SOLUBILITY PRODUCT PRACTICE PROBLEMS

Answer Key

Solubility Practice Questions: Solution

1.

$PbF_2 <=> Pb^{2+} + 2F^-$ C = n/v

2.15×10^{-3} 2.15×10^{-3} 4.3×10^{-3} C = 2.15×10-3 mol

1L

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

$K_{sp} = (2.15\times10^{-3})(4.3\times10^{-3})^2$

$K_{sp} = 3.98\times10^{-8}$

5.

$Ag_2CO_3 <=> 2Ag^+ + CO3^-$ $K_{sp} = 8.1\times10^{-12}$

2x x

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

$8.1\times10^{-12} = 4x^3$

$x^3 = 2.015\times10^{-12}$

$x = 1.3\times10^{-4}$

∴ Molar solubility is 1.3×10^{-4}

8.

Trial $K_{sp} = [Ca][SO_4]$

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

Trial $K_{sp} = 7.5\times10^{-5}$ $K_{sp} = 2.4\times10^{-5}$

∵ Trial Qsp > Ksp

∴ Precipitate will form

9.

$K_{sp} = [Ag^+]^2 [CrO_4^{-2}]$ $Ag_2CrO_4 => 2Ag^+ + CrO_4^{2-}$

Trial $K_{sp} = (4.8\times10^{-5})^2 (3.4\times10^{-4})$

Trial $K_{sp} = 7.83\times10^{-13}$

∵ Trial Qsp < Ksp

of the week Monday Date March 6, 2017 Day

Group/Room SUBJECT Solubility Product Practice Problems Cont.

1 11) $Pb(NO_3)_{2(aq)} + NaCl_{(aq)} \rightarrow PbCl_{2(?)} + 2NaNO_3$

$PbCl_{2(s)} \leftrightharpoons Pb^{2+}_{(aq)} + 2Cl^-_{(aq)}$

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

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

$\frac{0.00500mol}{0.0700L} =$

$= 0.00035M$

3 $[Cl^-]$ $0.0200L \times 0.040\frac{mol}{L} = 0.00080mol$

$\frac{0.00080mol}{0.0700L}$

$= 0.11\frac{mol}{L}$

4 lunch $K_{trial} = (0.00035)(0.11)^2 = 4.2\times10^{-6} < K_{sp}$

$\therefore$ no ppt

$K_{sp} = 1.6\times10^{-5}$

12) $\frac{0.00245g\ BaSO_4}{1.00L} \times \frac{1mol}{233g} = 1.05\times10^{-5}\frac{mol}{L}$

$BaSO_4$: 137, 32, $16\times4=64$

$= max$ solubility

4 lunch $K_{sp} = [Ba^{2+}][SO_4^{2-}] = (1.05\times10^{-5})^2 = 1.10\times10^{-10}$

5 13) $\frac{0.416g\ CaCrO_4}{100mL} \times \frac{1000mL}{1L} \times \frac{1mol}{156g} = 0.0267\frac{mol}{L}$

$K_{sp} = [Ca^{2+}][CrO_4^{2-}] = (0.0267)^2 = 7.13\times10^{-4}$

6 15) $LiF \leftrightharpoons Li^+ + F^-$ $K_{sp} = 1.7\times10^{-3} = x^2$

x x x

$BaF_2 \leftrightharpoons Ba^{2+} + 2F^-$ $K_{sp} = 1.7\times10^{-6} = (x)(2x)^2$

x x 2x

K_{sp}

MEMO

Day of the week Tuesday Date March 7, 2017 Day

Period	Group/Room	SUBJECT
1		$K_{sp}\ LiF = [Li^+][F^-] = x^2 = 1.7\times10^{-}$ $LiF \leftrightharpoons Li^+ + F^-$ $x = x \quad x$ $\therefore x = 0.041\ \frac{mol}{L}$ solubility
2		$K_{sp}\ BaF_2 = [Ba^{2+}][F^-]^2 = (x)(2x)^2 = 4x^3$ $BaF_2 \leftrightharpoons Ba^{2+} + 2F^-$ $x = x \quad 2x$ $\therefore x = 6.5\times10^{-4}\ \frac{mol}{L}$ solubility
3		$\therefore$ LiF > solubility than BaF_2
4 lunch	23.	Always have to solve for solubility x to decide. ppt technique = if you add another ion that has a high Ksp value with one of the ions present.
4 lunch		Cl^- Ca^{2+} eg add PO_4^{3-} ions $Ca^{2+} + PO_4^{3-} \rightarrow Ca_3(PO_4)_2(s)$
5		Will pull the Ca^{2+} ions out of the soln as a ppt $K_{sp}\ 2.0\times10^{-}$ eg add Ag^+ ions $K_{sp}\ 1.8\times10^{-}$ $Ag^+ + Cl^- \rightarrow AgCl(s)$ $\therefore$ ppt
6	24.	Ag^+ Ba^{2+} Mg^{2+} 1) add Cl^- = AgCl ppts = filter 2) add OH^- = $Mg(OH)_2$ ppts = filter 3) add CO_3^{2-} = $BaCO_3$ ppt

MEMO