K_{sp} Problems

5. Given $[Ag^+] = 3.5 \times 10^{-2}$ find K_{sp}

$$AgCl_{(s)} \rightleftharpoons Ag^+ + Cl^-$$

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

$$K_{sp} = (3.5 \times 10^{-2})(3.5 \times 10^{-2})$$

$$= 1.2 \times 10^{-3}$$

10. $AlPO_4 \rightleftharpoons Al^{3+} + PO_4^{-3}$

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

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

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

$$9.9 \times 10^{-11} = x$$

Meaning of Keq

1. When K_{eq} is large (>1) there are more products than reactants.
2. If k is small (<1) there are more reactants ....
3. If $k=1$ [products $\cong$ reactants] approximately

At equilibrium.

Common Ion Effect

Recall- Demonstration on solubility of NaCl.

$NaCl_{(s)} \rightleftharpoons Na^+_{(aq)} + Cl^-_{(aq)}$

Added HCl (conc) $\rightarrow$

Some solid NaCl crystallized

Explain using LeChatelier's ...

Stress- $\uparrow [Cl^-]$.

Shift- reactants

Consequence - $[Cl^-] \downarrow$ Also $[Na^+] \downarrow$

$NaCl_{(s)} \uparrow$

This is the common ion effect.

Examples - Common Ion

What is the solubility of AgCl added to a solution of 0.10 mol/L NaCl? (Given $K_{sp} = 1.8 \times 10^{-10}$)

$AgCl_{(s)} \rightleftharpoons Ag^+ + Cl^-$

		Ag^+	Cl^-
I		0	0.10
C		x	x
E		x	0.10 + x

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

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

↑ assume x is small

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

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

$1.8 \times 10^{-9} = x$

Check assumption * correct!

1.8×10^{-9} mol/L

Compare to solubility of AgCl in H_2O (1.3×10^{-5} mol/L)

Questions 3, 8, 9 worksheet

Introduction to Acid-Base Equilibrium

Text – Ch. 14 & 15

Definitions –

1. Common –

	Acid	Base
	Sour taste	bitter
		slippery

2. Arrhenius – H^+ ions | OH^-

e.g. HCl, CH_3COOH, HNO_3 | e.g. NaOH, $Ca(OH)_2$

3. Brönsted-Lowry – proton (H^+) donor | proton receiver

e.g. $NH_{3(g)} + H_2O \rightleftharpoons NH_{4(aq)}^+ + OH^-_{(aq)}$

Base Acid Conjugate acid Conj base

e.g. $CH_3COOH_{(g)} + H_2O \rightleftharpoons H_3O^+_{(aq)} + CH_3COO^-_{(aq)}$

acid base Conj acid (hydronium ion) Conj base

Amphoteric – behaves like an acid or base e.g. H_2O

Questions – p. 557 #1–7