Solubility and Solubility Product Problems

1. A chemist adds water to 120mL of a 6M solution of NaOH until the final volume is 2L. What is the molarity of the resulting solution? {0.36M}

2. 5.0L of 0.1M HCl is needed. The stock solution is 12M. How much stock solution is needed to make the desired solution?{41.67mL}

3. 2.0L of 0.6M $FeCl_3$ is mixed with 1.0L of 0.9M $BaCl_2$. No reaction occurs. What is the concentration of each ion in the final solution?
{Fe^{+3}=0.4M, Cl^-=1.8M, Ba^{+2}=0.3M}

4. The solubility of AgBr is found to be $8.8*10^{-7}$M. Find the K_{sp} of AgBr. {$7.744*10^{-13}$}

5. Calculate the solubility of $CaCO_3$ in water at 25°C.
K_{sp} $CaCO_3$=$4.8*10^{-9}$.{$6.928*10^{-5}$M}

6. The solubility of iron (II) hydroxide, $Fe(OH)_2$, is found to be $1.5*10^{-3}$g/L. Find K_{sp}.{$1.86*10^{-14}M^3$}

7. The K_{sp} for magnesium fluoride, MgF_2, has a value of $6.4*10^{-9}$. What is its solubility in g/L?{0.07287g/L}

8. Will a precipitate form if 40.0mL of $8*10^{-3}$M $Mg(NO_3)_2$ are mixed with 60.0mL of $1*10^{-2}$M K_2CO_3? K_{sp} for $MgCO_3$= $2.6*10^{-5}$.{no}

9. Will a precipitate form if 25mL of $4*10^{-3}$M $AgNO_3$ are mixed with 75mL of $2*10^{-4}$M Na_2CrO_4?K_{sp} for Ag_2CrO_4 = $9*10^{-12}$.{yes}

10. What is the maximum [Sr^{+2}] that can be dissolved in a 0.02M solution of K_2SO_4 without precipitating $SrSO_4$? K_{sp} for $SrSO_4$ = $7.6*10^{-7}$.{$3.8*10-5$M}

11. Water hardness is caused by the presence of Ca^{+2} and Mg^{+2} ions. One way of removing these ions is to add washing soda (Na_2CO_3) which causes precipitation of $CaCO_3$ and $MgCO_3$. If 5.0L of water has a [Ca^{+2}] of 0.004M, calculate the maximum mass of Na_2CO_3 which can be added without causing any precipitate to form. K_{sp} for $CaCO_3$ = $4.8*10^{-9}$.{$6.36*10-4$}

12. A sample of lake water is analysed for chloride ion by being titrated with Ag^+. It is found that 23.64mL of 0.1M $AgNO_3$ are required to precipitate all the chloride ion in a 125 mL sample. What is the [Cl^-] in the sample? {0.018912M}

13. What is the molar solubility of PbI_2 in a 0.1M NaI solution? K_{sp} for PbI_2 = $7.9*10^{-9}$.{$7.9*10^{-7}$M}

14. A solution of calcium fluoride is added to a 0.1M solution of calcium chloride. What will be the maximum concentration of fluoride ions in this mixture? K_{sp} CaF_2 = $3.9*10^{-11}$.{$1.975*10-5$M}

15. Is a precipitation reaction likely to occur when aqueous solution of copper (II) sulfate and sodium hydroxide are mixed? What is the balanced net ionic equation?

K_{sp} Problems

1. Determine the solubility of silver sulfate in pure water at 25°C.{0.01442M}

2. Determine the solubility (in moles) of silver sulfate in a 500mL solution which is 0.1M in sodium sulfate.{$2.75*10^{-3}$ moles}

3. 200mL of used photographic solution contains $4.0*10^{-3}$ M silver ions. What mass of table salt (in grams) would be needed to begin to precipitate the silver as silver chloride?{$5.26*10^{-7}$g}

4. Mix 500mL of 0.1M Ag^+ with 500mL of 0.1M CH_3COO^-. Will a precipitate occur? How much?{1.07g}

5. A 1L solution contains 0.1M of each of Pb^{+2}, Ca^{+2} and Sr^{+2}. Which ion precipitates last as Na_2SO_4 is slowly added with no volume change?

6. From 5, what is the concentration of the ion that precipitates first when the second ion precipitates?