KNOWLEDGE ORGANISER Year 7: Acids and Alkalis Page 1 of 2

Key Scientific Words

Hazard	Something that could cause harm
Risk	The likelihood that a **hazard** will cause damage or harm.
Precaution	Action taken to reduce **risk** of harm from a **hazard**.
Solution	Formed when a substance dissolves in a liquid.
Acid	A substance with a **pH** of less than 7. Lower the **pH** the more acidic the solution.
Alkali	A substance that can dissolve in water to give a solution with a **pH** of more than 7. Higher the **pH** the more acidic the solution.
Neutral	Substance that is neither acidic or alkaline. Has a pH of 7.
Dilute	Add water to a solution to make it less concentrated.
pH scale	A numerical scale that goes from 0 to 14 that shows how acidic or alkaline a substance is.
Indicators	A substance that changes different colours, depending upon the pH of the solution it is in.
Neutralisation	A reaction in which an acid and alkali (**base**) react to produce a **salt** and water only.
Base	Any substance, soluble or insoluble in water, that **neutralises** an acid.
Salt	A compound containing a metal and a non-metal

Risks can be **reduced** by taking **precautions**. e.g. wearing eye protection to prevent chemicals splashing in your eyes or tying long hair back to prevent it catching fire in a Bunsen flame.

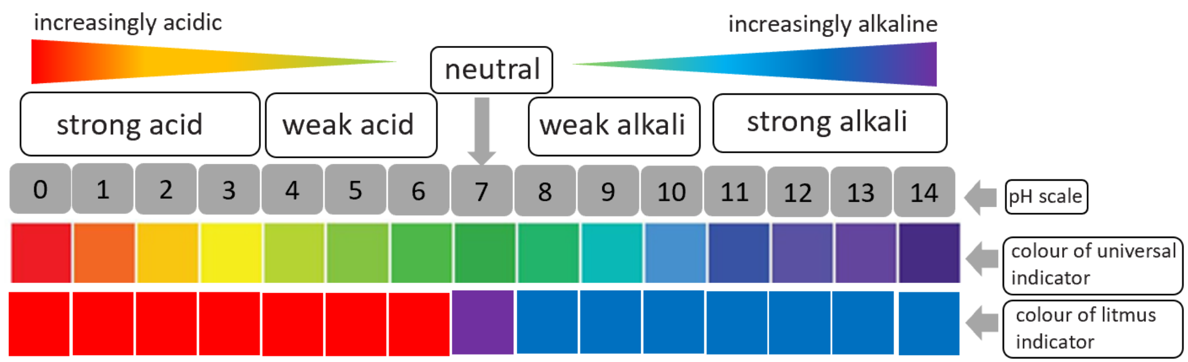
Symbols show the type of harm caused by a substance

Acids in the lab

Hydrochloric acid (HCl)
Sufuric acid (H_2SO_4)
Nitric acid (HNO_3)

Acids and alkalis in the home

The pH Scale



KNOWLEDGE ORGANISER Year 7: Acids and Alkalis **Page 2 of 2**

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Neutralisation Reaction

ACID + BASE → SALT + WATER

pH <7 pH >7 Neutral pH = 7

Reactants **Products**

Always →
Never =

Neutralisation reaction are useful in everyday life

- People take these antacids (medicine) if they have indigestion caused by too much acid in the stomach. The antacid contains a base to neutralises the acid.
- Soil can become too acidic for some crops to grow. Farmers spread lime (common name for calcium oxide = a base) on the soil to neutralise the acid.
- Toothpaste contains a mild alkali to neutralise the acid in our mouths.

- Salts are made when an acid reacts with an alkali or a base.
- **Salts names** are made of **two words**.
- The **first** part of the name of the salt is the **same** as the **metal** in the **alkali** or base.
- The **second** part of the name of the salt comes from the **acid**.

Alkali	First part of the name of the salt	Acid	Second part of the name of the salt
magnesium hydroxide	**magnesium**	hydro**chlor**ic acid	**chlor**ide
lithium hydroxide	**lithium**	**sulfur**ic acid	**sulf**ate
zinc oxide	**zinc**	**nitr**ic acid	**nitr**ate

Sulfuric acid + copper oxide → copper sulfate + water

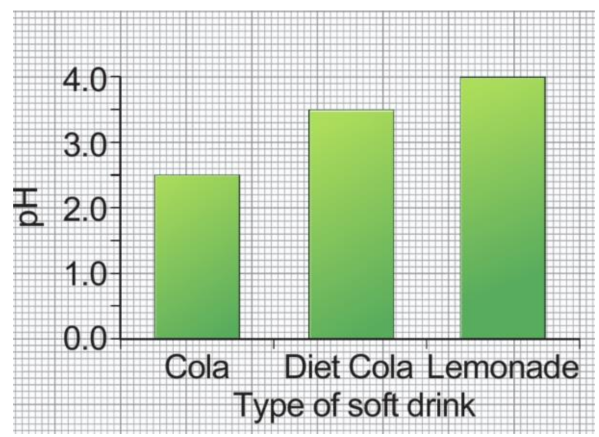
Confidence level? Not sure … Very happy									
1	2	3	4	5	6	7	8	9	10

Graphs and Titles

Dairy **M**ilk = **D**ependent variable we **M**easure
Ice **C**ream = **I**ndependent variable we **C**hoose to **C**hange

Dependent variable is plotted on vertical y-axis
Graph title is written in form: "**How** [dependent variable] **depends on** [independent variable]"

e.g**. How the pH depends on the type of soft drink**



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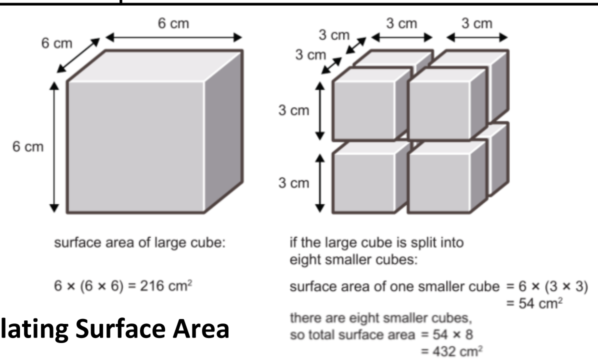
Key Scientific Words

Diet	The food that you eat.
Nutrients	A substances needed in the diet to provide raw materials for making new materials and for energy release.
Constipation	When the intestines get blocked.
Absorb	To soak up or take in.
Bias	A shift away form a correct meaning or value.
Deficiency disease	A diseases caused by a lack of a nutrient
Malnutrition	A problem cause by having too much or too little of a nutrient in the diet.
Soluble	Describes a substance that can dissolve in a liquid.
Enzymes	Substances that can speed up some processes in living cells e.g. breaking down food molecules.
Diffusion	When particles spread and mix with each other without anything moving them.



Calculating Surface Area

Substance needed	**Examples**	**Why it is needed**	**Good sources**
carbohydrate	starch, sugars	for energy (in respiration)	pasta, bread, rice, potatoes
protein		for growth and repair (building new substances)	meat, fish, beans
vitamins	vitamin C	for health	fruits and vegetables (e.g. oranges contain lots of vitamin C)
minerals	calcium	for health	fruits, vegetables and dairy products (e.g. milk contains calcium)
fibre		for health (helps to stop constipation)	wholemeal bread, wholegrain rice, celery and other fibrous vegetables
water		for health (water dissolves substances and fills up cells)	

Testing for foods:

Starch: add 2 drops of iodine solution.
Blue/Black = positive
Yellow/brown = negative

Fats: Rub a small dry food sample on some white paper. Fats will leave a greasy, translucent mark on the paper.

Proteins: Place a 1cm^3 food sample in attest tube and add 5 drops Biuret solution.
Purple = positive
Blue = negative

Balanced diets

<u>Deficient diseases</u>:

- **Kwashiorkor** → lack of protein; symptoms = "pot belly" causes by fluids collecting around intestines and weak muscles that cannot hold stomach in
- **Night blindness** → lack of Vitamin A; symptoms = can't see well at night
- **Scurvy** → lack of Vitamin C; symptoms = painful joints and bleeding gums
- **Rickets** → lack of Vitamin D; symptoms = bent legs due to weak bones that do not form properly
- **Anaemia** → lack of Iron; symptoms = tiredness and shortness of breath

<u>Other types of Malnutrition</u>:

- Too much **fat** may cause **heart disease** and can make people overweight. Very overweight people are **obese**.
- People **starve** and become weak if **they eat too little**.
- **Starvation** and **obesity** are both forms of **malnutrition**.

KNOWLEDGE ORGANISER Year 8: Food and Nutrition

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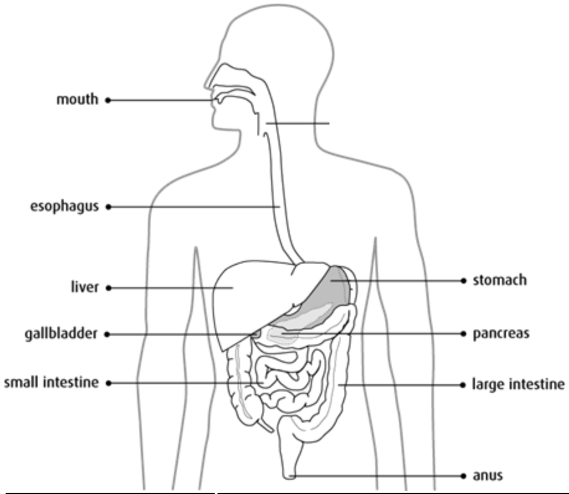
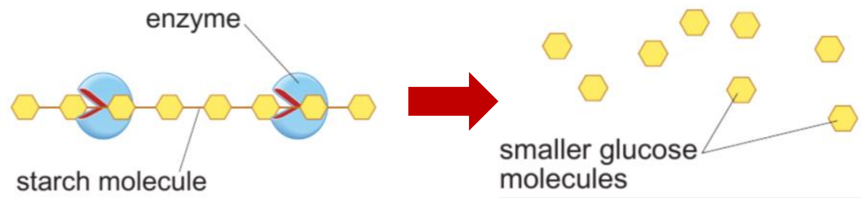
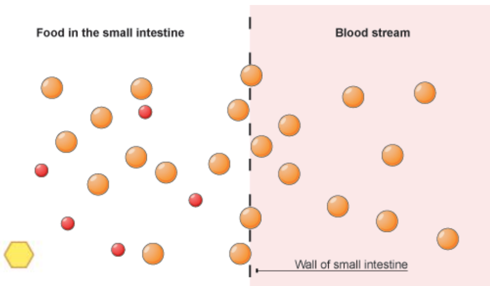


Digestion turns large insoluble substances into small soluble ones. The organs of the digestive system help us digest food. Many digestive organs produce enzymes →substances that are catalysts and help speed up food digestion.



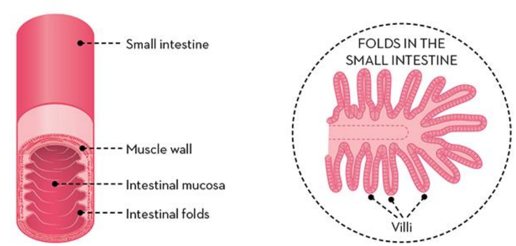


Organ	Function
Mouth	Contains teeth to chew food to make it smaller
Salivary gland	Produces enzymes to break down food
Oesophagus	A tube that connects the mouth to the stomach; muscles in the oesophagus contract to push food down
Liver	Produces bile that emulsifies fat (turns large droplets of fat into lots of smaller droplets)and reduces the pH of the stomach
Gall bladder	Stores bile
Stomach	Produces hydrochloric acid to kill any bacteria and produces enzymes to break down food
Pancreas	Produces enzymes to break down food
Small intestine	Absorbs nutrients and produces enzymes that break down food
Large intestine	Absorbs water
Anus	Where faeces exits the body

The **wall** of the small intestine is

- **folded** and covered with **villi** to give **large surface area** to absorb digested food
- The cells have **microvilli** to increase the **surface area even more**.
- The wall of the small intestine is only **one-cell thick** so it is easy for **small molecules** to **diffuse out** of the **small intestine** and **into** the **blood**.
- A **good blood** supply to the small intestine allows **diffusion** to happen **quickly**
- The digested food **molecules** are carried in the **blood plasma**.

THE SMALL INTESTINE AND ITS VILLI, WHICH HELP TO INCREASE THE SURFACE AREA



Confidence level?									
Not sure								Very happy	
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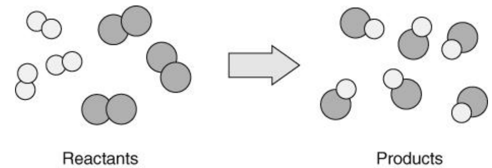
Key Scientific Words

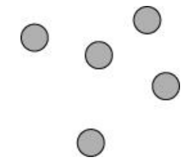
Chemical reaction	A change in which one or more new substances are formed.
Physical change	A change in which no new substances are formed (e.g. changes of state).
Group	A vertical column of elements in the periodic table. Elements in the same group generally have similar properties.
Period	A process in which energy is released from substances so it can be used by an organism. All living organisms respire.
Chemical formula	A combination of symbols and numbers that shows how many atoms of different elements are in a particular molecule. In compounds that do not form molecules, it shows the ratio of the different elements in the compound.
Halogen	An element in group 7 of the periodic table, such as fluorine and chlorine.
Alkali Metal	A group of very reactive metals. Found in group 1 of the periodic table.
Nobel gas	Group of very unreactive non-metal gases. Found in group 0 of the periodic table.
Anomalous Result	A measurement that doesn't fit the same pattern as other measurements from the same experiment.
Range	The difference between the highest and lowest values in a set of data (usually ignoring any anomalous results).

Dalton's Atomic theory

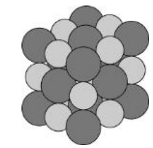
- All matter is made up of tiny particles called atoms.
- Atoms are indestructible, and cannot be created, or destroyed.
- The atoms in an element are all identical.
- In compounds, each atom of an element is always joined to a fixed number of atoms of the other elements.
- During chemical reactions, atoms rearrange, to make new substances.



No atoms are lost or gained so the **mass** of the **reactants** is **equal** to the **mass** of the **products**.



Atoms of an element.

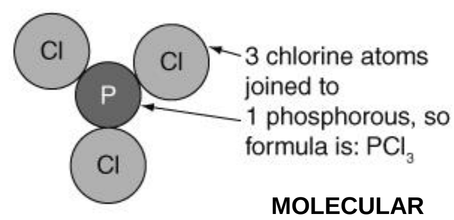


Atoms in a compound

Signs of a chemical reaction : **colour change, temperature change, gas given off, solid formed**

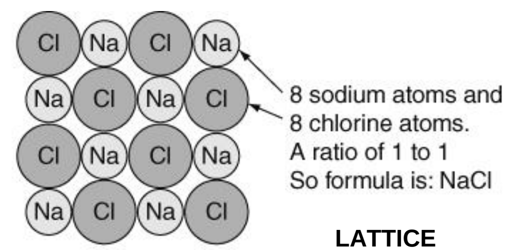
reactants → products

The **chemical formula** of a substance tells you the number of atoms of each element that are joined in its molecules, or the ratio of atoms of each element in the compound.



MOLECULAR

Phosphorous chloride
PCl_3



LATTICE

Sodium chloride
NaCl

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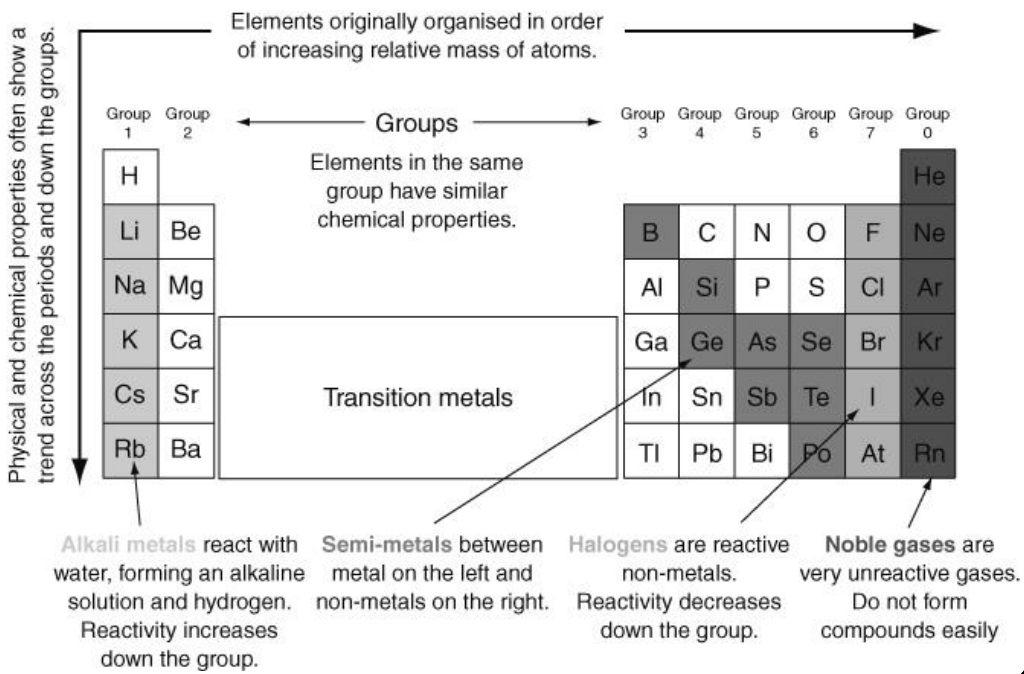
The Periodic Table



Independent Variable (Unit)	Dependent Variable (Unit)
0.0	0.0
1.0	0.5
2.0	1.9
3.0	1.7
4.0	2.5
5.0	3.1

Range = highest value – lowest value
Mean = average by adding values and dividing by number of measurements
Anomalous value = outlier so ignore in both range and mean calculation

Metal and non-metal oxides

Many elements burn in air/oxygen to form oxides

- calcium + oxygen → calcium oxide
- carbon + oxygen → carbon dioxide

- metal oxides tend to form alkaline solutions
- non-metal oxides tend to form acidic solutions.

Properties of substances: *often seen as trends*
chemical properties (e.g. flammability, pH, reaction with oxygen, water)
physical properties (e.g. melting point, boiling point, density, colour)

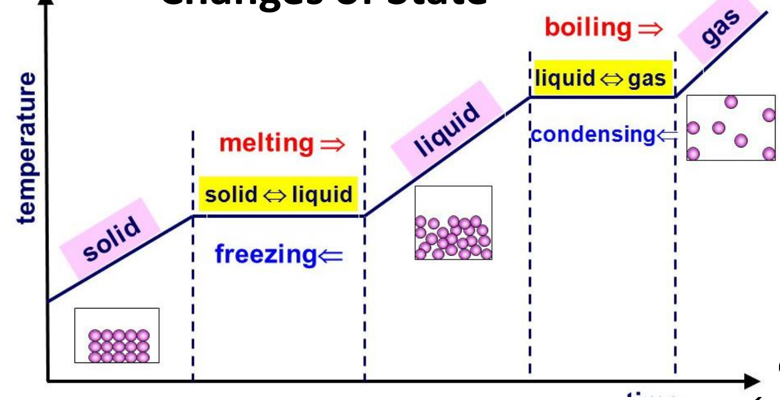
Elements are described by symbols of 1 or 2 letters. **1st letter** is always a **CAPITAL** and the **2nd letter** is always **LOWER CASE**

N	**Nitrogen**	Fe	**Iron**

How are elements arranged in Periodic table?

Dobereiner: Triads (similar chemical reactivity)
Newlands: law of octaves (increasing mass)
Mendeleev: increasing atomic mass AND groups with similar properties; left GAPS for elements yet to be discovered

Changes of State



Confidence level?									
Not sure								Very happy	
1	2	3	4	5	6	7	8	9	10

Key Scientific Words

Internal energy	Sometimes called **thermal** energy. The energy stored in the movement of particles.
Evaporation	A substance that speeds up a chemical reaction, without itself being used up.
Radiation	When something, such as stone or metal, reacts with chemicals in the air or water and gets worn away.
Conduction	The way energy is transferred through solids by heating.
Convection	The way energy is transferred by heating in fluids. **Convection current** is the flow of a fluid caused by a part being heated or cooled more than the rest.
Emit	To give out.
Absorbed	Taken into an object.
Reflected	To bounce off a surface rather than passing through or being absorbed
Medium	Any substance through which something travels
Fluid	A gas or a liquid
Valid	Valid conclusions or results relate to the original question being investigated and are only based on the evidence.
Precise	Measurements that are close to one another.
Systematic errors	An error that is the same for all readings such as forgetting to zero a balance.
Random errors	An error that can be different for every reading.
Efficiency	A way of saying now much energy something wastes.
Payback time	The time it takes to get back in energy savings the money you spent on making the energy-saving.

Energy and temperature

Temperature is measured in degrees **Celsius (°C). Internal (thermal) energy** is measured in **joules (J).** The amount of thermal energy stored in something depends on:

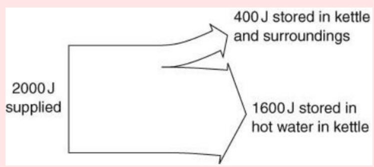
- how hot it is (its temperature)
- the material it is made from
- its mass.

When two objects are at different temperatures, energy will be **transferred** from the hotter one to the cooler one until they are at the same temperature.

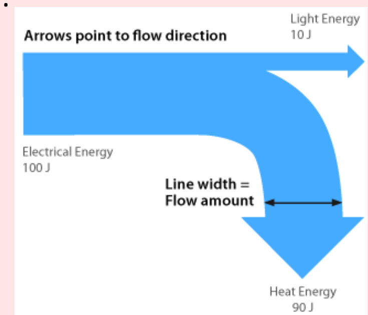
- Amount of Energy (in J) transferred per (every) second is the **power** of an appliance (= machine powered by electricity used in the home)
- Unit for power are watts (W) or kilowatts (kW)

$$\text{efficiency} = \frac{\text{useful energy transferred}}{\text{total energy supplied}} \times 100\%$$

- Energy cannot be created or destroyed: appliances do not transfer all the energy supplied to them in useful forms so some is "wasted".
- **Sankey diagram** shows the energy transfers:

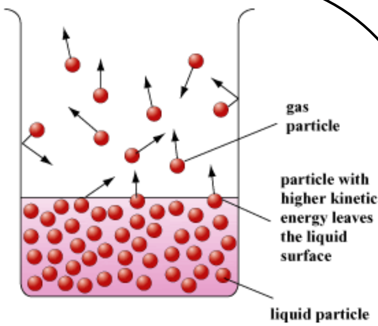


$$\text{efficiency of kettle} = \frac{1600\text{ J}}{2000\text{ J}} \times 100\%$$
$$= 80\%$$

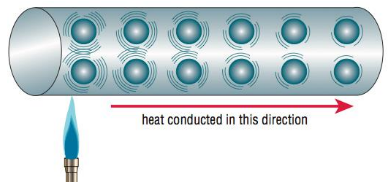


Transferring energy by heating

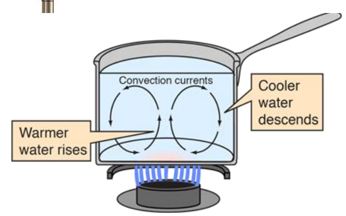
1. **Evaporation:** when part of a liquid evaporates the fastest-moving particles escape to form a gas. The particles that are left are storing less energy because average particle movement is slower and therefore the temperature of the remaining liquid is lower.



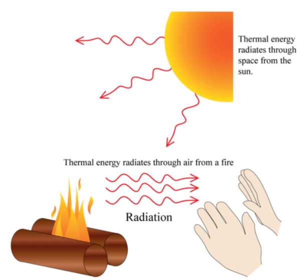
2. **Conduction** takes place best in solids. The particles in a solid are held together tightly. When they gain energy they vibrate more and the vibrations are passed on through the solid. Metals are the best conductors. Most other solids e.g. brick, wood, glass and plastics and liquids are poor conductors (good insulators). Particles in gases are far apart, so gases hardly conduct heat at all. Therefore materials that contain a lot of *trapped air* are *insulators* e.g. carpets, feathers, wool.



3. **Convection** takes place in fluids (liquids and gases). When part of a fluid is heated, the particles spread further apart and the fluid becomes less dense. This makes it rise. As it rises it meets cooler fluid and passes the energy on. More cool fluid moves in to replace the rising fluid, setting up a convection current.



4. **Radiation** can transfer energy through empty space and also through transparent materials. Radiation does not require the movement of particles. Any hot or warm object gives off or emits radiation. When something takes in energy from radiation, it is said to absorb it. Infrared radiation is similar to light. It can be absorbed or reflected, and it can also be focused.



Confidence level?									
Not sure								Very happy	
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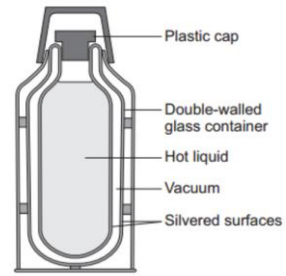
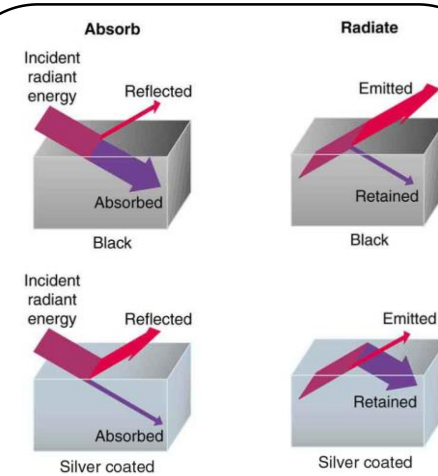
Vacuum Flask



Conduction: reduced by the vacuum, stopper, glass cork and air spaces
Convection: reduced by the vacuum, stopper and the trapped air spaces
Radiation: reduced by the silvered glass walls



- A kilowatt-hour (kWh) is the amount of energy transferred in 1 hours by an appliance with a power rating of 1kW

$$\underset{(\text{kWh})}{\text{energy use}} = \underset{(\text{kW})}{\text{power rating}} \times \underset{(\text{hours})}{\text{time}}$$

- We can reduce bills by insulating our homes and by using more efficient appliances.

$$\text{payback time} = \frac{\text{cost of change}}{\text{savings per year}}$$

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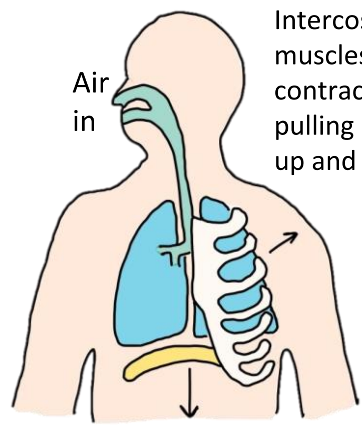
Key Scientific Words

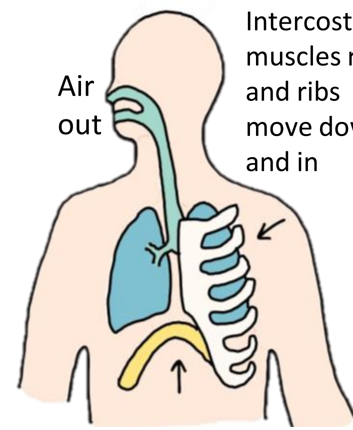
Respiration	An (exothermic) reaction that releases energy from glucose to supply all energy needed by living organisms.
Aerobic respiration	A type of **respiration** that does need oxygen to release energy from substances such as glucose.
Anaerobic respiration	A type of **respiration** that does not need oxygen.
Trachea	An air passage that connects the nasal cavity to the **bronchus**.
Diaphragm	Organ containing muscle. Contracts and moves downward to increase volume of chest during inhalation, causing lungs to expand.
Alveoli	Small pockets in lungs where gas exchange takes place between air and blood (singular = alveolus)
Bronchiole	Small tubes inside the lung that provides air to the **alveoli**.
Bronchi	Two tubes that branch off from the **trachea** into the lungs. Singular = bronchus
Breathing	When intercostal muscles between ribs and in **diaphragm** change to increase size of lungs
Ventilation	The movement of air into and out of the lungs

Inhalation

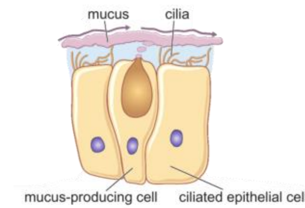


Diaphragm contracts and moves down

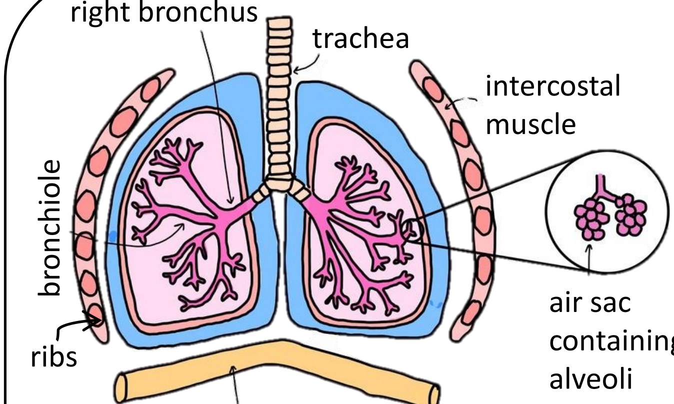
Exhalation



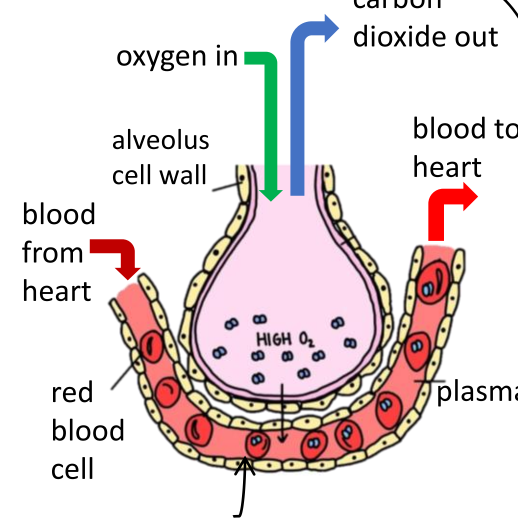
Diaphragm relaxes and moves up



Specialised cells help keep lungs clean; mucus traps dirt, cilia sweep mucus out



lungs are adapted for gas exchange by having millions of alveoli to give them a **large surface area** to allow for **fast diffusion** of gases (oxygen in and carbon dioxide out)



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Aerobic Respiration

Releases ENERGY from the glucose

OXYGEN + GLUCOSE → CARBON DIOXIDE + WATER

Reactants — Products

- needs oxygen
- releases energy so cells can perform their functions
- happens in the mitochondria of all animal and plant cells
- most efficient way of releasing energy

Anaerobic Respiration

Releases less ENERGY

GLUCOSE → LACTIC ACID

Reactant — Product

- does not need oxygen
- releases less energy than aerobic respiration
- happens in the cytoplasm of muscle cells in animals
- allows muscle to move suddenly and quickly
- lactic acid produced is converted back to glucose in the liver

Means and ranges

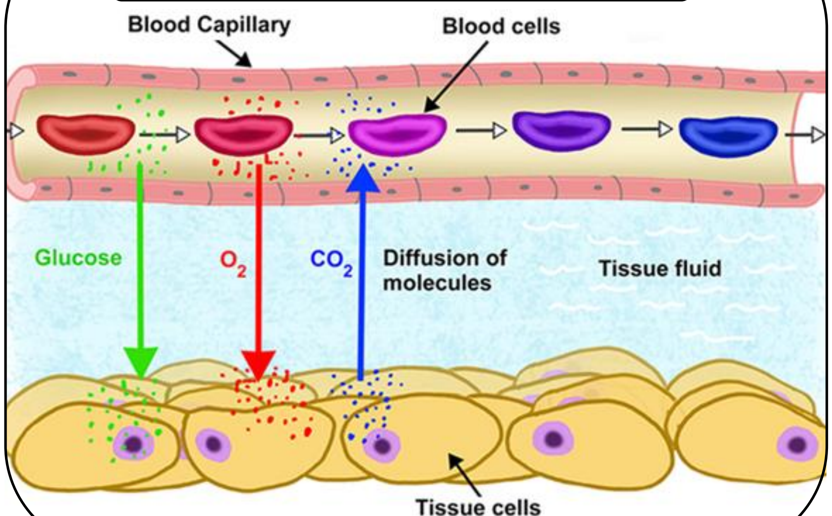
range = highest value – lowest value
(with smaller ranges you can be more certain of your results)

$$\textbf{mean} = \frac{\text{total of all values}}{\text{number of values}}$$

(the more repeated measurements, the closer the mean is likely to be to the real value for the measurement)

anomalous result = does not follow the same pattern as other results; leave out when calculating the mean

Getting oxygen from lungs to rest of body



Lack of oxygen

heart disease/heart attack	narrowed blood vessels due to fatty deposits reduce blood flow; cells start to die (heart attack)
nicotine from cigarette smoke	makes arteries narrower, causes heart disease
tar from cigarette smoke	can cause cancer, coats lungs reducing surface area, can cause alveoli to break apart (emphysema)
carbon monoxide	stops red blood cells carrying so much oxygen
high temp of smoke/asthma	cilia stop working so lungs are not cleaned and mucus collects

Confidence level?

Not sure									Very happy
1	2	3	4	5	6	7	8	9	10

KNOWLEDGE ORGANISER **Year 8:** Metals and their Uses

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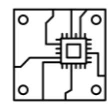
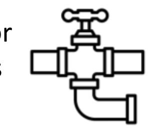
Key Scientific Words

Chemical property	How a substance reacts with other substances
Catalysts	A substance that speeds up a chemical reaction, without itself being used up
Corrosion	When something, such as stone or metal, reacts with chemicals in the air or water and gets worn away.
Rusting	The corrosion of iron or steel
Reactivity	A description of how quickly or vigorously something reacts.
Accurate	A measurement of how close a value its to its real value
Reliable	Results that are **repeatable** and **reproducible**
Repeatable	Results that are similar when repeated by the same experimenter
Reproducible	Results that are similar when repeated by different experimenters
Anomalous Result	A measurement that doesn't fit the same pattern as other measurements from the same experiment.
Effervescence	The production of a gas in a reaction occurring in a liquid
Alloy	A metal with one or more other elements added to improve its properties
Salt	Compound formed during the neutralisation of an acid with a metal or reaction of a metal with acid.

Metals	Non-metals
good conductors of heat and electricity	poor conductors of heat and electricity
shiny	dull
solids with a high melting point (except for mercury)	most are low melting point solids or gases
flexible and malleable	Brittle if solid (break easily instead of bending)

Many metals have common properties. Decision to use one metal over another depends on precise properties, appearance, and relative cost


Copper: electrical circuits as good conductor of electricity and unreactive; water pipes as malleable, non-poisonous and unreactive



Aluminium: window frames and airplane parts as strong and light

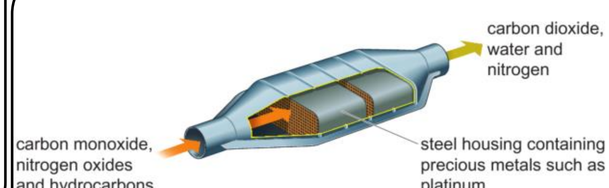

Gold: jewellery as malleable and very unreactive so stays shiny


Iron: construction industry (buildings) as strong and relatively cheap


Corrosion of metals refers to the reaction of oxygen. Some metals corrode more quickly than others. Metal oxides are formed.

Rusting refers specifically to the corrosion of iron and steel and water and oxygen is needed. Weakens and can destroy iron structures.

To stop rusting or unwanted corrosion, a barrier coating can be used to prevent oxygen meeting the metal surface e.g. paint; oil; plastic coating; powder coating; galvanisation (coating with a more reactive "sacrificial" metal in case coating is broken).



Catalysts are important in everyday e.g. catalytic convertors in cars. Some metal catalysts are very expensive but tiny amounts are used and because they are unchanged by the reaction they can be recovered used again and again.

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Metal Reactivity (links to uses):

Metal	Reaction with O_2 in Air	Reaction with H_2O	Reaction with dilute acids
K	🔥	🔥	✸
Na	🔥	✓✓✓	✸
Li	🔥	✓✓	✸
Ca	🔥	✓✓	✓✓✓
Mg	🔥	✓	✓✓✓
Al	✓✓✓	½✓	✓✓✓
Zn	✓✓	½✓	✓✓
Fe	✓✓	½✓	✓
Sn	✓	½✓	✓
Pb	✓	½✓	✓
Cu	✓	✗	✗
Hg	½✓	✗	✗
Ag	½✓	✗	✗
Au	✗	✗	✗
Pt	✗	✗	✗

GENERAL Word Equations and example Formula Equations

Metal + Oxygen → Metal Oxide

e.g. Sn + O_2 → SnO_2

Metal + Water → Metal hydroxide + Hydrogen

e.g. 2Na + $2H_2O$ → 2NaOH + H_2

Metal + Acid → Salt + Hydrogen

e.g. Fe + 2HCl → $FeCl_2$ + H_2

e.g. Mg + H_2SO_4 → $MgSO_4$ + H_2

e.g. Li + HNO_3 → $LiNO_3$ + H_2

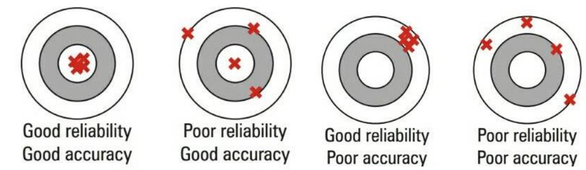
The name of the salt formed depends on the name of the acid:

- hydrochloric acid → chlori**de**
- sulfuric acid → sulf**ate**
- nitric acid → nitr**ate**

REMEMBER!

Test for hydrogen:

A **lit splint** will burn with a **squeaky pop** if the gas is hydrogen

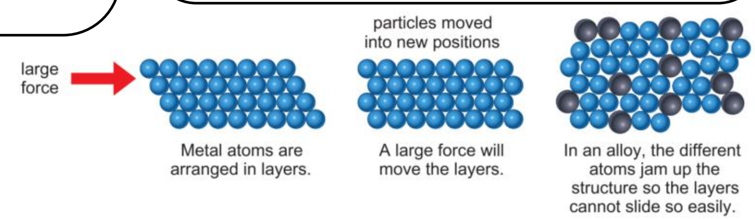


- Alloys have different properties from the pure metal and so can be more useful.
- e.g. steel, an alloy of iron, is stronger and does not rust as quickly.
- Pure metals have a fixed, precise melting point where as alloys have a lower m.p. and melt over a range of temperatures. Melting points can therefore be used to identify pure metals.
- Alloys are usually also harder than pure metals because the different sized atoms disrupt the regular structure making it harder for the layers of atoms to slip over each other.

Solder = Pb plus Sn → lower m.p. than lead

Stainless Steel = Fe plus C, Cr, Ni → stronger & more resistant to corrosion than Fe

Duralumin = Al plus Cu & Mg → lighter and stronger than aluminium



Confidence level?									
Not sure								Very happy	
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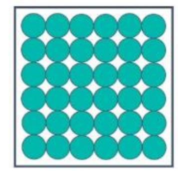
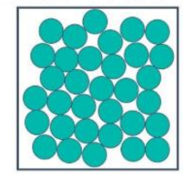
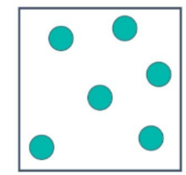
Key Scientific Words

Compress	To squeeze into a smaller volume.
Diffusion	When particles spread and mix with each other without anything moving them.
Brownian motion	An erratic movement of small specks of matter caused by them being hit by other moving particles that make up liquids or gases.
Density	The mass that one cm^3 of a substances has. Often measured in grams per cm^3 or g/cm^3 or kg/m^3
Condenses	When a liquid turns into a gas.
Anomalous	Something that does not fit a pattern.
Fluids	A gas or liquid.
Upthrust	A force that pushes things up in liquids or gases
Weight	The force with which gravity pulls things. Measured in Newtons (N).
Friction	A force between two objects that are touching.
Streamlined	Something that has a smooth shape to reduce water or air resistance.
Balanced Forces	When two forces on an object are the same size but act in opposite directions.

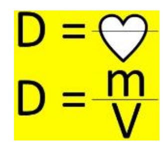
Particle Theory of matter explains the pro[erties of the different states of matter

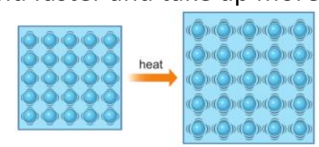
	Solids	**Liquids**	**Gases**
Properties	• fixed volume • fixed shape	• fixed volume • take shape of container	• expand to fill container • take shape of container
Particle diagram			
Particles	• are close together • are held in fixed positions by strong forces	• are close together • are held by fairly strong forces • can move around	• are far apart • are held by very weak forces • can move around

Expanding and **Contracting**:

- materials expand when heated and contract when cooled
- this is because the particles are hotter and move faster so take up more space
- Density also changes when a material expands because the same mass takes up a large volume because particles move around faster and take up more space

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

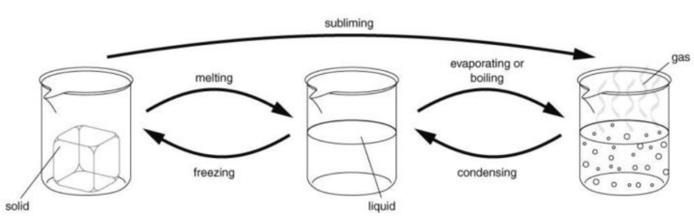




The particles do **not** change size when heated, they just vibrate further about their fixed position

Changes of state

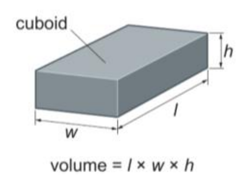
Substances can change state when they are heated or cooled. The three states of matter are solid, liquid and gas.



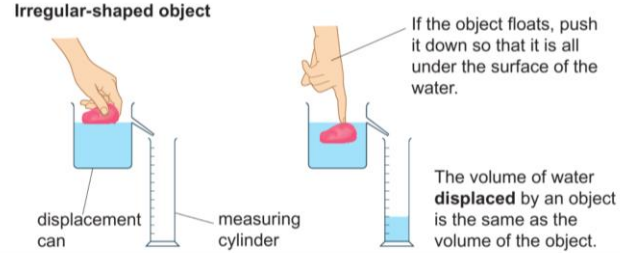
A liquid evaporates from its surface. When it is boiling, bubbles of gas form within the liquid.

If the volume of the object is 216 cm^3 and the mass is 64g the density = $\frac{64 \text{ (mass)}}{216 \text{ (volume)}}$
= 0.296
= **0.3 g/cm^3**
to 1d.p

Regular-shaped object



Irregular-shaped object



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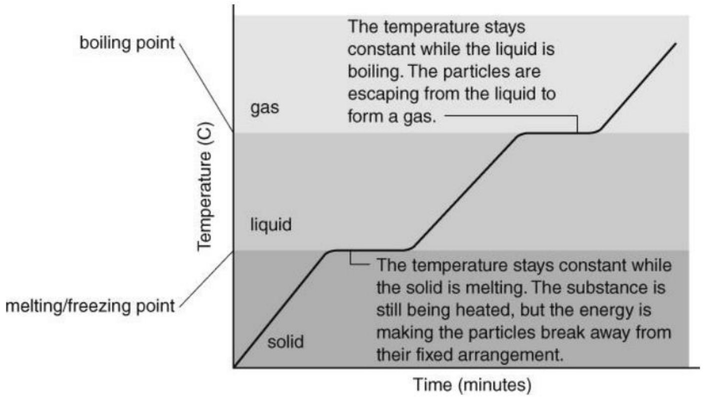
Changing state

- The melting point and the freezing point of a substance are the same temperature.
- The temperature of a substance does not change while it is melting, even if it is still being heated.



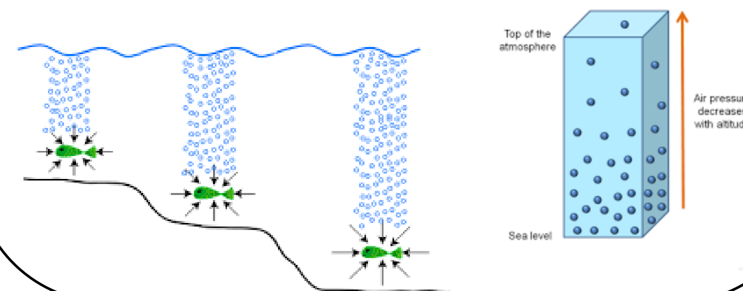
- Water shows **anomalous** behaviour near its freezing point because **ice** takes up <u>more</u> space (**expands**) than liquid water
- This explains whey ice forms on top of ponds

Pressure in fluids

The pressure of gas in a container can be increased by:

- putting more particles into the container (so there will be more collisions with the container walls each second).
- heating the gas (so the particles move faster, hitting the walls harder and more often).
- reducing the volume of the container (so the particles do not have as far to go between the walls and so collide with the walls more often).

- Both gases and liquids are **fluids**.
- Fluids can **flow**.
- **Pressure** in fluids **acts** in **all directions**.
- The **particles** in fluids are **moving** all the time and **hitting** the **walls** of containers and other things they come into contact with.
- The **force** of the **collisions** causes **pressure**, which acts in all directions.
- As you go **deeper** into the **sea**, **pressure increases** because there is **more water** above you **pressing down**.
- If you climb a **high mountain**, the **air pressure** on you will get **less**, because there is **less air** above you **pressing down**.



Floating and sinking

- If the density of the object is less than the density of the fluid, it will float. The density of water is 1 g/cm^3 , so objects with densities less than 1 g/cm^3 will float in water.

Drag

- The amount of drag on something can be reduced by giving it a smooth surface and a streamlined shape
- The drag increases as speed increases and so top speed depends on force from an engine being balanced by the drag
- Drag is caused by particles in the fluid hitting the moving object and by the force needed for the object to push the fluid out of the way.

Confidence level?

Not sure								Very happy	
1	2	3	4	5	6	7	8	9	10

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Key Scientific Words

Prokaryotes	Member of prokaryote kingdom; all unicellular with no nuclei.
Protoctists	Member of protoctist kingdom; many protoctists are unicellular.
Bacterium	A type of prokaryote organism. Plural is bacteria.
Fungi	A member of the fungus kingdom. A fungus can be multicellular or unicellular but does not make its own food. Plural is fungi.
Microorganism	An organism too small to be seen with the naked eye.
Virus	A non-living particle that can change how a living cell functions when it enters a cell. Inside a cell, a virus often causes the cell to make copies of the virus.
Budding	A type of asexual reproduction in which a new small cell, a bud, grows out from a parent cell.
Binary fission	When a cell splits in two.
Pseudopod	An extension from a cell that can extend and contract and so pull a cell in a certain direction
Cilia	A small hair-like structures on the surface of some cells. Singula is cilium.
Flagella	A tail-like structure that rotates, allowing a unicellular organism to move. Singular is flagellum.

Organisms are classified into five **kingdoms**.
Viruses are not living and so are not in a kingdom.

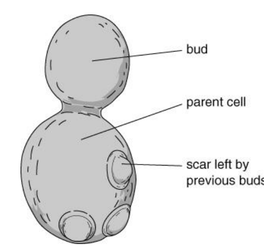
Cell part	**Kingdom**				
	prokaryotes (all unicellular)	**protoctists (mainly unicellular)**	**fungi (mainly multicellular)**	**plants (all multicellular)**	**animals (all multicellular)**
cytoplasm	✓	✓	✓	✓	✓
cell membrane	✓	✓	✓	✓	✓
nucleus	×	✓	✓	✓	✓
mitochondria	×	✓	✓	✓	✓
cell wall	✓	×/✓	✓	✓	×
chloroplasts	×	×/✓	×	✓	×

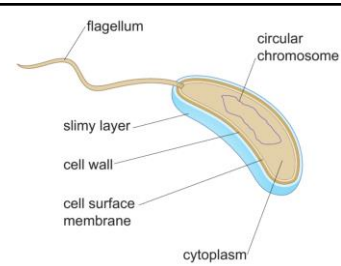
- **Unicellular** organisms can only grow to a certain size: too big and it cannot get enough of the substances it needs throughout the cell because **diffusion** is **too slow**.
- The tissues in **multicellular** organisms need to have raw materials **transported to them** because diffusion would be too slow.

Microscopic fungi e.g yeast.

- reproduce asexually by budding
- can use aerobic respiration (important in baking)
- can use anaerobic respiration = fermentation (important in alcoholic drink manufacture)

glucose → carbon dioxide + ethanol (alcohol)





Bacteria

- Some important in making yoghurt and cheese.
- These bacteria use a type of anaerobic respiration to ferment milk

glucose → lactic acid

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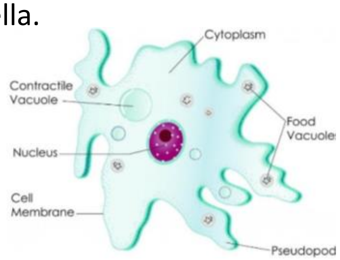
Protoctists

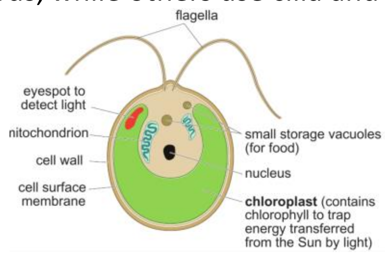
- Many different types of protoctist and some can **photosynthesise** and are therefore producers in food chains

carbon dioxide + water → glucose + oxygen

algae (producer) → pond snail (consumer, herbivore) → minnow → grey heron (consumers, carnivores, predators)

- Some protoctists move using pseudopods, while others use cilia and others use flagella.

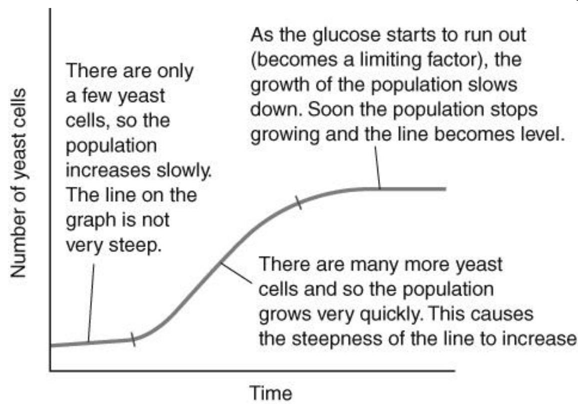


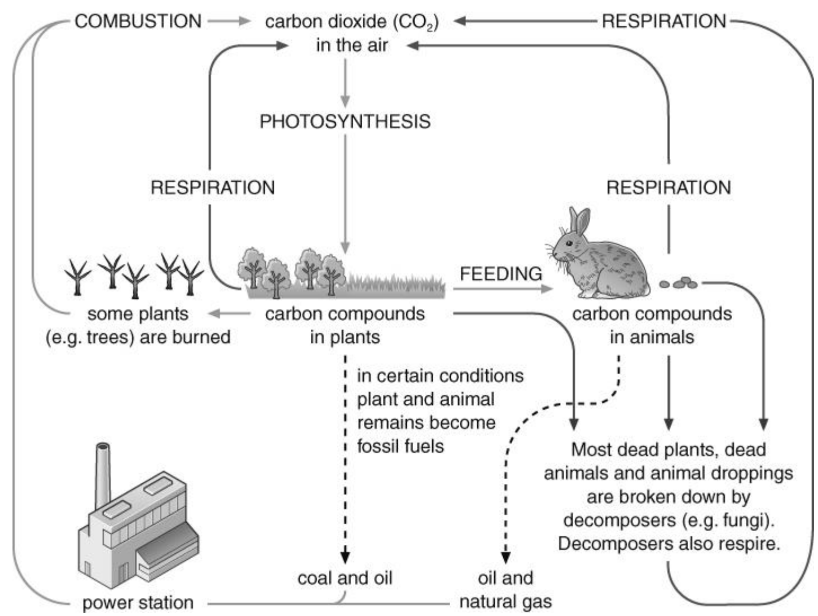


- The arrow in a food chain show the direction of energy transfer
- The bars in a pyramid of numbers represent the number of organisms
- At each level, organisms transfer some of the energy in their food out of their bodies eg by moving or as waste.
- There is therefore less energy available for the next level so there are fewer animals

Many unicellular microorganisms are **decomposers** and play an important part in the **carbon cycle**. During a process called **decay**, they feed by releasing enzymes which break down large insoluble molecules into small soluble molecules, which can then be absorbed by the cell.

To grow all **microorganisms** need
- Warmth
- Food eg glucose
- Moisture
- <u>**Some**</u> need oxygen for aerobic respiration
- Something that stops a population of microorganisms growing further is called a **limiting factor**





Confidence level?									
Not sure								Very happy	
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KNOWLEDGE ORGANISER **Year 8:** Combustion

Key Scientific Words

Reactants	A substance that takes part in a chemical reaction. Written on the left hand side of a chemical equation, before the arrow.
Products	A new substance made in a chemical reaction. Written on the left hand side of a chemical equation, after the arrow.
Hydrocarbons	A compound made up of only carbon and hydrogen atoms.
Oxidation	Reacting with oxygen e.g., when a fuel combusts or when a metal reacts with oxygen to form a metal oxide.
Exothermic	A reaction that gives out energy, that can be felt as heat, to the surrounding.
Combustion	Burning in air; the reaction gives out energy which is transferred to the surroundings by heating or light.
Phlogiston	A substance that scientists once thought explained why things burn; has since been proven that it does not exists.
Greenhouse effect	The warming effect on the Earths surface caused by greenhouse gases absorbing energy emitted from the warm Earth surface and then re-emitting it back to the surface
Global warming	Increased warming of the Earths surface as a result of increased amounts of greenhouse gases in the air.
Climate change	Changes that will happen to the weather as a result of global warming

Combustion is when a fuel burns. → Stored energy in the fuel is transferred to the surroundings. → This transfer causes the surroundings to get hotter. Some energy may also be transferred by light or sound. → The transfer can be useful for heating, or making engines move.

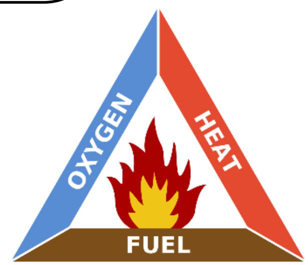
Word Equations:

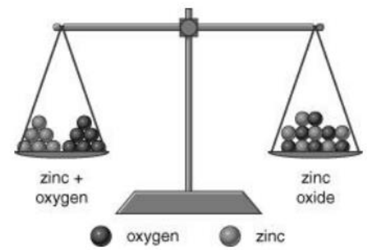
In a fuel cell
Hydrogen + oxygen → water

Oxidation of a metal
Metal + oxygen → Metal oxide

Conservation of Mass: Mass is never lost or gained in a chemical reaction because no new atoms are created or destroyed -- the atoms are just rearranged to form different substances.
The mass of all the reactants = the mass of all the products
(even if some of the products are gases and so “appear” to be lost)

Fire Triangle:
three factors needed for a fire to burn. If any factor is removed, the fire will go out.

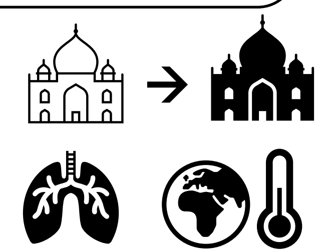




Complete combustion of hydrocarbons (plenty of oxygen)
Hydrocarbon + oxygen → carbon dioxide + water

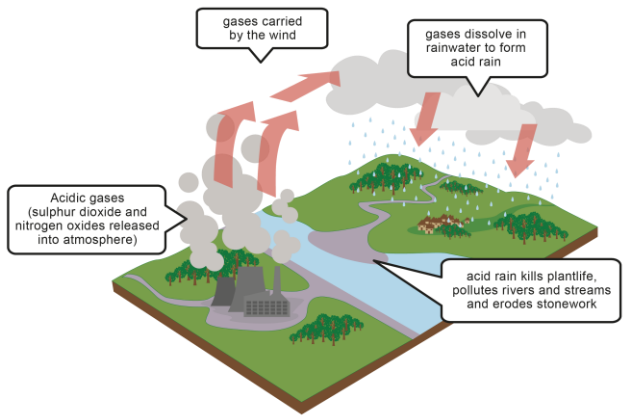
Incomplete combustion of hydrocarbons (insufficient supply of oxygen)
Hydrocarbon + oxygen → carbon dioxide + carbon monoxide + carbon (soot) + water

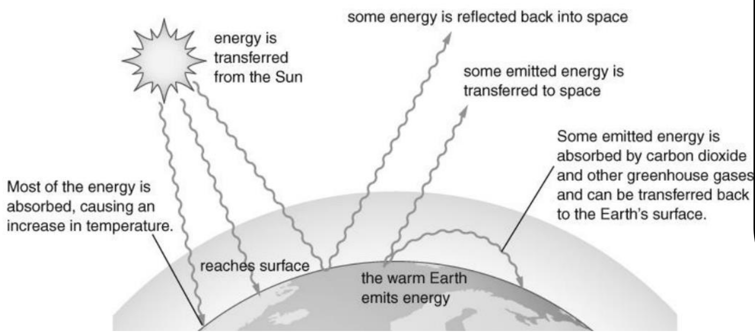
***Problems caused by products of both types of combustion*:**
Carbon dioxide: greenhouse gas/global warming/climate change
Carbon monoxide: poisonous gas/odourless/can kill/silent killer
Soot particles: damage lungs/trigger asthma attacks/blacken buildings



Air pollution

- Carbon dioxide, carbon monoxide and soot all from the combustion of hydrocarbon fossil fuels
- Hydrocarbon fuels have impurities such as sulfur which react in hot conditions to produce sulfur dioxide, which in turn can produced acid rain
- High car engine temperatures cause nitrogen and oxygen from the air to form nitrogen oxides which in turn can produced acid rain
- Controls can be put in place to reduce both gases getting into the air e.g. catalytic convertors in cars reoves nitogen oxides and neutralisation reaction remove acidic gases from chimney smoke

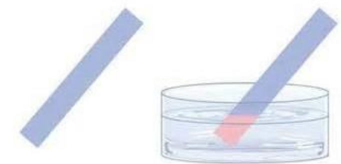




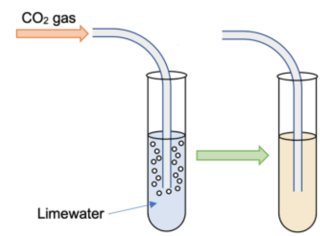
- **Greenhouse gases** in the Earth's atmosphere keep the Earth's surface **warm**. This is the **greenhouse effect.**
- **Carbon dioxide** is a **greenhouse gas**.
- Most scientists think that the extra carbon dioxide released from burning fossil fuels has increased the temperature of the Earth's surface (global warming).
- Scientists predict that global warming will cause climate change.
- The best way to control global warming is to reduce the amount of carbon dioxide we release into the air.

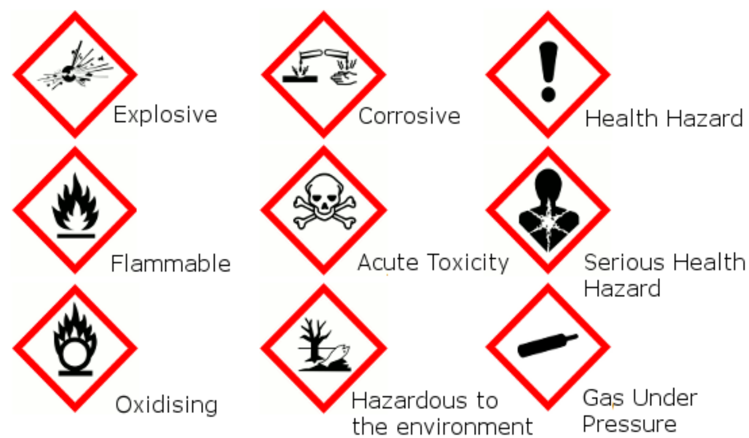
The catalysts in the **catalytic convertor** speed up the reactions but are not used up themselves

Test for Water
Blue cobalt chloride paper will turn pink in the presence of water



Test for Carbon Dioxide
Bubble the gas through colourless limewater which will turn cloudy if the gas is carbon dioxide





Confidence level?									
Not sure								Very happy	
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KNOWLEDGE ORGANISER Year 8: Earth and Space

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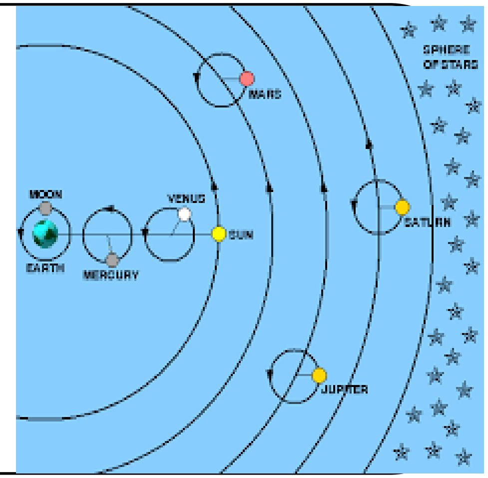
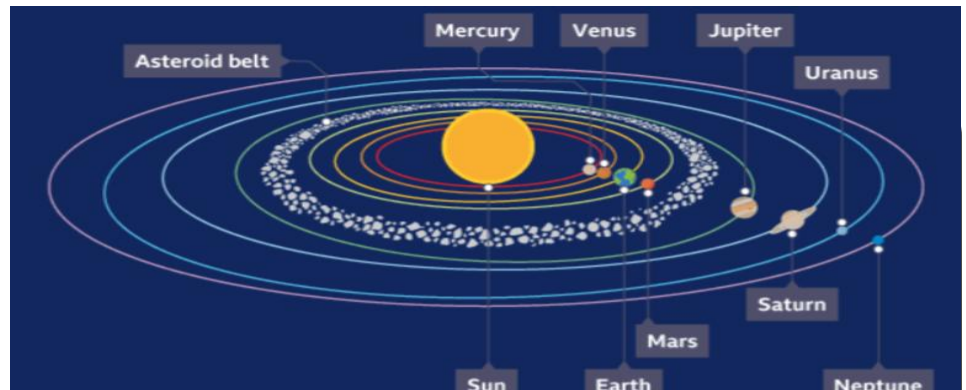
Key Scientific Vocabulary

Weight	The amount of force with which gravity pulls on an object. It is measured in newtons. Weight changes in space and on different planets.
Mass	Mass is a measure of matter in an object. It is measured in kilograms or grams. Mass does not change when you go into space or if you are on a different planet.
Density	Mass per unit volume. This can be in grams per centimetre cubed or kilograms per metre cubed.
Magnetic pole	All magnets have poles, where the magnetic field is the strongest. Magnets have North and South poles. Like poles repel and opposite poles attract.
Hemisphere	Half of a sphere if you cut it in half. The North and south hemisphere of the Earth is cut by the equator.
Compass	A magnetised needle that is able to spin around. It was points to a magnetic south pole which is Earth's geographical North.
Galaxy	Millions of stars grouped together
Light year	The **distance** light travels in one year
Elliptical	Oval-shaped
Gravity	The force of attraction between any two objects. The Earth is very big and so has strong gravity that pulls everything down towards it.
Satellite	Anything that orbits a planet or a moon. Can be natural e.g. the moon or artificial e.g. ISS
Magnetic field	The space around a magnet where it can affect magnetic materials or other magnets.

Ptolemy (90-168) worked out a solar system model with the *__Earth__* at the *__centre__*—this is called the **__geocentric model__**.





Copernicus (1473-1543) suggested that the Earth and other planets moved in circles (orbits) *__around__* the *__Sun__*. This is the **__heliocentric model__** (our modern-day solar system model).

Galileo used one of the first telescopes to provide *evidence* for Copernicus' model.

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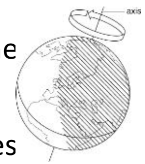
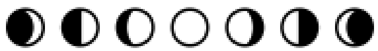
The Earth and Moon

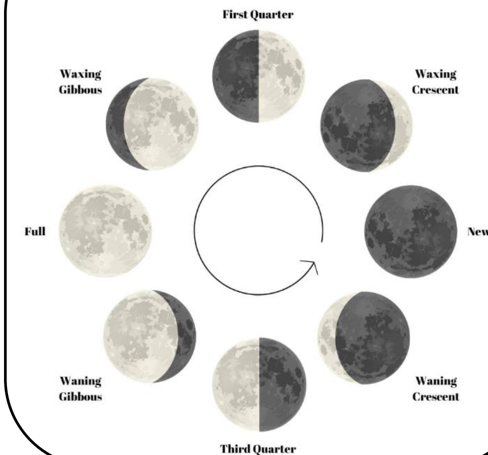
- **Day** → Earth spins on its axis once every 24 hours.
- **Daytime and Night time** → side of the Earth facing the Sun has daylight, and it is night on the side facing away from the Sun.

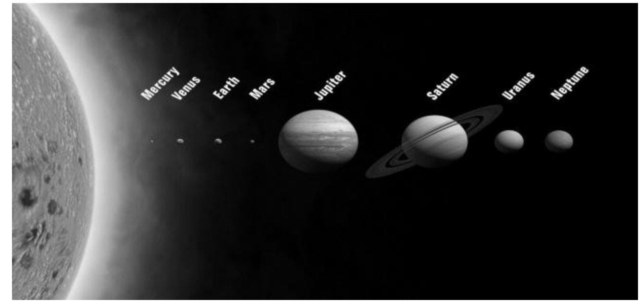


- **Year** → The Earth orbits around the Sun. It takes one year to go around once.
- **Phases of the Moon** → The different shapes. Phases happen because we cannot always see all of the part that is lit by the Sun.



Phases of the moon

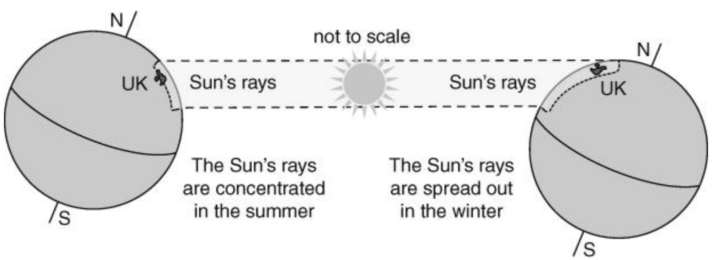




Planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

Seasons

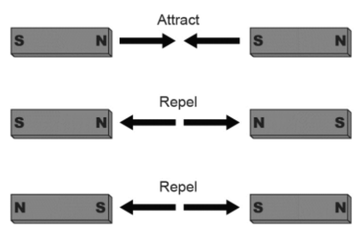
- The Earth's axis is tilted.
- When the **northern hemisphere** is tilted towards the Sun it is summer in the UK. Days are longer than nights, and the Sun is higher in the sky. The Sun's rays are more concentrated, so it feels hotter



Magnets

Magnets attract **magnetic materials**

- North pole and south pole attract each other.
- Two north poles or two south poles repel each other



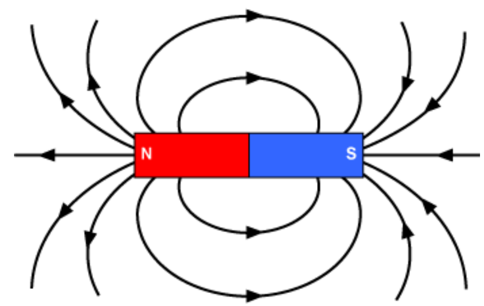
Gravity is the force of attraction between two masses. The force of gravity is stronger if:

- the objects have large masses
- the objects are close together.
- Sun's gravity keeps all the planets in our Solar System moving in elliptical orbits around it.
- Earth's gravity keeps the Moon in orbit around Earth

weight (N) = mass (kg) × **gravitational field strength** (N/kg)

Magnetic fields

shape of the magnetic field of a bar magnet: draw lines with arrows N → S



Confidence level?

Not sure								**Very happy**	
1	2	3	4	5	6	7	8	9	10

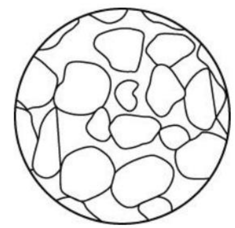
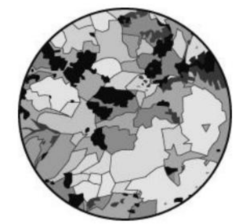
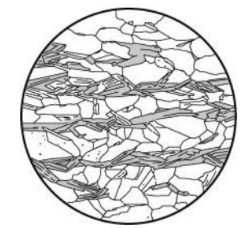
KNOWLEDGE ORGANISER Year 8: Rocks

THE DEAN TRUST
Ashton on Mersey School

Key Scientific Words

Geologists	A scientists who studies rocks and the Earth.
Grain	A distinct part of a rock made of one or more **minerals**.
Mineral	A naturally occurring element or compound that can form distinct **grains** in rocks.
Texture	Describes the shapes and sizes of **grains** in rocks and how the grains are packed together.
Interlocking	When crystals fit together with no gaps between them.
Porous	Rocks that have tiny gaps. **Porosity** measures how much space is between rocks.
Permeable	Permeable rocks let water soak through them.
Mantle	The part of the Earth below the crust.
Magma	Molten rock beneath the surface of the Earth
Extrusive	Igneous rocks formed when lava freezes.
Intrusive	Igneous rocks formed when magma freezes underground.
Compress	To squeeze into a smaller volume.
Weathering	When rocks are broken up by physical, chemical or biological processes.
Erosion	The movement of loose and weathered rock.
Abrasion	When rock fragments bump into each other and wear away.
Sediment	Rock grains and fragments dropped by moving air or water.
Compaction	When layers of **sediment** or rock are **compressed** by the weight of the sediment above them

Rocks are made of **grains**. Each grain is made of a naturally occurring compound called a **mineral**. The texture of a rock is a description of the **size** and **shape** of the **grains**.

Type of rock	Sedimentary	Igneous	Metamorphic
Examples	limestone, sandstone, mudstone, chalk	basalt, gabbro, granite	marble, quartzite, slate, schist, gneiss
Grains or crystals?	separate grains	interlocking crystals that are not lined up	interlocking crystals, often lined up in bands of different colours
Hard or soft?	often soft or crumbly	hard	hard
Porous?	often	not usually	not usually
Example of texture			

Materials from the Earth

Many of the **materials** we use are obtained from the Earth. We use stone for building. Cement is made from limestone, and concrete is made by mixing cement, sand and gravel with water.

We also obtain **metals** from the Earth. Unreactive metals like gold and silver are found in their native states. Other metals are found as parts of **minerals**.

An **ore** is a **rock** with **enough** of a **particular mineral** in it to make it **worth mining**.

Pure metals are obtained from minerals using chemical reactions.

Mining for metals can **destroy habitats** and cause **pollution**. If we recycle metals we will:

- make supplies of metals last longer
- reduce amounts of mining (and so reduce the pollution and environmental damage this causes)
- reduce pollution caused by putting metals in landfill sites.

KNOWLEDGE ORGANISER Year 8: Rocks

The Dean Trust
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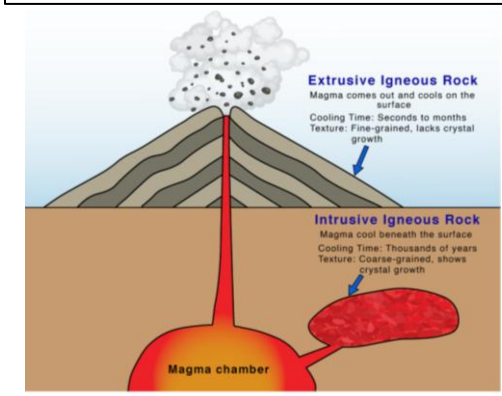
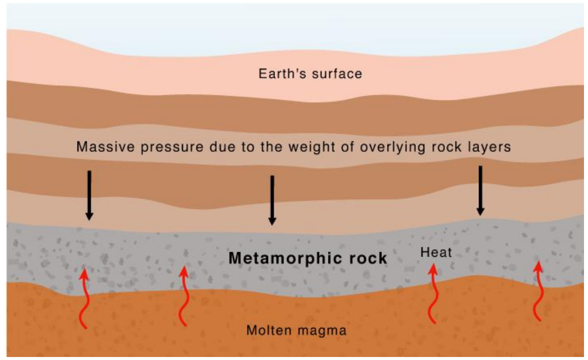
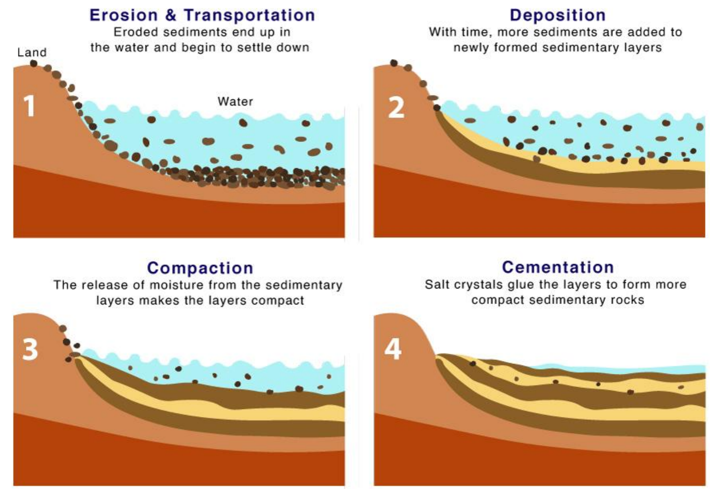
Igneous rock formation
low cooling → large crystals e.g. **granite**
Fast cooling → small crystals e.g. **obsidian**



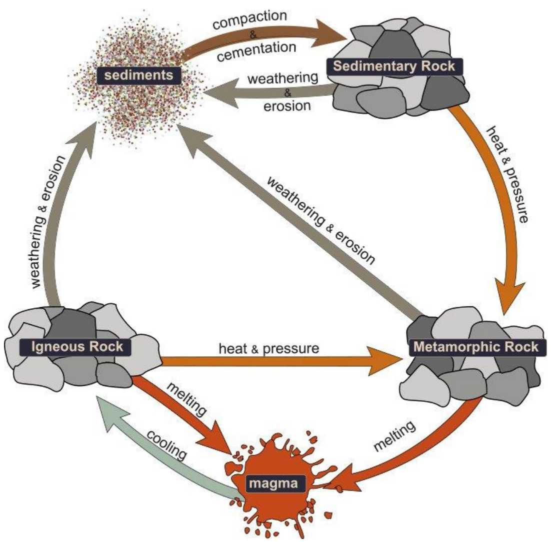
Metamorphic rock formation
Increasing temperature and pressure → increasing crystal size and thickness of layers e.g. **Slate → Schists → Gneiss**

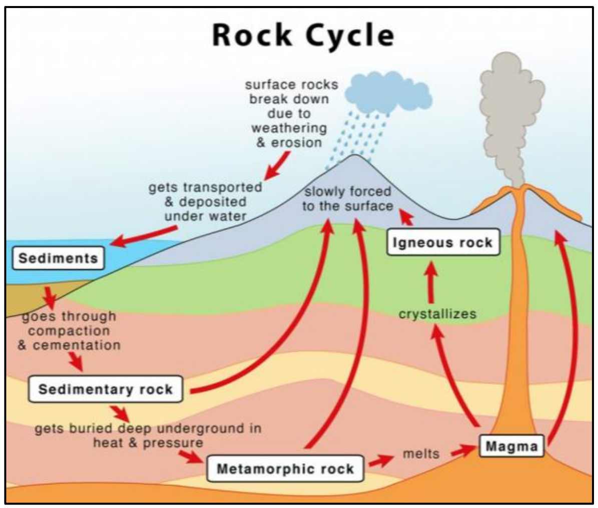


Sedimentary rock formation
Grains carried e.g. by rivers/glaciers/wind.
Speed of river and time before deposited impacts the size and shape of the abraded grains e.g. large, rounded grains → **conglomerate;** small grains → **sandstone**
Sedimentary rocks can also be formed from remains of dead plants and animals e.g. **limestone**



The rock cycle





Chemical weathering happens when acidic rain water reacts with minerals in the rock.

Physical weathering happens because of temperature changes. The minerals in a rock expand if the rock gets hot, and contract if it cools. These changes in size can produce strong forces. If the rock is heated and cooled over and over again, the forces can make cracks in the rock. This is called **onion-skin weathering**.

Physical weathering can also happen if water gets into a crack. Water expands when it turns into ice, and makes the crack wider. This is called **freeze–thaw action**.

Biological weathering is when rocks are broken up or worn away by plants and animals. For example, plant roots can grow into cracks in rocks and make the cracks bigger.

Confidence level?									
Not sure								Very happy	
1	2	3	4	5	6	7	8	9	10