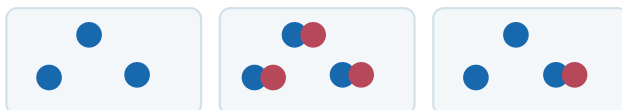


C1 Atomic structure and the periodic table

Chemistry Paper 1 | AQA Combined Science Trilogy | Key ideas to remember

Atoms are conserved

1 Elements, compounds and mixtures



Element

Compound

Mixture

Element: one type of atom.

Compound: different elements chemically bonded in fixed proportions.

Mixture: substances not chemically bonded together; separate by physical methods.

Formula: $\text{H}_2\text{O} = 2 \text{ H atoms} + 1 \text{ O atom}$.

Balanced: $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$.

Same number of each atom on both sides.
Change coefficients, **never subscripts**.

Protons identify elements

2 Particles, numbers and isotopes

Particle	Charge	Rel. mass	Location
Proton	+1	1	Nucleus
Neutron	0	1	Nucleus
Electron	-1	Very small	Shells

Atomic number = protons.

Mass number = protons + neutrons.

Neutral atom: electrons = protons.

Na-23: atomic no. 11; **11 p, 12 n, 11 e.**

Isotopes: same protons, different neutrons.

Relative atomic mass: weighted mean.

Chlorine (75% Cl-35, 25% Cl-37):

$(75 \times 35 + 25 \times 37) / 100 = 35.5$.

Groups show patterns

3 Models and electron shells

Dalton: solid spheres.

Thomson: electrons; plum pudding model.

Rutherford: tiny positive nucleus.

Alpha scattering: most pass through $\rightarrow$ mostly empty space; a few turn sharply $\rightarrow$ small, dense, positive nucleus.

Bohr: electrons in shells/energy levels.

Chadwick: evidence for neutrons.

First 20 elements: fill inner shells first, using the pattern **2, 8, 8, 2**.

Sodium has 11 electrons: **2, 8, 1**.

Atom radius $\approx 0.1 \text{ nm}$ (10^{-10} m); nucleus much smaller.

4 Separating mixtures

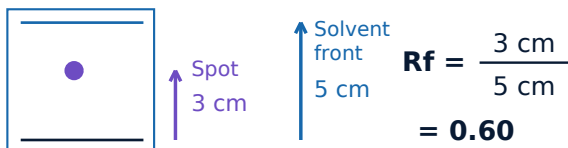
Filtration: insoluble solid from liquid.

Crystallisation: soluble solid from solution.

Simple distillation: collect the solvent; evaporate and condense.

Fractional distillation: liquids with different boiling points.

Chromatography: separates substances by distance travelled.



Both distances start at the **pencil baseline**. Keep the starting solvent level below this line.

5 How the periodic table works



Elements are ordered by **atomic number**.

Period: row; number of occupied shells.

Group: similar properties; same outer electrons (main groups).

Metals: left/centre; conduct, malleable.

Non-metals: right side + hydrogen.

Mendeleev: used mass/properties; left gaps and predicted missing elements.

6 Groups 1, 7 and 0

GROUP 1 - alkali metals

1 outer electron; soft metals.

With water $\rightarrow$ metal hydroxide + hydrogen.

Down group: more reactive; lower melting points.

GROUP 7 - halogens

7 outer electrons; diatomic, e.g. Cl_2 .

Down group: less reactive; higher melting/boiling points. A more reactive halogen displaces a less reactive one from its halide solution.

GROUP 0 - noble gases

Full outer shell (He has 2); unreactive, single atoms. Boiling points rise down the group.