

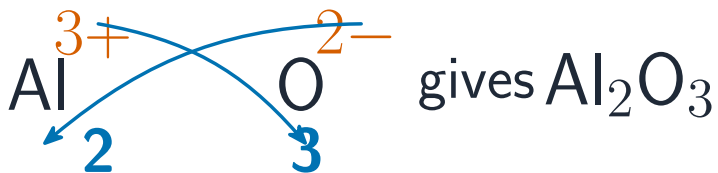
Exercise walk-through

3.1

Formulae

IGCSE Chemistry

Chemical formulae



the charge numbers cross over to become the subscripts (then simplify if they share a factor)

- The **molecular formula** is the actual number of each atom in one **molecule**. For glucose it is C₆H₁₂O₆.
- The **empirical formula** is the simplest whole-number **ratio** of the atoms or **ions** in a **compound**. For glucose it is CH₂O.

Formulae, equations and state symbols

an ionic compound

work the formula out from the **charges**: total positive must balance total negative

the common ions

+: Na^+ , K^+ , Ca^{2+} , Mg^{2+} , Al^{3+} , NH_4^+ . -: Cl^- , OH^- , NO_3^- , SO_4^{2-} , CO_3^{2-} , O^{2-}

a word equation

uses names: *magnesium + oxygen → magnesium oxide*

a symbol equation

uses formulae, and must be **balanced**

state symbols

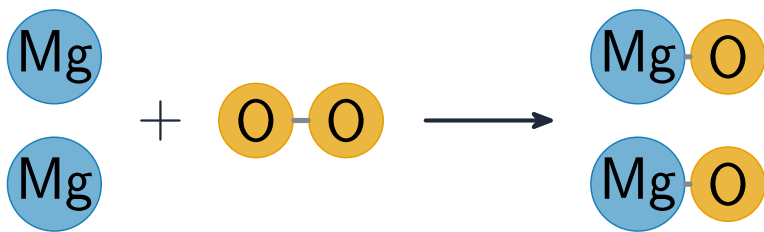
(s) solid, (l) liquid, (g) gas, (aq) **aqueous** – dissolved in water

an ionic equation

shows only the ions that actually change; spectator ions are left out

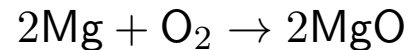
Balance by changing **the numbers in front**, never the formulae themselves. Changing a subscript makes it a different substance.

Writing and balancing equations



2 Mg and 2 O on each side: balanced

A **balanced** symbol equation has the **same** number of each atom on both sides.



State symbols :
(s) (l) (g) (aq).

The words an equation uses

ReactantsThe **reactants**

are on the left – what you start with.

ProductsThe **products**

are on the right – what you finish with.

Balancing

Change the *numbers in front*, never the formulas. Atoms are conserved, so each element must appear the same number of times on both sides.

In solution

A **solute** dissolves in a solvent to give a solution; concentration is moles of solute per dm^3 .

A balanced equation is a recipe in *moles*, which is why every reacting-mass calculation begins by writing one.

Exercises 2.1·2.2

2.1 Give the formula of the compound formed from Mg^{2+} and Cl^- . [1]

2.2 State what the symbol (*aq*) means. [1]

Exercises 2.1·2.2

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2.1

- two Cl^- balance one Mg^{2+}
- MgCl_2

2.2 State what the symbol (*aq*) means. [1]

2.2

- (*aq*) means **aqueous** – dissolved in water

Exercises 3.1·3.2

3.1 The formula of the ionic compound from Ca^{2+} and NO_3^- is:

[1]

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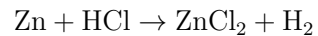
A CaNO_3

B $\text{Ca}(\text{NO}_3)_2$

C Ca_2NO_3

D $\text{Ca}_2(\text{NO}_3)_3$

3.2 Balance the equation, adding state symbols:



[3]

Exercises 3.1·3.2

3.1 The formula of the ionic compound from Ca^{2+} and NO_3^- is:

[1]

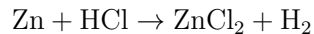
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- A** CaNO_3
- B** $\text{Ca}(\text{NO}_3)_2$
- C** Ca_2NO_3
- D** $\text{Ca}_2(\text{NO}_3)_3$

3.1 B

- one Ca^{2+} needs two NO_3^-
- **$\text{Ca}(\text{NO}_3)_2$**

3.2 Balance the equation, adding state symbols:



[3]

3.2

- zinc + hydrochloric acid $\rightarrow$ zinc chloride + hydrogen
- **$\text{Zn}(s) + 2\text{HCl}(aq) \rightarrow \text{ZnCl}_2(aq) + \text{H}_2(g)$**

Exercise 3.3

3.3 Write the ionic equation for the neutralisation of a strong acid by a strong alkali, and name the spectator ions when NaOH reacts with HCl. [3]

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3.3

- strong acid + strong alkali: H^+ and OH^- make water
- $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$
- spectator ions: Na^+ and Cl^-