Marks

- The solubility product constant of $BaSO_4$ is 1.1×10^{-10} M^2. What is the solubility of $BaSO_4$ in g L^{-1}? **3**

The dissolution equilibrium is: $BaSO_4(s) \rightleftharpoons Ba^{2+}(aq) + SO_4^{2-}(aq)$. As equal amounts of cations and anions are produced, the expression for the solubility product is:

$K_{sp} = [Ba^{2+}(aq)][SO_4^{2-}(aq)] = (S)\times(S) = S^2$ where S is the molar solubility.

As $S^2 = 1.1 \times 10^{-10}$, the molar solubility = $S = 1.05 \times 10^{-5}$ M.

The formula mass of $BaSO_4$ is:

(137.34 (Ba) + 32.07 (S) + 4 × 16.00 (O)) g mol^{-1} = 228.41 g mol^{-1}

Hence, the solubility is (1.05 × 10^{-5} M) × (228.41 g mol^{-1}) = 2.4 × 10^{-3} g L^{-1}

ANSWER: **2.4 × 10^{-3} g L^{-1}**

- The solubility product constant of Ag_2CrO_4 is 2.6×10^{-12} M^3. What is the molar solubility of Ag_2CrO_4 in water? **5**

The dissolution equilibrium is: $Ag_2CrO_4(s) \leftrightarrows 2Ag^+(aq) + CrO_4^{2-}(aq)$. As two mol of cation is produced for every one mol of anion, the expression for the solubility product is:

$K_{sp} = [Ag^+(aq)]^2[CrO_4^{2-}(aq)] = (2S)^2\times(S) = 4S^3$ where S is the molar solubility.

As $4S^3 = 2.6 \times 10^{-12}$ M^3, the molar solubility = S = 8.7×10^{-5} M.

ANSWER: **8.7×10^{-5} M**

What is the molar solubility of Ag_2CrO_4 in a solution of 0.10 M $AgNO_3$?

As $AgNO_3$ is very soluble, $[Ag^+(aq)] = 0.10$ M.

If S is the solubility, $K_{sp} = [Ag^+(aq)][CrO_4^{2-}(aq)] = (0.10)^2 \times S = 2.6 \times 10^{-12}$.

Hence, $S = 2.6 \times 10^{-10}$ M

ANSWER: **2.6×10^{-10} M**