Calculate the minimum number of grams of AgCl that must be added to 250ml of water in order to form a precipitate. Ksp= 1.8 x 10^(-10) for AgCl

Solution:

Silver chloride dissociates in solution according to the equation: $AgCl \leftrightarrow Ag^+ + Cl^-$

The solubility product of silver chloride is given in the problem condition. Write down his expression: $K_{sp}=[Ag^+]\times[Cl^-]=1.8\times10^{-10}$.

Then, from the equation of dissociation of silver chloride should: $[Ag^+]=[Cl^-]=s$.

We substitute the unknown accepted by us into the equation for the product of solubility:

$Ksp=[Ag+]\times[Cl-]=s\times s=s^2=1.8\times10^{-10}$. Find s: $s=\sqrt{1.8\times10^{-10}}=1.3\times10^{-5}\frac{mol}{L}$.

We convert the solubility from the moles dimension per liter to the gram dimension per liter by multiplying the obtained value by the molar mass of silver chloride, which is 143.34 $\frac{g}{mol}$:

$s'=1.3\times10^{-5}\times143.34=1.86\times10^{-3}\frac{g}{L}$.

Now we find the minimum amount of grams of silver chloride to be added to 250 ml of water:

$m(AgCl)=s'\times V(water)=1.86\times10^{-3}\times250\times10^{-3}=0.465\times10^{-3}$ g.

Answer: 0.465×10-3 g