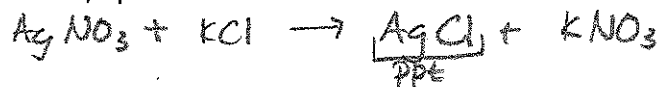


Solution

Predicting Precipitates Practice Questions

To solve each of these questions, you will need to look up the K_{sp} values of the potential precipitate.

1. Will a precipitate form from the mixing of 25.0 mL of 0.0100 mol/L of silver nitrate and 25.0 mL of 0.00500 mol/L potassium chloride?



$$K_{sp} = [\text{Ag}^+][\text{Cl}^-]$$

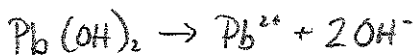
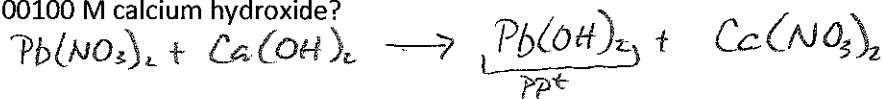
$$K_{sp} = (5 \times 10^{-3})(2.5 \times 10^{-3})$$

$$1.7 \times 10^{-7} < 1.25 \times 10^{-5} \quad \therefore \text{ppt occurs}$$

$$[\text{Ag}^+] = \frac{0.025 \text{ L} \cdot 0.010 \frac{\text{mol}}{\text{L}}}{0.050 \text{ L}} = 5 \times 10^{-3} \text{ M}$$

$$[\text{Cl}^-] = \frac{0.025 \text{ L} \cdot 0.005 \frac{\text{mol}}{\text{L}}}{0.050 \text{ L}} = 2.5 \times 10^{-3} \text{ M}$$

2. Will a precipitate form if 20.0 mL of 0.000100 M lead (II) nitrate solution is combined with 15.0 mL of 0.00100 M calcium hydroxide?



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

$$K_{sp} = (5.714 \times 10^{-5})(8.57 \times 10^{-4})^2$$

$$4.2 \times 10^{-15} < 4.20 \times 10^{-11}$$

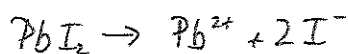
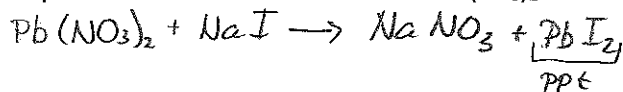
$$\therefore \text{ppt occurs}$$

$$[\text{Pb}^{2+}] = \frac{0.020 \text{ L} \times 0.0001 \frac{\text{mol}}{\text{L}}}{0.035 \text{ L}} = 5.714 \times 10^{-5}$$

$$[\text{OH}^-] = \frac{0.015 \text{ L} \cdot 0.001 \frac{\text{mol}}{\text{L}} \cdot 2 \text{ OH}^-/\text{mol}}{0.035 \text{ L}} = 8.57 \times 10^{-4}$$

↑
there are 2 OH⁻
for every 1 Ca(OH)₂

3. Will a precipitate form if 15.0 mL of 0.150 M Pb(NO₃)₂ is mixed with 100.0 mL of 0.100 M NaI?



$$K_{sp} = [\text{Pb}^{2+}][\text{I}^-]^2$$

$$K_{sp} = (1.9565 \times 10^{-2})(8.6957 \times 10^{-2})^2$$

$$8.3 \times 10^{-7} < 1.48 \times 10^{-4}$$

$$\therefore \text{ppt occurs}$$

$$[\text{Pb}^{2+}] = \frac{0.015 \text{ L} \times 0.150 \frac{\text{mol}}{\text{L}}}{0.115 \text{ L}} = 1.9565 \times 10^{-2} \text{ M}$$

$$[\text{I}^-] = \frac{0.10 \text{ L} \times 0.10 \frac{\text{mol}}{\text{L}}}{0.115 \text{ L}} = 8.6957 \times 10^{-2} \text{ M}$$