

Unit 6 Topic 3: Solubility Equilibrium and Common Ion Effect

What This Topic Covers:

Understanding how ionic compounds dissolve in water and how equilibrium applies to their solubility.

Key Concepts:

1. Solubility Product Constant (K_{sp})

- Equilibrium constant for the dissolution of a slightly soluble ionic compound
- For example, for $\text{AgCl} \leftrightarrow \text{Ag}^{++} + \text{Cl}^{-}$

$$K_{sp} = [\text{Ag}^{++}][\text{Cl}^{-}]$$

- Larger K_{sp} means more soluble

2. Calculating Solubility

- Use K_{sp} to find molar solubility or concentrations of ions at equilibrium
- Set up ICE tables for calculations

3. Common Ion Effect

- Presence of a common ion decreases solubility
- Shifts equilibrium toward solid (precipitate forms) due to Le Châtelier's Principle

Quick Tips:

- Always write the balanced dissolution equation first
- Use ICE tables to organize calculations
- Remember that K_{sp} only applies to slightly soluble salts, not soluble ones
- Understand how adding ions affects solubility through the common ion effect

Practice Questions:

1. Write the K_{sp} expression for BaSO_4 .
2. Calculate the molar solubility of PbCl_2 given its K_{sp} .
3. Explain what happens to the solubility of AgCl when NaCl is added to the solution.
4. Predict whether a precipitate will form when solutions of BaCl_2 and Na_2SO_4 are mixed.