

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 how much?
 - We know that blood alcohol level is related to the amount of alcohol in the breath.
 - Have a person breathe through a bright orange dichromate solution.
 - If alcohol is present the dichromate will react to form $\text{Cr}^{3+}_{(\text{aq})}$ ions.
 - $\text{Cr}^{3+}_{(\text{aq})}$ is green. We can detect how much by using a photocell.

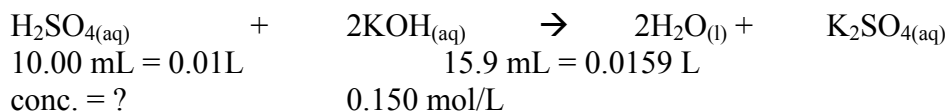
Solution Stoichiometry

- 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 ratios.
 - 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 ratio from the balanced equation.
 - Convert the required amount in moles to the required value using the 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:



for KOH

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

$\text{H}_2\text{SO}_4 : 2\text{KOH}$

1 : 2 ratio

$$\text{therefore, } n_{\text{H}_2\text{SO}_4} = n_{\text{KOH}} \times \frac{1}{2} = 0.00239 \text{ moles} (0.5) = 0.00119 \text{ moles} = 1.19 \times 10^{-3} \text{ moles}$$

$$\text{Concentration of } \text{H}_2\text{SO}_4 = n_{\text{H}_2\text{SO}_4} / V_{\text{H}_2\text{SO}_4} = 0.00119 \text{ moles} / 0.01 \text{ L} = 0.119 \text{ mol/L} = 1.19 \times 10^{-1} \text{ mol/L}$$

The concentration of H_2SO_4 in this reaction is $1.19 \times 10^{-1} \text{ mol/L}$.

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