

# Ksp, precipitation and the common ion effect

AP Chemistry · Test

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_ Mark: \_\_\_\_ / 20

Answer all questions and show your working. A calculator is allowed. Give Ksp values to two significant figures. Use  $K_{sp}(\text{AgCl}) = 1.8 \times 10^{-10}$  where it is not stated.

**Level:** AP Chemistry · **Curriculum:** AP Chem Unit 7

Time: 45 minutes · 8 questions · Total: 20 marks · Calculator allowed

## Question 1 Writing Ksp (2 marks)

Write the Ksp expression for  $\text{Ca}_3(\text{PO}_4)_2$  and express it in terms of the molar solubility  $s$ . (2 marks)

## Question 2 Molar solubility (3 marks)

$K_{sp}(\text{PbF}_2) = 3.3 \times 10^{-8}$ . Calculate the molar solubility and  $[\text{F}^-]$  in a saturated solution. (3 marks)

## Question 3 Ksp from mass solubility (3 marks)

0.62 g of  $\text{BaF}_2$  ( $M = 175.3 \text{ g/mol}$ ) dissolves in  $1.00 \text{ dm}^3$  of water. Calculate Ksp. (3 marks)

## Question 4 Common ion calculation (3 marks)

Calculate the molar solubility of  $\text{AgCl}$  in  $0.020 \text{ mol/dm}^3$   $\text{AgNO}_3$  ( $K_{sp} = 1.8 \times 10^{-10}$ ) and explain why it is smaller than in pure water. (3 marks)

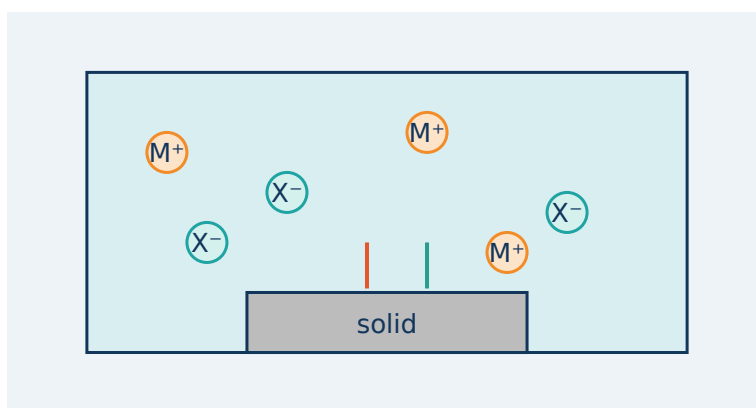
## Question 5 Precipitation test (3 marks)

$40.0 \text{ cm}^3$  of  $1.0 \times 10^{-3} \text{ mol/dm}^3$   $\text{BaCl}_2$  is mixed with  $60.0 \text{ cm}^3$  of  $2.0 \times 10^{-4} \text{ mol/dm}^3$   $\text{Na}_2\text{SO}_4$ .  $K_{sp}(\text{BaSO}_4) = 1.1 \times 10^{-10}$ . Show by calculation whether a precipitate forms. (3 marks)

## Question 6 Solubility in acid (2 marks)

Explain why  $\text{CaCO}_3$  dissolves in dilute hydrochloric acid but  $\text{AgCl}$  does not. (2 marks)

## Question 7 Saturated solution diagram (2 marks)



*A saturated solution with excess solid.*

Describe what happens to the rate of dissolving and the rate of crystallisation in this saturated solution, and state what happens to the concentrations of  $M^+$  and  $X^-$ . (2 marks)

**Question 8 Comparing salts** (2 marks)

$K_{sp}(\text{AgCl}) = 1.8 \times 10^{-10}$  and  $K_{sp}(\text{AgI}) = 8.5 \times 10^{-17}$ . Both are 1:1 salts. Calculate how many times more soluble AgCl is than AgI. (2 marks)