

Worksheet

Ksp Problems

10. $Al_2PO_4(s) \rightleftharpoons Al^{3+}(aq) + PO_4^{3-}(aq)$

I	}	0	0
C	}	x	x
E	}	x	x

$$K_{sp} = [Al^{3+}][PO_4^{3-}]$$

$$9.8 \times 10^{-21} = x \cdot x$$

$$\sqrt{9.8 \times 10^{-21}} = \sqrt{x^2}$$

$$= x$$

Common Ion Effect

Demonstration - solubility of NaCl

$$NaCl(s) \rightleftharpoons Na^+ + Cl^-$$

Added some HCl (concentrated)

↓
H⁺ Cl⁻

Some of the NaCl crystallized

* Cl⁻ is the common ion.

Explain using LeChatelier's principle

Stress - [Cl⁻] ↑

Shift - to reactant side (to lower [Cl⁻])

Consequence - more NaCl(s)

* Common ion effect.

Common Ion Effect Problems

What is the solubility of AgCl added to a solution of 0.10 mol/L NaCl?
(K_{sp} of AgCl = 1.8 × 10⁻¹⁰)

$$AgCl \rightleftharpoons Ag^+ + Cl^-$$

I	}	0	0.10
C	}	+x	+x
E	}	x	0.10+x

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

$$1.8 \times 10^{-10} = x \cdot (0.10 + x)$$

2.10 → ← assume x is small

$$1.8 \times 10^{-10} = x \cdot (0.10)$$

$$\frac{1.8 \times 10^{-10}}{0.10} = x$$

$$1.8 \times 10^{-9} = x = [Ag^+] \text{ solubility}$$

Compare to solubility of AgCl. (1.3 × 10⁻⁵ mol/L)

Washing soda Na₂CO₃ to lower CaCO₃
(Good assumption)

Questions - # 3, 8, 9 worksheet