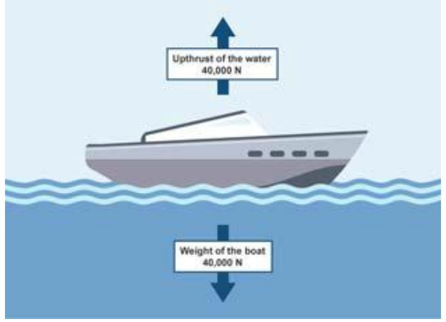
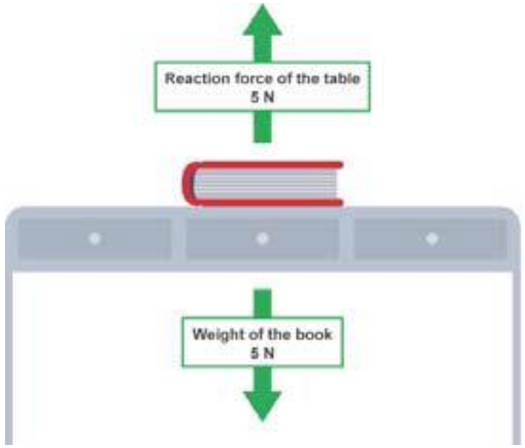
Force Diagrams

To show the forces acting on a body we use a free body force diagram. **A free body force diagram** shows all of the forces that are acting on the body. It has arrows that show the direction the force acts, the larger the arrow, the larger the force. A free body fore diagram should always have labelled arrows.

A boat floating



A book on a desk



Types of force

In the table below different forces are summarised:

Name of Force	What causes it?	Example
Friction	When two objects rub together	Car tyres moving on a road.
Air resistance	When an object rubs against air particles	A sky diver falling through the air
Reaction	A force that acts in the opposite direction	A book on a desk, the force acting up is a reaction force
Weight	The force an object exerts on the ground due to gravity	You will exert a force on the ground, that is your weight
Thrust	The force that drives on objects with an engine	Thrust moves a plane forwards

A force can be a **push or a pull,** for example when you open a door you can either push it or pull it. You can not see forces, you can only see what they do. When a force is applied to an object it can lead to a change in the objects

- **Speed**
- **Direction of movement**
- **Shape (think about a rubber band)**

Forces can also be divided into 2 types, contact forces and non contact forces.

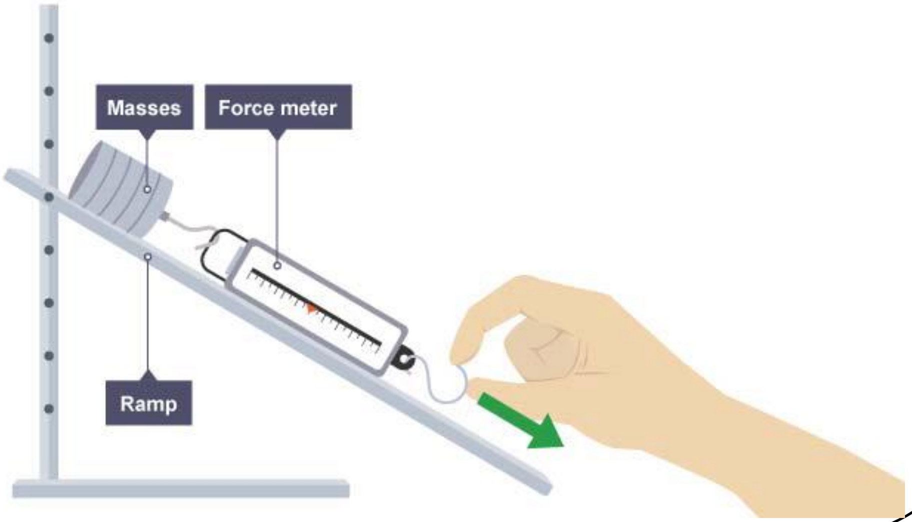
1. Contact forces for example friction, are caused when two objects are in contact.
2. Other forces for example gravity, are non contact forces. The two objects do not need to be in contact for the force to occur.

Measuring the size of forces

To measure the size of frictional forces on different surfaces you can drag
some masses along the different surfaces and record how much force is
required.

For this experiment :

- Independent variable: Surface
- Dependent variable: Force
- Control variable: Mass



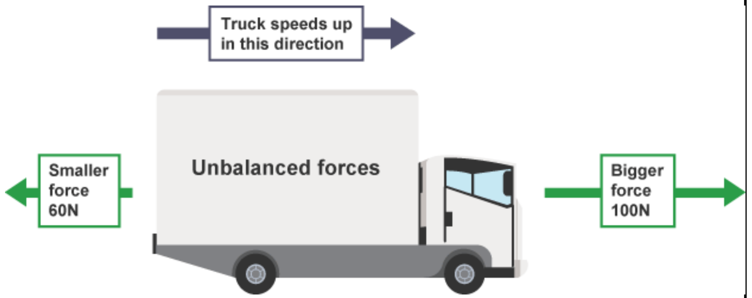
Unbalanced Forces

If the forces are unbalanced on an object there are two things that could happen:

1. If the object is stationary then it will move in the direction of the resultant force
2. If the object is moving, then the object will speed up or slow down in the direction of the resultant force.

For example, what is the resultant force on the lorry below?

100N-60N= 40N (to the right)



Remember the resultant force does not tell you what direction the lorry is moving in.

- If the resultant force is in the same direction as the movement of the lorry then the lorry will speed up
- If it is in the opposite direction the lorry will slow down

The larger the resultant force the larger the change in movement.

Balanced Forces

When we talk about the total force acting on object we call this the **resultant force.** When the forces acting in opposite directions are the same size we say the forces are **balanced**. This means one of two things:

1. The object is stationary (not moving)
2. The object is moving at a constant speed

This is known as Newton’s first law.

For example, the resultant force acting on this object is 5N-5N=0N

Using Maths Skills in SCIENCE

Setting out equations

e.g. A car travels 1,000m in a time of 40 seconds. What is the cars average speed?

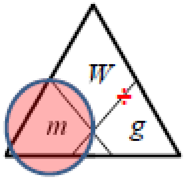
Average speed= Distance ÷ Time

= 1,000 ÷ 40

<u>= 25m/s</u>

e.g. A crate has a weight of 500N. On Earth the gravitational field strength is 10N/kg. What is the mass of the crate?

Weight = Mass × Gravitational field strength



We need to find the mass so we cover up the mass term in the triangle and it tells us to find mass we do:

Mass = Weight ÷ Gravitational field strength

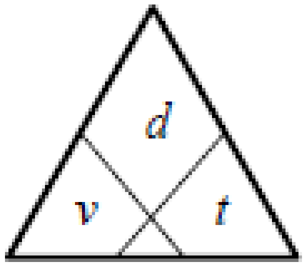
= 500 ÷ 10

<u>= 50kg</u>

Average Speed

Average speed (m/s) = Distance (m) ÷ Time (s)

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



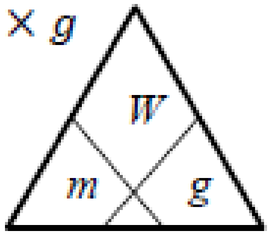
Average speed can also be measured in other units like km/h, mph or cm/s

You need to be careful which units you are using.

Weight

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

$$W = m \times g$$



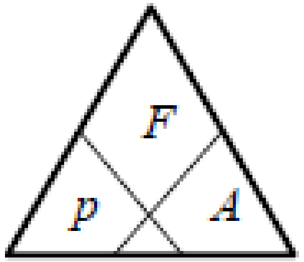
Weight is a measure of the size of the gravitational pull acting on an object.

This pull depends upon the size and mass of an object.

Pressure

Pressure (N/m^2) = Force (N) ÷ Area (m^2)

$$p = \frac{F}{A}$$



Pressure is caused by an object pushing on another.

The bigger the force applied by the object and the smaller the area over which the force is applied the larger the pressure

Distance-time graphs

A distance-time graph shows how far an object has moved from its
starting point over time.
Distance travelled is always plotted on the y-axis (vertical)
Time taken is always plotted on the x-axis (horizontal)
You can find the speed of an object from a distance-time graph by finding
the gradient of the graph. This is the ‘steepness’ of the line.

Gradient = Change in y-axis ÷ Change in x-axis

Using the graph opposite we can find the speed of the object represented by the green line between 6 and 10 seconds by:

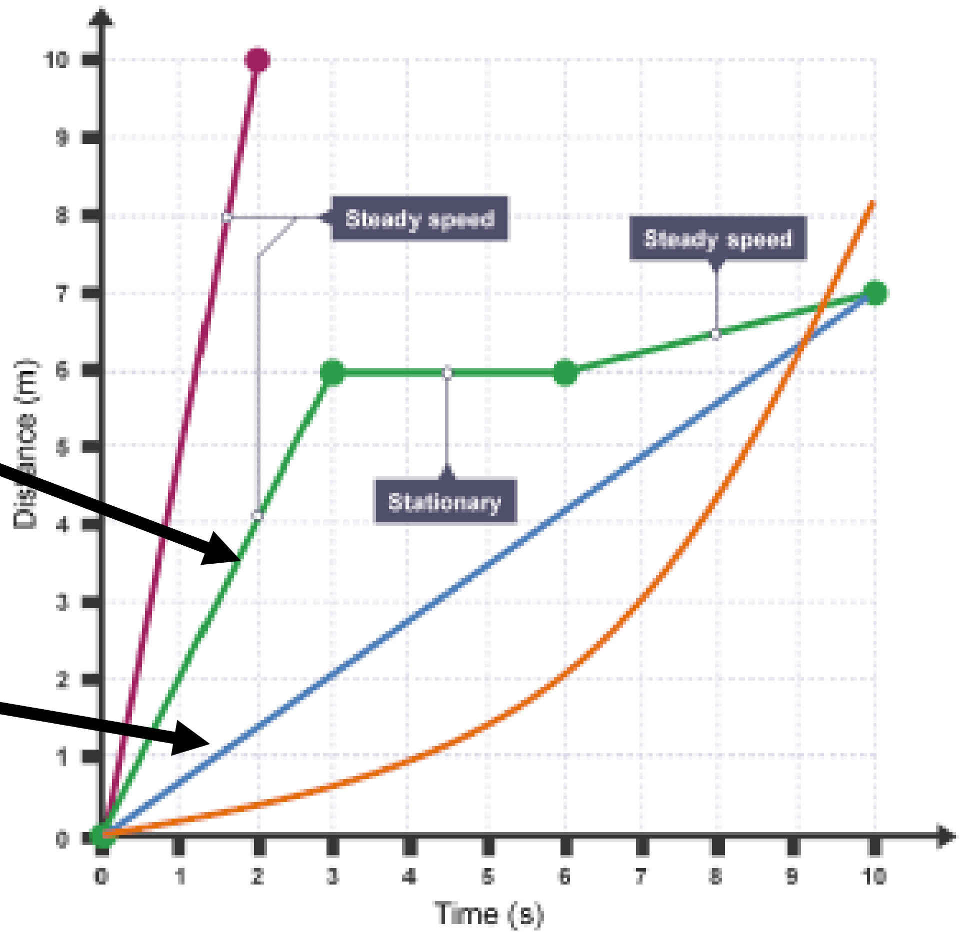
Gradient = Change in y-axis ÷ Change in x-axis
= (7-6) ÷ (10-6)
= 1 ÷ 4
<u>= 0.25m/s</u>

We can also find the average speed of the green object by drawing a line from the start of its motion to the end of its motion. This is shown opposite by the **blue line** and how to find the average speed is shown below.

Gradient = Change in y-axis ÷ Change in x-axis
= (7-0) ÷ (10-0)
= 7 ÷ 10
<u>= 0.7m/s</u>

Interpreting Distance-time graphs

- A straight diagonal line of a distance-time graph shows that the object is travelling at a steady/constant speed.
- A straight horizontal line on a distance-time graph shows that the object is not moving (stationary)
- If a curved line were to appear on a distance-time graph (orange line) this shows the object is accelerating.



A force can be a _________ or a _________.
Forces are measured in _______________ using a _____________________________.

Explain the term 'interaction pairs' using two examples:

____

____

1. ________________________________
2. ________________________________

Make a list of:

a) Contact forces:

____

____

b) Non-contact forces:

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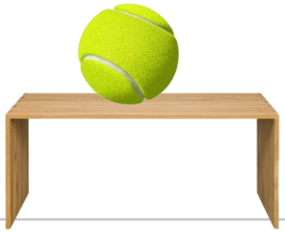
____

1: Forces
TASK 1

Draw force diagrams to show **ALL** the forces acting on:

a) Falling tennis ball:

b) Tennis ball sitting on a table:



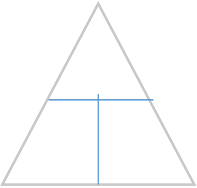
Sketch a force diagram showing an object for which the forces are balanced (equilibrium):

Explain the term 'resultant forces'. Use a diagram to help with your explanation:

Sketch force diagrams showing the forces acting on an accelerating car and a decelerating:

The equation used to calculate speed is:

Units:
Speed-
Distance-
Time-



Two students are running. Runner A runs 100 metres in 12.5 seconds, runner B runs 150 metres in 18.9 seconds. Who is faster? Show your working and units.

Key words and definitions:

Describe the relative speeds of the vehicles below:

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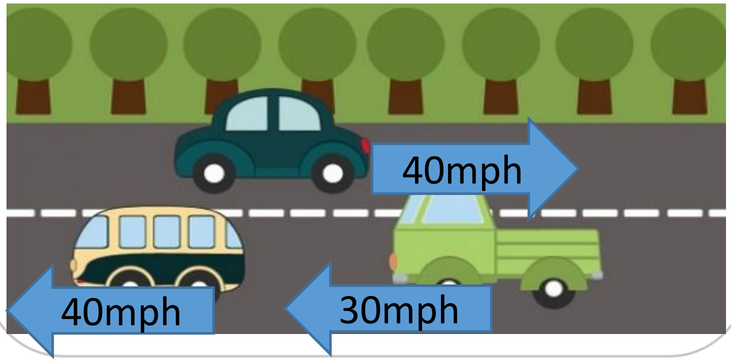
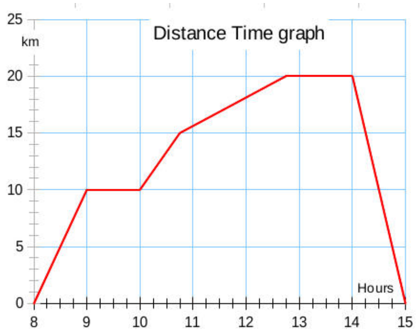




1: Forces TASK 2

Describe the journey made in the distance-time graph above:

____
____
____
____
____

Calculate the average speed of the journey:

____
____

Chapter 2.1 and 2.2 Knowledge Organiser - ELECTROMAGNETS

Science Department

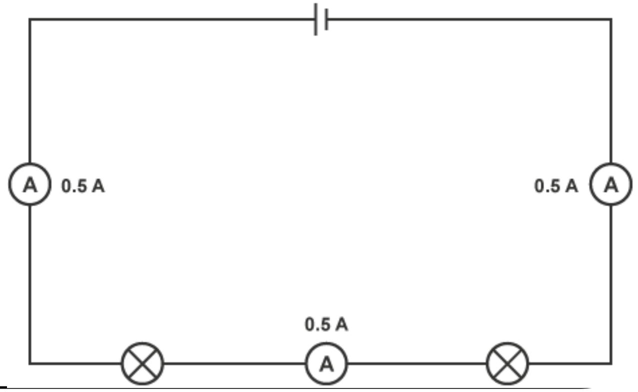
RAINFORD HIGH

Some particles carry an electric charge. In electric wires these particles are electrons. We get an electric current when these charged particles move from place to place.
An electric current is a flow of charge, and in a wire this will be a flow of electrons.

Current is a measure of how much electric charge flows through a circuit. The more charge that flows, the bigger the current.
Current is measured in amperes (amps). The symbol for ampere is A.

Current in series circuits

The current is the same everywhere in a series circuit. It does not matter where you put the ammeter, it will give you the same reading.

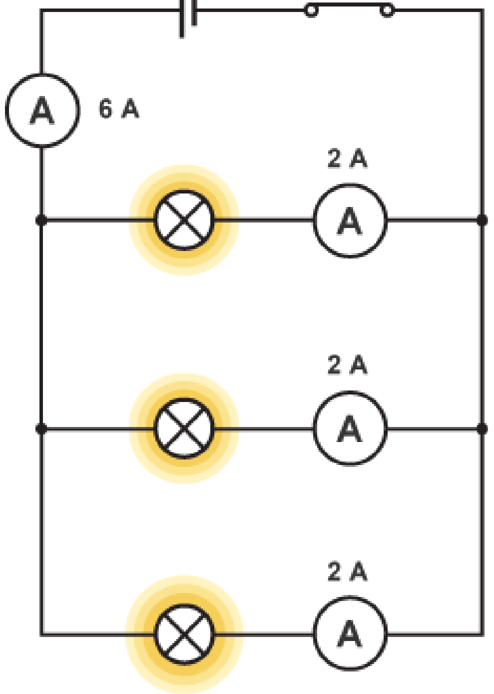


Current in series circuits continued…

The current in a series circuit depends upon the number of cells. If you make the cells face in the same direction, th**e more cells you add, the greater the current**.
If you put more lamps into a series circuit, the lamps will be dimmer than before because less current will flow through them.
You might think that the current gets less as it flows through one component after another, but it is not like this - the current isn't used up!

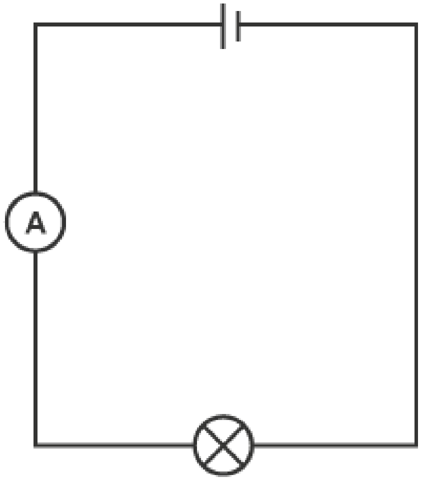
Current in Parallel Circuits

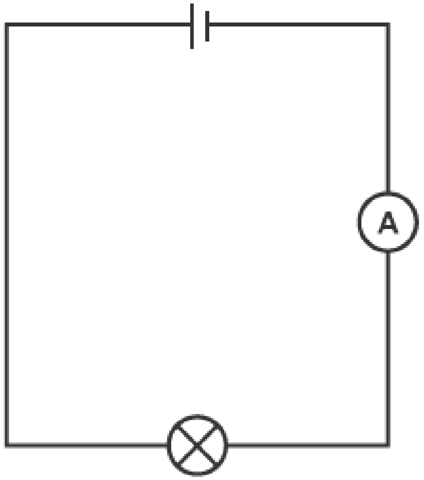
Current in parallel circuits
Current is shared!
When two components are connected in parallel, the current is shared between the components. The current is shared when it reaches the branches, then adds again where the branches meet.



Measuring current

A device called an ammeter is used to measure current. To measure the current flowing through a component in a circuit, you must connect the ammeter in series with it – look at the diagram to see what is meant by this.





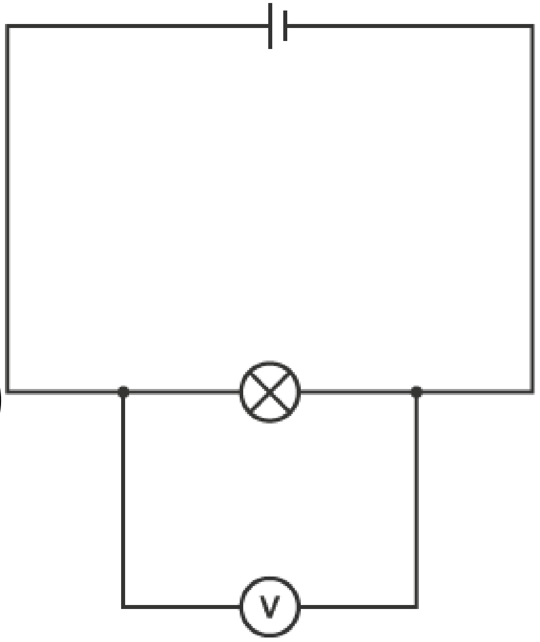
Measuring Potential Difference

Potential difference is a measure of the difference in energy between two parts of a circuit. The bigger the difference in energy, the bigger the potential difference.

Potential difference is measured in volts. The symbol for volts is V. Some people use the term voltage instead of potential difference but this is less accurate.

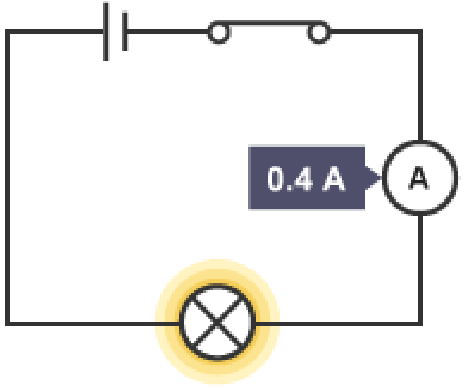
Potential difference is measured using a device called a voltmeter. Unlike an ammeter, you must connect the voltmeter in parallel to measure the potential difference across a component in a circuit.

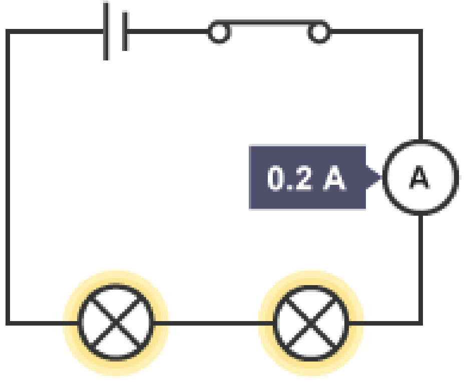
Can you see the difference in how the AMMETER and VOLTMETER are positioned?



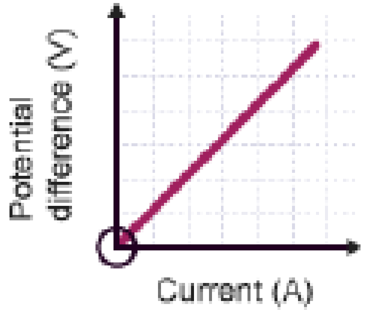
Resistance

The wires and the other components in a circuit reduces the flow of charge through them. This is called resistance.
The unit of resistance is the ohm, and it has the symbol Ω (an uppercase Greek letter omega).
The resistance increases when you add more components in series. For example, the resistance of two lamps is greater than the resistance of one lamp, so less current will flow through them. Can you see how this affects the lamps?





Resistance represents the ratio of potential difference to current. Therefore, if you plot a graph of current against potential difference for a wire, you get a straight line.



Calculating resistance

To find the resistance of a component, you need to measure:
the potential difference across it
the current flowing through it
The resistance is the ratio of potential difference to current. We use this equation to calculate resistance:
resistance = potential difference ÷ current
E.g. 3A flows through a 240 V lamp. What is the resistance of the lamp? resistance = 240 ÷ 3 = 80 Ω

Conductors and insulators of electricity

Different materials have different resistances:
- an electrical conductor has a low resistance
- an electrical insulator has a high resistance

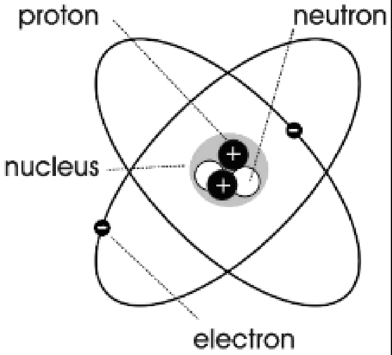
You can easily find out which materials are conductors and which are insulators using a simple circuit. You set up a series circuit with a cell, lamp and wires. Leave a gap in the circuit between two of the wires. Then connect the two wires using pieces of each material and see if the lamp lights up:
- it will light up if the material is a conductor
- it will not light up if the material is an insulator

The table lists some examples of conductors and insulators:

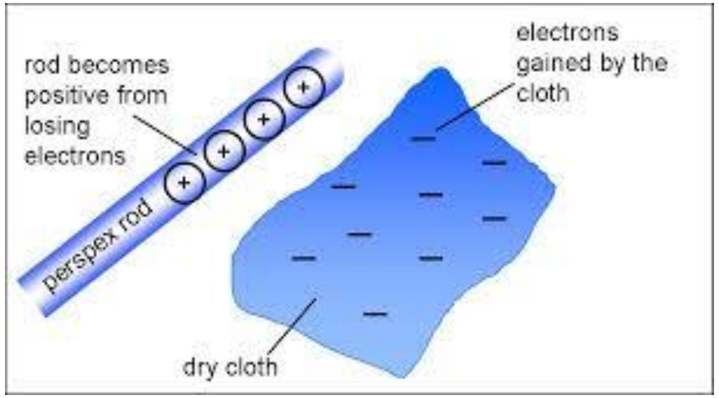
Conductors	Insulators
Metal elements	Most non-metal elements, e.g. sulfur, oxygen
Graphite (a form of carbon, a non-metal element)	Diamond (a form of carbon, a non-metal element)
Mixtures of metals, e.g. brass, solder	Plastic
Salt solution	Wood
Liquid calcium chloride	Rock

All substances are made of atoms. These are often called particles. An atom is electrically neutral - has no overall electrical charge. However, each atom contains even smaller particles called electrons. (remember, these are negatively charged).

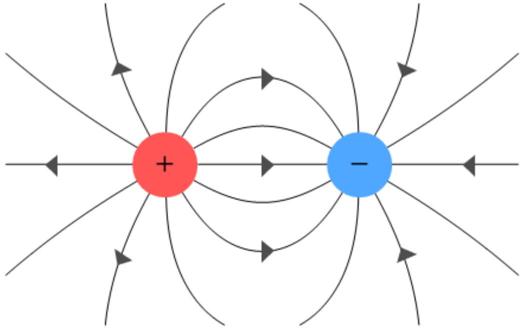
- If an atom gains an electron, it becomes negatively charged.
- If an atom loses an electron, it becomes positively charged.



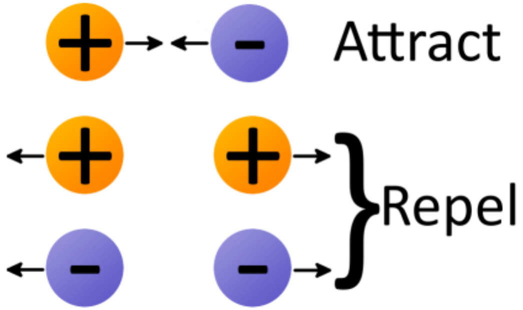
Electrons can move from one substance to another when objects are rubbed together. You may have done this with a party balloon: if you rub a balloon on your sweater, you can get the balloon to stick to the wall or to your hair. This is because of static electricity.



A charged object creates an electric field. You cannot see an electric field, but it surrounds the charged object. If another charged object is moved into the electric field, a force acts on it. The force is a non-contact force because the charged objects do not have to touch for the force to be exerted.



Two charged objects will:
- repel each other if they have like charges (they are both positive or both negative)
- attract each other if they have opposite charges (one is positive and the other is negative)



Charged objects will also attract small, uncharged objects. This is why a charged plastic comb or ruler, or a party balloon, can pick up small pieces of paper.
The only way to tell if an object is charged is to see if it repels another charged object.

Some particles carry electrical ____________. In electric wires these particles are ____________. An electrical current is a __________ ___ _____________.

Explain the term Current and what it is measured in.

____

____

____

Make a list of:

a) Contact forces:

____

____

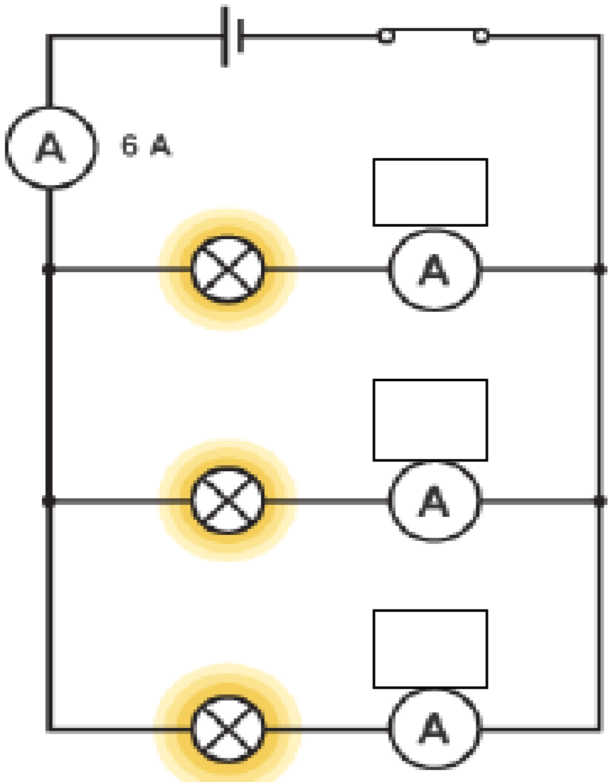
b) Non-contact forces:

____

____

<u>Current in a PARALLEL circuit</u>

Add values into the boxes showing that current is SHARED in a parallel circuit



2:Electromagnets TASK 1

Describe the relationship between the number of cells in a circuit and size of current.

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<u>Current in a SERIES circuit</u>

Draw a SERIES circuit showing that current is the SAME everywhere.

Current is measured using an

____

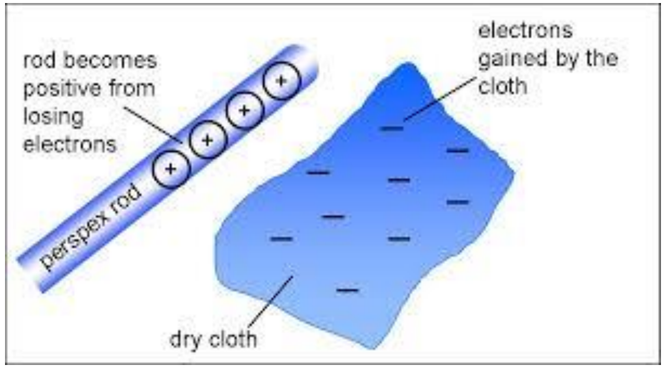
Potential Difference is measured using a

____

Units:
Current:
Potential Difference:
Resistance:

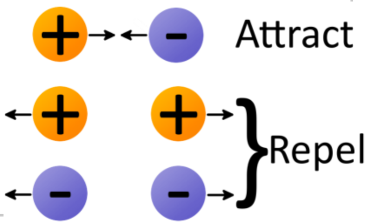
Potential difference is a measure of the __________________ in _________________ between two parts of a ________________. The bigger the difference in energy, the bigger the ____________________ ______________________.

Charging up – Static Electricity Experiments

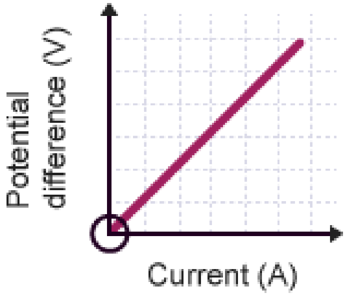


Electrons are ____________________ charged particles.
Electrons can __________ from one substance to another when objects are ___________ together.

Two charged objects will:
- _______________ each other if they have like charges (they are both positive or both negative)
- ____________________ each other if they have opposite



Measuring Potential Difference
Draw a circuit with a voltmeter showing how potential difference is measured.



2:Electromagnets
TASK 2

Describe the relationship between resistance and the number of components in a circuit:

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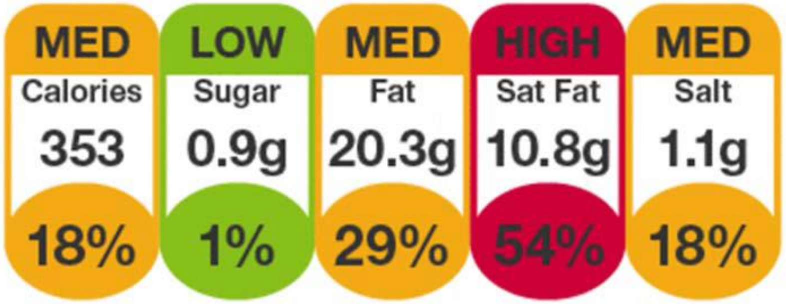
Chapter 3.1 and 3.2 Knowledge Organiser - ENERGY

Science Department

RAINFORD HIGH

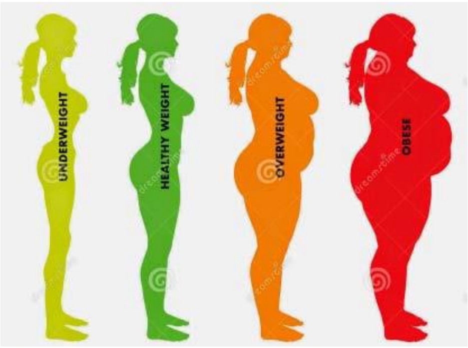
Food labelling

Food labels give you information about which food groups and how much energy each food contains. They give guidance to tell you what percentage of nutrients each food contains.
We measure the energy stored in food in calories.



Food labelling

Different people require different amounts of energy depending upon their energy needs. For example an accountant who sits at his desk all day may only require 2,500kcal of energy whereas a builder may require 4,500kcal.
Eating too much can cause obesity which can lead to heart disease and diabetes. Eating too little can lead to malnutrition and can be caused by diseases such as anorexia or bulimia.

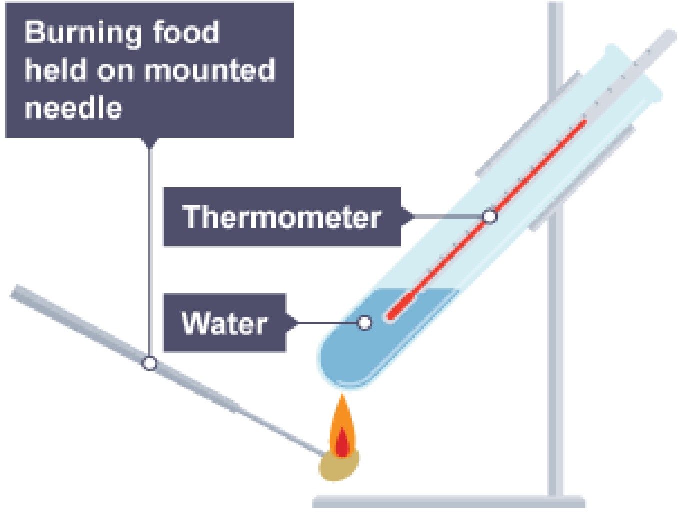


Energy in Food

The energy in food is often measured in kJ, the amount of energy you need depends on your lifestyle. If there is an imbalance you will put on or loose weight.

Measuring Energy in Food

The energy in different foods can be measured using a simple experiment. If the food is set on fire, it can be used to heat up water and by measuring the temperature change, you should be able to see Which foods cause the greatest rise in temperature and have given out the most energy.



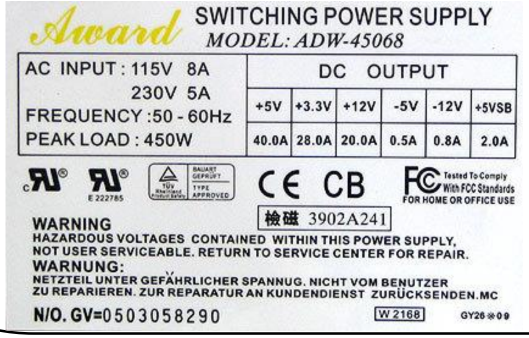
Electrical appliances use energy but we describe this energy use in a slightly different way.

• Power is the rate at which energy is used. The unit of power is the watt, which has the symbol W.

• 1 W is 1 J per second. So, for example, a 20 W electric lamp uses 20 J of electrical energy every second to stay alight.

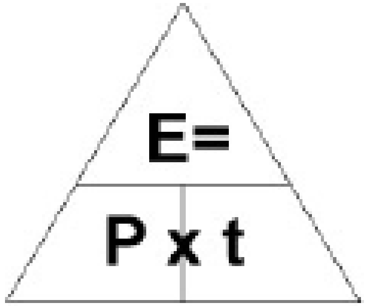
• Electrical appliances (TV sets, kettles and so on) have electrical rating plates on them. These show the power rating of the appliance in W.

See if you can find some more power ratings at home and explain what these mean.



Using Maths Skills in SCIENCE

To calculate power you divide the value of the energy transferred (in Joules) by the time taken for the transfer (in seconds).
You can also rearrange the equation using the triangle on the right.



Values for power and energy are useful to anyone wanting to use an electrical appliance. Therefore, we need to be able to compare these values.

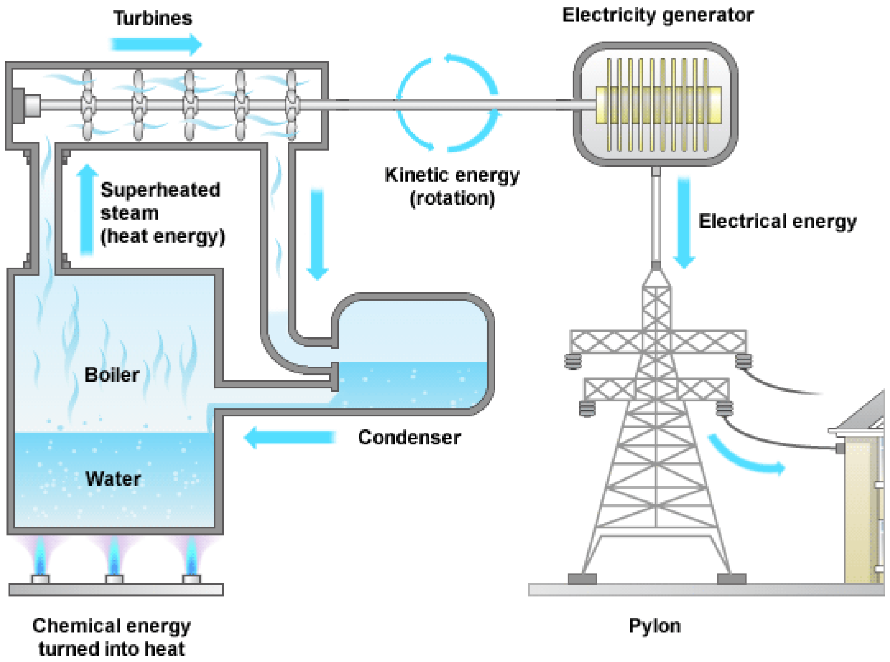
Appliance	Power in W	Power in kW
Clock	10	0.01
Lamp	50	0.05
Drill	800	0.8
Iron	1250	1.25
Kettle	2400	2.4
Hot water heater	3000	3
Electric oven	12000	12

Sometimes, the values aren't all given in the same units. If you look at the table above, one column is given in kW, this means kilowatts (1kW = 1000W just like 1 kilometre is equal to 1000 metres). So if you want to change W to kW then divide the power value by 1000. If you want to change kW to W then multiply the value by 1000.

We get energy from many different types of energy resources, including fuels and stores of energy such as batteries or the wind. We can divide energy resources into two categories:

- non-renewable energy resources cannot be replaced once they are all used up
- renewable energy resources can be replaced, and will not run out

Fossil fuels are non-renewable energy resources. Generally fossil fuels provide a high amount of energy but will soon run out and cause environmental problems including global warming due to CO_2 emissions and acid rain sue to SO_2 emissions from these power stations (shown below).



Renewable energy resource	☺	☹
Wind is used to turn a turbine	No fuel cost, no pollution these point are true for all renewable fuels!)	Noise pollution, unreliable
Water – either tides, waves or hydroelectric where water runs through a dam and turns a turbine	Reliable	Destruction of habitats, dams cause flooding of farmland
Geothermal – water is pumped down to hot rocks or steam naturally rises to turn a turbine	Hot water can be used directly for heating	Very rare for a country to have these hot rocks
Solar cells convert light energy directly into electricity (don't confuse with solar panels!!)	Useful in remote locations	Solar cells are expensive, inefficient and won't work when its's cloudy or at night!

Nuclear fuel (plutonium & uranium) is an alternative to traditional fossil fuels and emits no pollution, however there is radioactive waste to get rid of!

Stores of energy

Energy can be stored in different ways, including:

- kinetic energy
- internal energy
- elastic potential energy
- gravitational potential energy
- electrical energy
- magnetic energy

All objects have internal energy. This includes:

- energy caused by the movement of particles in the object, sometimes called thermal energy
- energy due to the bonds between particles, sometimes called chemical energy

Do you think a hot or cold cup of tea would have more internal energy?

When an object is heated, its particles move more vigorously and its internal energy increases. Unless the object changes state (e.g melts or boils), its temperature will increase.

Energy can be transferred from one store to another in the following ways:

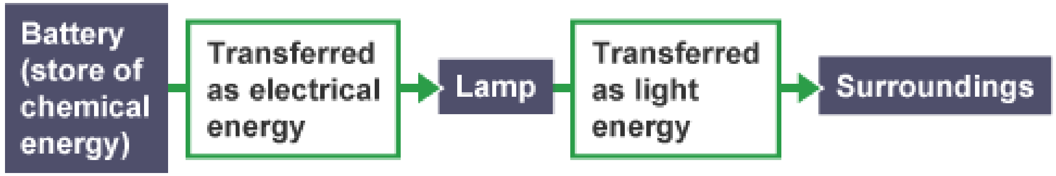
- by heating
- mechanically
- electrically
- by radiation

Some key examples:

1. If an object's motion changes = mechanical transfer
2. If an object is dropped = mechanical transfer
3. Completing an electrical circuit = electrical
4. Stretching a spring = mechanical
5. Metabolising food = heating (a weird one!)
6. Burning fuels = heating

You might need to be able to describe a transfer e.g. if an object is dropped its gravitational potential energy is converted into kinetic energy. Half way through the drop, half of the energy would have been transferred and so on.

Another example is shown below as a diagram– can you see which of the 6 examples is shown?



Conservation of Energy

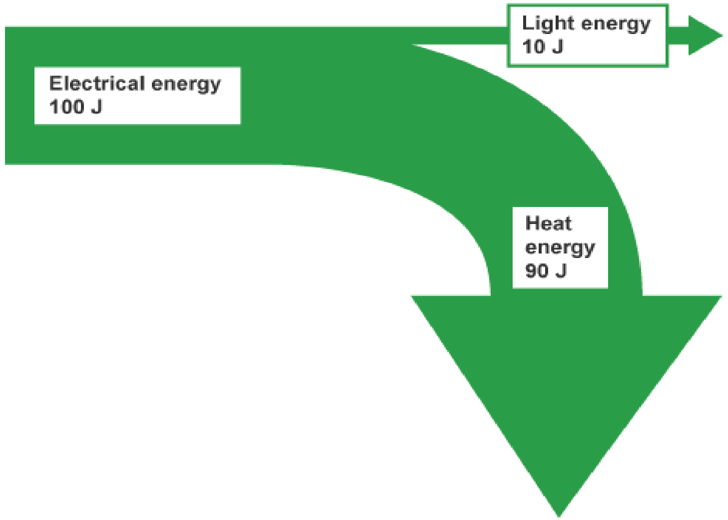
Energy can be stored or transferred, but **energy cannot be created or destroyed**. This means that the total energy of a system stays the same. When we use the word system we mean objects that might transfer energy e.g. a plug to a lamp to the surroundings.

The idea that the total energy has the same value before and after a change is called conservation of energy.

Sankey Diagrams

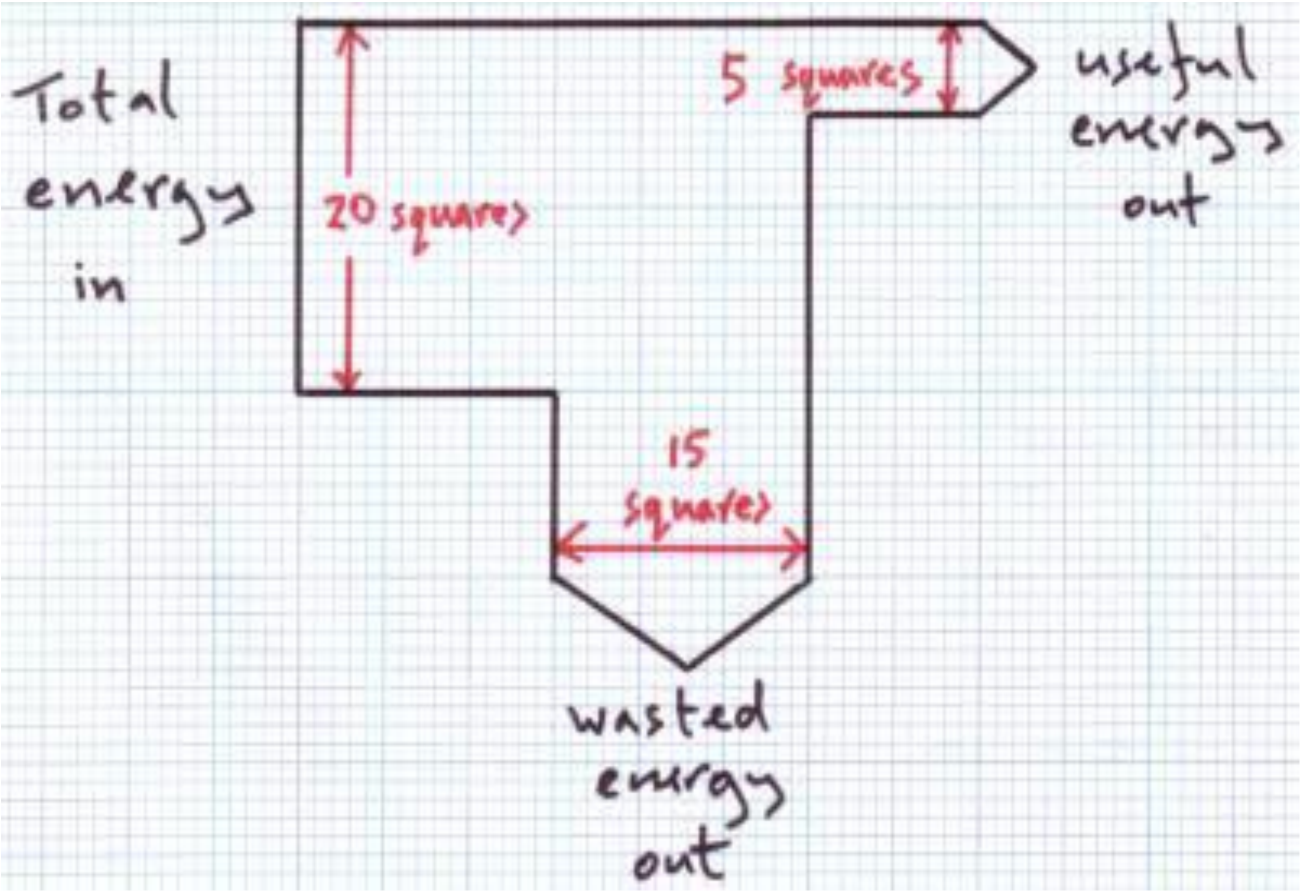
The key to understanding this idea is to be able to use Sankey diagrams. These diagrams (shown below and on the left) show how much energy is transferred into the system and where this energy goes.

The numbers on the arrows out of the system should add up to the value of the energy that went into the system. E.g. in the diagram below 10J + 90J adds up to the 100J that went into the system.



Drawing Sankey Diagrams

The diagram on the below shows an important point to remember. If you draw a Sankey diagram, the size of the arrow should represent the value of the energy. So in this diagram if 1 square represents 1 Joule of energy then there is a 5J useful energy transfer and the other 15J of energy are 'wasted'.



Energy in Food
The energy in food is often measured in _______________ (units) _______,
the amount of energy you need depends on your _____________.

Power is the rate at which ___________ is used. The unit of power is the ______ (units) _________.
1 W is 1 J per second. So, for example, a 20 W electric lamp uses ____________of electrical energy every second to stay alight.

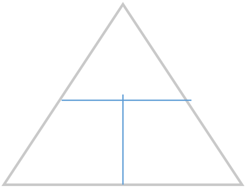
Make a list of:
a) **Non-renewable** Energy Resources:
____
____
b) **Renewable Energy** Resources:
____
____

	Advantages	**Disadvantages**
Wind		
Water		
Geo-thermal		
Solar		

3: Energy TASK 1

The equation used to calculate **ENERGY** is:

Units:
Energy -
Power-
Time-

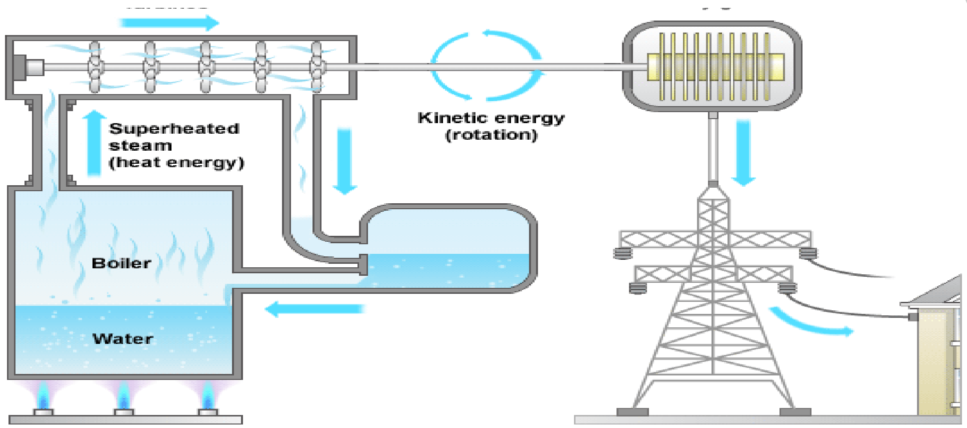


Give some examples of appliances and their power ratings in W and kW.

1.

2.

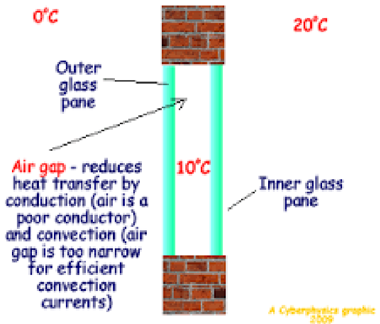
3.



Energy STORES
List as many examples as you can below:

<u>Law of the Conservation of Energy</u>

Energy can be ___________ or ____________, but energy cannot be _____________or __________________. This means that the total energy of a _________________ stays the same.



3: Energy TASK 2

Define the term
Thermal Equilibrium:

____
____
____
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____
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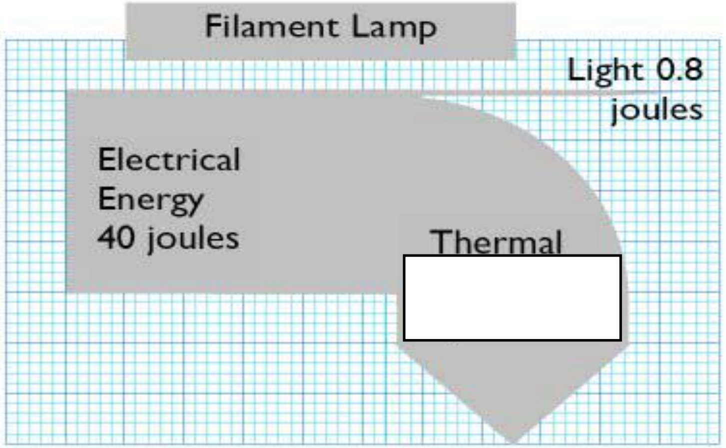
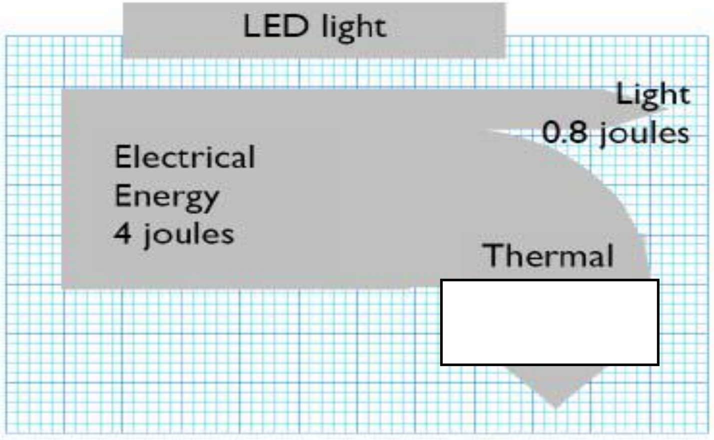
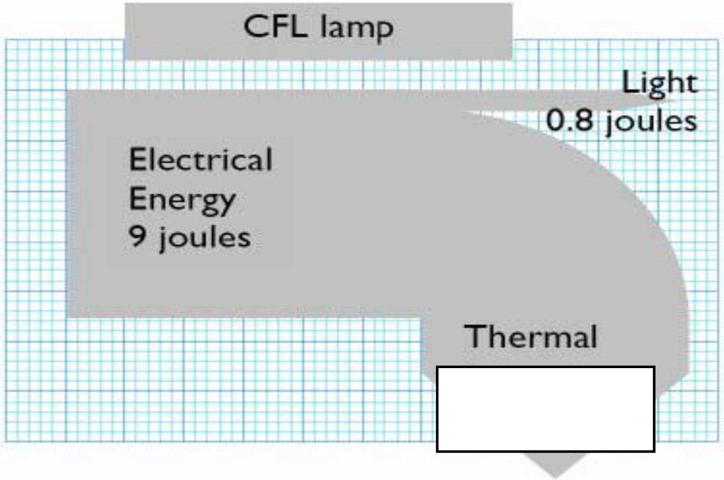
____

Sankey Diagrams:







Chapter 4.1 and 4.2 Knowledge Organiser - WAVES

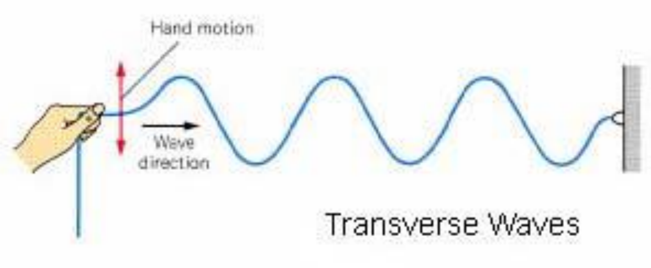
Science Department

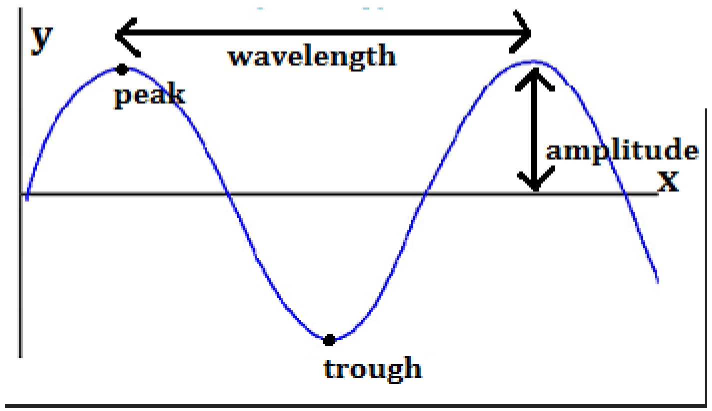
Waves transfer energy from one place to another.
Waves are made by forcing something to vibrate or oscillate.
There are two types of waves; transverse and longitudinal.
Sound waves are longitudinal waves.
Light and waves on water are transverse waves. Sound travels faster through liquids and solids than it does through air and other gases.

Substance	Speed of sound
Air	343 m/s
Water	1493 m/s
Steel	5130 m/s

Transverse Waves

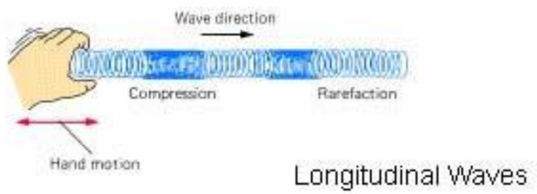
If you throw a pebble into a pond, ripples spread out from where it went in. These ripples are waves travelling through the water. The waves move with a transverse motion. The undulations (up and down movement) are at 90° to the direction of travel.
For example, if you stand still in the sea, the water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





Longitudinal Waves

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



1. Sound waves are collected by the ear lobe or *pinna*

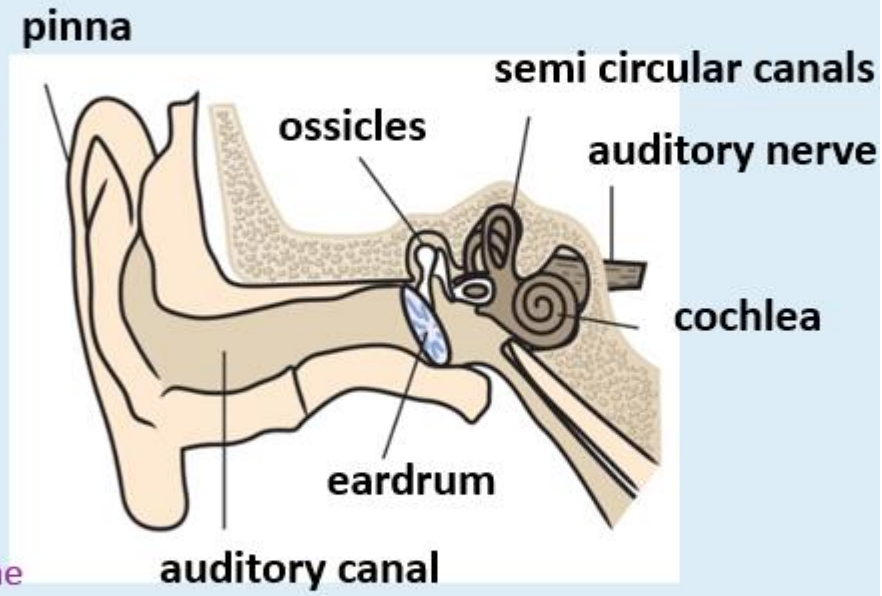
2. The waves travel along the auditory canal.

3. The waves make the ear drum vibrate.

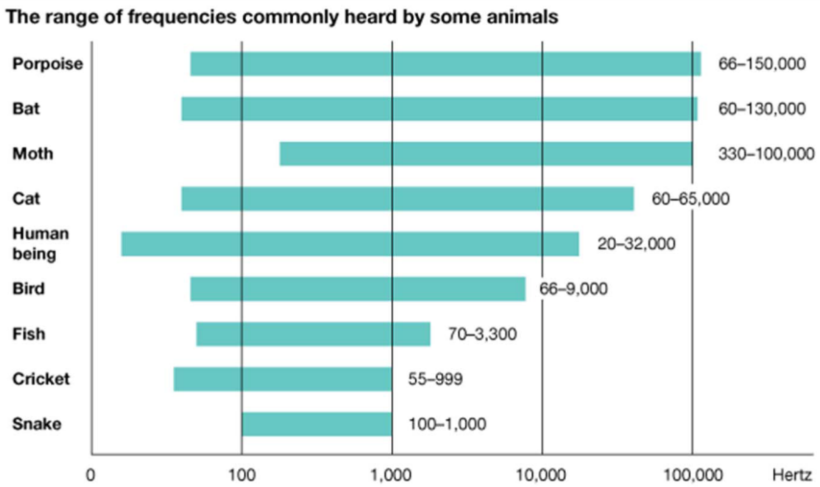
4. The small bones (ossicles) amplify the vibrations.

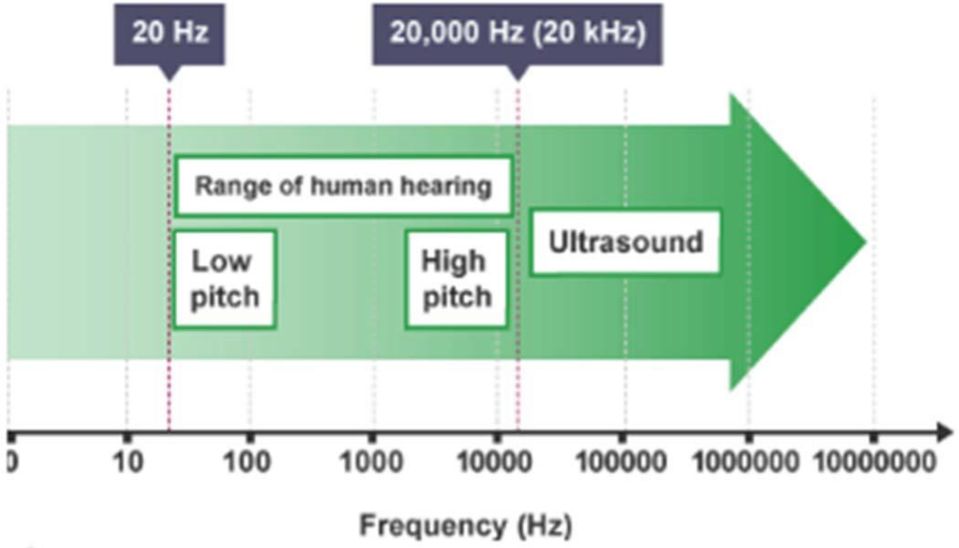
5. The cochlea turns these into electrical signals.

6. The auditory nerve takes the signals to the brain.



The frequency of sound waves is measured in hertz, which has the symbol Hz. The bigger the number, the greater the frequency and the higher the pitch of the sound. Human beings can generally hear sounds as low as 20 Hz and as high as 20,000 Hz (20 kHz).





Hearing Loss

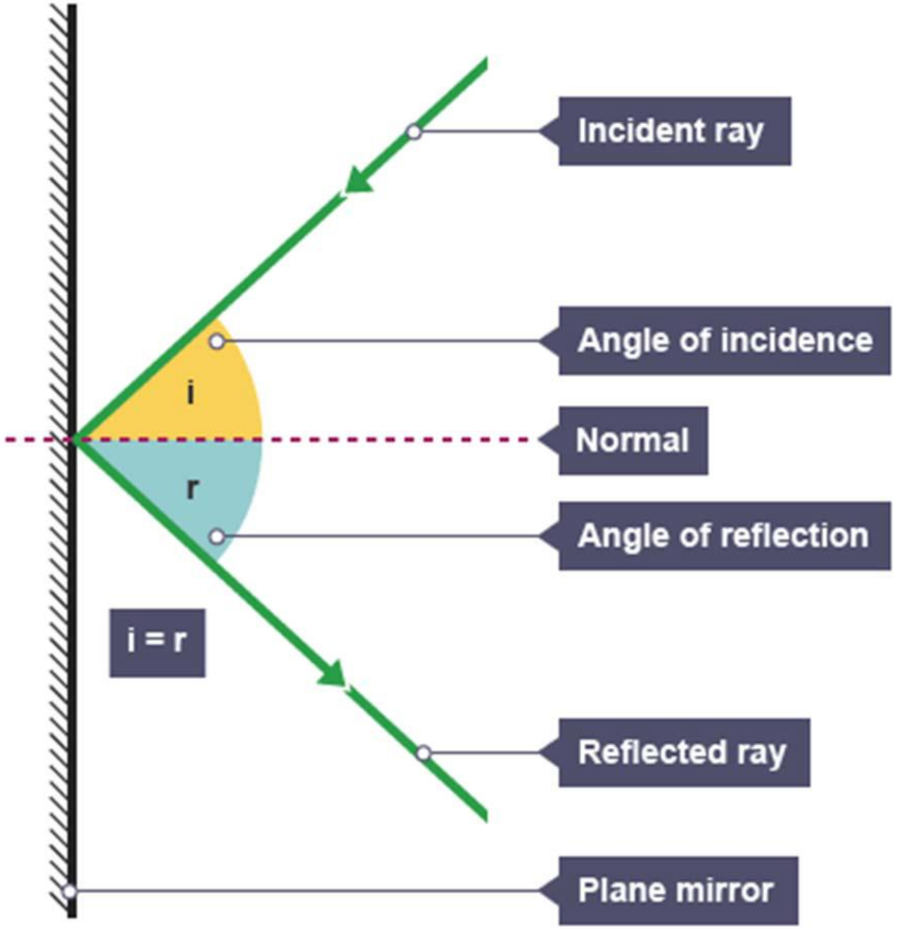
You measure sound intensity in decibels (dB). Loud noises and damage to the eardrum can cause hearing loss. Hearing loss can be prevented by:

- Wearing Ear defenders/ ear plugs
- Reducing the volume

Light - Reflection

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

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



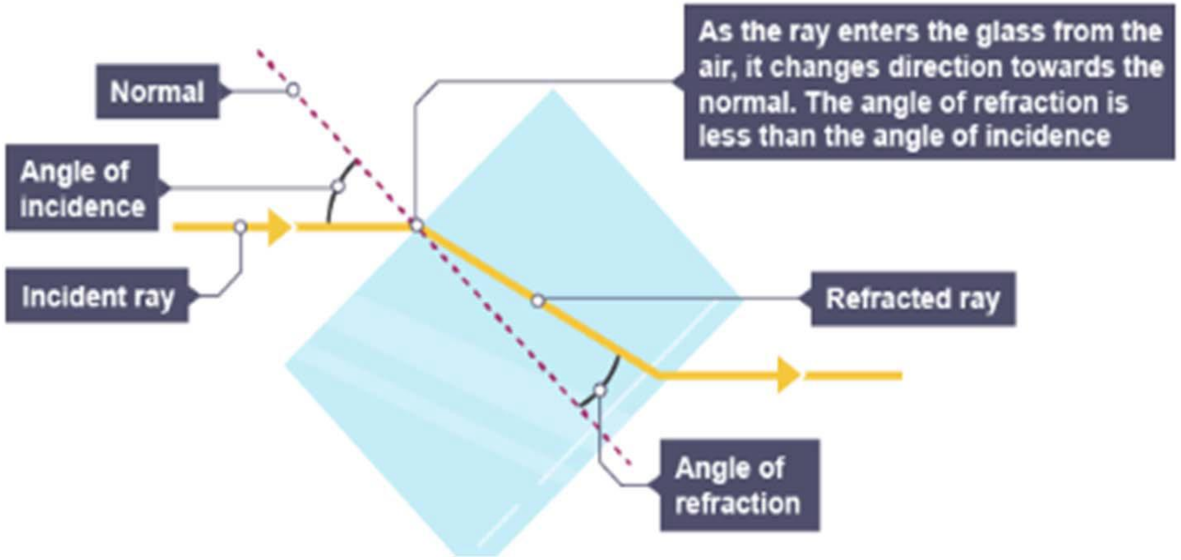
Refraction

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

At the boundary between two transparent substances:

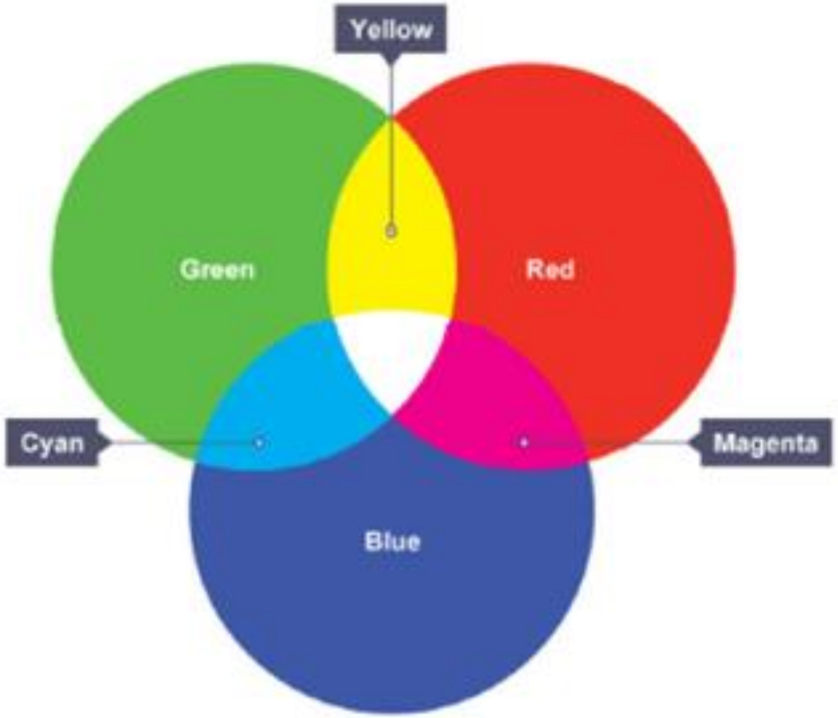
- the light slows down going into a denser substance, and the ray bends towards the normal
- the light speeds up going into a less dense substance, and the ray bends away from the normal

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



Coloured light

There are three primary colours in light: red, green and blue. Light in these colours can be added together to make the secondary colours magenta, cyan and yellow. All three primary colours add together make white light.



Primary colours of light add together to make white light, or secondary colours

The way coloured light mixes is very different from the way that paint does.

	White paper	Red apple	Green apple
Colours(s) that the object can reflect	All	Red only	Green only
Appearance of object in white light	White (no colours absorbed)	Red (all colours absorbed except red)	Green (all colours absorbed except green)
Appearance of object in red light	Red (only red light to reflect)	Red	Black (no green light to reflect)
Appearance of object in green light	Green (only green light to reflect)	Black (no red light to reflect)	Green
Appearance of object in blue light	Blue (only blue light to reflect)	Black (no red light to reflect)	Black (no green light to reflect)

TIP

When drawing light ray diagrams make sure you always:

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

When light is incident upon a surface it might be reflected, absorbed, scattered, refracted or it may act as a filter and remove some colours of the light.

Key Words

Transparent – light can pass though

Opaque – light cannot pass through

Translucent – some light passes through

Detecting light

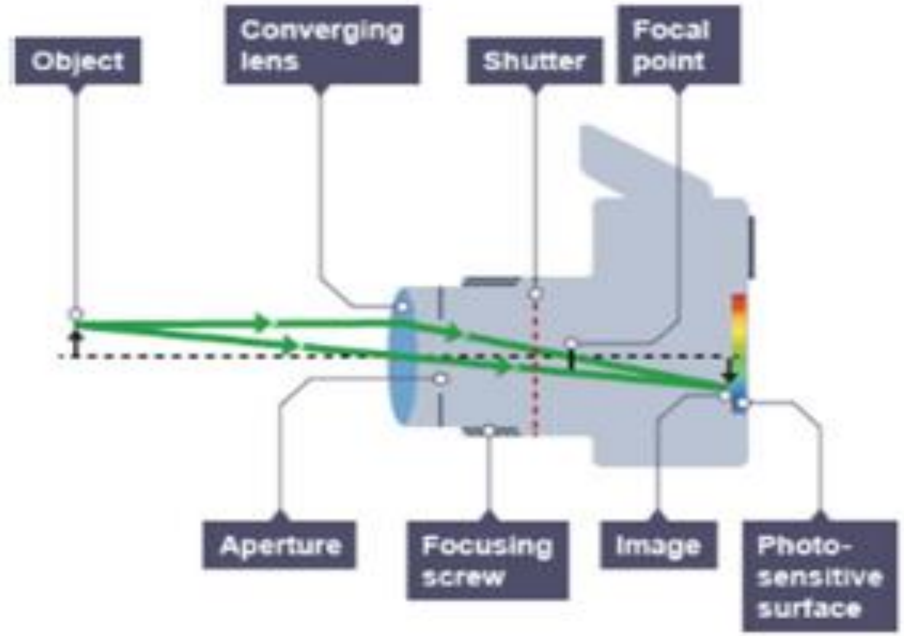
Cameras and our eyes detect light. In each case, they have:

- a material that is sensitive to light
- a change that happens when this material absorbs light

The camera

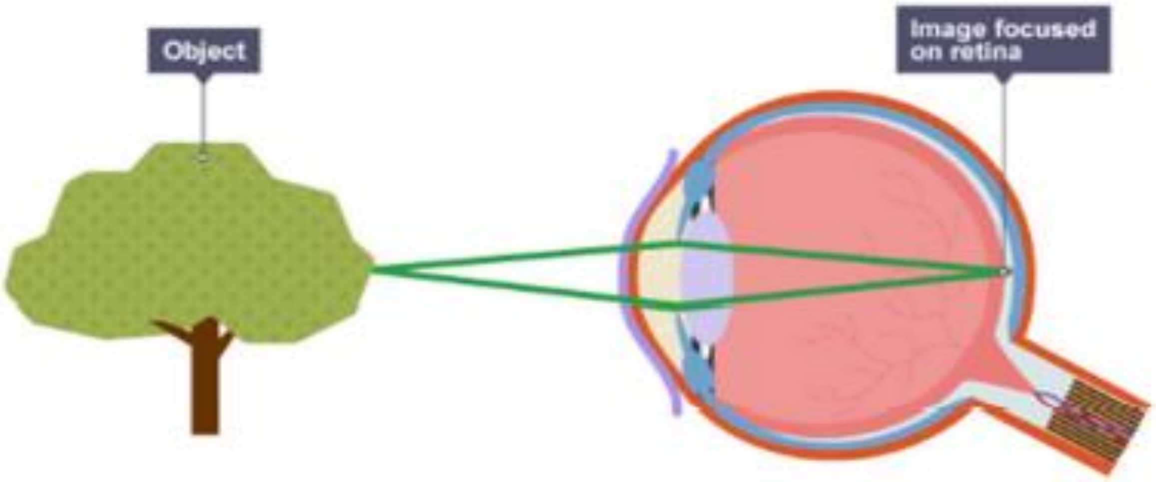
Cameras are devices that focus light from an object onto a photo-sensitive material using a lens. In an old-fashioned camera, the photo-sensitive material was camera film. When the film absorbed light, a chemical change produced an image in the film, called the 'negative'. This was used to produce a photograph on photo-sensitive paper.

In a modern camera or the camera in a mobile phone, the photo-sensitive material produces electrical impulses, which are used to produce an image file. This can be viewed on the screen, or its information sent to a printer.

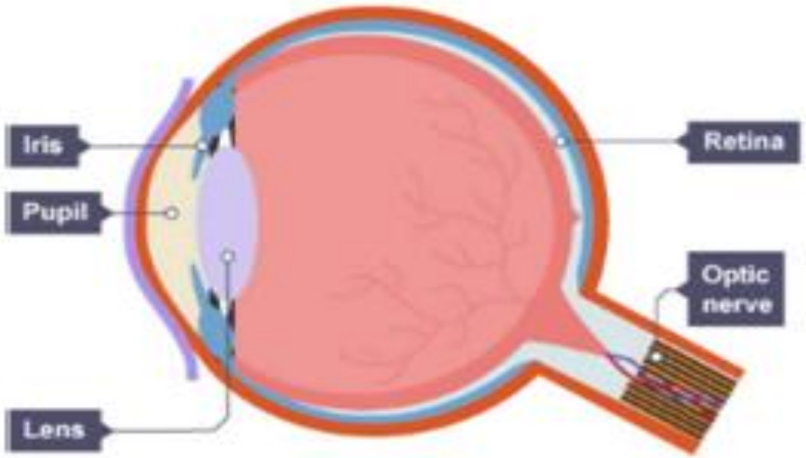


The eye

Like the camera, the eye focuses light from an object onto a photo-sensitive material. However, in the eye, this material is the retina. The retina contains cells that are sensitive to light. They produce electrical impulses when they absorb light. These impulses are passed along the optic nerve to the brain, which interprets them as vision.



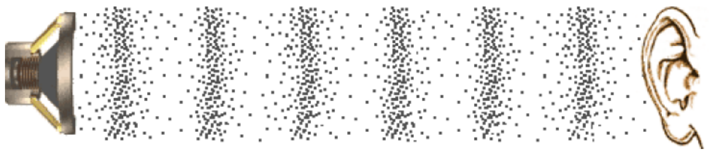
Light is focused onto the retina of the eye



Component parts of the eye

4: Waves
Sound
TASK 1

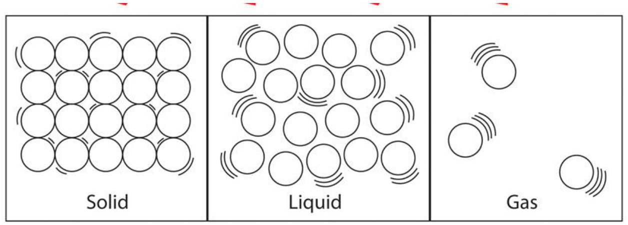
Label and annotate the diagram to explain what a sound wave is (you must include the word 'vibration'.



Sound is a type of __________________ wave.

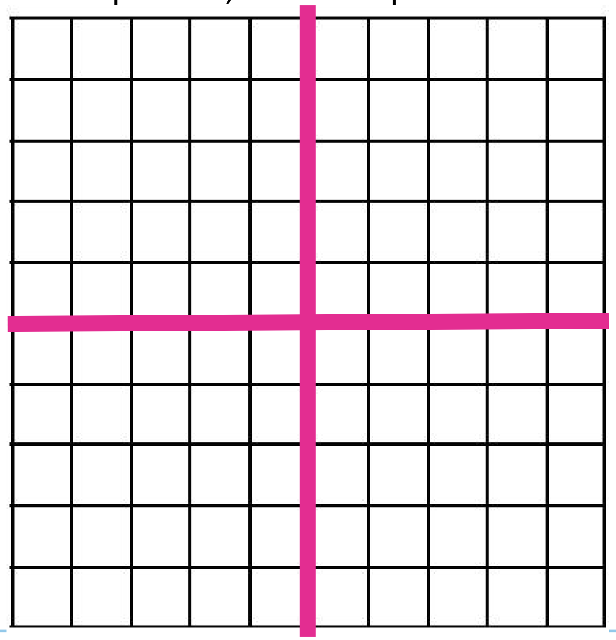
Explain why we can see the Sun, but can not hear it-

Label the diagrams with the average speed of sound for that medium, then explain the difference in terms of particle arrangement:



Sketch sound waves for the following sounds:

Quite high pitched; Loud high pitched; Quite low pitched; Loud low pitched

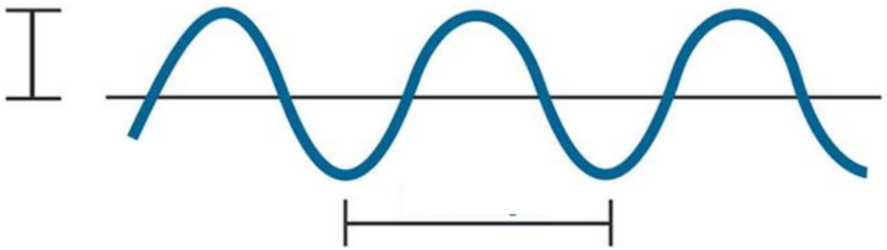


Explain the term 'frequency' and state its units:

What is the auditory range of humans?

What do we call frequencies above and below this range?

Add the following labels to the diagram of a wave: amplitude; wavelength; peak/crest; trough



4: Waves Sound TASK 2

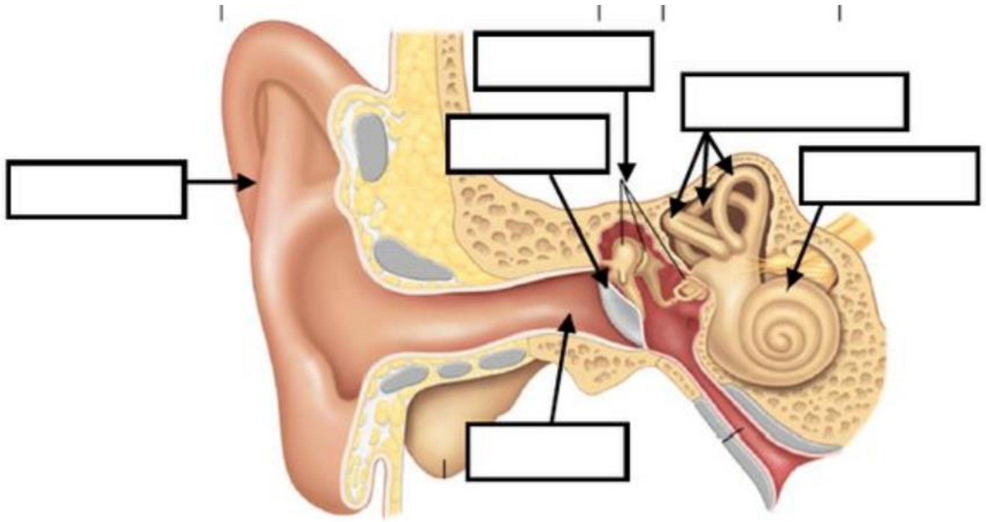
Describe how hearing can be damaged:

State one simple method of helping reduce hearing damage:

Unit of sound intensity (volume)=

Key words and definitions:

Label the parts of the ear and briefly describe its function.



Explain in detail how light allows us to see things.

____
____
____
____
____
____
____

Draw a light ray being reflected from a mirror. State the law of reflection.

What does a lens do?-

____
____
____
____
____
____

What are the primary colours of light?

____
____
____

What is white light?

____
____
____

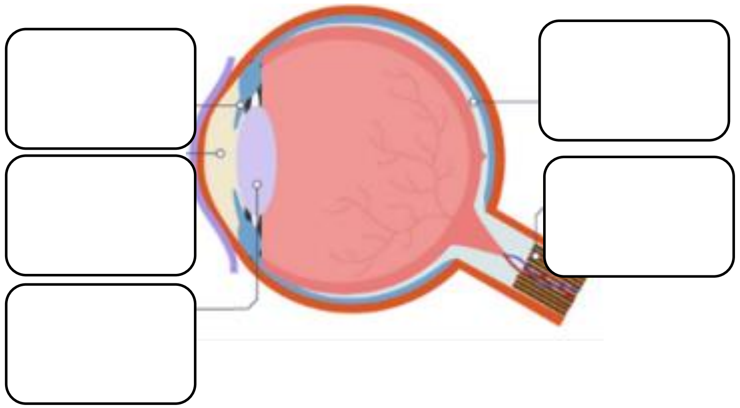
Why are objects different colours?

____
____
____

Explain what a colour filter does to light.

____
____
____

Chapter 4: Waves TASK 3



Explain in as much detail as possible how our eyes are like cameras.

____
____
____
____
____
____
____
____

Draw a diagram of light passing into and out of a glass block. Explain why refraction happens.

Chapter 5.1 and 5.2 Knowledge Organiser - MATTER

Science Department

RAINFORD HIGH

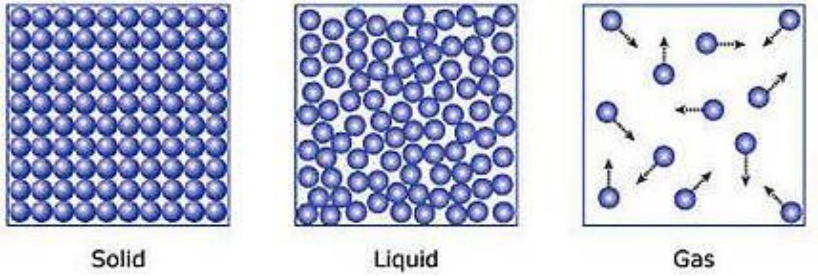
Particle Theory

All matter is made up of particles. Particles are found in all 3 states of matter. Particles in the 3 states behave differently.

In **solids**, particles are arranged in a **regular pattern** and they can only **vibrate** in a fixed position. Particles in solids are not free to move.

In **liquids**, particles can **slide pass** each other. They are **arranged randomly**.

In **gases**, particles carry a lot of energy and they **move in all directions** in a high speed. Particles are **far apart** and are **arranged randomly**.



Key Terms	Definitions
State of matter	Matter is divided into three states: solid, liquid, and gas.
Melting	Change of state from solid to liquid.
Freezing	Change of state from liquid to solid
Evaporation	Change of state from liquid to gas.
Condensation	Change of state from gas to liquid.
Diffusion	Particles spread from a region of higher concentration to a region of lower concentration.
Rate	How fast an event, e.g. diffusion, is happening.
Concentration	The number of particles in a known volume.
Particles	All matter is made up of tiny particles.
Pressure	Pressure is formed when particles collide with the walls of containers.

Diffusion and Factors Affecting Diffusion

Diffusion is the **movement of particles from a higher concentration to a lower concentration. Diffusion will stop when particles spread themselves evenly.** Diffusion occurs in liquids and gases but not in solids, because particles in a solid are not free to move.

There are **2 factors** affecting the rate of diffusion:

1. Temperature: When temperature increases, particles gain more energy. They can then move and spread out at a higher rate.

2. Concentration: When concentration increases, the rate of diffusion increases.

State	Properties
SOLID	Fixed shape, cannot flow, cannot be compressed (squashed) *Particles can vibrate in a fixed position but cannot more past each other. Particles are close together.*
LIQUID	Can flow, will take the shape of a container, cannot be compressed (squashed) *Particles are close together but are able to move past each other.*
GAS	Flow, completely fill any space that they occupy, can be compressed squashed. *Particles can move quickly in all directions, are far apart and have space to move into.*

Pure and Impure Substance

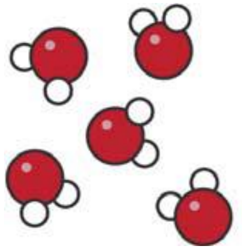
Pure Substances

If you could see the particles in pure water, you would only see water particles. There would be no other particles. Examples of pure substances include gold, oxygen and pure water.

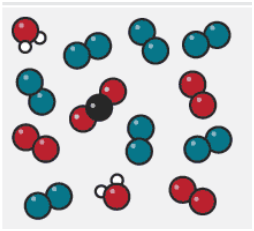
Impure Substances

Impure materials may be mixtures of elements, mixtures of compounds, or mixtures of elements and compounds. For example, even the most pure water will contain dissolved gases from the air. Impurities in a substance will affect its properties. For example, they may change its boiling point.

Pure Substances

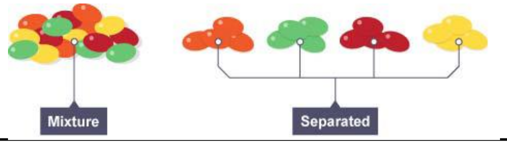


Impure Substances



Mixtures

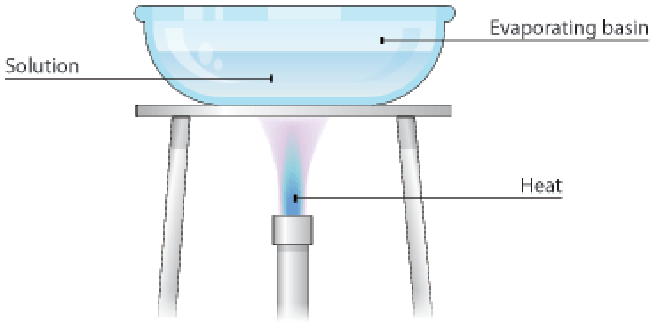
A mixture contains different substances that are not chemically joined to each other. For example, a packet of sweets may contain a mixture of different coloured sweets. The sweets are not joined to each other, so they can be picked out and put into separate piles.



Key Terms	Definitions
Pure	A material that is composed of only one type of particle.
Impure	A material that is composed of more than one type of particle.
Evaporation	A change of state involving a liquid changing to a gas
Distillation	A process for separating the parts of a liquid solution. The solvent is heated and the gas is collected and cooled.
Filtration	The act of pouring a mixture through a mesh, in attempts to separate the components of the mixture.
Mixture	A material made up of at least two different pure substances.
Chromatography	A technique used to separate mixtures of coloured compounds.

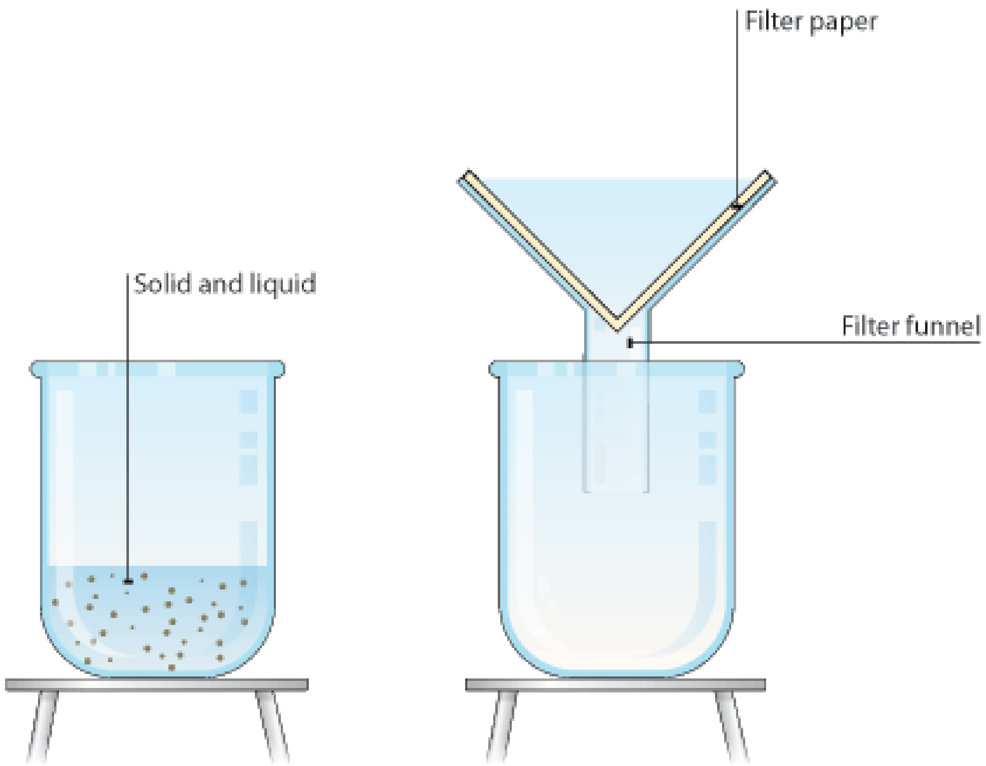
Evaporation

This is good for separating a soluble solid from a liquid (a soluble substance dissolves, to form a solution). For example copper sulphate crystals can be separated from copper sulphate solution using evaporation. Remember that it is the water that evaporates away, not the solution.



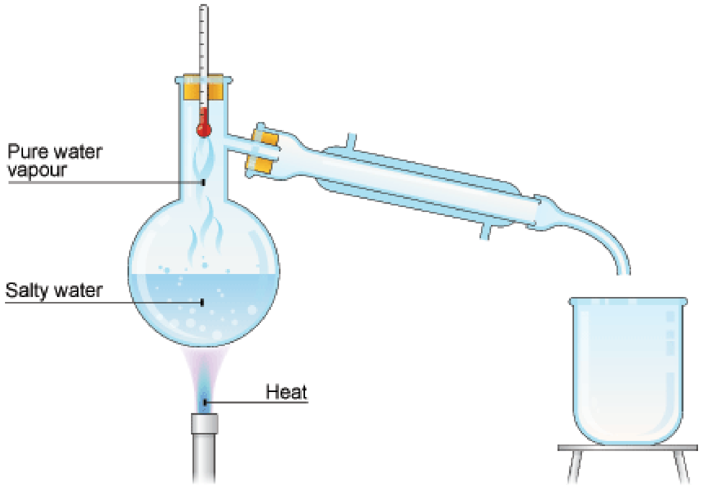
Filtration

This is good for separating an insoluble solid from a liquid. (An insoluble substance is one that does not dissolve). Sand, for example, can be separated from a mixture of sand and water using filtration. That's because sand does not dissolve in water.



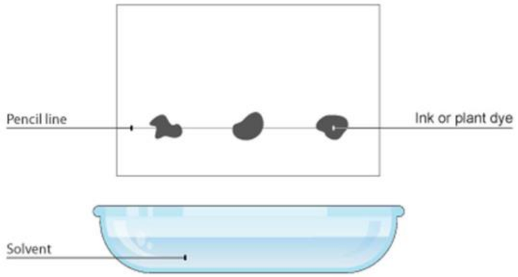
Distillation

This is good for separating a liquid from a solution. For example, water can be separated from salty water by simple distillation. This method works because the water evaporates from the solution, but is then cooled and condensed into a separate container. The salt does not evaporate and so it stays behind. Distillation can also be used to separate two liquids that have different boiling points.



Chromatography

Simple chromatography is carried out on paper. A spot of the mixture is placed near the bottom of a piece of chromatography paper and the paper is then placed upright in a suitable solvent, e.g. water. As the solvent soaks up the paper, it carries the mixtures with it. Different components of the mixture will move at different rates. This separates the mixture out.



Chapter 5: Matter
Task 1

In the boxes below, draw and describe the properties of a solid, liquid and gas .

Solid	Liquid	Gas

What is diffusion?

Describe what condensation and evaporation mean.

Explain in as much detail as you can what freezing means .

Explain in as much detail as you can what boiling means .

What is gas pressure?

Draw in the balloons below particles showing low and high gas pressure:

Chapter 5: Matter
TASK 2

Explain in detail the differences between mixtures and compounds. –

What is a saturated solution? –

Define these words:

Solvent:

Solute:

Dissolve:

Soluble:

Filtrate:

Residue:

With the aid of a diagram, show how a substance dissolves into a liquid

Using a diagram, show how filtration works.

What does solubility mean?

What things can affect solubility?

Explain the process and the result of a chromatography test on a felt tip pen.

Describe what distillation is and how it works.

Explain how people get salt from salt water.

Chapter 6.1 and 6.2 Knowledge Organiser - REACTIONS

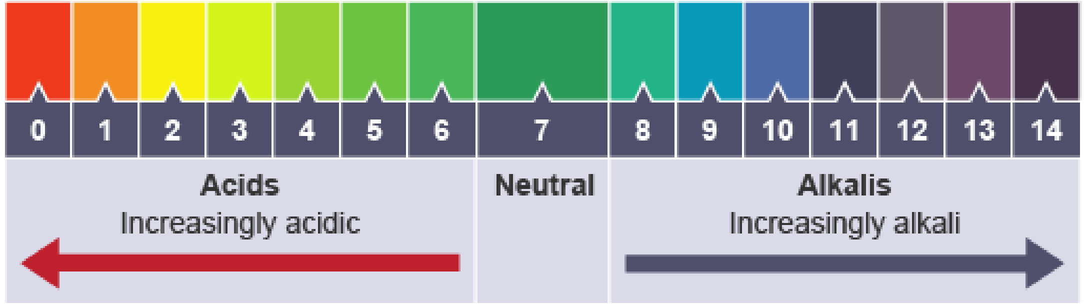
Science Department

RAINFORD HIGH

Universal pH scale

Universal indicator is supplied as a solution or as universal indicator paper. It is a mixture of several different indicators. Unlike litmus, universal indicator can show us how strongly acidic or alkaline a solution is, not just that the solution is acidic or alkaline. This is measured using the pH scale, which runs from pH 0 to pH 14.

Universal indicator has many different colour changes, from red for strongly acidic solutions to dark purple for strongly alkaline solutions. In the middle, neutral pH 7 is indicated by green.



These are the important points about the pH scale:

- neutral solutions are pH 7 exactly
- acidic solutions have pH values less than 7
- alkaline solutions have pH values more than 7
- the closer to pH 0 you go, the more strongly acidic a solution is
- the closer to pH 14 you go, the more strongly alkaline a solution is

Indicators and the pH scale

Solutions can be acidic, alkaline or neutral: we get an acidic solution when an acid is dissolved in water we get an alkaline solution when an alkali is dissolved in water solutions that are neither acidic nor alkaline are neutral Pure water is neutral, and so is petrol. An indicator is a substance that changes colour when it is added to acidic or alkaline solutions. You can prepare homemade indicators from red cabbage or beetroot juice - these will help you see if a solution is acidic or alkaline. Litmus and universal indicator are two indicators that are commonly used in the laboratory.

Litmus indicator

Litmus indicator solution turns red in acidic solutions and blue in alkaline solutions. It turns purple in neutral solutions. Litmus paper is usually more reliable, and comes as red litmus paper and blue litmus paper. The table shows the colour changes it can make.

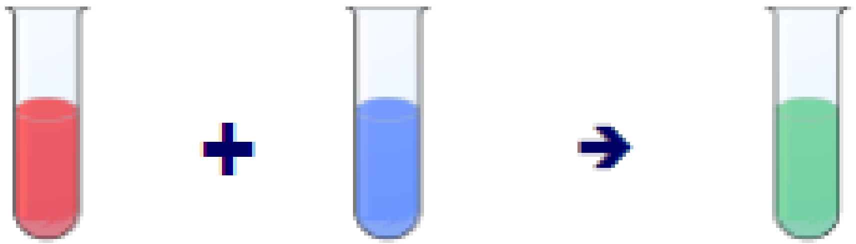
	Red litmus	Blue litmus
Acidic solution	Stays red	Turns red
Neutral solution	Stays red	Stays blue
Alkaline solution	Turns blue	Stays blue

Neutralisation

A chemical reaction happens if you mix together an acid and an alkali. The reaction is called neutralisation. A neutral solution is made if you add just the right amount of acid and base together. The products formed are salt and water.

acid + alkali ⟶ salt + water

- When an alkali reacts with **hydrochloric acid**, the salt produced is a **chloride**.
- When an alkali reacts with **sulphuric acid**, the salt produced is a **sulphate**.
- When an alkali reacts with **nitric acid**, the salt produced is a **nitrate**.



acid + alkali → salt + water

E.g:

Hydrochloric acid + Sodium hydroxide → Sodium chloride + water

Other ways to neutralise

metal oxide + acid → salt + water

metal hydroxide + acid → salt + water

metal carbonate + acid → salt + water + carbon dioxide

Notice they all produce a salt and water…

Word and symbol equations

sodium hydroxide + hydrochloric acid → sodium chloride + water

$NaOH + HCl \rightarrow NaCl + H_2O$

copper oxide + sulphuric acid → copper sulphate + water

$CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$

sodium hydroxide + sulphuric acid → sodium sulphate + water

$2NaOH + H_2SO4 \rightarrow Na_2SO4 + 2H_2O$

copper carbonate + sulphuric acid → copper sulphate + water + carbon dioxide

$CuCO_3 + H_2SO_4 \rightarrow CuSO_4 + H_2O + CO_2$

Highlight all acids in red and all salts in green.

Reactions of metals with acid

The general equation for the reaction of a metal with acid is:

Metal + acid → salt + hydrogen

The test for hydrogen is sometimes called the squeaky pop test. Hydrogen makes a small ‘pop’ when it is placed near a lit wooden splint.

Reactions of metals with water

The general equation for the reaction of a metal with water is:

Metal + water → meal hydroxide + hydrogen

The test for hydrogen is sometimes called the squeaky pop test. Hydrogen makes a small ‘pop’ when it is placed near a lit wooden splint.

Reactions of metals with oxygen

The general equation for the reaction of a metal with oxygen is:

Metal + oxygen →metal oxide

This reaction only occurs on heating with oxygen. Reactions with oxygen where no heat is introduced do occur but at a much slower rate. For example the rusting of iron.

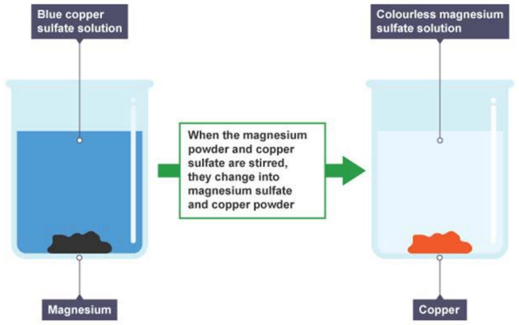
The reactivity series shows a list of metals in the order of how reactive they are. The metals towards the top of the list react readily with air and water and violently with acid.

The metals towards the bottom of the list do not even react with acid.
The order of the reactivity series can be remembered using a mnemonic.

"Pond slime can make a zoo interesting - the long crinkly sort goes purple."

Displacement reactions

Displacement reactions involve a reaction between a metal and a compound of a different metal.
A more reactive metal will displace a less reactive metal from its compounds.
For example the more reactive magnesium will displace the less reactive copper from the copper sulfate solution.



Magnesium + copper sulfate → magnesium sulfate + copper

Universal indicator has many different ________________ changes, from ___________ for strongly acidic solutions to dark ____________ for strongly alkaline solutions. In the middle, neutral pH 7 is indicated by ____________.

Describe what a Neutralisation Reaction is:

____

____

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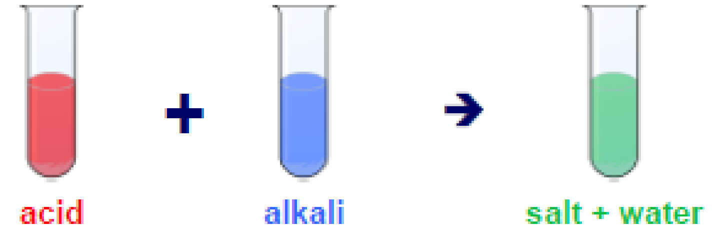
Making Salts

- Hydrochloric Acid makes ________________salts
- Nitric Acid makes __________________salts
- Sulphuric Acid makes __________________salts



E.g:

Hydrochloric acid + Sodium hydroxide → Sodium chloride + water

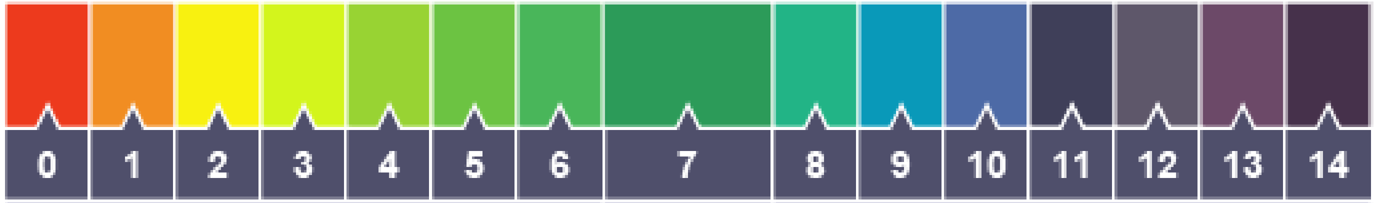
Litmus Indicator

	Red litmus	**Blue Litmus**
Acid		
Neutral		
Alkaline		

6: Reactions

Task 1

The pH Scale – add missing labels then research and find some examples of Acids, Neutral and Alkalis.



Acids –

Neutral –

Alkalis -

Reactions of metals with acid
The general equation for the reaction of a metal with acid is:

Reactions of metals with water
The general equation for the reaction of a metal with water is:

Reactions of metals with Oxygen
The general equation for the reaction of a metal with oxygen is:

6: Reactions Task 2

Element Symbols REVISION – write the first 20 symbols out from memory

1.
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14.
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18.
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20.

Describe what a DISPLACEMENT Reaction is in your own words and give an example:
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____
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Key words and definitions:

Atom:____________________
____
____

Element:__________________
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Compound:________________
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Mixture:__________________
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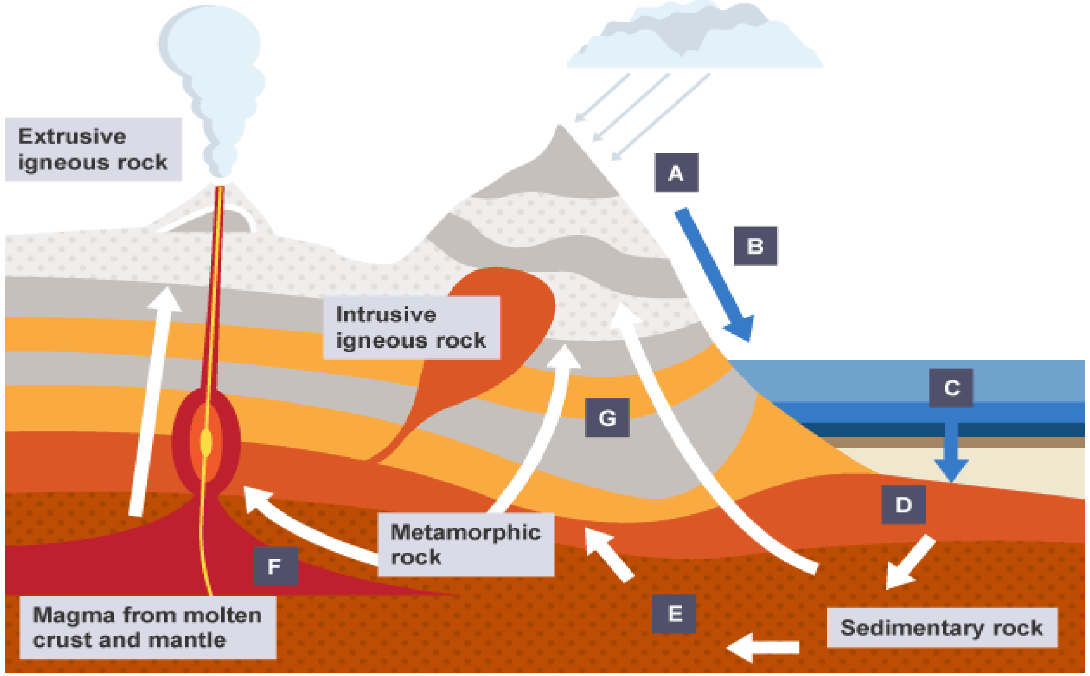
____

Chapter 7.1 and 7.2 Knowledge Organiser - EARTH

Science Department



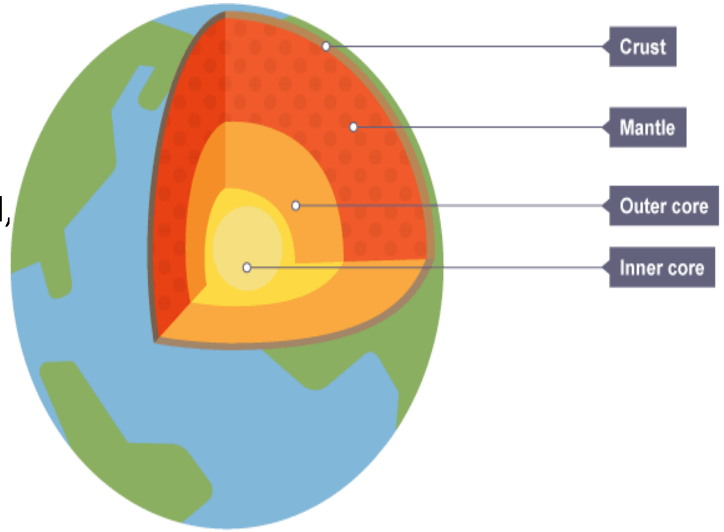
A	Weathering and erosion	D	Compaction and cementation	F	Melting
B	Transportation and deposition	E	Burial, high temperatures and pressures	G	Slow uplift to the surface
C	Sedimentation				

Letter	Description
A	There are 3 types of weathering (biological, physical and chemical).
B	Rivers and streams transport rock particles to other places.
C	Rock particles form layers.
D	This presses the layers and sticks the particles together, forming sedimentary rock.
E	Rocks underground and are changed into metamorphic rock.
F	Rocks melt and turn into magma. When it cools it forms igneous rocks.
G	Areas of rock can move slowly upwards, this is called uplift.

Structure of the earth

The Earth is almost a sphere.
These are its main layers, starting with the outermost:

- Crust (relatively thin and rocky)
- Mantle (has the properties of a solid, but can flow very slowly)
- Core (made from nickel and iron)



Types of rocks

Igneous rocks

Igneous rocks are formed from molten rock that has cooled and solidified.

Sedimentary rocks

Sedimentary rocks are formed from the broken remains of other rocks that become joined together.

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.

Years and seasons

A planet's year is the time it takes to make one complete orbit around the Sun. The Earth goes once round the Sun in one Earth year, which takes 365 Earth days.

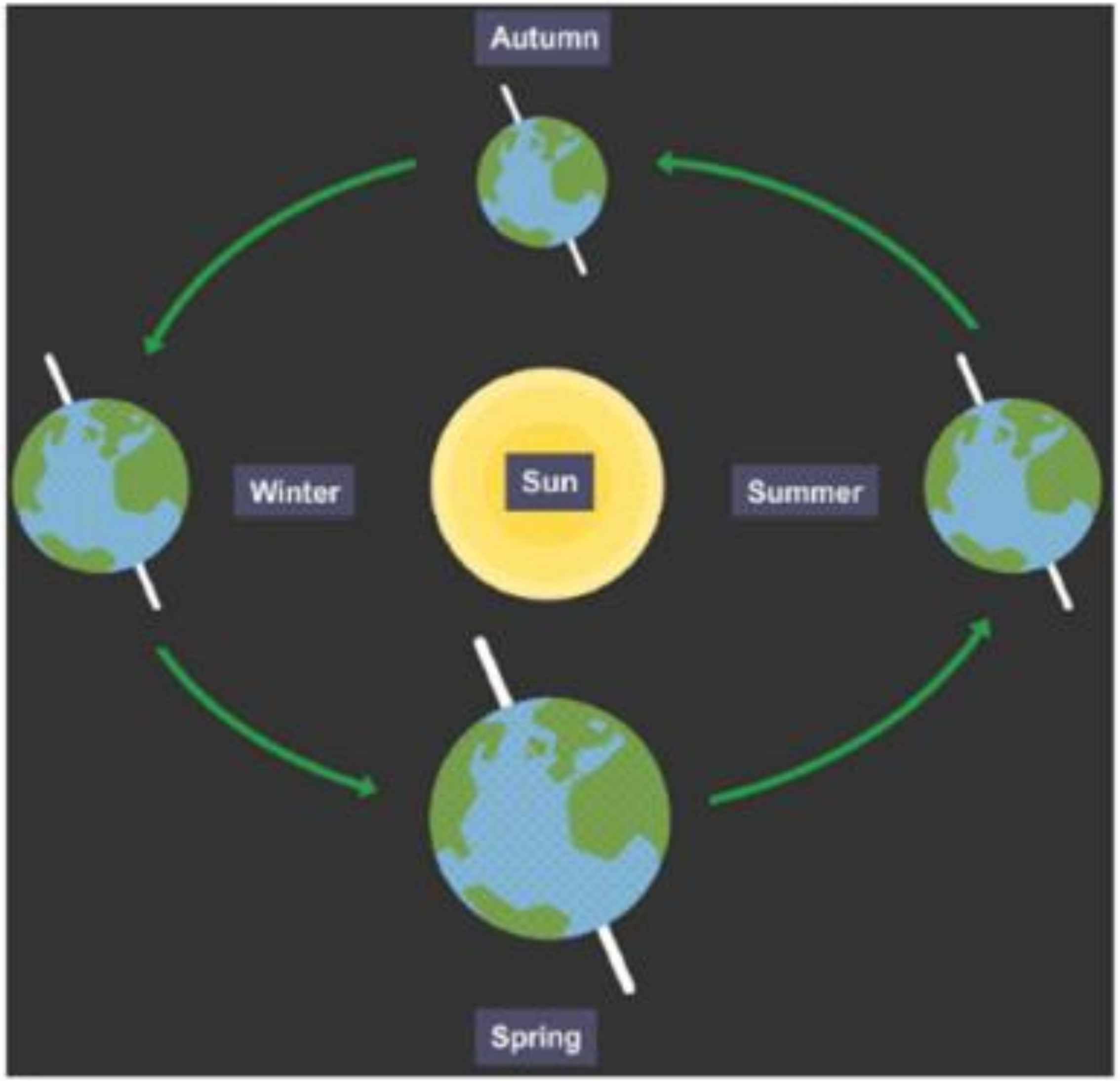
Seasons

The Earth's axis is the imaginary line through the centre of the Earth between the South and North poles about which the Earth rotates. This axis is tilted slightly compared with the way the Earth orbits the Sun.

The Earth's axis is tilted 23.4° from vertical

We get different seasons (winter, spring, summer and autumn) because the Earth's axis is tilted. This is how it works:

- it is summer in the UK when the Northern Hemisphere is tilted towards the Sun
- it is winter in the UK when the northern hemisphere is tilted away from the Sun



When it is summer in the Northern Hemisphere, it is winter in the Southern Hemisphere

Stars and galaxies

Our Sun is a star. It seems much bigger than other stars in the sky because it is much closer to Earth. Stars form immense groups called galaxies. A galaxy can contain many millions of stars, held together by the force of gravity.

Our Sun is in a spiral galaxy called the Milky Way. The Sun is about half-way from the centre of the galaxy, on one of the arms.

Our galaxy contains millions of stars, including our Sun. It is just one of more than 100 billion galaxies in the universe

The light year

The distances between objects in space are huge:

- the distance from one star to another in a galaxy is millions of times more than the distance between the planets in the solar system
- the distance from one galaxy to another is millions of times more than the distance between the stars in a galaxy

This means that the numbers used to describe distances in space become very difficult to understand and to write down. For example, the distance between the Earth and the Sun is about 150,000,000,000 m but the distance to the next nearest star (Proxima Centauri) is 39,900,000,000,000,000 m.

To get around this problem, scientists use the light year as the unit of astronomical distance. It is the distance travelled by light in one year. So, for example:

- Sun to Proxima Centauri distance is about 4.24 light years
- Milky Way to Andromeda (the next nearest spiral galaxy) distance is about 2.5 million light years

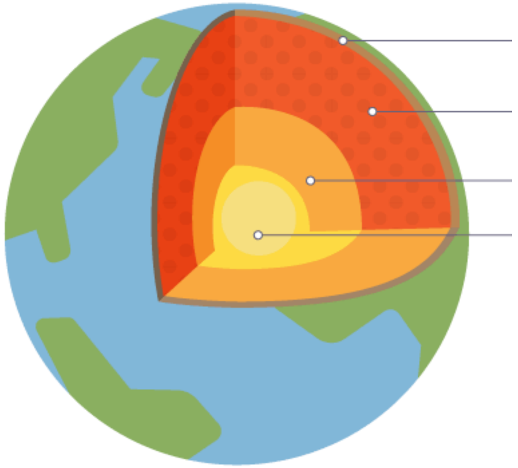
It takes light from our Sun about 8 minutes to reach the Earth.

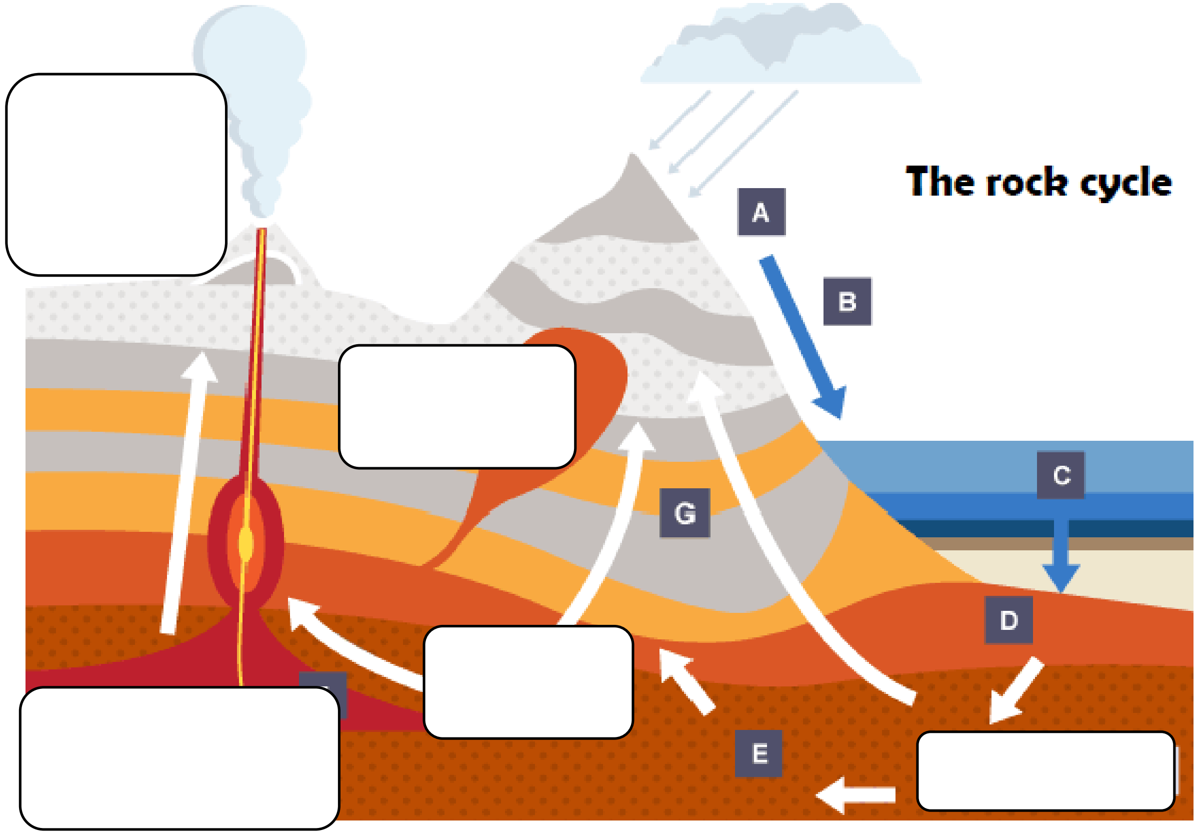
Ceramics
What are Ceramics, give some examples of objects made from this material?

Outline some Advantages and Disadvantages of using Ceramics.

Chapter 7: Earth Task 1

Add the correct labels





1. Describe how each type of rock is formed:

Sedimentary rock

____

____

____

Metamorphic rock

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____

____

Igneous rock

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____

____

Chapter 7: Earth - TASK 2

What are the 8 planets in the Solar System and what are their distances from the Sun?

Define these words-
Artificial satellite –
____
____

Natural Satellite–
____
____

Planet–
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Galaxy–
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Orbit–
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Universe–
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____

Annotate the diagram and explain why the Earth has seasons throughout the year.
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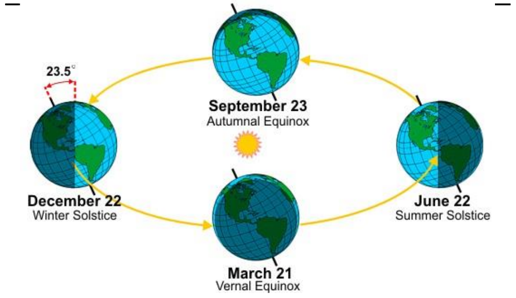

What is a solar eclipse?
____
____
____

What is a lunar eclipse?
____
____
____

What are the 4 terrestrial planets?
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____
____
____

Draw a diagram showing why we see different phases of the moon. Label the phases.

What is a the difference between a comet and a meteor?
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____
____
____
____
____

What is a the difference between a day and a year in terms of the Earth moving?
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____
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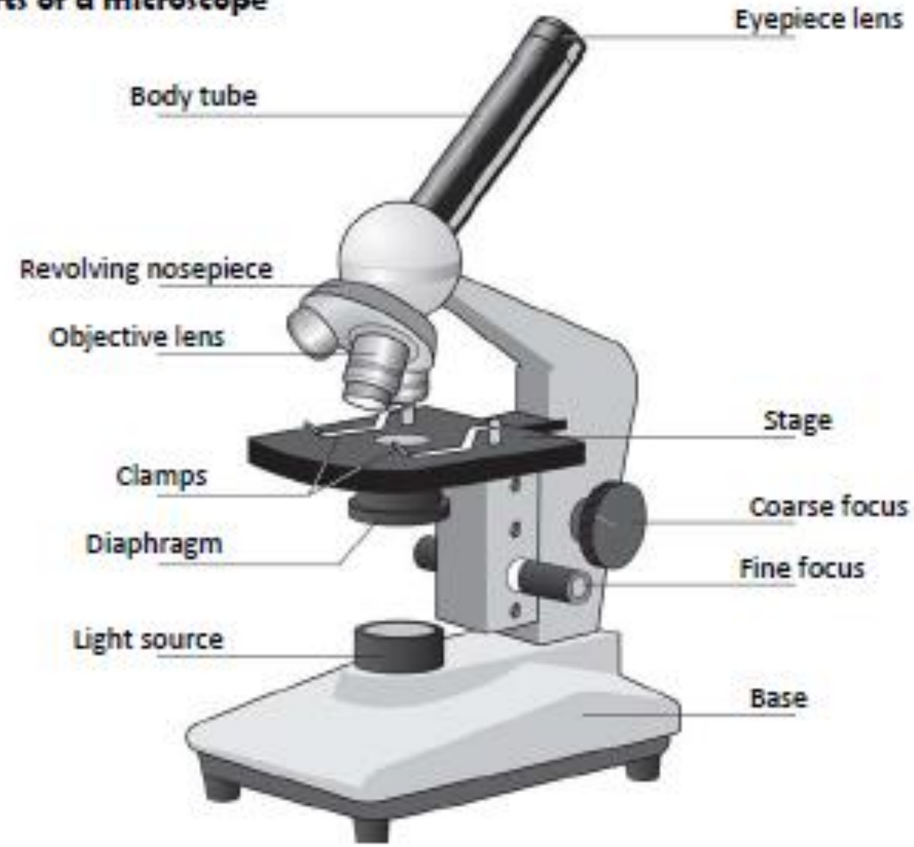
Chapter 8.1 and 8.2 Knowledge Organiser - ORGANISMS

Science Department

RAINFORD HIGH

Parts of a microscope



Magnification

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

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

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

Using a microscope

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

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

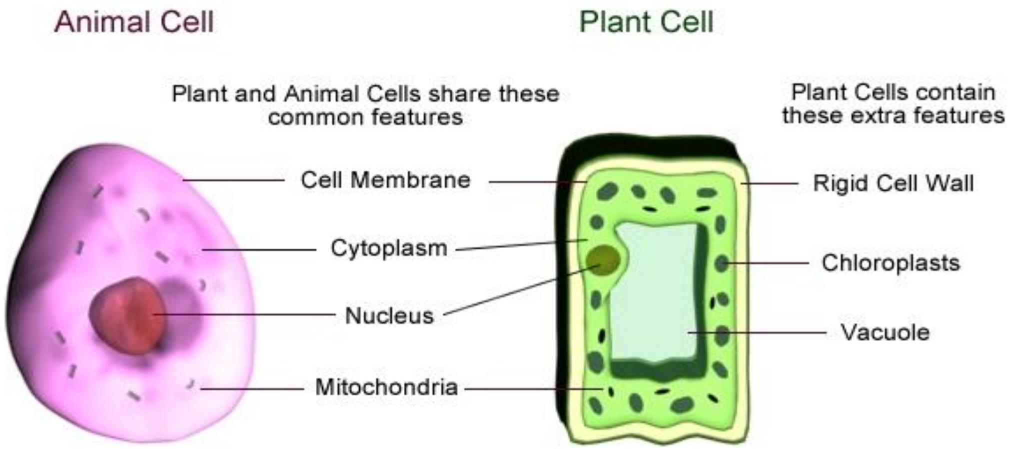
Preparing a microscope slide

To prepare a slide to view onion cells we can use the following steps:

1. cut open an onion
2. use forceps to peel a thin layer from the inside
3. spread out the layer on a microscope slide
4. add a drop of iodine solution to the layer
5. carefully place a cover slip over the layer

Cells

Cells are the building blocks of all living organisms.



Organelle	Definition
Cell wall	Made of cellulose, which supports the cell
Cell membrane	Controls movement of substances into and out of the cell
Cytoplasm	Jelly-like substance, where chemical reactions happen
Nucleus	Contains genetic information and controls what happens inside the cell
Vacuole	Contains a liquid called cell sap, which keeps the cell firm
Mitochondria	Where most respiration reactions happen
Chloroplast	Where photosynthesis happens

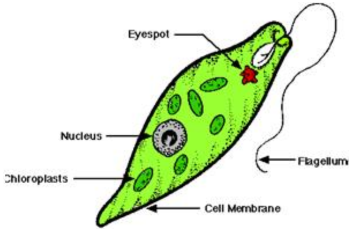
Specialised cells

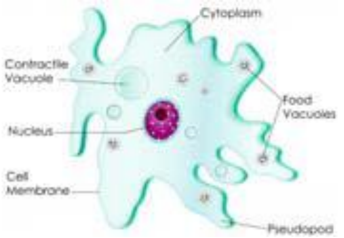
Specialised cells are found in multicellular organisms. Each specialised cell has a particular function within the organism.

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

Unicellular Organisms

Some organisms are only made of a single cell, these are called unicellular organisms. All the processes needed for the organism to survive happen in that one, single cell. There are no tissues, organs or organ systems. Unicellular organisms often have structural adaptations to help them survive.





The skeleton

Our **skeleton** is made of more than 200 **bones**. Calcium and other minerals make the bone strong but slightly flexible. Bone is a living **tissue** with a blood supply. It is constantly being dissolved and formed, and it can repair itself if a bone is broken.

Function of the skeleton

The skeleton has four main functions:

1. Support - to **support** the body **e.g. Our backbone keep us upright**

2. Protection - Here are some examples of what the skeleton protects:

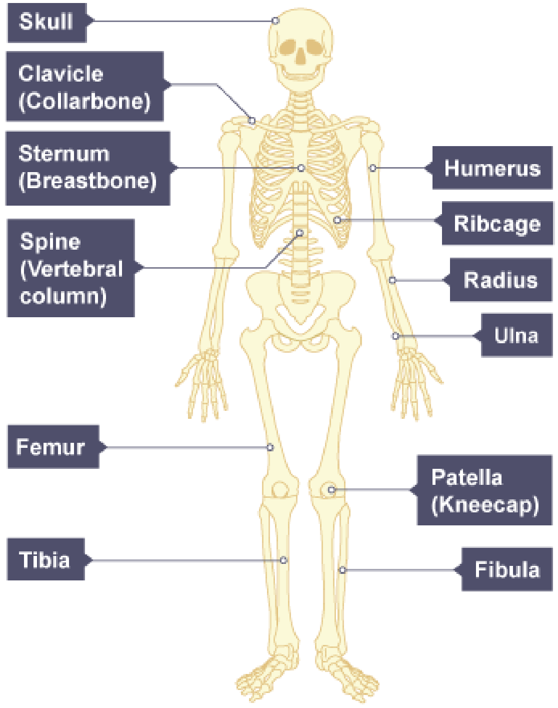
- skull protects the brain
- ribcage protects the heart and lungs
- backbone protects the spinal cord

3. Movement - Some bones are joined rigidly together and cannot move e.g. Bones in the skull. Other bones are joined to each other by flexible joints. Muscles are needed to move bones attached by joints.

4. Making blood cells - There are different kinds of blood cells, including:

- **Red blood cells** - carry oxygen
- **White blood cells** – used in the immune system

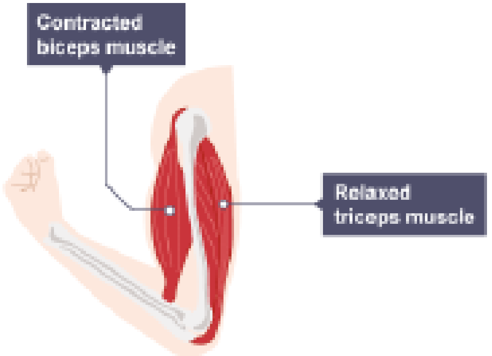
These cells are made in the **bone marrow**. This is soft tissue inside our larger bones which is protected by the hard part of the bone which surrounds it.

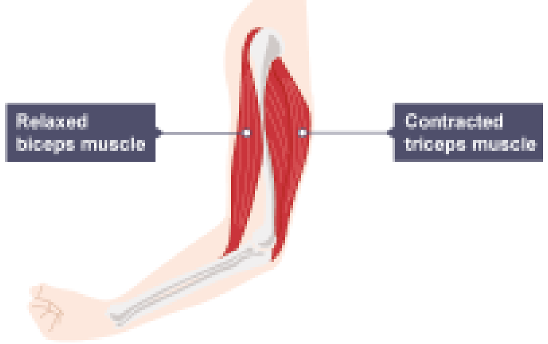


Antagonistic muscles

Muscles are attached to bones by strong tendons, they can only pull and cannot push. E.g. your elbow joint has two muscles that move your forearm up or down.

- to raise the forearm, the biceps contracts and the triceps relaxes
- to lower the forearm again, the triceps contracts and the biceps relaxes





Joints - Bones are linked together by joints which allow different parts of the skeleton to move. They are called **synovial joints.**

Type of joint	Example	Movement allowed
Hinge joint	Knee, elbow	Same as opening and closing a door, no rotation
Ball and socket joint	Hip, shoulder	Backwards and forwards in all directions, with rotation

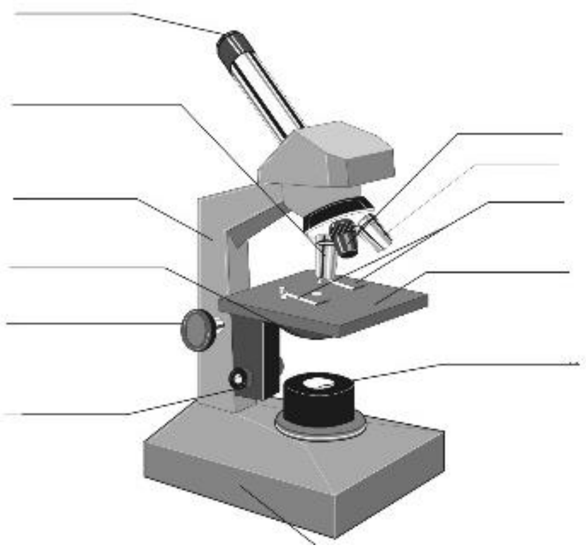
The make up of an organism

Organisms are constructed according to the following hierarchy:

Cell → Tissue → Organ → Organ System → Organism

Chapter 8 Cells – TASK 1

Label this microscope.



What is the magnification equation?

Draw a plant and animal cell and label all key features. –p17

Write a step by step method describing how to prepare a microscope slide.

What is a specialised cell?

Draw an example specialised cell.

Draw and label a unicellular organism.

Chapter 8 Cells TASK 2

Define these words-

Cell–

____
____
____

Tissue–

____
____
____

Organ–

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____
____

Organism -

____
____
____

Joint–

____
____
____

Muscle–

____
____
____

Skeleton–

____
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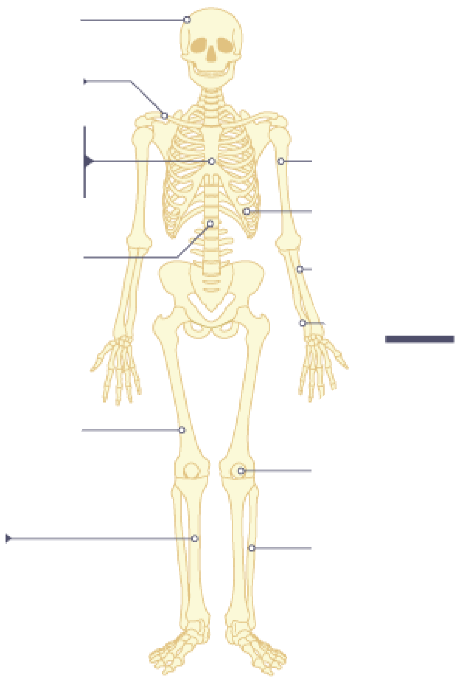


Name as many types of joint as you can.

Give some examples…

Describe the four reasons we need a skeleton.

____
____
____
____
____
____

Explain why nearly all muscles in the body have to work in pairs. Use the term antagonistic pair at least once.

____
____
____
____

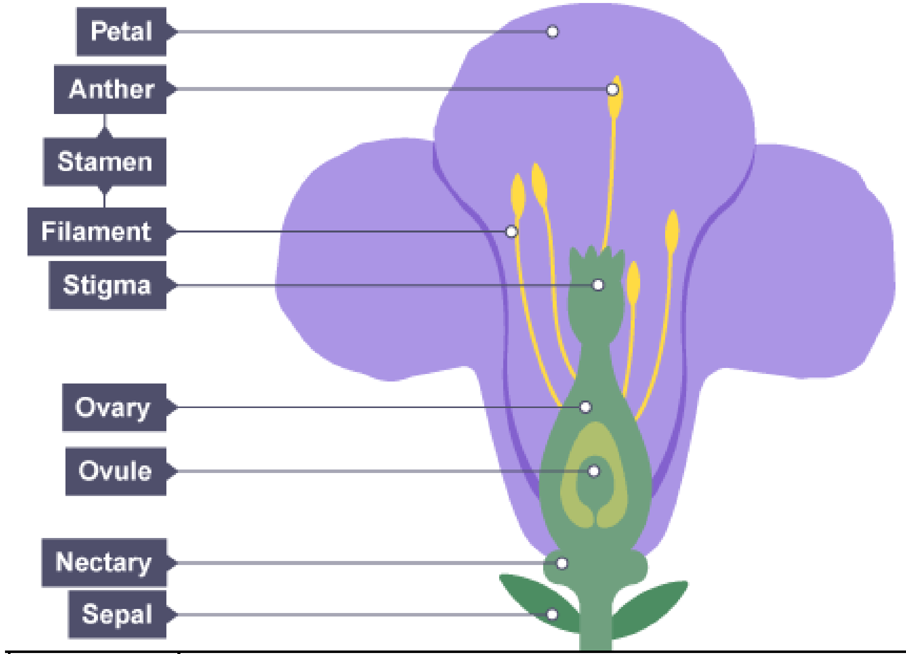
Chapter 9.1 and 9.2 Knowledge Organiser - ECOSYSTEMS

Science Department

RAINFORD HIGH

Structure of a flower

The flower is the reproductive organ of many plants

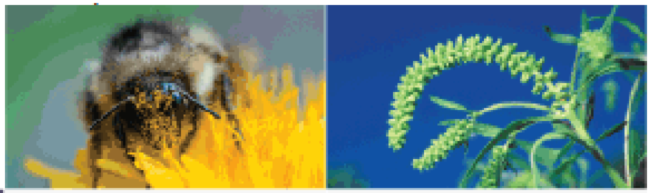


Structure	Function
Sepal	Protects the flower when it is a bud
Petal	These are often colourful to attract insects
Stamen	The male part of the flower (anther and filament)
Anther	Produces male sex cells (pollen)
Filament	Supports the anther
Ovary	Produces female sex cells (ova)
Stigma	Collects pollen grains, this is the top of the female part of the flower

Structure of a flower

Plants reproduce in a process called pollination. Because plants have both male and female reproductive organs , it is possible for a plant to pollinate itself (self-pollination) but this can be problematic as creates little genetic variation between plants.

Cross-pollination is when a pollen from one plant fertilises the ova of another plant. Pollen can be carried between plants by either the wind or insects. Plants have different adaptations depending on the types of pollination they use:



Feature	Insect-pollinated	Wind-pollinated
Petals	Large and brightly-coloured – to attract insects	Small, often dull green or brown – no need to attract insects
Scent and nectar	Usually scented and with nectar – to attract insects	No scent or nectar – no need to attract insects
Number of pollen grains	Moderate - insects transfer pollen grains efficiently	Large amounts – most pollen grains are not transferred to another flower
Pollen grains	Sticky or spiky - sticks to insects well	Smooth and light – easily carried by the wind without clumping together
Anthers	Inside flower, stiff and firmly attached - to brush against insects	Outside flower, loose on long filaments – to release pollen grains easily
Stigma	Inside flower, sticky - pollen grains stick to it when an insect brushes past	Outside flower, feathery – form a network to catch drifting pollen grains

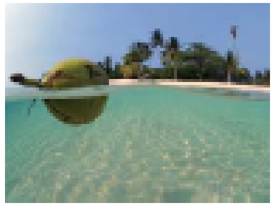
Seed dispersal: When an ova is fertilised by pollen, a seed forms which will eventually grow into a new plant.
However, plants are constantly in competition with one another for:

- Light
- Space
- Water
- Minerals in the soil

To reduce competition, seeds must be **dispersed** (spread away) from their parent plant. There are several method of seed dispersal used by different species of plants.

Water dispersal

- Some seeds are quite spongy so can float.
- They fall off a plant and into water. They are carried by the current to somewhere else and then wash up, allowing them to grow.



Coconut seeds float so are dispersed by water.

Explosions

- Certain seeds are contained in pods. Some of these pods shrivel and become too tight, causing the seeds to burst out of them.
- Others may explode at the slightest touch. When this happens, the seeds are dispersed in different directions.

Pea plants have pods which burst open when ripe, throwing the seeds away from the plant.

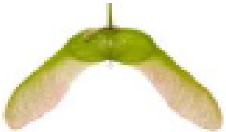
Animal dispersal

- Some seeds are sticky or have small hooks on them to allow them to attach to the skin/fur of animals and get transported.
- Some seeds are held within tasty fruit (the grown ovary) so the animal eats it and the seed passes out at a later date.

Raspberry fruit is eaten and burdock seeds stick to animal fur.

Wind dispersal

- Other seeds are attached quite loosely to the plant.
- With a bit of wind, they become detached and are carried by the wind far away from the parent plant. When they settle, the seed can grow away from the parent plant.



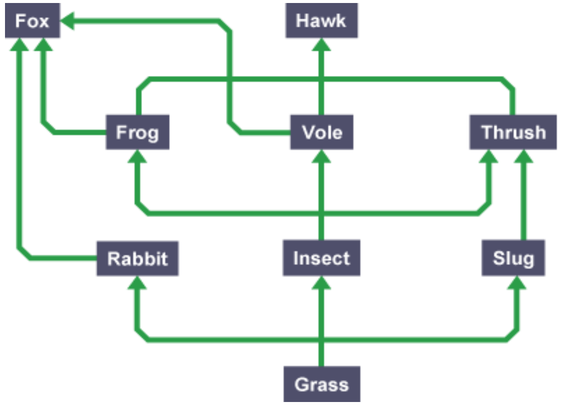
Sycamore and dandelion seeds are dispersed by the wind.

Feeding relationships

A food chain shows the different species of an organism in an ecosystem, and what eats what. Here is an example of a simple food chain:

grass → cow → human

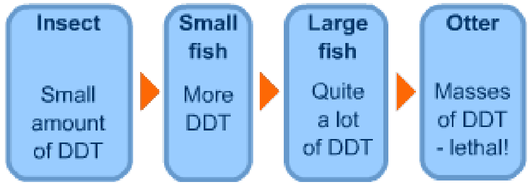
When all the food chains in an ecosystem are joined up together, they form a
food web. Here is an example of a food web:



Factors including changes in the producer, changes in the number of consumers, and the population of pollinating insects all affect the size of populations within a food web.

Toxic waste

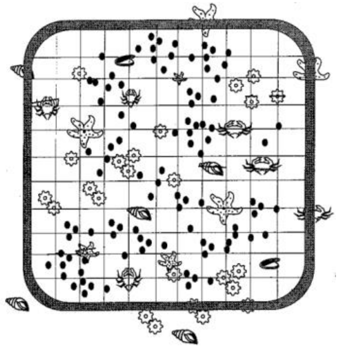
Some poisonous toxins accumulate in food chains and damage organisms in it, especially predators at the end of the chain because accumulating toxins cannot be excreted.
Examples include mercury and DDT. High levels of mercury can cause damage to the nervous and reproductive systems. DDT causes birds to lay eggs with weak shells.



Term	Description
Environment	All the conditions that surround a living organism
Habitat	The place where an organism lives
Population	All the members of a single species that live in a habitat
Community	All the populations of different organisms that live together in a habitat
Ecosystem	A community and the habitat in which organisms live.
Producer	An organism that makes food – usually a green plant
Consumer	An animal that eats plants or another animal These are divided into: Primary consumer: the first consumer in the food chain Secondary consumer: the second consumer in the food chain Tertiary consumer: the third consumer in the food chain
Carnivore	A consumer that eats other animals
Omnivore	A consumer that eats plants and other animals
Herbivore	A consumer that eats only plants
Predator	An animal that hunts and eats other animals
Prey	An animal that gets eaten by the predator
Interdependence	The name given to the relationship between all organisms in an ecosystem

Sampling

A quadrat (wooden frame) of a known size (e.g. 1m2) is placed several times.



2. Where to put the quadrat should be chosen randomly (by generating co-ordinates using a calculator)
3. Count what is in each quadrat
4. Work out an average number from all of the quadrats
5. Work out the average of the whole ecosystem

e.g. on average there are 20 flowers in 1m2 so in the whole field (1500m) there will be 20 x 1500 = 30,000 flowers

Chapter 9: Ecosystems – TASK 1

Describe how both wind and insect pollination works.

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Define these words-

Germination –

Fertilisation–

Seed–

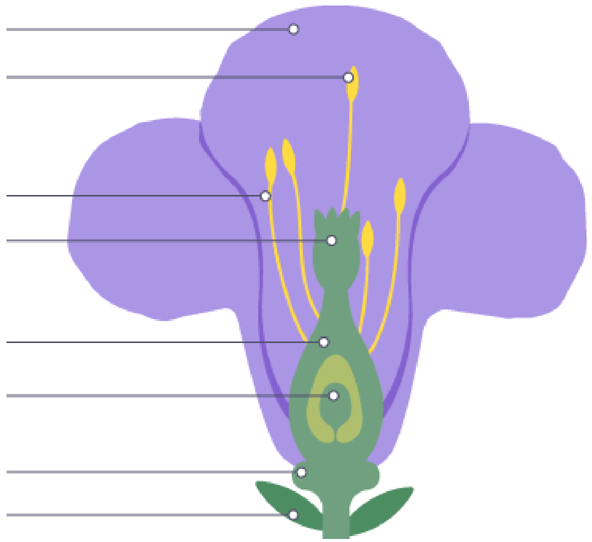
Stigma -

Anther –

Ovary –

Filament –

Label the male and female reproductive organs of this flower.



Structure	Function
Sepal	
Petal	
Stamen	
Anther	
Filament	
Ovary	
Stigma	

Describe the four common forms of seed dispersal below.

Wind Dispersal

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Animal Dispersal

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Water Dispersal

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Explosive Dispersal

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Food Chain

A food chain shows the different ___________________ of an organism in an ____________________, and what ______what.

Give an example below:

Identify 3 factors that affect the size if populations in a food web.

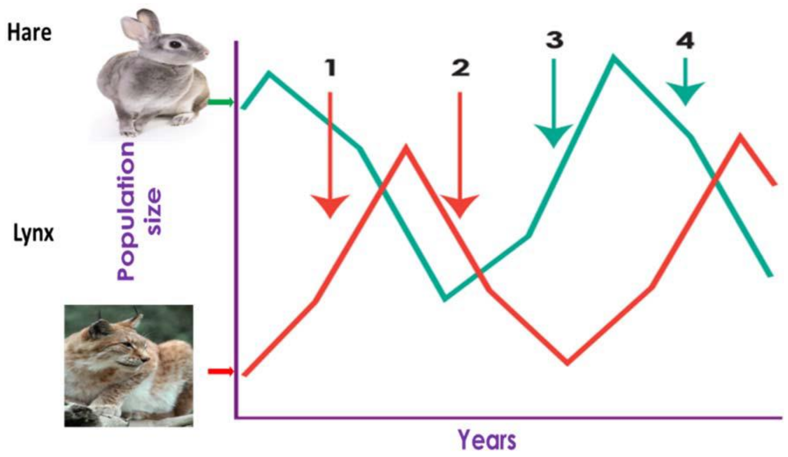
1)

2)

3)

9: Ecosystems
Task 2

Competition



Describe the relationship between the Hare and Lynx Population sizes.

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Explain in your own words what a Food web is:

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What is a QUADRAT and how is it used?

Chapter 10.1 and 10.2 Knowledge Organiser - GENES

Science Department

RAINFORD HIGH

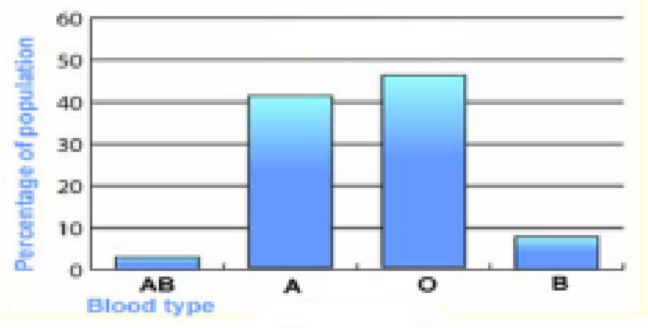
Variation
Variation can occur *within* or *between* species.
For example, you may have a different eye or hair colour to your friend. Therefore there is variation amongst the human species.
There is more variation between different species, such as between a human and a dog.
Causes of variation can be genetic (inherited from your parents) or environmental (caused by your surroundings). Here are some examples of the types of variation:

Inherited	Environmental
Blood group	Language
Eye colour	Hair length
Genetic diseases	Weight
Natural hair colour	Tattoos
Skin colour	Scars
Ability to roll tongue	Piercings

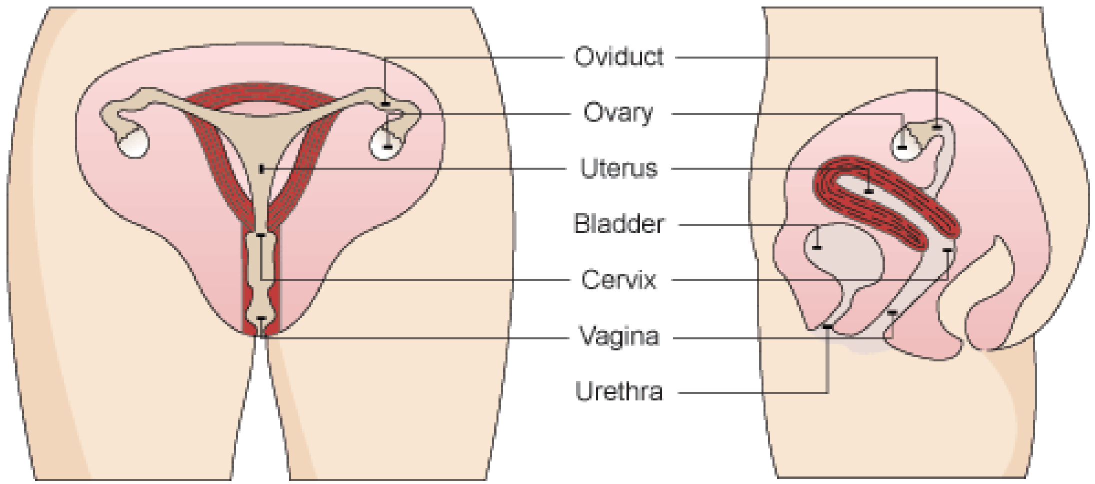
Continuous variation
Continuous variation is when any value is possible within a range.
For example, a person's height can take **any** value between that of the shortest person and of the tallest person in the world.
Other examples of continuous variation include weight, heart rate and hand span.

As there is no limit on the value that can occur within a population, continuous variation is often represented with a line graph:

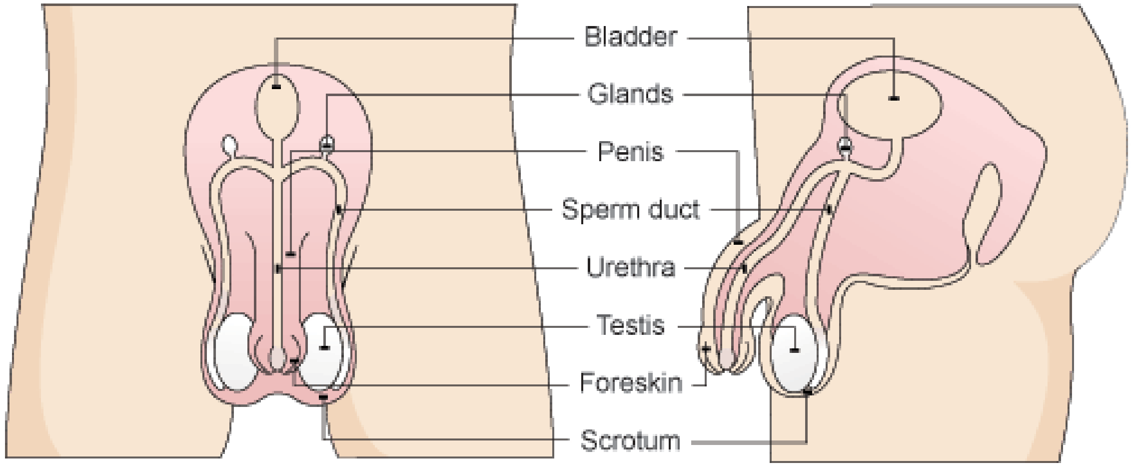
Discontinuous variation
Discontinuous variation is a when a characteristic can only have a certain value. For example, your blood group could only be A, B, AB or O. There is no in between value.
Other examples of discontinuous variation include gender, ability to roll your tongue and eye colour.
A bar chart can be used to represent discontinuous variation:



Female reproductive system



Male reproductive system



Practice: Cover up the labels in the diagrams, can you remember each organ? What about their functions?

Functions of female reproductive organs

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

Functions of male reproductive organs

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

Continuous variation is when any __________ is possible within a _________.
Give some examples:

Discontinuous variation is a when a _________________ can only have a certain ______________.
Give some examples

Sketch a graph to show Continuous Variation

10: Genes
Task 1

Sketch a graph to show Discontinuous Variation

- **Circle the INHERITED characteristics**
- **Underline the ENVIRONMENTAL characteristics**

Tattoo

Ability to roll tongue

Blood Group

Skin Colour

Genetic Disease

Scars

Eye Colour

Language

Hair Length

Chapter 10: Genes – TASK 2

List all the things that can happen during puberty to your body (boy or girl).

Define these words-

Adolescence–

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Intercourse–

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Foetus (Fetus)–

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Gestation-

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Menstruation–

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Contraception–

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Pollination–

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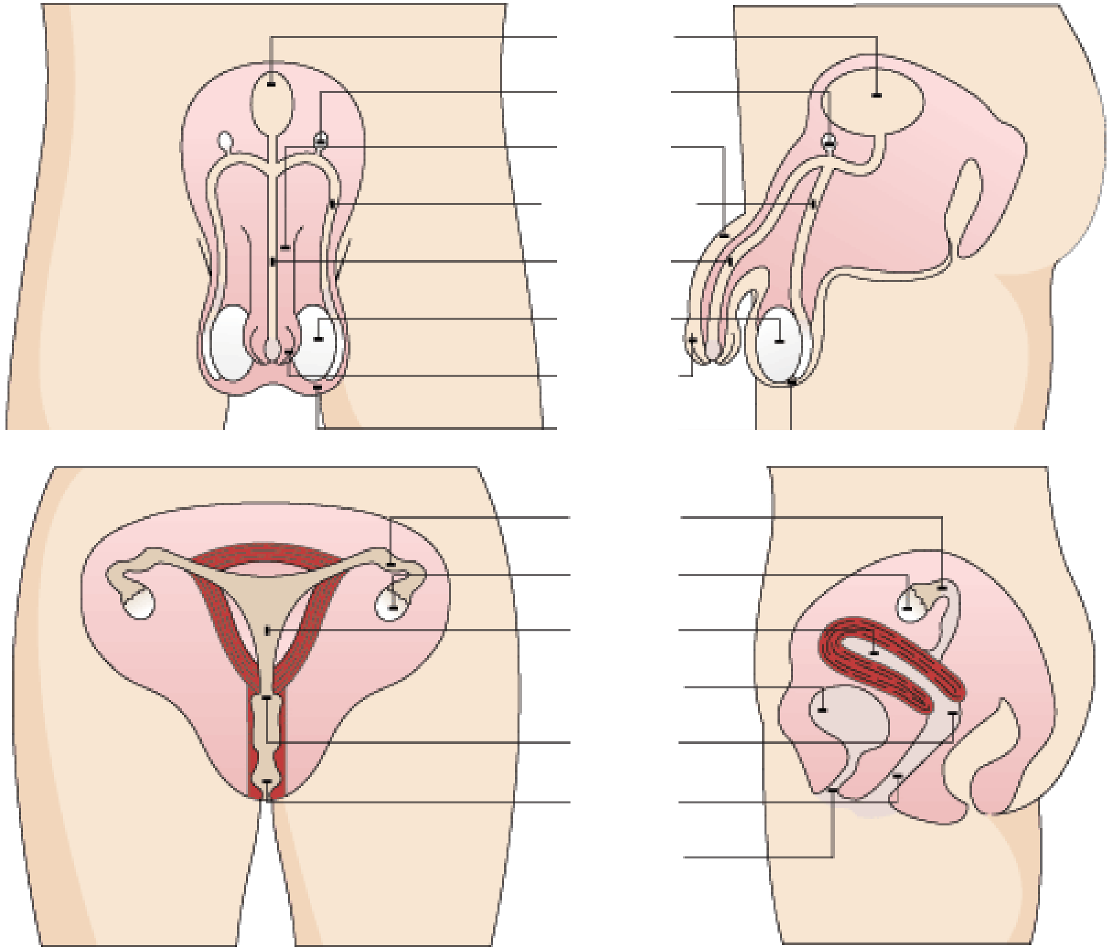
Label the male and female reproductive organs.



Explain where a baby grows and the stages of development it goes through and at what times.

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What happens during intercourse and how do sperm reach the egg?

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Explain in detail what the Menstrual cycle is and what days things generally happen.

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