**Chemistry Midterm**

**Name_____ (1pt.)**

**$Q = mC\Delta T$ Heat capacity of water = 4.184 Joules/ (gram* Celsius)**

1. What is the molar mass of $Mg(ClO_4)_2$? **(10 pts.)**

223.21 grams per mole

2. What is the percent by mass of carbon in carbon dioxide? **(10 pts.)**

27.29%

3. A sample of water releases $4.50 \times 10^3$ J of heat energy and its temperature drops from $80.0^{\circ}C$ to $68.0^{\circ}C$. What is the mass of the water? **(10 pts.)**

89.63 grams

4. Which of the following contains the greatest number of atoms? Circle the correct one. **(10 pts.)**

A. 1.0g of lithium ******
B. 1.0g of sodium
C. 1.0g of aluminum
D. 1.0g of silver

5. How many molecules are present in 59.0 grams of HBr? **(10 pts.)**

$4.39 \times 10^{23}$ Molecules

6. **(10 pts.)** Balance all terms in this equation: $Cr_2S_3 + HCl \rightarrow CrCl_3 + H_2S$

$Cr_2S_3 + 6HCl \rightarrow 2CrCl_3 + 3H_2S$

7. **(10 pts.)** Balance all terms in this equation: $H_2 + V_2O_5 \rightarrow V + H_2O$

$5H_2 + V_2O_5 \rightarrow 2V + 5H_2O$

8. An isotope of sodium has the atomic number 11 and the mass number 23. An atom of this isotope contains: (circle the best answer) **(5 pts.)**

A. 11 neutrons
B. 12 protons
C. 12 neutrons ******
D. 23 electrons

For each of the following questions, determine the compound name. Use roman numerals where appropriate. Assume acids are in water and use the acid name. **(10 pts. each)**

9) $FePO_4$ _____Iron (III) Phosphate_____

10) $CCl_4$ _____Carbon Tetrachloride_____

11) $HNO_2$ _____Nitrous Acid_____

*For each of the following questions, write the appropriate formula for it.* ***(10 pts. each)***

12) Magnesium nitride _____$Mg_3N_2$_____

13) Calcium acetate _____$Ca(C_2H_3O_2)_2$_____

14) Chromium (III) oxide _____$Cr_2O_3$_____

**Balance the equations below. (10 pts. each)**

15. $Co(NO_3)_2(aq) + Na_2CO_3(aq) \rightarrow$

$Co(NO_3)_2(aq) + Na_2CO_3(aq) \rightarrow CoCO_3 + 2NaNO_3$

16. $K_2CO_3(aq) + PbO\ (aq) \rightarrow$

$K_2CO_3(aq) + PbO\ (aq) \rightarrow K_2O + PbCO_3$

17. $CuSO_4(aq) + Ba(NO_3)_2(aq) \rightarrow$

$CuSO_4(aq) + Ba(NO_3)_2(aq) \rightarrow Cu(NO_3)_2 + BaSO_4$

**Write the complete equation for the neutralization reactions that take place when the following solutions are mixed. (If an acid has more than one acidic hydrogen, assume that there is enough base to remove all of them. Assume that there is enough acid to neutralize all of the basic hydroxide ions.)(10 pts. each)**

18. $HCl(aq) + LiOH(aq) \rightarrow$

$HCl(aq) + LiOH(aq) \rightarrow LiCl + H_2O$

19. $H_2SO_4(aq) + NaOH(aq) \rightarrow$

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

20. $Cd(OH)_2(s) + HCl(aq) \rightarrow$

$Cd(OH)_2(s) + 2HCl(aq) \rightarrow CdCl_2 + 2H_2O$

21. A chemical called BD (or BDO) is used in the synthesis of Spandex. BD is composed of 53.31% Carbon, 11.18% Hydrogen, and 35.51% Oxygen. It has a molecular mass of 90.122 grams per mole. Find: (1) the empirical formula (20 points), (2) the empirical mass (15 points) and the molecular formula (20 points) . (55 points total) Show work!!! If the empirical formula is wrong: you will be given 10 points maximum for the correct calculation set up of empirical mass. If the mass or formula calculations are wrong previously, you can receive 10 points maximum for the correct formula set up for molecular formula.

Empirical Formula $C_2H_5O$

Empirical Mass 45.061

Molecular Formula $C_4H_{10}O_2$