

$$K_{sp} = [\text{Ba}^{2+}][\text{Cl}^{-}]^2$$

$$23.6 = (x)(2x)^2$$

$$4x^3 = 23.6$$

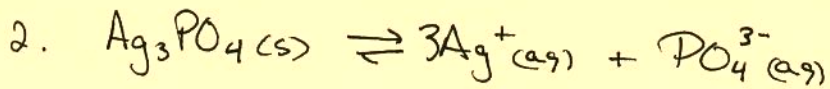
$$x = 1.81$$

$$\text{solubility BaCl}_2 = [\text{Ba}^{2+}] = \frac{1}{2}[\text{Cl}^{-}]$$

$$= 1.81 \frac{\text{mol}}{\text{L}}$$

$$\text{solubility BaCl}_2 = 1.81 \frac{\text{mol BaCl}_2}{\text{L}} \times \frac{208.23 \text{ g BaCl}_2}{1 \text{ mol BaCl}_2}$$

$$= 229.05 \frac{\text{g BaCl}_2}{\text{L}}$$



$$\text{solubility Ag}_3\text{PO}_4 = \frac{1}{3}[\text{Ag}^{+}] = [\text{PO}_4^{3-}] = 2.47 \times 10^{-5} \frac{\text{mol}}{\text{L}}$$

$$[\text{PO}_4^{3-}]_{\text{eq'm}} = 2.47 \times 10^{-5} \frac{\text{mol}}{\text{L}}$$

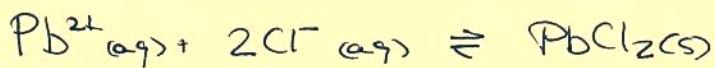
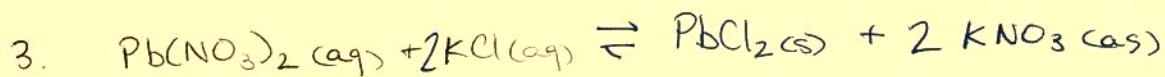
$$\frac{1}{3}[\text{Ag}^{+}]_{\text{eq'm}} = 2.47 \times 10^{-5} \frac{\text{mol}}{\text{L}}$$

$$[\text{Ag}^{+}]_{\text{eq'm}} = 7.41 \times 10^{-5} \frac{\text{mol}}{\text{L}}$$

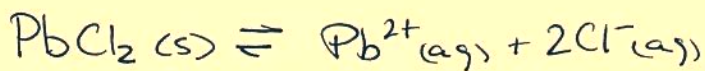
$$K_{sp} = [\text{Ag}^{+}]^3[\text{PO}_4^{3-}]$$

$$= (7.41 \times 10^{-5})^3 (2.47 \times 10^{-5})$$

$$= 1.00 \times 10^{-17}$$



$$K_{sp} = 1.2 \times 10^{-5}$$



$$\begin{aligned} [\text{Pb}^{2+}] &= [\text{Pb}(\text{NO}_3)_2] \times \frac{V}{V_T} \times \text{mol ratio} \\ &= 0.15 \frac{\text{mol Pb}(\text{NO}_3)_2}{\text{L}} \times \frac{1 \text{ mol Pb}^{2+}}{1 \text{ mol Pb}(\text{NO}_3)_2} \times \frac{50.0 \text{ mL}}{125 \text{ mL}} \\ &= 0.0600 \frac{\text{mol Pb}^{2+}}{\text{L}} \end{aligned}$$

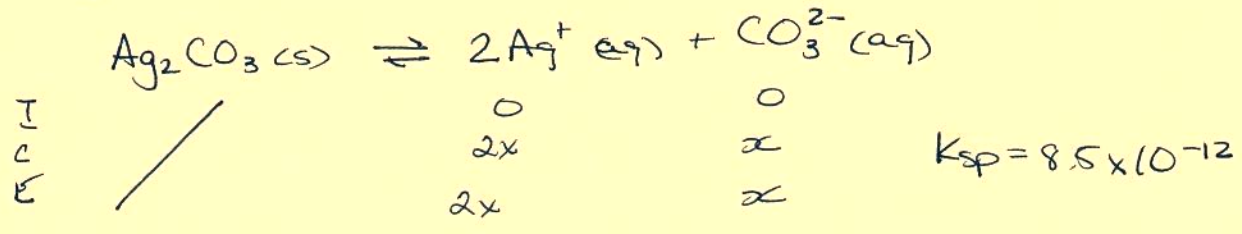
$$\begin{aligned} [\text{Cl}^-] &= [\text{KCl}] \times \frac{V}{V_T} \times \text{mol ratio} = 0.40 \frac{\text{mol KCl}}{\text{L}} \times \frac{1 \text{ mol Cl}^-}{1 \text{ mol KCl}} \times \frac{75 \text{ mL}}{125 \text{ mL}} \\ &= 0.24 \frac{\text{mol Cl}^-}{\text{L}} \end{aligned}$$

$$\begin{aligned} Q_{sp} &= [\text{Pb}^{2+}][\text{Cl}^-]^2 \\ &= (0.0600)(0.240)^2 \\ &= 3.46 \times 10^{-3} \end{aligned}$$

$$Q_{sp} > K_{sp}$$

\therefore ppt will form

4. a)



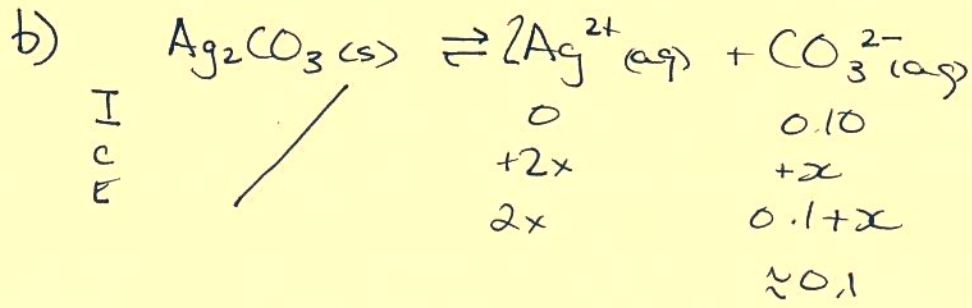
$$K_{sp} = [Ag^+]^2 [CO_3^{2-}]$$

$$8.5 \times 10^{-12} = (2x)^2 (x)$$

$$4x^3 = 8.5 \times 10^{-12}$$

$$x = 1.29 \times 10^{-4}$$

solubility $Ag_2CO_3 = \frac{1}{2} [Ag^+] = [CO_3^{2-}]$
 $= 1.3 \times 10^{-4} \frac{mol}{L}$



check

$$\frac{[]_I}{K_{sp}} = \frac{0.1}{8.5 \times 10^{-12}} > 100$$

$$K_{sp} = [Ag^+]^2 [CO_3^{2-}]$$

$$8.5 \times 10^{-12} = (2x)^2 (0.1)$$

$$(2x)^2 = 8.5 \times 10^{-11}$$

$$x = 4.6 \times 10^{-6}$$

proof

$$\frac{x}{[CO_3^{2-}]_I} \times 100\%$$

$$\left(\frac{4.6 \times 10^{-6}}{0.1} \right) 100\%$$

$$= 4.6 \times 10^{-3} \% \ll 5\%$$

\(\therefore\) assumption valid

solubility $Ag_2CO_3 = \frac{1}{2} [Ag^+]$
 $= 4.6 \times 10^{-6} \frac{mol}{L}$