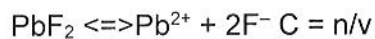


SOLUBILITY PRODUCT PRACTICE PROBLEMS

Answer Key

Solubility Practice Questions: Solution

1.



$$2.15 \times 10^{-3} \quad 2.15 \times 10^{-3} \quad 4.3 \times 10^{-3} \quad C = 2.15 \times 10^{-3} \text{ mol}$$

1L

$$K_{sp} = [\text{Pb}^{2+}][\text{F}^-]^2 \quad C = 2.15 \times 10^{-3} \text{ mol/L}$$

$$K_{sp} = (2.15 \times 10^{-3})(4.3 \times 10^{-3})^2$$

$$K_{sp} = 3.98 \times 10^{-8}$$

5.



2x x

$$K_{sp} = [\text{Ag}^+]^2 [\text{CO}_3^{2-}]$$

$$8.1 \times 10^{-12} = 4x^3$$

$$x^3 = 2.015 \times 10^{-12}$$

$$x = 1.3 \times 10^{-4}$$

∴ Molar solubility is 1.3×10^{-4}

8.

$$\text{Trial } K_{sp} = [\text{Ca}][\text{SO}_4]$$

$$\text{Trial } K_{sp} = (0.0025)(0.03)$$

$$\text{Trial } K_{sp} = 7.5 \times 10^{-5} \quad K_{sp} = 2.4 \times 10^{-5}$$

∴ Trial $Q_{sp} > K_{sp}$

∴ Precipitate will form

9.



$$\text{Trial } K_{sp} = (4.8 \times 10^{-5})^2 (3.4 \times 10^{-4})$$

$$\text{Trial } K_{sp} = 7.83 \times 10^{-13}$$

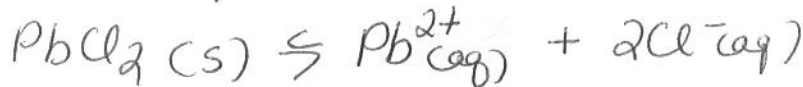
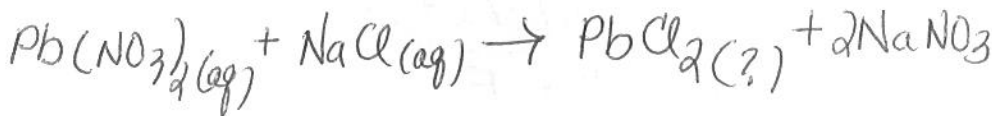
∴ Trial $Q_{sp} < K_{sp}$

Group/Room

SUBJECT Solubility Product Practice Problems

Cont.

11)



$$K_{\text{trial}} = [\text{Pb}^{2+}][\text{Cl}^{-}]^2$$

$$[\text{Pb}^{2+}] = \frac{0.0500\text{L} \times 0.10 \frac{\text{mol}}{\text{L}}}{0.0700\text{L}} = 0.00500 \frac{\text{mol}}{\text{L}} = 0.00035\text{M}$$

$$[\text{Cl}^{-}] = \frac{0.0200\text{L} \times 0.040 \frac{\text{mol}}{\text{L}}}{0.0700\text{L}} = 0.00080 \frac{\text{mol}}{\text{L}} = 0.11 \frac{\text{mol}}{\text{L}}$$

$$K_{\text{trial}} = (0.00035)(0.11)^2 = 4.2 \times 10^{-6} < K_{\text{sp}}$$

∴ no ppt.

$$K_{\text{sp}} = 1.6 \times 10^{-5}$$

12)

$$\frac{0.00245\text{g BaSO}_4}{1.00\text{L}} \times \frac{137.32}{233\text{g}} \times \frac{16 \times 4 = 64}{1\text{mol}} = 1.05 \times 10^{-5} \frac{\text{mol}}{\text{L}} = \text{max. solubility}$$

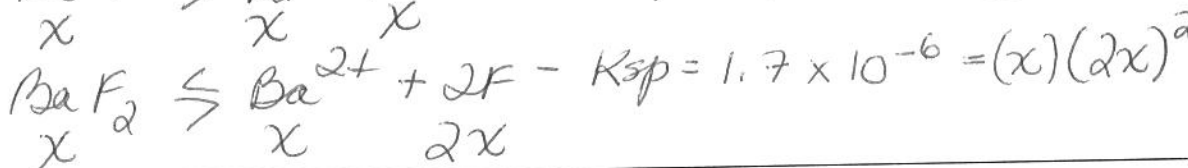
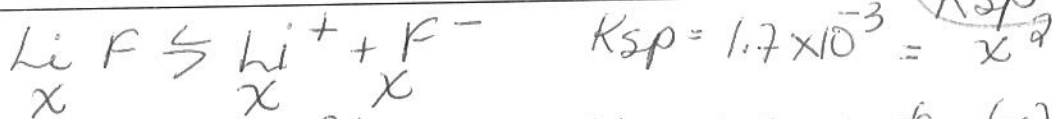
$$K_{\text{sp}} = [\text{Ba}^{2+}][\text{SO}_4^{2-}] = (1.05 \times 10^{-5})^2 = 1.10 \times 10^{-10}$$

13)

$$\frac{0.416\text{g CaCrO}_4}{100\text{mL}} \times \frac{1000\text{mL}}{1\text{L}} \times \frac{1\text{mol}}{156\text{g}} = 0.0267 \frac{\text{mol}}{\text{L}}$$

$$K_{\text{sp}} = [\text{Ca}^{2+}][\text{CrO}_4^{2-}] = (0.0267)^2 = 7.13 \times 10^{-4}$$

15)



| Period | Group/Room | SUBJECT |
|--------|------------|---|
| 1 | | $K_{sp} \text{ LiF} = [\text{Li}^+][\text{F}^-] = x^2 = 1.7 \times 10^{-4}$ $\text{LiF} \rightleftharpoons \text{Li}^+ + \text{F}^-$ $x = x + x \quad \therefore x = 0.041 \frac{\text{mol}}{\text{L}}$ <p>solubility</p> |
| 2 | | $K_{sp} \text{ BaF}_2 = [\text{Ba}^{2+}][\text{F}^-]^2 = (x)(2x)^2 = 4x^3$ $\text{BaF}_2 \rightleftharpoons \text{Ba}^{2+} + 2\text{F}^-$ $x = x \quad 2x$ $\therefore x = 6.5 \times 10^{-4} \frac{\text{mol}}{\text{L}}$ |
| 3 | | <p>solubility</p> <p>$\therefore \text{LiF} > \text{solubility than BaF}_2$</p> |
| 4 | 23. | <p>Always have to solve for solubility x to decide.</p> <p>ppt technique = if you add another ion that has a high K_{sp} value with one of the ions present.</p> |
| 4 | | <div style="border: 1px solid black; padding: 5px; display: inline-block;"> Cl^- Ca^{2+} </div> <p>eg add PO_4^{3-} ions</p> $\text{Ca}^{2+} + \text{PO}_4^{3-} \rightarrow \text{Ca}_3(\text{PO}_4)_2(\text{s})$ |
| 5 | | <p>Will pull the Ca^{2+} ions out of the soln as a ppt</p> <p>eg add Ag^+ ions</p> $\text{Ag}^+ + \text{Cl}^- \rightarrow \text{AgCl}(\text{s})$ <p>$K_{sp} 2.0 \times 10^{-10}$</p> <p>$K_{sp} 1.8 \times 10^{-10} \therefore \text{ppt}$</p> |
| 6 | 24. | <div style="border: 1px solid black; padding: 5px; display: inline-block;"> Ag^+ Ba^{2+} Mg^{2+} </div> <ol style="list-style-type: none"> 1) add Cl^- = AgCl ppts = filter 2) add OH^- = $\text{Mg}(\text{OH})_2$ ppts = filter 3) add CO_3^{2-} = BaCO_3 ppt. |