

GRAVIMETRIC STOICHIOMETRY

(Relief is spelled Na-H-C-O-3)

Objective: You will cooperate with your classmates in this laboratory to discover the mass relationships associated with the reaction between bicarbonate of soda and stomach acid. Simply described you will quantitatively mix the bicarbonate of soda with stomach acid, allow them to react and determine the mass of product gas that is released. You will all combine your data together and construct a graph relating the masses of reactants and products. From this graph you will be able to reach some conclusions about the reaction stoichiometry. Perform your work very carefully because others are depending on you!

Procedure:**Week 1**

A. Weighing out bicarbonate of soda:

- 1) Place a weigh boat on the balance, weigh it and record the mass.
- 2) Add between 0.1 and 3 grams bicarbonate of soda and record the combined mass. Use at least 3 significant figures.

B. Preparing the stomach acid:

- 1) Use a graduated cylinder to carefully measure out 10.0 mL of stomach acid (0.73 g HCl).
- 2) Carefully pour the stomach acid into a 100 mL beaker.

C. Determining the initial TOTAL MASS:

- 1) Place the beaker, containing acid, on the balance.
- 2) Set the weigh boat with the bicarbonate on top of the beaker.
- 3) Record the total mass of the beaker, acid, weigh boat, and bicarbonate.

D. Allow reaction to occur:

- 1) Remove everything from the balance.
- 2) **SLOWLY** pour all the bicarbonate into the acid beaker, swirl the contents gently and allow the reaction to subside.
- 3) Again place the beaker and contents and the **EMPTY** weigh boat back on the balance and record the total mass after reaction.

E. Calculate the mass of gas given off for your reaction, record your data on the board at the front of the room, label your beaker (still with contents) with the mass of bicarbonate used and place it in the order of bicarbonate mass at the back of the room with the others. Note the contents and the colors of this series of beakers.

F. Repeat the entire process (A-E) using a different mass of bicarbonate.

G. And again if required.....

Week 2H. You will be given a related unknown to study using the same lab procedure. You must determine as much as you can about the chemistry of the unknown (Is it a bicarbonate or carbonate? Which metal is it combined with?).

Write Up

Complete the write up sheet posted at the web page.

Questions (answer after Week 1):

1. Write a reaction for what you see.
2. How many grams of CO_2 would be released if you used 50 g of NaHCO_3 in this lab?
3. How many grams of CO_2 were released at the equivalence point?
4. Suppose you started with 100 g ZnCO_3 instead of NaHCO_3 . How many grams of CO_2 would be released?

Graph:

Using the data from the entire class construct a well-organized graph with mass of gas on the dependent axis and mass of bicarbonate on the independent axis. Draw the best straight line(s) to summarize the behavior of the data.

Observe the line-up of reaction beakers and summarize your observations. Considering your graph and your observations of the beakers, what conclusions can you reach about the reaction as observed in this lab?

Mass Stoichiometry:

From your data and graph determine the appropriate mass relationships at the equilibrium point:

- Between gas and bicarbonate
- Between gas and HCl
- Between HCl and bicarbonate