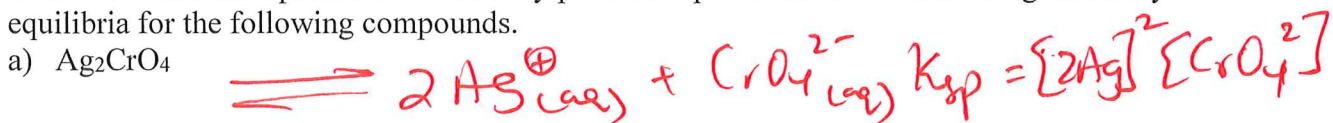


- 1) Write the balanced equation and solubility product expressions for the following solubility equilibria for the following compounds.

a) Ag_2CrO_4

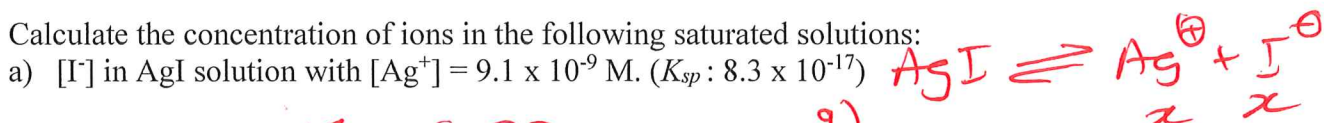


b) AuCl_3



- 2) Calculate the concentration of ions in the following saturated solutions:

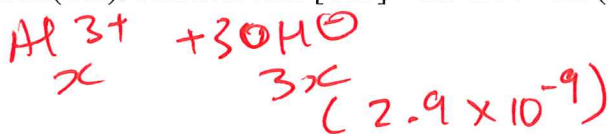
a) $[\text{I}^-]$ in AgI solution with $[\text{Ag}^+] = 9.1 \times 10^{-9} \text{ M}$. ($K_{sp}: 8.3 \times 10^{-17}$)



$$8.3 \times 10^{-17} = [\text{I}^{\ominus}] (9.1 \times 10^{-9})$$

$$[\text{I}^{\ominus}] = \frac{8.3 \times 10^{-17}}{9.1 \times 10^{-9}} = \boxed{9.1 \times 10^{-9} \text{ M}}$$

b) $[\text{Al}^{3+}]$ in $\text{Al}(\text{OH})_3$ solution with $[\text{OH}^-] = 2.9 \times 10^{-9} \text{ M}$. ($K_{sp}: 1.8 \times 10^{-33}$)



$$K_{sp} = [\text{Al}^{3+}] [\text{OH}^{\ominus}]^3$$

$$[\text{Al}^{3+}] = \frac{1.8 \times 10^{-33}}{(2.9 \times 10^{-9})^3} = \boxed{7.4 \times 10^{-8} \text{ M}}$$

- 3) The molar solubility of MnCO_3 is $4.2 \times 10^{-6} \text{ M}$. What is the K_{sp} for this compound?



$$K_{sp} = (x)(x) = x^2 = (4.2 \times 10^{-6})^2 = \boxed{1.8 \times 10^{-11}}$$

- 4) The solubility of an ionic compound MX (mol mass = 346 g/mol) is $4.63 \times 10^{-3} \text{ g/L}$. What is the K_{sp} for this compound? (Hint: Convert g to mol first)

$$4.63 \times 10^{-3} \text{ g/L} \times \frac{1 \text{ mol}}{346 \text{ g}} = 1.34 \times 10^{-5} = x$$



$$K_{sp} = (x)(x) = x^2 = (1.34 \times 10^{-5})^2 = \boxed{1.8 \times 10^{-10}}$$

5) What is the pH of a saturated zinc hydroxide solution? (K_{sp} : 1.8×10^{-14})



$$1.8 \times 10^{-14} = (x)(2x)^2 = 4x^3$$

$$x = \sqrt[3]{\frac{1.8 \times 10^{-14}}{4}} = 1.65 \times 10^{-5} \rightarrow \text{multiply by } 2 \text{ b/c } 2\text{OH}^-$$

$$\text{pOH} = -\log 3.3 \times 10^{-5} = 4.48 \quad \boxed{\text{pH} = 9.52} \quad 3.3 \times 10^{-5} \text{ M}$$

6) If 20.0 mL of 0.10 M $\text{Ba(NO}_3)_2$ is added to 50.0 mL of 0.10 M Na_2CO_3 , will BaCO_3 precipitate? (K_{sp} : 8.1×10^{-9})

$$\frac{20 \text{ mL} \times 0.1 \text{ M}}{(20 + 50) \text{ mL}} = 2.9 \times 10^{-2} \text{ M Ba}^{2+}; \quad \frac{50 \text{ mL} \times 0.1 \text{ M}}{(20 + 50) \text{ mL}} = 7.1 \times 10^{-2}$$



$$Q_{sp} = (2.9 \times 10^{-2})(7.1 \times 10^{-2}) = 2.1 \times 10^{-3}$$

$$\boxed{Q_{sp} > K_{sp} \text{ ppt occurs.}}$$

7) Which of the following ionic compounds will be more soluble in acid solution than pure water:

a) BaSO_4

b) PbCl_2

c) Fe(OH)_3

d) CaCO_3

little more
 SO_4^{2-} is CB of
weak acid HSO_4^-

more
 OH^- is
basic

more
 CO_3^{2-} is CB
of weak acid