

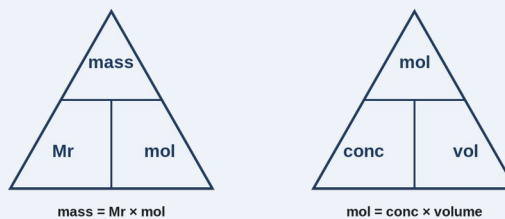
1.5 Chemical Formulae, Equations & Calculations

Mr Curran · practical-science.com

1. KEY VOCABULARY

TERM	MEANING
Relative atomic mass (A_r)	Weighted mean mass of an element's atoms.
Relative formula mass (M_r)	Sum of the A_r values in a formula.
Mole	The amount of substance containing 6.02×10^{23} particles.
Avogadro's number	6.02×10^{23} — particles in one mole.
Concentration	Amount of solute per unit volume (mol/dm^3 or g/dm^3).
Empirical formula	Simplest whole-number ratio of atoms.

2. THE FORMULA TRIANGLES



Cover the value you want — the triangle shows the formula.

Cover what you want to find and the triangle shows the calculation.

3. WRITING FORMULAE

Use ion charges and balance them. The total positive charge must equal the total negative charge.

Example — Mg^{2+} and Cl^- → you need two Cl^- → MgCl_2 .

State symbols: (s) solid, (l) liquid, (g) gas, (aq) dissolved in water.

4. BALANCING EQUATIONS

Rule: atoms can't be made or destroyed — the same number of each atom on both sides.

Only change the big numbers in front; never change a formula.

Example — $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$ becomes $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$.

5. WORKED EXAMPLE — MOLES

Q: How many moles in 8 g of NaOH?

Step 1 M_r of NaOH = $23 + 16 + 1 = 40$.

Step 2 moles = mass \div M_r = $8 \div 40 = 0.2$ mol.

6. THE WHY

Why we use moles: atoms are far too small and too numerous to count — the mole lets us weigh out a known number of particles.

Why we balance: mass is conserved in a reaction. Atoms are only rearranged, never created or destroyed.

7. COMMON EXAM MISTAKES

- ✗ Changing a formula to balance an equation.
- ✓ Only change the big numbers in front.
- ✗ Forgetting to multiply inside brackets, e.g. $\text{Ca}(\text{OH})_2$.
- ✓ $\text{Ca}(\text{OH})_2$ has 1 Ca, 2 O, 2 H.
- ✗ Using volume in cm^3 for concentration.
- ✓ Convert to dm^3 first ($\div 1000$).

8. SELF-CHECK · cover & quiz

Can you...

1. Work out the M_r of any compound?
2. Convert between mass and moles?
3. Write a formula from two ion charges?
4. Balance an equation without changing a formula?
5. Explain what a mole is, and why chemists use it?
6. Explain why equations must be balanced?