02/04/14
Workshop 2-part 2
Chem. 103, Spring 2014

Completed reports to be submitted by 02/11/2014, 2.00 PM (no late submission)

Chapter 2: Moles, formula, and basic stoichiometric calculations

1. The molar mass of any substance is expressed as *the mass of 1 mole of the substance*. An element's molar mass in *grams* is numerically equal to its average atomic mass in *atomic mass unit*.
   a) How many moles of sodium does a 71.3 g sample contain?
   b) How many atoms are in 71.3 g sample of sodium?
   c) How many moles of barium does a 71.3 g sample contain?
   b) How many atoms are in 71.3 g sample of barium?

2. Molecules are group of atoms joined by bonds representing *smallest fundamental units of a chemical compound* in a reaction. Ions are formed, when atoms/group of atoms lose or gain electrons to become charged. A formula is an *expression of the number and type of atoms* present in a molecule/ion. If a formula contains more than one atom of a certain element, the number is subscripted (underlined). The charges of ions are superscripted.
   a) Each of the following molecules/ions is made up of two elements. Provide names and a brief description of these chemical species
   H_2O, CO_2, NH_3, CH_4, OH^-, CO_3^{2-}, NO_3^-, PO_4^{3-}
   b) Calculate the molar mass of these chemical species.
   c) Calculate the number of moles of each substance present in 71.3 g of chemical species
   d) In each molecule, calculate the number of moles of individual elements and their ratios?
   e) What is general significance of the subscript in a formula?

3. Reaction describes transformation of certain substances, where group of atoms rearrange resulting new molecules. The number of distinct chemical species in a reaction is not subscripted and placed before its formula and is called a 'coefficient'.
   A reaction equation shows the reactant and product joining by an '=' sign.
   a) Calculate the moles of the second reactant required for 71.3 g of the first reactant
   $C + O_2 = CO_2$;
   $2H_2 + O_2 = 2H_2O$;
   $N_2 + 3H_2 = 2NH_3$
   b) Calculate the ratio of moles of the two reactants.
   c) What is the general significance of the coefficients in a equation?
   d) Calculate the mass of second reactant.
   e) Calculate the mass of product formed if all of the reactants were converted to product.

4. Find out the missing coefficients in the following equations

   a) $P_4 + \ldots O_2 = 2P_2O_5$

   b) $C_6H_{12} + \ldots O_2 = 6CO_2 + \ldots H_2O$

   c) $3H_2SO_4 + \ldots Fe = Fe_2(SO_4)_3 + \ldots H_2$

   d) $4Al + \ldots O_2 = \ldots Al_2O_3$

5. a) How many moles of the second reactants are required to completely convert 1 mol of the first reactant in each case of Qn 4a-d?
   b) Calculate the mass of product(s) formed in each case of Qn. 4 starting from 1 mole of the first reactant.
   c) What will happen to the product amount if you have less number of moles of the second reactant than what you have calculated in 5a?