Chemistry 1140 Exam Four **Name** _____

R = 0.08206 L·atm/K·mol **N = 6.022 x 10^{23} /mol**

All work must be shown to get full credit. Five points will be deducted if a pen is used.

1. (8 points) For a 0.025 M HCl solution, determine each of the following quantities. Calculations need not be shown.

a) $[H_3O^+]$ b) pH

c) $[OH^-]$ d) pOH

2. (8 points) For a 0.074 M NaOH solution, determine each of the following quantities. Calculations need not be shown.

a) $[H_3O^+]$ b) pH

c) $[OH^-]$ d) pOH

3. (8 points) What volume of 2.00 M $CuSO_4$ should be diluted with water to form 250.0 mL of 0.100 M $CuSO_4$?

4. (12 points) Given the reaction

$$2\ FeCl_3(aq)\ +\ 3\ Na_2CO_3(aq)\ \rightarrow\ Fe_2(CO_3)_3(s)\ +\ 6\ NaCl(aq)$$

what mass of iron(III) carbonate would be produced if 545 mL of 0.150 M iron(III) chloride were added to a solution containing excess sodium carbonate?

5. (12 points) Calculate the molarity of each solution listed below.

a) 4.34 g of $Ca(C_2H_3O_2)_2$ in 250.0 mL of solution

b) 3.575 g $K_2C_2O_4$ in 45.7 mL of solution

c) 0.095 g NaOH in 0.5000 L of solution

6. (8 points) Consider a 10-g cube of ice at –10 ºC and a 10-g cube of steel at –10 ºC. Which will be better at cooling a glass of soda? Briefly explain why.

7. (12 points) Given the reaction

$$H_2SO_4(s) + 2\ NaOH(aq) \rightarrow 2\ H_2O(l) + Na_2SO_4(aq)$$

what is the molarity of the sodium hydroxide solution if 32.58 mL is required to react completely with 25.00 mL of 0.5124 M sulfuric acid?

8. (8 points) Circle the substances that have hydrogen bonding in the pure liquid state.

HF NH_3 CH_3F H_2O H_2 H_2S HCl CH_4

9. (8 points) Circle the substances that have dipole-dipole attractions in the pure liquid state.

HBr N_2 CH_3F CCl_4 CO CH_4 H_2S CO_2

10. (8 points) Ethyl chloride boils at 12 ºC. When it is sprayed on the skin, it freezes a small part of the skin and thus serves as a local anesthetic. Briefly explain why it cools the skin.

11. (8 points) Consider the compounds CF_4 and CCl_4. One is a gas at room temperature and one is a liquid. Which is the liquid? Briefly explain your choice.