Review Material For Exam I

1. Give the IUPAC name of the following substances:

   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$_5$
   LiBr
   N$_2$F$_2$
   MgI$_2$
   Al$_2$(SO$_4$)$_3$
   CaCO$_3$
   Fe(IO$_3$)$_3$·2H$_2$O

2. Write the chemical formula for the following compounds:

   cesium oxide
   iron(II) nitrate hexahydrate
   copper(I) oxide
   dichlorine pentoxide
   tin(II) fluoride
   lead(II) dichromate
   sulfur tetrafluoride
   dinitrogen tetrafluoride
   bismuth(III) fluoride
   xenon tetroxide
   mercury(II) sulfate
   vanadium(V) oxide
   nickel(II) phosphate
   ammonium nitrate
3. Give the number of protons, neutrons and electrons for the following:

- $^{58}_{\text{Cu}}$: 29 protons, 29 neutrons, 29 electrons
- $^{58}_{\text{Fe}}$: 26 protons, 32 neutrons, 26 electrons
- $^{24}_{\text{Ne}}$: 10 protons, 14 neutrons, 10 electrons
- $^{17}_{\text{O}}$: 8 protons, 9 neutrons, 8 electrons
- $^{187}_{\text{Au}}$: 79 protons, 108 neutrons, 79 electrons
- $^{74}_{\text{Br}}$: 35 protons, 39 neutrons, 35 electrons
- $^{84}_{\text{Sr}}$: 38 protons, 46 neutrons, 38 electrons
- $^{30}_{\text{P}}$: 15 protons, 15 neutrons, 15 electrons
- $^{189}_{\text{Os}}$: 78 protons, 111 neutrons, 78 electrons
- $^{196}_{\text{Hg}}$: 80 protons, 116 neutrons, 80 electrons
- $^{90}_{\text{Zr}}$: 40 protons, 50 neutrons, 40 electrons
- $^{204}_{\text{Pb}}$: 82 protons, 122 neutrons, 82 electrons

4. 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. number of moles of SO$_4^{2-}$ ions in 14.3 g of Cr$_2$(SO$_4$)$_3$
   f. number of moles of H in 11 g H$_3$PO$_4$.

5. Halothane, CF$_3$CHBrCl, is an inhalation anesthetic. What are the mass percentages of the elements in halothane?

6. Hydroquinone, used as a photographic developer is 65.4% C, 5.5% H and 29.1% O by weight. Determine the empirical formula.

7. Oxalic acid is a toxic substance used by laundries to remove rust stains. Its composition is 2.20% H, 26.7% C, and 71.1% O by weight. What is the empirical formula? The formula weight is approximately 90 g/mole. What is the molecular formula?

8. 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?

9. White phosphorous, P$_4$, is prepared by fusing calcium phosphate with carbon and sand (SiO$_2$) in an electric furnace.

   \[ \text{Ca}_3(\text{PO}_4)_2 + \text{SiO}_2 + \text{C} \rightarrow \text{P}_4 + \text{CaSiO}_3 + \text{CO} \]

   How many grams of calcium phosphate are required to give 5.00 g of phosphorous?
10. The following reaction is used to make carbon tetrachloride

\[ \text{CS}_2(s) + \text{Cl}_2(g) \rightarrow \text{CCl}_4(s) + \text{S}_2\text{Cl}_2(s) \]

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

11. Carbon disulfide burns in oxygen

\[ \text{CS}_2(g) + \text{O}_2(g) \rightarrow \text{CO}_2(g) + \text{SO}_2(g) \]

Calculate the grams of sulfur dioxide produced when a mixture of 15.0 g of carbon disulfide and 35.0 g of oxygen react. What mass (in grams) of the reactant in excess is leftover?

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

\[ 3 \text{TiO}_2(s) + 4 \text{C}(s) + 6 \text{Cl}_2(g) \rightarrow 3 \text{TiCl}_4(g) + 2 \text{CO}_2(g) + 2 \text{CO}(g) \]

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? What mass (in grams) of the reactants in excess are leftover?