AP CHEMISTRY • EXERCISE SHEET

4.2 Net Ionic Equations

Name: _____ Class: _____ Date: _____ **Total: 11 marks**

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**: $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$.
- **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 $AgNO_3 \rightarrow Ag^+ + NO_3^-$, but the precipitate 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

$$Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s).$$

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 $Pb(NO_3)_2(aq) + 2KI(aq) \rightarrow PbI_2(s) + 2KNO_3(aq)$.

(a) Identify the spectator ions. [2]

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

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

4 Go further

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

2.1 $Na^+(aq) + Cl^-(aq)$ (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) $Pb^{2+}(aq) + 2I^-(aq) \rightarrow PbI_2(s)$.

3.3 Complete ionic cancels Na^+ and Cl^-; net ionic: $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$.