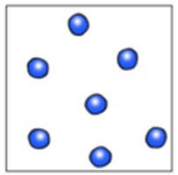
L1 – 4 Atomic Structure

Atoms, elements and compounds

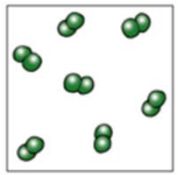
All substances are made of **atoms** that cannot be chemically broken down. It is the smallest part of an **element**.

Elements are made of only one type of atom. Each element has its own **symbol.**
e.g. Na is sodium.

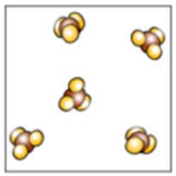
Compounds contain more than one type of atom.
Naming compounds-
Two elements = **ide**
e.g. Na_2S Sodium sulphide
Two or more including oxygen = **ate**
e.g. Na_2SO_4 = sodium sulphate



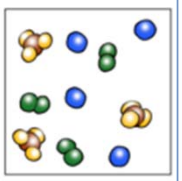
a) Atoms of an element



b) Molecules of an element



c) Molecules of a compound



d) Mixture of elements and a compound

There are two elements here – Magnesium and chlorine

magnesium ← $MgCl_2$ → 2 x chlorine

Magnesium chloride

There are 3 atoms. 1 x Mg and 2 x Cl

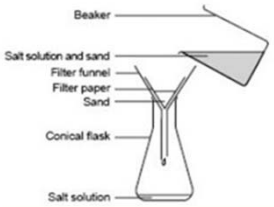
Small numbers (subscripts) after symbols tell you how many of the element BEFORE the number.

Separating mixtures

A mixture consists of **two or more** elements or compounds **not** chemically combined together.

Filtration

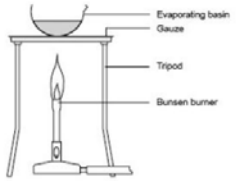
This technique separates substances that are insoluble in a solvent from those that are soluble



Example - filtering a mixture of sand, salt and water to collect the sand

Crystallisation

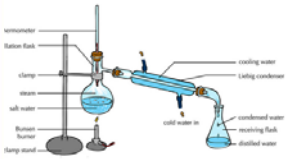
This technique separates a soluble substance from a solvent by heating



Example - crystallisation of sodium chloride from salt solution

Simple distillation

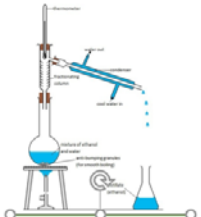
This technique separates a liquid from a mixture by evaporation follow by condensation



Example - obtaining water from sea water

Fractional distillation

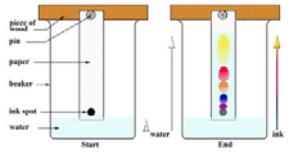
This technique differs from distillation only in that it separates a mixture into a number of different parts, called fractions.



Example - obtaining ethanol from a mixture of ethanol and water

Chromatography

This technique separates small amounts of dissolved substances by running a solvent along absorbent paper

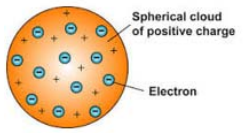


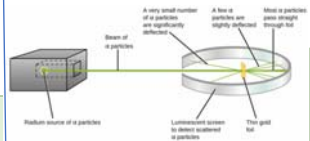
Example - separating the different colours in ink

Development of Atomic Model

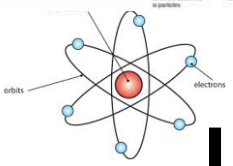
Dalton – atoms can't be divided

JJ Thompson discovered electrons – Plum pudding model





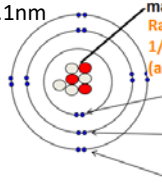
Geiger-Marsden The Nuclear Model of the Atom



Bohr – electrons in shells

Chadwick – the neutron

Atomic radius = 0.1nm



Nucleus - almost all of the mass of an atom is here
Radius of a nucleus is less than 1/10 000 of that of an atom (about 1 x 10^{-14}m)
The first shell (energy level) can hold 2 electrons
The second can hold 8 electrons
The third can hold 8 electrons

Subatomic Particles

	Mass	Charge	Location
Proton	1	+	nucleus
Neutron	1	0	nucleus
Electron	Very small	-	shells

Mass number = Number of protons and neutrons

Atomic number = Number of protons

$^{7}_{3}Li$

Number of protons(+) = Number of electrons (-)

Number of neutrons =
mass number – atomic number

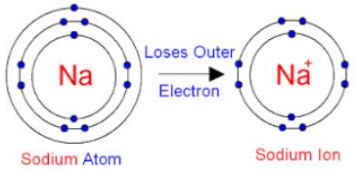
$^{7}_{3}Li$ Protons = 3
Electrons = 3
Neutrons = 4

Isotopes Different mass numbers

$^{12}_{6}C$ $^{13}_{6}C$ $^{14}_{6}C$

Same atomic number

Atoms lose or gain electrons to form ions



1nm = $1x10^{-9}$m