

4.2 Net Ionic Equations

Name: _____ Class: _____ Date: _____

Total: 11 marks

KEY WORDS net ionic equation 净离子方程 • spectator ions 旁观离子
 • complete ionic equation 完整离子方程 • precipitate 沉淀

Objective

Build the skills to answer exam questions on **net ionic equations**.

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

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ 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.

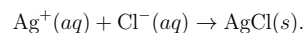
■ Splitting into ions

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 $\text{AgCl}(s)$ stays whole.

■ Spectator ions

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

■ The net ionic equation



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

2 Practice

Now apply the methods above.

2.1 Write Na^+ and Cl^- as they appear when NaCl dissolves. [1]

2.2 In a reaction, K^+ appears on both sides unchanged. What is it called? [1]

2.3 Which species are NOT split into ions in an ionic equation? [1]

3 Exam-style questions

3.1 A spectator ion is one that [1]

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

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

(a) Identify the spectator ions. [2]

(b) Write the net ionic equation. [2]

3.3 For the reaction of $\text{HCl}(aq)$ with $\text{NaOH}(aq)$ to form water and $\text{NaCl}(aq)$, write the net ionic equation. [3]

Solutions

2.1 $\text{Na}^+(aq) + \text{Cl}^-(aq)$ (separate ions).

2.2 A spectator ion.

2.3 Solids, gases, molecular substances (and weak electrolytes).

3.1 B — unchanged on both sides.

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

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