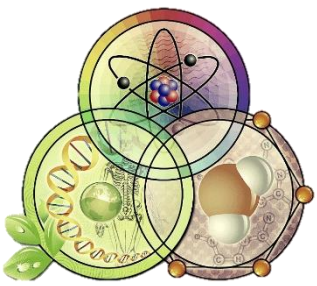
Year 7 Knowledge Organisers:

Name: _____ Class: _____

Science Teacher: _____

Contents

Biology: the study of living organisms, their structure, adaptations and environment.



Chemistry: studies the properties of matter and how matter interacts with energy.

Physics: the study of matter and small parts that make up matter, its motion and behaviour through space and time, including energy and forces.

Lab Rules:

The lab rules are designed to keep you and the people around you safe. Make sure you have read these carefully.

1. Only enter the lab when you are told to do so by a teacher.

2. Do not run or mess about in a lab.

3. Keep your bench and floor clear – put bags and coats in provided storage spaces.

4. Follow all instructions first time, every time.

5. Wear goggles from the start of the practical until the teacher tells you to take them off.

6. Replace lids on all chemical bottles and only touch them when instructed to do so.

7. When using a Bunsen burner – tie hair back and tuck in ties.

8. Stand up during practical work.

9. Do not eat or drink in the lab – never smell or taste anything that is in the lab – if you do, report it to the teacher.

10. Wash your hands carefully after every practical lesson.

11. If you are burnt or a chemical splashes on your skin – wash the area immediately and report it to the teacher.

12. Do not put solid waste down the sink – it goes in the bin unless instructed otherwise.

13. Wipe up all small spills and report bigger ones to your teacher.

14. Report any breakages to the teacher.

15. Enjoy your practical lessons – ask questions, be inquisitive and learn some amazing science!

I have read and understand the rules of the lab at SMS/KMS, signed: _____ Date: _____

Periodic Table:

The Periodic Table of Elements

1	2											3	4	5	6	7	0
							1 H hydrogen 1										4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	[285] Cn copernicium 112	[286] Nh nihonium 113	[289] Fl flerovium 114	[289] Mc moscovium 115	[293] Lv livermorium 116	[294] Ts tennessine 117	[294] Og oganesson 118

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted.

Relative atomic masses for **Cu** and **Cl** have not been rounded to the nearest whole number.

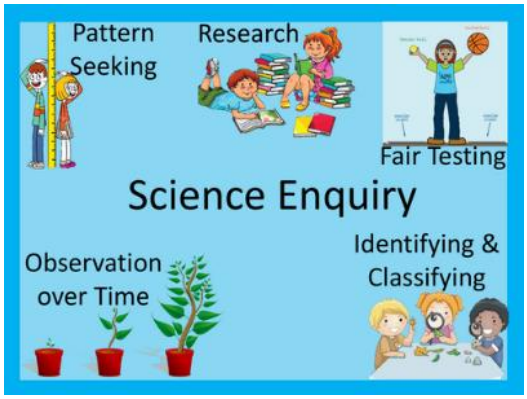
Working Scientifically Knowledge Organiser:

Keyword / Concept	Definition
Types of enquiry	Observing over time, research, classifying, fair testing, and pattern seeking.
Variable	A value that could be changed during an experiment.
Independent variable	The thing that you change
Dependent variable	The thing that you measure
Control variable	The thing that you keep the same
Prediction	What do you think will happen in an investigation and why?
Equipment	Special pieces of glassware and tools that allow you to carry out scientific investigations.
Risk assessment	A list of hazards, risks and how to reduce the chances of them.
Method	Step by step set of instructions on how to carry out an investigation
Conclusion	An explanation of what is found out during an investigation and why.
Evaluation	An explanation of what has gone well with an investigation and what can be done to improve it if carried out again.
Accuracy	An accurate measurement is considered to be close to the true value. Accurate readings are done by using suitable equipment.
Precision	How close together measurements are.
Anomaly	A result that does not fit the pattern.
Scale	A set of numbers that indicate certain intervals on a graph / measuring equipment used for measurement.
Axis	The horizontal (x axis) and vertical (y axis) lines on a graph that contain the scales.
Line of best fit	A line that follows the trend of data showing the correlation of results

Working Scientifically:

1. Aim:
   What are you investigating?
   In this investigation we are going to …..

2. Type of enquiry:



3. Identifying variables:
   - Independent variable
   - Dependent variable
   - Control variable
4. Prediction:
   - Can you predict what your results will show?
     I predict that if I change the (independent variable) it will *increase/decrease* the (dependent variable)
   - Can you use a scientific idea to support your prediction?

5. Risk Assessment:

What are the risks with your investigation?

- ❑ Identify the hazard.
- ❑ State what harm the hazard can do (risk).
- ❑ How could you stop any accidents from happening?
- ❑ If an accident occurred, what would you do?

Hazard	Risk	Preventing Risk	What to do if an accident happens.

6. Method:

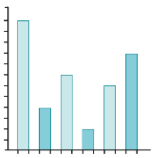
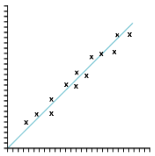
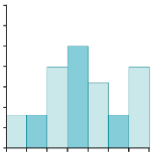
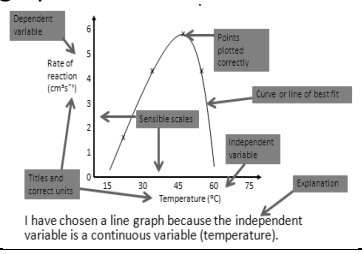
Make sure your method has:

- ☐ Numbered steps (step 1:…..)
- ☐ Written in a clear order
- ☐ Short, simple sentences
- ☐ Bossy verbs (Collect, Measure, Pour)
- ☐ Be specific – use amounts or timings
- ☐ Do not use I, we, you
- ☐ You may want to include a diagram

7. Collecting Results:

Independent variable (units)	Dependent variable (units)			
	Repeat 1	Repeat 2	Repeat 3	Mean Average

8. Representing data:

Types of Graph:	Graph Check List:
• Bar chart: When one of our variables is discrete, we draw a bar chart. 	☐ Drawn with a pencil and ruler ☐ Axes drawn using the lines on the graph paper ☐ X axis – independent variable (what you changed) ☐ Y axis – dependent variable (what you measured) ☐ Axes labelled – what do the numbers/words mean make sure you include units ☐ Scales are evenly spaced ☐ Bar chart – bars equal widths with spaces between them. ☐ Line graph – points drawn with small x, line of best fit. ☐ Histogram – bars equal without spaces between them. ☐ Title – This graph shows….
• Line graph: When both variables are continuous, we draw a line graph. 	
• Histogram: When continuous data is grouped into categories, we draw a histogram. 	

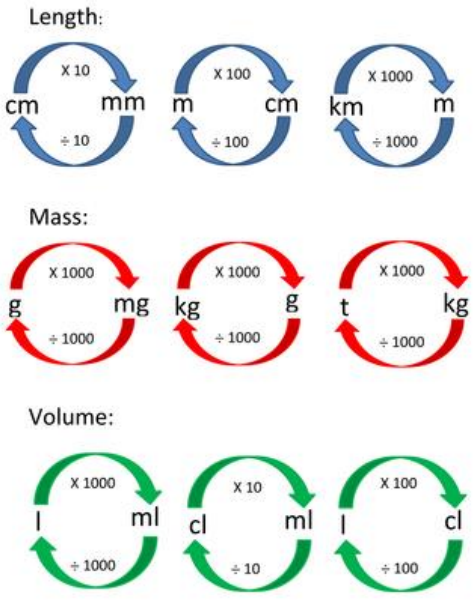
9. ***Conclusion:***

- When the (independent variable) increases / decreases, (dependent variable) ….
- We can see this from… (use your data).
- This happened because… (explain your results using science).
- Was your prediction correct? My prediction was correct/not correct because…

10. ***Evaluation:*** Answer these questions below in full sentences to evaluate your experiment.
    A measurement is repeatable if the same experimenter repeats the investigation using the same method and equipment and gets the same result.
    a. Were the range and number of readings you took sufficient to see whether you had repeatable results?
    b. Can you explain any anomalous results?

    An experiment gives valid results if it is a fair test and provides repeatable results. If a variable should be controlled but isn't, then the experiment will not be a fair test.
    c. How successful were you at keeping your control variables the same throughout your investigation?
    d. Were the results of your investigation valid? How do you know?
    e. How could you increase the validity of your results? (How could you overcome any weaknesses with your method?

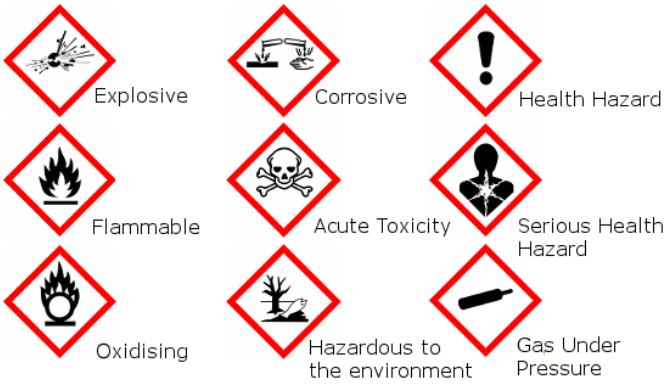
Thing being measured	**Standard Units**	**Equipment if applicable**
Energy	Joules (J)	
Force	Newtons (N)	Newton meter
Length	Meters (m)	Ruler
Speed	Meters per second (m/s)	
Gravity	Newton per kilogram (N/kg)	
Volume	Centimeters cubed (cm^3)	Measuring cylinder
Current	Amps (A)	Ammeter
Temperature	Degrees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



Scientific Skills Knowledge Organiser:

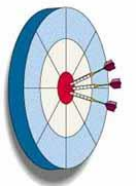
Accuracy	The value closest to the true value.
Precision	How close together measurements are.
Oxidising	Provides oxygen and can cause a fire or explosion.
Explosive	Chemical is unstable and could explode.
Flammable	Catches fire easily.
Gas under pressure	Compressed gas could explode if damaged or heated.
Toxic	Can cause death if swallowed, breathed or absorbed through the skin
Corrosive	Attacks and destroys living tissues.
Health hazard	Could cause irritation and harmful if swallowed, inhaled or contact with the skin.
Serious health hazard	Cause serious and long term damage to health.
Hazardous to the environment	Chemicals may present an immediate or delayed danger to the environment, including toxicity to aquatic life.
Bunsen burner	Piece of laboratory equipment used to heat things in a lab.
Measuring cylinder	Piece of equipment for measuring the volume of a liquid.
Thermometer	Piece of equipment for measuring the temperature.
Ruler	Piece of equipment used for measuring length.

Hazard symbols are a way of identifying what hazards are associated with chemicals:



Measuring:

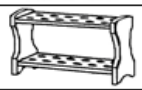
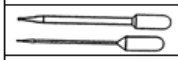
- Accuracy the value closest to the true value.
- Precision how close together measurements are.



Accurate and precise – accurate = the darts are all on bullseye, precise = the darts are all close together.

What are you measuring?	Equipment?	Units?
Mass	Balance	Grams
Length	Ruler	cm
Volume of a liquid	Measuring cylinder	cm^3
Angle	Protractor	°
Temperature	Thermometer	°C

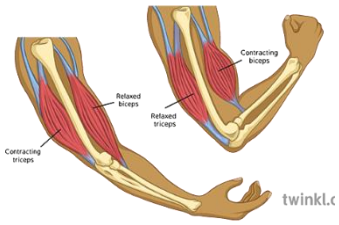
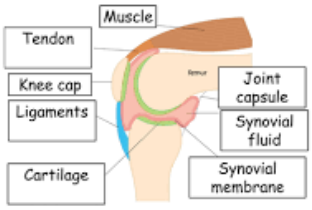
Lab Equipment:

Equipment	Name	Equipment	Name
	Test tube		Measuring cylinder
	Boiling tube		Tripod
	Beaker		Gauze
	Conical flask (i.e. cone-shaped)		Bunsen burner
	Crucible		Filter funnel (with paper)
	Tongs		Test tube holders
	Mortar and pestle		Thermometer
	Pipe clay triangle		Test tube holder
	Stand boss and clamp		Balance
	Dropping pipette		Evaporating basin
	Glass rod		Spatula

Units of measurement:

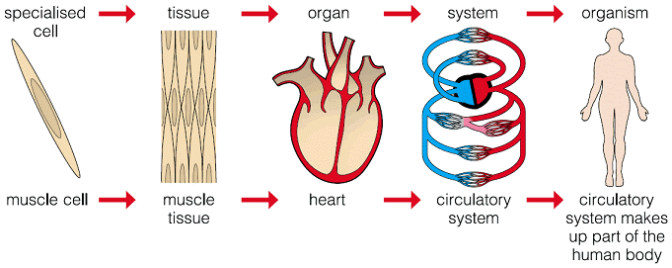
Thing being measured	Standard Units	Equipment if applicable
Energy	Joules (J)	
Force	Newtons (N)	Newton meter
Length	Meters (m)	Ruler
Speed	Meters per second (m/s)	
Gravity	Newton per kilogram (N/kg)	
Volume	Centimeters cubed (cm^3)	Measuring cylinder
Current	Amps (A)	Ammeter
Temperature	Degrees celcius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

Cells Knowledge Organiser:

Antagonistic muscle pair	Muscles working in opposite directions to create movement. When one contracts (gets shorter), the other relaxes. 
Backbone	The bone that protects the spinal cord.
Cartilage	Smooth tissue found at the end of bones, which reduces friction between them and stops them rubbing.
Cell	The basic unit of an organism, contains smaller parts called organelles to carry out life processes.
Cell membrane	Controls what moves in and out of the cell.
Cell wall	Strengthens plant cells and provides support.
Chloroplast	Absorb light energy so that plants can make food by photosynthesis.
Cytoplasm	Where the chemical reactions take place in the cell.
Joints	Places where bones meet. 
Ligaments	Connect bones in joints.
Microscope	Piece of equipment used to see objects that are too small to be seen by the naked eye. 
Mitochondria	The site of aerobic respiration which releases energy.
Nucleus	Contains genetic material (DNA) that controls the cell.
Organ	Group of different tissues working together to carry out a job.
Organ system	Group of organs with related functions working together to perform certain functions within the body.
Organelle	Specialised part of a cell which performs a specific function.
Organism	Any living thing.
Ribcage	The bones that protect the heart and lungs.
Skeleton	The support structure for an organism. In humans, this is bones inside the body.
Skull	The bone that protects the brain.
Tendons	Connect muscles to bones.
Tissue	Group of cells of one type.
Vacuole	Contains a watery fluid called sap. It keeps the cell firm.

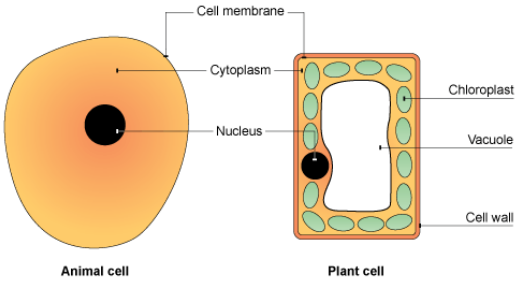
Organisation:

Cells are described as the building blocks of life. Cells can be organised to create multicellular organisms.



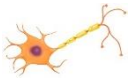
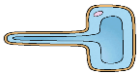
Cells:

Cells contain smaller parts (organelles) that have specific jobs.

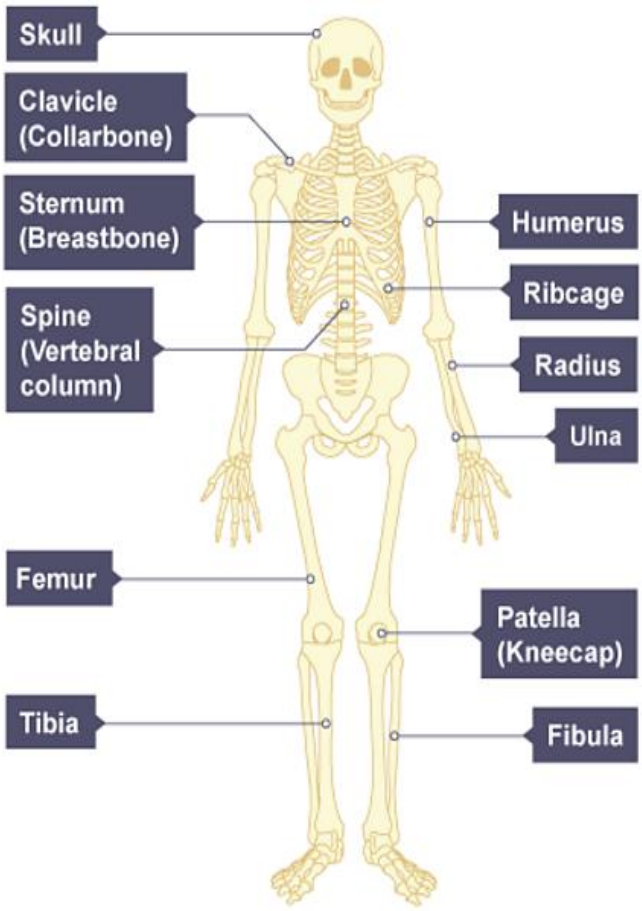


Organelle	**Function**
Nucleus	Contains genetic material that controls the cell.
Cell membrane	Controls what goes in and out.
Cytoplasm	Where the chemical reactions take place.
Mitochondria	The site of aerobic respiration which releases energy.
Cell wall	Strengthens plant cells and provides support.
Vacuole	Contains a watery fluid called sap. It keeps the cell firm.
Chloroplast	Absorb light energy so that plants can make food by photosynthesis.

Specialised cells have shape and structures that make them well suited (adapted) to doing their job.

Name of cell	Diagram of cell	Function of cell
Nerve cell		Carries electrical impulses around the body.
Red blood cell		Carries oxygen round the body. This cell contains no nucleus.
Sperm cell		Carries fathers DNA to the egg cell in a woman for fertilisation.
Muscle cell		Held together in bundles which pull together to make muscles contract.
Root hair cell		Absorbs minerals and water into the roots of a plant. Has a large surface area.
Palisade cell		To carry out photosynthesis in a plant cell.

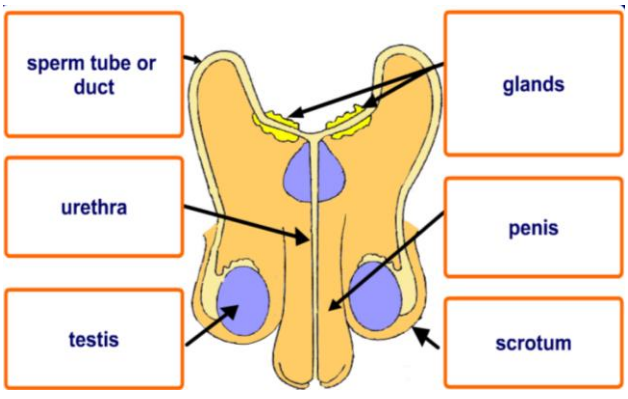
Skeleton: The human skeleton is the bones in your body. The skeletal system is there for support, movement and making red blood cells.



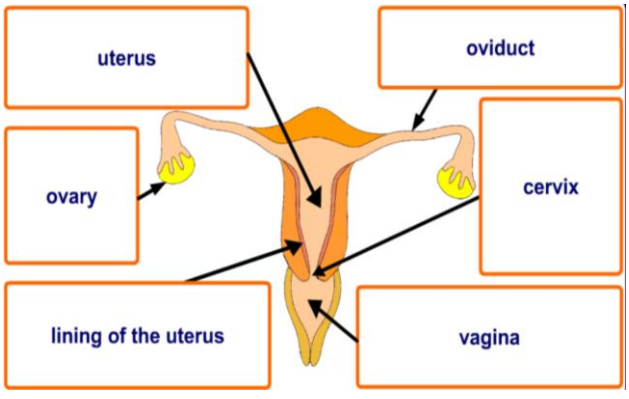
Reproduction Knowledge Organiser:

Abstinence	Not partaking in any sexual activity.
Consent	Permission for something to happen or an agreement to do something.
Contraception	A method of preventing unwanted pregnancy during sexual intercourse.
Egg	Female reproductive cell produced in the ovaries
Embryo	A developing baby in the early stages (usually before three months)
Fertilisation	When the nucleus of the egg and sperm cell join together, creating one cell.
Foetus	An unborn baby that has developed from an embryo.
Gametes	Sex cells – in humans these are the egg and sperm cells
Gestation	The time during which a fertilized egg develops into a baby ready to be born.
Hormone	Chemical messanger in the body that stimulates a response
IVF	In vitro fertilization – the egg cell is fertilized outside of the body.
Menstrual cycle	Recurring series of events that happen in the female reproductive system about every 28 days.
Ovulation	The release of an egg from the ovary
Penis	The male reproductive organ
Placenta	Organ responsible for providing oxygen and nutrients and removing waste substances between mother and foetus.
Pregnancy	The period of time where a women is carrying a developing fetus
Puberty	A period of time where adolescents bodies are becoming capable of reproduction.
Sperm	Male reproductive cell produced in the testes
Vagina	The female reproductive organ

Male Reproductive System:



Female Reproductive System:

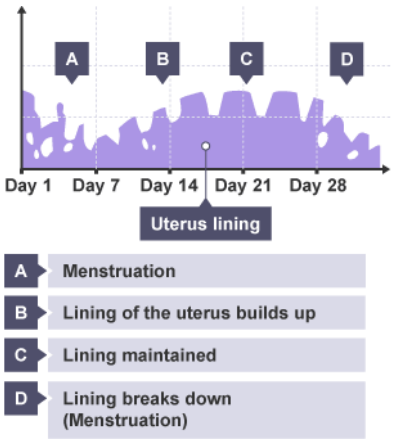


Puberty:

Puberty usually occurs during teenage years and is your body preparing for sexual maturity. Both boys and girls bodies will change during puberty. There is no set time or pattern in which these changes happen. Typically girls will reach puberty before boys.

Menstrual Cycle:

The female reproductive system includes a cycle of events called the menstrual cycle. It lasts about 28 days, but it can be slightly less or more than this. The cycle stops while a woman is pregnant.



Day 1 - Bleeding from the vagina begins because the uterus lining is breaking down.

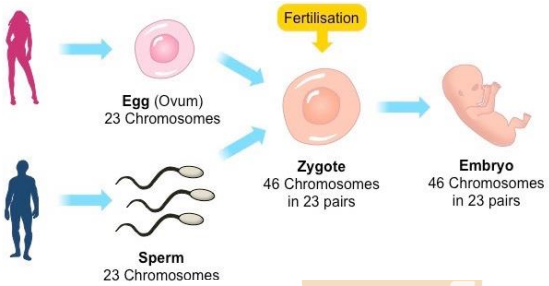
Day 5 - Bleeding stops. Egg starts to mature in an ovary.

Day 14 – Mature egg is released from the ovary – ovulation.

Day 28 – If the egg is not fertilised, the cycle starts again.

Fertilisation:

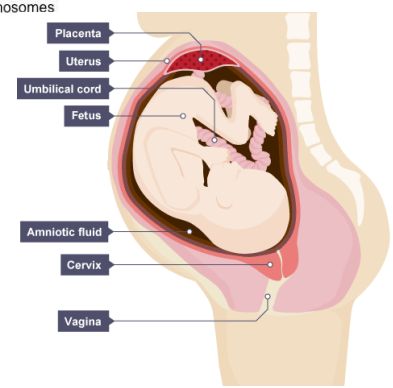
Fertilisation is when the egg cell nucleus and the sperm cell nucleus combine, this happens inside the woman's oviduct. The fertilised egg cell implants into the woman's uterus lining and the cell begins dividing. The tiny ball of dividing cells is called an embryo . After the implantation of an embryo the woman is said to be pregnant.

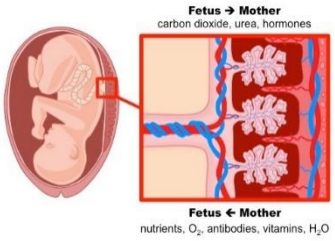


Pregnancy:

Pregnancy in humans is approximately 39 weeks. During this time the baby will develop inside the mother. The foetus relies on its mother as it develops. The foetus needs:

- Protection against knocks, bumps and temperature changes.
- Oxygen for respiration.
- Nutrients (food and water).
- The removal of waste substances.





The placenta is an organ that allows useful substances to pass from mother to baby and waste substances to pass from baby to mother.

Pregnancy and Lifestyle:

A mothers lifestyle during pregnancy can affect the a baby.
Pregnant women need to:

- Not drink alcohol or take drugs.
- Maintain a healthy balanced diet
- Exercise regularly.

Consent:

The age of consent to any form of sexual activity is 16 for both men and women. The age of consent is the same regardless of the gender or sexual orientation of a person and whether the sexual activity is between people of the same or different gender.

Energy Part 1 Knowledge Organiser:

Attract	When magnets pull each other closer
Component	The objects that a circuit provides energy too.
Conservation of energy	The idea that energy cannot be created or destroyed, it can only be transferred from one store to another.
Efficiency	The proportion of useful energy out of a process compared to total energy put in.
Energy Store	Somewhere energy is stored until it is transferred into a different store.
Joules	The unit used to measure energy.
Kinetic	The energy store of a moving object.
Magnet	An object that permanently creates a magnetic field
Magnetic field	The area within which a magnetic object can imparts a magnetic force.
Potential energy	An energy store that is in object because of its position or state.
Repel	When magnets push each other apart

Stores of energy

Energy can be stored in different ways. Energy is then moved from one store to another. There is considered to be 8 different ways of storing energy.

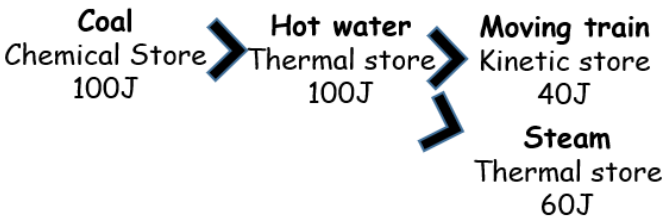
kinetic	Moving objects have kinetic energy.
thermal	All objects have thermal energy.
chemical	Anything that can release energy during a chemical reaction.
elastic potential	Things that are stretched.
gravitational potential	Anything that is raised.
electrostatic	Charges that attract or repel.
magnetic	Magnets that attract or repel.
nuclear	The nucleus of an atom releases energy.

Conservation of energy

Energy is measured in Joules (J). It can never be created or destroyed. It can only be transferred from one store to another. So, if a process starts off with 100J, then after the end of the process all 100J will be present somewhere.

Efficiency:

When energy is transferred, some energy is wasted. The less energy that is wasted during the transfer, the more efficient the transfer is.



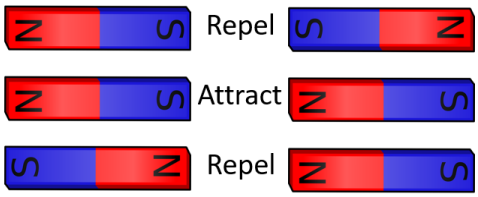
In the example above the kinetic store is useful, the thermal store is wasted.

We can use this equation to calculate the efficiency of this process.

$$\text{Efficiency} = \frac{\text{Useful Energy Output}}{\text{Energy Input}} \times 100\%$$

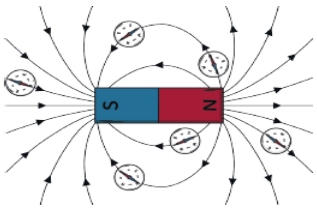
Magnetism:

- Magnetism is a non-contact force.
- Magnetic materials can be magnetised or attracted to a magnet.
- There are three metals that can be used to make magnets or are attracted to magnets; Cobalt, Iron (found in steel) and Nickel.
- A bar magnet is a permanent magnet, it has a north pole and a south pole.



Magnetic fields

- All the Earth's magnetic field so we can see which direction the north pole is. In the image, compasses are aligning with the field from a permanent magnet.
-
- A compass uses the Earth's magnetic field to point North.



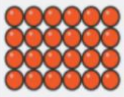
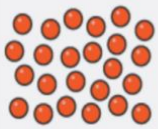
Matter Knowledge Organiser:

Aqueous	A solution formed from a liquid and dissolved solid (solute and solvent).
Atom	The smallest particle of an element that can exist.
Boiling point	The temperature at which a liquid turns into a gas.
Brittle	A substance will break if it bent.
Chemical Formula	Shows the elements present in a compound and their relative proportions.
Chromatogram	The result of chromatography showing the result of separating soluble substances. This can be seen on chromatography paper.
Chromatography	A separating technique used to separate mixtures of soluble substances.
Compound	Pure substances made up of two or more elements strongly joined together.
Compressed	When particles are pushed closer together.
Concentration	The amount of solute that is dissolved in a solvent (the amount of solid dissolved in a liquid).
Condensation	The process of a gas turning into a liquid.
Condenser	A piece of equipment that is used to cool a gas down so that it condenses into a liquid.
Conductor	A substance that will allow heat or electricity to pass through it.
Crystallisation	Separating technique used to produce solid crystals from a solution.
Density	The amount of matter within a certain volume.
Diffusion	The process by which particles in liquids or gases spread out through random movement from a region where there are many particles to one where there are fewer.
Dissolving	Particles of solvent collide with particles of solute. They surround the particles of solute, gradually moving them away until the particles are evenly spread through the solvent.
Distillation	Separating substances by boiling and condensing liquids
Ductile	A substance can be pulled into a thin wire.
Element	What all substances are made up of, and which contain only one type of atom.
Evaporating	The process of a liquid turning into a gas
Filtration	Separating technique used to separate an insoluble solid from a solvent.
Group	The vertical columns in the periodic table.
Insoluble	Substance will not dissolve in the solvent.
Insulator	A substance that does not allowed heat or electricity to pass through it.
Irreversible	Something that can not be changed back into its original form.
Malleable	A substance can be shaped / bent.
Melting point	The temperature at which a solid turns into a liquid.
Mixture	Two or more molecules or atoms not chemically joined together.
Mixture	Two or more molecules or atoms not chemically joined together.
Molecules	Two to thousands of atoms joined together. Most non-metals exist either as small or giant molecules.
Particle	Small piece of matter, this could be an atom, molecule, proton, electron or neutron.

Period	The horizontal rows in the periodic table.
Periodic table	A table arranged by increasing atomic number that contains all known elements.
Products	The things that are made during a chemical reaction. (e.g. the cake)
Pure substance	Only contains one type of element or compound
Reactants	The things put in to a chemical reaction. (e.g. the ingredients)
Reversible	Something that can be changed back into its original form.
Soluble	Substance will dissolve in the solvent.
Solute	A substance that can dissolve in a liquid to form a solution
Solution	The mixture of a solute and solvent
Solvent	A substance, normally a liquid, that dissolves another substance
Sonorous	When hit will produce a deep, ringing sound.
State of matter	Collective term used to describe whether something is a solid, liquid or gas.
Subliming	Change from a solid to a gas.
Surface area	The total area on the surface of a 3D object.

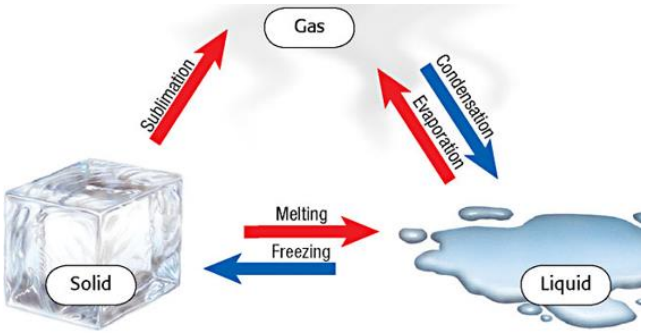
States of Matter:

- Materials are made up of tiny particles.
- There are three states of matter- solid, liquid and gas.

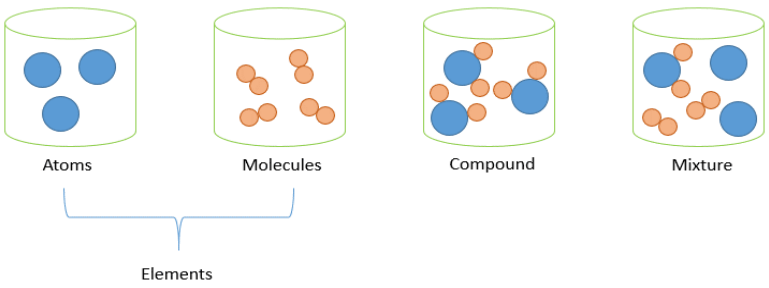
State	Solid	Liquid	Gas
Diagram			
Arrangement of particles	Regular arrangement	Randomly arranged	Randomly arranged
Movement of particles	Vibrate about a fixed position	Move around each other	Move quickly in all directions
Closeness of particles	Very close	Close	Far apart

Changes of State:

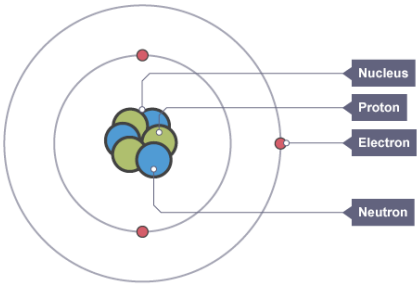
- For melting, boiling and sublimation to occur that particles need to gain energy. This gain in energy will cause the forces between molecules to break and particles to move more.
- For condensation and freezing to occur the particles need to reduce the amount of energy that they have, this reduces the movement of the particles.



Atoms, elements, compounds and mixtures:



Atomic Structure:



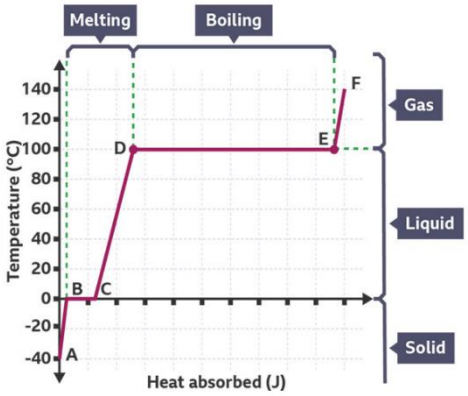
Each particle has its own charge and its own mass.

	Relative electric charge	Relative mass
Proton	+1	1
Neutron	0 (neutral)	1
Electron	-1	1/1840

Heating Curves:

A heating curve can be produced by heating a substance at a constant rate and measuring its temperature.

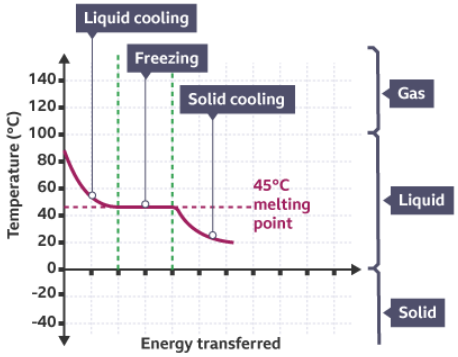
The diagram shows a heating curve for water.



Cooling Curves:

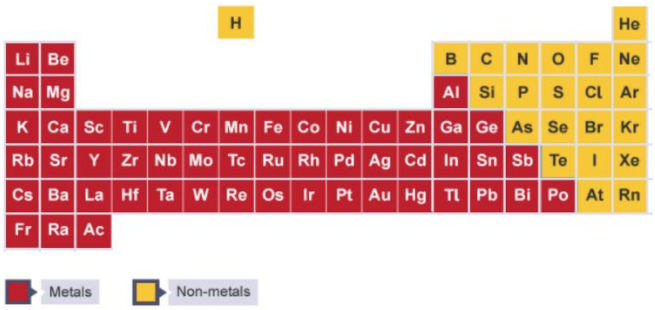
A cooling curve can be used to determine the temperature at which changes of state occur.

A cooling curve is produced by measuring the temperature of a substance as it cools and then plotting a graph of temperature against the amount of energy transferred.



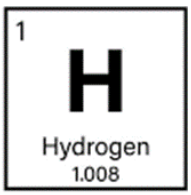
Periodic Table:

The periodic table shows every element that has been discovered. Periods go across and groups go down.

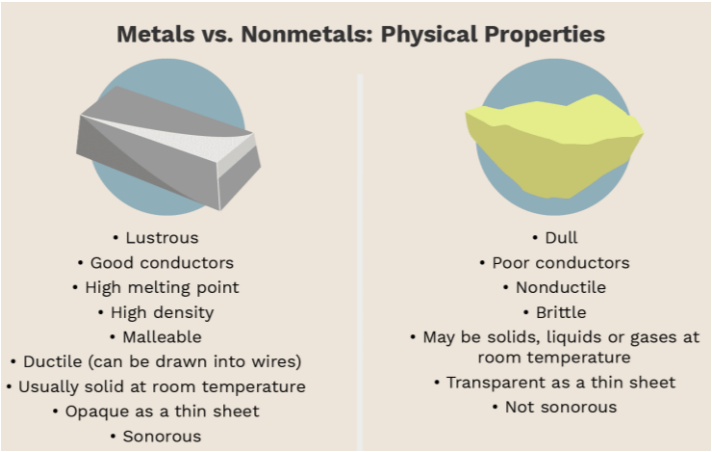


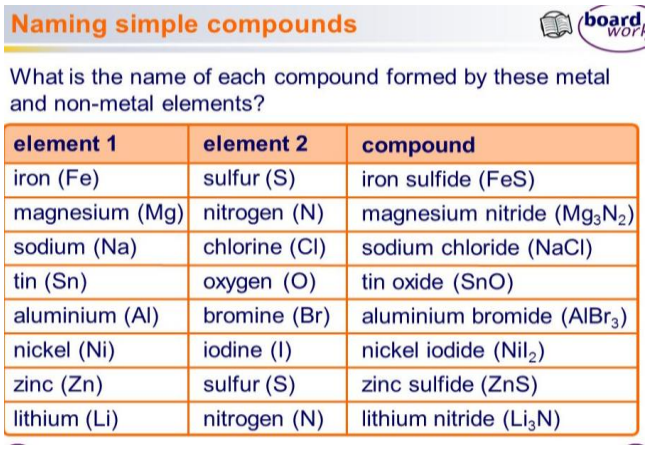
Chemical Symbols and Formula:

All **materials** are made up of one or more **elements**.
Every element has its own chemical **symbol**.



Metals and Non-metals:





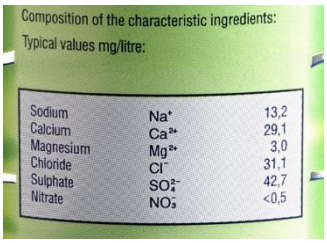
element 1	element 2	compound
iron (Fe)	sulfur (S)	iron sulfide (FeS)
magnesium (Mg)	nitrogen (N)	magnesium nitride (Mg_3N_2)
sodium (Na)	chlorine (Cl)	sodium chloride (NaCl)
tin (Sn)	oxygen (O)	tin oxide (SnO)
aluminium (Al)	bromine (Br)	aluminium bromide ($AlBr_3$)
nickel (Ni)	iodine (I)	nickel iodide (NiI_2)
zinc (Zn)	sulfur (S)	zinc sulfide (ZnS)
lithium (Li)	nitrogen (N)	lithium nitride (Li_3N)

Physical and Chemical Changes:

- Physical changes have a change of state and are reversible.
- Chemical changes make new substances and are often non-renewable.

Pure Substances:

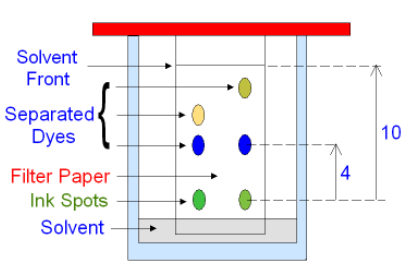
- The chemistry definition of a pure substance is that is contains only one element or compound.
- Mineral water is mostly water but it contains other substances mixed in with it, therefore it is not a pure substance.
- Impurities in a substance will affect its properties, for example it may change a substances boiling point.

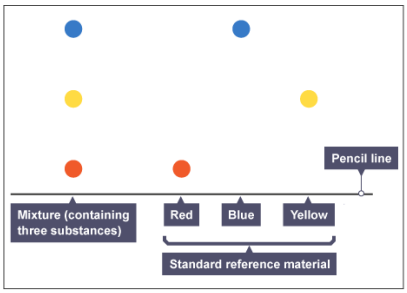


Diffusion is the movement of particles from an area of high concentration to an area of low concentration.

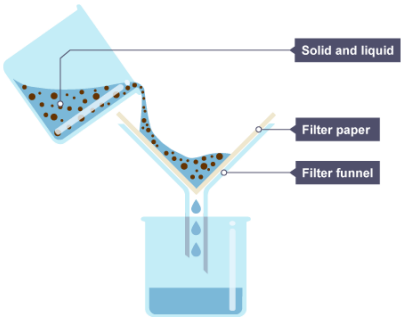
Chromatography:

- Chromatography is a separating technique used to separate mixtures of soluble substances. These are often coloured substances such as food colourings, inks, dyes or plant pigments.
- The line on the chromatography paper must be drawn with a ruler and pencil.
- The start line must be above the solvent.



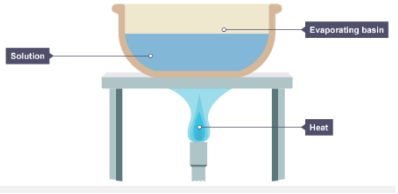


Filtration – separating substances using a filter to produce a filtrate (solution) and a residue.



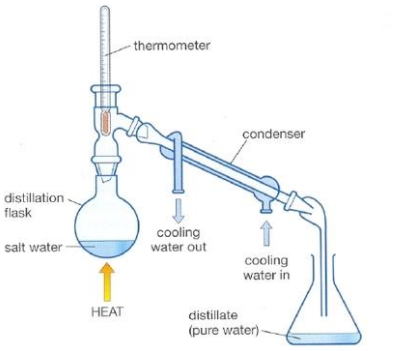
- The mixture is poured into the funnel containing filter paper.
- The insoluble solid remains in the filter paper and the solvent passes through.
- Filter paper contains small holes that will let small particle through. A particle that is small enough to fit through the holes in the filter paper will pass through, those that are too large will be held by the filter paper.

Crystalisation:



- Crystallisation is used to produce solid crystals from a solution.
- When the solution is warmed, some of the solvent evaporates leaving behind a more concentrated solution.
- The concentrated solution is left in an evaporating dish until the remainder of the solvent evaporates, leaving solid crystals.

Distillation:



- Distillation is a separating technique that can be used to separate liquids with different boiling points.
- Distillation involves the processes of evaporation and condensation.

Forces Knowledge Organiser:

Balanced forces	When two forces are the same size and cause an object to move at a constant speed or remain stationary.
Contact Force	A force that occurs when two objects touch each other to exert a force.
Distance – time graph	Graphical representation of the motion of an object. Time taken plotted on the x-axis, distance plotted on the y axis.
Force	Push or pull that arise from the interaction between two objects.
Friction	Force opposing motion which is caused by the interaction of surfaces moving over one another. It is called 'drag' if one is a fluid.
Gradient	The steepness of a line.
Gravitational Field	The area where other objects feel the effect of gravitational force.
Gravitational field strength, g	The force from gravity on 1kg (N/kg) On Earth gravitational field strength is 9.8 N/kg.
Mass	The amount of matter an object contains (kg)
Newton	Unit for measuring forces (N).
Newton meter	Piece of equipment used to measure the force exerted.
Non-contact Force	A force that occurs when two objects do not have to touch to exert a force.
Relative motion	When two cars are passing each other on a motor way, they look like they are moving slowly past you even though the speeds are high. This concept is relative motion.
Resultant force	If forces are unbalanced, the difference in these forces is the resultant force – it is the overall force that would be acting on the object.
Speed	Measure of how fast an object is moving.
Unbalanced forces	When two forces are different sizes and cause an object to speed up, slow down or change direction.
Weight	The force of gravity acting on an object (N)

Forces:

Forces are **push**es or **pull**s, measured in **newtons** (**N**) using a Newton Meter.

Contact and Non-Contact Forces:

When two objects or materials need to be touching for a force to have an effect, it is a **contact** force.

Examples:
- **friction**
- **air resistance**

When two objects or materials do not need to be touching for a force to have an effect, it is a **non-contact** force.

Examples:
- **gravity**
- **electrostatic**
- **magnetic**

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

Force diagrams:

Force diagrams show the direction and size of the force.

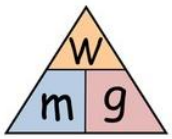
The arrows need to be proportional to the size of the force – the larger the force, the larger the arrow should be.

Weight and Gravity:

- Mass (kg) is a property of an object. It tells us how much of it there is.
- Weight (N) depends on the mass of an object, AND the gravitational field strength.
- Weight (N) = mass (kg) x gravitational field strength (N/kg)

$$W = m \times g$$

Weight (N) = Mass (kg) x Gravitational field strength (N / kg)



Speed:

Speed is a measure of how fast an object is moving.

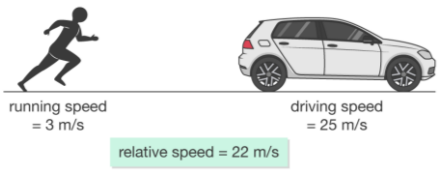
average speed = distance ÷ time

Units for speed are determined by the units used for distance and time.

Example: distance is measured in meters, time is measured in seconds, speed will be measured in meters per second.

Relative Motion:

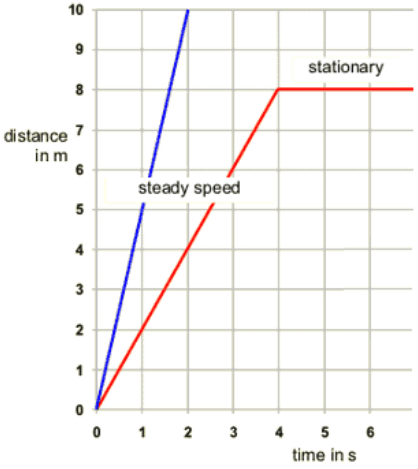
- **Same direction:** Relative speed = fastest speed – slowest speed
- **Opposite directions / past each other:** Relative speed = train A + train B



Distance time graphs:

- Distance time graphs represent the motion of an object.
- A distance time graph shows how an object has moved from a starting point.
- Time taken is plotted on the x axis.
- Distance is plotted on the y axis.
- Gradient of line = speed
- To calculate the gradient: $\frac{Change\ in\ y}{change\ in\ x}$
- The steeper line, the faster the object is moving.

A horizontal line shows the object is stationary.



Energy Part 2 Knowledge Organiser

Amps	The unit used to measure the current.
Ammeter	The piece of equipment used to measure current in a circuit.
Cell	What provides push for the current in the circuit and energy to the components the circuit powers. Often referred to as a battery
Circuit	The loop of wires needed to allow electrical current to flow and the components that this flow provides energy to.
Component	The objects that a circuit provides energy too.
Current	The flow of charges around a circuit.
Electromagnet	A temporary magnet, powered by the flow of current. Turning off the flow will turn off the magnet.
Magnetic field	The area within which a magnetic object can imparts a magnetic force.
Parallel	A parallel circuit is a circuit with more than one route for charges around it.
Series	A series circuit is a circuit with only route for the current to flow

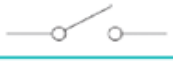
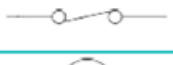
Electricity

Electricity is essential for modern life. Electricity must flow around a circuit. Circuits are made of conductors and form a loop that allows electrical current to flow around in one direction and form a complete circuit.

How to draw a circuit

Circuits are represented using circuit diagrams. When drawing a circuit its essential that; -

- symbols are used to represent the components
- straight lines are used for the wires
- right angles for the corners
- Components are placed in the middle of lines.

switch (open)	
switch (closed)	
bulb	
cell	
battery	
ammeter	
voltmeter	
resistor	
motor	

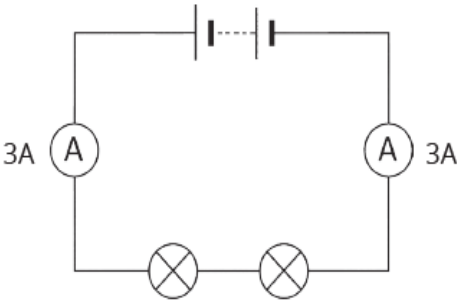
Current:

Current is the flow of charge in a circuit, measured by an ammeter (connected in series) and measured with the units amps (A).

Series and Parallel Circuits:

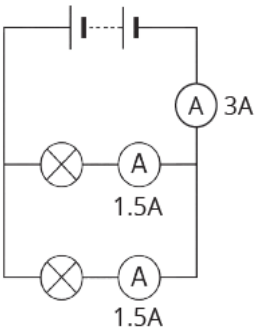
In a **series circuit** the components are connected end to end in a loop. If one bulb breaks, none of the bulbs will be lit as the circuit is no longer complete.

The current is the same everywhere in a series circuit as the current is not used up. The more cells are in the circuit the higher the current will be.



In a **parallel circuit**, the components are connected on separate branches. This gives the current several different paths to flow down. If one bulb stops working, the other bulbs will remain lit

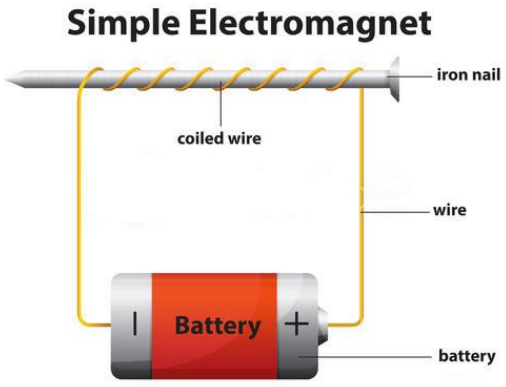
The current is split between the branches in a parallel circuit.



Electromagnets

Current flowing through a wire produces a weak magnetic field. This can be made stronger by wrapping a wire around a magnetic metal core. These are called electromagnets and their main advantage over permanent magnets is that they can be turned on and off.

Electromagnets can be made more powerful by increasing the number of times the wire is wrapped around the core, or by increasing the current flow through the wire.

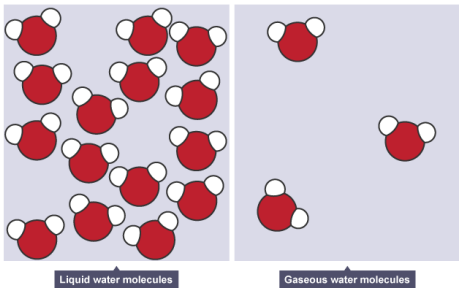


Reactions Knowledge Organiser:

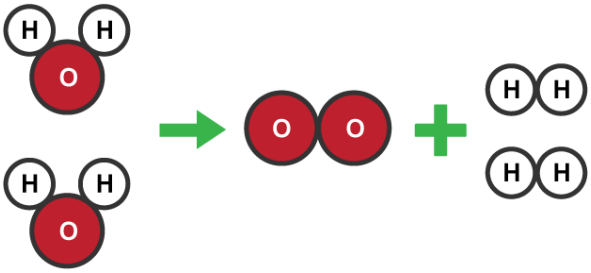
Acid	A substance with a pH less than 7.
Alkali	A base that will dissolve. A substance with a pH greater than 7.
Base	A substance with a pH greater than 7.
Copper sulfate	A salt made from copper oxide and sulfuric acid
Indicator	A substance that will change colour based
Indicator	Substances used to identify whether unknown solutions are acidic or alkaline.
Litmus	Red litmus turns blue in an alkali, blue litmus turns red in an acid.
Neutral	A substance with a pH of 7.
Neutralisation reaction	A reaction of an acid and alkali to produce a neutral solution containing a metal salt and water.
pH scale	Scale of acidity and alkalinity from 0-14
Salt	The product of a neutralisation reaction consisting of a metal (from the alkali) and non-metal (from the acid).
Universal indicator	Indicator will change colour when in an acid or alkali based on the colour of the pH scale.

Chemical changes and physical changes:

Physical changes: Physical changes do not lead to new chemical substances forming. In a physical change, a substance simply changes physical **state**, e.g. from a solid to a liquid.
For example: Liquid water becoming steam (when water boils) is a physical reaction:



Chemical changes: Chemical changes happen when something new is made. For example liquid water **decomposing** into hydrogen and oxygen, e.g. when an electric current is passed through water, is a chemical reaction:



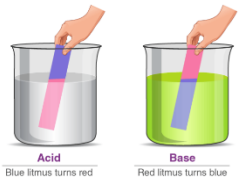
Acids and Bases:

- Examples of acids: hydrochloric acid (HCl), sulphuric acid (H_2SO_4), nitric acid (HNO_3).
- Examples of bases: copper oxide (CuO), sodium hydroxide (NaOH), calcium carbonate ($CaCO_3$).
- An alkali is a base that will dissolve. Many bases are insoluble.

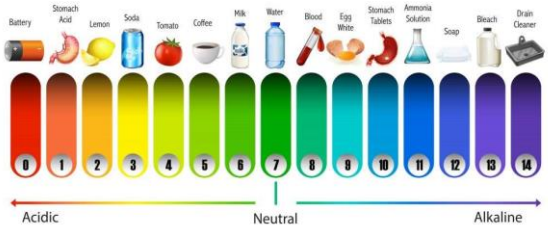
Indicators will change colour depending on whether they are in an acid, alkali or neutral solution.

Litmus paper:

- Red litmus – stays red in acid, turns blue in bases.
- Blue litmus – stays blue in bases, turns red in acids.



Universal indicator:



Changes colour that corresponds with the pH scale.

Strong acids: hydrochloric acid, nitric acid, sulphuric acid.

Weak acids: ethanoic acid, citric acid.

Neutralisation:

A chemical reaction happens if you mix together an acid and a base. The reaction is called neutralisation.

metal oxide + acid → a salt + water

metal hydroxide + acid → a salt + water

metal carbonate + acid → a salt + water + carbon dioxide

Rules for naming salts:

1) The METAL name from the base always comes first

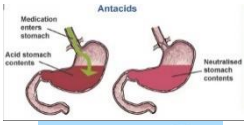
2) The ACID name always comes second

Hydrochloric Acid + Sodium Hydroxide → Sodium Chloride + Water

3) The Acids changes it's name

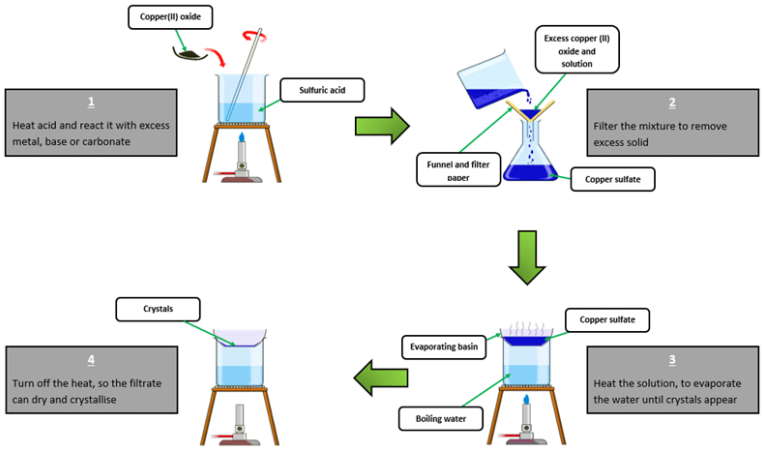
Sulphuric Acid → Sulphate **Nitric Acid → Nitrate** **Hydrochloric Acid → Chloride**

Uses of neutralization reactions:



- Bee strings are acidic – they can be neutralized using a basic compound such as baking powder which contains sodium hydrogen carbonate.
- Indigestion is caused by too much stomach acid, antacid tablets are made using bases that react with the acid in the stomach forming a salt and water. Examples of bases in antacid tablets include: magnesium hydroxide and magnesium carbonate.
- Farmers use neutralization reactions to neutralize acidic soil – lime (calcium oxide) is used to neutralize soil.

Making Copper Sulfate:



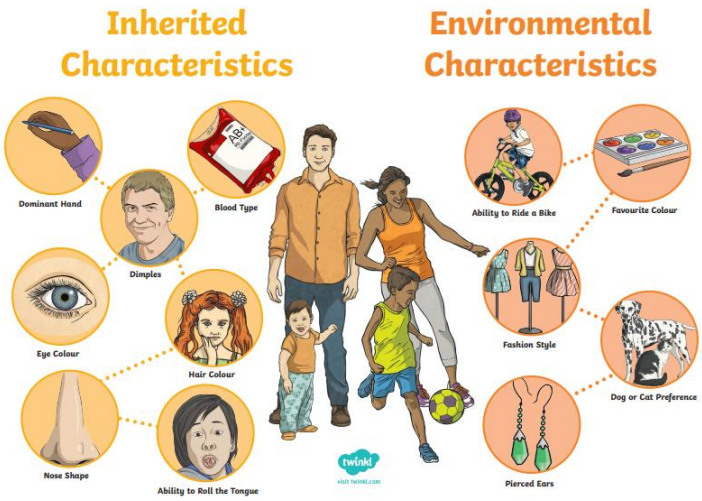
Ecosystems Knowledge Organiser:

Adaptations	Adaptations are features of living organisms that help them survive.
Bioaccumulation	The build up of these toxins is called bioaccumulation .
Characteristic	A characteristic is a feature of an organism. It can be something we can see (like hair colour) or something we can't see (like blood group).
Consumer	An Animal which eats another animal and /or plants
Continuous Variation	Continuous variations are characteristics which can be any value between the largest and the smallest such as the your height.
Discontinuous Variation	Discontinuous variations are characteristics which only have certain values. For example eye colour has categories like blue, brown, green or hazel.
Ecosystem	An ecosystem is an area, within which plants and animals interact with each other and their non-living environment
Food Chain	a series of organisms each dependent on the next as a source of food.
Food Web	A group of food chains interlocking together to show how different organisms feed
Predator	An animal which hunts and eats other animals.
Prey	An animal that is hunted and eaten by a predator
Producer	An animal that eats (consumes) other plants and/or animals.
Quadrats	A quadrat is a square shape placed at random locations in an ecosystem to count the number of a particular plant within the square.
Species	Organisms with lots of common characteristics, that can mate to produce fertile offspring
Toxins	Toxins are poisonous chemicals which harm organisms in their habitat
Variation	Differences in characteristics within a species

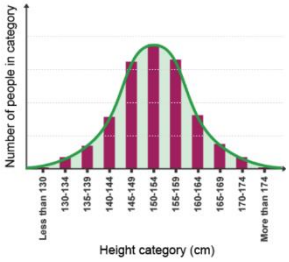
Variation

Variation is all the differences that exist in a population of the same species. These differences are caused by:

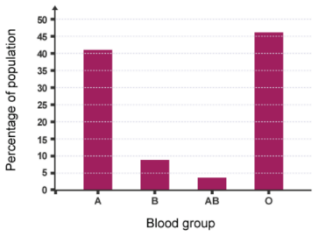
- **Genetic variation** - these are differences between individuals that are inherited from parents, such as the colour of your eyes, hair and skin.
- **Environmental variation** - these are differences between individuals that are not inherited but caused by the environment that the organism lives in, including scars and tattoos.
- **Genetic and environmental variation** - differences between individuals that are caused by both genetic and environmental factors, such as height and weight.

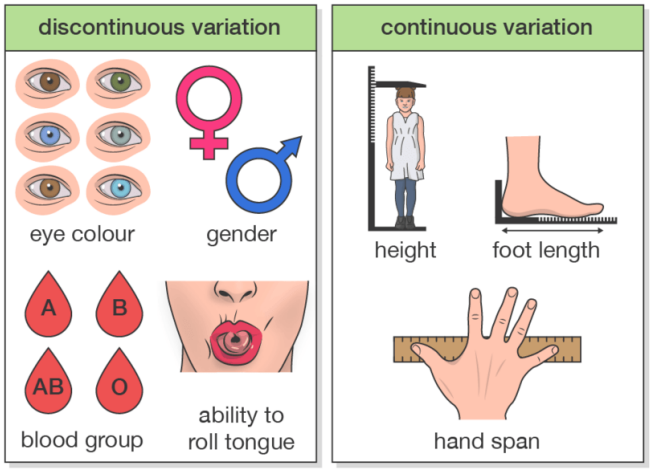


Continuous Variation
Results from surveys of continuous variation are presented in line graphs or bar charts with a drawn through them.



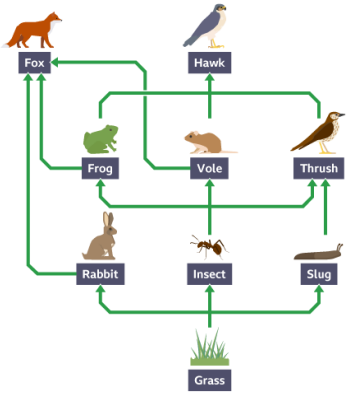
Discontinuous Variation
Surveys of discontinuous variation give us values that come in groups rather than a range. Human blood groups are an example of discontinuous variation.

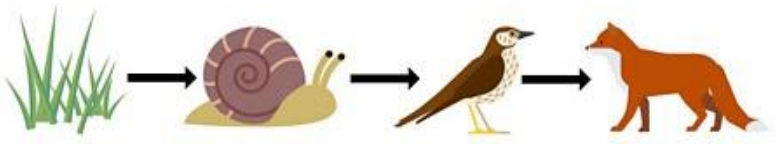




Food chains and webs:

Most populations of organisms that live in a habitat usually have more than one food source. They usually consume more than one organism from the trophic level below. This means that there are almost always more than one food chain and these are interlinked into a food web.

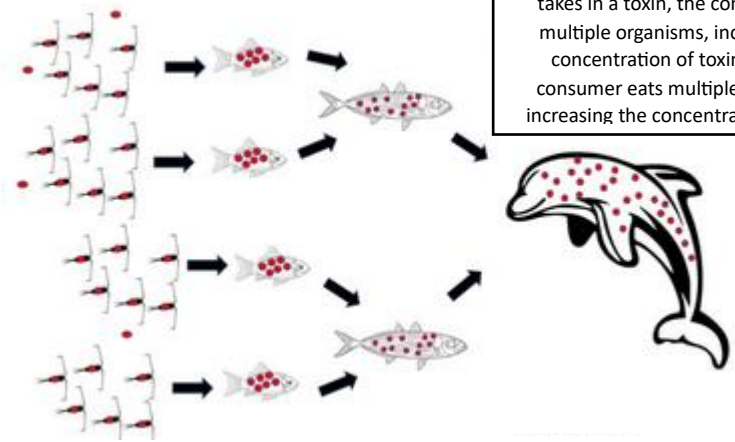




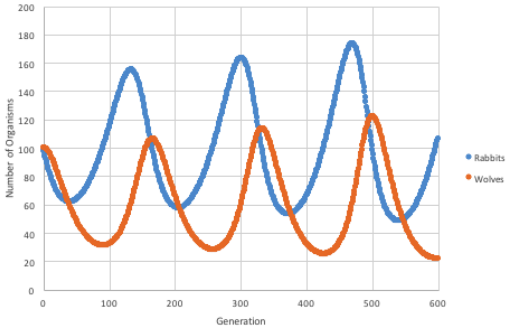
Producer → Primary consumer → secondary consumer → tertiary consumer

Bioaccumulation:

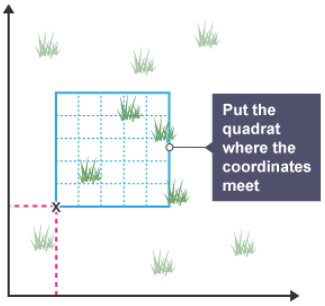
Bioaccumulation is the build up of toxins in a food chain, the first organism takes in a toxin, the consumer eats multiple organisms, increasing the concentration of toxin, the next consumer eats multiple organisms, increasing the concentration of toxin.

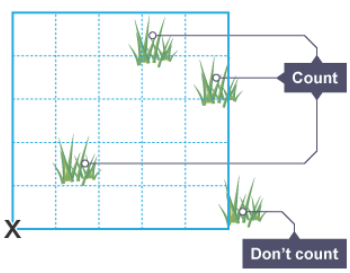


Predator, Prey, Relationships:



Population sampling: Sampling is used to estimate a population that would be too difficult to count, a quadrat is used to do this.





A quadrat is usually a 1 m^2 frame made of wood. It may contain wires to mark off smaller areas inside, such as 5 × 5 squares or 10 × 10 squares. The organisms underneath, usually plants, can be identified and counted.

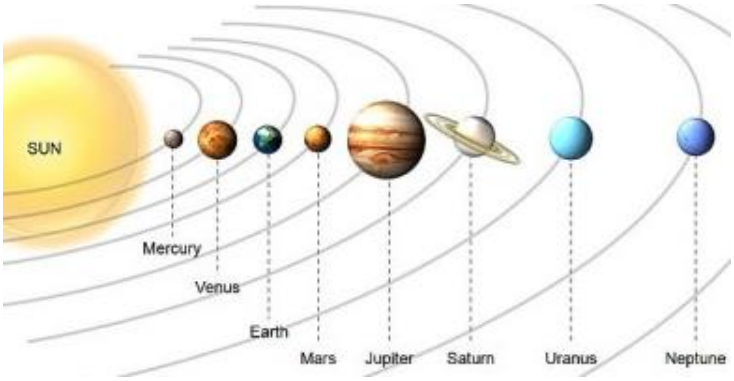
$$\text{Total grass plants found in sample} \times \frac{\text{Total area } (m^2)}{\text{Total area sampled } (m^2)}$$

Earth Science Knowledge Organiser:

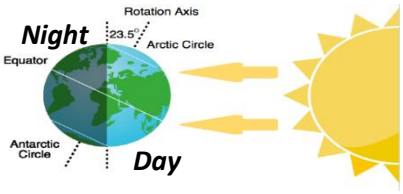
Axis	An imaginary line through the center of the Earth between the North and South poles.
Cementation	The water is squeezed from between the layers of rock, crystals form and the crystals stick the piece so of rock together.
Crust	Outer layer of the Earth made of solid rock.
Day	Length of time it takes for a planet to make one rotation on its axis.
Deposition	Grains and rock fragments that are transported by rivers are deposited on the banks or beds of lakes.
Extrusive igneous rocks	Igneous rocks that are formed when magma erupts to the surface and cools slowly. Forms rocks with small crystals.
Fossil	The remains or traces of plants or animals that lived many years ago.
Galaxy	Cluster of billions of stars held together by gravity
Igneous rock	Rock made from the cooling of molten rock
Inner core	The layer of the Earth's structure in the center of the Earth, made of liquid metal.
Intrusive igneous rocks	Igneous rocks formed from magma that has cooled slowly, deep underground. Forms rocks with large crystals.
Light year	Measure of astronomical distance – distance travelled by light in one year.
Magma	Molten rock found within the Earth
Mantle	Semi-molten, 3rd layer from the center.
Metamorphic rock	Rocks made from the heating and pressure applied to other rocks.
Northern Hemisphere	The top half of the Earth (anywhere above the equator
Orbit	The path taken by a satellite
Outer core	The second layer from the center of the Earth, liquid.
Planet	An object orbiting a star that is large enough to be rounded by its own gravity
Satellite	Any object that orbits around a planet
Season	A length of time with different climates. Spring, summer, autumn and winter.
Sediment	Rock grains and fragments of rocks.
Sedimentary rocks	Rocks made of compacted grains.
Solar system	Consists of a star, planets and smaller objects such as asteroids.
Southern Hemisphere	The bottom half of the Earth (anywhere below the equator)
Star	Large mass at the center of a solar system that produces heat and light.
Telescope	An object that is used to see objects that are far away
Universe	Contains all space, time and matter
Year	The length of time it takes for a planet to do one full orbit of the sun.
Polymer	Polymers are very long chain molecules made from small repeating units called monomers.
Composite	Composite materials are made from two or more different types of material.
Ceramic	A material formed from a soft substance that is heated to make a hard material.

The Universe:

Our solar system is part of the Milky Way galaxy and contains 8 planets.



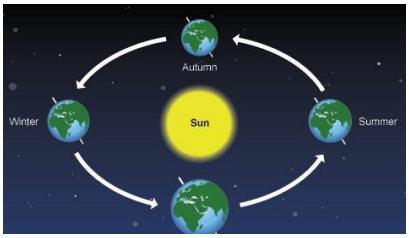
Lengths of time on Earth:



A day – 24 hours – the time it takes for the Earth to rotate once on it's axis.

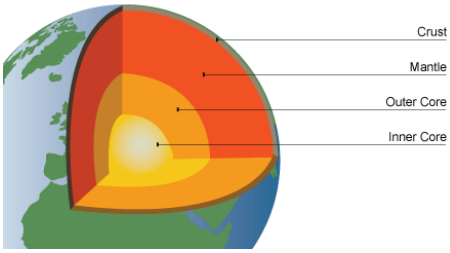
A year – 365 ¼ days – the time it takes for the Earth to complete one full orbit of the Sun.

Seasons:



The seasons happen because of the Earth's tilt on its axis. When the Northern hemisphere is tilled towards to the sun, it is summer, when it is tilted away it is winter.

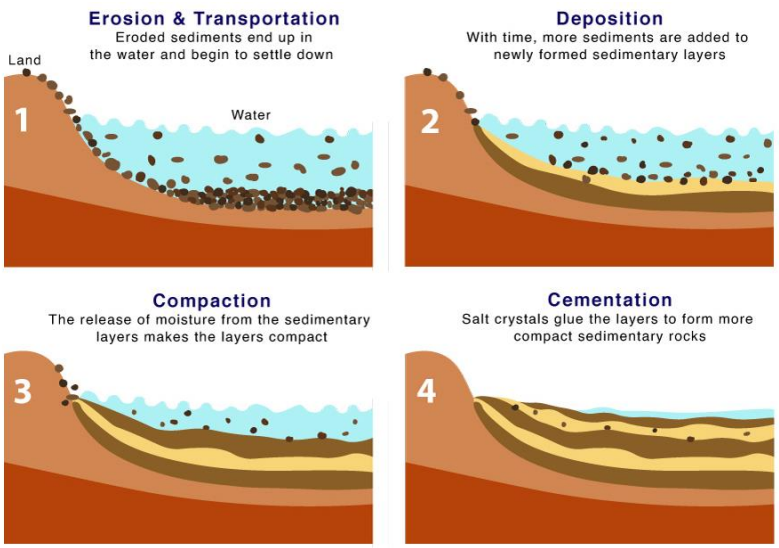
Structure of the Earth:



The Earth is made of 4 layers.

- The inner core of the Earth is 5,500°C. It is a very dense solid made from iron and nickel.
- The outer core is 2,000 km thick and is liquid.
- The mantle is semi-molten and is about 3,000 km thick.
- The crust is the rocky outer layer of the Earth, it is about 5 - 7 km thick.

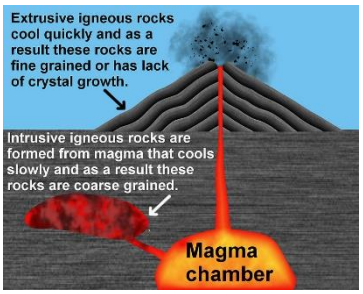
Sedimentary Rocks:



Examples: chalk, limestone, sandstone.

Igneous Rocks:

- **Igneous** rocks are formed from molten rock that has cooled and solidified.
- The inside of the Earth is very hot - hot enough to melt rocks. Molten (liquid) rock is called **magma**. When the magma cools enough, it solidifies and igneous rock forms.



	Extrusive	Intrusive
Where the magma cooled	On the surface	Underground
How fast the magma cooled	Quickly	Slowly
Size of crystals	Small	Large
Examples	Obsidian and basalt	Granite and gabbro

Metamorphic Rocks:

Metamorphic rocks are formed from other rocks that are changed because of heat or pressure. They are not made from molten rock – rocks that do melt form igneous rocks instead.

Earth movements can cause rocks to be deeply buried or squeezed. As a result, the rocks are heated and put under great **pressure**. They do not melt, but the minerals they contain are changed chemically, forming metamorphic rocks.

Examples: Slate and marble.

Rock Cycle: