Chapter 3—SOME REVIEW/ SOME NEW!!
Mass and Mole
Chem 100

1. If a carbon dioxide molecule interacts with certain photons in the IR region, it will vibrate. For CO_2, the major absorptions occur at 2350 cm^{-1} and 667 cm^{-1}.

    a. What is the Energy in Joules associated with the IR photon at 2350 cm^{-1}?

    b. What is the Energy in Joules associated with the IR photon at 667 cm^{-1}?

    c. Which of these wavenumbers corresponds to stretching (higher energy)?

    d. Which of these wavenumbers corresponds to bending (lower energy)?

2. Silver has an atomic mass of 107.9 and an atomic number of 47. There are just 2 naturally occurring isotopes of silver (Ag).

    a. If ${}^{107}_{47}\text{Ag}$ accounts for 52% of natural silver, what is the mass number of the other isotope of silver?

    b. How do the numbers of protons, neutrons, and electrons in a neutral atom of ${}^{107}_{47}\text{Ag}$ compare with those of the other isotope?

3. Carbon dioxide is released into the atmosphere through a process called fermentation. Fermentation involves the conversion of glucose ($C_6H_{12}O_6$) into ethanol (C_2H_5OH) and carbon dioxide (CO_2). This reaction is catalyzed by yeast.

    a. Write a balanced chemical equation of the fermentation process.

    b. How many “ethanol” are produced for each “glucose”?

    c. How many “carbon dioxide” are produced for each “glucose”?

    d. How many moles of Carbon are there in glucose?

        i. What is the mass in grams of Carbon in glucose?

    e. How many moles of Hydrogen are there in glucose?

        i. What is the mass in grams of Hydrogen in glucose?

    f. How many moles of Oxygen are there in glucose?

        i. What is the mass in grams of Oxygen in glucose?

    g. What is the molar mass of glucose?

    h. What is the molar mass of ethanol?

i. What is the molar mass of carbon dioxide?

j. If you have 3 grams of glucose, how many moles of glucose would you have?

   i. How many moles of ethanol would you produce?

   ii. How many moles of carbon dioxide would you produce?

   iii. How much, in grams, would you have more of – ethanol or carbon dioxide?