Salt Lake Community College, Chemistry Department

Chem 1110 Workshop 7

Topic: Mole and Mass Relationship

Objective

- Molecular and Empirical Formula
- Molecular Weight
- Stoichiometry
- Grams of reactants converted to moles and Moles of product converted back to grams
- Calculation of relative quantities of reactants and products

Molecular and Empirical Formula

1. Empirical formula: the formula of a compound with the simplest whole number ratio of elements involved in the compound- Empirical Formula for Glucose ($C_6H_{12}O_6$) is CH_2O
2. Molecular formula: the types and actual number of atoms in a compound Glucose ($C_6H_{12}O_6$)

Molecular Weight vs. Formula Weight

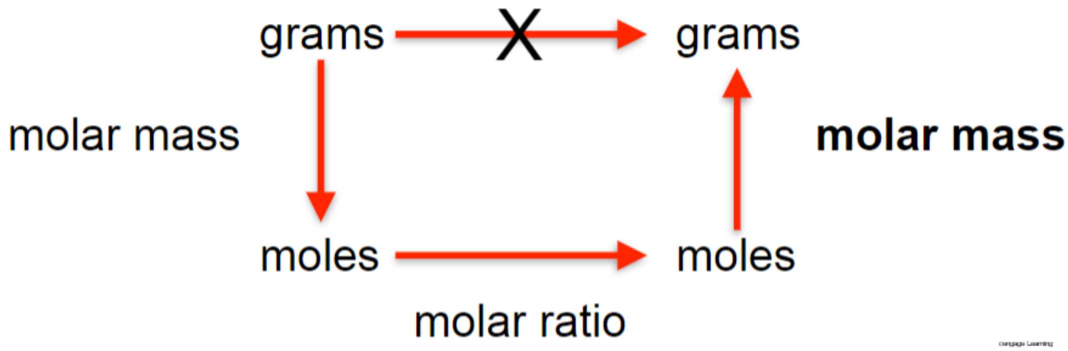
- Given the molecular formula of a compound, we find the molecular weight by finding the sum of the masses of all the atoms in the compound
- The mass of individual atoms is found on the Periodic Table and is given in amu
- Examples
    1. Sodium chloride: 22.99 amu + 35.45 amu = 58.44 amu

Stoichiometry

- As defined by Ebbing "calculation of the quantities of reactants and products involved in a chemical reaction"

- Note: a balanced chemical equation is essential to stoichiometry; a knowledge of molar masses is often also necessary

Grams to moles, mole to mole and Moles to grams conversion:



Practice Problems:

1. Please fill the following tables

Molecular Compounds	Molecular Weight
Cl_2	
H_2O	
NH_3	

Ionic Compounds	Formula Weight
NaCl	
$MgBr_2$	
BaS	

1 Mole	Molar Mass
$Mg(NO_3)_2$	
Br	

3. Convert 54.0 g of H_2O to moles of H_2O.
4. Find the mass of 0.647 moles of CO_2.
5. How many moles of Ca^{2+} and Cl^{-} ions are there in 1 mole of $CaCl_2$?
6. How many moles of copper would be produced from 6 moles of copper (I) oxide according to the following equation:

$$\mathbf{Cu_2S_{(s)} + 2Cu_2O\ (s) \rightarrow 6Cu\ (s) + SO_2\ (g)}$$

7. If 30.4 grams of CO_2 can be produced in the reaction of C_2H_2 with O_2 to form CO_2 and H_2O, how many grams of H_2O can be produced in the reaction?

8. Elemental iron is produced according to the following reaction:

$$\mathbf{Fe_2O_3}\boldsymbol{(s)} + \mathbf{Al}\boldsymbol{(s)} \text{ ---> } \mathbf{Al_2O_3}\boldsymbol{(s)} + \mathbf{Fe}\boldsymbol{(s)}$$

If 5.34 g Fe_2O_3 is allowed to react with excess Al, what is the theoretical yield of elemental iron for this reaction?