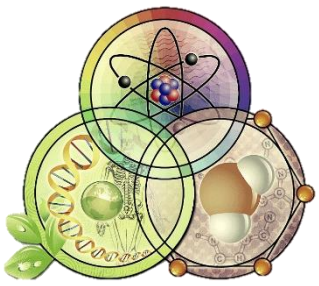
Year 8 Knowledge Organisers:

Name: _____ Class: _____

Science Teacher: _____ Pathway: _____

Contents

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.

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.

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/KMS, 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.

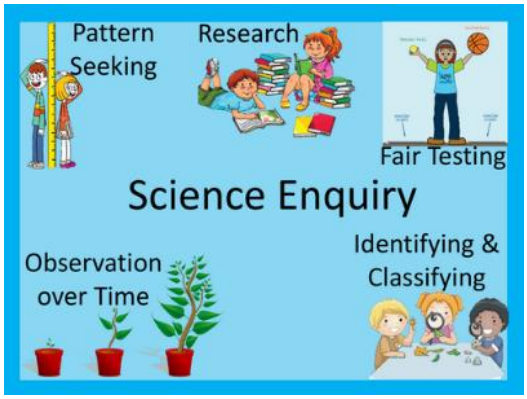
Working Scientifically Knowledge Organiser:

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:

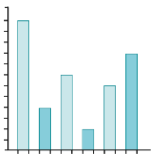
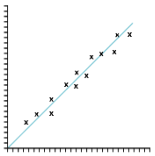
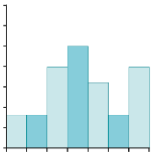
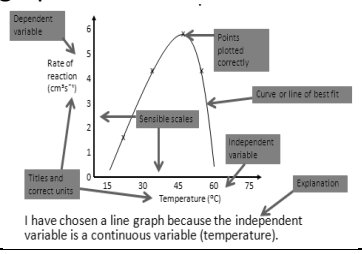
Make sure your method has:

- ☐ 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?

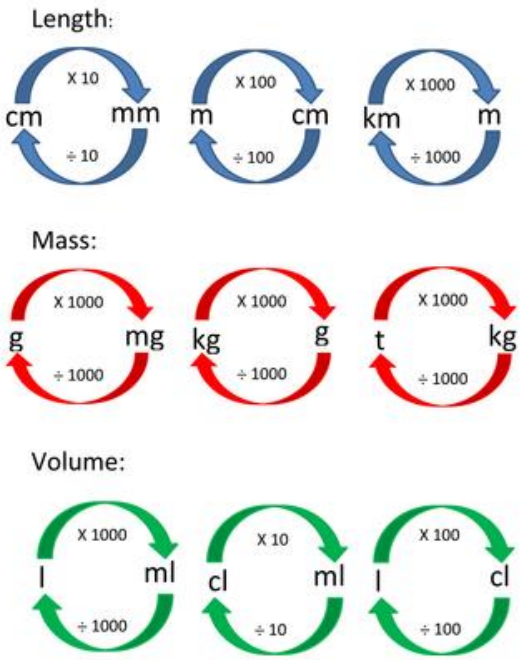
    An experiment gives valid results if it is a fair test and provides repeatable results. If a variable should be controlled but isn't, then the experiment will not be a fair test.
    c. How successful were you at keeping your control variables the same throughout your investigation?
    d. Were the results 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	Meters (m)	Ruler
Speed	Meters per second (m/s)	
Gravity	Newton per kilogram (N/kg)	
Volume	Centimeters cubed (cm^3)	Measuring cylinder
Current	Amps (A)	Ammeter
Temperature	Degrees celcius (°C)	Thermometer
Mass	Kilogram (kg)	Balance
Distance	Meters (m)	Trundle wheel / meter ruler / tape measure
Time	Seconds (s)	Stopwatch
Angle	Degrees (°)	Protractor

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



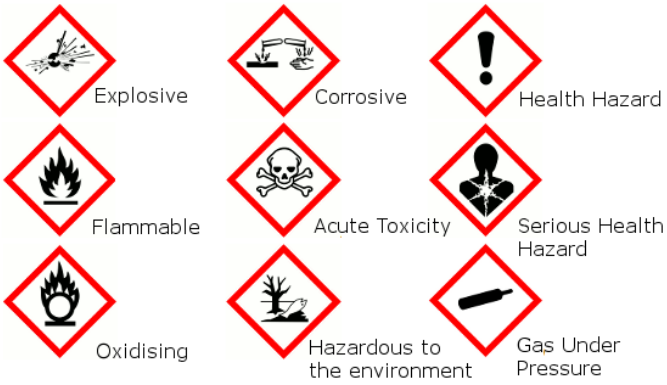




Scientific Skills Knowledge Organiser:

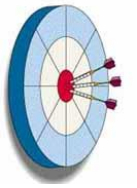
Accuracy	An accurate measurement is considered to be close to the true value. Accurate readings are done by using suitable equipment.
Anomaly	A result that does not fit the pattern.
Dependent variable	The thing that you measure (changes with the independent variable).
Equipment	Special pieces of glassware 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:

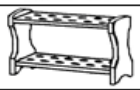
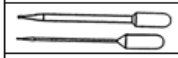
- Accuracy the value closest to the true value.
- Precision how close together measurements are.



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

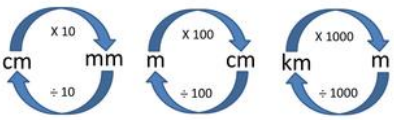
Units of measurement:

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

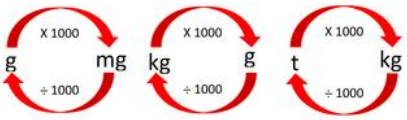
Sometimes the standard units are not a convenient size, so we use bigger or smaller versions. An extra part is added to the name of the unit to show when we are using bigger or smaller versions. This is called a prefix.

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

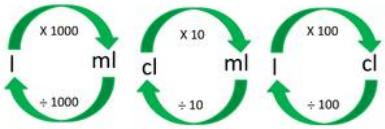
Length:



Mass:



Volume:



Risk assessment:

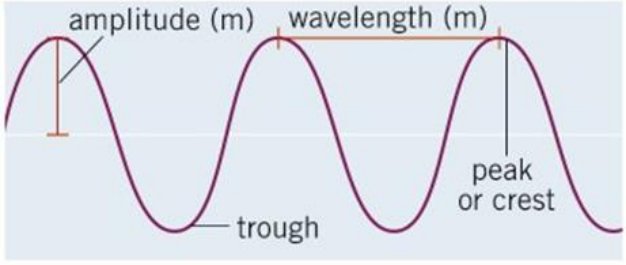
Hazard	Risk	Method of minimising risk.
What could cause harm.	The harm the hazard could cause.	What are you going to do to keep yourself and others safe?

Waves Knowledge Organiser:

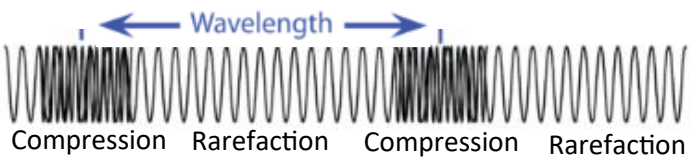
Absorption	When energy is transferred from light to a material.
Amplitude	The maximum amount of vibration, measures from the middle position of the wave, in metres.
Angle of incidence	Between the normal and incident ray
Angle of reflection	Between the normal and reflected ray.
Convex lens	A lens made 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.

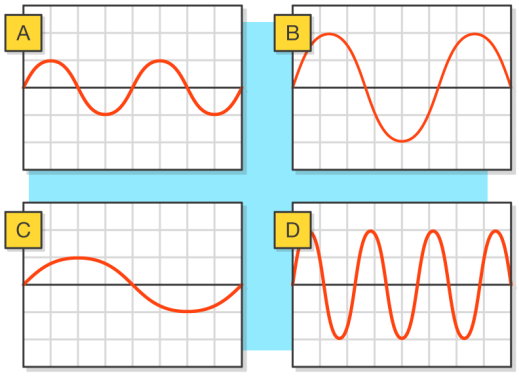


Sound is a longitudinal wave.



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**).



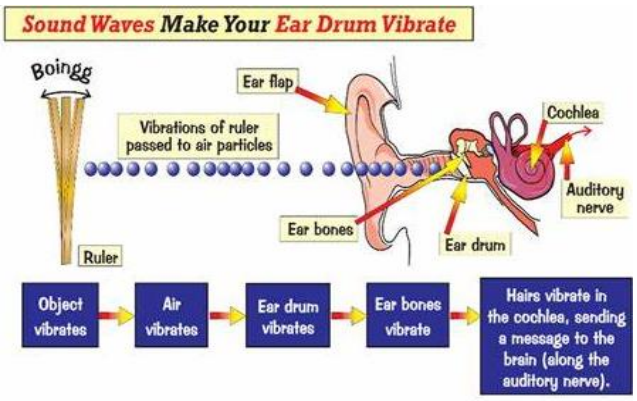
A - Quiet, higher pitch

B - Loud, low pitch,

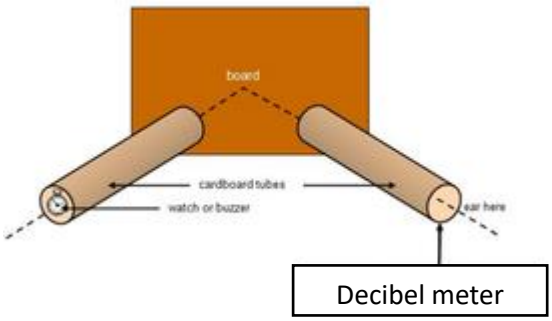
C - Quiet, low pitch,

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.

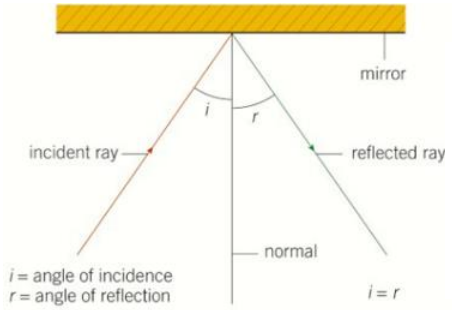
Control variables – length of the tube, position of the tube, position of the decibel meter, environmental sounds.

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

Light:

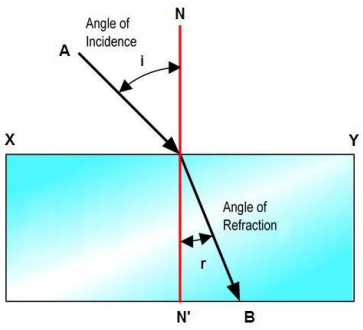
Light is emitted from luminous sources. It can be transmitted through, reflected, or absorbed by non-luminous objects.

Reflection:



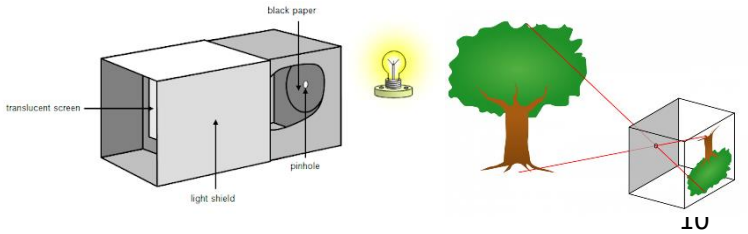
The law of reflection says that the angle of incidence equals the angle of reflection.

Refraction:

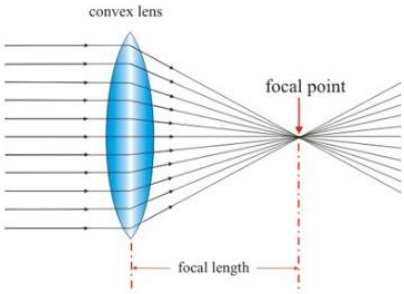


Light slows down when it moves into a thicker (more dense) material. When light slows down it is **refracted** towards the **normal** (an imaginary line at 90° to the surface).

Pin hole camera:



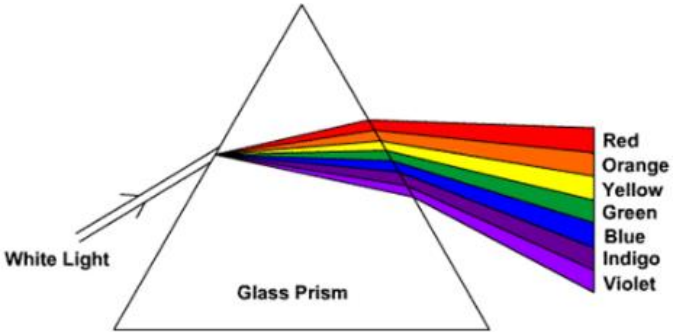
Lenses:

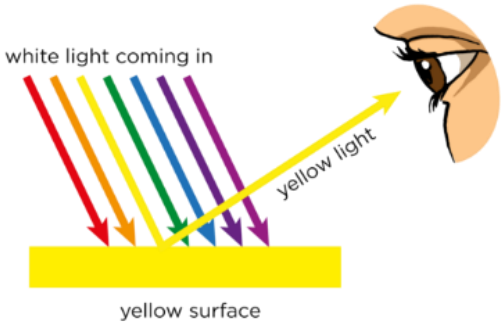


- Lenses use this property to focus light so that they meet at a specific point, called the focal point.
- Convex lenses (fat in the middle) work to focus light together.
- Convex lenses are used for magnifying glasses, spectacles for people with long-sight and telescopes.

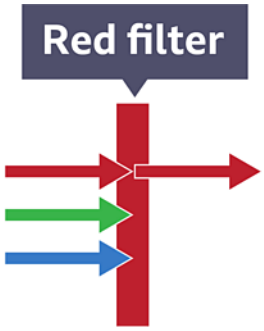
Colour:

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:

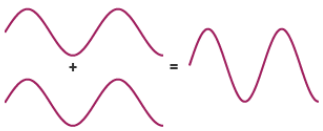
A filter will absorb all colours, except for the colour it is and let that colour light pass through.

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.

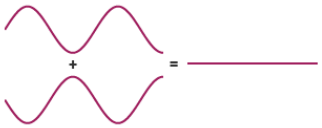
Adding: If two waves meet each other in step, they add together and reinforce each other. They produce a much higher wave, a wave with a greater amplitude.



Adding two waves together

Cancelling

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



Cancelling out two waves

Matter Knowledge Organiser:

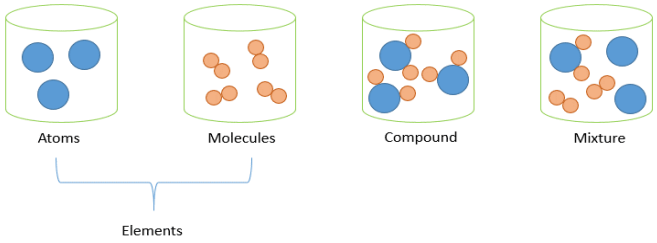
Alkali metal	Any element in group 1 in the periodic table.
Chemical Formula	Shows the elements present in a compound and their relative proportions.
Chemical properties	Features of the way a substance reacts with other substances.
Compound	Pure substances made up of two or more elements strongly joined 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.

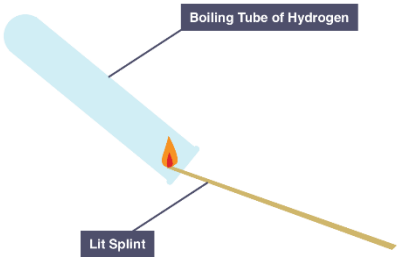
Reminder:

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)





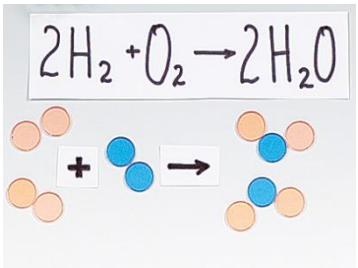
Test for hydrogen gas:

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

Balancing Equations:

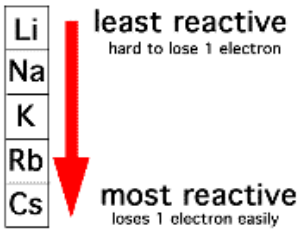
Conservation of mass states that no atoms can be created or destroyed. Therefore all the atoms that go in at the start of a reaction must come out at the end.

- 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.



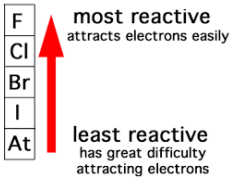
Group 1:

- 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:

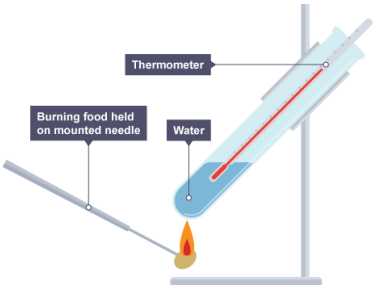
- Group 0 elements are called the noble gases. They are highly unreactive.
- The noble gases glow brightly when high-voltage electricity passes through them which is why many advertising signs use letters containing neon gas.
- Argon is a better insulator than air, so it is used in the gap between the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

Organisms 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.

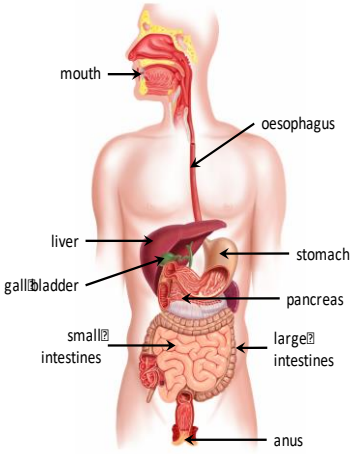
Nutrient	Use in the body	Good sources
Carbohydrate	To provide energy	Cereals, bread, pasta, rice and potatoes
Protein	For growth and repair	Fish, meat, eggs, beans, pulses and dairy products
Lipids (fats and oils)	To provide energy. Also to store energy in the body and insulate it against the cold.	Butter, 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.

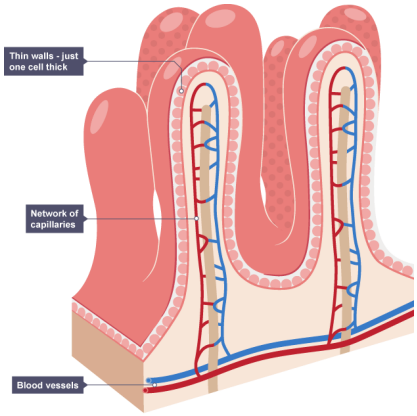
Organ	Role	Special adaptations
Mouth	Contains teeth to mechanically break down food and saliva to start chemically breaking down food.	Presence of amylase to start the chemical breakdown of carbohydrates.
Oesophagus	The tube that connects the mouth and stomach.	Contains muscle that relaxes and contracts 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.	

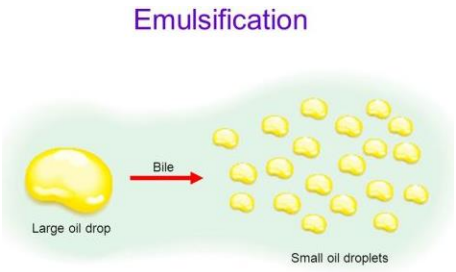


Villi:

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



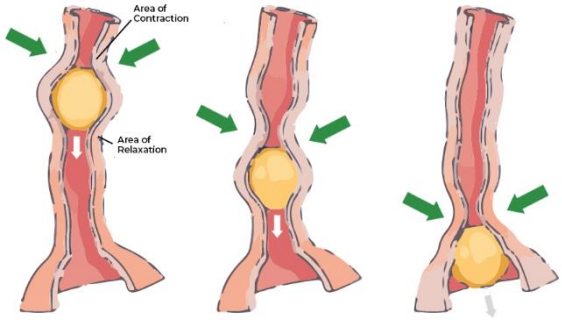


Bile:

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

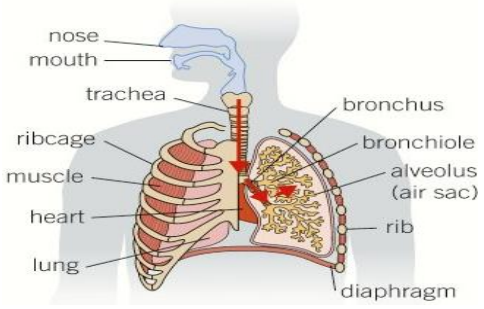
Breathing and Respiration Knowledge Organiser:

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.

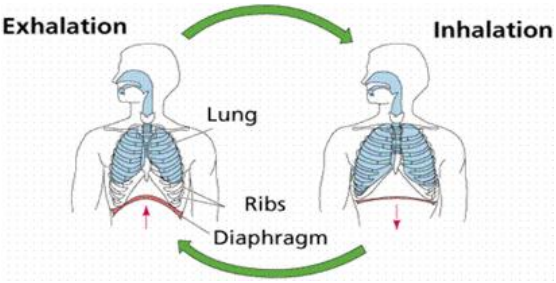
Respiratory System:

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

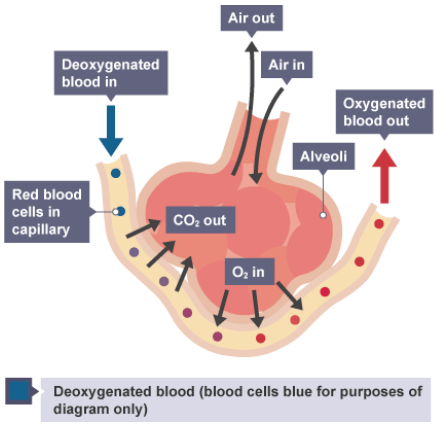


Gas Exchange:

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:

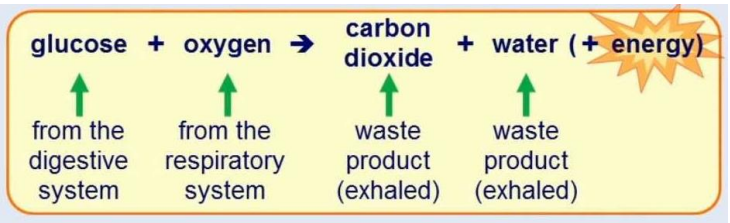
- A **lung volume** test is a way of measuring the total amount of air in your lungs, and how much air is left after you have breathed out as far as you can.

- 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:

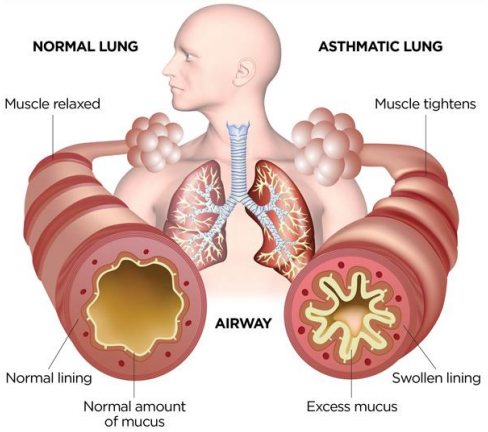
- Anaerobic respiration happens in microorganisms such as bacteria.
- Yeast carry out a type of anaerobic respiration called fermentation – this is used for making bread and alcoholic beverages.
- Fermentation: Glucose → ethanol + carbon dioxide.
- Bacteria are added to milk, they respire anaerobically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

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.

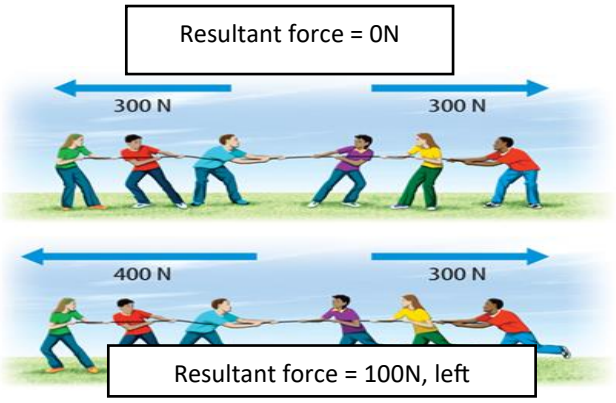
Examples:
- gravity
- electrostatic
- magnetic

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

Resultant forces:

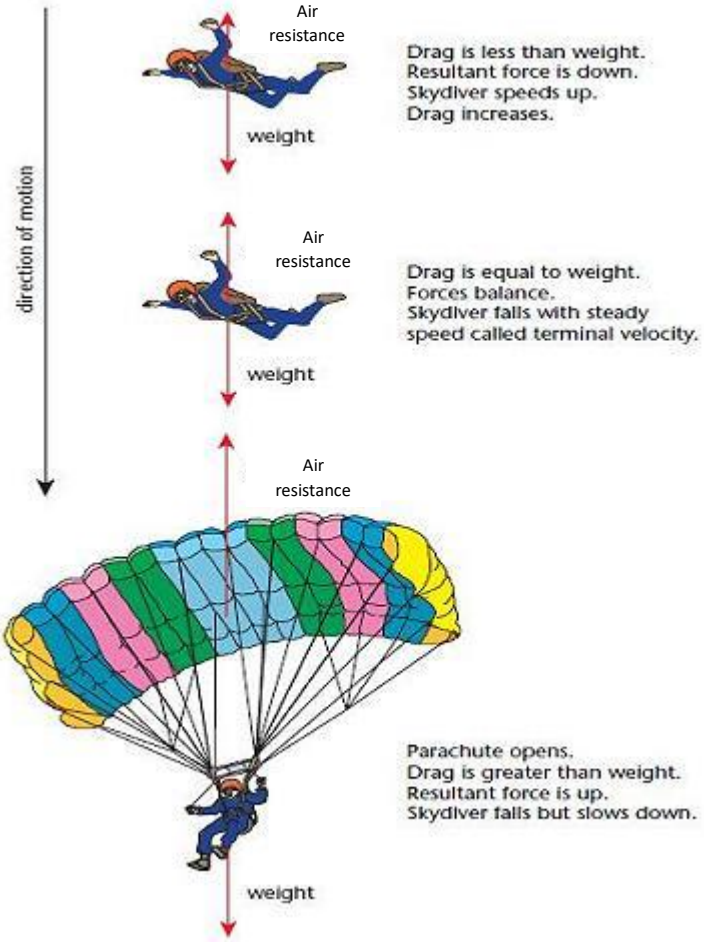
When the forces acting on an object are equal in size and acting in opposite direction they are **balanced**. The object is in **equilibrium**.

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



Terminal Velocity:

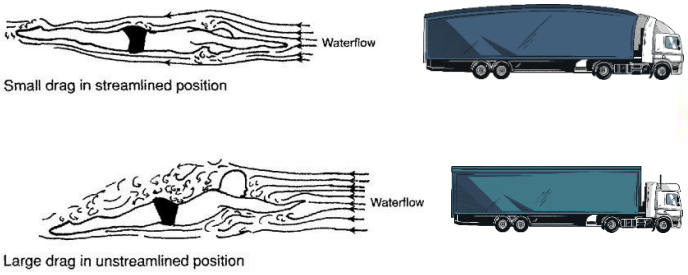
At terminal velocity, the object moves at a steady speed in a constant direction because the **resultant force** acting on it is zero.



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.



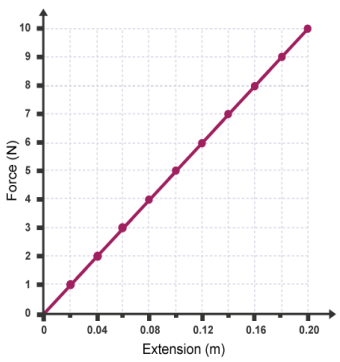
Hooke's law:

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

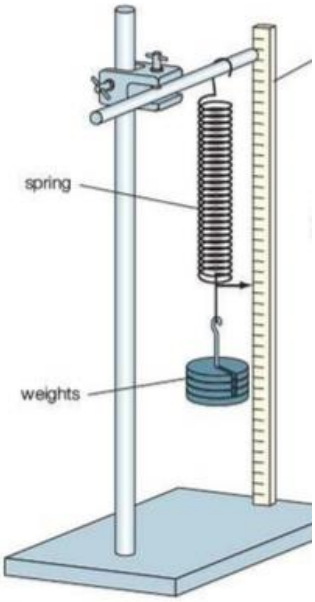
- stretching happens when the material or object is pulled
- compression happens when the material or object is squashed.

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.

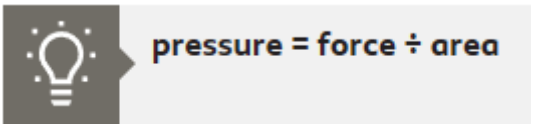


Calculating pressure

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:

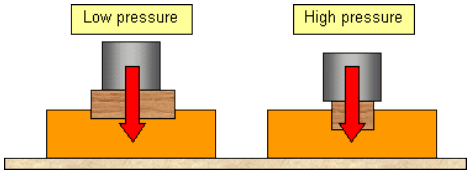


Example:

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.

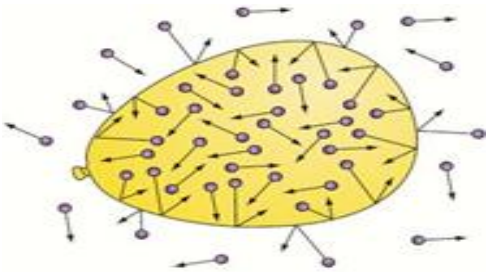
- The larger the surface area, the lower the pressure.
- The smaller the surface area, the greater the pressure.

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.



Reactions Knowledge Organiser:

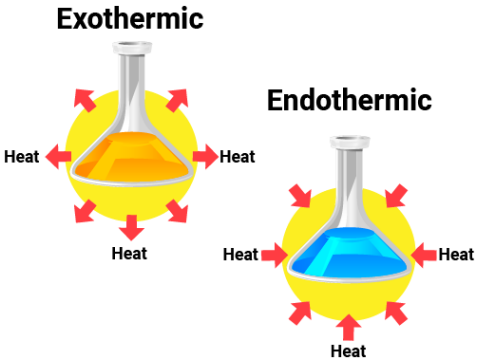
Acid rain	Acid rain is formed when sulfur dioxide produced from burning fuels dissolves in rain water.
Bond	A force that holds two atoms together in a compound.
Catalyst	A substance that speeds up a chemical reaction.
Chemical change	Atoms in substances rearrange to create new substances.
Combustion	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.

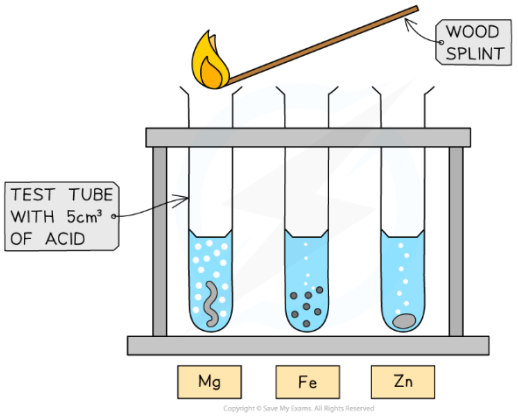
Exothermic reaction: the temperature increases, energy is taken in from the surroundings. Examples: combustion, neutralization.

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



Metal + acid:

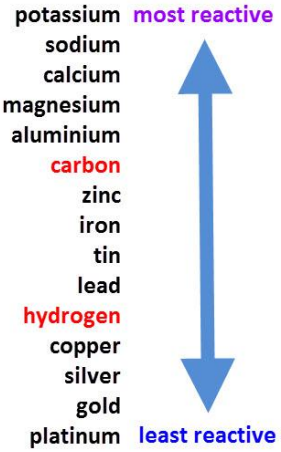
- Hydrogen released – seen as bubbles.
- More reactive metal = more bubbles produced.
- Metal + acid → salt + hydrogen
- Salt names:
    - Name of metal first (e.g. iron)
    - Convert the name of the acid:
        - Sulfuric acid = sulfate
        - Nitric acid = nitrate
        - Hydrochloric acid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

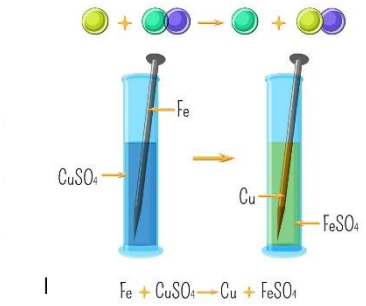


Reactivity series and displacement reactions:

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.



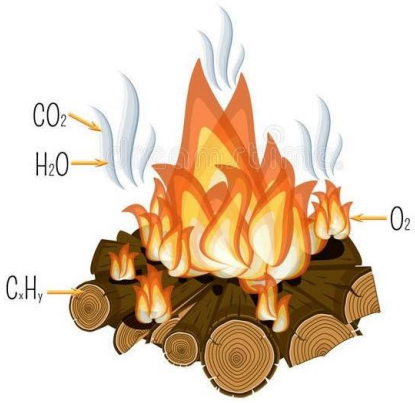


more reactive element takes the place of a less reactive element in a compound.

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

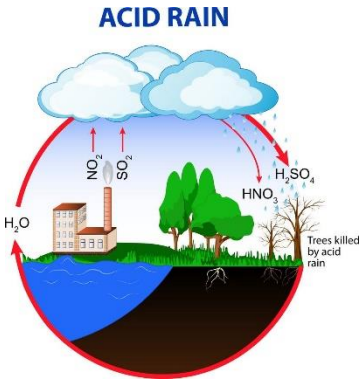
$$C_xH_y + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(g)}$$



	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.

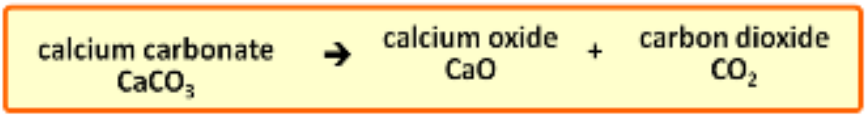


Non-metal oxides:

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.

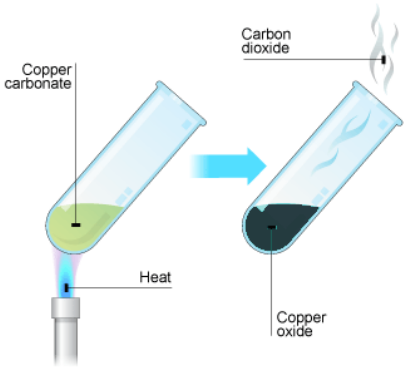


Investigation:

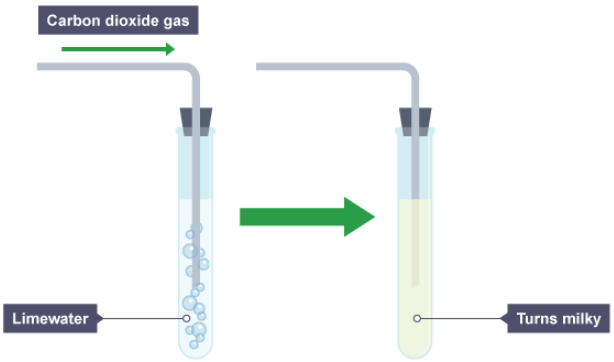
Independent variable: the type of carbonate used.

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.



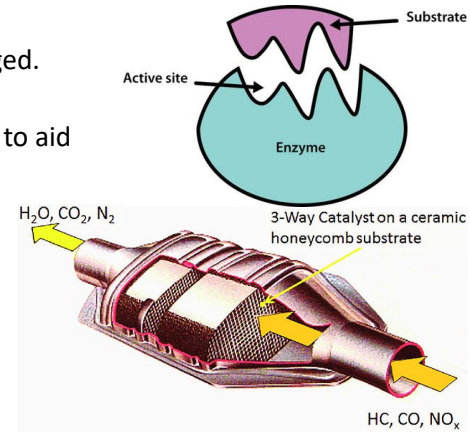
Test for carbon dioxide:



Role of a catalyst:

A catalyst speeds up a chemical reaction, whilst remaining chemically unchanged.
Examples of catalysts:

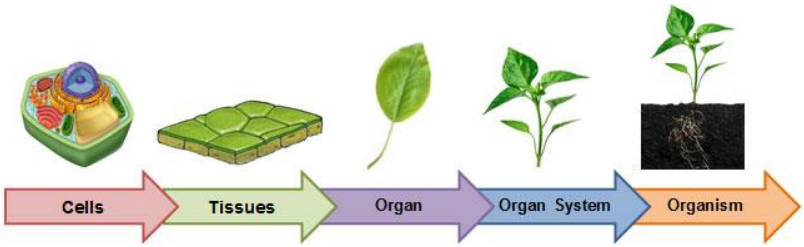
- Enzymes – found in the human body, particularly the digestive system to aid the break down of food.
- Rhodium and platinum in catalytic converters.



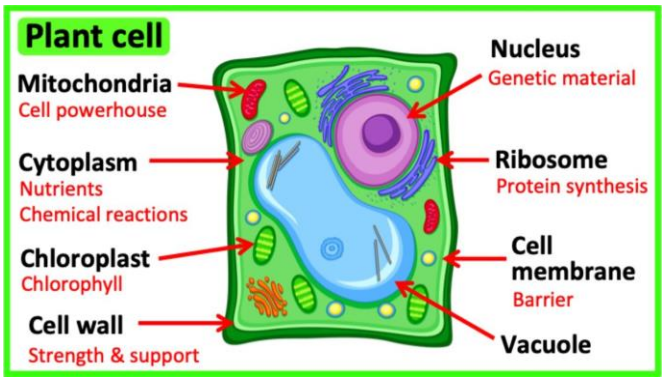
Organisms - Plants Knowledge Organiser:

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

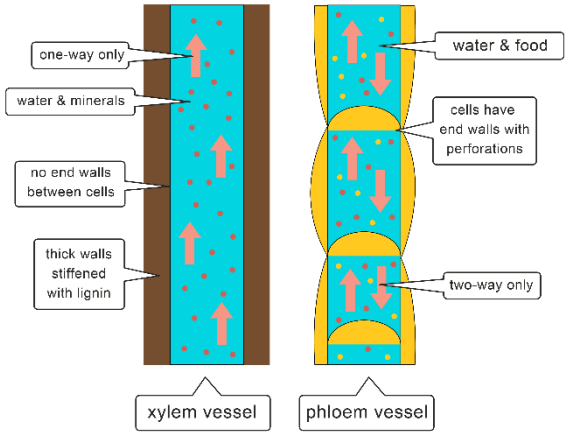
Organisation:



Cell Structure:

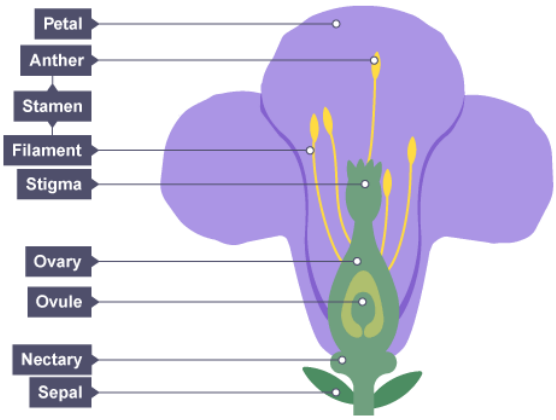


Transport in plants:



Structure of Flowers:

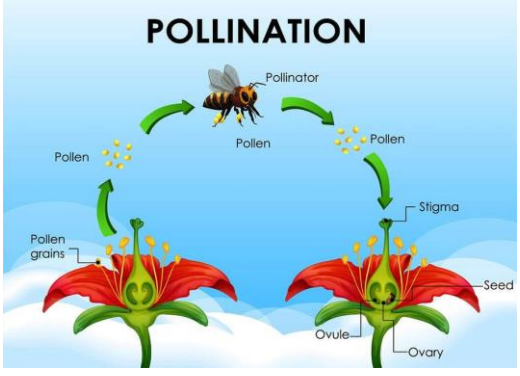
The flower is the reproductive organ of many plants.

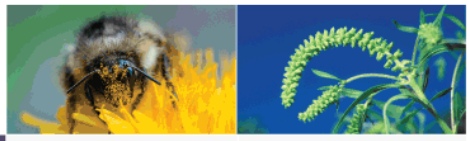


Structure	Function
Sepals	Protect the unopened flower
Petals	May be brightly coloured to attract insects
Stamens	The male parts of the flower (each consists of an anther held up on a filament)
Anthers	Produce male sex cells (pollen grains)
Stigma	The top of the female part of the flower which collects 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:



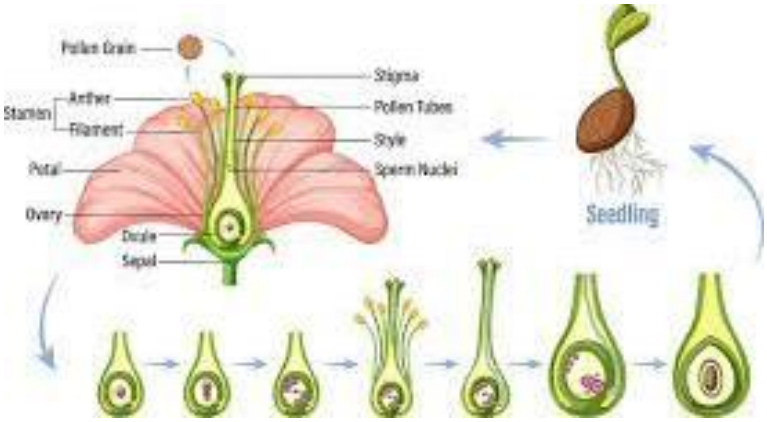


Feature	Insect-pollinated	Wind-pollinated
Petals	Large and brightly-coloured – to attract insects	Small, often dull green or brown – no need to attract insects
Scent and nectar	Usually scented and with nectar – to attract insects	No scent or nectar – no need to attract insects
Number of pollen grains	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

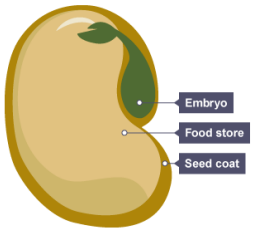
inside the ovary. The nucleus of the pollen grain (the male gamete) then passes along the pollen tube and joins with the nucleus of the ovule (the female gamete). This process is called fertilisation.



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



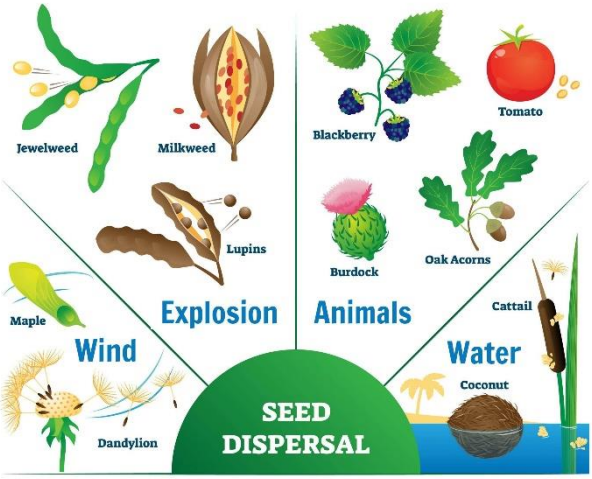
Seed dispersal:

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.

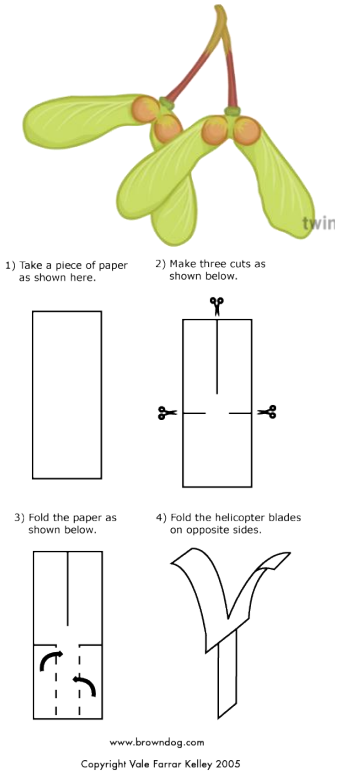
Method	Detail	Examples
Wind	Seeds have lightweight parts, wings or parachutes. 	Dandelion, sycamore
Animals (inside)	Brightly coloured and tasty fruits contain seeds with indigestible coats, so that the seeds pass through the animal's digestive system undamaged. 	Tomato, plum, raspberry, grape
Animals (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

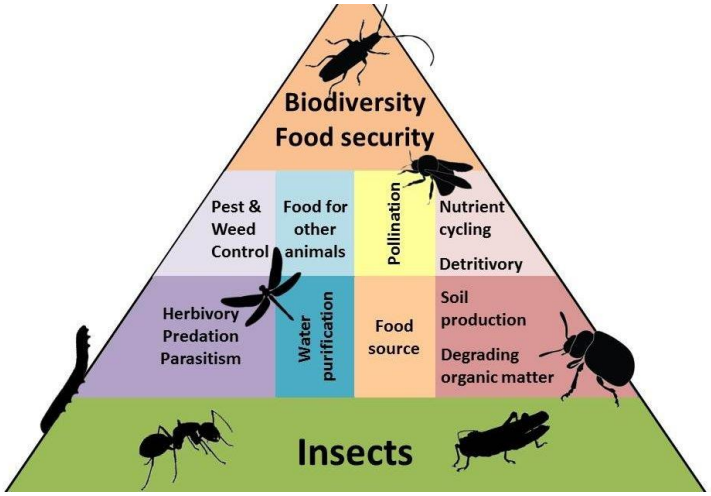


Investigation:

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:

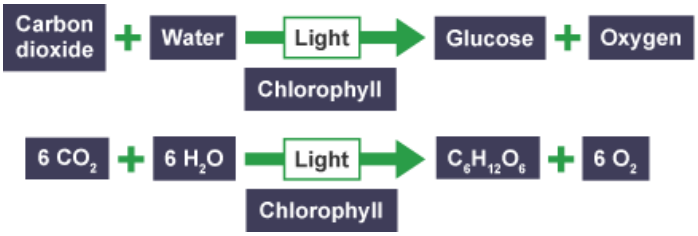


Seed Banks:

- 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.

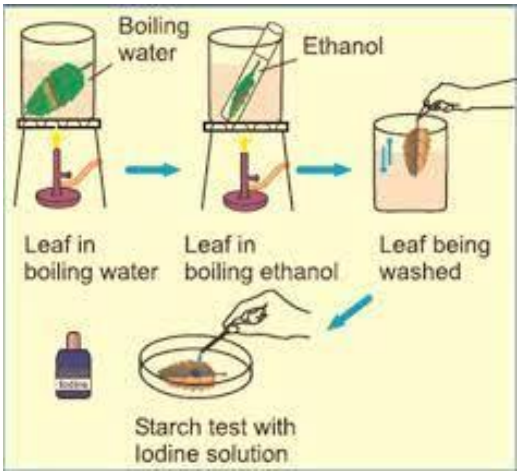
Proving Photosynthesis – Testing for Starch:

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.

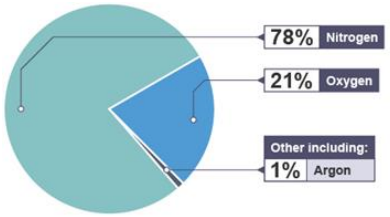


Earth Science Knowledge Organiser:

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:

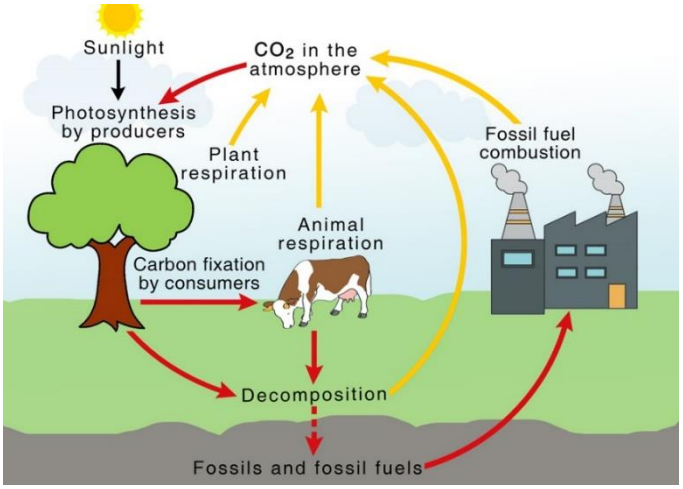
Carbon is being continually recycled on Earth. The processes that release carbon dioxide to the atmosphere include:

- 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

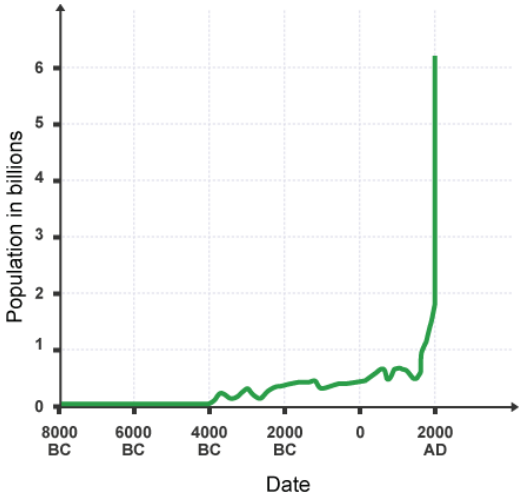


Using Earth's Resources:

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:

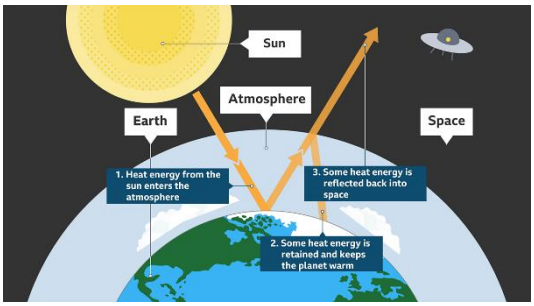
The growing human population means that more resources are required to sustain it.

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.

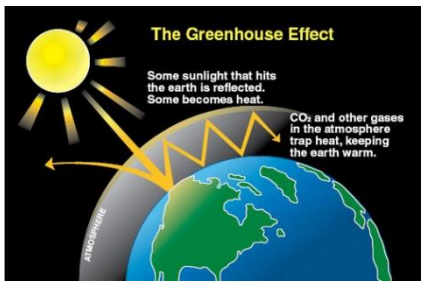
Greenhouse effect:

- 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.