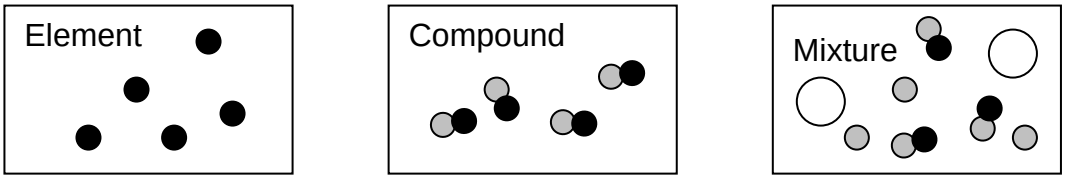
DEMONSTRATE KNOWLEDGE OF MATTER
18973 Version 2
Level 1, 2 Credits

element 1 Describe types of matter.
element 2 Describe methods used to separate substances in a mixture.
element 3 Describe a simple model of an atom.
element 4 Describe metals and non-metals.

Elements, compounds and mixtures

An element has only one kind of atom – eg copper, magnesium, gold, lead
A compound has two or more types of atom chemically joined together – eg copper sulfate, sodium hydroxide
A mixture is a physical combination of two or more substances – eg air, salty water, tap water, smoke. It can be a mixture of elements, mixture of compounds, or a mixture of elements & compounds!



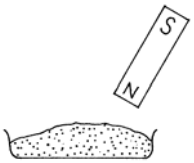
Separation techniques

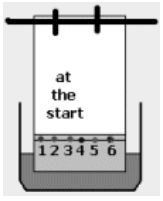
Example: Sand, cork dust, sugar and water have been mixed together. The mixture can be separated using simple separation techniques. Sugar is soluble in water; cork dust and sand are not. Cork dust is light and so floats on water and the sand sinks because it is dense.

- Decant the cork dust and sugar solution from the sand. Sand is heavy and will stay at the bottom and the light cork dust will pour off with the sugar solution.
- Filter cork dust from sugar solution. The sugar solution will go through the filter paper / the cork dust will get stopped by the filter paper as the cork dust particles too large to go through the paper.
- Distil the water from the sugar solution. The water will evaporate off, leaving the sugar, then the water will condense again. Or evaporate the water from the sugar solution. The water will evaporate off, leaving the sugar and condense the water again.

Other separation techniques include:

- Magnetic separation: eg iron is magnetic and can be removed from a pile of iron and salt, using a magnet.
- Chromatography: eg to separate colours in a mixture of inks.
- Sieving: eg to remove large solids from smaller ones eg pea seeds from flour.





Atomic Structure

Atom consists of 3 types of subatomic particles
- Protons (+) located in nucleus
- Neutrons (uncharged/0) located in nucleus
- Electrons (-) located around nucleus in energy levels or shells

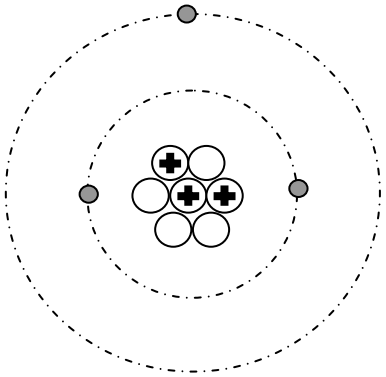
Atoms are neutral overall so no. of protons = no. of electrons. Number of protons can be found from atomic number (given on the Periodic Table)

- The mass number tells you the number of protons plus neutrons.
- The atomic number tells you the number of protons.

Electrons are arranged in energy levels around the nucleus: Each level can hold a maximum number: Ist level: 2 2^{nd} level 8; 3^{rd} level 8.

Electrons fill up from innermost (lowest) energy level. Eg Na has 11 electrons. Electron arrangement or "configuration" is 2.8.1. The outermost energy level is called the **valence shell.**

The diagram opposite represents an atom of the element lithium. The nucleus contains 3 protons (+) charge and 4 neutrons (no charge/neutral). It has 3 electrons, 2 in the inner shell and 1 in the outer (valence) shell. It has an atomic number of 3, and a mass number of 7.



Periodic table of the elements

The rows (horizontal) of the periodic table are called PERIODS. The columns (vertical) are called GROUPS. Every group has a NUMBER.
Elements in the same group have SIMILAR CHEMICAL PROPERTIES because elements in the same group have the SAME NUMBER of electrons in their outer shell.
For example, all of the elements in Group 1 lithium, sodium, potassium etc. - have 1 ELECTRON IN THEIR OUTER SHELL.

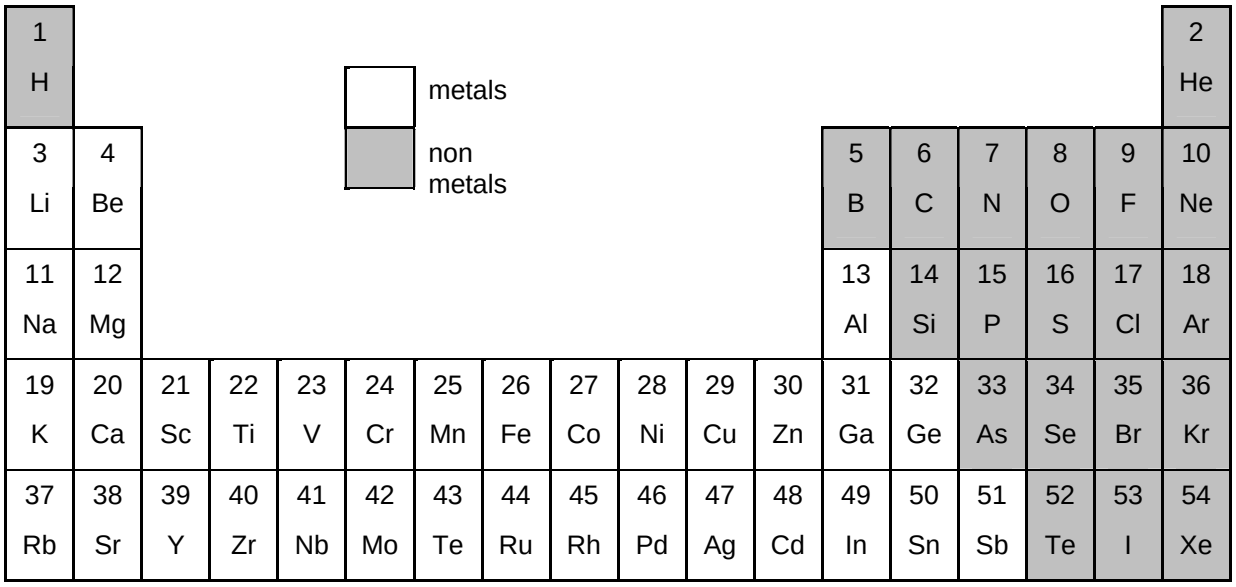
Metals

Iron	Fe	Properties – Heavy, strong, relatively cheap. Only metal that rusts. Uses - car bodies, bolts, nails, bridges.
Aluminium	Al	Properties – silvery, shiny metal, good conductor of electricity, light and strong, doesn't corrode. Uses – overhead electric cables, aircraft industry, racing bikes, cooking utensils, drink cans, window frames.
Copper	Cu	Properties – pinky-orange coloured metal, excellent conductor of heat and electricity, resists corrosion. Uses – electrical wires, water pipes, saucepan bottoms, ornaments.
Magnesium	Mg	Properties – light, shiny, silvery metal, burns with bright light. Uses – used in alloys, used in flares.
Zinc	Zn	Properties – shiny grey metal, quite reactive metal. Uses – used for galvanising iron/steel to stop it rusting.

Non metals

Nitrogen	N	Colourless unreactive gas making up about 79% of air.
Carbon	C	Has different forms including charcoal, diamonds and graphite.
Oxygen	O	Colourless gas we breathe; 21% of air. Needed to allow things to burn.
Sulfur	S	Yellow solid, melts easily and burns with a blue flame to make a poisonous gas, sulfur dioxide.
chlorine	Cl	Poisonous, reactive, yellow-green gas; used for water purification and making bleach and many other uses.

The diagram below shows a simple periodic table of the elements.



Physical properties to metals and non-metals

Physical Property	**Metal**	**Non Metal**
Lustre (shine)	shiny	dull
Colour	most are silvery except copper and gold	various colours
State at room temperature (solid, liquid, gas)	solids (except mercury)	most are gases, one liquid and some solids
Conduct electricity	yes	no / poorly
Conduct heat	yes	no / poorly
Malleable – can be bent, moulded	yes	no
Ductile – can be drawn into wires	yes	no
Magnetic	some, eg iron	no
Strong	yes	no (solids are brittle)