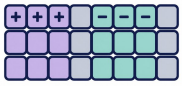
Formulae and Equations Map

OCR A Level Chemistry A · 2.1.2 Compounds, formulae and equations

1 Charges from the periodic table

2.1.2 (a)(i)

- Groups 1, 2, 13: **1+, 2+, 3+**
- Groups 15, 16, 17: **3−, 2−, 1−**
- Group 18: no ions
- d block: **Roman numeral** gives the charge
- Iron(III): Fe^{3+}; copper(II): Cu^{2+}



2 Ions to learn

2.1.2 (a)(ii)

- **NO_3^-** nitrate, **CO_3^{2-}** carbonate
- **SO_4^{2-}** sulfate, **OH^-** hydroxide
- **NH_4^+** ammonium
- **Zn^{2+}** zinc, **Ag^+** silver: one charge only
- Formulae: total charge zero; brackets, $Ca(OH)_2$

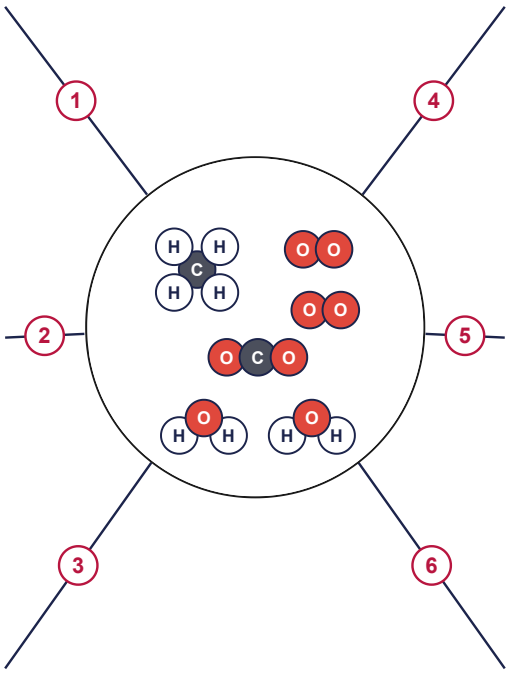


3 Balancing equations

2.1.2 (b)

- Atoms **rearranged**, never made or destroyed
- Same atoms on **both sides**
- Change **coefficients** only
- Never change a formula
- Combustion: C, then H, then O





4 State symbols

2.1.2 (b)

- **(s)** solid, **(l)** liquid, **(g)** gas
- **(aq)**: dissolved in water
- Water is (l), not (aq)
- Insoluble product: (s)
- Boils below 25 °C: (g)



5 Ionic equations

2.1.2 (b)

- Split **aqueous** ionic substances
- Keep solids, liquids, gases whole
- Cancel **spectator ions**
- Balance atoms **and charge**
- $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$



6 Unfamiliar reactions

2.1.2 (b)(iii)

- The question gives the **substances**
- Write every **formula** first
- Balance atoms in one substance first
- Then O and H; count every element
- **Data** give the states: solubility, b.p.



Ionic equations and observations

the spectator ions are left out of every ionic equation

Reaction	Ionic equation	Observation
Acid + alkali	$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$	warms; no visible change
Acid + solid carbonate	$BaCO_3(s) + 2H^+(aq) \rightarrow Ba^{2+}(aq) + H_2O(l) + CO_2(g)$	fizzing; solid dissolves
Silver nitrate + chloride	$Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$	white precipitate
Barium ions + sulfate	$Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$	white precipitate
Hydroxide + copper(II)	$Cu^{2+}(aq) + 2OH^-(aq) \rightarrow Cu(OH)_2(s)$	blue precipitate
Ammonium + hydroxide (warm)	$NH_4^+(aq) + OH^-(aq) \rightarrow NH_3(g) + H_2O(l)$	alkaline gas
Zinc + copper(II) sulfate	$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$	blue fades; pink-brown solid

Worked examples

Write the formula

- zinc nitrate: Zn^{2+}, NO_3^-
- two NO_3^- balance Zn^{2+}
- **$Zn(NO_3)_2$**

Balance it

- $Fe + O_2 \rightarrow Fe_2O_3$
- O: LCM 6: $3O_2$, $2Fe_2O_3$
- **$4Fe + 3O_2 \rightarrow 2Fe_2O_3$**

A new reaction

- Li_3N + water → LiOH + NH_3
- 3 Li: 3LiOH, so $3H_2O$
- **$Li_3N + 3H_2O \rightarrow 3LiOH + NH_3$**

Balanced equations give the mole ratios for reacting masses, gas volumes and concentrations (2.1.3).

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