AP CHEMISTRY • EXERCISE SHEET

7.12 The Common-Ion Effect

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

Objective

Build the skills to answer exam questions on the **common-ion effect**.

You must be able to:

- predict that a **common ion** 同离子 lowers a salt's solubility
- explain it with Le Chatelier / Q vs K_{sp}
- reason qualitatively about the shift

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.

The common-ion effect

Adding an ion that is **already** part of a solubility equilibrium **decreases** the salt's solubility. The extra ion pushes the equilibrium back toward the solid.

A worked case

$AgCl(s) \rightleftharpoons Ag^+ + Cl^-$. Add NaCl (a source of Cl^-): the extra Cl^- raises Q above K_{sp}, so the equilibrium shifts **left** —more AgCl precipitates, and less dissolves.

Le Chatelier view

Adding a product (Cl^-) stresses the system; it shifts to consume the added ion, forming more solid. The salt is **less** soluble than in pure water.

The practical result

You can reduce how much of a slightly soluble salt dissolves by adding a soluble salt sharing one of its ions.

2 Practice

Now apply the methods above.

2.1 Does adding a common ion increase or decrease solubility? [1]

2.2 For $AgCl \rightleftharpoons Ag^+ + Cl^-$, name a salt that provides a common ion. [1]

2.3 Which way does the equilibrium shift when a common ion is added? [1]

3 Exam-style questions

3.1 Adding NaCl to a saturated AgCl solution makes AgCl [1]

- **A** more soluble
- **B** less soluble
- **C** unaffected
- **D** a gas

3.2 Consider $CaF_2(s) \rightleftharpoons Ca^{2+} + 2F^-$. Sodium fluoride (NaF) is added.

(a) State the effect on the solubility of CaF_2. [1]

(b) Explain using Le Chatelier's principle. [2]

3.3 Explain, in terms of Q and K_{sp}, why adding a common ion causes precipitation. [2]

4 Go further

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

- work through the **7.12 The Common-Ion Effect** lesson on the **Learn** page;
- read the **The Common-Ion Effect** section of the AP Chemistry handout on the **Know** page.

Solutions

2.1 Decrease.

2.2 NaCl (or any soluble chloride).

2.3 Toward the solid (left, toward less dissolving).

3.1 B —less soluble.

3.2 (a) It decreases. (b) Adding F^- (a product) stresses the equilibrium, which shifts left to consume it, forming more solid CaF_2 —so less dissolves.

3.3 The added common ion raises the ion product Q above K_{sp}; the system responds by precipitating solid until Q falls back to K_{sp}.