

# 4.2 Net Ionic Equations

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 11 marks

## Objective

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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

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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.

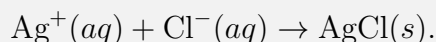
### ■ Splitting into ions

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  $\text{Na}^+$  and  $\text{NO}_3^-$ ) are **spectators** —cancel them.

### ■ The net ionic equation



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

## 2 Practice

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Now apply the methods above.

**2.1** Write  $\text{Na}^+$  and  $\text{Cl}^-$  as they appear when  $\text{NaCl}$  dissolves. [1]

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**2.2** In a reaction,  $\text{K}^+$  appears on both sides unchanged. What is it called? [1]

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

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### 3 Exam-style questions

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**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
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**3.2** 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. [2]

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

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

### 4 Go further

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You are now ready for the real exam questions on this subtopic:

- work through the **4.2 Net Ionic Equations** lesson on the **Learn** page;
- read the **Net Ionic Equations** section of the AP Chemistry handout on the **Know** page.

## Solutions

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**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)  $\text{K}^+$  and  $\text{NO}_3^-$ . (b)  $\text{Pb}^{2+}(aq) + 2\text{I}^-(aq) \rightarrow \text{PbI}_2(s)$ .

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