Equations and Reacting Masses Map

AQA A-level Chemistry · 3.1.2 Amount of substance: equations and reacting masses

1 Balancing equations

3.1.2.5 i

- Atoms are **rearranged**, never made or lost
- Balance with **coefficients** only
- Never change a formula
- Elements on their own last
- Count every element at the end



2 Unfamiliar reactions

3.1.2.5 ii

- Write every **formula** from the description
- Then balance; halves, then **double**
- **State symbols**: (s), (l), (g), (aq)
- Water is (l); a gas given off is (g)
- $4FeS_2 + 11O_2 \rightarrow 2Fe_2O_3 + 8SO_2$

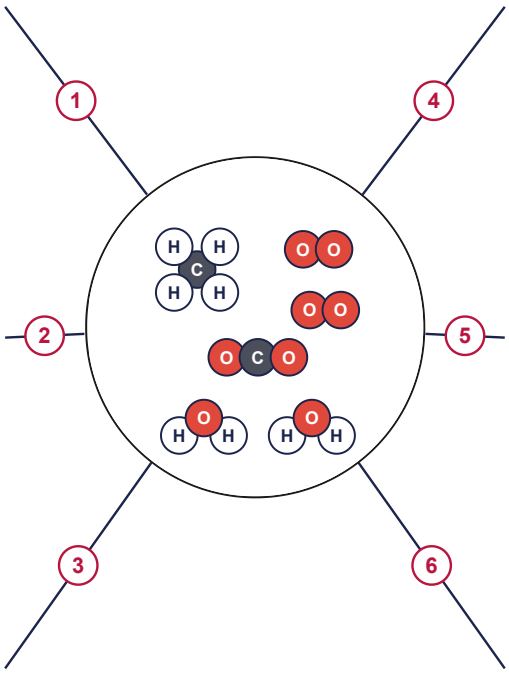


3 Ionic equations

3.1.2.5 i

- **Split** aqueous ionic substances
- Keep solids, liquids, gases whole
- Cancel the **spectator ions**
- Acid + alkali: $H^+ + OH^- \rightarrow H_2O$
- Atoms **and charge** balance





4 Precipitation

3.1.2.5 i

- Two ions form an **insoluble solid (s)**
- Halide test: $Ag^+ + X^- \rightarrow AgX(s)$
- AgCl white, AgBr cream, AgI yellow
- Sulfate test: $Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4(s)$
- $Mg^{2+} + 2OH^- \rightarrow Mg(OH)_2(s)$



5 Acids and redox

3.1.2.5 i

- $Mg + 2H^+ \rightarrow Mg^{2+} + H_2$
- $CO_3^{2-} + 2H^+ \rightarrow H_2O + CO_2$
- $Mg + Cu^{2+} \rightarrow Mg^{2+} + Cu$
- $Cl_2 + 2Br^- \rightarrow 2Cl^- + Br_2$
- Check the charges: 6+ = 6+



6 Reacting masses

3.1.2.5 v

- **Moles** of what you know
- **Ratio** from the equation
- **Mass** of what you want
- **Limiting reactant**: used up first
- Moles in the coefficient ratio, never masses



Ionic equations for the reactions studied

the spectator ions are left out of every ionic equation

Reaction	Ionic equation	Spectators
Acid + alkali	$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$	e.g. Na^+, Cl^-
Acid + carbonate	$CO_3^{2-} + 2H^+ \rightarrow H_2O(l) + CO_2(g)$	e.g. Na^+, Cl^-
Acid + metal	$Zn(s) + 2H^+(aq) \rightarrow Zn^{2+}(aq) + H_2(g)$	SO_4^{2-}
Halide test	$Ag^+(aq) + Br^-(aq) \rightarrow AgBr(s)$	Na^+, NO_3^-
Sulfate test	$Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$	Na^+, Cl^-
Halogen displacement	$Cl_2(aq) + 2I^-(aq) \rightarrow 2Cl^-(aq) + I_2(aq)$	K^+

Worked examples

Balance it

- $NH_3 + O_2 \rightarrow NO + H_2O$
- N, H first: $4NH_3 \rightarrow 4NO + 6H_2O$
- **$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$**

Charge check

- $Al + Cu^{2+}$: $Al^{3+} + Cu$
- $2 \times 3+ = 3 \times 2+$
- **$2Al + 3Cu^{2+} \rightarrow 2Al^{3+} + 3Cu$**

Reacting mass

- 11.2 g Fe: 0.201 mol
- $4Fe : 2Fe_2O_3$
- **16.0 g Fe_2O_3**

Balanced equations are the start of every calculation in solutions, gases, yield and atom economy.

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