CHM152 Quiz 6 25 Pts Fall 2019 Name: Key

Show all work to receive credit.

1. (4 Pts) The molar solubility of magnesium carbonate ($MgCO_3$) is 1.8×10^{-4} mol/L. What is K_{sp} for this compound? Be sure to write the correct chemical equation.

$MgCO_3(s) \rightleftharpoons Mg^{2+} + CO_3^{2-}$ $\quad K_{sp} = [Mg^{2+}][CO_3^{2-}]$

$[Mg^{2+}] = [CO_3^{2-}] = 1.8 \times 10^{-4} M$ $\quad K_{sp} = [1.8 \times 10^{-4}]^2$

$K_{sp} = 3.2 \times 10^{-8}$

2. (4 Pts) The molar solubility of tin(II) iodide is 1.28×10^{-2} mol/L. What is K_{sp} for this compound? Be sure to write the correct chemical equation.

$SnI_2(s) \rightleftharpoons Sn^{2+} + 2I^-$ $\quad K_{sp} = [Sn^{2+}][I^-]^2$

$[SnI_2] = 1.28 \times 10^{-2}$

$[Sn^{2+}] = 1.28 \times 10^{-2}$

$[I^-] = 2.56 \times 10^{-2}$

$K_{sp} = [1.28 \times 10^{-2}][2.56 \times 10^{-2}]^2$

$K_{sp} = 8.4 \times 10^{-6}$ (8.39 $\times 10^{-6}$)

3. (5 Pts) The K_{sp} for silver(I) phosphate is 1.8×10^{-18}. Calculate the molar solubility of silver(I) phosphate. Be sure to write the correct chemical equation.

$Ag_3PO_4(s) \rightleftharpoons 3Ag^+ + PO_4^{3-}$ $\quad K_{sp} = 1.8 \times 10^{-18} = [Ag^+]^3[PO_4^{3-}]$

0 0

$3x$ x

$1.8 \times 10^{-18} = [3x]^3[x] = 27x^4$

$x = 1.6 \times 10^{-5}$

4. (4 Pts) Calculate the concentration of chloride ions in a saturated lead(II) chloride ($K_{sp} = 2.4 \times 10^{-4}$) solution. Be sure to write the correct chemical equation.

$PbCl_2(s) \rightleftharpoons Pb^{2+} + 2Cl^-$ $\quad K_{sp} = [Pb^{2+}][Cl^-]^2$

x $2x$

$2.4 \times 10^{-4} = [x][2x]^2 = 4x^3$

$x = 3.9 \times 10^{-2}$

$2x = [Cl^-] = 7.8 \times 10^{-2}$

5. (4 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? [$K_{sp}(MgF_2) = 6.9 \times 10^{-9}$] **You must show the value of the Q_{sp}.**

A) Yes, $Q > K_{sp}$
B) No, $Q < K_{sp}$
C) No, $Q = K_{sp}$
D) Yes, $Q < K_{sp}$
E) Yes, $Q = K_{sp}$

$MgF_2(s) \rightleftharpoons Mg^{2+} + 2F^-$ $\quad Q_{sp} = [Mg^{2+}][F^-]^2$

$[Mg^{2+}]: (1.1 \times 10^{-3})(300) = M_2(800)$

$[Mg^{2+}] = 4.125 \times 10^{-4}$

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

$[F^-] = 7.5 \times 10^{-4}$

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

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

Less than K_{sp}

6. (4 Pts) Calculate the molar solubility of $BaCO_3$ in a 0.10 M solution of Na_2CO_3(aq). ($K_{sp}(BaCO_3) = 8.1 \times 10^{-9}$)

$BaCO_3(s) \rightleftharpoons Ba^{2+} + CO_3^{2-}$ $\quad K_{sp} = [Ba^{2+}][CO_3^{2-}]$ (drop?)

0 0.10

$+x$ $+x$

$8.1 \times 10^{-9} = [Ba^{2+}][0.10 + x]$

$[Ba^{2+}] = 8.1 \times 10^{-8}$