7.6 Quantitative Analysis

Definitions
- Solution stoichiometry

Breathalyzer
- We can tell a person has been drinking alcohol by the smell of their breath. How do we tell home much?
    - We know that blood alcohol level is related to the amount of alcohol in the breath.
    - Have a person breath through a bright orange dichromate solution.
    - If alcohol is present the dichromate will react to form $Cr^{3+}_{(aq)}$ ions.
    - $Cr^{3+}_{(aq)}$ is green. We can detect how much by using a photocell.

Solution Stoichiometry
- In a reaction with solutions we often know a number of factors. From this information we can calculate molar concentrations.
- Summary (from textbook)
    - Write a balanced equation for the reaction, to obtain the mole rations.
    - Convert the given value to an amount in moles using the appropriate conversion factor.
    - Convert the given amount in moles to the required amount in moles, using the mole ration from the balanced equation.
    - Convert the required amount in moles to the required value using he appropriate conversion factor.

Using Molar Concentration
- Example Problem: In an experiment, a 10.00 mL sample of sulfuric acid reacts completely with 15.9 mL of 0.150 mol/L potassium hydroxide solution. Calculate the molar concentration of the sulfuric acid.

  Solution:

  $H_2SO_{4(aq)} + 2KOH_{(aq)} \rightarrow 2H_2O_{(l)} + K_2SO_{4(aq)}$

  10.00 mL = 0.01L 15.9 mL = 0.0159 L

  conc. = ? 0.150 mol/L

  for KOH

  $n = CV = 0.0159\ L\ (0.150\ mol/L) = 0.00239\ moles = 2.39 \times 10^{-3}\ moles$

  $H_2SO_4 : 2KOH$

  1 : 2 ratio

  therefore, $n_{H2SO4} = n_{KOH} \times ½ = 0.00239\ moles\ (0.5) = 0.00119\ moles = 1.19 \times 10^{-3}\ moles$

  Concentration of $H_2SO_4 = n_{H2SO4} / V_{H2SO4} = 0.00119\ moles/0.01\ L = 0.119\ mol/L = 1.19 \times 10^{-1}\ mol/L$

  The concentration of H_2SO_4 in this reaction is 1.19×10^{-1} mol/L.

Homework
- Do Lab Exercise 7.6.1 – You do not have to execute the lab since all the data is given.
- Practice Q's: 1-3
- Section Q's:1-4