earth's atmosphere is the relatively thin layer of gases that surround the planet. It provides us with the oxygen we need to stay alive.



Carbon Cycle:

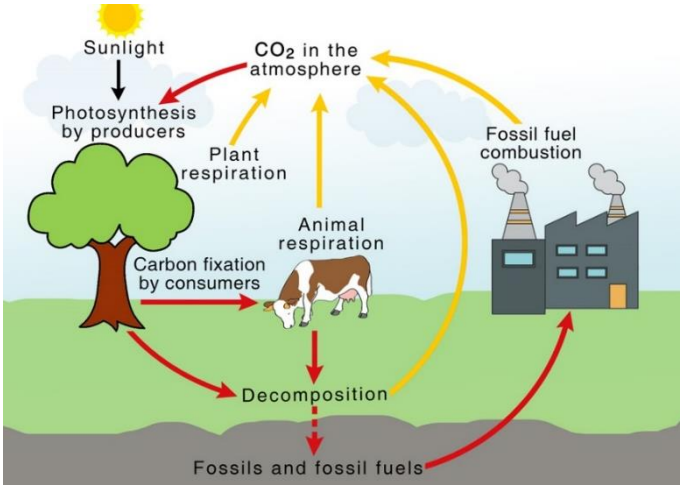
Carbon is being continually recycled on Earth. The processes that release carbon dioxide to the atmosphere include:

- combustion of fossil fuels
- respiration by plants and animals

Carbon dioxide is taken in from the atmosphere by plants for photosynthesis.

Some processes move carbon compounds from place to place, including:

- feeding by animals
- formation of fossil fuels

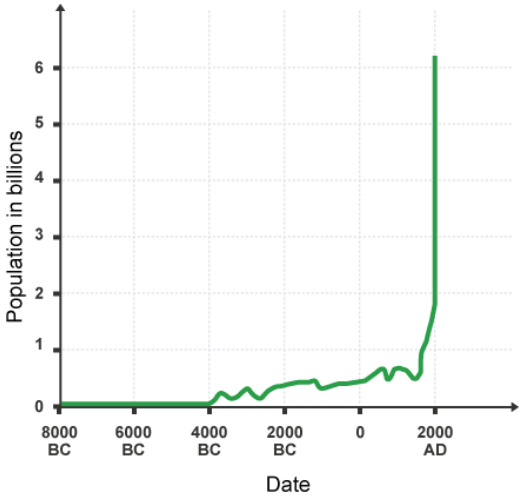


Using Earth's Resources:

Humans use the Earth's natural resources for a number of purposes, including:

- energy and fuels for warmth
- building materials for shelter
- food through farming
- fuels for transport
- materials for clothing

The human population is growing very quickly and many people argue that humans are using up the Earth's finite resources at a rate which is too fast and therefore unsustainable.



Population:

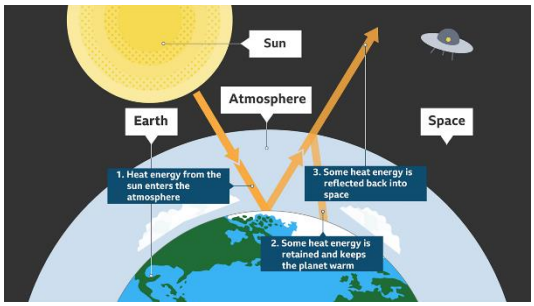
The growing human population means that more resources are required to sustain it.

Reduce, reuse and recycle:

It is important that humans do their part in creating a sustainable future, it is important that we consider what we are using and how we are disposing of it.

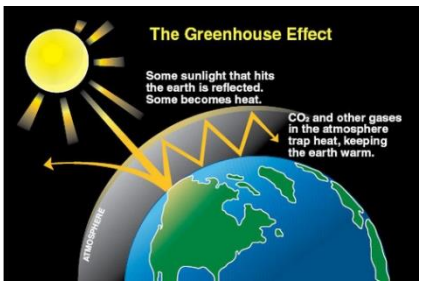
Greenhouse effect:

- Some thermal energy from the Earth's surface escapes into space.
- Some gases in the atmosphere, called greenhouse gases, trap escaping thermal energy.
- This causes some of the thermal energy to pass back to the surface.
- This is called the greenhouse effect, and it keeps our planet warm. Carbon dioxide is an important greenhouse gas.



Global Warming:

Humans burn fossil fuels which produces carbon dioxide. Extra carbon dioxide increases the green house effect. This causes more thermal energy to be trapped by the atmosphere, causing the planet to become warmer than it would be natural, this is global warming.



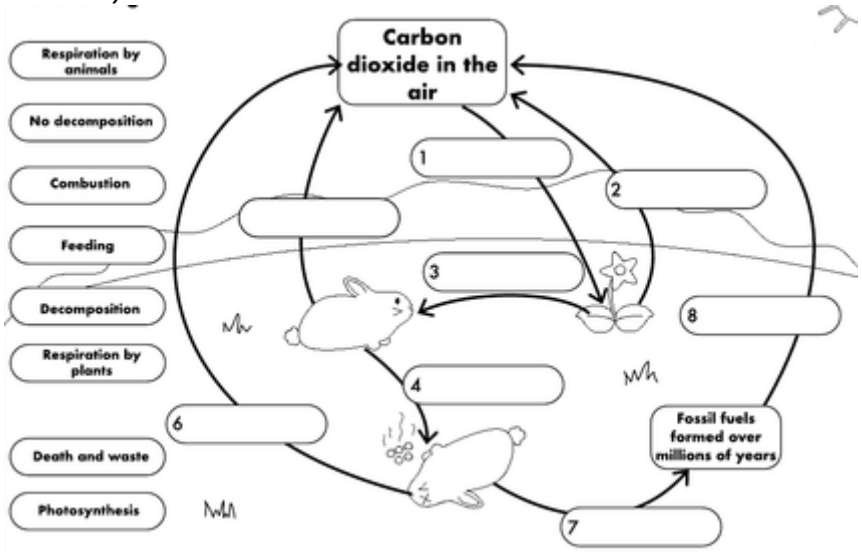
Impacts of global warming:

- ice melting faster than it can be replaced in the Arctic and Antarctic
- the oceans warming up – their water is expanding and causing sea levels to rise
- changes in where different species of plants and animals can live.

Earth Science Revision:

Earth's Atmosphere:

Carbon Cycle:



Global warming and climate change:

Humans on Earth:

In Science This Year:

In Science Next Year: