CHEM 120
Fall 2009
Quiz 6

Name: _____

1. (14 Points) Fill in the blanks. If a compound is soluble in water, write "Y" in the Solubility column, but if it is not soluble write "N". Note that the presence of waters of hydration does not affect the compound's solubility.

Note on the actual quiz the "di" is diposphorous pentoxide was accidently omitted. Everyone received credit for their answer because this was my mistake.

Name	Chemical Formula	Solubility
mercury(I) phosphate	**$(Hg_2)_3(PO_4)_2$**	**N**
lead(II) nitrate	**$Pb(NO_3)_2$**	**Y**
diphosphorous pentoxide	**P_2O_5**	------
magnesium sulfite	**$MgSO_3$**	**Y**
silicon dioxide or **silicon(IV) oxide**	SiO_2	------
mercury(II) iodide	HgI_2	**N**
ammonium chromate	$(NH_4)_2CrO_4$	**Y**
xenon tetrafluoride	XeF_4	------

2. (6 Points) A solution of Cu^{2+} where the $[Cu^{2+}]$ is $6.00x10^{-4}$ M was prepared from a $Cu(NO_3)_2$ stock solution by a serial dilution. The first dilution took 2.00 ml of the stock solution and diluted it to 25.0 ml, and the second dilution took 3.00 ml of this new solution and diluted it to 50.0 ml. What was the $[Cu^{2+}]$ in the stock solution?

$$\left(\frac{3.00\text{ ml}}{50.0\text{ ml}}\right)\left(\frac{2.00\text{ ml}}{25.0\text{ ml}}\right)C_i = 6.00x10^{-4}\text{ M}$$

$$C_i = 6.00x10^{-4}\text{ M}\left(\frac{50.0\text{ ml}}{3.00\text{ ml}}\right)\left(\frac{25.0\text{ ml}}{2.00\text{ ml}}\right) = 0.125\text{ M}$$

The $[Cu^{2+}]$ in the stock solution was 0.125 M.

3. (10 Points) The quantitative determination of oxalate anion in solution is performed by titration with permanganate according to the balanced chemical equation shown below.

$$5\ C_2O_4^{2-}\ (aq) + 2\ MnO_4^-\ (aq) + 16\ H^+\ (aq) \rightarrow 2\ Mn^{2+}\ (aq) + 10\ CO_2\ (g) + 8\ H_2O\ (l)$$

A 0.1537-g sample that contains some amount of oxalate is dissolved in water and titrated with a 0.02003 M MnO_4^- solution. It is found that 21.06 ml of the permanganate solution is required to exactly react with the oxalate present in the sample. What is the percent oxalate by mass in the sample? The molar mass of $C_2O_4^{2-}$ is 88.018 g/mole.

Determine the amount of $C_2O_4^{2-}$ in the sample from the titration data.

$$21.06x10^{-3}\ \text{L}\left(\frac{0.02003\ \text{mole}\ MnO_4^{2-}}{1\ \text{L}}\right)\left(\frac{5\ \text{mole}\ C_2O_4^{2-}}{2\ \text{mole}\ MnO_4^{2-}}\right)\left(\frac{88.018\ \text{g}\ C_2O_4^{2-}}{1\ \text{mole}\ C_2O_4^{2-}}\right) = 0.09282_2\ \text{g}\ C_2O_4^{2-}$$

Now determine the % oxalate by mass.

$$\%\ C_2O_4^{2-}\ \text{by mass} = \left(\frac{\text{mass}\ C_2O_4^{2-}}{\text{mass sample}}\right)\times 100 = \frac{0.09282_2\ \text{g}}{0.1537\ \text{g}}\times 100 = 60.39\%$$

The sample is 60.39% oxalate by mass.

4. (8 Points) Complete the following reactions by filling in missing products, missing states (i. e., solid, liquid, gas, aqueous) and balancing the reaction. If no reaction occurs, write "NR" to the right of the arrow.

a. Ag_2CO_3 (**s**) + **2** HNO_3 (aq) → **2** $AgNO_3$ (**aq**) + CO_2 (g) + H_2O (l)

b. $Mg(NO_3)_2$ (aq) + **2** NaF (aq) → **MgF_2 (s) + 2 $NaNO_3$ (aq)**

c. $Hg_2(NO_3)_2$ (aq) + **2** $NaC_2H_3O_2$ (aq) → **$Hg_2(C_2H_3O_2)_2$ (s) + 2 $NaNO_3$ (aq)**

d. $NaClO_3$ (aq) + K_2SO_4 (aq) → **NR**