**Quiz 5**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. Two compounds with general formulas AX and AX2 have Ksp = 1.5 x 10-5 M. Which of the two compounds has the higher molar solubility (2 points)?

AX2

1. Describe the solubility of calcium fluoride in each of the following solutions compared to its solubility in water. Be sure to explain your answers (6 points).
	1. In a 0.10 M sodium chloride solution No change
	2. In a 0.10 M sodium fluoride solution Less soluble
	3. In a 0.10 M hydrochloric acid solution More soluble
2. Consider a solution prepared by mixing 50.00 mL of 2.50 M ammonia with 50.00 mL of 0.00100 M silver nitrate. The following reactions may occur in the solution (12 points):
3. NH3 (aq) + H2O (l) $⇌$ NH4+ (aq) + OH- (aq) Kb = 1.8 × 10-5
4. Ag+ (aq) + NH3 (aq) $⇌$ AgNH3+ (aq) K1 = 2.1 × 103
5. AgNH3+ (aq) + NH3 (aq) $⇌$ Ag(NH3)2+ (aq) K2 = 8.2 × 103
	1. Which reaction does not go to completion? \_\_\_\_\_i\_\_\_\_\_\_
	2. What are the equilibrium concentrations of Ag+, AgNH3+, and Ag(NH3)2+?

First, complete a limiting reagent experiment:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Ag+ (aq) +  | 2 NH3 (aq) → | Ag(NH3)2+ (aq)  |
| I | $$\frac{(50.00 mL)(0.0010 M)}{(50.00 mL+50.00 mL)}=$$$$5.00×10^{-4} M$$ | $$\frac{(50.00 mL)(2.50 M)}{(50.00 mL+50.00 mL)}=$$$$=1.25 M$$ | 0 M |
| C | $$-5.00×10^{-4} M$$ | $$-2(5.00×10^{-4} M)$$ | $$+5.00×10^{-4} M$$ |
| E | $$=0 M$$ | $$=1.25 M$$ | $$=5.00×10^{-4} M$$ |

Then look at equilibrium:

AgNH3+ (aq) + NH3 (aq) $⇌$ Ag(NH3)2+ (aq) $K\_{2}=8.2×10^{3}=\frac{\left[Ag(NH\_{3})\_{2}^{+}\right]}{\left[AgNH\_{3}^{+}\right][NH\_{3}]}$

$$K\_{2}=8.2×10^{3}=\frac{5.00×10^{-4} M}{\left[AgNH\_{3}^{+}\right](1.25 M)}$$

$$\left[AgNH\_{3}^{+}\right]=4.88×10^{-8} M$$

Ag+ (aq) + NH3 (aq) $⇌$ AgNH3+ (aq) $K\_{1}=2.1×10^{3}=\frac{\left[AgNH\_{3}^{+}\right]}{\left[Ag^{+}\right][NH\_{3}]}$

$$K\_{2}=2.1×10^{3}=\frac{4.88×10^{-8} M}{\left[Ag^{+}\right](1.25 M)}$$

$$\left[Ag^{+}\right]=1.86×10^{-11} M$$