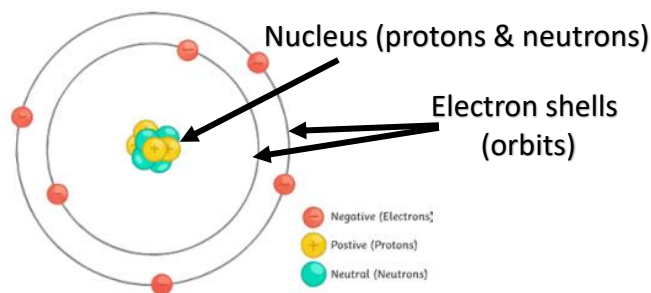


C1 – Atomic Structure and The Periodic Table

Atoms

- Made up of **protons, electrons and neutrons.**



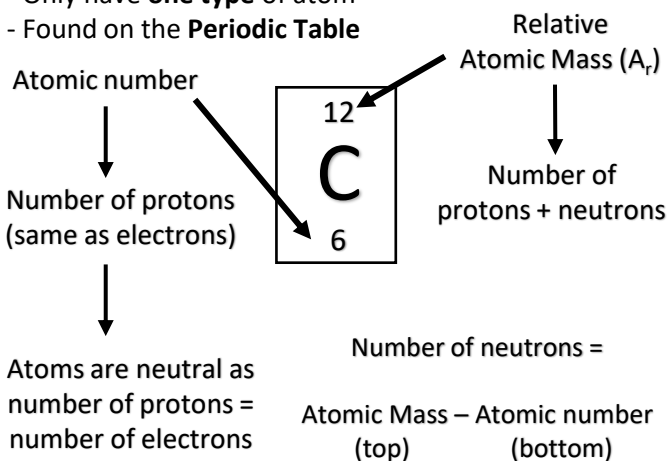
Atoms have a radius of about 0.1nm ($1 \times 10^{-10}\text{m}$)

Radius of nucleus = about $1 \times 10^{-14}\text{m}$

Subatomic particle	Relative Mass	Charge
Proton	1	Positive
Neutron	1	Neutral
Electron	Very small	Negative

Elements

- Only have **one type** of atom
- Found on the **Periodic Table**



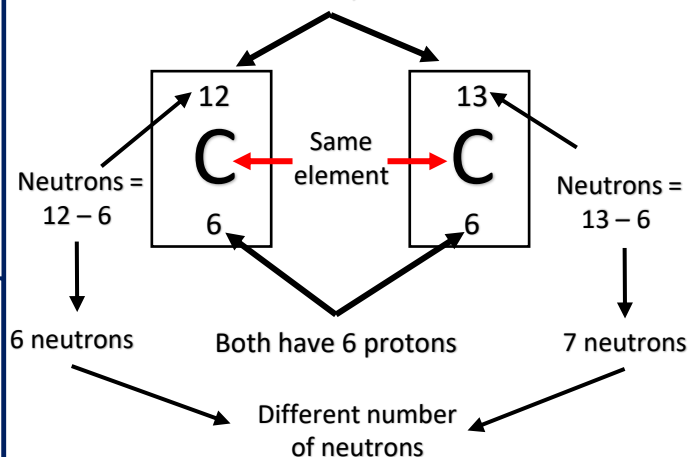
Compounds

- Two or more elements **chemically combined.**
- Formed by chemical reactions
- For example: CO_2 H_2O CH_4 HCl NaCl

Isotopes

Isotope = atoms of the **same element** which have the **same number of protons**, but a **different number of neutrons.**

These are isotopes because..



Chemical Equations

- Shown by using a **word equation.**
- e.g. magnesium + oxygen \rightarrow magnesium oxide

Left of the arrow = **reactants**

Right of the arrow = **products.**

- Also can be shown by a **symbol equation**
- e.g. $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$

Mixtures and Separation

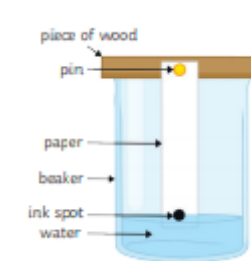
Mixtures – two or more elements or compounds **not** chemically joined.

This means the different components of the mixture can be separated by physical methods (below)

E.g. air is a mixture mainly made of nitrogen, oxygen and carbon dioxide.

Chromatography

to separate out mixtures (usually liquids) (e.g. colours in ink)



Filtration

To separate insoluble solids from liquids (e.g. sand and water)



Evaporation

To quickly separate soluble solids from a solution. (e.g. salt and water)



Crystallisation

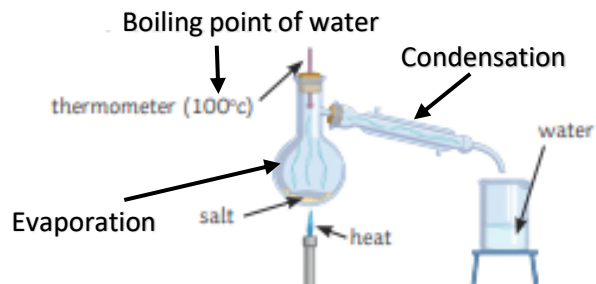
To slowly separate a soluble salt from a solution. (e.g. copper sulfate crystals)



C1 – Atomic Structure and The Periodic Table

Distillation

Simple distillation – separating a liquid from a solution.

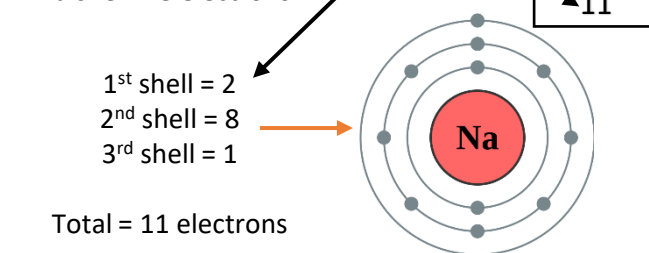


- Liquid is heated to boiling point and evaporates
- Vapours travel up into the condenser
- Condenser has cold water around it.
- Vapours cool and condense (turn back into a liquid).

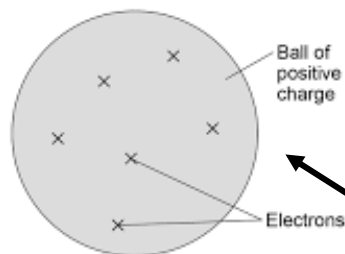
Electronic Structure

- Electrons are found on shells (orbits) orbiting the nucleus.
- There is a maximum number of electrons allowed on each shell:

First shell = 2 electrons
 Second shell = 8 electrons
 Third shell = 8 electrons.



Plum pudding model



Differences to nuclear model

- Ball of positive charge (no protons)
- No nucleus
- No neutrons
- Evenly distributed mass

Rutherford tested the plum pudding model

History of the atom

Scientist	Time	Discovery
John Dalton	Start of the 19 th century	Atoms were first described as solid spheres.
JJ Thomson	1897	Plum pudding model – atom is a ball of + charge with electrons scattered
Ernest Rutherford	1909	Alpha scattering experiment - mass concentrated at the centre, only the nucleus is + charged. Most of the atoms is empty space.
Niels Bohr	Around 1911	Electrons are in shells orbiting the nucleus
James Chadwick	Around 1940	Discovered that there are neutrons in the nucleus.

What happened?

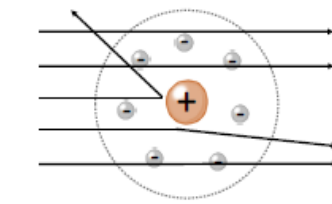
Rutherford's scattering experiment

alpha particles are positively charged

Fired at gold foil

some alpha particles are deflected/ repelled

most alpha particles passed straight through



Conclusions made

Observation	Conclusion
Most of the particles passed straight through	Most of the atom is empty space
Some were deflected to the sides	The particles had passed close by a positive charge
A very small number were repelled straight back	The alpha particles had approached the nucleus straight on. the tiny number told him that the positive charge is in a very small dense core

