

****SHOW ALL WORK TO RECEIVE CREDIT****

1. (6 Pts) The solubility product for chromium(III) fluoride is $K_{sp} = 6.6 \times 10^{-11}$. What is the molar solubility of chromium(III) fluoride?
2. (6 Pts) Calculate the silver ion concentration in a saturated solution of silver(I) carbonate ($K_{sp} = 8.1 \times 10^{-12}$).
3. (6 Pts) The solubility of lead(II) iodide is 0.064 g/100 mL at 20°C. What is the solubility product for lead(II) iodide? Molar Masses: Pb 207.2, I 126.9.
4. (7 Pts) Will a precipitate of magnesium fluoride form when 300. mL of 1.1×10^{-3} M $MgCl_2$ are added to 500. mL of 1.2×10^{-3} M NaF? [$K_{sp}(MgF_2) = 6.9 \times 10^{-9}$]. Show calculations to support your answer.

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1. (7 Pts) Will a precipitate of magnesium fluoride form when 300. mL of 1.1×10^{-3} M MgCl_2 are added to 500. mL of 1.2×10^{-3} M NaF ? [$K_{sp}(\text{MgF}_2) = 6.9 \times 10^{-9}$]. Show calculations to support your answer.



$$[\text{Mg}^{2+}] : M_1 V_1 = M_2 V_2$$

$$(1.1 \times 10^{-3})(300) = M_2(800)$$

$$M_2 = 4.125 \times 10^{-4}$$

$$[\text{F}^-] : M_1 V_1 = M_2 V_2$$

$$(1.2 \times 10^{-3})(500) = M_2(800)$$

$$M_2 = 7.5 \times 10^{-4}$$

$$Q_{sp} = [4.125 \times 10^{-4}][7.5 \times 10^{-4}]^2$$

$$Q_{sp} = 2.3 \times 10^{-10}$$

$Q_{sp} < K_{sp}$ no precipitate

2. (6 Pts) The solubility of lead(II) iodide is 0.064 g/100 mL at 20°C. What is the solubility product for lead(II) iodide? Molar Masses: Pb 207.2, I 126.9.



$$\frac{0.064 \text{ g PbI}_2}{0.100 \text{ L}} \Bigg| \frac{\text{mol}}{461 \text{ g}} = 1.39 \times 10^{-3} \text{ M}$$

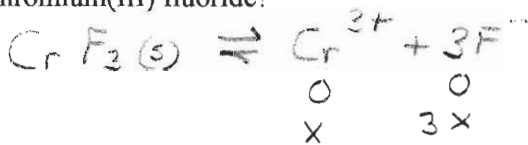
$$[\text{Pb}^{2+}] = 1.39 \times 10^{-3}$$

$$[\text{I}^-] = 2.78 \times 10^{-3}$$

$$K_{sp} = [1.39 \times 10^{-3}][2.78 \times 10^{-3}]^2$$

$$K_{sp} = 1.1 \times 10^{-8}$$

3. (6 Pts) The solubility product for chromium(III) fluoride is $K_{sp} = 6.6 \times 10^{-11}$. What is the molar solubility of chromium(III) fluoride?



$$K_{sp} = [\text{Cr}^{3+}][\text{F}^-]^3$$

$$6.6 \times 10^{-11} = [x][3x]^3 = 27x^4$$

$$x = 0.00125$$

$$1.25 \times 10^{-3} \text{ M}$$

4. (6 Pts) Calculate the silver ion concentration in a saturated solution of silver(I) carbonate ($K_{sp} = 8.1 \times 10^{-12}$).



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

$$8.1 \times 10^{-12} = [2x]^2[x] = 4x^3$$

$$x = 1.27 \times 10^{-4}$$

$$2x = [\text{Ag}^+] = 2.5 \times 10^{-4}$$