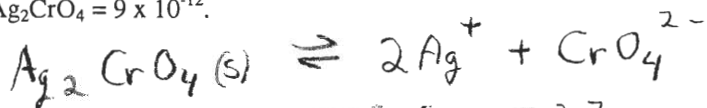


Key

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1. What is the molar concentration of silver ion in a solution containing 1.3×10^{-4} M CrO_4^{2-} , saturated with Ag_2CrO_4 ? K_{sp} of $\text{Ag}_2\text{CrO}_4 = 9 \times 10^{-12}$.



$$K_{sp} = [\text{Ag}^+]^2 [\text{CrO}_4^{2-}]$$

$$9 \times 10^{-12} = [\text{Ag}^+]^2 [1.3 \times 10^{-4}]$$

$$[\text{Ag}^+] = \underline{2.63} \times 10^{-4}$$

2. What is the pH in a saturated solution of $\text{Mg}(\text{OH})_2$ where $[\text{Mg}^{2+}] = 1.5 \times 10^{-5}$ M? K_{sp} $\text{Mg}(\text{OH})_2 = 1.5 \times 10^{-11}$.



$$K_{sp} = [\text{Mg}^{2+}] [\text{OH}^-]^2$$

$$1.5 \times 10^{-11} = [1.5 \times 10^{-5}] [\text{OH}^-]^2$$

$$[\text{OH}^-] = 0.0010$$

$$\text{pOH} = 3.00$$

$$\text{pH} = 11.00$$

3. The solubility of BaCO_3 is 7.9×10^{-3} g·L⁻¹. Calculate the solubility product, K_{sp} , ignoring hydrolysis.

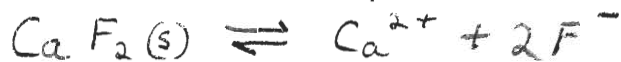
Molar Mass of $\text{BaCO}_3 = 197$ g/mol.

$$\text{BaCO}_3(\text{s}) \rightleftharpoons \text{Ba}^{2+} + \text{CO}_3^{2-} \quad \frac{7.9 \times 10^{-3} \text{ g/mol}}{\text{L} \quad 197 \text{ g}} = \underline{4.01} \times 10^{-5}$$

$$K_{sp} = [4.01 \times 10^{-5}]^2$$

$$K_{sp} = \underline{1.61} \times 10^{-9}$$

4. Typical "hard" water contains about 2.0×10^{-3} mol of Ca^{2+} per liter. Calculate the maximum concentration of fluoride ion which could be present in hard water. K_{sp} of $\text{CaF}_2 = 4.0 \times 10^{-11}$



$$K_{sp} = [\text{Ca}^{2+}] [\text{F}^-]^2$$

$$4.0 \times 10^{-11} = [2.0 \times 10^{-3}] [\text{F}^-]^2$$

$$[\text{F}^-] = 1.4 \times 10^{-4}$$