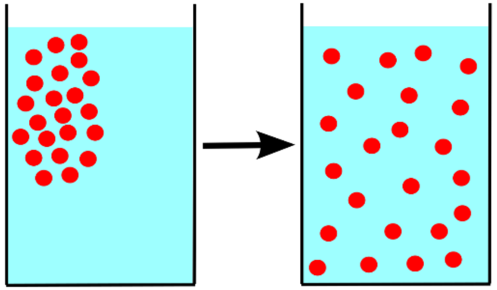
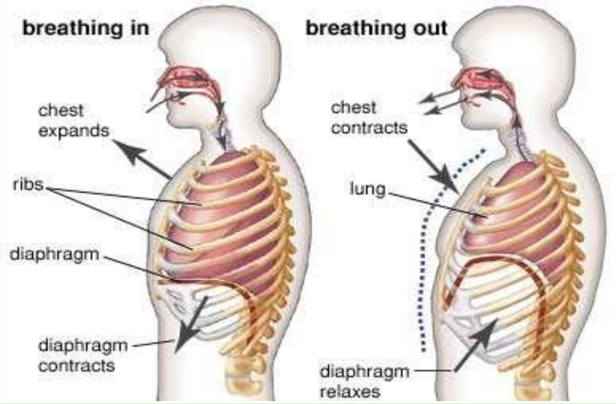
Year 7 Knowledge Organiser : Exchange and Transport in Animals



Diffusion is the movement of particles **from a high concentration to a low concentration**.

During exercise there is an increase in physical activity and muscle cells respire more than they do when the body is at rest. **The heart rate increases during exercise**. The rate and depth of breathing increases - this makes sure that more oxygen is absorbed into the blood, and more carbon dioxide is removed from it.



Respiration is a reaction that happens in our cells that **releases energy** so that normal activities can happen.

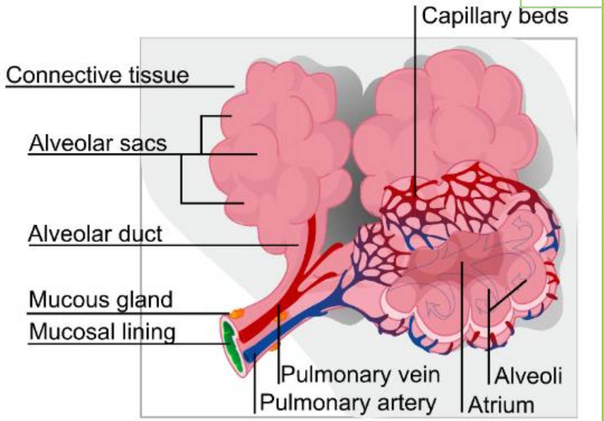
There are **two** types of respiration that occur in humans:

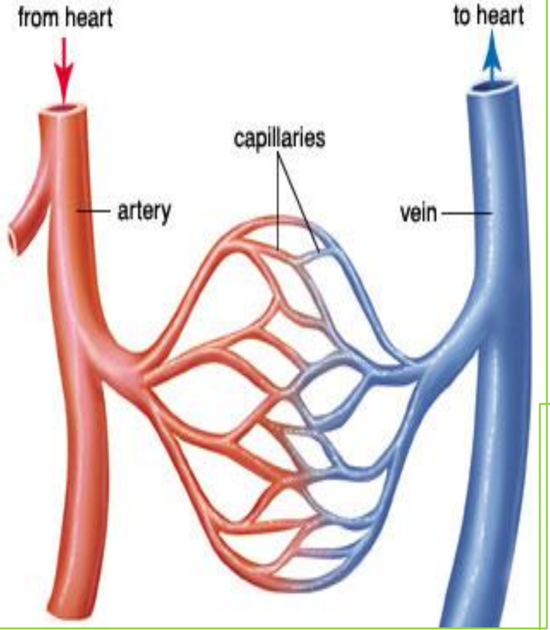
- **Aerobic** respiration happens when there's lots of oxygen.

GLUCOSE + OXYGEN → CARBON DIOXIDE + WATER

- **Anaerobic** respiration happens when our muscles don't get enough oxygen during exercise.

GLUCOSE → LACTIC ACID

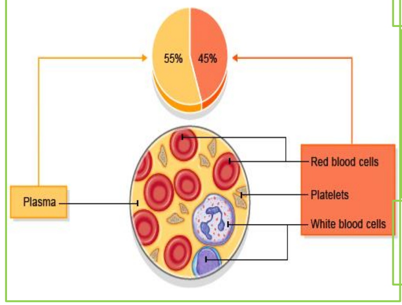




Name of blood vessel	Job	How is it specialised?
Artery	Transport blood away from the heart at high pressure	Thick walls to prevent it from bursting
Vein	Transport blood back to the heart at low pressure	They have valves to stop the blood flowing backwards
Capillary	Exchange of materials between the blood and body cells	Walls are thin and one cell thick so diffusion is easier

Alveoli are specialised for gas exchange in the following ways:

- they have a **large surface area**
- their walls are **very thin**
- they have **many capillaries carrying blood** covering them



Red blood cells carry **oxygen** around the body

White blood cells destroy disease-causing microbes, like bacteria.

Plasma carries **dissolved substance**, such as **glucose**, around the body.

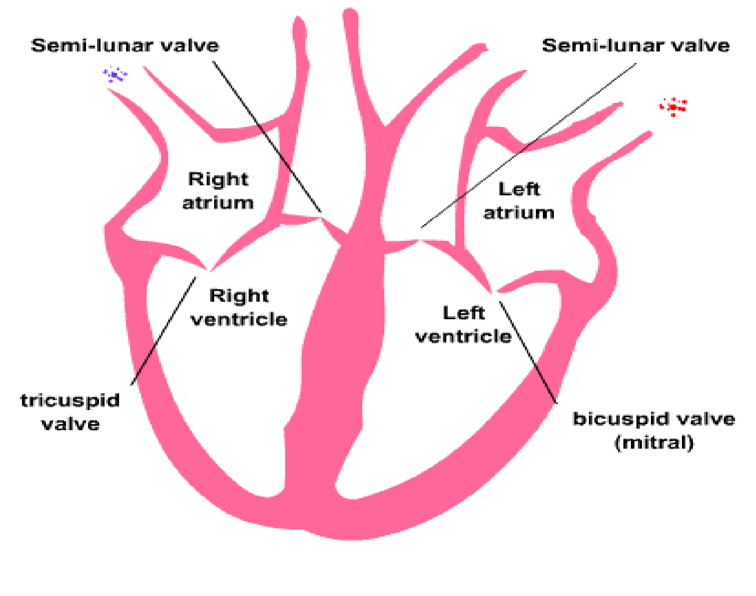
Platelets help to **clot the blood** and stop us from **bleeding** when our skin is cut.

The **heart** pumps blood around the body.

The muscles in the wall of the heart **contract** to put **pressure** on the blood, which forces it out of the different **chambers** – the **atria** and the **ventricles.**

The right side of the heart **pumps deoxygenated blood** to the **lungs.**

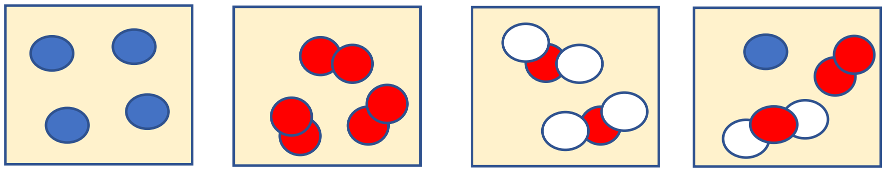
The left side of the heart **pumps oxygenated blood** to **all parts of the body.**



7C2
Elements and compounds

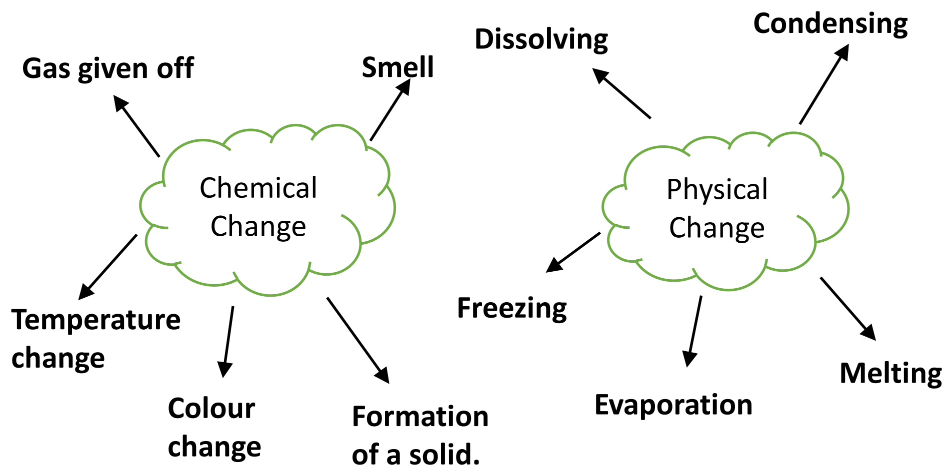
Properties of metals
Metals are good conductors of heat and electricity, have a high density, melting and boiling points. They are sonorous, malleable and ductile.

Atoms, Molecules, Elements, compounds and mixtures
An atom is the smallest particle of a chemical element that can exist.
Molecules form when two or more atoms form chemical bonds with each other.
An element is a substance that contains only one type of atom.
A compound is a substance containing two or more elements chemically bonded together.
A mixture is a substance containing two or more elements/compounds, not chemically bonded.

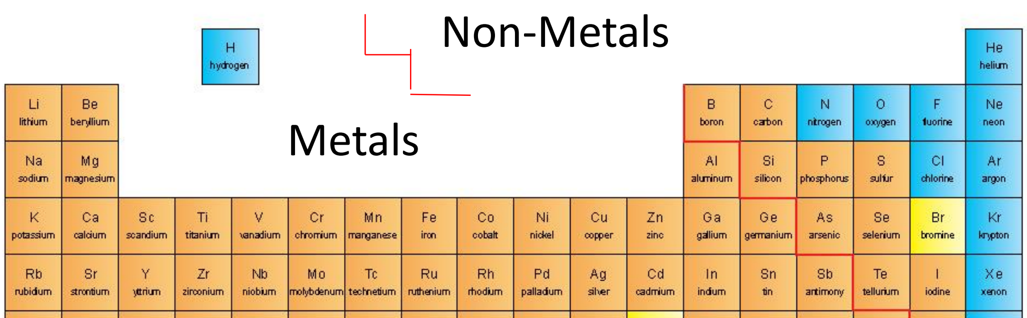


Atoms of one type of element. | **Molecules of one type of element.** | **Molecules of one type of compound.** | **A mixture of elements and compounds.**

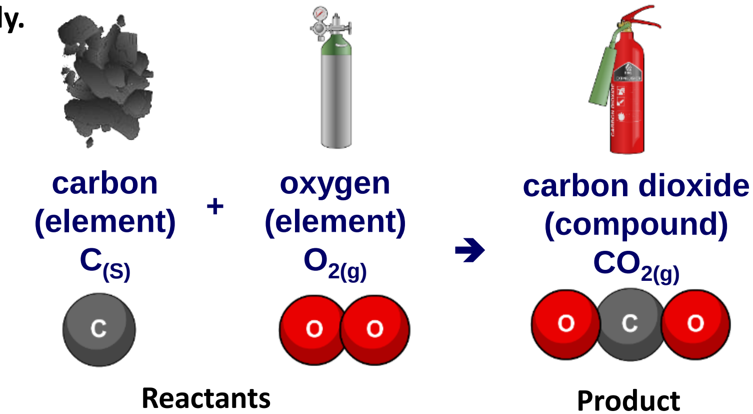
Chemical and physical changes
Chemical changes occur when elements and compounds combine to form a new substance. The change is permanent.
Physical changes occur without forming new substances. This are not permanent and are reversible.



Elements and the periodic table
Dmitri Mendeleev created first version of the modern periodic table.
Elements are arranged into periods (horizontal) and groups (vertical) on the periodic table. Each element has a unique chemical symbol.
Elements are either metals or non-metals.
TRENDS can be found in properties along periods and down groups.



Properties of compounds
Compounds have very different properties to the elements from which they are made. This is because the atoms are joined together differently.



Rusting is a type of chemical reaction when oxygen reacts with iron

Year 7 Knowledge Organiser : Bridging the Gap

Laboratory Rules


Explosive


Flammable


Corrosive


Hazardous to the environment

1. No pupil may enter a Science room without permission.
2. NOTHING must be taken out of the laboratory without permission.
3. No equipment, apparatus or science materials may be touched except on the instruction of a teacher. Follow instructions precisely; check bottle labels carefully and keep tops on bottles except when pouring liquids from them.
4. When using naked flames (e.g. bunsen burners, spirit burners or candles), make sure that ties, hair, loose clothing etc. is tied back or tucked away. Care must be taken with hot items such at test tubes and tripods.
5. NEVER run in the laboratory.
6. DO NOT eat or drink in the laboratory.
7. DO NOT play with taps or switches.
8. Make sure you are fully aware of the health and safety issues for the experiment you are carrying out.
9. Wear eye protection when told to do so. Keep it on from the very start until all practical work is finished and cleared away. Only remove eye protection when told to do so.
10. Always stand up when working with hazardous substances or when heating things so you can quickly move out of the way if you need to.
11. Accidents, breakages or spills MUST be reported to the teacher at once. The teacher will then deal with them.
12. Keep your bench and floor area clear, with bags and coats well out of the way. Stools must be kept under benches.
13. If you are burnt or a chemical splashes on your skin, wash the affected part at once with lots of water. Tell your teacher.
14. Hands must be washed after working with chemicals or biological materials.
15. After an experiment, apparatus must be cleaned, put away and the bench left clean and dry. Waste materials should be disposed of as the teacher instructs.


Caution – harmful or irritant


Toxic


Radioactive material

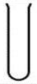
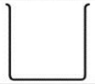
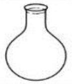
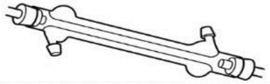
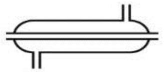
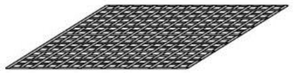
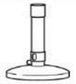
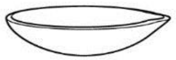
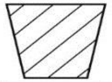
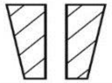

Health Hazard


Gas under Pressure

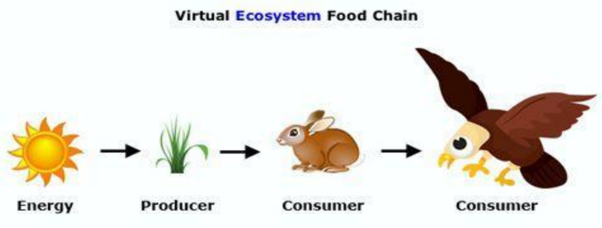

Oxidising


Risk of Electric shock

Science Equipment

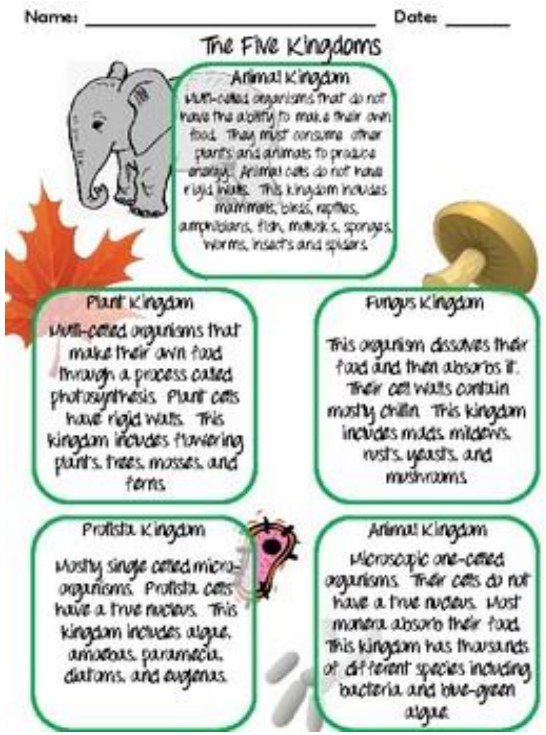
Apparatus	Name	Diagram	What it is used for
	test tube		storing or mixing solids and liquids
	boiling tube		heating solids and liquids
	beaker		holding liquids or solids
	conical flask		holding and mixing liquids
	round-bottom flask		heating liquids
	measuring cylinder		measuring volumes of liquids
	Liebig condenser		cooling a vapour and condensing it into a liquid
	tripod		heating a beaker, flask or crucible over a Bunsen burner
	gauze	--------------	supporting a beaker or flask and spreading the heat from the flame
	Bunsen burner	HEAT	heating things
	evaporating basin		evaporating the water from a solution
	filter funnel (with paper)		separating an insoluble solid from a liquid
	rubber bung		keeping things in a tube or flask
	rubber bung with a hole		the hole is so that a tube or thermometer can be put into the liquid without any gases escaping

Year 7 Knowledge Organiser : B3 - Ecology



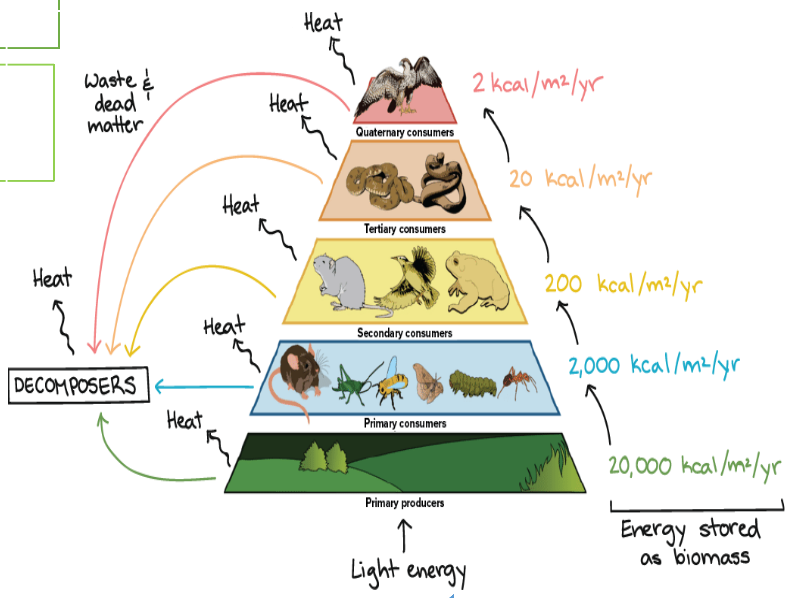
Food chains show the flow of energy within an ecosystem & how organisms are dependent on each other.

Classification is the sorting of organisms into different groups.
The five kingdoms are shown below



Abiotic Factors are non-living factors which affect the survival and distribution of organisms within an ecosystem, e.g. light intensity, volume of rainfall, pH of the soil.

Biotic Factors are living factors which affect it – e.g predators and competition for resources with other organisms.



This pyramid of biomass shows how much 'living material' makes up each trophic level. It also shows how much energy Is passes onto the next level as it is lost with each organism.

Sampling: This is a process in Biology where a 'sample' of a population is taken to achieve an overview of the whole population.

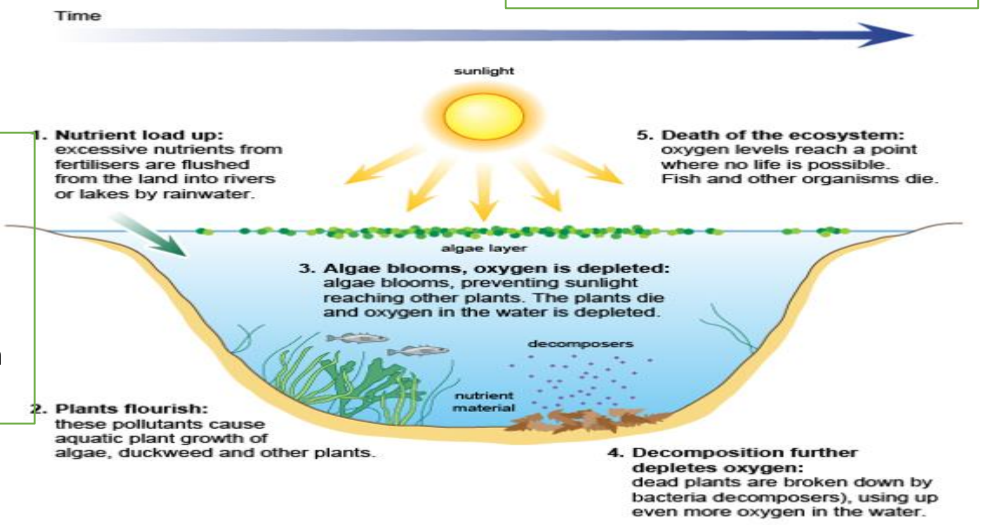
Type of Variable	Job
Independent	The one you change
Dependent	The one that you measure
Control	The ones that you keep the same so that you can compare results

Quadrat – normally a 1m^2 grid which is used to sample the number of plants in an area. It is placed randomly and the number of each plant in the quadrat is taken. A MEAN average is then taken of the number of plant.

The area of the quadrat is scaled up to the whole area of the field and the number of plants in the whole field is estimated.

Eutrophication is a process where humans use fertilisers which leach into lakes and they cause death within the ecosystem.

This is due to the development of an algal bloom.

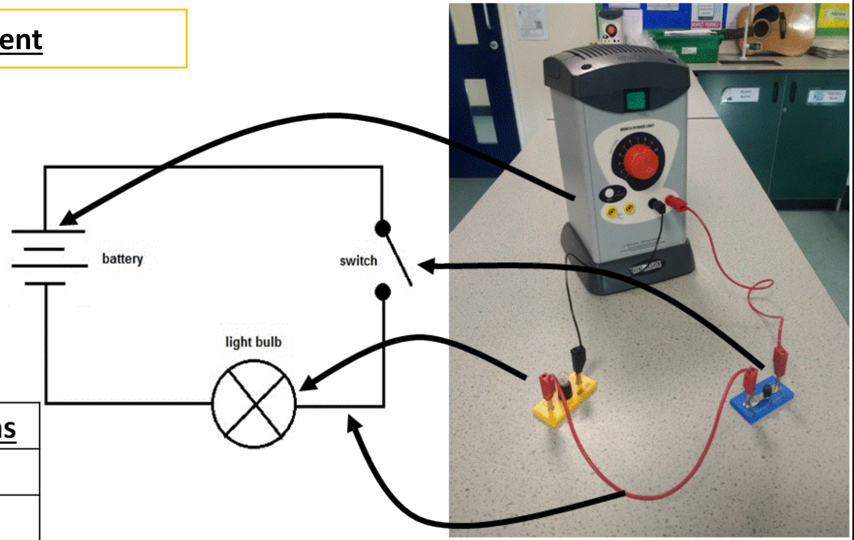


Year 7 Knowledge Organiser : Electric Current

Electricity is the transfer of energy, normally down a wire. This energy is carried by particles we call electrons (as in electr-icity).

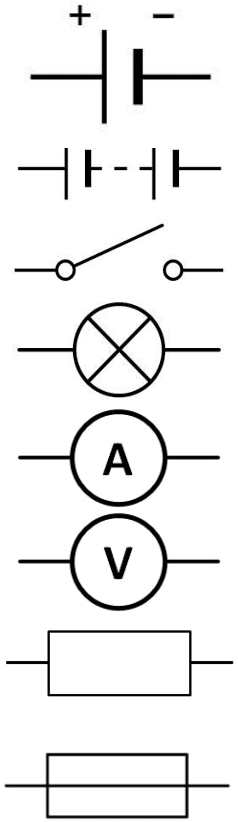
Electrical circuits take energy stored in cells or in a power supply and transfer it into something useful such as heat or light

We use special symbols to represent different parts of an electrical circuit. These are shown below.



Circuit symbols

- Cell
- Battery
- Switch
- Bulb/lamp
- Ammeter
- Voltmeter
- Resistor
- Fuse



Measurement	Unit	Unit suffix	In equations
Potential Difference	volts	V	V
Current	amps	A	I
Resistance	ohms	Ω	R

- For current to flow in a circuit, the circuit must have a power supply (a cell or a power pack) and a complete loop with no breaks.
- Different parts of a circuit – such as a bulb or a switch – are called components.
- Charge – groups of electrons, measured in coulombs – move round the circuit. Current is how much charge/how many coulombs flow per second through the circuit.
- Potential difference is how much energy each packet gains or loses as it goes through a component.
- If a circuit only has one loop it is called a series circuit. If it has more than one loop it is called a parallel circuit.
- We use an ammeter to measure current. It goes *in series* with the component so everything that goes through the component also goes through the ammeter.
- We use a volt meter to measure potential difference across a component. This goes *in* parallel with the component so it can measure the difference in energy being carried by the charge on each side of the component
- Resistance is how much a component prevents electricity flowing through it.
- Ohm's law: the potential difference across a component equals the product of the current through the component and the component's resistance – or V = IxR
- Electricity is dangerous so various safety systems are in place to put a "break" in the circuit, stopping dangerous current flowing. Each safety device protects against a sudden high current which could damage expensive electrical items like TVs etc – or anyone touching them. The most common safety device is the fuse, found in all UK plugs.

Common barriers to learning:

- Circuits are **already** full of electrons, they don't come from a switch or from a plug or from the power station.
- Electrons can't just be created or disappear.
- Electrons are each so small and have so little energy that we think of them in groups, called coulombs.
- Electrons leave a power source (e.g. a cell) with full energy and return to the power source with no energy.
- Resistance is not created by friction.

Energy Stores:
Chemical
Kinetic
Gravitational
Elastic
Thermal
Magnetic
Electrostatic
Nuclear

Energy Transfers:
Energy stores can be transferred in the following ways:
- Mechanical (sound)
- Electrical
- Heating
- Radiation (light)

7P1 Energy Knowledge Organiser

Gravitational energy depends on mass of the object (in kg), its height above the ground (m) and gravitational field strength, "g", which is 10N/kg

Gravitational Energy = mass x g x height

Gravitational energy practical: Investigate which ball is the most efficient at bouncing

Independent variable – different types of balls
Dependent variable – the rebound height
Control variables:
– Drop the ball from the same height
- Measure the ball's position from the same point

Energy Resources (non- renewable):
Coal, Oil, Gas
Nuclear
(Fossil fuels contribute to global warming and are running out)

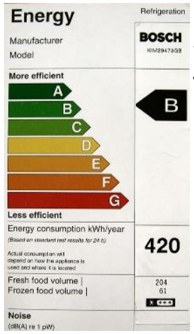
Energy Resources (renewable):
Solar
Wind
Hydroelectric
Wave
Tidal
Geothermal
Biomass

electrically → radio → by radiation (sound) / by heating → THERMAL (environment)

Candle

CHEMICAL (wax + oxygen) → by heating / by radiation (light) → THERMAL (environment)

Energy efficiency:
The more efficient an appliance is the more is transfer input energy into useful energy

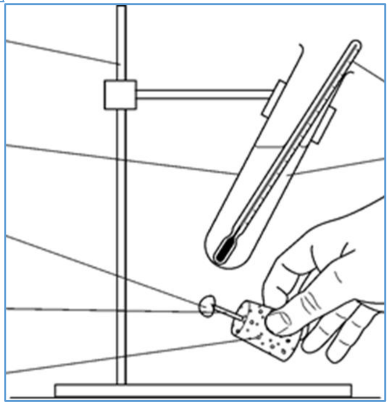


Appliances will have these labels stuck to them so you can see their efficiency. You can calculate efficiency using the equation

$$\text{efficiency} = \frac{\text{useful energy out}}{\text{total energy in}} \times 100$$

Law of conservation of energy – Energy cannot be created or destroyed. It is only transferred

Energy in food practical
Method:
- Measure out a volume of water using a measuring cylinder and measure its temperature.
- Set fire to the food
- Use the flame from the food to heat the water.
- Measure the temperature of the water after the food has stopped burning

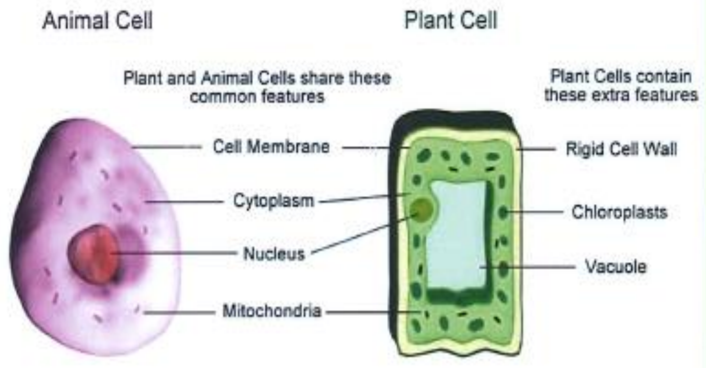


Energy changes:
- Chemical energy store in food transfers to the thermal store in the water

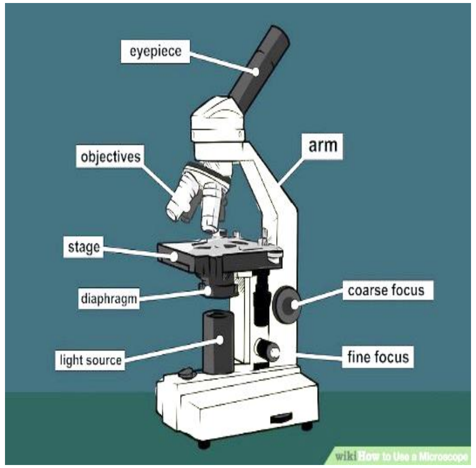
Conclusion:
The experiment where the water heats up the most is where the biggest chemical energy store has transferred to the thermal energy store in water

Year 7 Knowledge Organiser : It's all about You : From Cells to Organisms

Cells
Cells are the building blocks of all living organisms



Part of the Cell	What Does it Do
Nucleus	Controls the activities of the cell/ Stores DNA
Cell Membrane	Controls movement into and out of the cell
Mitochondria	Where respiration takes place
Cytoplasm	jelly like substance where chemical reactions happen
Ribosome	makes proteins for the cell
Chloroplast	absorbs light energy for photosynthesis
Vacuole	filled with a solution called cell sap



Key Terms	Function
Stage	Area where specimen is placed
Clamps	Hold the specimen still whilst it is being viewed
Light source	Illuminates the specimen
Objective lens	Magnifies the image of the specimen
Eyepiece lens	Magnifies the image of the specimen
Course/fine focus	Used to focus the specimen so it can be seen clearly
Revolving nosepiece	Holds 2 or more objective lenses

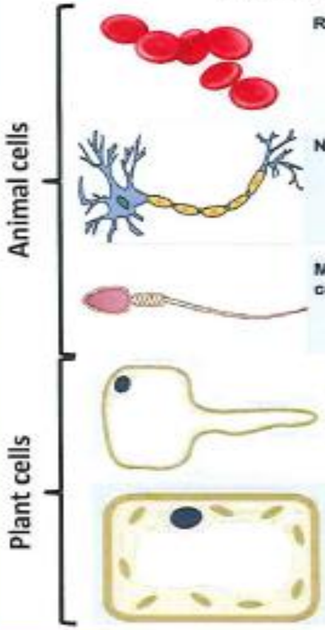
Magnification
We can use the following equation to calculate the magnification of an object viewed through a microscope:

$$magnification = \frac{image\ size}{actual\ size}$$

Using a microscope
To view an object down the microscope we can use the following steps:

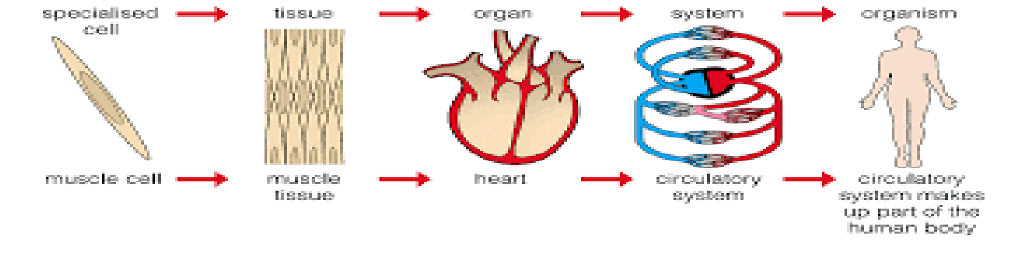
1. Plug in the microscope and turn on the power
2. Rotate the objectives and select the lowest power (shortest) one
3. Place the specimen to be viewed on the stage and clamp in place
4. Adjust the course focus until the specimen comes into view
5. Adjust the fine focus until the specimen becomes clear
6. To view the specimen in more detail repeat the process using a higher power objective

Specialised cells
Specialised cells are found in multicellular organisms. Each specialised cell has a particular function within the organism.



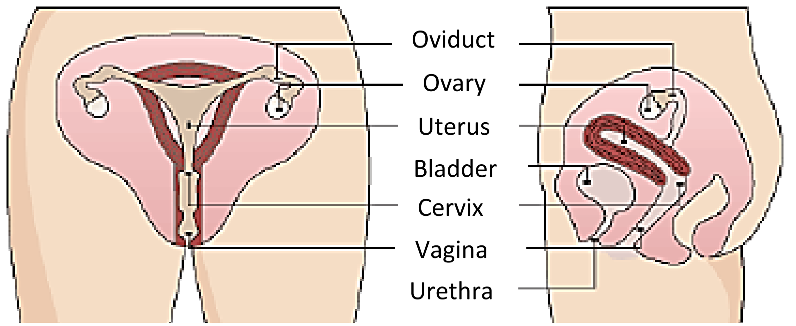
Type of cell	Function	Special features
Red blood cells	To carry oxygen	• Large surface area, for oxygen to pass through • Contains haemoglobin, which joins with oxygen • Contains no nucleus
Nerve cells	To carry nerve impulses to different parts of the body	• Long • Connections at each end • Can carry electrical signals
Male reproductive cell (sperm cell)	To reach female cell, and join with it	• Long tail for swimming • Head for getting into the female cell
Root hair cell	To absorb water and minerals	• Large surface area
Leaf cell	To absorb sunlight for photosynthesis	• Large surface area • Lots of chloroplasts

organelles → cells → tissues → organs → organ systems → organisms



Year 7 Knowledge Organiser : It's All About You : From Cells to Organisms Part 2

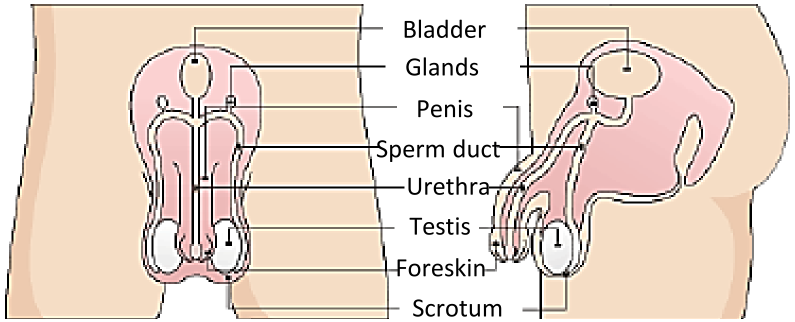
Female reproductive system



Functions of female reproductive organs

Structure	Function
Ovary	Contain undeveloped gametes (sex cells) called ova (or eggs). Every month, an egg matures and is released from the ovary.
Oviduct	Connects the ovaries to the uterus. Their cells are lined with cilia, tiny hairs that help waft the egg along to the uterus.
Uterus	A muscular bag with a soft lining, this is where an unborn baby develops.
Cervix	A ring of muscle which keeps the baby in place while the woman is pregnant.
Vagina	Muscular tube leading from the cervix to the outside of the woman's body. The vagina is where a man's penis enters during sexual intercourse.

Male reproductive system

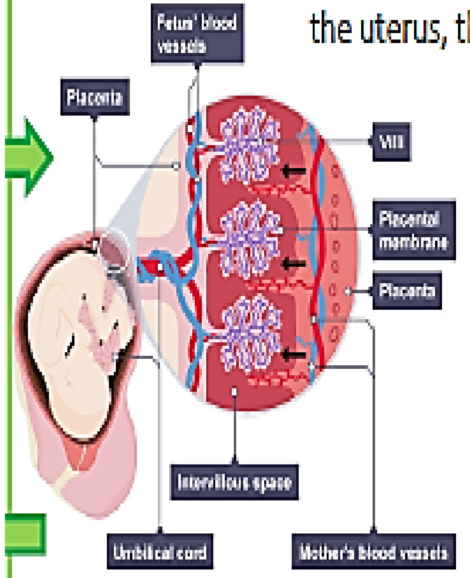


Functions of male reproductive organs

Structure	Function
Testes	To produce gametes (sex cells) called sperm. Also makes male sex hormones.
Penis	Passes urine and semen out of the man's body.
Urethra	Tube inside the penis which carries urine and semen.
Sperm Duct	Sperm passes through these and mix with fluids produced by the glands, creating semen.
Glands	Produce fluids to provide the sperm cells with nutrients.

Gestation

It takes approximately 40 weeks for a baby (foetus) to develop in the uterus, this time is known as gestation.



The placenta is an organ which provides oxygen and nutrients from the mother to the developing foetus. It also helps to remove waste such as carbon dioxide.

The foetus is connected to the placenta by the umbilical cord.

The menstrual cycle

Takes place in the female reproductive system. It involves a cycle of events which last approximately 28 days, stopping if a woman becomes pregnant.

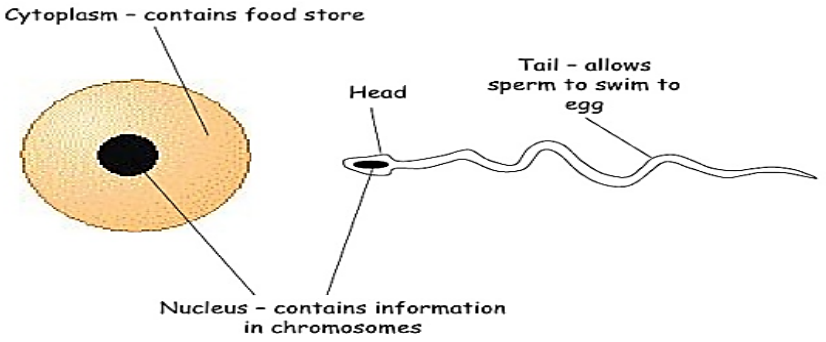
Day 1-5: The uterus lining breaks down. This is called menstruation.

Day 5-14: A female gamete (egg cell) matures in one of the ovaries. The uterus lining thickens.

Day 14: The mature egg is released from the ovary. This is known as ovulation.

Day 14-21: The egg travels down the oviduct and towards the uterus. The cilia in the oviduct help to waft the egg to the uterus.

Day 21-28: If the egg cell does not meet with a sperm cell in the oviduct, the uterus lining will break down and the cycle will repeat.



Fertilisation

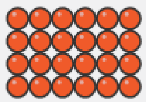
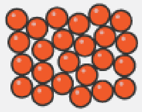
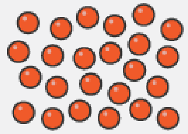
Fertilisation will occur if the egg cell meets and joins with a sperm cell in the oviduct. The fertilised egg attaches to the uterus lining and the woman becomes pregnant. This stops the menstrual cycle, preventing the uterus lining from breaking down.

7C1 Part 1
States of Matter

Factors affecting the rate of dissolving:

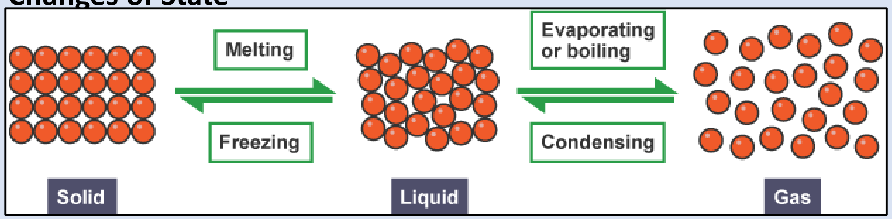
1. Stirring
2. Surface area of solute
3. Temperature of solvent

States of Matter – SOLID LIQUID GAS

State	Solid	Liquid	Gas
Diagram			
Arrangement of particles	Regular arrangement	Randomly arranged	Randomly arranged
Movement of particles	Vibrate about a fixed position	Move around each other	Move quickly in all directions
Closeness of particles	Very close	Close	Far apart

The particles should be the same in all 3 diagrams.

Changes of State



As a substance is heated it gains **energy**.
When the particles gain enough energy they overcome the **forces** between them.
Solids have the strongest forces of attraction, gases have the weakest.
Whilst a **change of state** is happening the **temperature** of the substance does not change.

Sublimation

When a solid changes into a gas without becoming a liquid first for example iodine is a grey solid which produces a purple vapour when heated.

Deposition

When a gas changes into a solid without becoming a liquid first.

Pure substance – made of one type of particle.

Mixture – two or more different substances not chemically combined and easily separated.

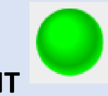
Melting point – the temperature at which a substance melts.

Boiling point – the temperature at which a substance boils.

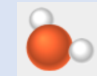
Dissolving

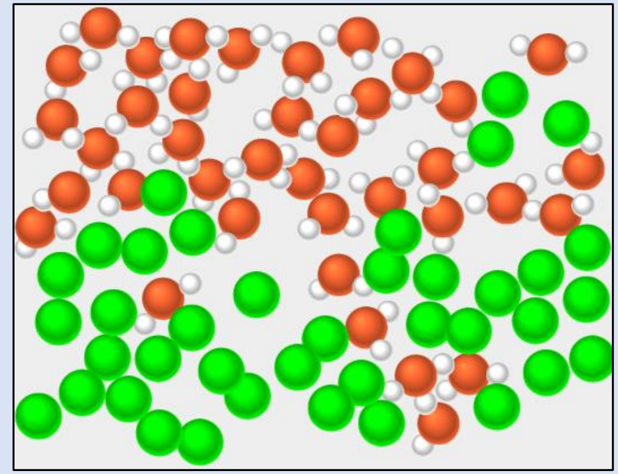
When the particles in a solid spread out in a liquid.

We call the liquid the **SOLVENT**



We call the solid the **SOLUTE**





We call the mixture of the solid and the liquid a **SOLUTION**.

A solid that will dissolve in a liquid is called **SOLUBLE**.

A solid that will not dissolve in a liquid is called **INSOLUBLE**.

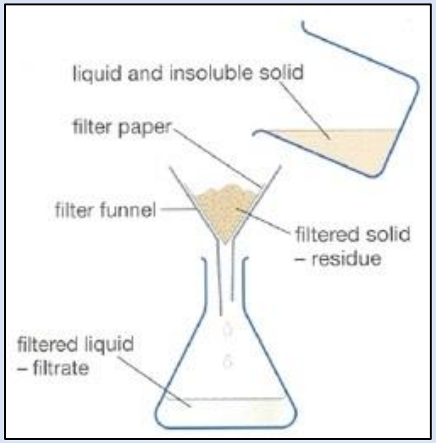
7C1 Part 2
Separation Techniques

All separation methods are dependent on the solubility of a substance.

Filtration

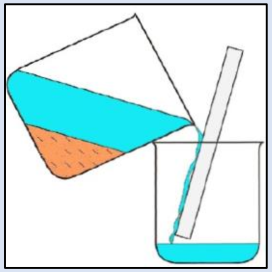
Separates an insoluble solid from a liquid.

The solid pieces are too big too fit through the holes in the filter Paper.



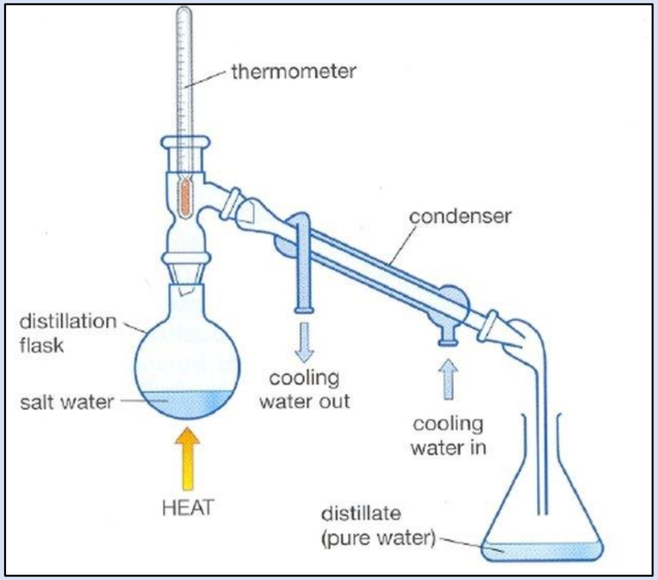
Decanting

Pour a liquid from the top of a settled solid or a more dense liquid.



Distillation

Separating substances with different boiling points.



Salt water mixture is heated.
At 100 °C water boils and the particles gain enough energy to become a gas (water vapour).

Boiling point of salt is 1413 °C so it does not boil and stays in the flask.

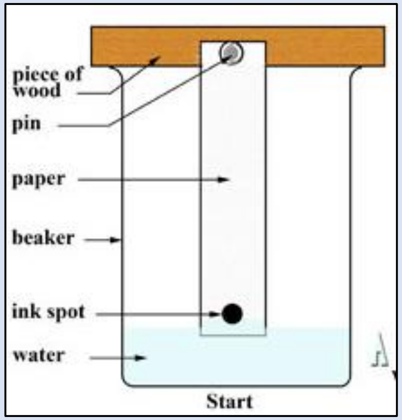
Water vapour rises and travels past the thermometer into the condenser.

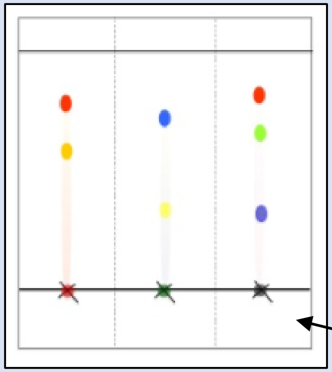
Thermometer checks the temperature to identify the gas.

Condenser cools the water vapour so that it condenses back to liquid water.

Chromatography

Method
Draw pencil line.
Put dot of colour on line.
Hang bottom edge (below dot) in the water.
Leave until water soak up to almost the top of the paper..
Compare with known substances.



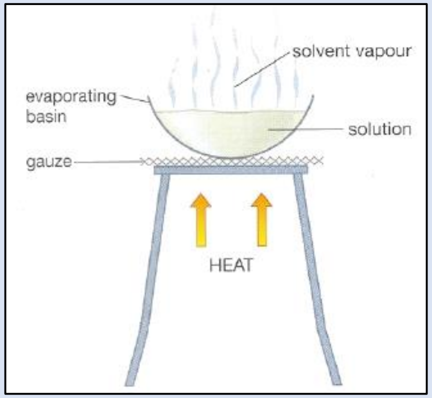


Different colours contain different mixtures of inks.
The different inks move at different speeds up the paper.
This is because of different solubility.

Chromatogram

Evaporation

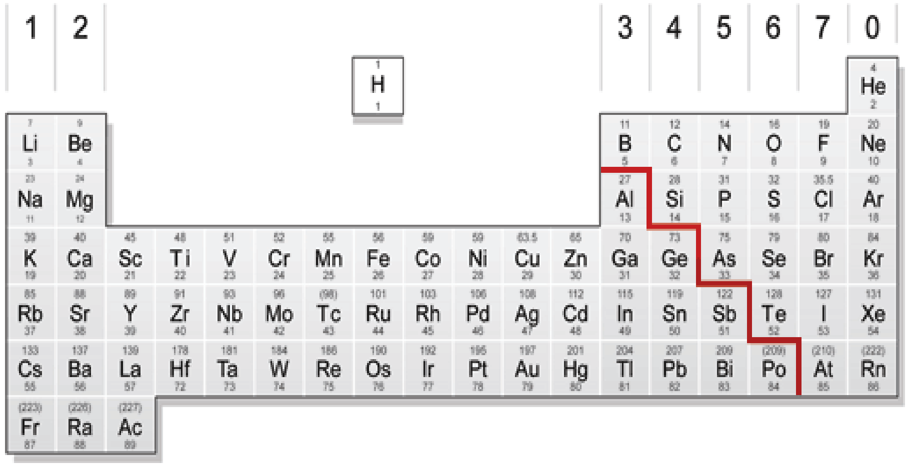
Separating a soluble solid from a liquid.



Crystallisation

Heat until almost all the water has evaporated.
Leave for the remaining water to evaporate slowly to form crystals.

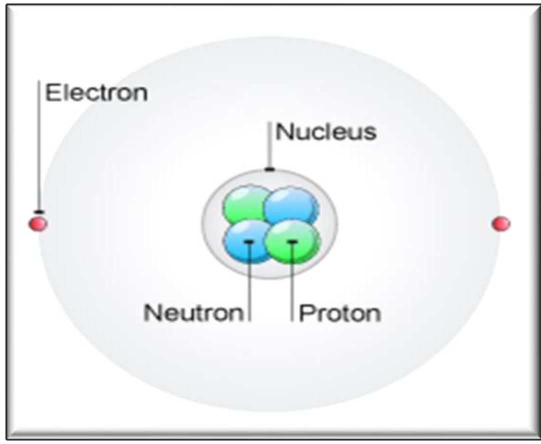
7C3
Knowledge Organiser The Periodic Table



The layout of the periodic table

Groups	Vertical columns are called groups. Each group has a number. Elements in a group have similar properties.
Periods	These are horizontal rows on the periodic table
Patterns and trends	These are relationships between elements in a group and how they can change e.g. melting point

The structure of the atom



Physical reactions are reversible and involve a change of state. Chemical reactions are usually irreversible and produce new substances.

Evidence for Chemical Reactions:

- Colour change
- Bubbles of gas
- Temperature change
- Change in mass (caused by loss of gas)
- Precipitation (solid formed)

Physical Properties depend on the type of element:
Metals have high melting points and boiling points, conduct heat and electricity, are malleable, ductile and strong. They are all solid at room temperature except Mercury.
Non-metals have low melting points and boiling points. Most are gases at room temperature. They are insulators and are brittle.

Chemical properties depend on the types of chemical reactions a substance does.
e.g. Reactions with oxygen, water, acid or displacement.
Elements in the same group will show similar chemical properties.

Knowledge organiser-P2-Waves

Waves transfer energy from one place to another.
Waves are made by forcing something to vibrate or oscillate.
There are two types of waves; transverse and longitudinal.
Sound waves are longitudinal waves.
Light and waves on water are transverse waves.

Comparing Light and Sound waves

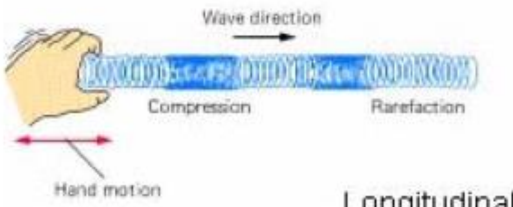
Similarities	Differences
• Both transfer energy • Both have a range of frequencies and wavelengths	• Travel as different type of wave • Sound waves need particles to carry energy but light waves do not • Different speeds – light travels up to a million times faster than sound

The law of reflection states that for a plane (flat) mirror the angle of reflection will be the same as the angle of incidence. You need to make sure your diagrams show this.

$$v = \frac{x}{t}$$

$$v = f \times \lambda$$

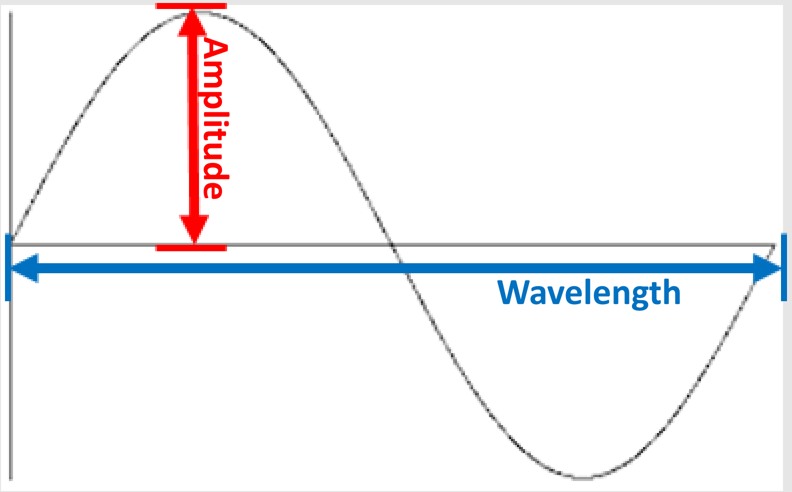
When an object or substance vibrates, it produces sound. These sound waves can only travel through a solid, liquid or gas. They cannot travel through empty space.
Sound waves are longitudinal waves - the vibrations are in the same direction as the direction of travel.
The diagram below shows this.



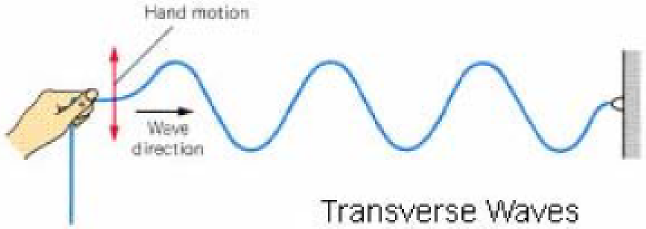
Longitudinal Waves

Time period - time needed for one complete cycle of vibration to pass a point.

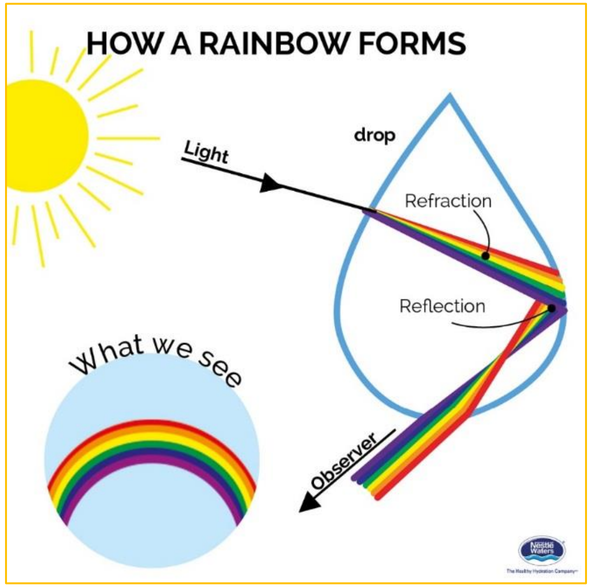
Frequency - number of waves produced by a source each second



If you throw a pebble into a pond, ripples spread out from where it went in. These ripples are waves travelling through the water. The waves move with a transverse motion. The undulations (up and down movement) are at 90° to the direction of travel.
For example, if you stand still in the sea, the water rises and falls as the waves move past you.
The diagram below shows a transverse wave.



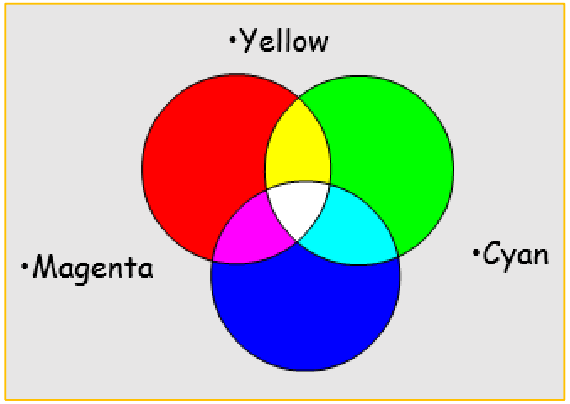
Transverse Waves



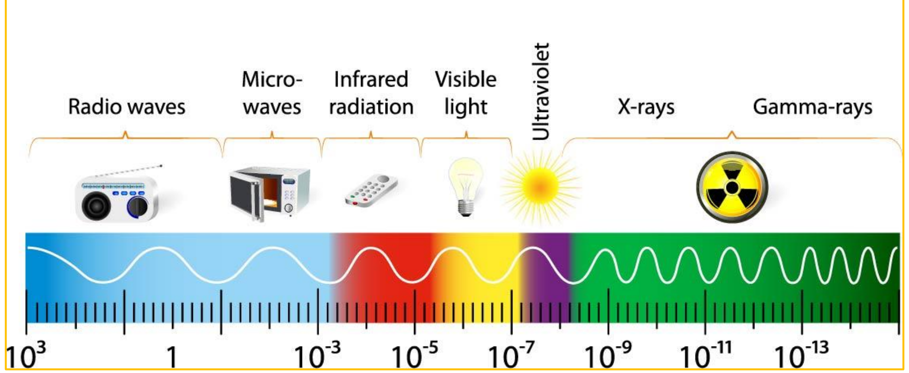
Red
Orange
Yellow
Green
Blue
Indigo
Violet

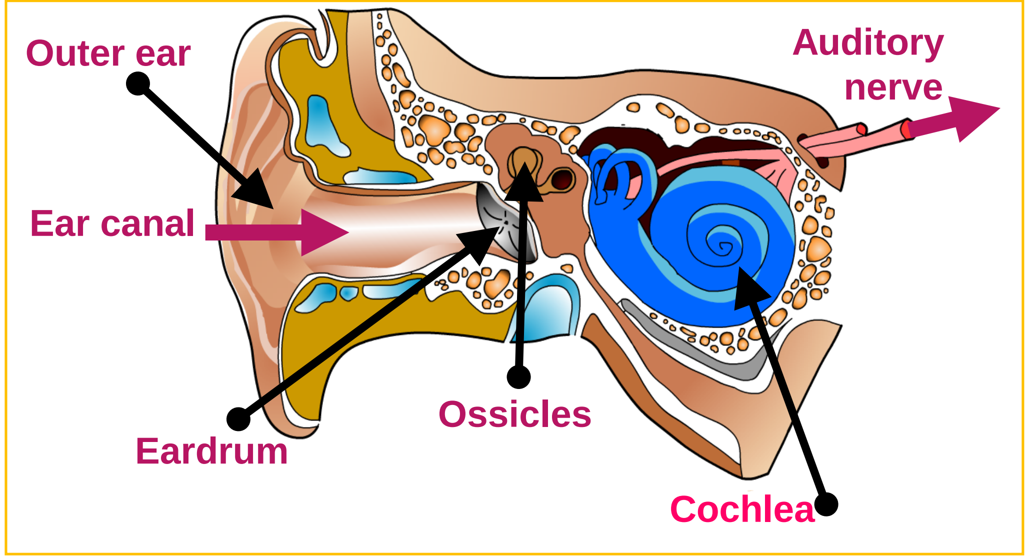
Mechanical waves- needs a substance for the wave to transfer energy e.g. Sound waves

Non-mechanical waves- does not need a substance for the wave to transfer energy e.g. Light waves



THE ELECTROMAGNETIC SPECTRUM





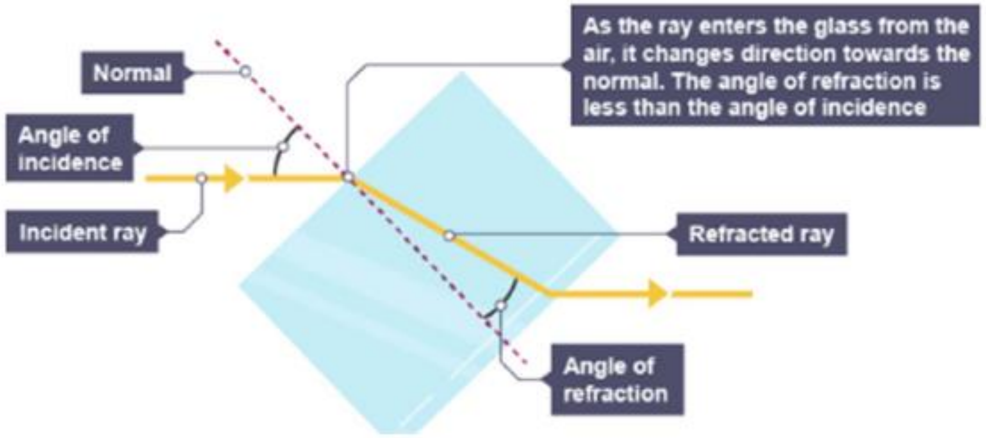
Refraction

Light waves change speed when they pass across the boundary between two substances with a different density, such as air and glass. This causes them to change direction, an effect called refraction.

At the boundary between two transparent substances:

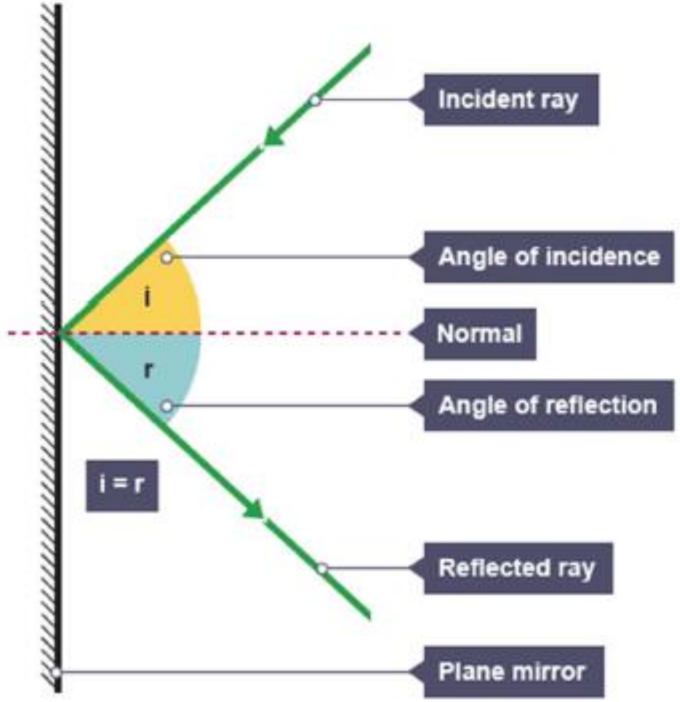
- the light slows down going into a denser substance, and the ray bends towards the normal
- the light speeds up going into a less dense substance, and the ray bends away from the normal

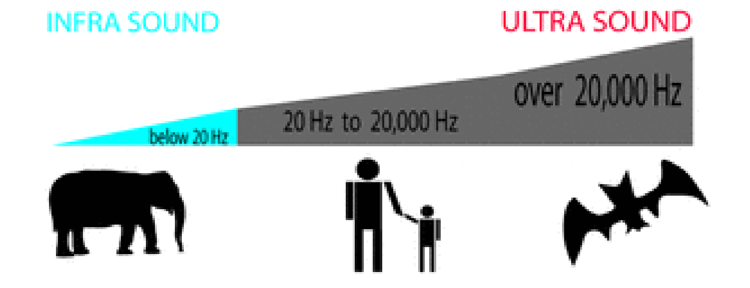
The diagram shows how this works for light passing into, and then out of, a glass block. The same would happen for a Perspex block:



Frequency = Pitch
Amplitude = Loudness

- the incident ray is the light going towards the mirror
- the reflected ray is the light coming away from the mirror





TIP

When drawing light ray diagrams make sure you always:

- Use a pencil and a ruler
- Draw the initial lines faintly so you can erase them
- Always add an arrow to show the direction of the light ray
- Real light rays are a solid line and virtual light rays are dashed lines