2.1 Health and Lifestyle

Section 1: Nutrients

Nutrient	Function
1 Carbohydrates	Provides **energy**. Found in sugary foods and bread and pasta,
2 Lipids	Provides you with a store of **energy** and keeps you warm.
3 Proteins	Are used for **growth and repair**. Found in **meat** and **dairy**.
4 Vitamins and Minerals	Keeps you healthy (needed for normal function). Found in **fruit** and **veg**.
5 Water	Needed in all cells and body fluids.
6 Fibre	Not a **nutrient** but important for a healthy diet. Keeps food moving through gut. Found in **carbohydrates.**

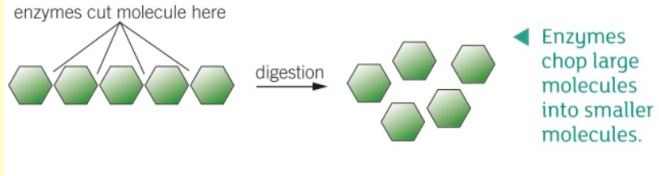
Section 2: Food Tests

Nutrient	Chemical Used	Colour Change if Present
7 Starch	Iodine	Turns blue-black
8 Lipids	Ethanol	Solution turns cloudy
9 Sugar	Benedict's Solution	Turns brick-red
10 Protein	Copper Sulphate and Sodium Hydroxide	Turns purple

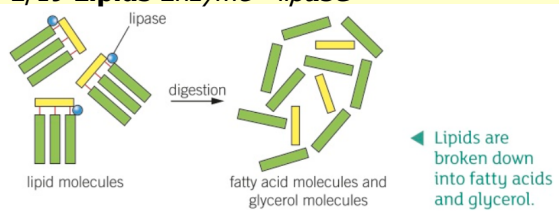
Section 4: Digestion

11 Digestion	**Large molecules** being broken down into smaller **molecules**.
12 Mouth	Food is chewed and mixed with saliva
13 Gullet	Food passes down this tube.
14 Stomach	Food is mixed with digestive juices in and acids.
15 Small Intestine	Small food molecules absorbed into the bloodstream.
16 Villi	Small structures the line the intestine, increasing **surface area** and maximising **absorption**.
17. Large Intestine	Water absorbed leaving undigested food called faeces.
18. Rectum	Faeces stored here.
19. Anus	Where faeces leave the body.
20. Enzymes	Special proteins that break large molecules into smaller molecules for absorption. Found in the mouth, stomach and small intestine

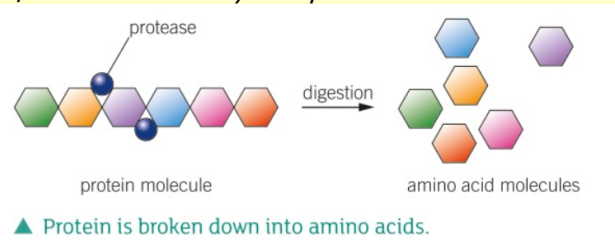
1/19 **Carbohydrates** *Enzyme - carbohydr**ase***



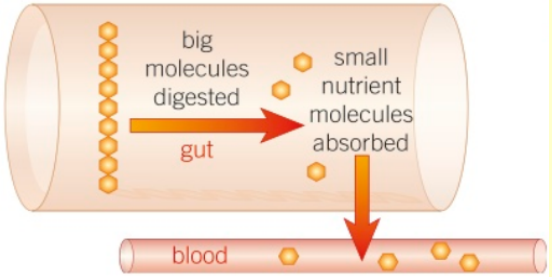
2/19 **Lipids** *Enzyme - lip**ase***



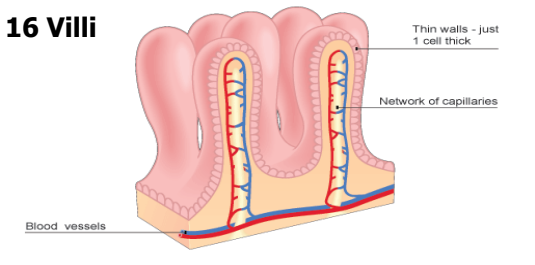
3/19 **Proteins.** *Enzyme - protea**se***



11 Digestion



16 Villi

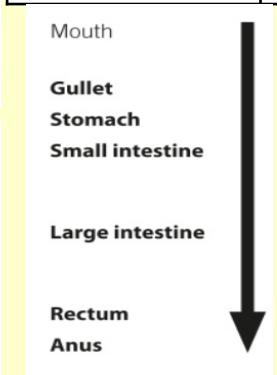


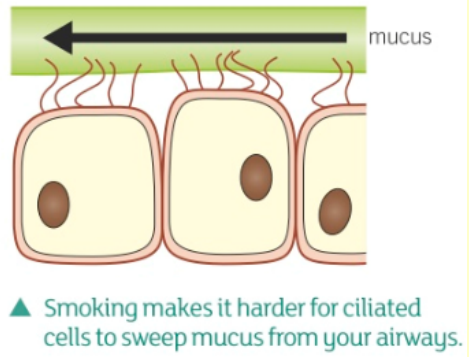
Section 5 unhealthy diets

21. Starvation	Energy eaten in food is less than the energy used
22. Obese	Extremely overweight - Energy eaten in food is more than the energy used; stored as fat under skin and around organs;
23. Deficiency	When a person does not have enough of a vitamin, mineral of food group.

Section 6: Drugs and alcohol

24. Medicinal drugs	Used in medicine to **benefit health**, treat symptoms of a condition e.g. paracetamol used to relieve pain
25. Recreational drugs	Drug taken for **enjoyment only** – no benefit to health
26. Addiction	When you need to take a drug to feal normal
27. Stimulant	e.g. nicotine in cigarettes – speeds up bodies reactions
28. Depressant	e.g alcohol – slows down bodies reactions
29. Ethanol (Alcohol)	**Absorbed** into your blood stream; affects nervous system reducing reaction time and thinking ability; damages **liver** causing **scaring** (cirrhosis).
30. Liver	Organ responsible for removing toxic chemicals e.g **alcohol**
31. Smoking	linked to heart disease, Emphysema (lung disease), lung cancer, respiratory infections





Biology B2.2 Ecosystem processes

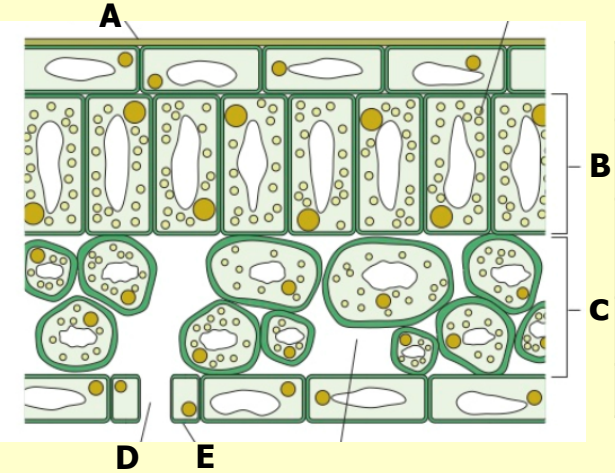
Section 1: Photosynthesis

Key word	Definition
1. Producer	An organism that makes its own food using photosynthesis
2. Consumer	An organism that eats other organisms as food
3. Photosynthesis	The process plants use to make their own food, glucose.
4. Chlorophyll	Green pigment that absorbs light for use in photosynthesis

5. Word equation for photosynthesis:

$$\text{carbon dioxide} + \text{water} \xrightarrow{\textit{light}} \text{glucose} + \text{oxygen}$$

Section 2: Leaves



	Letter	Part of leaf	Function
6	A	Waxy layer	Reduces the amount of water evaporating
7	B	Palisade layer	Packed with chloroplasts to enable photosynthesis
8	C	Spongy layer	Contains air spaces to enable gases to diffuse throughout of the leaf
9	D	Stomata	Allows gases to diffuse into and out of the leaf
10	E	Guard cell	Open and close stomata

Section 3: Plant minerals

11	nitrates	Contain nitrogen for healthy growth
12	phosphates	Contains phosphorus for healthy roots
13	Potassium	Contains potassium for healthy leaves and flowers
14	magnesium	For making chlorophyll

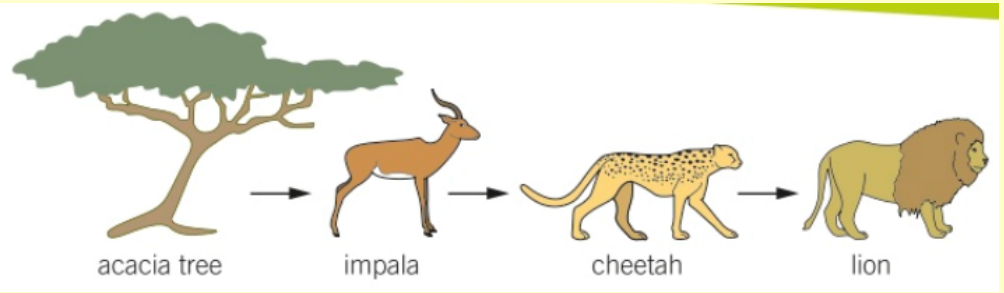
Section 4: Chemosynthesis

	Definition
15 Chemosynthesis	Chemosynthesis uses chemicals as a source of energy by bacteria

Section 5: Respiration

16	**Aerobic respiration**	Glucose + oxygen → carbon dioxide + water (+ energy)
17	**Anaerobic respiration**	Glucose → lactic acid (+ energy)
18	**Fermentation**	Glucose → ethanol + carbon dioxide (+ energy)

Section 6: Food chains and webs



Key word	Definition
19. Food chain	Diagram showing the transfer of energy between organisms
20. Food web	Diagram showing linked food chains
21. Predator	Animal that eats another animal
22. Prey	Animal that is eaten
23. Bioaccumulation	The build up of toxic chemicals inside organisms in a food chain

Section 7: Ecosystems

Key word	Definition
24. Ecosystem	Living organisms in a particular area, and the habitat they live in
25. Community	Plants and animals found in a particular habitat
26. Habitat	Place where a plant or an animal lives
27. Niche	Particular place or role that an organism has in an ecosystem

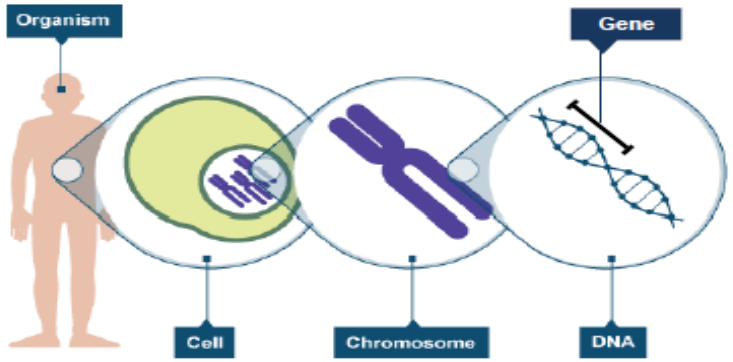
Biology B2.3 Adaptation and inheritance

Part 1

KPI 1: Identify variation between individuals of a species and state the differences between species, describing the difference between continuous and discontinuous variation.

DNA

- All the instructions to make organisms are kept in coded form on a very long molecule called DNA
- DNA is kept in the nucleus of every cell
- The molecule is so long it is twisted and folded into tiny structures called chromosomes so it can fit inside the nucleus
- It has a ladder like structure and is a double helix
- A short length of chromosome which codes for a characteristic is called a gene
- You have thousands of genes they are like recipes for proteins



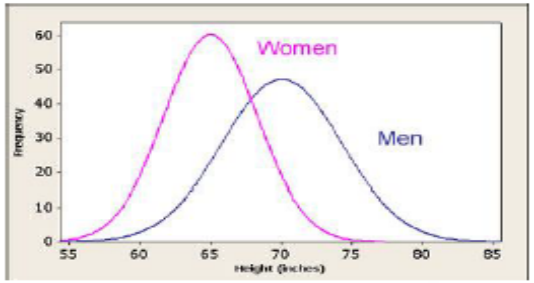
Variation

- The differences between living things of the same species is known as variation.
- Variation can be caused by differences in genes or differences in the environment.
- Some variation is caused by a mixture of both genes and environment.

Key Terms	Definition
DNA	Molecule that carries all the instructions needed for an organism
Gene	A short length of DNA that has the information for a characteristic
Chromosome	A structure containing DNA found inside the nucleus of a cell
Variation	Differences between living organisms of the same species
Continuous variation	Differences that can take any value, e.g. height
Discontinuous variation	Differences that can only take set values, e.g. blood groups

Measuring variation

- Continuous variation is variation that can take any value (e.g. height or weight)
- Continuous variation should always be shown on a line graph
- Discontinuous variation is variation that can only take set values (e.g. shoe size or blood group)
- Discontinuous variation should always be shown on a bar chart



Continuous variation

Discontinuous variation

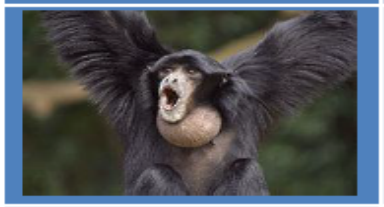
Biology B2.3 Adaptation and inheritance
Part 2

Key Terms	Definition
Adaptation	Something which helps an organism to survive in their environment, e.g, humps for storing water
Habitat	The environment that an organism lives in

Adaptation

- Every animal has evolved gradually over millions of years to become well suited, or adapted, to its habitat.
- These adaptations are specific to the environment of the animal and are essential for survival.
- An animal must be able to find food, breed and navigate its way around its habitat if it is to survive.

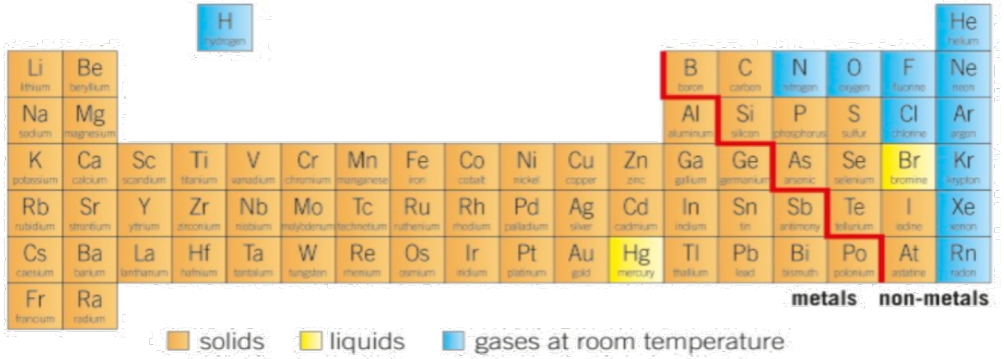
Examples of adaptations

Animal		Habitat	Adaptations
	Snow leopard	Cold mountains	- Big paws to evenly spread weight and help with walking through snow - Thick fur for insulation - Sharp teeth for killing and eating prey
	Siamang gibbon	Tropical rainforest	- Long arms and fingers for swinging through trees and gripping branches - Forward facing eyes for judging distances - Inflatable throat sac so their calls can travel long distances through the dense rainforest
	Bactrian camel	Desert	- Two humps to store fat which can be converted to water - Wide feet to even spread weight and prevent sinking into the sand - Long eyelashes to keep sand out of their eyes
	Humboldt penguin	Coastal; cold water	- Streamlined bodies to help with swimming - Serrated beaks to help with catching and swallowing slippery fish - Countershading (black backs and white bellies) to help avoid detection by prey and predators

Chemistry 2.1: The Periodic Table

Section 1: The Periodic Table

2	**Metals**	Found on the **left** side whereas **non-metals** are on the **right.**
3	**Metalloids**	Near the **stepped line** and share properties of both metals/non-metals.
4	**Group**	The vertical columns found on the **Periodic Table**. These elements share similar properties such as **density**
5.	**Period**	The horizontal rows found on the **Periodic Table.**



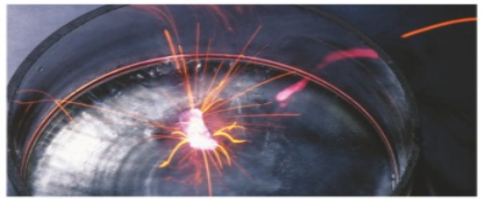
Section 2: Metals and non-metals

	Properties of metals and non-metals	Metal	Non-metal
6	Good **conductor** of electricity	Y	
7	Good **conductor** of heat	Y	
8	Appearance?	Shiny	Dull
9	Density? (**Mass** of a material in a certain **volume**)	High	Low
10	**Malleable** (can be hammered into shapes)	Y	Breaks
11	**Ductile**? (can be pulled into a wire)	Y	Breaks
12	**Sonorous?** (makes a ringing sound when hit	Y	

Section 3: Elements of Group 1

13	**The Alkali Metals**	**Lithium** (*Li*), **Sodium** (*Na*), **Potassium** (*K*), **Rubidium** (*Rb*), **Caesium** (*Cs*) and **Francium** (*Fr*).
14	**Reactive**	The ability to take part in **chemical reactions**.
15	**Reactivity** of **Group 1**	As we move down **group 1,** the elements become **more** reactive
16	These are the **word equations** for group 1 metals reacting with water:	Lithium + Water → Lithium hydroxide + hydrogen Sodium + Water → Sodium hydroxide + hydrogen Potassium + Water → Potassium hydroxide + hydrogen

▲ Lithium, at the top of Group 1, reacts vigorously with water.



▲ The reaction of potassium with water is very vigorous.

Section 4: Elements of Group 7

17	**The Halogens**	**Fluorine** (*F*), **Chlorine** (*Cl*), **Bromine** (*Br*), **Iodine** (*I*) and **Astatine** (*At*).
18	**Reactivity** of **group 7**	Fluorine most reactive: As we move down **group 7,** the elements become **less** reactive.
19	**Displacement Reaction**	A **more reactive** element pushes out a **less reactive** element from its **compound** in a **chemical reaction.**
20	Group 7 **displacement**	Elements nearer the top of **group 7 displace** elements lower in the group: fluorine will displace chlorine; chlorine will dislace bromine
21	Example of **displacement**	Chlorine + potassium bromide → potassium chloride + bromine

Section 5: Elements of Group 0

22	**The Noble Gases**	**Helium** (*He*), **Neon** (*Ne*), **Argon** (*Ar*), **Krypton** (*Kr*), **Xenon** (*Xe*) and **Radon** (*Rn*).
23	**Reactivity** of **group 0**	The elements in **Group 0** are **unreactive.**
24	**Melting** and **boiling points**	The **melting/boiling point** for the **Noble gases increase** as you move down the group.

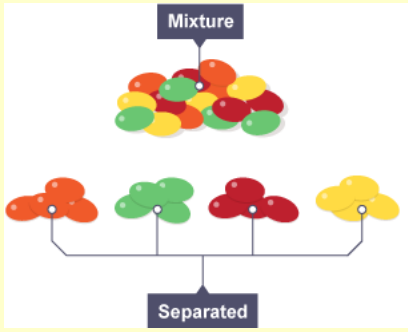
Chemistry 2 – Separation Techniques

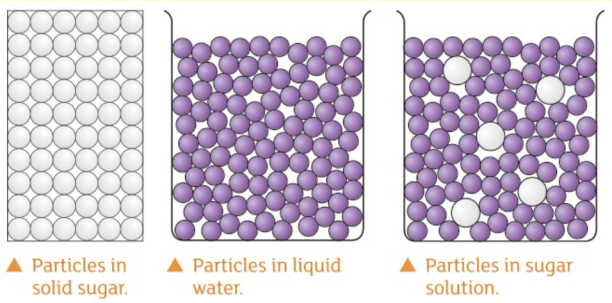
Section 1: Mixtures

Key Word	Definition
1. Mixture	A mixture is made up of substances that are **not chemically joined** together.
2. Pure Substances	A substance is pure if it has **no other substances mixed** in with it. It has a sharp melting point.
3. Impure Substances	A substance is impure if it has **different substances mixed** in with it. It does not have a sharp metling point.

Section 2: Solutions

Key Word	Definition
4. Solution	A mixture of a liquid with a solid or a gas. All parts of the mixture are the same.
5. Solvent	The liquid in which a solid or gas dissolves.
6. Solute	The solid or gas that dissolves in a liquid.
7. Dissolve	The mixing of a substance (the solute) with a liquid (the solvent) to make a solution.





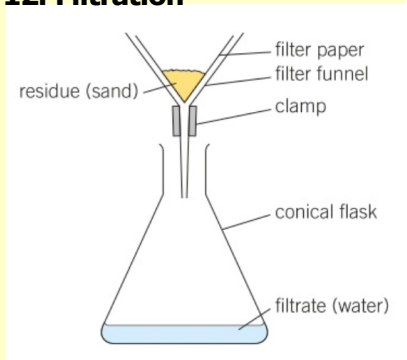
Section 3: Solubility

Key Word	Definition
8. Saturated Solution	A solution in which no more solute can dissolve.
9. Solubility	The solubility of a substance is the mass that dissolves in 100g of water.
10. Soluble	The **greater the mass** of a substance you **can dissolve** in 100g of water, the more soluble the substance.
11. Insoluble	Substances that **cannot dissolve** in water are insoluble.

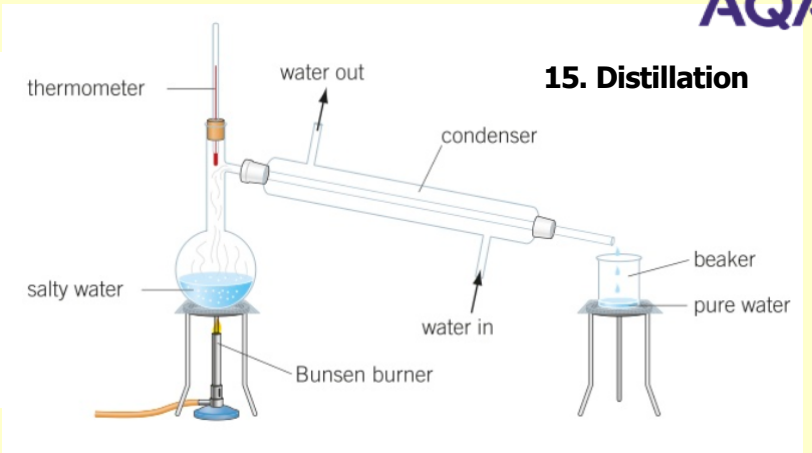
Section 4: Filtration

Key Word	Definition
12. Filtration	A way of **separating** pieces of **solid** that are **mixed** with a **liquid** or solution by filtration.
13. Filtrate	The **liquid** or **solution** that **collects** in the container after the mixture has passed through the filter paper.
14. Residue	The **solid** that **collects** in the filter paper.

12. Filtration



15. Distillation



Section 5: Evaporation and Distillation

Key Word	Definition
15. Distillation	A technique that uses **evaporation** and **condensation** to obtain a **solvent** from a **solution**.
16. Evaporation	The change of state from **liquid** to a **gas**, when particles leave the **surface** of the liquid.
17. Condensation	The change of state from a **gas** to a **liquid**.
18. Process of distillation	• Water in the salt solution boils • Steam leaves the solution • Steam travels through the condenser and cools down • The steam condenses to form liquid water • Liquid water drips into the beaker

Section 6: Chromatography

Key Word	Definition
19. Chromatography	A technique to **separate mixtures** of **liquids** that are soluble in the same solvent.
20. Chromatogram	An **image** obtained from **chromatography**.

Chemistry C2.3 Metals and Acids

Section 1: Acids and metals

1	**Observations with metal and acid reactions**	Magnesium: Bubbles vigorously Zinc/ iron: Bubbles steadily Lead: Few bubbles
2	**Products**	A salt and hydrogen
3	**Test for hydrogen**	Put a lit splint in the gas and there will be a squeaky pop

Section 2: Metals and oxygen

State symbols		
4	**(s)**	Solid
5	**(l)**	Liquid
6	**(g)**	Gas
7	**(aq)**	Solution

Reactions with oxygen		
8	**magnesium**	Burns vigorously
9	**Zinc**	Burns less vigorously
10	**Iron**	Burns
11	**lead**	Does not burn
12	**Copper**	
13	**Gold**	No reaction

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

Section 3: Metals and water

14	**Reactivity series**	A list of metals in order of how vigorously they react
15	Metals at the top of the reactivity series have very vigorous reactions. Going down the list, the metals get less reactive	

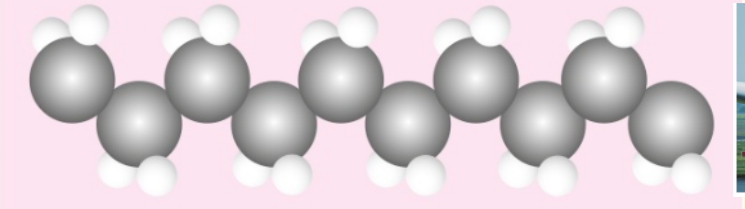
Section 4: Metal displacement reactions

16	**Displace**	A more reactive metal displaces – or pushes out – a less reactive metal from its compound
17	**Displacement**	In a displacement reaction, a more reactive metal displaces a less reactive metal from its compound
18	**Thermite reaction**	Aluminium + iron oxide → aluminium oxide + iron

Section 5: Extracting metals

19	**Ore**	A rock that you can extract a metal from
20	**How metals are extracted from their ore**	1. Separate the metal oxide from its ore 2. Use chemical reactions to extract the metal from its metal oxide
21	**Chemical reactions**	The chemical reactions involve heating the metal oxide with charcoal (carbon). Any metal that is below carbon in the reactivity series can be displaced from its compounds by carbon

magnesium
aluminium
carbon
zinc
iron
lead
copper



Section 6: Materials

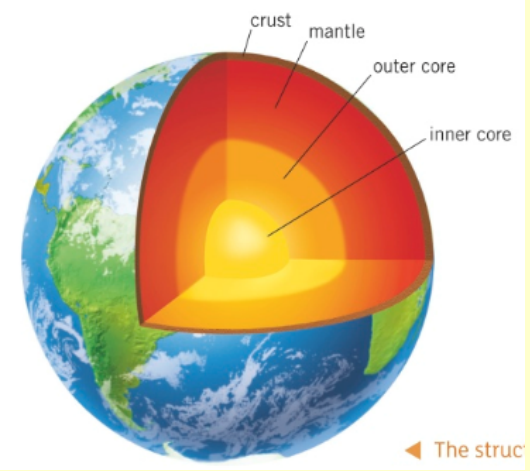
	Material	Description	Properties	Uses
22	**Ceramics**	A compound such a metal silicate or oxide that is hard, strong and has a high melting point	• Hard • Brittle • Stiff • Solid at room temperature • Strong • Break easily • Electrical insulators	• Bricks – are strong which makes them suitable for buildings • Electrical power-line insulators – ceramics do not conduct electricity
23	**Polymers**	A substance made up of very long molecules	• Does not conduct electricity • Poor conductors of heat	• Carrier bags (low-density polyethene) • Artificial joints (high-density polyethene)
24	**Composites**	A mixture of materials with properties that are a combination of those of the materials in it	Has properties that are a combination of the properties of the materials it is made up of	• Carbon-fibre-reinforced plastic • Glass-fibre-reinforced aluminium

Chemistry C2.4: The Earth

Section 1	The Earth
1 Layers	Inner core (solid) – Outer core (liquid) – Mantle (semisolid) – Crust (solid)
2 Crust	Mostly oxygen, silicon, aluminium and iron
3 Atmosphere	The gases surrounding the Earth
4 Troposphere	The layer of the atmosphere closest to the Earth. Mostly made of nitrogen and oxygen

Section 2	Rock types
6 Sedimentary rocks	Made of broken down rocks (sediment) which has been compacted and cemented together. Porous, permeable, contain fossils
7 Metamorphic rocks	Made when other rocks are heated and pressured. Very hard and strong, have distorted fossils.
8 Igneous rocks	Made when magma or lava cools down. Crystalline, hard, no fossils.
9 Rock cycle	The cycle that changes rocks from one type to another

Section 3	Weathering and erosion processes
10 Chemical weathering	Acid in rain reacts with rocks.
11 Biological weathering	Plants and animals break down rocks
12 Physical weathering	Temperature changes break down rocks
13 Erosion	Rocks hitting each other and breaking
14 Transportation	Rocks being moved usually by water or wind
15 Deposition	Rocks being dropped and settling
16 Compaction	Sediment being squashed together
17 Cementation	Minerals gluing the sediment together into one rock



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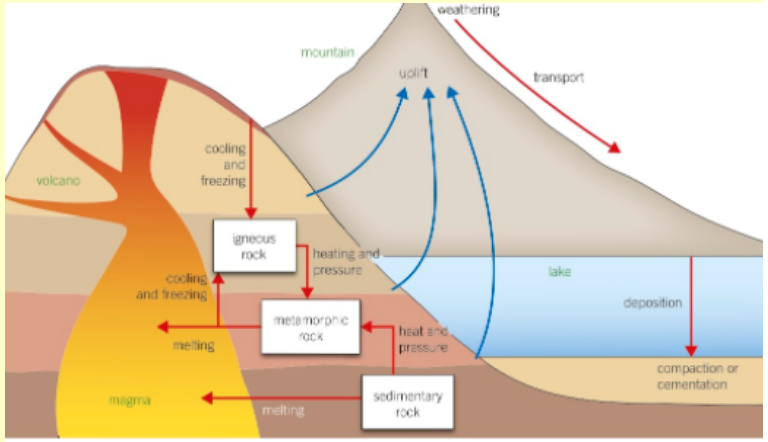
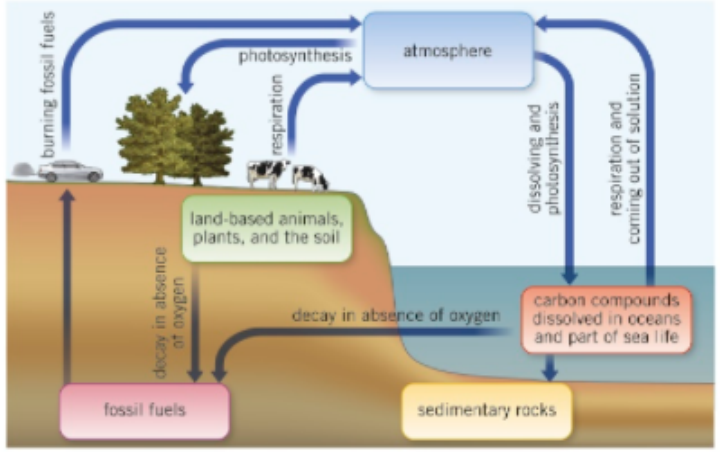
Section 4	Carbon cycle
19 Respiration	Transfers energy from food and plants. Gives out carbon dioxide into the atmosphere.
20 Combustion	Transfers energy from fuel. Gives out carbon dioxide into the atmosphere
21 Photosynthesis	Transfers energy from carbon dioxide and water. Removes carbon dioxide from the atmosphere
22 Dissolving	Takes carbon dioxide into the oceans. Removes it from the atmosphere
23 Carbon stores	Places where carbon is held. Plants, animals, rocks, oceans, atmosphere.

Section 5	Climate change
24 Greenhouse effect	Gases in the atmosphere such as carbon dioxide trap energy from the sun, leading to global warming.
25 Increased greenhouse gases	Combustion of fuels and deforestation leading to excess carbon dioxide in the atmosphere.

Section 6	Recycling
26 Recycling	Collecting and processing materials which have been used so the materials can be used again
27 Advantages	Resources will last longer, uses less energy than making new resources, reduces waste and pollution
28 Disadvantages	Effort of sorting recycling materials, the lorries emit pollution, cannot recycle everything.



The rock cycle.

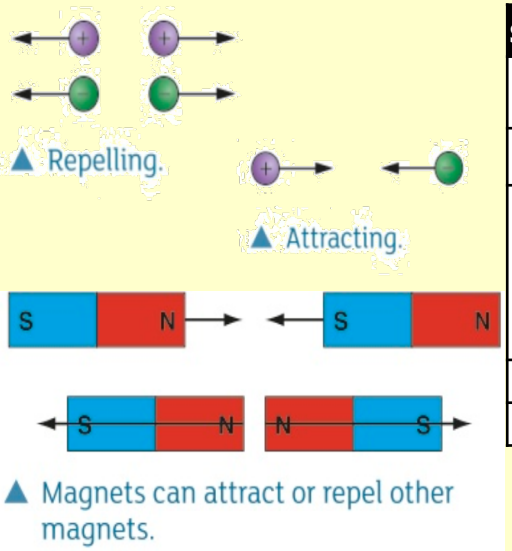


The carbon cycle.

Physics 2.1: Electricity and Magnetism

Section 1: Charging Up

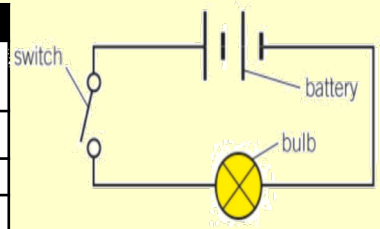
1	**Charges**	There are ***positive*** and ***negative*** charges
2	Two of the same charge **repel**, opposite charges **attract**	
3	**Atoms**	The smallest particle that everything is made up of
4	**Electrons**	Negatively charged
5	**Protons**	Positively charged
6	**Neutrons**	Neutrally charged



Magnets can attract or repel other magnets.

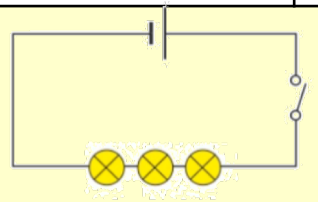
Section 2: Circuits and Current

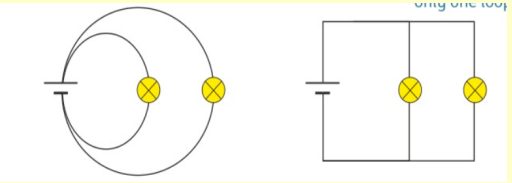
7	**Current**	The flow of **electrical charge** around a **circuit** per seconds
8	**Amps**	Units of measure for an **electrical current** (A)
9	**Ammeter**	Measures an electrical current
10	**Cell**	Provides the push that moves charge around a circuit



Section 3: Potential Difference

11	**Potential Difference**	The measure of the push that a **cell/battery** can supply
12	**Volts**	The measurement of potential difference
13	**Voltmeter**	Measures the potential difference.





Section 4: Series and Parallel

14	**Series** circuits	**Series** circuits are joined in one big loop
15	**Parallel** circuits	**Parallel** circuits have two or more paths for the current to travel

Section 5: Resistance

16	**Resistance**	How difficult it is for **current** to flow through a **component** in a **circuit**
17	**Ohms**	The unit of measurement for **resistance**
18	**Resistance** can be measured using this equation	$\text{resistance } (\Omega) = \frac{\text{potential difference (V)}}{\text{current (A)}}$
19	**Conductors**	Materials that have a **very low** resistance, such as metal
20	**Insulators**	Materials that have a **very high** resistance such as plastic

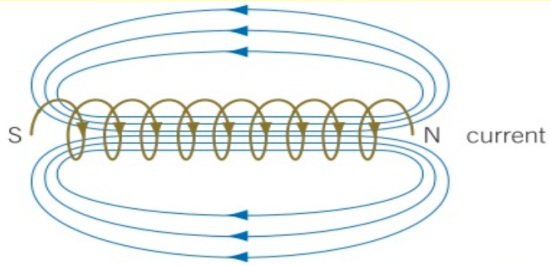
Section 6: Magnets and Magnetic Fields

21	**Magnetic Field**	A region where there is a **force** that acts on a **magnet**
22	**Magnetic Material**	A **material** that is attracted to magnets such as **iron** or **steel**
23	**Magnetic Field Lines**	Imaginary lines that show the direction of **force** on **magnetic materials**

Section 7: Electromagnets

24	**Electromagnet**	A **temporary** magnet produced using an **electric** A wire with an **electric current** flowing through it has a **magnetic field** around it
25	**Magnetise**	To make a **material** into a **magnet**
26	**Core**	A rod of **magnetic material** placed inside a coil to make the **magnetic field** of an electromagnet **stronger**

24



The magnetic field around a coil of wire.

Section 8: Using Electromagnets

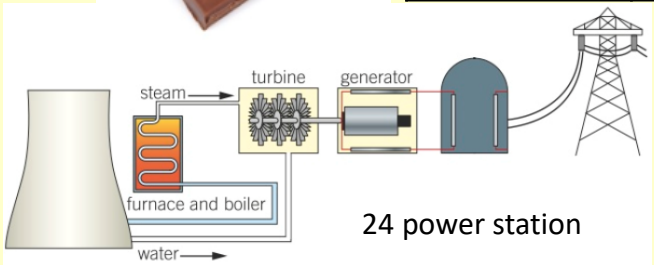
27	**Uses of Electromagnets**	Can be used to **lift iron cars** in a scrap yard and in **MRI scanners** found in hospitals
28	**Relay**	Electrical device that uses **current** flowing through it in one circuit to switch **on** and **off** a current in a second circuit
29	**Motor**	A **component** or **machine** that **spins** when a **current** flows through it

Physics P2.2 Energy

Section 1	Energy basics
1 Energy	Measured in joules (J). Often written in kilojoules (kJ)
2 Food	Energy store which we need to take in to our bodies. We need different amounts of energy to do different activities.
3 Fuel	Energy store which we need to heat houses or make transport work.

3 Fuels

Section 2	Energy stores
Energy to do with…	Type of store
4 Food, fuels, batteries	**Chemical**
5 Hot objects	**Thermal**
6 Moving objects	**Kinetic**
7 Position in a gravitational field	**Gravitational potential**
8 Changing shape, stretching or squashing	**Elastic**



24 power station

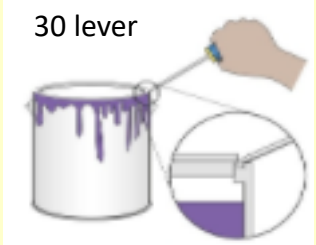
Section 3	Transferring energy
9 Law of conservation of energy	Energy cannot be created or destroyed, it can only be stored or transferred.
10 Method of transferring energy	Electric current, light & sound
11 Wasted energy	Energy which is transferred into a store you do not want
12 Thermal store of the surroundings	Common wasted energy transfer, energy described as dissipated

Section 4	Energy and temperature
13 Temperature	Measured in degrees Celsius (or Kelvin). Measure of the energy store in an object.
14 Energy in particles	All particles have energy, and are moving. As you heat them, they move faster.
15 Increasing temperature	Increasing the temperature of an object depends on its mass, what it is made of and the temperature rise you want
16 Energy transfer	Energy is transferred from hot objects to cooler objects until there is no temperature difference and they are in equilibrium.

Section 5	Thermal energy transfer
17 Conduction	Happens in solids. Particles gain energy and vibrate faster. They collide with adjoining particles and pass on the energy. Happens well in metals because they have free electrons.
18 Convection	Happens in fluids. Particles gain energy and move apart. They become less dense and rise. This sets up a convection current.
19 Radiation	Very hot objects give out infrared radiation. This travels as waves. It can travel through a vacuum. The radiation can be reflected, absorbed or transmitted.

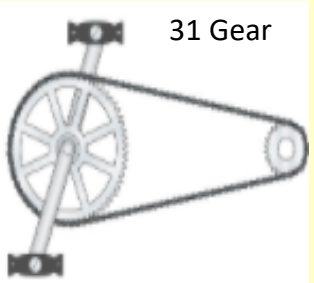
Section 6	Generating energy
20 Fossil fuels	Non-renewable fuels coal, gas and oil. Made from the remains of sea creatures and plants.
21 Fossil fuel power station	Fuels are burned and the energy is used to boil water. The steam produced turns a turbine attached to a generator.
22 Renewable energy	Energy sources which will not run out, such as wind, solar, tidal, geothermal, wave, biomass and hydrothermal.

30 lever



Section 7	Power
23 Power	The amount of energy transferred by a device per second. Measured in Watts.
24 Kilowatt hours	Energy used – the power of a device and how long you have used it for. This is what you are charged for on your power bill.

31 Gear



Section 8	Work, energy and machines
25 Work	The energy required to exert a force over a distance.
26 Lever	A simple machine which multiplies the force you are exerting by making the distance larger.
27 Gear	A simple machine which multiplies the force being exerted using different sized cogs.

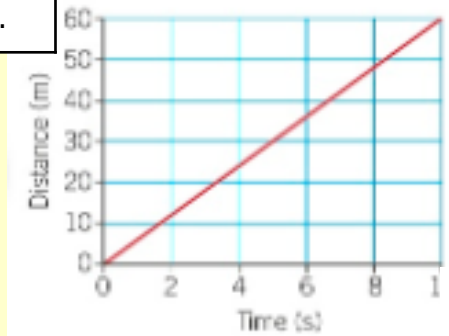
Physics P2.3 Motion and Pressure

Section 1	Speed
1 Speed	How far something travels in a particular time. Measured in metres per second.
2 Calculating speed	Speed (m/s) = distance travelled (m) / time taken (s)
3 Instantaneous speed	The speed at any given time. Speed on the speedometer in a car
4 Average speed	The total distance covered divided by the time taken to cover the entire distance.
5 Relative motion	How fast ab object moves compared to another object.

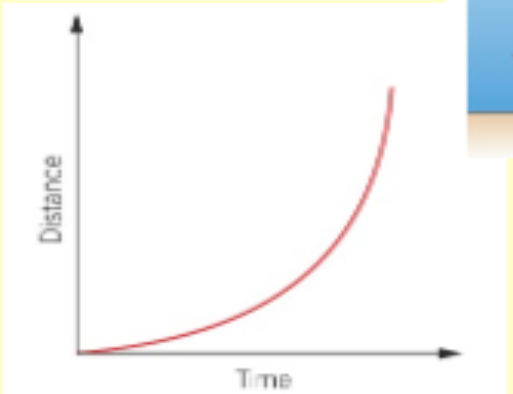
Section 2	Motion graphs
6 Distance – time graph	A graphical way of showing how something moves.
7 Gradient	The gradient on a distance time graph shows you the speed it was travelling. Horizontal = stationary, steeper = faster.
8 Acceleration	Shown on a distance – time graph as a curved line
9 Finding speed	Can be calculated from a distance – time graph by finding the gradient of the line.

Section 3	Pressure in gases
10 Gas pressure	Gas particles are constantly moving. When they hit the walls of their container they exert a force. This force over the surface area of the container exerts a pressure.
11 Changing volume	If you decrease the volume, you increase the pressure
12 Changing temperature	If you increase the temperature, the particles have more energy and move faster. The pressure will increase
13 Atmospheric pressure	The pressure exerted by the air on your body at all times.
14 Changing atmospheric pressure	Where there is greater air density, there is greater air pressure. High up mountains, there is less air pressure.

▲ A distance–time graph for a stationary object.



▲ A distance–time graph for a constant speed.

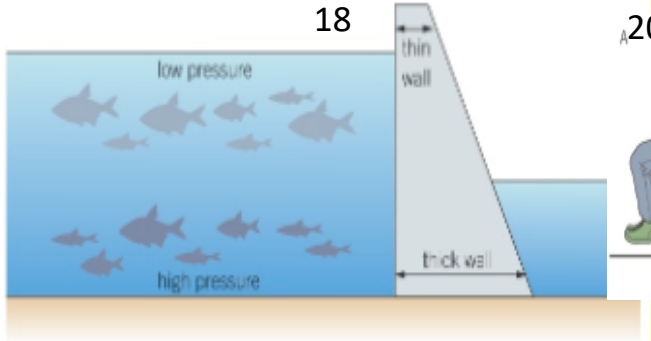


▲ A distance–time graph for an accelerating object.

Section 4	Pressure in liquids
15 Water pressure	The pressure caused by water particles colliding with an object
16 Increasing water pressure	The further underwater, the greater the water pressure
17 Floating and sinking	Water pressure causes upthrust, pushing up on objects. If upthrust is bigger than the gravitational force, the object will float.

Section 5	Pressure on solids
18 Pressure	The force on an object over an area. Measured in newtons per metre squared.
19 Increasing pressure	Increase the force or decrease the area it acts over

18



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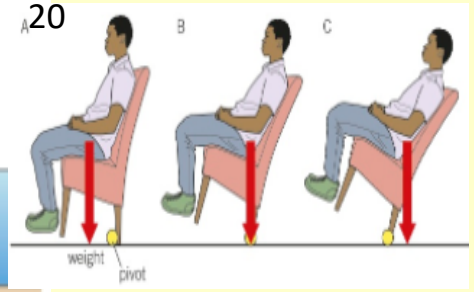

Section 6	Turning forces
20 Turning force	A force which causes an object to rotate around a pivot. Also known as a moment. Measured in newton metres.
21 Law of moments	For a balanced object, the sum of the clockwise moments is equal to the sum of the anticlockwise moments.
22 Centre of gravity	The place the weight of an object acts through. If this is over the pivot, the object will not fall. If it is outside the pivot, the object will fall.