

Exercise walk-through

Net Ionic Equations ■ 4.2

eXercise

You must be able to

- write a **complete ionic equation** 完整离子方程 by separating soluble strong electrolytes into ions
- cancel **spectator ions** 旁观离子
- write the **net ionic equation** 净离子方程

Method — Three forms of an equation

- **Molecular:** $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$.
- **Complete ionic:** separate all **soluble** ionic compounds into ions.
- **Net ionic:** cancel the ions that appear on both sides.

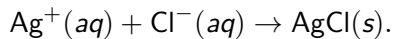
Method — Splitting into ions

Soluble strong electrolytes are written as **separate ions**; solids, gases, and molecular substances stay together. So $\text{AgNO}_3 \rightarrow \text{Ag}^+ + \text{NO}_3^-$, but the precipitate AgCl(s) stays whole.

Method — Spectator ions

Ions that appear **unchanged** on both sides (here Na^+ and NO_3^-) are **spectators** — cancel them.

Method — The net ionic equation



Only the species that actually react remain — the real chemistry.

Practice 2.1 ■ 1 mark

Write Na^+ and Cl^- as they appear when NaCl dissolves.

Solution 2.1

Method: Three forms of an equation

Worked steps

$\text{Na}^+(aq) + \text{Cl}^-(aq)$ (separate ions) **B1**.

Practice 2.2 ■ 1 mark

In a reaction, K^+ appears on both sides unchanged. What is it called?

Solution 2.2

Method: Spectator ions

Worked steps

A spectator ion **B1**.

Practice 2.3 ■ 1 mark

Which species are NOT split into ions in an ionic equation?

Solution 2.3

Worked steps

Solids, gases, molecular substances (and weak electrolytes) **B1**.

Exam-style 3.1 ■ 1 mark

A spectator ion is one that

- A** forms the precipitate
- B** appears unchanged on both sides
- C** is a gas
- D** is the solvent

Solution 3.1

- A** forms the precipitate
- B** appears unchanged on both sides 
- C** is a gas
- D** is the solvent

Worked steps

B — unchanged on both sides.

Exam-style 3.2 ■ 2 marks

Consider $\text{Pb}(\text{NO}_3)_2(\text{aq}) + 2\text{KI}(\text{aq}) \rightarrow \text{PbI}_2(\text{s}) + 2\text{KNO}_3(\text{aq})$.

- (a) Identify the spectator ions.
- (b) Write the net ionic equation.

Solution 3.2

Method: Three forms of an equation

Worked steps

(a) K^+ and NO_3^- **B1** **B1**. (b) $\text{Pb}^{2+}(\text{aq}) + 2\text{I}^-(\text{aq}) \rightarrow \text{PbI}_2(\text{s})$ **M1** **A1**.

Exam-style 3.3 ■ 3 marks

For the reaction of $\text{HCl}(aq)$ with $\text{NaOH}(aq)$ to form water and $\text{NaCl}(aq)$, write the net ionic equation.

Solution 3.3

Method: Three forms of an equation

Worked steps

Complete ionic cancels Na^+ and Cl^- **M1**; net ionic: $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$
M1 A1.