CHEM 122 – Problem Set 2

1. Write out the electronic structure of the following elements:

a) B b) Al c) Cl d) F

e) Ca f) Na g) Ar h) O

2. Write out the electronic structures for the most common ionic forms of the ions of the above elements.

3. Identify the following half reactions as either reduction or oxidation reactions:

a) $Cu^{2+} + 2e^- \rightarrow Cu$ b) $Zn \rightarrow Zn^{2+} + 2e^-$

c) $Fe \rightarrow Fe^{2+} + 2e^-$ d) $Fe^{3+} + 3e^- \rightarrow Fe$

e) $Ag \rightarrow Ag^{+} + 1e^-$ f) $Au^{3+} + 3e^- \rightarrow Au$

g) $Sr^{2+} + 2e^- \rightarrow Sr$ h) $O + 2e^- \rightarrow O^{2-}$

i) $Cu^{2+} + 1e^- \rightarrow Cu^{+}$ j) $Fe^{2+} \rightarrow Fe^{3+} + 1e^-$

4. Combine the reactions from Question #3 and determine the products AND balance the reactions correctly as follows:

a) 3a with 3b b) 3e with 3f c) 3c with 3e

d) 3d with 3h e) 3c with 3d f) 3e with 3g

g) 3c with 3j h) 3i with 3h i) 3e with 3h

5. Determine the percent of Li in LiOAc.

6. Determine the percent of N in NH_4NO_3.

7. Determine the percent of O in $H_2C_2O_4$.

8. Determine the percent of Cr in $K_2Cr_2O_7$.

9. For the following reaction: $AgNO_3 + HCl \rightarrow AgCl + HNO_3$, if you started with 1 g of $AgNO_3$ and formed 10 g AgCl, how many g of HCl would you need to complete the reaction?

10. For the following reaction: $Sr(NO_3)_2 + BaCO_3 \rightarrow SrCO_3 + Ba(NO_3)_2$, if you started with 2 g of strontium nitrate and 4 g of barium carbonate, how much strontium carbonate would you obtain?

11. Predict the hybridization and the geometry for the following:

a) B b) Xe c) Be d) C e) S f) O

12. Define the following, succinctly:

a) Acid b) Base c) Buffer d) Neutral

13. What kind of acids are the following?

a) HCl b) HNO_3 c) H_2SO_4 d) H_3PO_4 e) HCN

f) H_3PO_3 g) HNO_2 h) H_2CO_3 i) H_2SO_3 j) HOCl

14. Name the following bases:

a) NaOH b) KOH c) $Mg(OH)_2$ d) Na_2CO_3

e) $NaHCO_3$ f) $Al(OH)_3$ g) $CaCO_3$ h) K_2CO_3

i) $LiHCO_3$ j) Li_2CO_3 k) $Fe(OH)_3$ l) $Mg(HCO_3)_2$

15. In Question #4, identify which reactant is the oxidizing agent and the reducing agent.

16. In Question #4, identify which reactant is oxidized and which is reduced.

17. Draw a simple battery and label its parts.

18. Using Graham's Law, determine the following:

a) How much faster does CH_4 diffuse than F_2?

b) How much faster does H_2 diffuse than I_2?

c) How much faster does O_2 diffuse than I_2?

d) How much faster does He diffuse than N_2?

e) How much faster does H_2 diffuse than He?

f) How much faster does Cl_2 diffuse than Br_2?

19. What's the limiting reagent in question #10?

20. Litmus turns _____ in base and _____ in acid. Phenolphthalein turns _____ in base and _____ in acid. Bromocresol Purple turns _____ in base and _____ in acid.