Year 8 Homework Booklet

WHGS

8BD Digestion and Nutrition

The 7 nutrients		
Nutrient	**Use in the body**	**Good sources**
Carbohydrate	To provide energy	Cereals, bread, pasta, rice and potatoes
Protein	For growth and repair	Fish, meat, eggs, beans, pulses and dairy products
Lipids (fats and oils)	To provide energy. Also to store energy in the body and insulate it against the cold.	Butter, oil and nuts
Minerals	Needed in small amounts to maintain health	Salt, milk (for calcium) and liver (for iron)
Vitamins	Needed in small amounts to maintain health	Fruit, vegetables, dairy foods
Fibre	To provide roughage to help to keep the food moving through the gut	Vegetables, bran
Water	Needed for cells and body fluids	Water, fruit juice, milk

Chemical food tests

Nutrient	Chemical test	Positive result
Starch	Iodine solution	Iodine solution turns from orange/brown→ blue black
Sugar	Benedict's solution & heat	Benedict's solution turns from: blue → green /yellow/brick red
Fat	Ethanol & shake, then water & shake	Ethanol turns cloudy white
Protein	Biuret reagent	Biuret reagent changes from blue to purple

Respiration

A chemical reaction that takes place in all living cells to release the energy in food:

Sugar + oxygen → carbon dioxide + water

Energy released from food is used for things like:
- muscle contraction
- keeping warm
- making new cells

Each person needs a different amount of energy depending on factors such as:
- gender (male or female)
- age
- amount of daily activity

Energy in food is measured in **kilojoules**, kJ.

A **balanced diet** contains the right energy intake **and** the correct amounts of necessary nutrients.
An **imbalanced diet** contains too much or too little of a particular nutrient and/or energy.

Nutrient deficiency diseases:
Mineral deficiency diseases are caused when your diet is lacking in a particular mineral:
- iron deficiency causes anaemia, where there are too few red blood cells;
- iodine deficiency can cause a swelling in the neck called goitre.

Vitamin deficiency diseases are caused when you diet is lacking in a particular vitamin:
- vitamin A deficiency can cause blindness;
- vitamin C deficiency causes scurvy, which makes the gums bleed;
- vitamin D deficiency causes rickets, which makes the legs bow outwards in growing children.

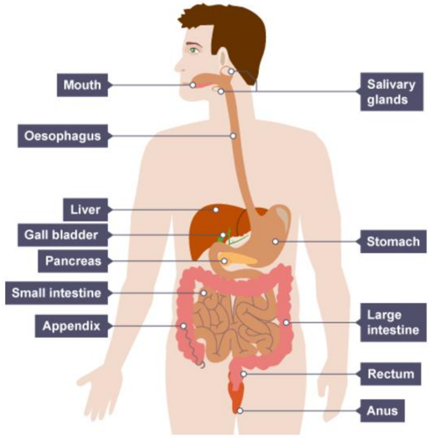
Energy imbalances in diets
If the amount of energy you get from your food is different from the amount of energy you use, your diet will be imbalanced:

- too little food/ energy can make you underweight
- too much food/ energy can make you overweight

Imbalanced energy intake diseases:
Starvation happens if you eat so little food that your body becomes very underweight. This can eventually cause death.

Obesity happens when you eat so much food that your body becomes very overweight. Diseases linked with obesity include heart disease, diabetes, arthritis and stroke.

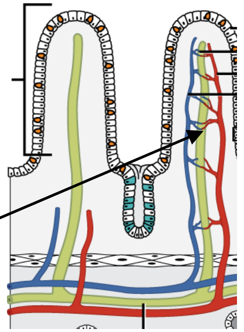
Stages of digestion
- Digestion starts in the **mouth**, where teeth **mechanically digest** food during chewing. **Chemical digestion** begins here when the food mixes with saliva.
- Food is swallowed as passes down the **oesophagus.**
- When food reached the **stomach**, the food continues to be **mechanically digested** when the stomach muscles contract to churn food. **Chemical digestion** also continues when the food mixes with acid and enzymes inside the stomach.
- Most **digestion** happens inside the **small intestine** when the food mixes with **enzymes** and **bile (chemical digestion),** and is moved along the canal by **muscle contractions (mechanical digestion)**
- Digested food is **absorbed** into the bloodstream, by diffusion from the small intestine. Water is reabsorbed into the body in the small intestine
- Undigested food passes out of the anus as faeces.



The role of liver and pancreas
- The liver produces **bile**, which helps the digestion of lipids (fats and oil).
- The pancreas produces biological **catalysts** called digestive **enzymes** which speed up the digestive reactions.

Absorption by diffusion across a surface happens efficiently if:
- the surface is thin;
- its area is large.

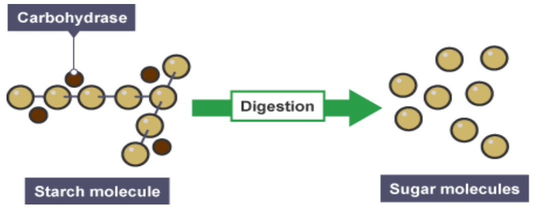
The inner wall of the small intestine is adapted. It has:
- a thin wall, just one cell thick;
- many tiny **villi** to give a really big **surface area.** The villi contain many **capillaries** to carry away the absorbed food molecules.



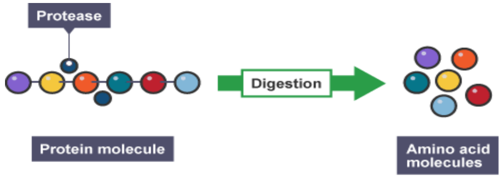
Digestion is when large **insoluble** food particles are broken down into small **soluble** particles so that they can be absorbed into our bloodstream.

This is carried out by **enzymes** - special proteins that can break large molecules into small molecules.

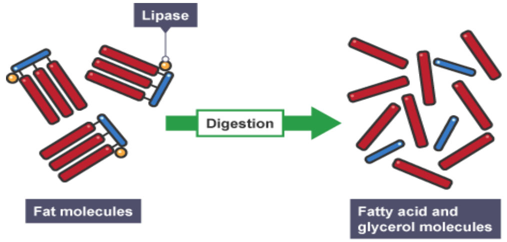
Different enzymes can break down different nutrients:
- **Carbohydrates** (eg starch) are broken down into **sugar** - by **carbohydrase** enzymes



- **Proteins** are broken down into **amino acids** - by **protease** enzymes;



- **Lipids** (ie fats and oils) are broken down into **fatty acids** and **glycerol** - by **lipase** enzymes.



At very high temperatures, these enzymes will be **denatured.**

Digestive enzymes cannot break down dietary fibre, which is why the body cannot absorb it.
Minerals, vitamins and water are not digested, as they are already small enough to be absorbed.

The digestive system contains some good **bacteria** which are important because they:
- can digest certain substances humans cannot digest;
- reduce chance of harmful bacteria multiplying, causing disease;
- produce vitamins that humans need eg vitamins B & K.

The 7 nutrients		
Nutrient	**Use in the body**	**Good sources**
Carbohydrate		Cereals, bread, pasta, rice and potatoes
	For growth and repair	
Lipids (fats and oils)		Butter, oil and nuts
	Needed in small amounts to maintain health	
Vitamins		
Fibre		Vegetables, bran
	Needed for cells and body fluids	Water, fruit juice, milk

Chemical food tests		
Nutrient	**Chemical test**	**Positive result**
	Iodine solution	
Sugar		
		Ethanol turns cloudy white
Protein		Biuret reagent changes from blue to purple

1. What is respiration?
2. Write the word equation for respiration

1. What are the 3 ways energy released from respiration is used?
2. State the 3 factors that determine how much energy a person needs
3. What is energy measured in?

8BD Digestion and Nutrition

1. What is a balanced diet?
2. What is an imbalanced diet?
3. Write down 2 mineral deficiency diseases and their causes
4. Write down 2 vitamin deficiency diseases and their causes
5. What is starvation? What can it lead to?
6. What is obesity? What can it lead to?

1. Where does digestion begin?
2. Describe what happens in the mouth during digestion
3. What do the muscles in the stomach do? Why?
4. How does the stomach chemically digest the food?
5. Name the 2 chemicals that mix with the food in the small intestine
6. By what process is food absorbed into the bloodstream?
7. What is the role of the liver?
8. What is the role of the pancreas?

1. What must a surface have efficient diffusion?
2. How is the inner wall of the small intestine adapted for diffusion?

1. What is digestion?
2. Name the chemical that carries out digestion
3. Which enzymes breaks down carbohydrates?
4. Which enzymes breaks down proteins?
5. Which enzyme breaks down fats?
6. What are fats broken down into?
7. What are proteins broken down into?
8. What are carbohydrates broken down into?
9. What happens to enzymes at high temperatures?
10. What can’t digestive enzymes break down?
11. Why don’t we need to digest vitamins and minerals?

1. Why do we need certain good bacteria in the digestive system?

A **food chain** shows the different **species** of an organism in an **ecosystem**, and what eats what.

A food chain always starts with a **producer.**

A food chain ends with a **consumer.**

Here is an example of a simple food chain:

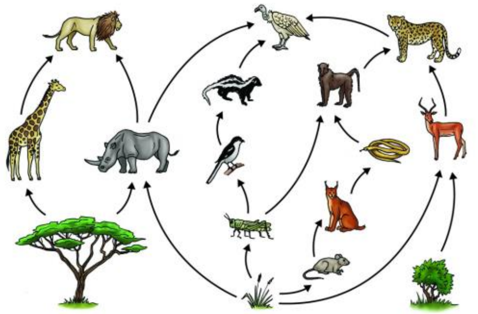
Consumer
Tertiary consumer
Carnivore

Consumer
Secondary consumer
carnivore

Consumer
Primary consumer
herbivore

Producer

When all the food chains in an ecosystem are joined up together, they form a **food web**.



Food webs are just several food chains joined together.
Some of the food chains in this food web are:
Tree → giraffe → lion
Tree → rhino → lion
Grass → rhino → eagle
Grass → grass hopper → small bird → racoon → eagle

Ecological relationships and classification

When dead plant and animal materials are broken down by **decomposers**, it is called **decay.**

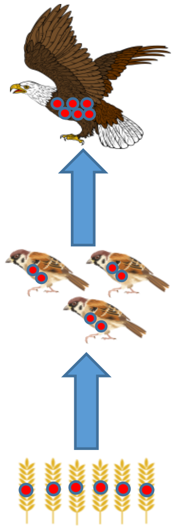
Decay releases the nutrients locked up in the dead material, back into the ground, so that it can be used for new plant growth.

This is important because there is only a finite amount of nutrients on our planet. Decay means that the nutrients can be constantly recycled.

The ideal conditions for decay are:

1) Plenty of oxygen, so that decomposers can respire.
2) Warm temperatures so that decomposers are more active.
3) Some moisture as this allows important chemical reactions to take place.

Bioaccumulation is the build up of toxic material through a food chain, often with devastating effects for the top carnivore.



= toxic particle

Adaptations are features that help organisms compete better and survive in their environment. For example:

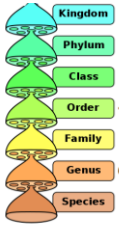
 Polar bear	White coat → camouflage Big feet → spread weight to reduce pressure on snow/ice Thick layer of fat → insulation & food store Greasy fur → water runs off easily after swimming
 Camel	Hump that stores fat → reduce heat loss over rest of the body Sandy colour → camouflage Big feet → spread weigh to reduce pressure on sand

Natural selection

- Individuals in a species show a wide range of **genetic variation** due to mutations**.**
- Individuals who are best adapted to the environment are **more likely to survive** and **reproduce.**
- The **genes** that allow these individuals to be successful are **inherited** by their offspring.
- Over many generations these small differences add up to the new evolution of species.

Classification is the sorting out of organisms into groups based on their similarities.

Today's classification system is designed by Carl Linnaeus
Organisms were divided into kingdoms. Each kingdom was then sub-divided into smaller groups (phylum) and these into even smaller groups (class), so on and so forth.
Species are the smallest group.



Many organisms with few similar characteristics

One type of organism, with many similar characteristics

Extinction
Changes in the environment may leave individuals less well adapted to compete for resources (eg food, water and mates). If an entire species is unable to compete successfully and reproduce it will lead to extinction.

Here are some of the changes in the environment that can cause a species to become extinct:

- a new disease;
- a new predator;
- a change in the physical environment (eg climate change);
- competition (from another species that is better adapted, including competition from humans).

Factors that can affect the population of individual organisms
Temperature (land/water)
Seasonal changes
Rainfall
Increased predation/hunting
Deforestation
pH of soil/water
Use of chemicals in farming
Disease
Pollution
New predators

Might lead to:
- a shortage of food
- loss of habitat
- lack of partners to reproduce with
- Less water

Estimating populations
Method:
Count the numbers of a species within a small section of the area being sampled by:

1. Using a **quadrat to** make multiple random small samples.

2. A mean is then calculated and multiplied up to the whole area.

Biodiversity
It is important to conserve the variety of living organisms on Earth because:

- moral and cultural reasons;
- In the future, plant species might be identified for medicines;
- keeps damage to food chains and food webs to a minimum;
- protects our future food supply.

Seeds are carefully stored in **seed banks** so that new plants may be grown in the future.
Seed banks are an example of a **gene bank**. Gene banks are used to preserve genetic animals and plant material for the future.

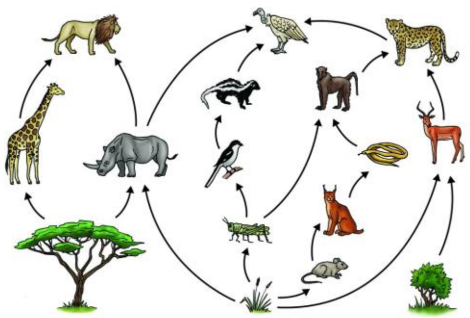
1. What is a food chain?

2. What does a food chain always start with?

3. What does a food chain always end with?

4. What type of consumer is a herbivore?

1. What is a food web?



1. How many food chains are there?

2. What do all food webs begin with?

Ecological relationships and classification

1. What is decay?

2. What are decomposers?

3. Why is decay important?

4. What are the ideal conditions for decay?

1. What is bioaccumulation?

2. Where in the food chain is it most devastating?

3. Where in the food chain does accumulation of the toxic particle begin?

1. What is adaptation?

1. In the box below, explain how each adaptation helps the animal survive in its environment

 Polar bear	Big feet → Thick layer of fat → Greasy fur →
 Camel	Hump that stores fat → Sandy colour → Big feet →

1. what do individuals in a species show? What is it caused by?

2. Organisms that are best adapted to their environment are able to do what?

3. What do the offsprings inherit?

1. What is classification?

2. Who created classification system?

3. What are species in the classification system?

1. Why do species become extinct?

2. What changes in the environment can lead to extinction?

1. Write down 5 factors that can affect the population of individual organisms

2. What do these factors can lead to?

1. What equipment is used to count the number of species?

2. Write down the steps for estimating population size in a small area.

1. What needs to be conserved on Earth?

2. Give 2 reasons why it is important to conserve biodiversity?

3. What are gene banks?

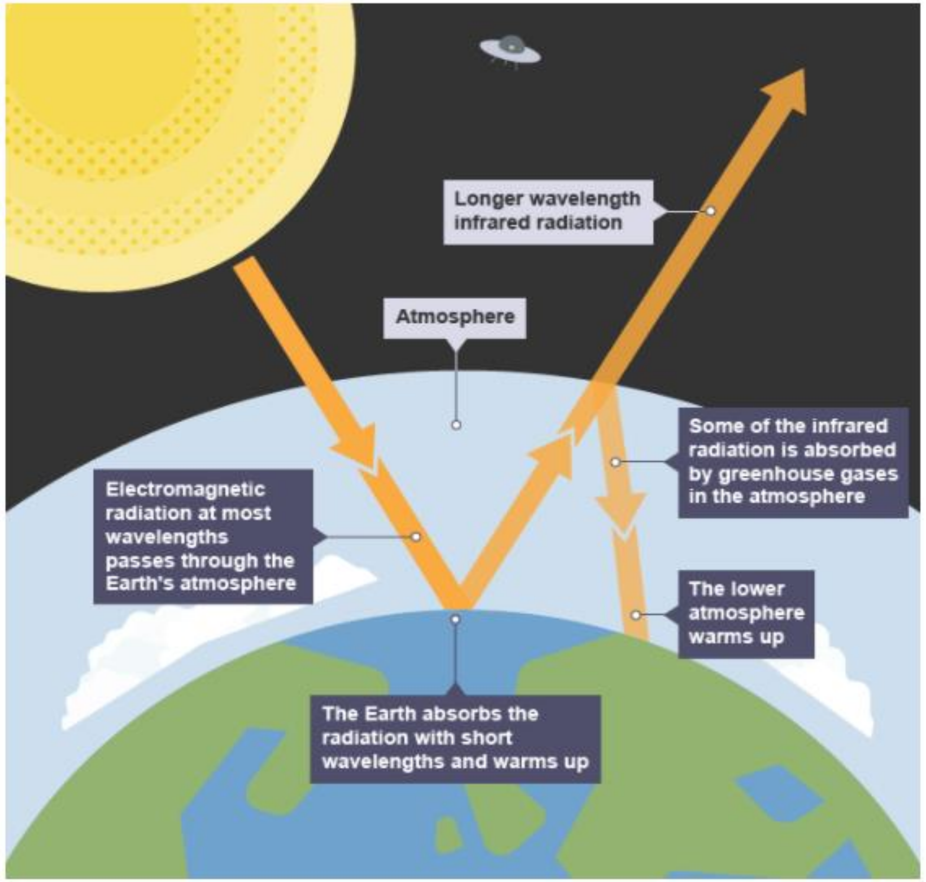
4. Where are seeds stored?

8CM Materials and the Earth

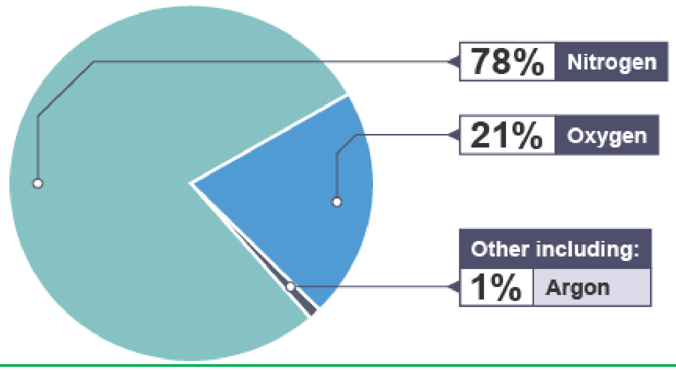
The greenhouse effect
- Thermal energy from the Earth's surface escapes into space;
- If too much thermal energy escaped, the planet would be very cold;
- Greenhouse gases in the atmosphere, trap escaping thermal energy;
- This causes some of the thermal energy to pass back to the surface;
- This is called the greenhouse effect, and it keeps our planet warm;
- Carbon dioxide is an important greenhouse gas.

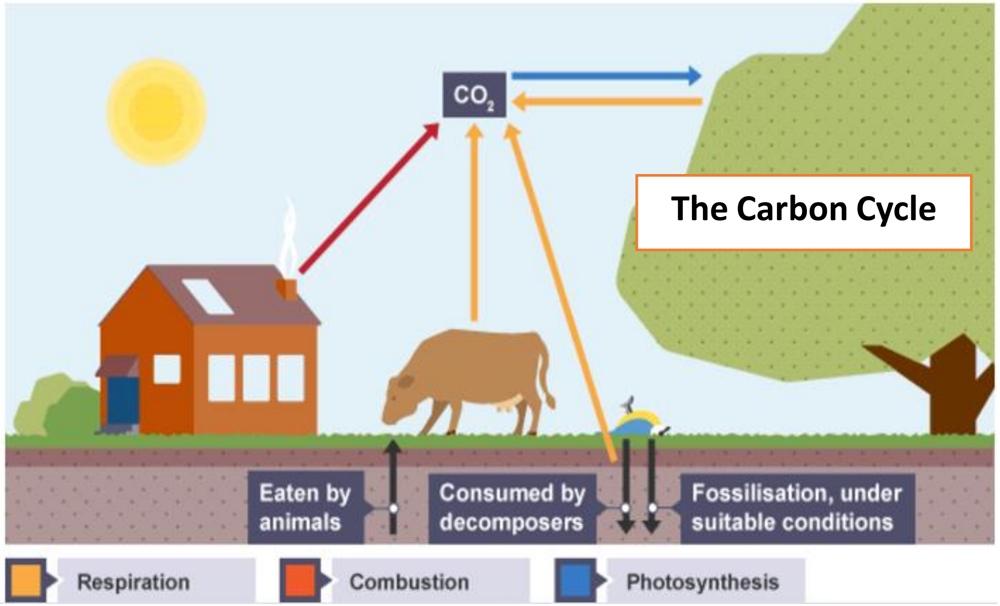
Humans burn fossil fuels which releases carbon dioxide, increasing the greenhouse effect. More thermal energy is trapped by the atmosphere, causing the planet to become warmer than it would be naturally. This increase in the Earth's temperature is called **global warming**.

Climate change and its effects as a result of global warming includes:
- ice melting faster than it can be replaced in the Arctic and Antarctic
- the oceans warming up – their water is expanding and causing sea levels to rise
- changes in where different species of plants and animals can live



The Earth's atmosphere

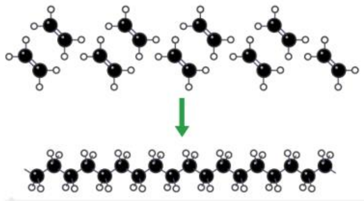




Ceramic materials:
- are solids made by baking a starting material in a very hot oven or kiln
- are hard and tough
- have very many different uses

Brick and pottery are examples of ceramics.

Polymers:
Polymers are made by joining lots of small molecules together to make long molecules.



- The properties of polymers are:
- chemically unreactive
- solids at room temperature
- plastic – they can be moulded into shape
- electrical insulators
- strong and hard-wearing

Polymers are usually chemically unreactive.
Advantage: plastic bottles will not react with their contents.
Disadvantage: they do not rot quickly and they can cause litter problems.

Composites
Composite materials are made from two or more different types of material.
e.g. MDF is made from wood fibres and glue; fibreglass is made from glass fibres and a tough polymer;

Reinforced concrete is a composite material made from steel and concrete. When the concrete sets, the material is:
- strong when stretched (because of the steel)
- strong when squashed (because of the concrete)

8CM Materials and the Earth

1. What happens to the thermal energy from the Earth's surface?
2. What would happen if too much thermal energy escaped the Earth?
3. What does the green house gases do to the thermal energy?
4. Name one gas that is a green house gas
5. What do you do humans to increase carbon dioxide levels?
6. Explain why this will increase the Earth's temperature?
7. What are the effects of climate change?

1. How are ceramics made?
2. What are the properties of ceramics?

1. How are polymers made?
2. State 4 properties of polymers
3. Polymers are unusually unreactive. What are the advantages and disadvantages of using polymers?

1. What are composites?
2. Give an example of a composite material. What are its properties?

8CM Materials and the Earth

Sedimentary rocks

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

transport → deposition → sedimentation → compaction → cementation

- **Transport**: A river carries pieces of broken rock as it flows along.
- **Deposit**: When the river reaches a lake/sea, it settles at the bottom.
- **Sedimentation**: The deposited rocks build up in layers, called sediments.
- **Compaction**: Weight of sediments on top squashes sediments at bottom.
- **Cementation**: Water is squeezed out from between pieces of rock and crystals of different salts form. The crystals stick the pieces of rock together.

Igneous rocks

Igneous rocks are formed molten rock that has cooled and solidified. Molten (liquid) rock is called magma. If it:

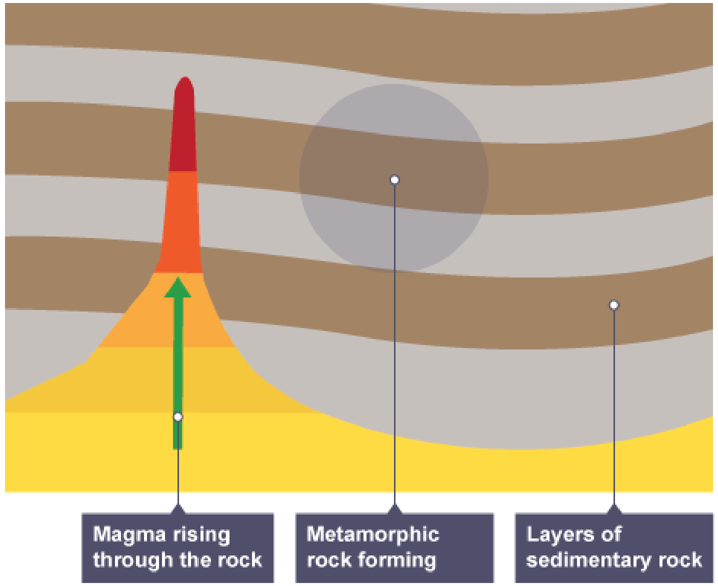
- cools **slowly**, it will form rock with **large** crystals
- cools **quickly**, it will form rock with **small** crystals

	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.

- Earth movements can cause rocks to be deeply buried or squeezed.
- These rocks are heated and put under great pressure.
- They do not melt, but the minerals they contain are changed chemically, forming metamorphic rocks
- Metamorphic rocks rarely contain fossils. Any that were present in the original sedimentary rock will not normally survive the heat and pressure.

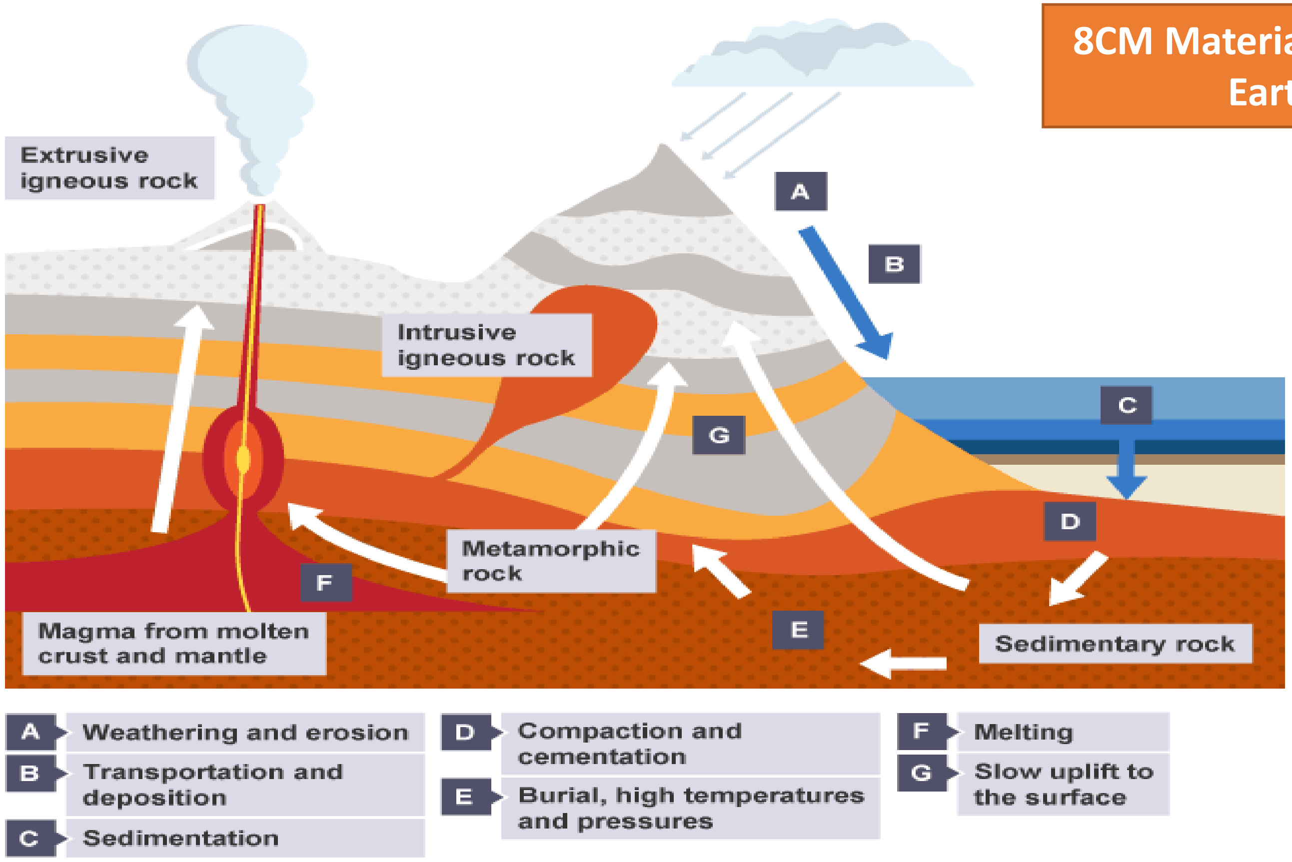


Metamorphic rocks may form from rocks heated by nearby magma

Recycling

The Earth's resources are limited. We can recycle many resources, including:

- **Glass**. It can be melted and remoulded to make new objects. The energy needed is less than the energy needed to make new glass. Must be sorted into different coloured glass ready for recycling, and transported to recycling plants;
- **Metal**. It takes less energy to melt and remould metals than it does to extract new metals from their ores. Aluminium is a metal that melts at a low temperature, so it is attractive for recycling;
- **Paper**. It is broken up into small pieces and reformed to make new sheets of paper. Takes less energy than making new paper from trees. Paper can only be recycled a few times before its fibres become too short to be useful and it is often only good enough for toilet paper or cardboard, or used as a fuel or compost;
- **Plastic**. Many plastics (but not all) can be recycled. For example, some plastic bottles can be recycled to make fleece for clothing. Recycling means that we use less crude oil, the raw material needed for making plastics. They have to be sorted first and this can be difficult, but recycling does stop it ending up in landfill.



1. How are sedimentary rocks formed?

2. Write the sequence of processes that leads to formation of sedimentary rocks

3. Explain the process of transport.

4. Explain the process of deposit.

5. Explain the process of sedimentation.

6. Explain the process of compaction.

7. Explain the process of cementation.

1. How are igneous rocks formed?

2. Explain how cooling of magma affect the crystal size?

	Extrusive	Intrusive
Where the magma cooled		Underground
How fast the magma cooled	Quickly	
Size of crystals		
Examples		Granite and gabbro

8CM Materials and the Earth

1. What are metamorphic rocks?

2. Explain how metamorphic rocks are formed?

3. Why is it rare to find fossils in metamorphic rocks?

1. Why is it important to recycle materials?

2. Which materials can be recycled?

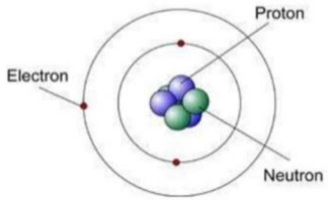
3. Explain how metals can be recycled?

4. What is the advantage of recycling plastics?

Atoms are tiny particles that everything is made of.

They are made of smaller particles called:

- **Protons** (+ positive)
- **Neutrons** (neutral)
- **Electrons** (- negative)



Metals have properties in common. They are:

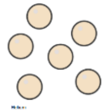
- **shiny**, especially when they are freshly cut
- **good conductors** of heat and electricity
- **malleable** (they can be bent and shaped without breaking)

Elements
There are over a hundred different elements.

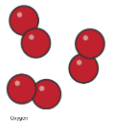
Atoms have the same number of protons as each other.

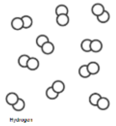
Atoms of differing elements have a different number of protons.

The atoms of some elements do not join together, but instead they stay as separate atoms, eg Helium.



The atoms of other elements join together to make **molecules**, eg oxygen and hydrogen.



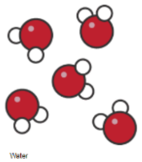


Most metals also have other properties in common. They are:

- **solid** at room temperature, except mercury;
- **hard** and **strong;**
- they have a **high density;**

Compounds
A compound is contains atoms of **two or more different elements**, and these atoms are **chemically joined together.**

For example, water is a compound of hydrogen and oxygen.



Each of its molecules contains two hydrogen atoms and one oxygen atom.

The elements are arranged in a chart called the periodic table. A Russian scientist, Mendeleev, produced the first periodic table in the 19th century.

The modern periodic table is based closely on the ideas he used:

- the elements are arranged in order of increasing atomic number (number of protons);
- the **horizontal** rows are called **periods;**
- the **vertical** columns are called **groups;**
- elements in the same group have the same number of electrons in their outside shell

Chemical formulae
Remember that we use chemical symbols to stand for the elements.
For example, **C stands for carbon**, **S stands for sulfur** and **Na stands for sodium.**

For a molecule, we use the chemical symbols of all the atoms it contains to write down its formula. For example, the formula for **carbon monoxide is CO.**

It tells you that each molecule of carbon monoxide is made of one carbon atom joined to one oxygen atom.

Be careful about when to use capital letters. For example, CO means a molecule of carbon monoxide but **Co is the symbol for cobalt** (an element).

Each element is given its own chemical symbol, like **H for hydrogen** or **O for oxygen.**

Chemical symbols are usually one or two letters.

Every chemical symbol **starts with a capital letter, with the second letter written in lower case**.For example, Mg is the correct symbol for magnesium, but mg, mG and MG are wrong.

Mg	mg	mG	MG
✓	✗	✗	✗

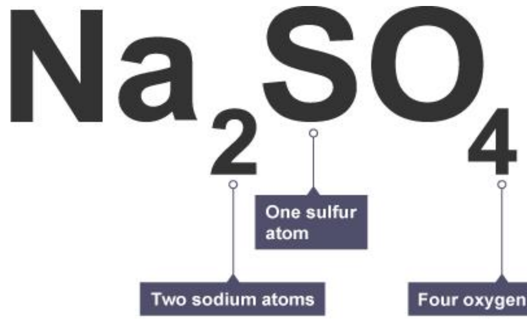
Numbers in formulae
We use numbers to show when a molecule contains more than one atom of an element.

The numbers are written **below** the element symbol. For example, CO_2 is the formula for carbon dioxide.

It tells you that each molecule has **one carbon atom** and **two oxygen atoms**.

The **small numbers go at the bottom**. For example:

- CO_2 is correct**;**
- CO^2 and CO2 are wrong.



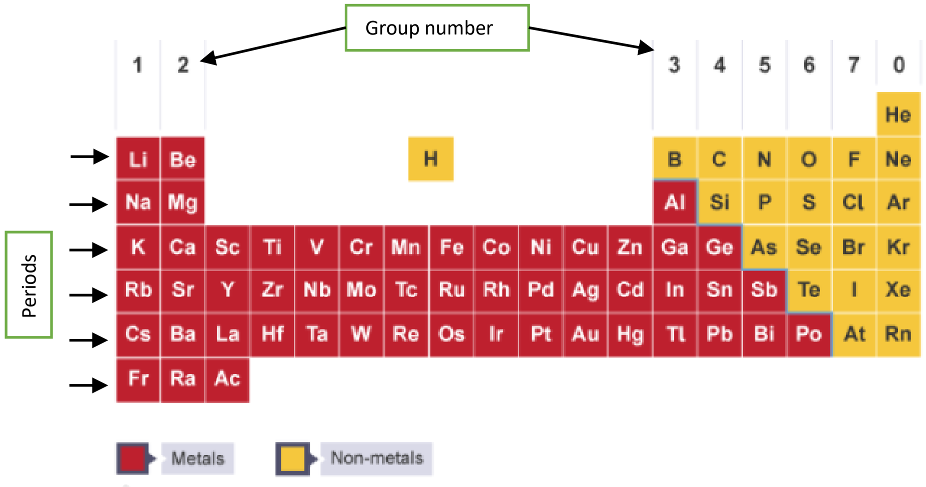
Some formulae are more complicated. For example, the formula for sodium sulfate is Na_2SO_4. It tells you that sodium sulfate contains two sodium atoms (Na x 2), one sulfur atom (S) and four oxygen atoms (O x 4).

We can use the periodic table to predict the properties of elements in the same group.

Group 7	Melting point	Density	Reactivity
Fluorine	Increases down the group ↓	Increases down the group ↓	Decreases down the group ↓
Chlorine			
Bromine			
Iodine			

Group 1	Melting point	Density	Reactivity
Lithium	Decreases down the group ↓	Increases down the group ↓	Increases down the group ↓
Sodium			
Potassium			
Rubidium			

8CP: Periodic Table



8CP: Periodic Table

1. what are atoms?
2. What is the charge of a proton?
3. What is the charge of a neutron?
4. What is the charge of an electron?

1. What are the common properties of metal

1. How many different elements are there?
2. What do all atoms of the same element have in common?
3. Why are some atoms different from one another?
4. What do you call when atoms join together?

1. In what state are most metals in at room temperature?
2. What other common properties do most metals have

1. What are compounds?
2. Give an example of a compound
3. What is water made up of?

1. Who designed the periodic table?
2. On what basis is the modern periodic table designed on?

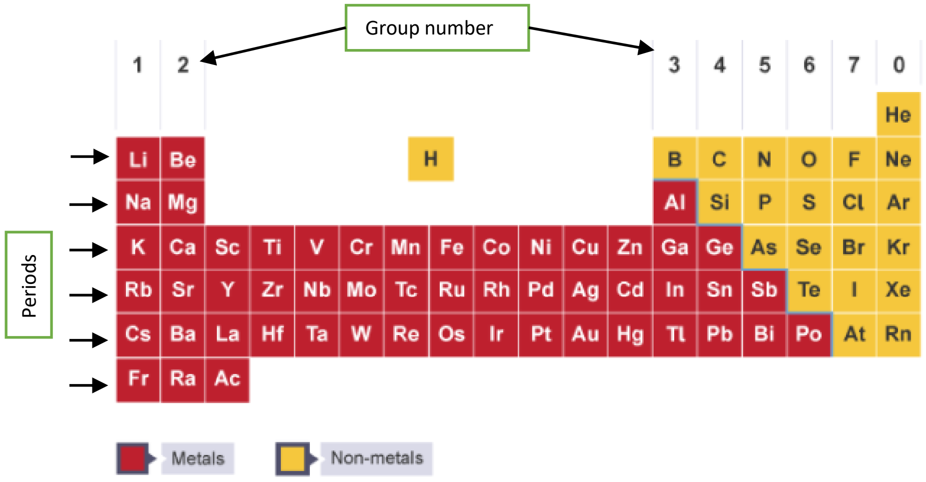
1. What is used to represent elements?
2. Which element does 'C' stand for?
3. Write down the formula for carbon monoxide
4. What does the chemical formula of carbon monoxide tell you?

1. What are chemical symbols usually made up of?
2. For every chemical symbol, what does the first letter always start with?

1. Complete the table below:

Group 7	Melting point	Density	Reactivity
Fluorine			
Chlorine			
Bromine			
Iodine			

Group 1	Melting point	Density	Reactivity
Lithium			
Sodium			
Potassium			
Rubidium			

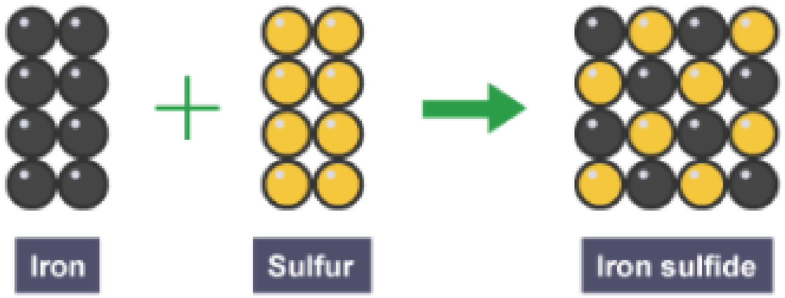


1. What is used to show when a molecule has more than one atom of an element?
2. Where are the numbers written in a chemical formula
3. For the chemical formula below:
    a) how many elements are there in total?
    b) How many sodium atoms are there?
    c) How many sulphur atoms are there?
    d) How many oxygen atoms are there

$$Na_2SO_4$$

Chemical reactions

When chemicals react, the atoms are rearranged. For example, iron reacts with sulfur to make iron sulfide



Iron sulfide, the compound formed in this reaction, has different properties to the elements it is made from.

	Iron	Sulfur	Iron sulfide
Type of substance	Element	Element	Compound
Colour	Silvery grey	Yellow	Black
Is it attracted to a magnet?	Yes	No	No
Reaction with hydrochloric acid	Hydrogen formed	No reaction	Hydrogen sulfide formed, which smells of rotten eggs

- The atoms in a compound are joined together by forces called **bonds**.
- The properties of a compound are different from the elements it contains;
- You can only separate its elements using another chemical reaction;
- Separation methods like filtration and distillation will not do this.

Chemical equations

We summarise chemical reactions using equations:

reactants → products

- **Reactants** are shown on the **left** of the arrow;
- **Products** are shown on the **right** of the arrow.

Do not write an equals sign instead of an arrow.

If there is more than one reactant or product, they are separated by a + sign. For example:

copper + oxygen → copper oxide

Reactants: copper and oxygen
Products: copper oxide

A **word equation** shows the names of each substance involved in a reaction, and **must not include any chemical symbols or formulae**

8CP: Periodic Table

Conservation of mass

When atoms are rearranged in a chemical reaction, they are not destroyed or created.

- **Reactants** - the substances that react together;
- **Products** - the substances that are formed in the reaction;
- **Mass is conserved** in a chemical reaction, this means…
- Total mass of the reactants = total mass of the products;

Symbol equations

A balanced **symbol** equation includes the **symbols** and **formulae** of the substances involved. For example:

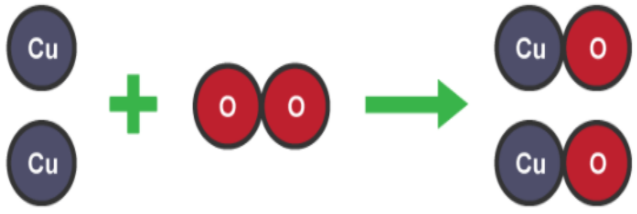
Word equation:
Copper + Oxygen → Copper Oxide

Symbol equation (unbalanced):
$Cu + O_2 \rightarrow CuO$

There is one copper atom on each side of the arrow, but two oxygen atoms on the left and only one on the right. This is **unbalanced.**

A **balanced** equation has the **same number of each type of atom on each side of the arrow.** Here is the balanced symbol equation:

$$2Cu + O_2 \rightarrow 2CuO$$



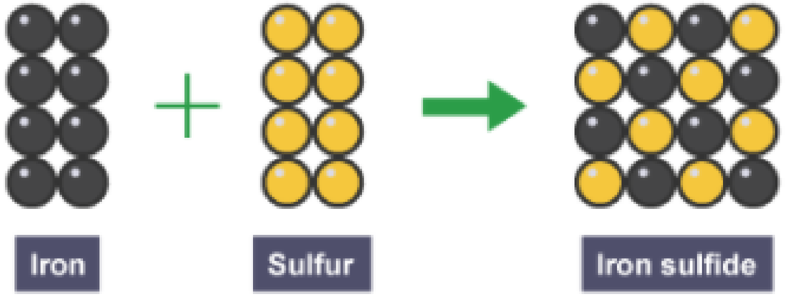
Some more examples of balanced symbol equations

- $C + O_2 \rightarrow CO_2$
- $2H_2 + O_2 \rightarrow 2H_2O$
- $2Mg + O_2 \rightarrow 2MgO$
- $CuCO_3 \rightarrow CuO + CO_2$
- $Mg + 2HCl \rightarrow MgCl_2 + H_2$

Take care when writing formula – e.g. for carbon dioxide:
CO_2 NOT CO^2 or Co_2

1. Describe what happens to atoms during a chemical reaction?

2. For the reaction below, describe what is happening?



3. What is the name of the force between atoms that are joined together?

4. What happens to the properties of elements after joining to other elements in a compound?

5. How can you separate elements in a compound?

6. Which separation methods cannot be used to separate elements in a compound?

1. How do you summarise a chemical reaction?

2. Where are the reactants shown?

3. How are the products shown?

4. What must you not write when showing a chemical reaction?

5. Write the chemical reaction for the following:
   Reactants: copper and oxygen
   Products: copper oxide

1. What is a balanced equation?

2. For each symbol equation, state whether it is balanced or unbalanced:

   a) $C + O_2 \rightarrow CO_2$

   b) $H_2 + O_2 \rightarrow H_2O$

   c) $2Mg + O_2 \rightarrow 2MgO$

   d) $CuCO_3 \rightarrow CuO + CO_2$

   e) $Mg + HCl \rightarrow MgCl_2 + H_2$

8CP: Periodic Table

1. What is the conservation of mass?

2. What are reactants?

3. What are products?

4. What is the mass conserved?

8PE Electricity and Magnetism

Bar magnets
Most materials are not magnetic.
A magnetic material can be **magnetised** or will be attracted to a magnet.
Not all metals are magnetic.
These metals are magnetic:
- Iron
- Cobalt
- nickel
- steel (because it contains iron).

A bar magnet is a **permanent magnet -** its magnetism cannot be turned on or off.

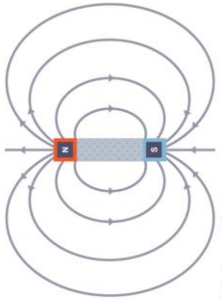
A bar magnet has two magnetic poles:
- north pole (or north-seeking pole)
- south pole (or south-seeking pole)

Attract and repel
Opposite poles will attract, and like poles will repel.

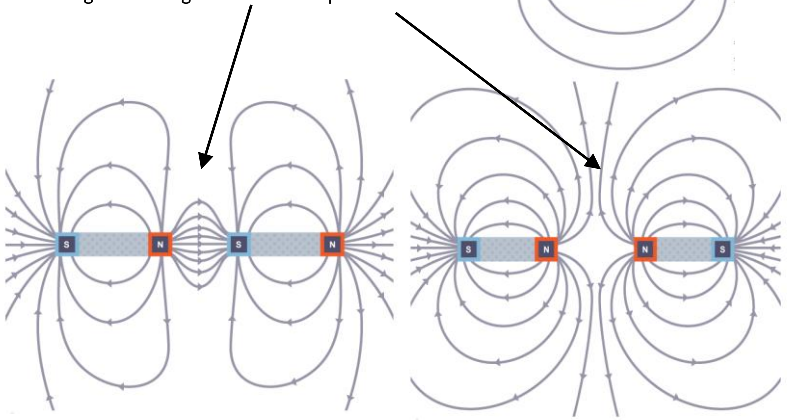
Testing for magnets
You can only show that an object is a magnet if it repels a known magnet.

Magnetic fields
A magnet creates a magnetic field around it (you cannot see a magnetic field)
A **non-contact force** is exerted on a magnetic material brought into a magnetic field. It is **non-contact force** because the magnet and the material do not have to touch each other.

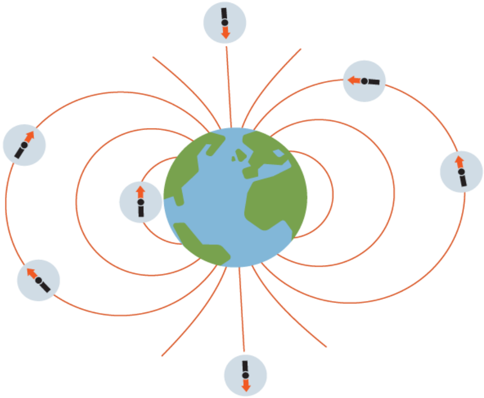
We represent magnetic fields using diagrams
- each field line has an arrow from **north to south**;
- the field lines are more concentrated at the poles;
- the magnetic field is strongest at the poles.



Field lines also show what happens to the magnetic fields of two magnets during attraction or repulsion.



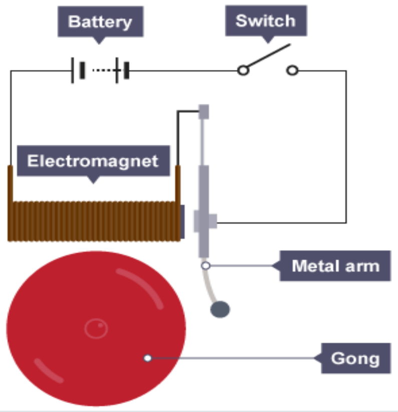
The Earth's magnetism
The Earth behaves as if it contains a giant bar magnet.
Its magnetic field lines are most concentrated at the poles.
This magnetic field can be detected using magnetic materials or magnets.



The compass
A compass comprises:
- a magnetic needle mounted on a pivot (so it can turn freely)
- a dial to show the direction

If the needle points to the N on the dial, you know that the compass is pointing north.

Electric bell
Electric bells like the ones used in most schools also contain an electromagnet.

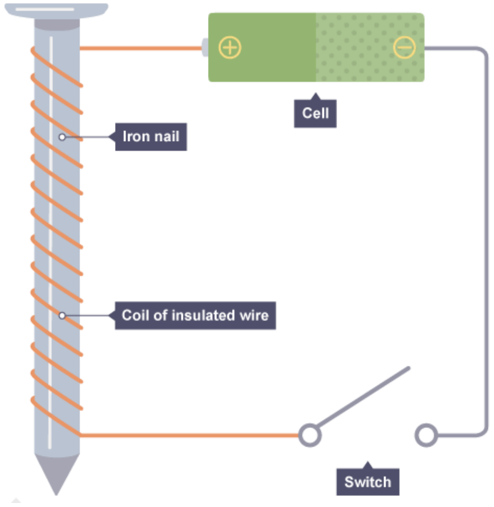


Electromagnets
When an electric current flows in a wire, it creates a magnetic field around the wire.
The magnetic field around an electromagnet is the same as around a bar magnet.

We can make the electromagnet stronger by:
- wrapping the coil around a piece of iron (such as an iron nail)
- adding more turns to the coil
- increasing the current flowing through the coil

Too much current can cause heating.

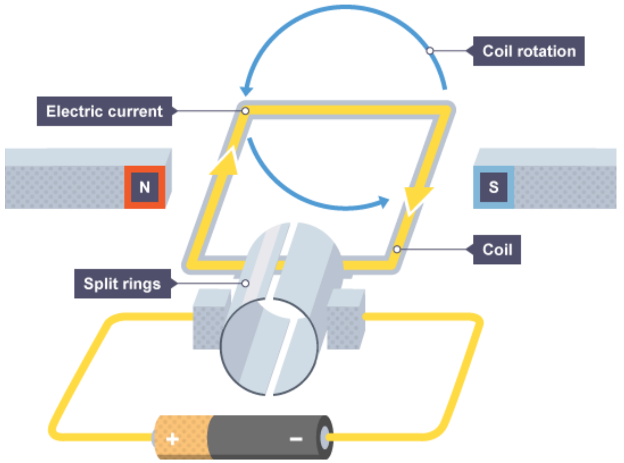
Advantages of electromagnets:
- they can be turned on and off
- the strength of the magnetic field can be varied
- reversing the current (turning the battery around), reverses the direction of the field (swaps the poles)



DC motors
Passing an electric current through a wire in a field will make the wire move.
This is called the **motor effect**.

The diagram shows a simple electric motor:
- there is an electric current in the coil of wire
- this generates a magnetic field;
- which interacts with the fixed magnets;
- this makes the coil rotate

The speed of the motor can be increased by:
- increasing the **strength of the magnetic field**
- **increasing the current** flowing through the coil



8PE Electricity and Magnetism

1. What can you do to magnetic materials?

2. State 3 magnetic metals

3. What is a permanent magnet?

4. What are the two magnetic poles of bar magnet called?

5. Which poles attract and repel?

---

1. What type of force is exerted on a magnetic material brought into a magnetic field?

2. Why is it a non-contact force?

3. Draw a magnetic bar with its magnetic field

4. Where is the magnetic field strongest?

5. Draw two magnets to show what happens to the magnetic field lines during attraction

---

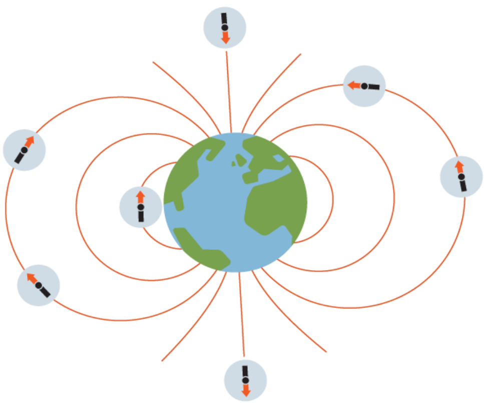
1. What does the Earth behave like?

2. Where are the magnetic field lines concentrated at?

3. How can you detect the Earth's magnetic field?

4. What is a compass comprised of?

5. What does it mean when the needle of a compass points to the N on the dial?



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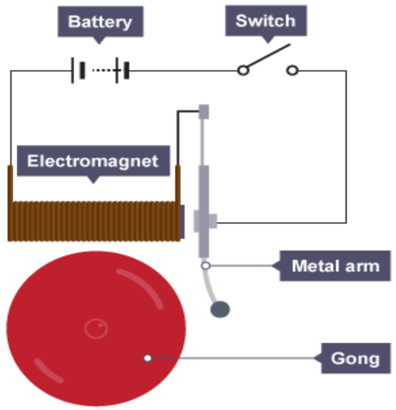
1. What does an electric bell contain?



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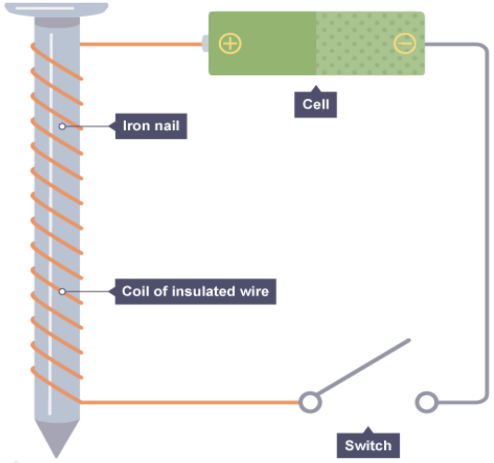
1. What is an electromagnet?

2. How do you create a magnetic field around a wire?

3. What are the 3 ways of making the electromagnet stronger?

4. What are the advantages of using an electromagnet?



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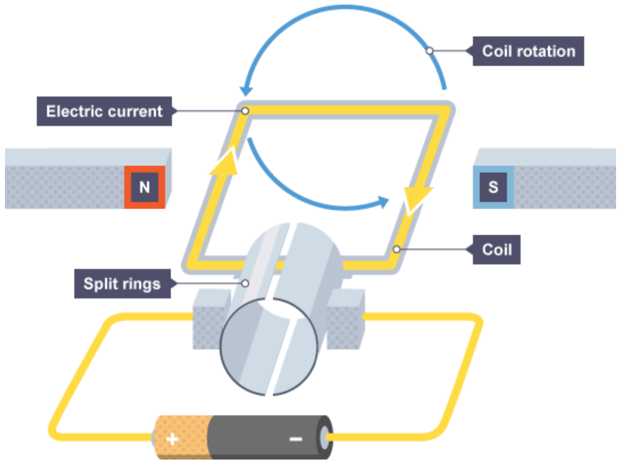
1. What is the motor effect?

2. The diagram on the right shows a simple electric motor.
   a) Which part is carrying an electric current?
   b) What is generated by the electric current?
   c) The magnetic field from the coil interacts with the 2 magnets. How does this affect the coil?

3. Explain how you can increase the speed of the motor?



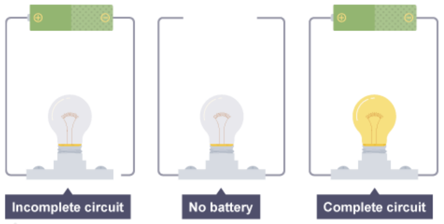
8PE Electricity and Magnetism

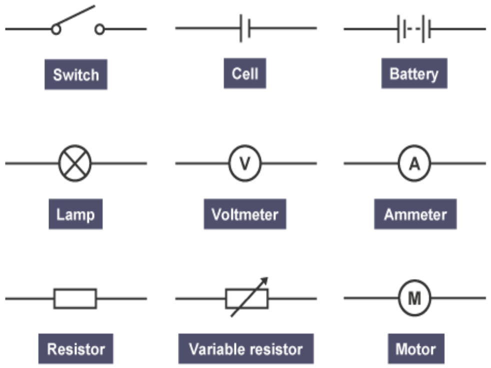
Electric charge
Some particles carry an electric **charge**.
In electric wires these particles are **electrons**.

Electric current
An electric current is a flow of charge, and in a wire this will be a flow of electrons.

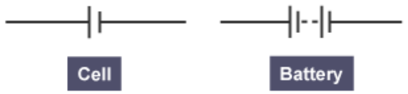
We need two things for an electric current to flow:

- something to transfer energy to the electrons, such as a battery or power pack
- a complete circuit for the electrons to flow through



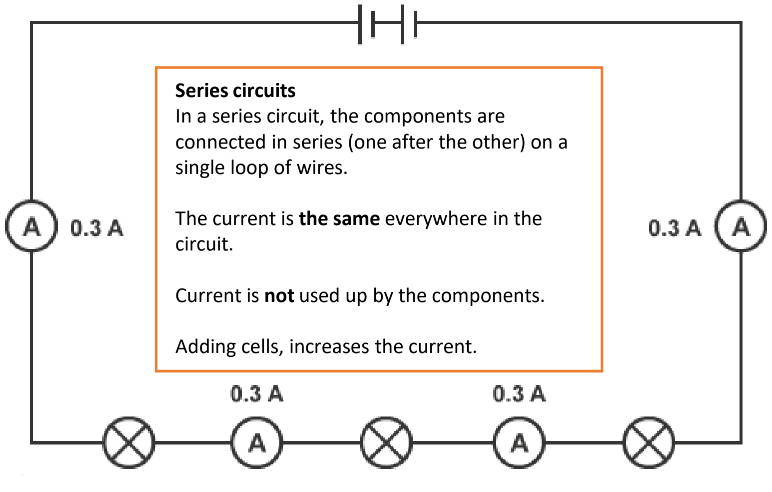


Circuit symbols



Conductors and insulators of electricity
Different materials have different resistances:

- an electrical **conductor** has a **low resistance;**
- an electrical **insulator** has a **high resistance.**

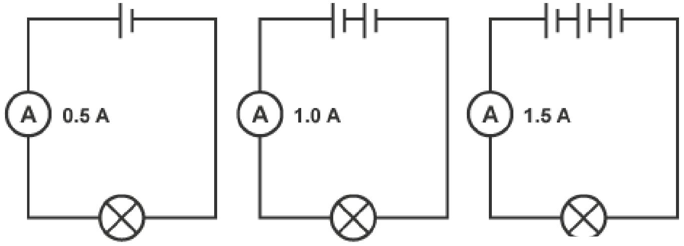


Series circuits
In a series circuit, the components are connected in series (one after the other) on a single loop of wires.

The current is **the same** everywhere in the circuit.

Current is **not** used up by the components.

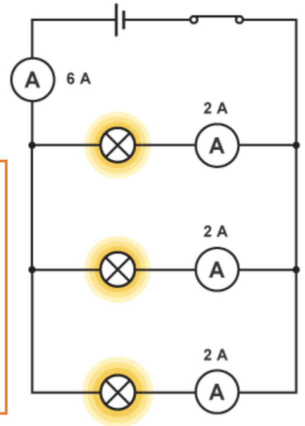
Adding cells, increases the current.



Parallel circuits
In a parallel circuit, the components are connected on different branches of the wire.

When components are connected in parallel, the current is **shared** between the components.

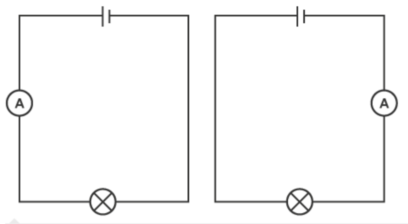
If a bulb breaks in a parallel circuit, the other bulb will remain lit.



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

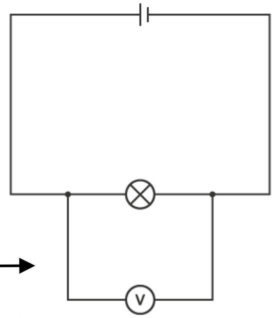
Current
The more charge that flows, the bigger the current.
Current is measured in **amperes (A)**.
This can be shortened to **amps**.

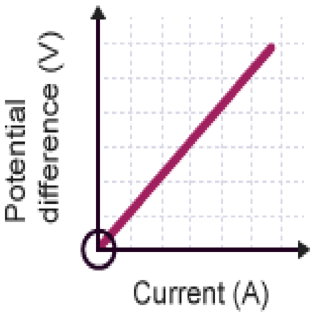
Measuring current
We measure current using an **ammeter**.
It is connected in **series**.



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 (V).**
It is sometimes called **voltage**.

Measuring potential difference
Potential difference is measured using a device called a voltmeter.
It is connected in **parallel**.

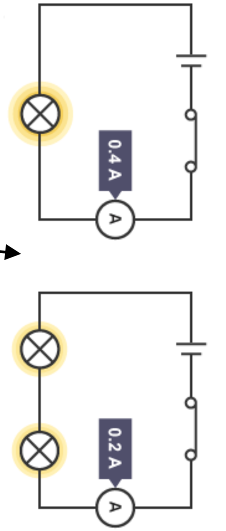




	Current	Potential difference
Unit	ampere, A	volt, V
Measuring device	Ammeter in series	Voltmeter in parallel
Circuit symbol of measuring device		

Resistance
Wires and the components in a circuit reduce the flow of charge. This is called **resistance**.
The unit of resistance is the ohm (Ω).

Adding components
The resistance increases when you add more components in series.



Calculating resistance
To find the resistance of a component, you need to measure:

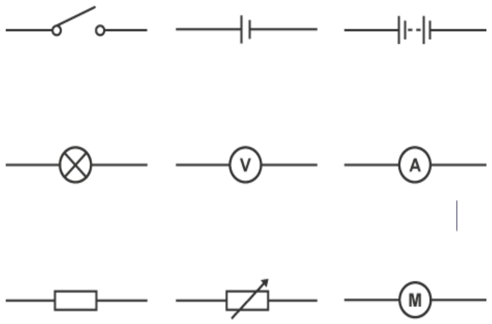
- the potential difference across it;
- the current flowing through it.

The resistance is the ratio of potential difference to current. We use this equation to calculate resistance:

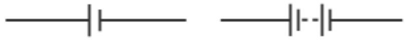
resistance = potential difference ÷ current

8PE Electricity and Magnetism

1. Which particles carry a charge?
2. What is an electric current?
3. What are the 2 things needed for an electric current to flow?
4. Label all the symbols below:



Circuit symbols



1. What type of resistance does an electrical conductor have?
2. What type of resistance does an electrical insulator have?

---

1. What is a series circuit?
2. Describe the current in a series circuit
3. What cannot be used up by the components in a series circuit?
4. How can you increase the current in a series circuit?

---

1. What is a parallel circuit?
2. Describe what happens to current in a parallel circuit?
3. What would happen if a bulb breaks in a parallel circuit?

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

---

1. What would happen to current if there more charges flowing through?
2. What is current measured in? Give the unit of current
3. Name the equipment is used to measure current? How do you connect this device in a circuit?
4. What is potential difference?
5. What is potential difference measured in? What are the units of potential difference?
6. Name the device used to measure potential difference. How do you connect this device on a circuit?

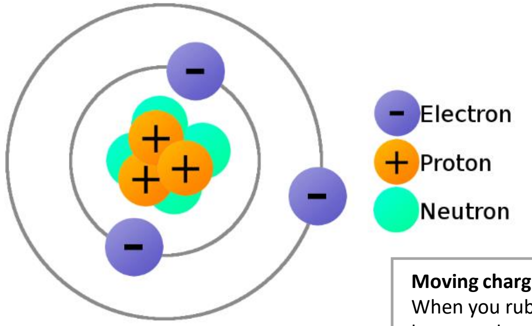
---

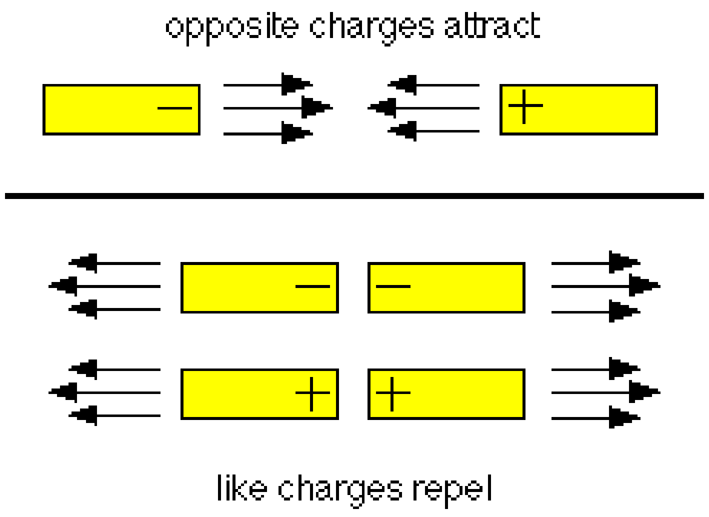
1. What is resistance?
2. State the units of resistance.
3. How can you increase the resistance in a circuit?
4. What do you need to measure to calculate the resistance?
5. Write down the formula for calculating resistance.

8BE Electricity and Magnetism

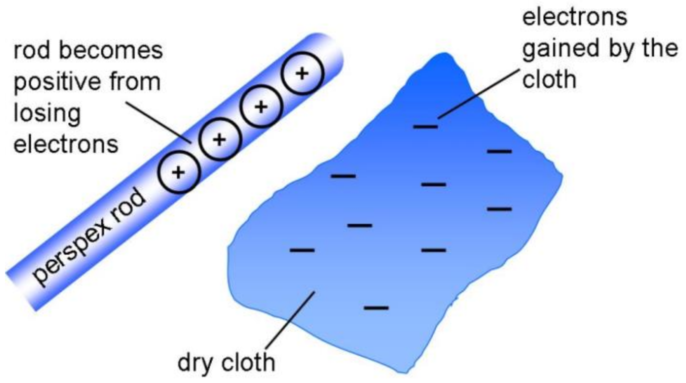
Atoms and electrons
All substances are made of **atoms**.
These are often called **particles**.
An atom has no overall electrical charge (**electrically neutral**);
Each atom contains even smaller particles called **electrons**.
Each electron has a negative charge.
- atom **gains** an electron, it becomes **negatively charged**.
- atom **loses** an electron, it becomes **positively charged.**

Electrons can move from one substance to another when objects are rubbed together.

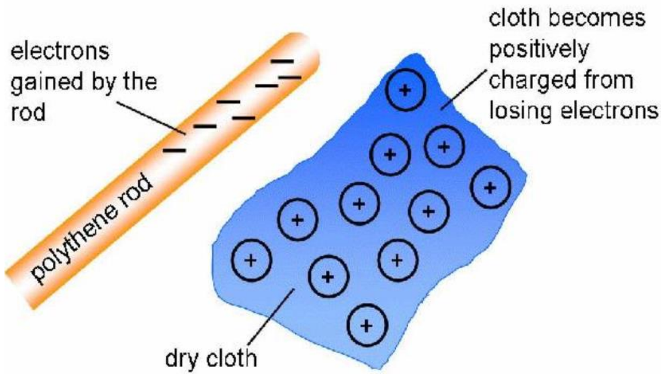




Moving charges
When you rub two different materials against each other, they become electrically charged.
This only works for electrically insulated objects and not with materials like metals, which conduct.
and the duster becomes positively charged



For example, if you rub an perspex plastic rod with a duster:
- electrons move from the rod to the duster
- the duster becomes negatively charged and the rod becomes positively charged



The opposite thing happens with a polythene rod:
- electrons move from the duster to the rod
- the rod becomes negatively charged and the duster becomes positively charged

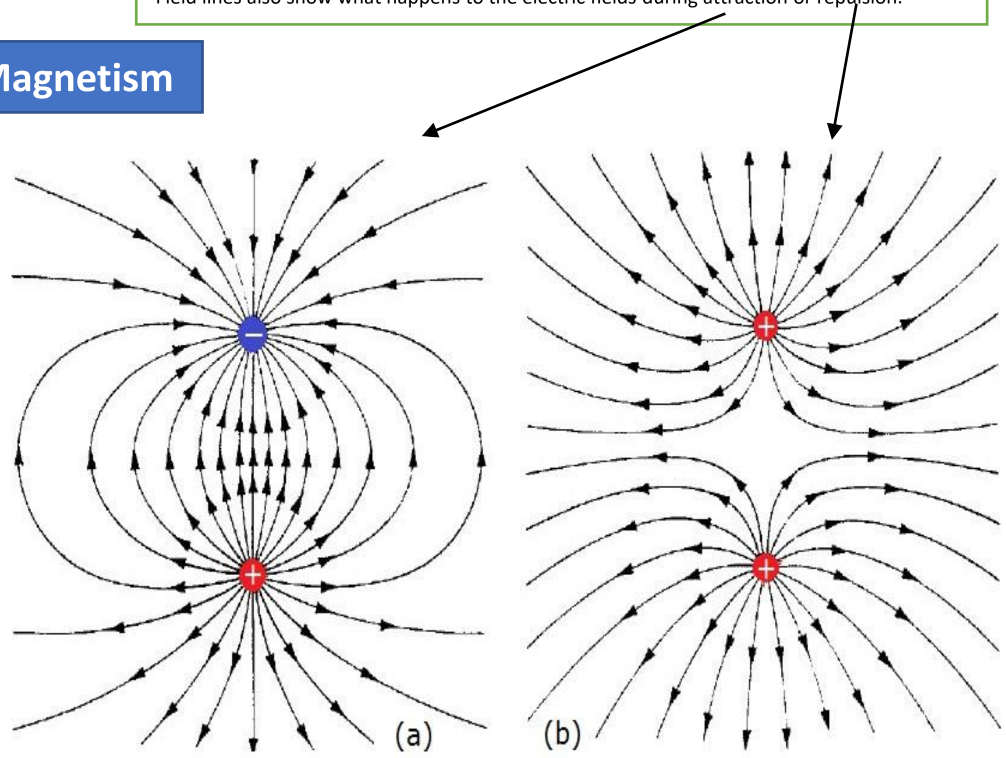
Forces from static electricity
A charged object creates an **electric field** (you cannot see an electric field).
If another charged object is moved into the electric field, a force acts on it.
The force is a non-contact force because the charged objects do not have to touch for the force to be exerted.

Repulsion and attraction
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).

Attract and repel
Opposite charges will attract, and like charges will repel.

Electric fields
We represent electric fields using diagrams (just like with magnetic fields):
- each field line has an arrow from **positive to negative**;
- the field lines are more concentrated where the field is strongest.

Field lines also show what happens to the electric fields during attraction or repulsion.

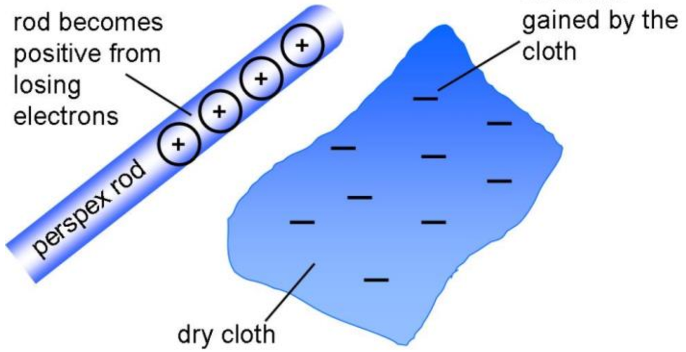


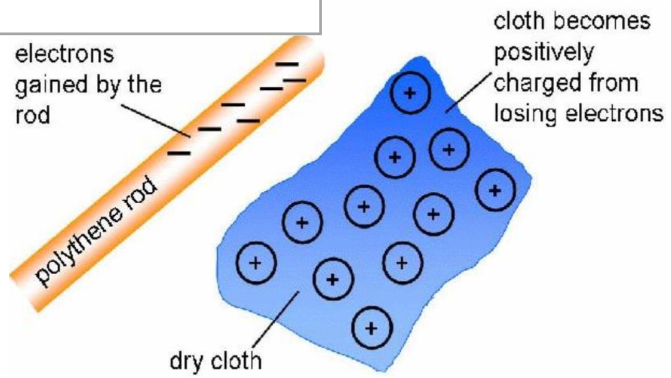
8PE Electricity and Magnetism

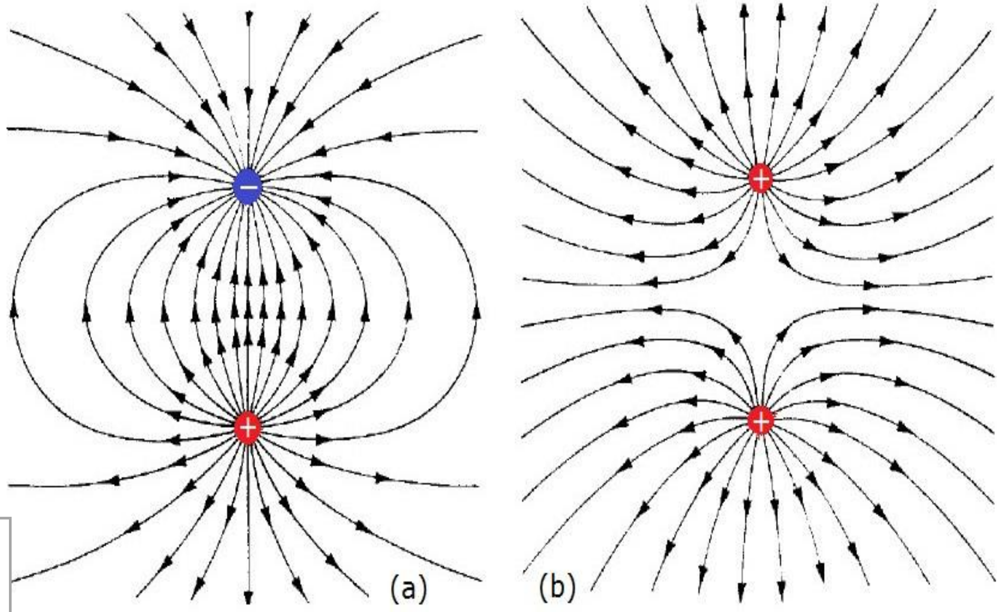
1. What are all substances made of? What are these often called?
2. What is the overall charge of an atom?
3. What is the charge of an electron?
4. When an atoms gains an electron what does it become?
5. When an atom loses an electron what does it become?
6. How can you move electrons from one substance to another?

1. What does a charged object create?
2. What type of force is an electrostatic force? Explain why?
3. When will two charged objects repel?
4. When will two charged objects attract?
5. What is an electric field?
6. What do the field line show?

1. What type of material can become electrically charged?
2. Describe you can make them charged?







1. Describe what happens you rub an Perspex plastic rod with a duster?

1. Describe what happens when you rub a polythene rod with a duster?

Reflection

A ray diagram shows how light travels, including what happens when it reaches a surface. In a ray diagram, you draw each ray as:

- a straight line;
- with an arrowhead pointing in the direction that the light travels;
- always use a ruler and a sharp pencil.

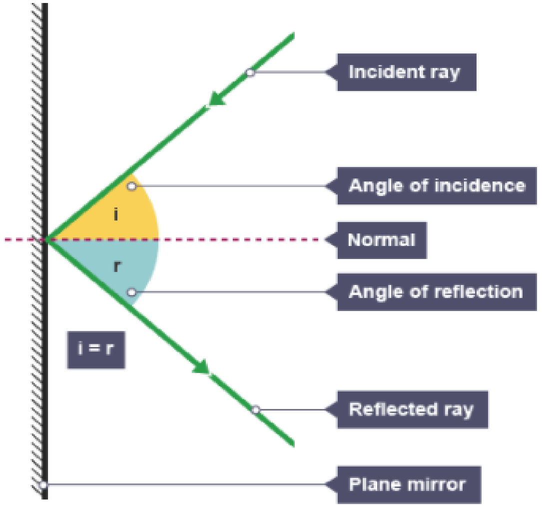
The law of reflection

When light reaches a mirror, it reflects off the surface of the mirror:

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

The law of reflection states:

- **the angle of incidence = the angle of reflection, i = r.**



Diffuse scattering

- If light meets a rough surface, each ray obeys the law of reflection;
- Different parts of the rough surface point in different directions;
- So the light is not all reflected in the same direction;
- The light is reflected in all directions.
- This is called **diffuse scattering.**

In the ray diagram:

- the hatched vertical line on the right represents the mirror;
- the dashed line is the normal, drawn 90° to the surface of the mirror;
- the angle of incidence, i, is the angle between the normal and incident ray;
- the angle of reflection, r, is the angle between the normal and reflected ray;
- The reflection of light from a flat surface such as a mirror is called **specular reflection** – light meeting the surface in one direction is all reflected in one direction.

Light and Space

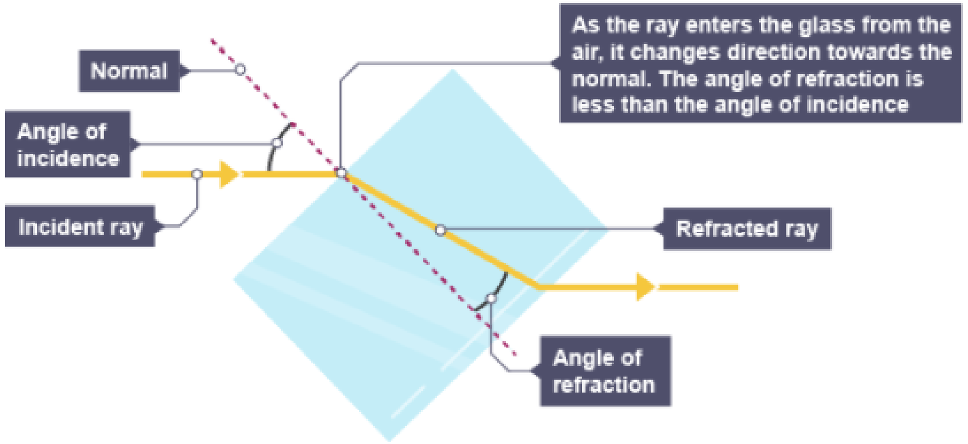
Refraction

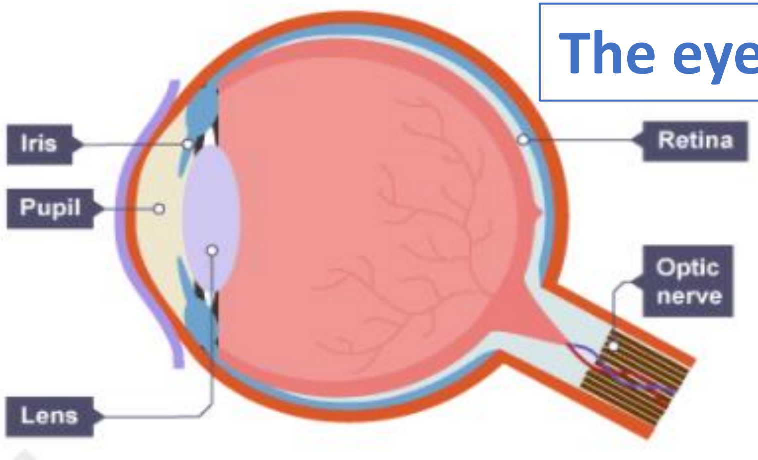
When light waves pass across a boundary between two substances with a different density, eg air and glass. They:

- change speed;
- causing them to change direction;
- This is called refraction.

At the boundary between two transparent substances:

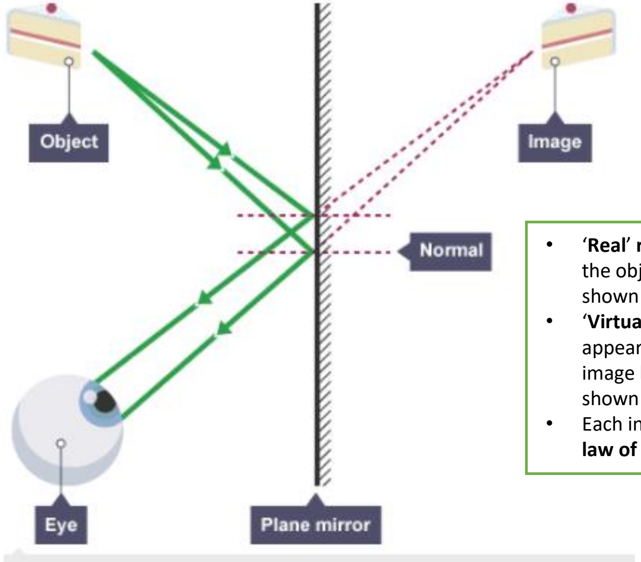
- the light slows down going into a denser substance, and the ray bends towards the normal;
- the light speeds up going into a less dense substance, and the ray bends away from the normal.





Imaging in mirrors

- A plane mirror is a flat mirror.
- When you look into a plane mirror, you see a reflected image of yourself. This image:
    - appears to be behind the mirror
    - is the right way up
    - is 'laterally inverted' (letters and words look as if they have been written backwards)
- 'Real' rays, the ones leaving the object and the mirror, are shown as solid lines.
- 'Virtual' rays, the ones that appear to come from the image behind the mirror, are shown as dashed lines.
- Each incident ray will obey the law of reflection.



- '**Real**' **rays**, the ones leaving the object and the mirror, are shown as solid lines.
- '**Virtual**' **rays**, the ones that appear to come from the image behind the mirror, are shown as dashed lines.
- Each incident ray will obey the **law of reflection**.

Light and Space

1. What are the rules or drawing light ray diagrams?

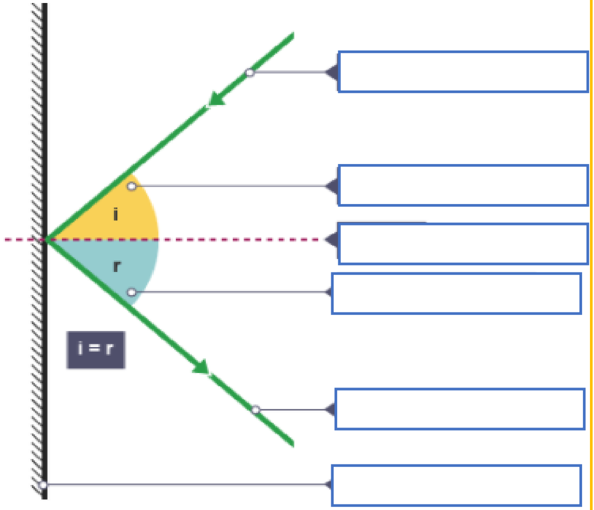
2. What is the law of reflection?

3. What happens to the light when it meets a rough surface?

4. In which direction is light reflected on a rough surface?

5. What do you call when light is reflected in all directions?

6. Complete the missing labels for the diagram below



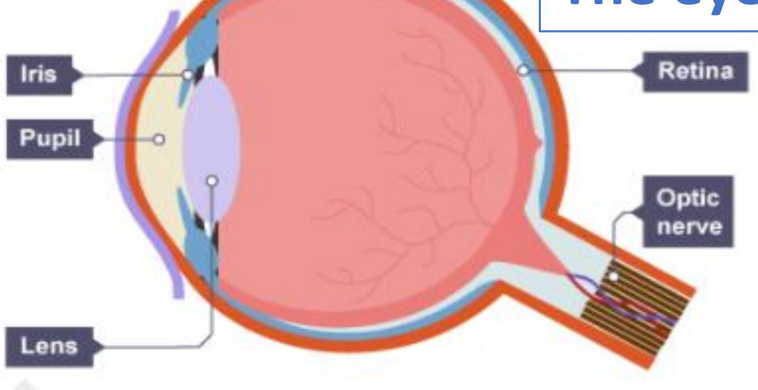
1. What happens to light when it passes across a boundary between two substances with a different density?

2. What do you call when light changes direction?

3. Describe what happens when light travels from a less dense medium to a more dense medium

4. Describe what happens when light travels from a more dense medium to a less dense medium

The eye



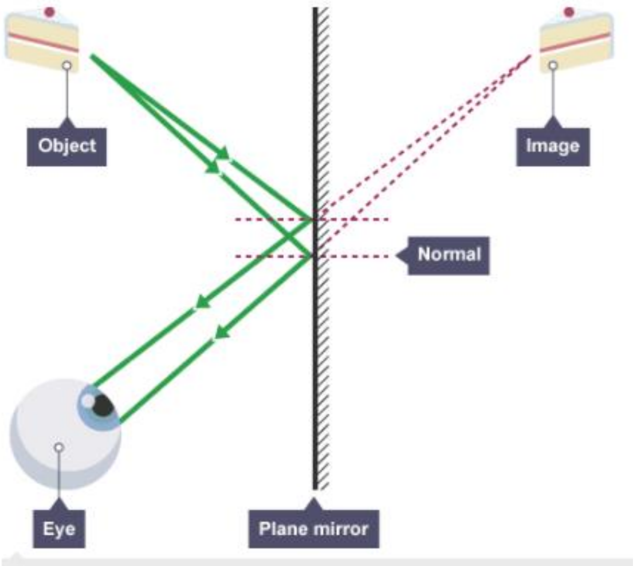
1. What is a plane mirror?

2. Where does the reflected image appear to be?

3. What does it mean by laterally inverted?

4. On a light ray diagram, how are the 'real' rays shown?

5. What will each incident ray will obey?



Light and Space

Colour

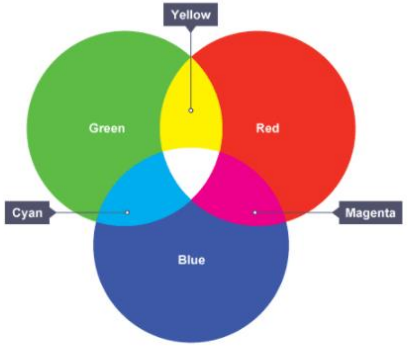
- White light is a mixture of many different colours;
- Each colour has a different frequency;
- White light can be split up into a **spectrum** using a prism, a triangular block of glass or Perspex;
- Light is refracted when it enters the prism;
- Each colour is refracted by a different amount;
- Light leaving the prism is spread out into different colours;
- This is called **dispersion**.

The spectrum

The seven colours of the spectrum listed in order of their frequency, from the lowest frequency (fewest waves per second) to the highest frequency (most waves per second):

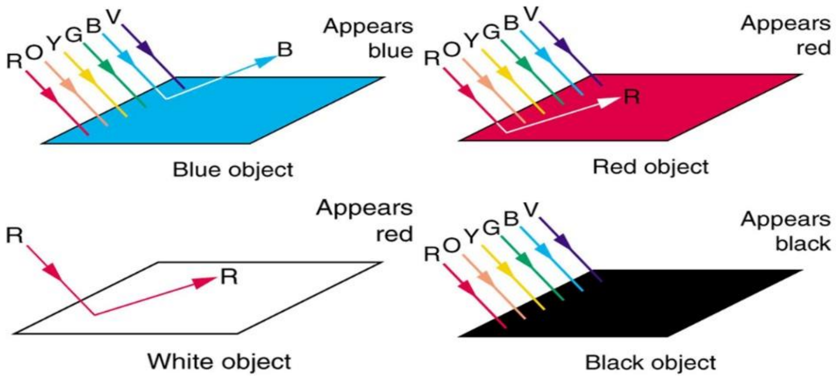
- <u>R</u>ed
- <u>O</u>range
- yellow
- green
- blue
- indigo
- Violet

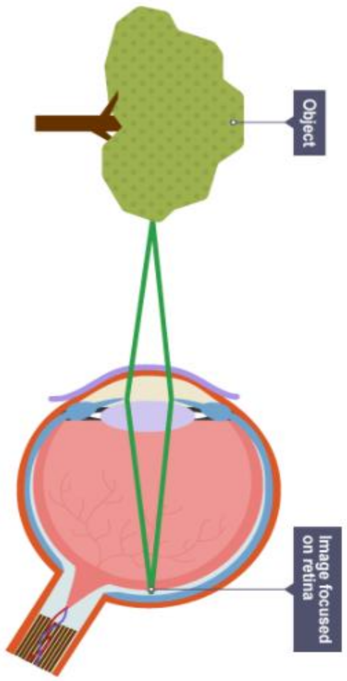
'<u>R</u>ichard <u>O</u>f <u>Y</u>ork <u>G</u>ave <u>B</u>attle <u>I</u>n <u>V</u>ain'.



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;
- When light hits a surface, some of it is absorbed and some of it is reflected.
- The colour of an object is the colour of light it reflects;
- All other colours are absorbed.





The eye

The eye is like the camera:

- The eye focuses light from an object;
- Onto the photo-sensitive **retina**;
- The retina contains cells 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.

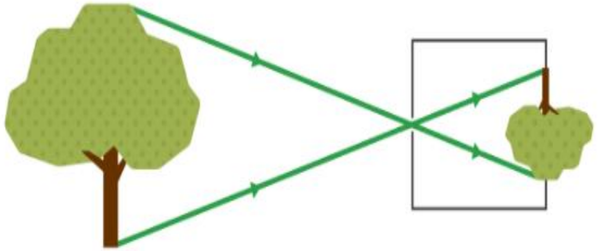
Focusing

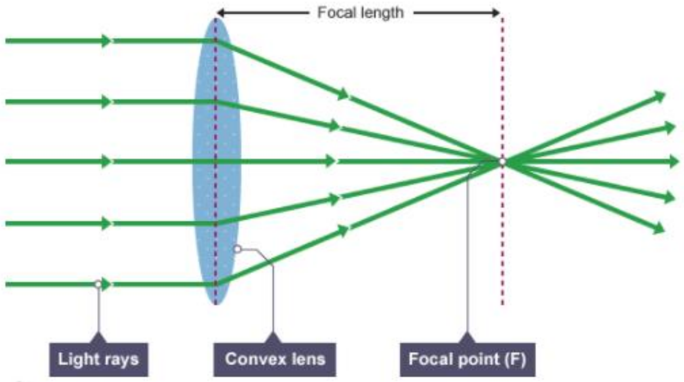
- Light rays can be focused so that they meet at a single point;
- Focusing is important for getting clear images in our eye;
- Images that are not focused appear blurred.

The pinhole camera

A pinhole camera consists:

- of a box with a **translucent screen** at one end;
- a tiny hole (the pinhole) in the other end;
- light enters the box through the pinhole;
- It is focused by the pinhole onto the screen;
- The image is inverted (upside down) and smaller than the object





The convex lens

- A convex lens is made from a transparent material that bulges outwards in the middle on both sides.
- It can focus light so that appears to meet at a single point, called the focal point.
- Light is refracted as it passes into, then out of, the lens.
- Convex lenses are found in:
  - **magnifying glasses**;
  - **spectacles** for people with long-sight (who can see distant objects clearly but not nearby ones);
  - **telescopes**.

Detecting light

Cameras and eyes detect light. They both have:

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

The camera

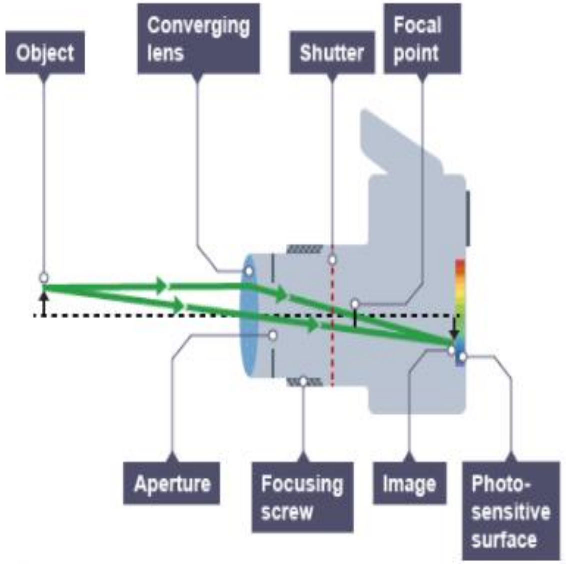
Cameras focus light onto a photo-sensitive material using a lens.

In old cameras, the photo-sensitive material was camera film;

- The film absorbs light;
- A chemical change produces an image, called the 'negative'.
- This was used to produce a photograph on photo-sensitive paper.

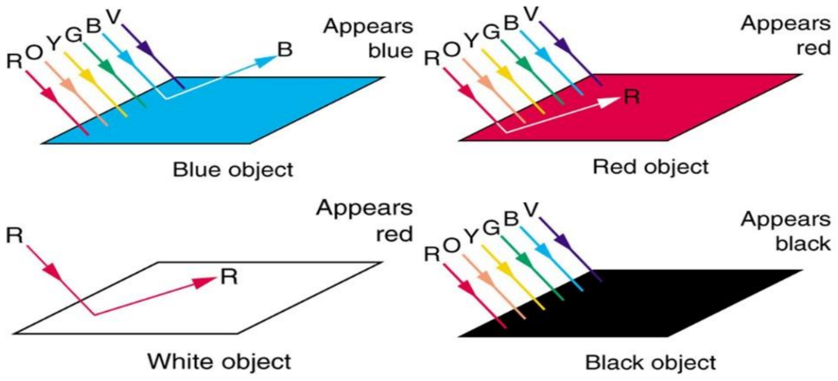
In a modern camera or the camera in a mobile phone:

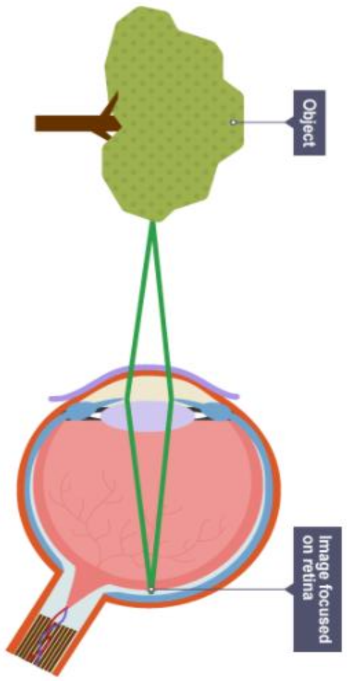
- The photo-sensitive material produces electrical impulses;
- Which are used to produce an image file;
- This can be viewed on the screen.



Light and Space

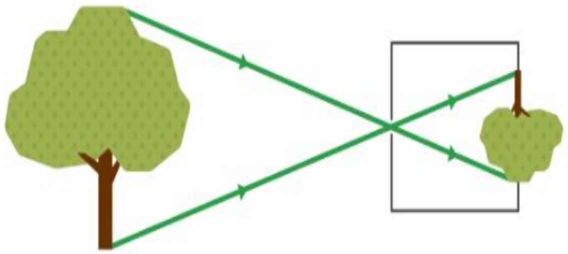
1. What is white lay a mixture of?
2. What are the 7 colours of the spectrum?
3. The seven colours of the spectrum are ordered based on their what?
4. State the 3 primary colours of light
5. What can you do to these primary colours of light?
6. Why are we able to see the colour of an object?
7. What happens to the rest of the colours of the light that is not reflected?

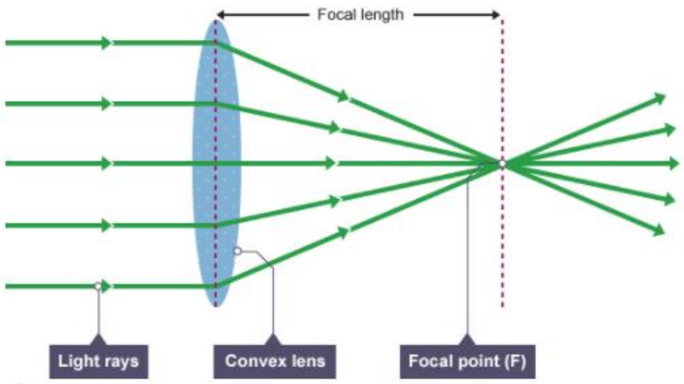




1. Where is the light focused to in the eye?
2. What happens when the light reaches the retina?
3. Name the nerve that passes electrical impulse from the eye to the brain

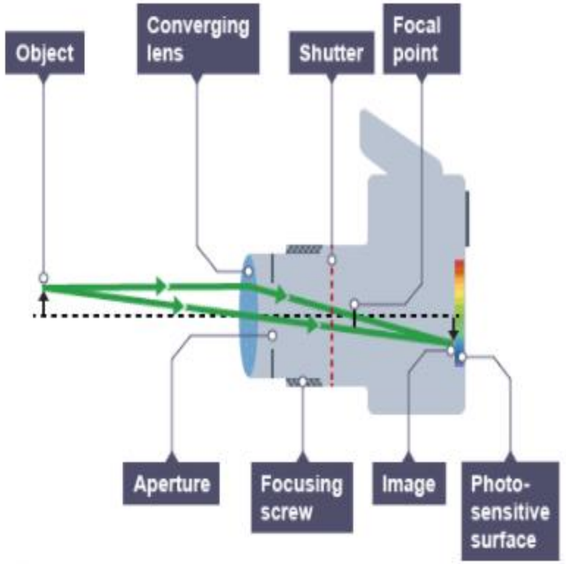
1. Why is it important to focus light rays to meet at a singe point?
2. What is a pinhole camera?
3. How is the virtual image different to the real image in a pinhole camera?





1. What is a focal point?
2. What happens to light as it passes through a convex lens?
3. Where can convex lens be found?

1. What do both camera and eye have?
2. In a camera, where is light focused to?
3. What happens when the camera film absorbs light?
4. What type of paper is used to produce an image?
5. In a modern camera, what does the photosensitive material produce?



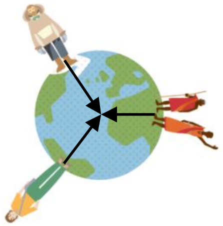
Gravity
Gravity is a force that attracts objects towards each other.

The greater the mass, the greater its force of gravity:
- gravity between Earth and Moon keeps Moon in orbit around Earth;
- gravity between Sun and Earth keeps Earth in orbit around Sun.

Gravity only becomes noticeable when there is a really massive object like a moon, planet or star.

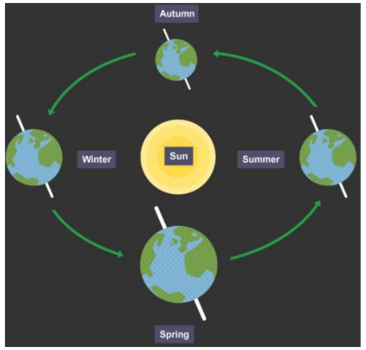
We are pulled down towards the ground because of gravity.

The gravitational force pulls in the direction towards the centre of any object.



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 gravity.
- Our Sun is in a spiral galaxy called the **Milky Way**.

The light year is the distance travelled by light in one year.



Mass, weight and gravitational forces

Mass
- The mass of an object is **the amount of matter** or 'stuff' it contains.
- Mass is measured in kilograms, **kg**.
- An object's mass stays the same wherever it is. So a 5 kg mass on Earth has a 5 kg mass on the Moon.

Weight
- The weight is **a force that acts upon a mass.**
- Weight is measured in newtons, **N**.
- The weight of an object is the gravitational force between the object and the Earth.
- The weight of an object depends upon its mass and the gravitational field strength.

Light and Space

Gravitational field strength
Gravitational field strength is given the symbol g.
(Do not confuse this with g for grams).

You can use this equation to calculate the weight of an object:
weight in N = mass in kg × gravitational field strength in N/kg

On Earth, g is about 10 N/kg. This means that a 2 kg object on the Earth's surface has a weight of 20 N (2 kg × 10 N/kg = 20 N).

Mass and weight
The mass of an object stays the same wherever it is, but its weight can change if the object goes where the gravitational field strength is different from the gravitational field strength on Earth, eg into space or another planet.

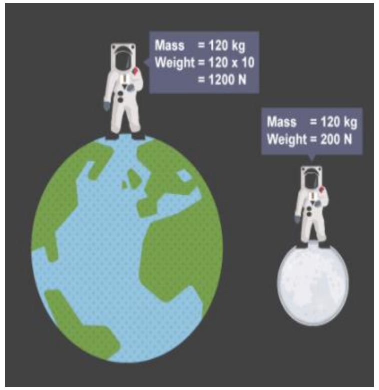
The Moon is smaller and has less mass than the Earth, so its gravitational field strength is only about one-sixth of the Earth's. So, for example, a 120 kg astronaut weighs 1200 N on Earth but only 200 N on the Moon.

Remember that their mass would still be 120 kg.

Years and seasons
- A 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;
- The further a planet is from the sun, the longer its year.

Seasons
The Earth's axis is tilted slightly (23.4° from vertical).

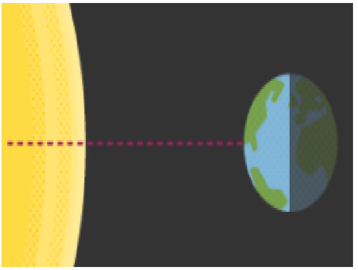
We get different seasons because the Earth's axis is tilted:
- it is summer in the UK when the Northern Hemisphere is tilted towards the Sun
- it is winter in the UK when the northern hemisphere is tilted away from the Sun

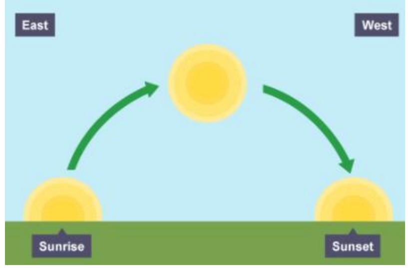


The speed of light
- Light travels extremely quickly.
- Its maximum speed is 300,000,000 m/s (3x10^8 m/) when it travels through a vacuum.

The speed of light is much faster than the speed of sound in air (343 m/s). This explains why you:
- see lightning before you hear it;
- see a firework explode before you hear it.

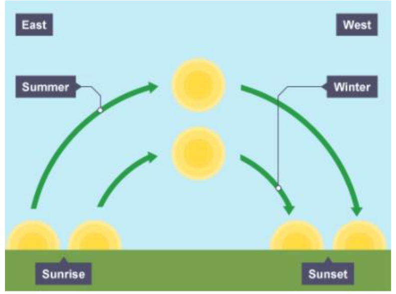
Days and nights
- A planet spins on its axis as it orbits the Sun.
- A day is the time it takes for a planet to turn once on its axis.
- An Earth day is 24 hours long;
- The Sun lights up one half of the Earth, and the other half is in shadow;





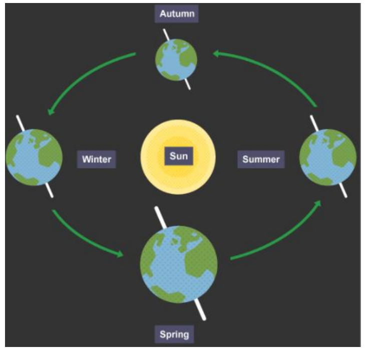
Path of the Sun
- During the day, the Sun appears to move through the sky;
- This happens because the Earth is spinning on its axis;
- The Sun appears to move from east to west. This is because the Earth turns from west to east.
- The Sun appears to:
  - rise in the east;
  - set in the west;
  - be due south at midday;
- One way to remember which way the Earth turns is
  - 'we spin'….**we** (the Earth) spins from **w**est to **e**ast.

Path of the Sun at different times of the year
- The length of the day changes during the year (unless you are on the equator);
- Daytime is longest in the summer and shortest in the winter.
- In winter, the Sun still rises in the east and sets in the west, but it does not climb so high in the sky as it does in the summer.



1. What is gravity?
2. How does mass affect the force of gravity?
3. What does the gravity between the Earth and moon allow the moon to do?
4. What keeps the Earth in orbit around the sun?
5. When is gravity only noticeable?
6. In which direction does the gravitational force pull?

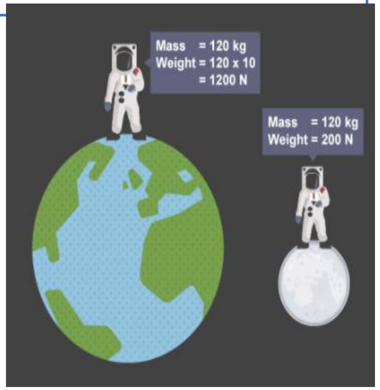
1. Which is our star?
2. what are galaxies made up of?
3. How many stars does a galaxy contain? How are they held together?
4. What is the light year?



1. What is a year?
2. How many days are there in a year?
3. Why do we get different seasons?
4. Describe the Earth's axis during the summer?

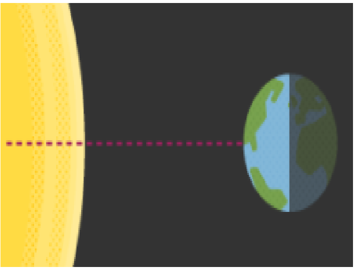
1. What is the mass of an object?
2. What is mass measured in?
3. How is the mass of an object affected in different planets?
4. What is weight?
5. What is the unit of weight?
6. What is the weight of an object dependent on?
7. Write down the formula for calculating weight
8. What is the gravitational field strength of Earth? Give the units
9. Why does the weight of an object change in a different planet?

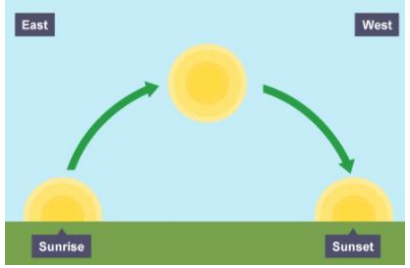
Light and Space



1. How fast does light travel?
2. What can light travel through?
3. Explain why you can see a lightning before you can hear it?

1. How long is a day on Earth?
2. What does a planet spin on when orbiting around the sun?





1. What does the sun appear to do during the day?
2. Why does this happen?
3. In which direction does the sun rise and fall?

1. What happens to the length of the day during the year?
2. How is the daytime in summer different to winter?
3. In which season does the sun rise highest?