Review Material For Exam I

1. Since 1982, a US 1 cent coin is 97.59% zinc and 2.41% copper. According to the US Mint website, the volume of the coin is 0.0270 in$^3$. It has a density of 6.94 g/cm$^3$. Calculate the number of copper atoms in the coin.

2. Give the group name of the following:
   a. I
   b. Te
   c. Xe
   d. Mg
   e. Li

3. Write the formula and proper name of the compound formed by combining:
   a. Ca and N
   b. K and O
   c. Fr and F
   d. Al and P
   e. Ba and Br
   f. Sr and Se
4. Give the **proper** name of the following substances (show work for ionic):

- Na$_2$SO$_4$
- SeF$_4$
- Cl$_2$O$_7$
- Na$_2$O
- Mn$_2$O$_3$
- CuCl
- Cr$_2$O$_3$
- ClF$_3$
- BaS
- Cu(NO$_3$)$_2$
- N$_2$O$_5$
- N$_2$F$_2$
- MgI$_2$
- Al$_2$(SO$_4$)$_3$
- CaCO$_3$
5. Write the chemical formula for the following compounds (show work for ionic):

- copper(I) oxide
  
  \( \text{Cu}_2\text{O} \)

- dichlorine pentoxide
  
  \( \text{Cl}_2\text{O}_5 \)

- tin(II) fluoride
  
  \( \text{SnF}_2 \)

- lead(II) dichromate
  
  \( \text{PbCr}_2\text{O}_7 \)

- sulfur tetrafluoride
  
  \( \text{SF}_4 \)

- dinitrogen tetrafluoride
  
  \( \text{N}_2\text{F}_4 \)

- bismuth(III) fluoride
  
  \( \text{BiF}_3 \)

- xenon tetroxide
  
  \( \text{XeO}_4 \)

- mercury(II) sulfate
  
  \( \text{Hg}_2\text{SO}_4 \)

- nickel(II) phosphate
  
  \( \text{Ni}_3\text{P}_2\text{O}_8 \)

- ammonium nitrate
  
  \( \text{NH}_4\text{NO}_3 \)
6. Give the number of protons, neutrons and electrons for the following:

- $^{58}$Cu$^+$
- $^{58}$Fe$^{3+}$
- $^{24}$Ne
- $^{17}$O$^{2-}$
- $^{187}$Au$^{3+}$
- $^{74}$Br$^-$
- $^{30}$P$^{3-}$
- $^{189}$Os$^{4+}$
- $^{196}$Hg
- $^{204}$Pb

7. Calculate the following:

a. number of atoms in 7.46 g of Li

b. number of atoms in 32.0 g of Br$_2$

c. number of molecules in 43.0 g of NH$_3$

d. number of molecules in 7.585 g CCl$_4$

e. moles of SO$_4^{2-}$ ions in 14.3 g of Cr$_2$(SO$_4$)$_3$

f. moles of H in 11 g H$_3$PO$_4$
8. Oxalic acid is a toxic substance used by laundries to remove rust stains. Its composition is 26.7% C, 2.20% H and 71.1% O by weight. What is the empirical formula? The formula weight is approximately 90 g/mole. What is the molecular formula?

9. Adipic acid is used in the manufacture of nylon. The composition of the acid is 49.3% C, 6.90% H and 43.8% O by weight. What is the empirical formula? The formula weight is approximately 146 g/mole. What is the molecular formula?

10. Butane, C₄H₁₀, is used in lighters because it is highly flammable and easily liquefied. Calculate the mass of water produced from the complete combustion of 3.00 moles of butane.
11. White phosphorous, $P_4$, is prepared by fusing calcium phosphate with carbon and sand ($SiO_2$) in an electric furnace.

$$Ca_3(PO_4)_2 + SiO_2 + C \rightarrow P_4 + CaSiO_3 + CO$$

How many grams of calcium phosphate are required to give 5.00 g of phosphorous?

12. The following reaction is used to make carbon tetrachloride

$$CS_2(s) + Cl_2(g) \rightarrow CCl_4(s) + S_2Cl_2(s)$$

Calculate the number of grams of carbon disulfide needed to react exactly with 62.7 g of chlorine gas.

13. Titanium(IV) chloride is obtained from titanium(IV) oxide by the following process:

$$3 TiO_2(s) + 4 C(s) + 6 Cl_2(g) \rightarrow 3 TiCl_4(g) + 2 CO_2(g) + 2 CO(g)$$

A vessel contains 4.15 g TiO$_2$, 5.67 g C and 6.78 g Cl$_2$. How many grams of titanium(IV) chloride can be produced?