

## Answer on Question #74883 – Chemistry – Organic Chemistry

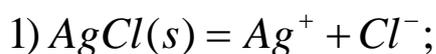
### Task:

A solution is 0.10 M in  $\text{Ag}^+$  and 0.10 M in  $\text{Au}^{3+}$ , which one will precipitate first as sodium chloride is added.

$$K_{sp}(\text{AgCl}) = 1.8 \cdot 10^{-10};$$

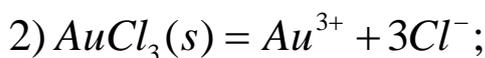
$$K_{sp}(\text{AuCl}_3) = 3.2 \cdot 10^{-25}.$$

### Solution:



$$K_{sp}(\text{AgCl}) = [\text{Ag}^+] \cdot [\text{Cl}^-];$$

$$[\text{Cl}^-]_1 = \frac{K_{sp}(\text{AgCl})}{[\text{Ag}^+]} = \frac{1.8 \cdot 10^{-10}}{0.10} = 1.8 \cdot 10^{-9} \text{ M}.$$



$$K_{sp}(\text{AuCl}_3) = [\text{Au}^{3+}] \cdot [\text{Cl}^-]^3;$$

$$[\text{Cl}^-]^3 = \frac{K_{sp}(\text{AuCl}_3)}{[\text{Au}^{3+}]} = \frac{3.2 \cdot 10^{-25}}{0.10} = 3.2 \cdot 10^{-24};$$

$$[\text{Cl}^-]_2 = \sqrt[3]{3.2 \cdot 10^{-24}} = 1.47 \cdot 10^{-8} \text{ M}.$$

$$[\text{Cl}^-]_1 < [\text{Cl}^-]_2;$$

$$1.8 \cdot 10^{-9} \text{ M} < 1.47 \cdot 10^{-8} \text{ M}.$$

The lower the concentration of chloride ions, the faster the precipitate precipitates.

Therefore,

AgCl will precipitate first as sodium chloride is added.

**Answer:** AgCl will precipitate first as sodium chloride is added.