BGE Science

Science 101

Revision Notes

Safety in the science lab

General safety rules

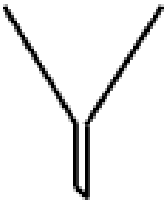
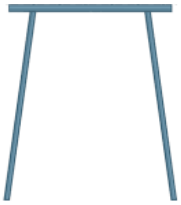
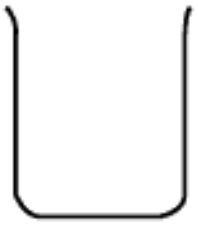
- Report all accidents, injuries and breakages (of glassware or equipment) to teacher immediately
- Keep pathways clear by placing extra items such as jackets and bags away
- Long hair must be tied back during experiments
- Do not taste chemicals or touch your face or mouth whilst carrying out experiments
- Do not smell samples directly, waft the smell towards you
- Wear safety goggles to protect your eyes
- Leave your workstation clean and tidy before leaving the laboratory
- Do not lean, hang over or sit on the laboratory benches
- Always carry out experiments standing up
- Always follow all instructions given by your teacher and pay attention
- No eating or drinking in the lab at any time

Hazard symbols

Symbol	*Meaning*	*Description*	*Precautions when using a chemical with this symbol*
	Flammable	Easily catches fire	Store in a fireproof cabinet and keep away from open flames
	Corrosive	Can cause burns to living tissue or surfaces	Store in a protected cabinet, wear protective clothing when using these chemicals
	Toxic	Can be harmful to health if swallowed	Store in a vented, cool, dry area Wear gloves and wash hands after using Seek medical attention if swallowed
	Irritant	Can irritate the skin	Store in a cool, dry cabinet which is clearly labelled Wear protective clothing

	Toxic to aquatic life	Very toxic to aquatic life	Store in a cool dry area Do not pour down the sink
	Oxidising	May cause or intensify fire	Store in a separate cabinet from flammable chemicals and keep away from open flames
	Gas under pressure	May explode if heated	Store in a cool dry area in an upright secure container Keep away from open flames

Lab apparatus

Bunsen burner 	Filter funnel 	Tripod 
Test tube 	Thermometer 	Beaker 

Variables

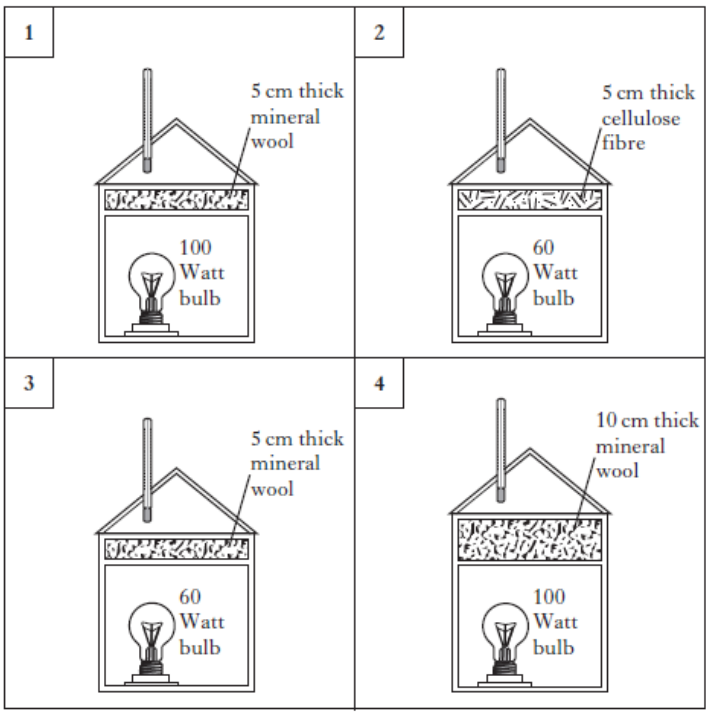
A variable is something which can be changed in an investigation.
To make an investigation fair only one variable should be changed at a time.

There are three types of variables:

- **An independent** variable is what you are investigating and is the only variable to be changed with each experiment. This is always the first column in a table and plotted on the x axis.
- **A dependent** variable is what you are measuring. This is always the second column(s) in a table and plotted on the y axis.
- **Controlled** variables stay the same in each experiment in an investigation.

Terms used to describe variables include:

Term	*What it is used to describe*	*Term*	*What it is used to describe*
Volume	How much there is of a liquid or gas	Concentration	A strong a chemical or solution is
Mass	How much there is of a solid	Number	How many there is of something
Length	Time or distance	Type	The kind of something
Temperature	Temperature	Size	How big something is



If you compare experiment 2 and 3, the only variable which has been changed is the type of fibre. These experiments can be compared to find out if the type of fibre affects heat loss.

If you compare experiment 1 and 4, the only variable which has been changed is the thickness of the mineral wool. These experiments can be compared to find out if the thickness or depth of wool affects heat loss.

You cannot compare experiment 1 and 2 because there is more than one difference between the experiment making this comparison unfair.

https://www.youtube.com/watch?v=iaewZmc4TYQ

Biology 101- Cells

Microscopes

Microscopes are used so you can see very small objects. Light passes through different lenses which makes the image larger.

There are two lenses in a microscope- the eye piece lens and the objective lens.

The total magnification is equal to the size of the eye piece lens multiplied by the size of the objective lens.

Example

Fiona was using a microscope to view cheek cells. The eyepiece lens has a size of x10 and the objective lens has a size of x40.

Calculate the total magnification

Total magnification	=	eye piece lens x objective lens
	=	10 x 40
	=	x400

Stains are used when viewing cells to help see the different structures clearly

- Iodine is used for plant cells
- Methylene blue is used for animal cells

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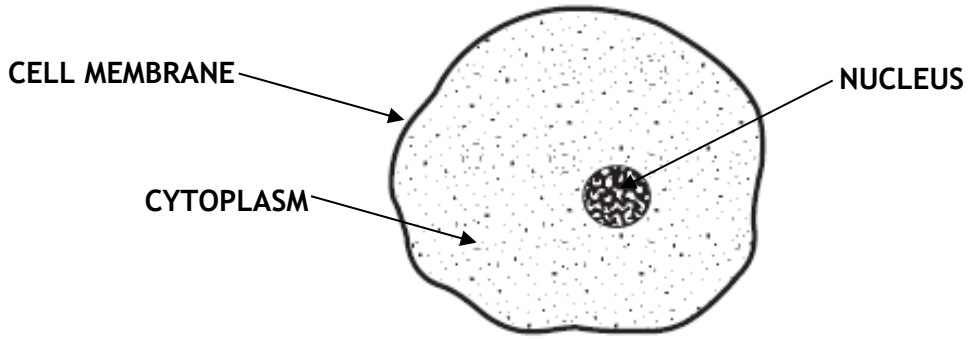
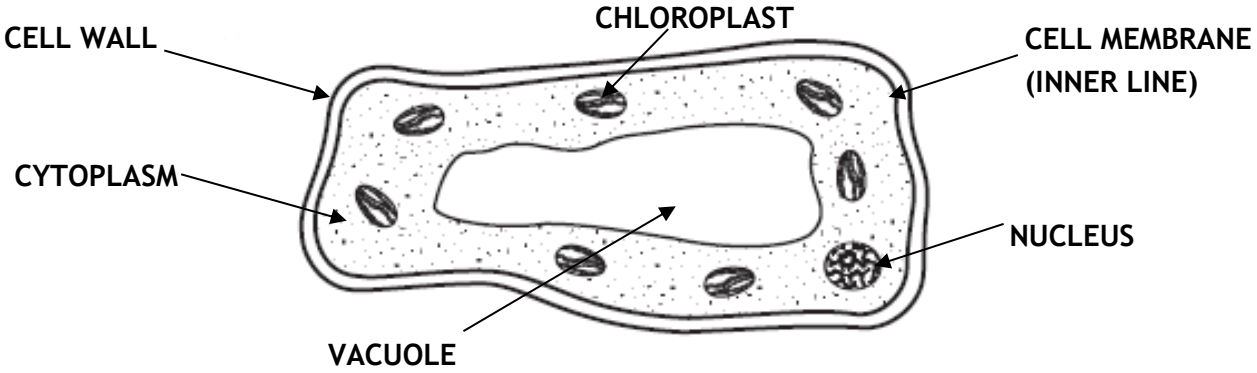
Animal and plant cells
Cells are the basic unit of life.

Animal Cell Diagram



Plant cell diagram



Planet cells have chloroplasts, vacuoles and cell walls which are not found in an animal cell.
If a cell has these parts, it identifies it as a plant cell.

Part of cell	*Function*
Nucleus	Controls cell activities
Cytoplasm	Where chemical reactions take place
Cell membrane	Controls what can enter and leave the cell
Chloroplast	Traps light energy to make food (photosynthesis)
Vacuole	Contains cell sap
Cell wall	Provides shape and support to the cell

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https://www.youtube.com/watch?v=9mvJ6GmMn1k

Physics 101- Energy

Forms of Energy

Energy is the ability to do work. It is measured in joules (J).

There are different forms of energy:

Stores of energy	Ways to transfer energy
Chemical Potential Nuclear	Sound Light Electrical Kinetic Heat

https://www.youtube.com/watch?v=63t0Y2ACoh4

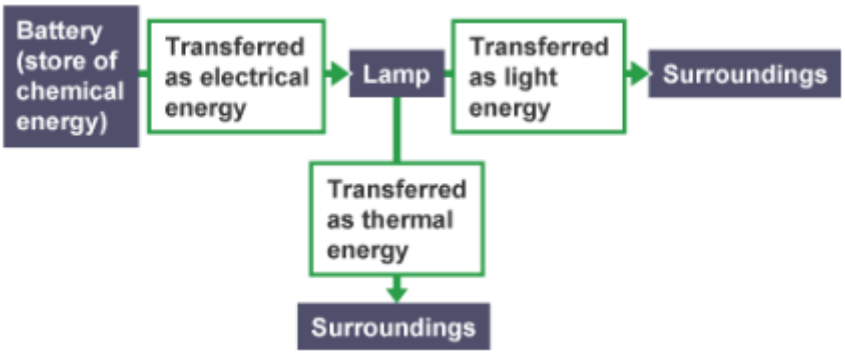
Energy transfers

Energy can transfer or move from one store to another in different ways. Devices such as lamps and heaters may be involved, or processes such as combustion (burning). For example, energy can be transferred:

- by heating
- electrically
- by radiation

Examples

Energy is transferred when an electrical circuit is complete. A simple circuit may consist of a battery, a lamp and wires. The chemical energy in the battery is transferred through the wires to the lamp, which then transfers the energy to the surroundings as light. These are the useful energy transfers - we use electric lamps to light up our rooms. The lamp also transfers thermal (heat) energy to surroundings. This is a wasted energy transfer.



The Law of Conservation of Energy

In science, a system is a set of things and the processes that happen in them and between them. Energy can be stored or transferred, but it cannot be created or destroyed. This means that the total energy of a system stays the same. The idea that the total energy has the same value before and after a change is called conservation of energy.

Example
If 100 J of electrical energy enters a fan and it uses 60 J of energy to spin the blades. The 40 J cannot disappear it must be transformed into a different form e.g. sound or heat.

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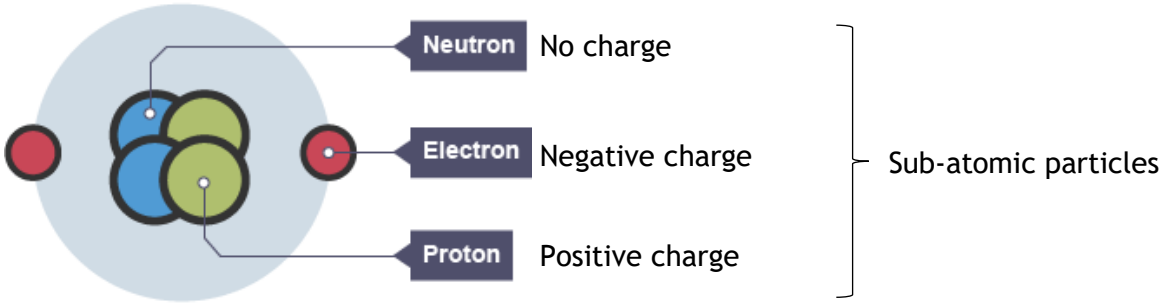
Chemistry 101- Elements

Atoms

Atoms make up all matter.
Atoms are made of subatomic particles.



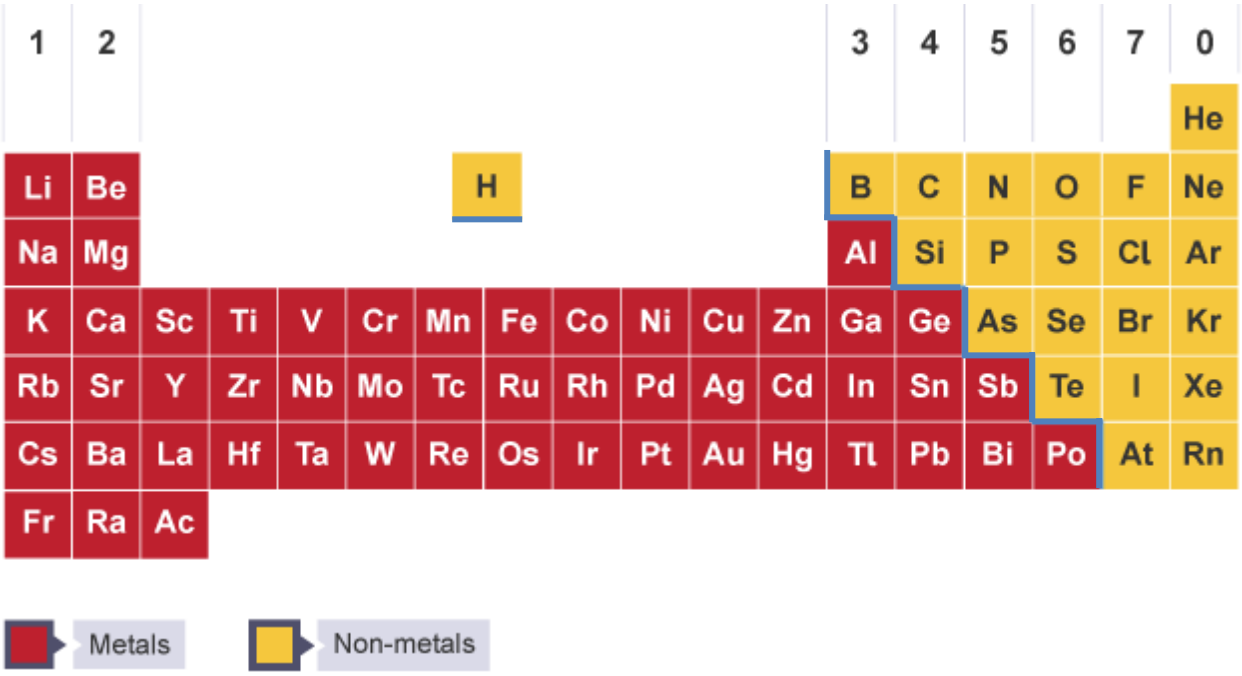
Elements

- An element is a substance that is made of only one type of atom and cannot be broken down into any other substance
- Each element can be identified by a unique symbol, found in the Periodic table
- A symbol can be one capital letter
    - For example, carbon has the symbol C
- A symbol can have two letters- the first is always a capital letter and the second is a small case letter
    - For example, copper has the symbol Cu

The Periodic Table

The Periodic Table contains all known elements

- The elements are organised in the table by their atomic number and chemical properties
- The elements are organised into rows called periods and columns called groups
- Metal elements are found on the left-hand side and non-metals are found on the right of the zig-zag line or 'staircase' which is shown as a blue line in the diagram below
    - Hydrogen is the exception to this rule



- Most elements are metals, which are shiny and conduct electricity well. Metals are mostly solid at room temperature, like gold, aluminium and iron. Mercury is the only metal that is liquid at room temperature.
- Some elements are non-metals. Most non-metals are gases at room temperature and do not conduct electricity. Non-metal elements with these properties include oxygen, hydrogen and chlorine. A few non-metals, such as carbon and sulphur, are in a solid state at room temperature. The only non-metal which conducts electricity is carbon in the form of graphite.

Groups of the Periodic Table

The periodic table lists all the known elements, grouping together those with similar properties

Group Number	*Group Name*	*Properties*
1	Alkali metals	• soft • very reactive • solids
7	Halogens	• colourful • poisonous • very reactive • non-metals
0 / 8	Noble Gases	• unreactive • non-metals • gases

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https://www.youtube.com/watch?v=vWHmX1fKTrI