St Patrick's

Science Department

Year 8 Knowledge organiser

B1 – Health and lifestyle

B2 – Ecosystem processes

B3 – Adaptation and inheritance

C1 – The Periodic Table

C2 – Separation techniques

C3 – Metals and acids

C4 – The Earth

P1 – Electricity and magnetism

P2 – Energy

P3 – Motion and pressure

St. Patrick's RC High School

Year 8: Knowledge Organisers

- What is the Knowledge Organiser?

A Knowledge Organiser contains all the information from each unit of work which we want all students to be able to recall with ease. This is the basic knowledge that ALL pupils need to have to be able to move on to further content and skills. Committing this knowledge to long-term memory frees up working memory, allowing pupils to tackle more challenging skills in class with the support of their teacher.

- How should it be used?

Pupils should learn the content of the Knowledge Organiser as instructed by their teacher, who will tell them where to focus. They should mainly self-quiz to check their learning but they can also complete online retrieval activities to test themselves, if they have access. Long-term, they will be completing a full examined assessment of what they have retained.

- What is self-quizzing?

Self-quizzing is the only way to ensure that the knowledge is being retained in long-term memory. Pupils should LOOK, COVER, WRITE, CHECK. This should be completed on paper and checked by parents, or can be completed verbally by parents quizzing their child.

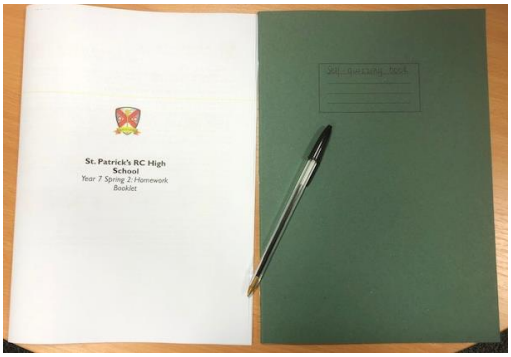
- How can parents help?

1. Set up a study-friendly area, preferably with a table or desk.
2. Schedule a regular academic time each day.
3. Remove distractions, such as phone, TV, loud music.
4. Know what they need to do and support them; give encouragement, check completed work, and make yourself available for questions and concerns. Quiz them verbally or let them teach it to you and mark your work.
5. Praise their work and efforts.
6. Know other places to guide children to learning. These are online and are free to access, simply search for KS3 Science on the following site:

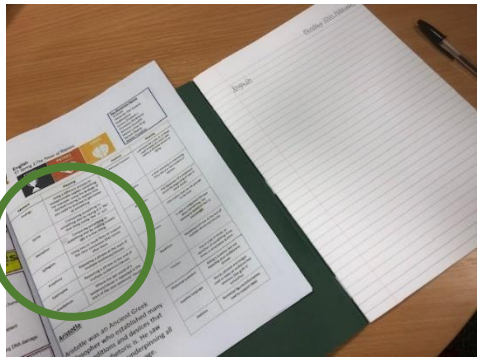
- SENECA - https://senecalearning.com/en-GB/
- YouTube – Revision Monkey KS3 Science
- BBC BITESIZE - https://www.bbc.co.uk/bitesize/subjects/zng4d2p

St. Patrick's RC High School
Year 7: Knowledge Organisers

Look, cover, write, check

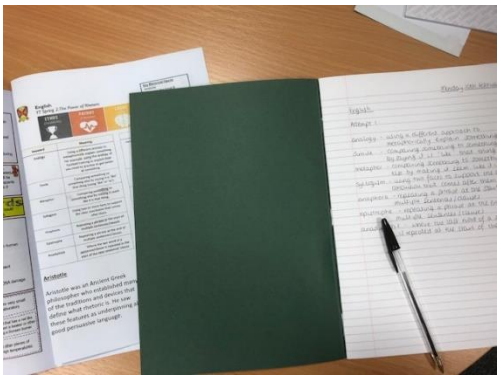


You should use a self-quizzing book with your knowledge organiser.

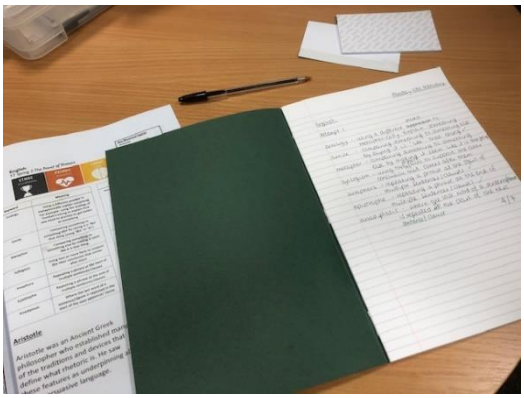


Spend time learning the section you have been set by your teacher e.g.

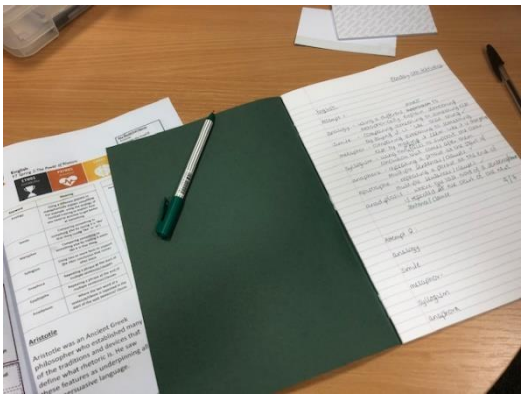
Cover it over and copy the keywords/prompts that you need.



Test yourself and then use the booklet to self-check



Correct as you check and award yourself a mark.



Do it again, as many times as you can in twenty minutes.

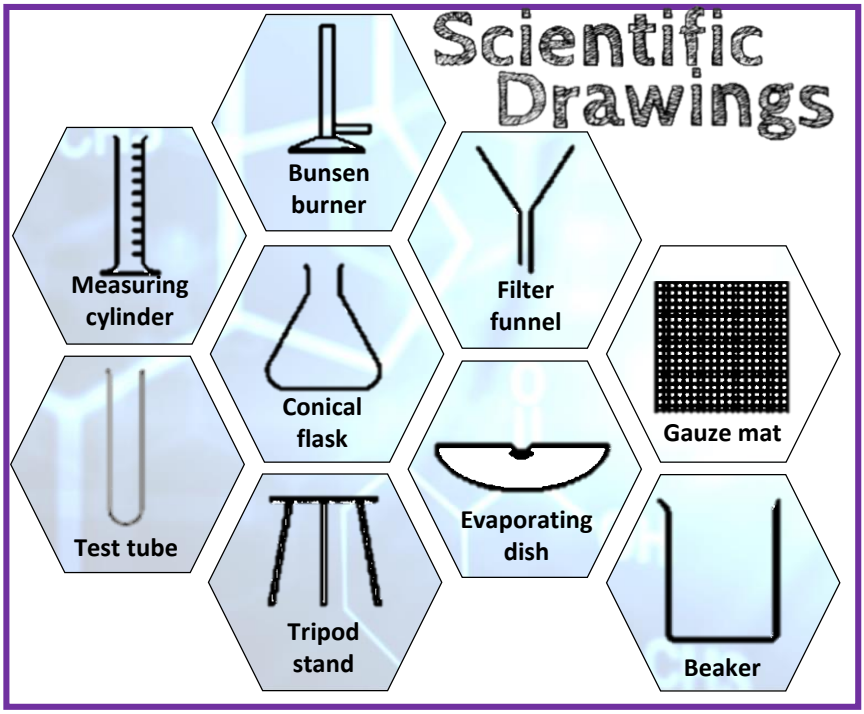
Science Lab Skills

Independent variable –
the variable that is changed during an experiment

Dependent variable –
the variable being tested or measured during an experiment

Control variable –
the variable that is kept the same during an experiment

Scientific Drawings



Before an experiment is carried out, a risk assessment should be completed to make it less likely that people will be injured, or equipment damaged. Hazards should be identified and what to do if something happens.

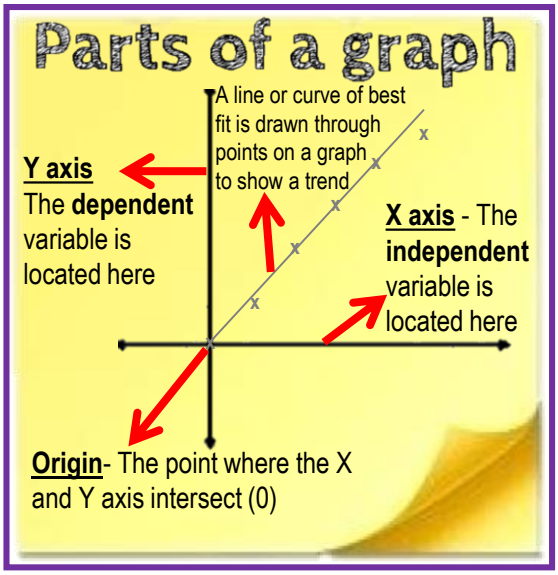
A hazard is something that could potentially cause harm.

An **oxidising** substance makes other substances burn more fiercely by providing O_2

Data is recorded in a table of results during a science experiment

Mass (g)	Extension 1 (mm)	Extension 2 (mm)	Average Extension (mm)
0	0	1	0.5
100	5	6	5.5
200	9	9	9
300	15	15	15
400	20	21	20.5
500	24	25	24.5
600	30	31	30.5

Parts of a graph



Flammable –
Catches fire easily

Biohazard –
Biological substances that can be a threat to human health

Toxic –
A substance that can cause death if swallowed, breathed in or absorbed by skin

Radiation –
Damages living tissue, possibly causing DNA damage and cancer

Corrosive –
Burns and destroys living tissues, such as eyes and skin

A measuring cylinder is used to measure volumes of liquids. Measuring cylinders have equally spaces lines so that volumes can be measured accurately. These are called graduations.

A spatula is used to measure very small quantities of solid in a laboratory

A Bunsen burner is used to heat substances in a laboratory

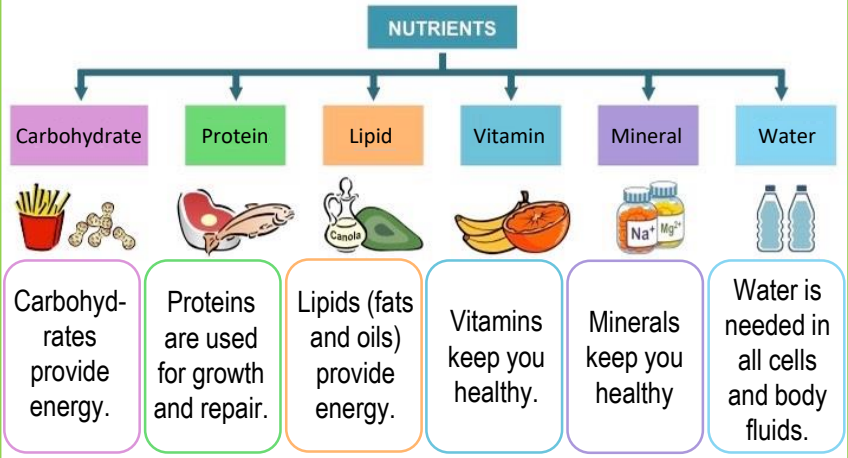
A gauze is a thin piece of metal that has a net like pattern. A gauze is used to support a beaker or other glassware when heating using a Bunsen burner

A filter funnel is used to separate large solids from a solution. Filter paper is placed inside the funnel. Solids that are too big to pass through the filter paper get trapped and liquids will flow through.

Tongs are used to hold other pieces of apparatus which are at high temperatures.

Biology 1 - Health and Lifestyle

Nutrients are important substances that the body needs to survive and stay healthy. There are different types of nutrients. We get most of them from our food. The types of nutrients are:



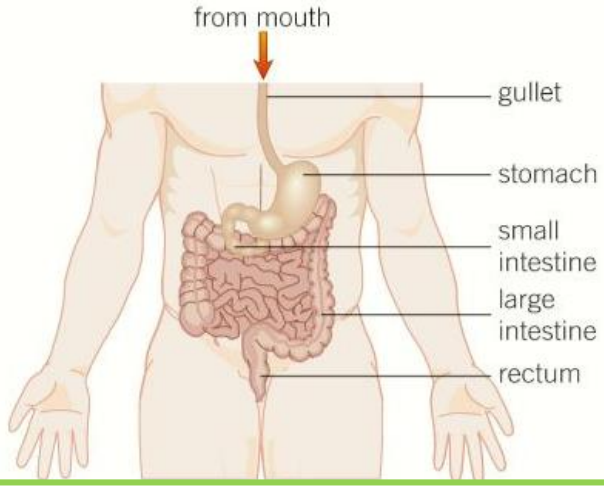
Carbohydrates provide energy.	Proteins are used for growth and repair.	Lipids (fats and oils) provide energy.	Vitamins keep you healthy.	Minerals keep you healthy	Water is needed in all cells and body fluids.

You need energy for everything you do, even sleep. This energy comes from your food. The energy in food is measured in joules (J) or kilojoules (kJ). 1 kilojoule is the same as 1000 joules.

If a person does not have enough of a certain vitamin or mineral, they are said to have a deficiency. For example, a vitamin D deficiency can lead to a condition called rickets, where your bones become weak.

Recreational drugs are taken for enjoyment. Medicinal drugs benefit health.

The digestive system is a group of organs that work together to break down food…



Food is chewed and mixed with saliva in the mouth. It then passes along the gullet to the stomach where it is mixed with digestive juices and acids to break it down into smaller molecules.

A different chemical test exists for each type of nutrient. For most food tests, you will need a solution of the food.

How do you test for starch?

1) Add a few drops of iodine to the food solution.
2) If the solution turns a blue-black colour, the food contains starch.

How do you test for lipids?

1) Rub some of the food sample onto a piece of filter paper.
2) Hold the piece of paper up to the light. If the paper has gone translucent the food contains lipids.

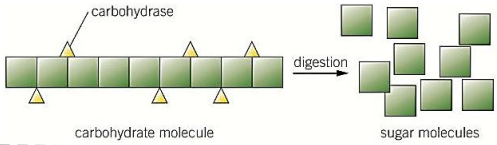
How do you test for sugar?

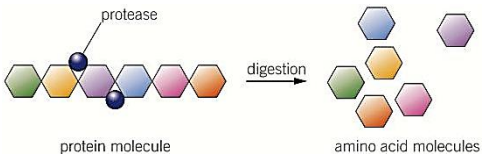
1) Add a few drops of Benedict's reagent to the food solution.
2) Heat the test tube in a water bath.
3) If the solution turns orange-red, the food contains sugar.

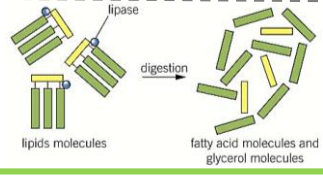
How do you test for protein?

1) Add a few drops of copper sulfate solution to the food solution.
2) Add a few drops of sodium hydroxide solution.
3) If the solution turns purple, the food contains protein.

Enzymes are special proteins that can break large molecules of nutrients into small molecules. Different types of enzymes break down different nutrients.



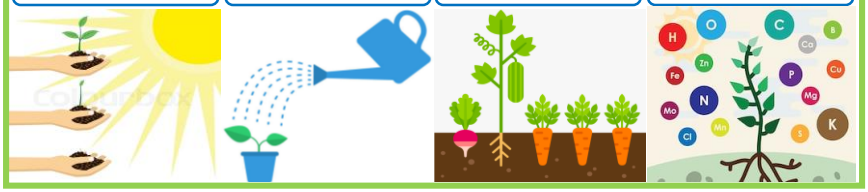




Biology 2 - Adaptation and Inheritance
Biology 3 - Ecosystems

In a habitat, there is limited supply of resources. To survive, plants compete to get enough of these resources. They compete for…

LIGHT	WATER	SPACE	MINERALS



How do animals cope with the seasons?

Hibernation
Animals find somewhere warm to sleep in winter.

Migration
animals move somewhere warmer, or with more food.

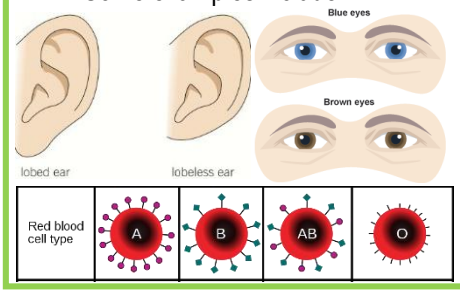
Grow thicker fur
To keep them warm by their thick coat.

A characteristic that enables an organism to be successful and survive is known as an **adaptation**.

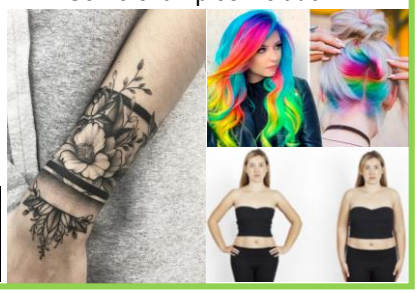
If two organisms depend on each other for something, this is called **interdependence.**

Differences in characteristics are known as variation...

Some variation is from characteristics people inherit from their parents – children share some characteristics with their mother and father. This is known as **inherited variation.**
Some examples include:



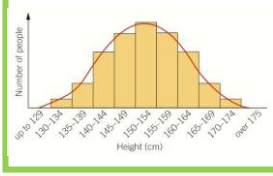
Variation caused by your surroundings is called **environmental variation**. For example, your characteristics can be affected by factors such as your diet, education and lifestyle.
Some examples include:



Continuous? **or** ***Discontinuous?***

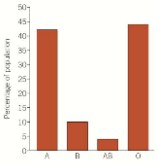
A characteristic that can take any value within a range shows continuous data. For example… height, mass, and arm span.

Continuous data should be plotted on a **histogram**.



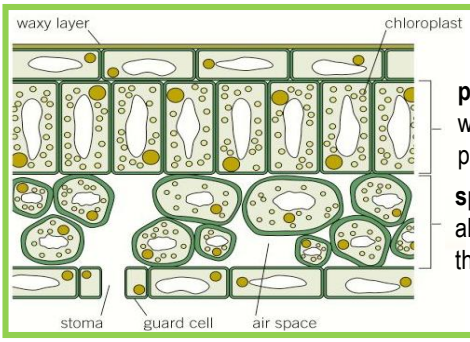
Characteristics that can only result in certain values show discontinuous data. For example…, gender, blood group and eye colour.

Discontinuous data should be plotted on a **bar chart**.



Organisms that have lots of characteristics in common and can mate to produce fertile offspring are known as a **species**.

Sperm and egg cells are the only cells in the human body to contain 23 chromosomes.



palisade layer – contains cells packed with chloroplasts. This is where the most photosynthesis takes place.

spongy layer – contains air spaces, allowing carbon dioxide to diffuse through the leaf. Oxygen diffuses out of the leaf

Producers
Plants and algae are called producers because they make their own food.

Consumers
Animals are called consumers as they have to eat other organisms to survive.

photosynthesis...

Carbon dioxide + Water → (Light) Glucose + Oxygen

Energy in stored food is transferred in a chemical reaction called **aerobic respiration**. The word equation for aerobic respiration is:

Glucose + Oxygen → Carbon dioxide + Water

Toxic chemicals can build up in organisms through a food chain. This is **bioaccumulation.**

Anaerobic respiration is a type of respiration that does not use oxygen.
The word equation for anaerobic respiration is:

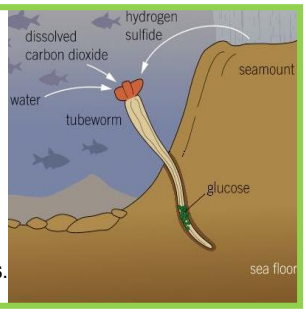
Glucose → Lactic acid + (energy)

An **ecosystem** is the name given to the plants and animals that are found in a particular location, and the are in which they live. These plants and animals depend on each other to survive.

Four minerals plants need for healthy growth are:

7 N Nitrogen 14.007	15 P Phosphorus 30.974
19 K Potassium 39.098	12 Mg Magnesium 24.305

Some species of bacteria use a variety of chemical reactions to make glucose. This process is known as chemosynthesis.



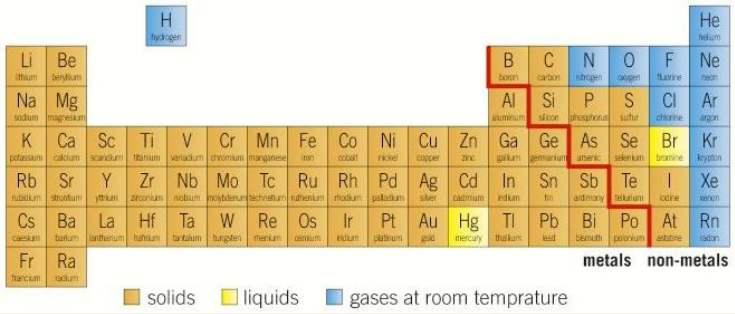
Chemistry 1 - The Periodic Table
Chemistry 2 - Separating techniques

Metals and Non-Metals

The Periodic table is a list of all elements. The elements are classified into two categories – metals and non-metals.
In the Periodic table, metals are on the left side of the stepped line. Non-metals are on the right.

Properties of metals

shiny
conduct heat and electricity
high density
malleable
Ductile
Sonorous
high melting/boiling points



Properties of non-metals

dull
poor conductors of heat
poor conductors of electricity
low density
brittle
not sonorous
low melting/boiling points

Group 1 – The Alkali Metals

Reactivity, increases down the group.
Melting and boiling points decrease down the group.
When reacted with water, group 1 elements produce hydrogen gas.

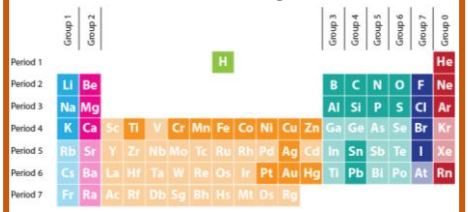
Group 7 – The Halogens

Reactivity decreases down the group.
Melting & boiling points increases down the group.

Group 0 – The Noble Gases

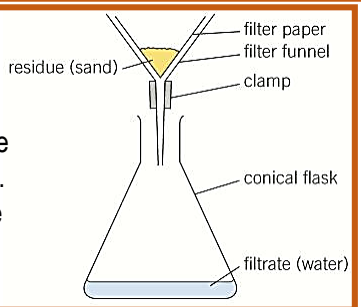
Unreactive – 'inert'
Low melting & boiling points
At room temp: all noble gases are colourless gases

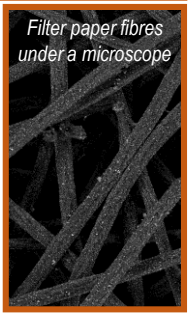
The vertical columns in the periodic table are called **groups**.



The horizontal rows in the periodic table are called **periods**.

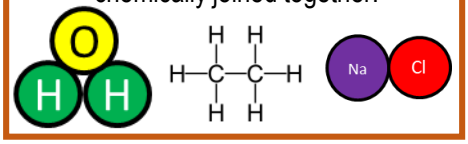
Filtration is used to separate a liquid from an insoluble solid. Filter paper has tiny holes in it. Water particles are smaller than the tiny holes so passes through them. The liquid collected after a mixture has passed through filter paper is called the **filtrate**.

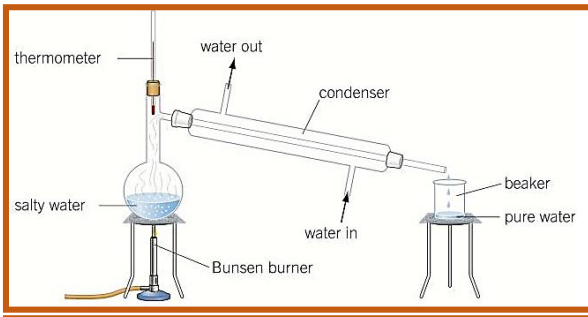



Filter paper fibres under a microscope

A mixture is made up of several different substances which are NOT chemically joined together.
Mixtures are easy to separate.

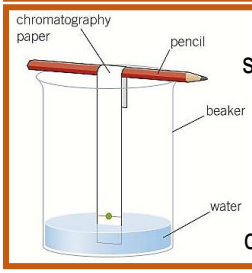
In a compound, substances ARE chemically joined together.





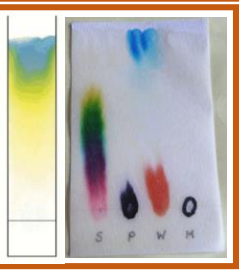
Distillation is a process that uses evaporation and condensation to obtain a solvent from solution.

You can also use distillation to separate water from inky water.

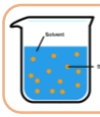


Chromatography is used to separate substances in a mixture. It works when the substance in a mixture are soluble in the same solvent.

The image that is formed at the end of chromatography is called a chromatogram

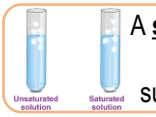


A **solute** is a substance which dissolves in a liquid.



A **solvent** is something in which a solid or gas dissolves.

If a substance is **insoluble** this means it cannot dissolve in water.



A **saturated** solution contains the maximum mass of a substance that will dissolve.

Chemistry 3 - Metals and Acids

In a displacement reaction, a more reactive metal will displace a less reactive metal from its compound.
The reactivity series helps to determine which metals are more reactive than others. For example…

magnesium + copper sulfate → magnesium sulfate + copper

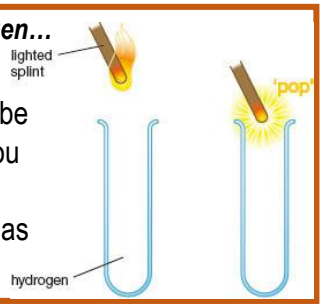
$Mg(s) + CuSO_4(aq) \rightarrow MgSO_4(aq) + Cu(s)$

However, copper **cannot** displace magnesium in magnesium sulfate solution. This is because magnesium is much more reactive than copper

reactive
potassium
sodium
lithium
calcium
magnesium
aluminium
zinc
iron
lead
copper
silver
gold
unreactive

To test for hydrogen…

Light a splint and hold it in a test tube with the gas. If you hear a 'squeaky-pop' sound, the gas is hydrogen.



State symbols

s solid

g gas

aq aqueous *(dissolved in water)*

Gold is unreactive…

Surface atoms do not react with oxygen. This explains why gold stays shiny.

Some metals react with acids. A reaction with a metal and an acid form a solution of a salt, and hydrogen gas. For example…

zinc + hydrochloric acid → zinc chloride + hydrogen

Most metals react with oxygen to form an oxide.
Copper + oxygen → copper oxide

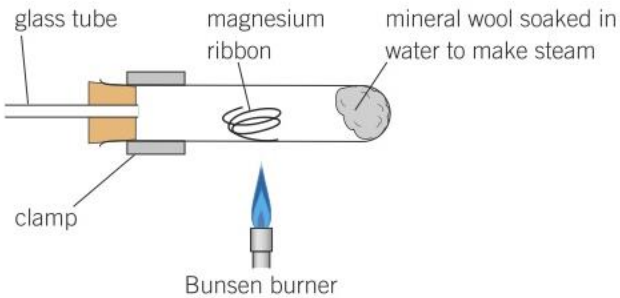
Some metals do react with water. Calcium bubble vigorously, then seems to disappear. The bubbles are hydrogen gas
Calcium + water → calcium hydroxide + hydrogen

How do metals react with steam?

Magnesium reacts slowly with cold water. But it reacts quickly with steam.

magnesium + water → magnesium oxide + hydrogen

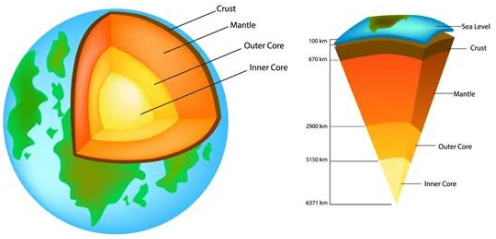
$Mg(s) + H_2O(g) \rightarrow MgO(s) + H_2(g)$



Extracting metals

Metals are found in rocks.
Rocks that contain metals are called ores.
Many ores are the oxides of the metal.
First the metal oxide must be removed from the ore.
Then the oxygen must be removed from the metal.
Many metals are extracted by reacting with carbon.
Copper oxide + carbon → copper + carbon dioxide

Chemistry 4 - The Earth

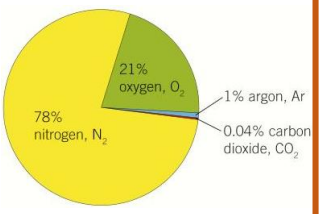


Low-density poly(ethene) (LDPE) is used for carrier bags because the molecules in LDPE slide over each other, which makes it flexible and strong.

Carbon-fibre reinforced is a composite. It consists of carbon fibres and a glue-like polymer. CFPR is used for bicycle frames as it has a lower density, making bicycles lighter. However, CFPR is also expensive and if crashed, bicycles are badly damaged.

Igneous rock forms when liquid rock cools and freezes. Igneous rocks are **not porous**, **hard** and **durable**

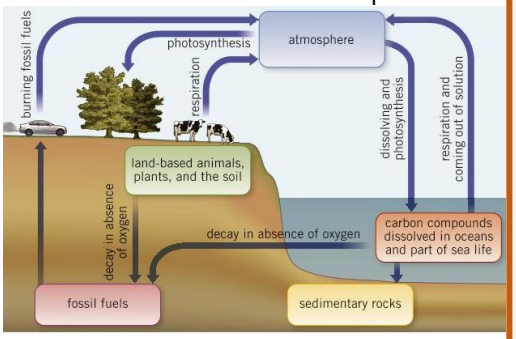
The **atmosphere** is a mixture of gases that surrounds the Earth.



The part of the atmosphere nearest the Earth is the **troposphere**.

Ceramic materials are compounds. They are electrical insulators

The carbon cycle shows how carbon dioxide enters and leaves the atmosphere.

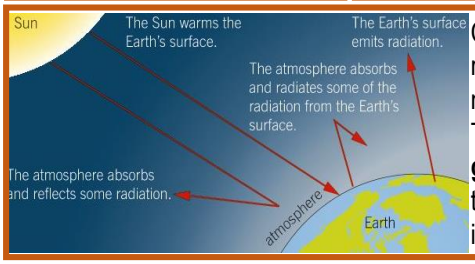


Carbon dioxide is ADDED to the atmosphere by **respiration & combustion**

Carbon dioxide is REMOVED from the atmosphere by **photosynthesis & dissolving in oceans**

There are many advantages of recycling…

- Resources will last longer
- Use less energy than using new materials
- Reduces waste and pollution

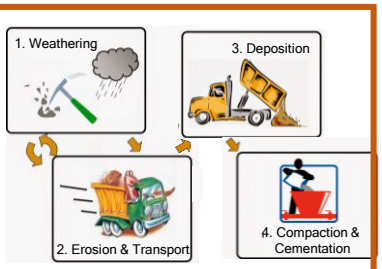


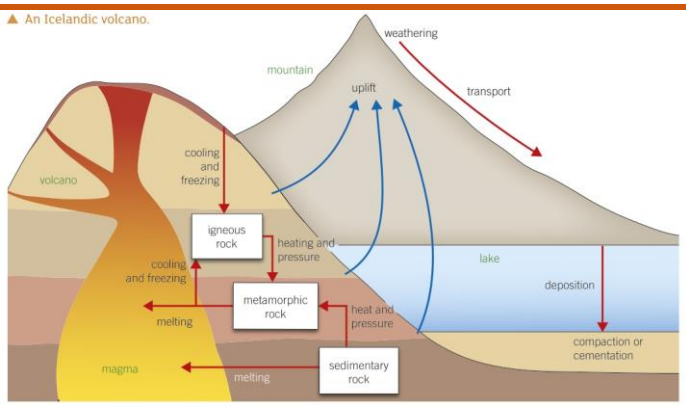
CO_2 in the atmosphere absorbs some radiation produced by Earth so it does not go back into space.
This keeps the Earth warm. This is the **greenhouse effect**. Extra CO_2 causes the global average air temperature to increase. This is **global warming**.

Carbon stores include…

Sedimentary rock

Sedimentary rocks are made up of separate grains. They are also **porous** –they have gaps between their grains where air or water can get in. Sedimentary rocks are made up of pieces of older rocks.
The process has several stages…

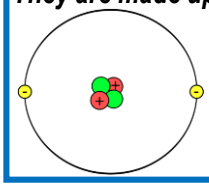




All the time, rocks are changing. Weathering breaks down rocks. Sediments make new rocks. Volcanoes erupt and their lava freezes. Deep within the crust, heat and pressure change the rocks.

Physics 1 - Electricity and Magnetism

Atoms are the smallest particles that exist
They are made up of three main components:

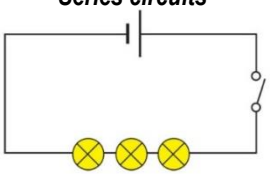


Proton – positive charge

Neutron – no charge

Electron – negative charge

Series circuits

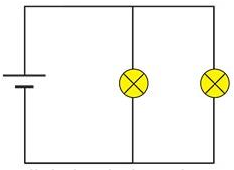


In a series circuit there is only one loop.

In a series circuit the current stays the same everywhere.

The potential difference across each component adds up to the potential difference across the battery.

Parallel circuits



In a parallel circuit there is more than one loop.

In a parallel circuit the current is split between branches.

The potential difference across each component is the same as the potential difference across the battery.

Current is the amount of charge flowing per second. Current is measured in amps (A)

Potential difference is the push provided by the cell or battery. It is measured in volts (V)

Current is measured using an ammeter

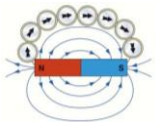
Potential difference is measured using a voltmeter

Calculating resistance:

resistance = potential difference ÷ current
(Ω) (V) (A)

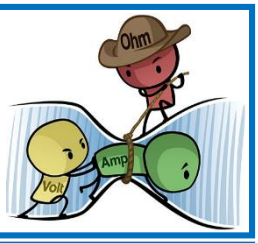
What is a magnetic field?

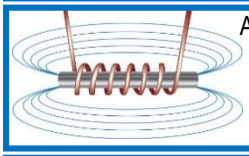
In a magnetic field there is a force on a magnet or a magnetic material.



Magnetic field lines go from the north pole to the south pole of the magnet.

Resistance tells you how easy or difficult it is for the charges to pass through a component in a circuit. Resistance is measured in **ohms** (Ω).

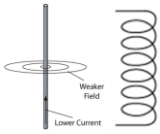




A wire with an electric current flowing through it has a magnetic field around it. This is an **electromagnet**.

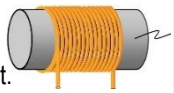
The current in a circuit depends on the push of the battery and also the resistance of the component.

To make an electromagnet stronger…

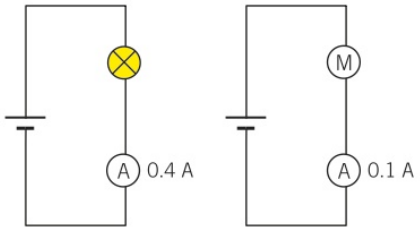


Increase the number of turn loops in the coil of wire.

Add an iron core. Iron is a magnetic material so increases the strength of an electromagnet.



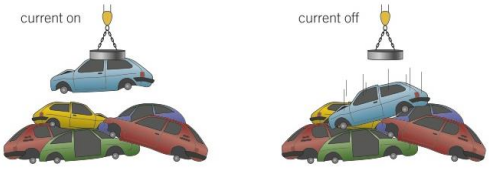
Increase the current flowing through the wire.



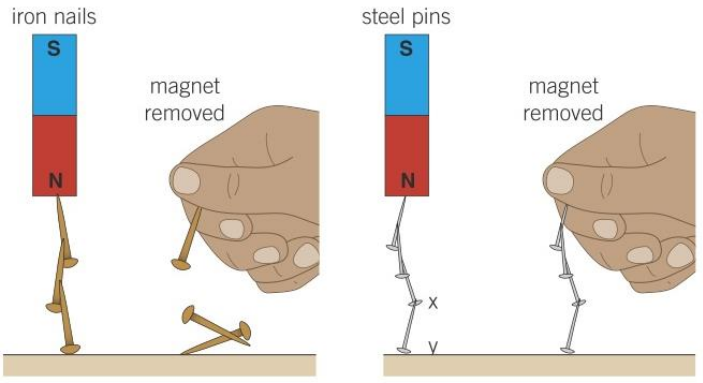
These circuits have different currents because they have different resistances. The bigger the resistance , the smaller the current.

Resistance is measured in ohms (Ω)

Resistance = Voltage / Current



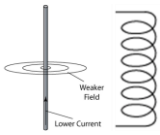
Electromagnets are used in scrapyards, door locks, maglev trains, MRI machines.



▲ Steel stays magnetic when you remove the magnet.

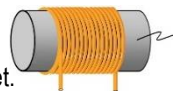
Physics 2 - Energy

To make an electromagnet stronger…



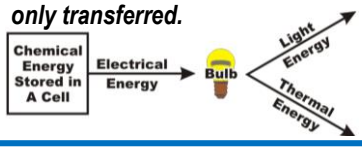
Increase the number of turn loops in the coil of wire.

Add an iron core. Iron is a magnetic material so increases the strength of an electromagnet.

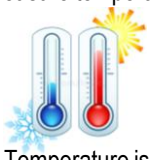


A — Increase the current flowing through the wire.

The law of conservation of energy states…
…energy cannot be created or destroyed, only transferred.



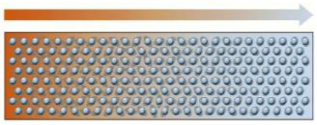
Temperature is a measure of how hot or cold an object is. You can use a thermometer to measure temperature



Temperature is measured in degrees Celsius (°C)

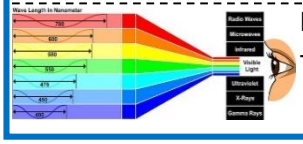
When fossil fuels are burned, they produce a lot of carbon dioxide. CO_2 is a greenhouse gas, so contributes to climate change. Burning fossil fuels also produces pollutants such as sulfur dioxide, nitrogen oxides and particulates.

When particles in a solid, liquid or gas are heated, they vibrate



Conduction:
– particles transfer energy by colliding with other particles when they vibrate.

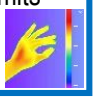
Convection:
– particles transfer energy in a liquid or gas and create a convection current.



Radiation:
– this is the transfer of (heat) energy by waves. An example of radiation is infrared.

Energy is measured in **joules** (J). One joule is a very small amount of energy, so we often use **kilojoules** (kJ). 1kJ = 1000J

The sun emits **infrared** radiation

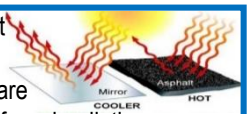


You can calculate work done using the equation: **work done = force x distance** (J) (N) (m)

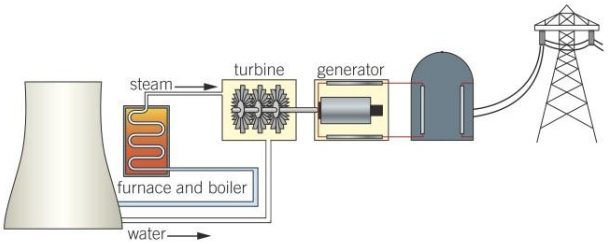
Fossil fuels are energy resources that were formed millions of years ago. For example…

Coal, oil and gas are non-renewable. This means you cannot easily get more of them when you run out.

Shiny surfaces reflect infrared radiation. Dull/darker surfaces are better at absorbing infrared radiation.



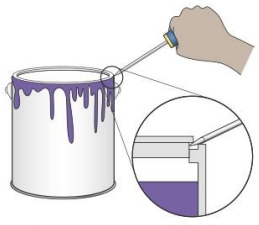
Renewable resources are alternative methods to produce energy. Renewable resources will not run out. Some examples are:



Fuels burn to produce heat. The heat turns water to steam. The steam turns a turbine which in turns a generator produces electrical energy.

Power is how much energy is transferred per second

Power = Energy transferred / time



Gears and levers can amplify forces through mechanical advantage.

Physics 3 - Motion and Pressure

	Speed (m/s)	Speed (km/h)	Speed (m.p.h.)
walking quickly	1.7	6.1	3.7
sprinting	10	36	22
typical speed limit	14	50	31
cheetah	33	119	75
aeroplane cruising speed	255	918	570
sound in air	330	1180	738
light in air	300 000 000	10 000 000 000	670 000 000

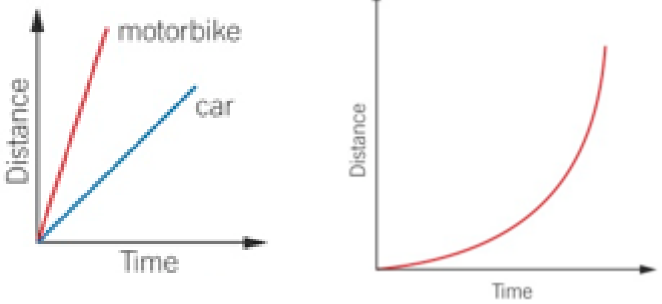
Speed is a measure of how fast something is moving

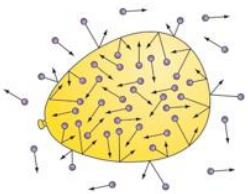
Speed = distance / time

The units of speed are m/s

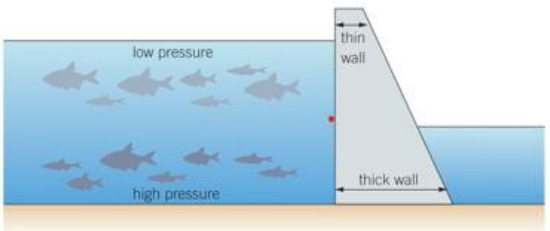
A distance time graph shows how something is moving.
A horizontal line is stationary.
Diagonal is constant speed.

The steeper the line the greater the speed.





The collisions between air molecules and the balloon cause gas pressure. More collisions make more force over an area so increased pressure.
Gas pressure acts equally in all directions.



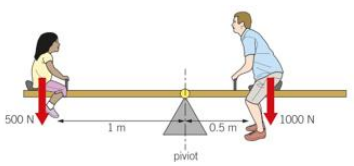
Pressure in liquids increases with depth.
Liquids cannot be compressed so they pass this pressure on.

Pressure is a force spread over an area

Pressure = Force / Area

Pressure is measured in N/m^2 or pascals

The moment of a force = force x distance from pivot



When something is balanced, it is in equilibrium, the clockwise moments are equal to the anticlockwise moments.