S.E.A.K.O Science – Chemistry Unit 1 Year 7

2 - What are the common properties of metals and non-metals?

Metals are shiny, good ***conductors*** of electricity and heat. They are solid at room temperature (except mercury). They have high melting points, are ***malleable, sonorous, ductile***, and have high density.

Non-metals are not shiny, poor conductors of electricity and heat. They can be solids or gases at room temperature (bromine is a liquid). They have low melting points, are ***brittle***, not sonorous, and have low density.

1 - How do we write symbols for elements?

Elements are made up of only one type of atom.

There are around 100 elements, all listed on the periodic table.

Element symbols follow these rules: one-letter symbols are capitalized, and two-letter symbols have the first letter capitalized and the second in lowercase.

3 - What are elements made of?

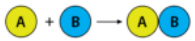
Atoms are the basic units of elements, with a nucleus and energy levels. Atoms contain subatomic particles:
Protons (+1 charge, mass 1Nucleus
Neutrons (0 charge, mass 1) Nucleus
Electrons (-1 charge, tiny mass) Energy Shells

Atoms have equal protons and electrons.

5 - What are compounds and how are they formed?

Compound: A substance formed when two or more elements are chemically joined.

In a chemical reaction ***atoms*** are re-arranged, and a new substance is made



The reactants are always on the left-hand side of the arrow and the products are always on the right-hand side of the arrow:
Reactants → Products

6 - What does a chemical formula tell us?

Compound Names:
- -ide: Made of two elements (e.g., copper chloride: copper and chlorine).
- -ate: Contains oxygen (e.g., sodium carbonate: sodium, carbon, and oxygen).

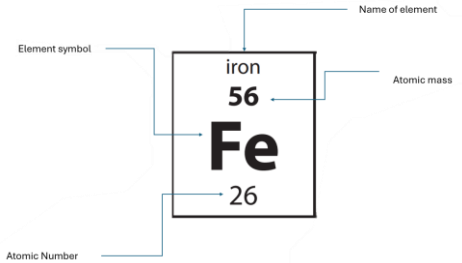
Chemical Formulas:
- Small number to the bottom right of an element's symbol shows the number of atoms.
- No number means one atom.
- Formulas have more than one capital letter.

4- What do the numbers on the periodic table tell us?

Periodic Table: Elements are ordered by atomic number.
Atomic Number: The number of protons in the nucleus.

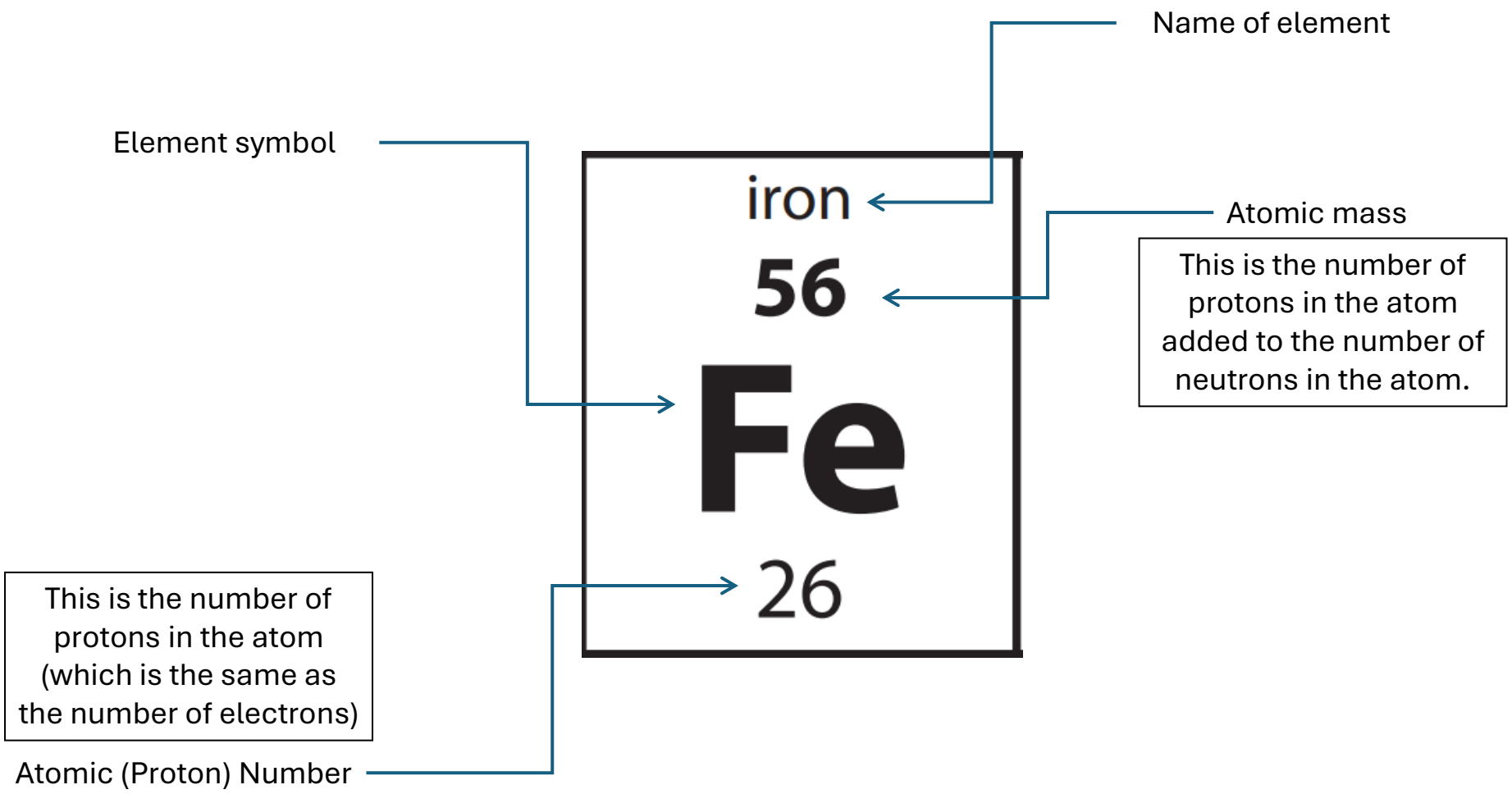
Relative atomic mass = The number of protons + number of neutrons

Number of neutrons = Relative atomic mass - number of protons



Glossary

Atom: Made up of protons, neutrons and electrons
Conductor: A material that is good at transferring energy either electrically or thermally.
Ductile: Can be drawn into wires without breaking.
Sonorous: Makes a ringing sound when hit.
Malleable: Can bend without breaking.
Brittle: Shatters easily
Nucleus: Centre of the atom
Energy Shells: Surround the nucleus of the atom


Name of element
Element symbol
iron
Atomic mass
56
This is the number of protons in the atom added to the number of neutrons in the atom.
Fe
26
This is the number of protons in the atom (which is the same as the number of electrons)
Atomic (Proton) Number

S.E.A.K.O Science – Chemistry Unit 1 Year 7

8 - What is needed for *combustion*?

Combustion is the scientific name for burning.
Combustion is carried out to release energy from a ***fuel*** when it burns.
The fire triangle shows what is required for ***combustion***.
If one of the side of the fire triangle are removed the fire will go out.

9 - What are the products of burning *fuel*s?

A ***fuel*** is a substance that releases useful heat energy when it is burnt. This causes the temperature to increase.
When ***combustion*** occurs in plenty of oxygen it is called ***complete combustion***. The products of ***complete combustion*** are carbon dioxide and water.
The general equation for ***complete combustion*** of a ***fuel*** is:

Fuel + oxygen → carbon dioxide + water

Limewater is a chemical that can be used to show the presence of carbon dioxide.

10 - What is the effect of oxygen on *combustion*?

If a ***fuel*** burns with a lack of oxygen it is called ***incomplete combustion***.
The products of ***incomplete combustion*** are: carbon, carbon monoxide and water.
The general equation for ***incomplete combustion*** of a ***fuel*** is:

Fuel + oxygen→ carbon + carbon monoxide + water

Solid carbon produced is called ***soot***. ***Soot*** a black solid.
Carbon monoxide is a dangerous gas. It has no taste, smell or colour. If you breathe in too much carbon monoxide your red blood cells will carry the carbon monoxide instead of oxygen. This means less oxygen gets to your body cells.

11 - How do you investigate the energy in *fuels*?

A ***fuel*** is a substance that releases useful energy, such as heat energy when it is burnt.
The longer the carbon molecule the more energy released when burnt.
We measure the volume of a liquid using a measuring cylinder in cm^3.
We measure temperature using a thermometer in ^oC.

12- What is produced when metals burn in air?

When a metal burns in air it reacts with oxygen to form a metal oxide.
This can be shown with this general word equation:
Metal + Oxygen -> Metal Oxide

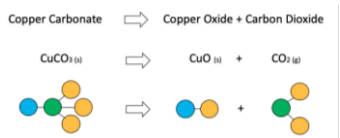
e.g. Copper + Oxygen → Copper Oxide

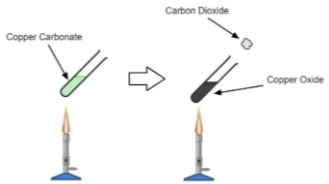
13- How do we test for an unknown gas?

There are three gases that we can identify using gas tests: hydrogen, oxygen or carbon dioxide.
The test for hydrogen uses a burning splint held at the open end of a test tube of the gas. Hydrogen burns rapidly with a pop sound.
The test for oxygen uses a glowing splint inserted into a test tube of the gas. The splint relights in oxygen.
The test for carbon dioxide uses an aqueous solution of calcium hydroxide (lime water).
When carbon dioxide is shaken with or bubbled through limewater the limewater turns cloudy.

14 -What is *thermal decomposition*?

Thermal decomposition is using heat to breakdown a substance.
When metal carbonates thermally decompose they produce a metal oxide and carbon dioxide.
The general word equation for the reaction is:
Metal Carbonate -> Metal Oxide + Carbon Dioxide
e.g.





Glossary

Combustion – scientific name for burning.

Fuel – a substance that releases useful heat energy when burnt.

Complete Combustion – burning of a fuel occurs in plenty of oxygen.

Limewater – chemical that turns cloudy in the presence of carbon dioxide.

Incomplete Combustion – burning of a fuel occurs with little/no oxygen.

Thermal Decomposition – using heat to break down a substance.

Soot – solid carbon produced from incomplete combustion.

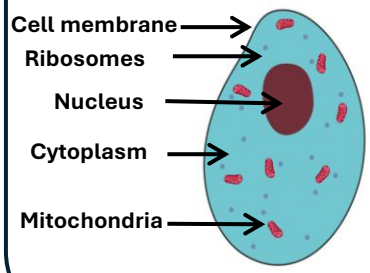
S.E.A.K.O Science – Biology Unit 1 Year 7

1 – What are the life processes? All living organisms...

Movement	Move on their own
Respiration	Break down sugar to release energy
Sensitivity	Detect/sense changes
Growth	Increase in mass
Reproduction	Produce more offspring
Excretion	Remove waste products
Nutrition	Need nutrients

2 - What is inside animal cells?

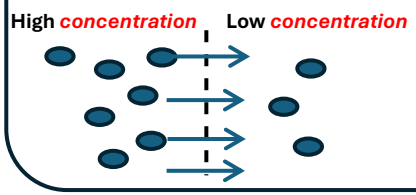
Animal cells contain ***organelles*** which have a function.



Cell membrane – controls what enters and leaves the cell
Ribosomes – where proteins are made
Nucleus – Contains genetic information and control the activities of the cell
Cytoplasm – where most chemical reactions happen
Mitochondria – where respiration happens

3 - How do substances move in and out of cells?

Substances move in and out of the cell, through the cell membrane, by ***diffusion***. It is made of a ***partially permeable*** membrane.



-Oxygen and glucose moves **into** the cell for respiration

-Water and carbon dioxide moves **out** of the cell

4 - Do all animal cells look the same?

Different animal cells have different **functions** (jobs) in the body. To help them do these jobs they have different ***adaptations***.

Specialised cell /**Function**	***Adaptations***
Red blood cell  **Transport oxygen around the body**	-No nucleus -Biconcave disc shape
Muscle cell  **Contract to bring about movement**	-Many mitochondria
Nerve cell  **Carry messages as electrical impulses around the body**	-Very long axon
Sperm cell  **Fertilise the egg cell for reproduction**	-Long tail -Many mitochondria -Enzymes in its head

5 - What is the difference between cells, tissue and organs?

Cells in multicellular organisms are arranged into levels of organisation to form an entire organism.

Cells – The basic building blocks of living organisms. 

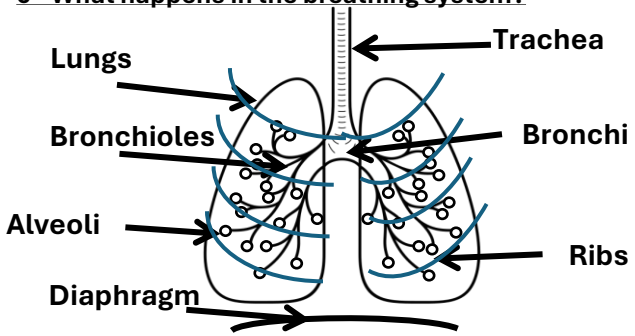
Tissues – A group of similar cells that perform a specific job. 

Organs – A group of different tissues that perform a specific job. 

Organ systems – A group of different organs that perform a specific job. 

Organism – an entire living thing e.g. an animal or plant.

6 - What happens in the breathing system?



Gas exchange happens at the alveoli.
The **ribs** protect the lungs.

Key Word	**Definition**
Organelle	A part of a cell.
Gas exchange	The movement of oxygen into the blood and carbon dioxide into the lungs by diffusion.
Partially permeable	Allows some substances to pass but not others.
Diffusion	Diffusion is the movement of particles from an area of high concentration to an area of low concentration across a partially permeable membrane.
Concentration	The amount of particles in a given volume.
Adaptation	A feature that helps a cell do its job.

S.E.A.K.O Science- Biology Unit 1 Year 7

7- How does exercise affect your breathing rate?

The breathing system transports oxygen from the air to the bloodstream, where it is carried to cells for ***respiration***.
To meet this demand:

- Heart rate increases to pump blood faster.
- Breathing rate increases, taking more breaths per minute.
- Breath volume increases, making each breath deeper.

These changes allow more oxygen to enter the bloodstream at the ***alveoli*** and be delivered to muscle cells.
This energy is needed for muscle contraction and movement during exercise.

8- What are digestive enzymes?

Your body needs different food groups for different reasons

Food Group	Function	Good Sources
Carbohydrates	Provide energy for the body	Bread, pasta, rice, potatoes
Proteins	Needed for growth and repair	Meat, fish, eggs, beans
Fats	Needed for energy storage	Butter, nuts, oils, cheese

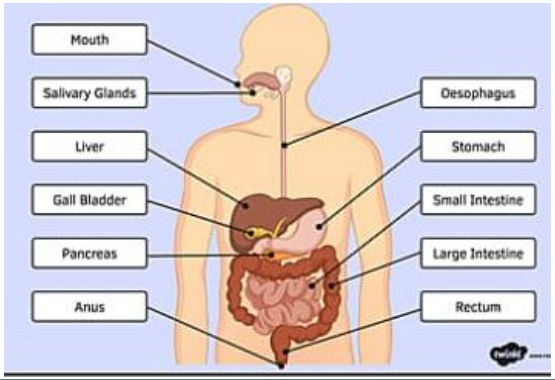
Enzymes are involved in the breakdown of food. Different enzymes have different shapes which allow them to break down different molecules.

Enzyme	Substrate (What it breaks down)	Broken down into
Amylase	Starch (carbohydrate)	Glucose (sugar)
Protease	Protein	Amino acids
Lipase	Fats (lipids)	Fatty acids and glycerol

7- What happens in the digestive system?

Food is broken down in ***digestion***

- **Mouth**: Food is chewed and broken down by teeth.
- **Oesophagus:** Tube connecting the mouth to the stomach.
- **Stomach:** Food is broken down and acid kills bacteria.
- **Small intestine**: Food is digested, and nutrients are absorbed into the blood.
- **Large intestine:** Water is absorbed from undigested food, forming solid waste.
- **Rectum**: Stores solid waste (faeces) until it's excreted.
- **Anus**: Where faeces exits the body.



Glossary

- ***Respiration*** is the process that uses oxygen to release energy from glucose. The more energy that we need, the more respiration we need to do.
- ***Alveoli*** are tiny air sacs in the lungs where gas exchange occurs.
- ***Digestion*** is the breaking down of large food molecules into small food molecules.
- ***Enzyme-*** a protein that speeds up the rate of a reaction

S.E.A.K.O Science- Biology Unit 1 Year 7

10- What happens in photosynthesis?

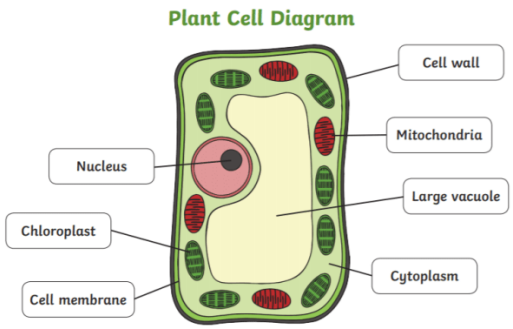
Plants make their own food during ***photosynthesis.***
The word equation for photosynthesis is

Carbon Dioxide + Water $\xrightarrow{\text{Sunlight}}$ Glucose + Oxygen

The symbol equation for photosynthesis is

$CO_2 + H_2O \xrightarrow{\text{Sunlight}} C_6H_{12}O_6 + O_2$

11- Are plant cells the same as animal cells?

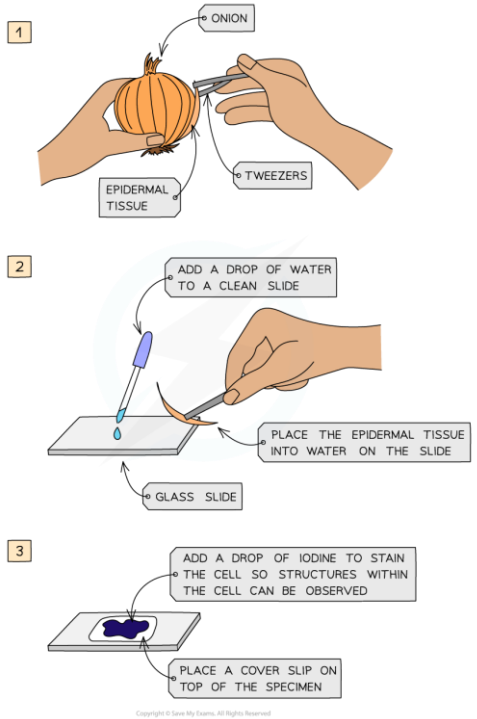


Plants also have cells, tissues, organs and organ systems.
Theses plant organs you need to know summarised below

Plant Organ	Function
Flower	Contains structures needed for reproduction
Leaf	Where most photosynthesis happens
Roots	Collect water and minerals from the soil
Stem	Transports water and minerals from the roots

12- How can we use a microscope to see cells?

In school we use ***light microscopes*** to look at cells.
You completed a practical to observe cells using a light microscope.



Glossary

- ***Photosynthesis*** the process by which green plants and some other organisms use light energy to convert carbon dioxide and water into glucose and oxygen.
- ***Light microscope*** uses lenses to produce a magnified image of an object.

S.E.A.K.O Science - Physics Unit 1 Year 7

1- What are the energy stores?

- There are eight energy stores. (GEEKM NCH)

-Gravitational Potential - when objects are raised above the ground
-Elastic Potential - when objects are squashed or stretched
-Electrostatic - when charged particles build up on an object
-Kinetic - all moving objects
-Magnetic - objects that are magnetic
-Nuclear - stored in the nucleus of atoms and released during nuclear reactions
-Chemical - stored in bonds between particles and released when particles react
-Heat(Thermal) - all hot objects.

WATCH VIDEO

2- What happens in an energy transfer?

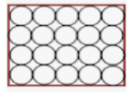
- The law of conservation of energy says that energy is neither created nor destroyed, only transferred.
- As energy is transferred it moves from one store to another - so one energy store decreases and another energy store increases.

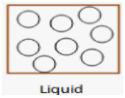
E.g. When an apple falls from a tree the gravitational potential energy store decreases and the kinetic energy store increases

WATCH VIDEO

3- What is the difference between states?

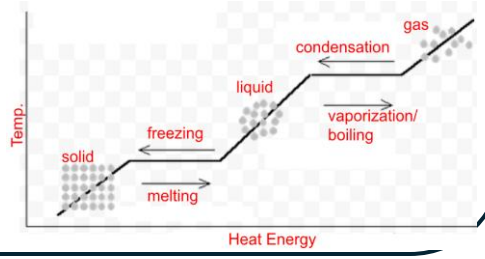
- Properties of the three states of matter:
- Solids: Hard, fixed shape, cannot flow, cannot be compressed
- Liquids: shape of bottom of container, flow, cannot be compressed
- Gases: Flow, take the shape of the container, can be compressed
- Arrangement of particles of the three states of matter:
- Solids: Particles are close together in a regular arrangement
- Liquids: Particles are close together in a random arrangement
- Gases: Particles are far apart in a random arrangement





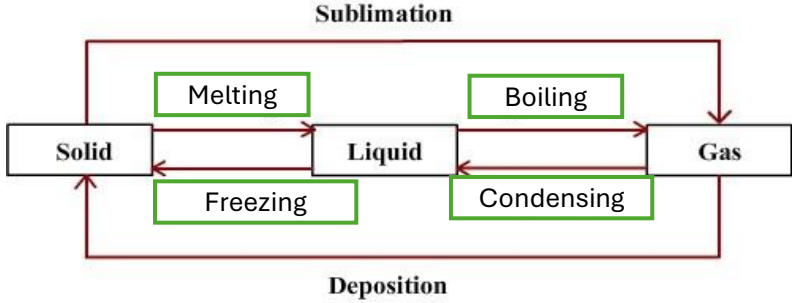
4- What happens to substances when they are heated?

- Heating a substance causes either the temperature of the substance to increase or the substance to change state.
- When a substance changes state: As the particles move faster the forces of attraction between the particles are overcome causing a change in state. As the happens the temperature of the substance does not change.
- Melting is when the state changes from a solid to a liquid.
- Boiling is when the state changes from a liquid to a gas.
- Melting point: The temperature at which a substance changes from solid to liquid.
- Boiling point: The temperature at which a substance changes from liquid to gas.



5- What happens to substances when they are cooled?

- When substances are cooled, energy is transferred to the heat energy store of the surroundings.
- If the particles move too little, the forces between the particles strengthen . This can cause the substance to change state.
- Forces: As a substance cools, the kinetic energy of its particles decreases. The particles move more slowly and come closer together. The strength of the forces between particles increases.
- Freezing: when the state changes from liquid to solid.
- Condensing: when the state changes from gas to liquid.

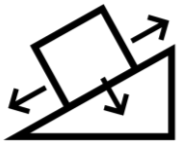


S.E.A.K.O Science - Physics Unit 1 Year 7

6 – What can a force do?

- Forces can cause energy to be transferred from one store to another.

- Arrows are drawn to represent the **direction** and **size** of the force applied to the object.



- Forces can change the **shape**, **speed** and **direction** of an object.

- Contact forces require objects to **touch** each other to transfer energy.
- Non-contact forces **do not** require the objects to touch to transfer energy.

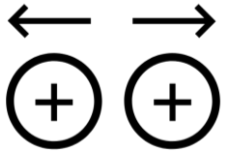
- Forces are measured using a **Newton** meter.

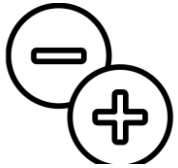
7 – What is a non-contact force?

- Gravitational: Attractive force caused by **gravity** where objects of mass are pulled together. E.g. Apple falling from a tree or planets orbiting the sun. The **bigger the mass the bigger the force.**

- Magnetic: **Attractive** or **repulsive** between magnetic objects. Magnets have a north and south pole. Opposite poles attract, like poles repel. Magnetic force gets weaker with distance.

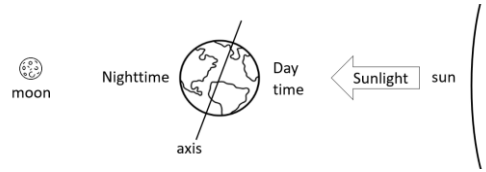
- Electrostatic: **Attractive** or **repulsive** force between charged objects. Charges are positive or negative. Opposite charges attract, like charges repel. E.g. Rubbing a balloon on hair, the charged balloon is attracted to the hair.





8 – What is the earth's place in the solar system?

- The Earth takes **24 hours** to spin on its axis. It is daytime for the side of the Earth that faces the sun. It is nighttime for the side of the Earth that faces away from the Sun.



- The Earth has **one moon** that orbits due to gravitational force.
- The Earth's axis is **tilted**. This causes parts of the Earth to have **seasons**.

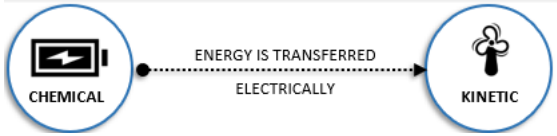
- The Earth's centre is made of **iron** which is **magnetic**. Compasses use the Earth's magnetic force.

- The **sun** is at the **centre** of our solar system. The time it takes a planet to orbit the sun is called a **year**. It takes the Earth **365** days to orbit the Sun. All of the planets in our solar system orbit the Sun at different distances, therefore, they have different lengths of year.

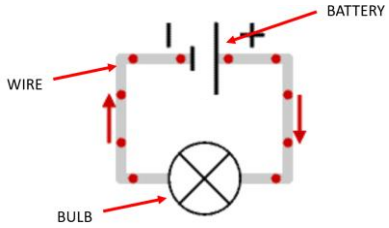
S.E.A.K.O Science - Physics Unit 1 Year 7

9 – What happens when energy is transferred electrically?

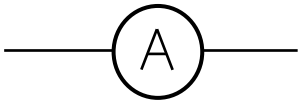
- Electricity can cause energy to be transferred from one store to another.



- Energy is transferred electrically by **tiny charged particles called electrons**.
- These particles transfer energy from one part of an electrical circuit to another.



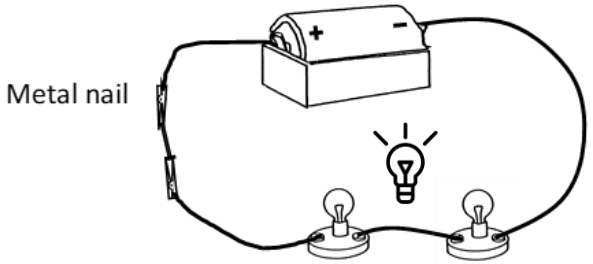
- The amount of charged particles that that flow is called electrical **current** which is measured in **Amps** (A) using an **ammeter**.



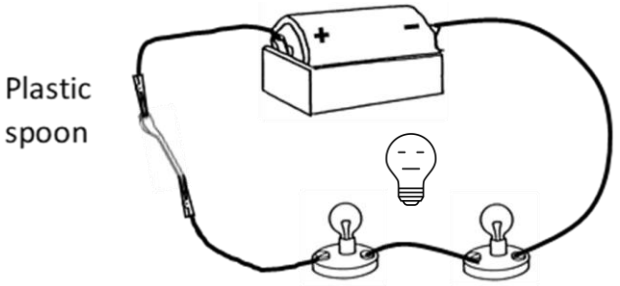
- In a **closed** circuit, the **current flows** continuously from the positive terminal to the negative terminal of the power source. In an **open** circuit, **no current flows** because the continuous path is interrupted.

10 – What is the difference between a conductor and an insulator?

- **Conductors** are materials that are **good** at transferring energy electrically such as metals e.g. copper, iron and aluminum.

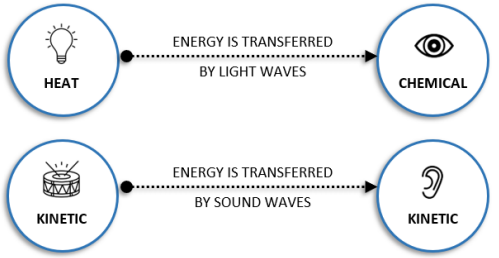


- **Insulators** are materials that are **bad** at transferring energy electrically. Such as plastic, rubber, wood, paper.



11 – What is a wave?

- Waves cause energy to be transferred from one store to another.
- Waves transfer **energy** without transferring **matter** (without particles moving from one place to another).
- There are many different types of waves including **light** waves and **sound** waves.



- Some waves need particles to travel through, but not all do.
- Light waves travel **don't need particles** to travel.
- Light waves travel at **300,000,000 m/s** in a **vacuum**.
- Sound waves **do need particles** to travel (to carry the vibrations).
- Sound waves travel at **330 m/s** in **air**.
- Sound waves cannot travel through a vacuum because there are no particles to pass on the vibrations.
- Light waves travel much faster than sound waves in air. This is why we see lightening before we hear the thunder.