

Answer on Question #56266 - Chemistry - Physical Chemistry

Question:

In 1 lit saturated solution of AgCl [$K_{sp}(\text{AgCl})=1.6 \times 10^{-10}$], 0.1 M of CuCl [$K_{sp}(\text{CuCl})=1.0 \times 10^{-6}$] is added. The resultant concentration of Ag⁺ in the solution is 1.6×10^{-x} . The value of 'x' is

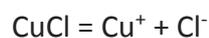
Solution:



$$K_{sp} = [\text{Ag}^+][\text{Cl}^-] = S^2 = 1.6 \times 10^{-10}$$

In the starting solution of AgCl, concentration of Cl⁻ is:

$$[\text{Cl}^-]_{\text{AgCl}} = S = \sqrt{1.6 \times 10^{-10}} = 1.265 \times 10^{-5}$$



$$K_{sp} = [\text{Cu}^+][\text{Cl}^-] = S^2 = 1.0 \times 10^{-6}$$

After the addition of 0.1 M CuCl concentration of Cl⁻ is:

$$[\text{Cl}^-]_{\text{CuCl}} = S = \sqrt{1.0 \times 10^{-6}} = 1.0 \times 10^{-3}$$

$$[\text{Cl}^-] = 1.0 \times 10^{-3} + 1.265 \times 10^{-5} = 1.01265 \times 10^{-3}$$

Final concentration of Ag⁺:

$$[\text{Ag}^+] = \frac{K_{sp}}{[\text{Cl}^-]} = \frac{1.6 \times 10^{-10}}{1.01265 \times 10^{-3}} = 1.58 \times 10^{-7}$$

Answer: x=7