

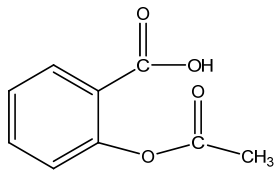
**C103 Lab
October 9, 2008**

**Determination of % by mass of NaHCO_3 in
AlkaSeltzer Tablets**

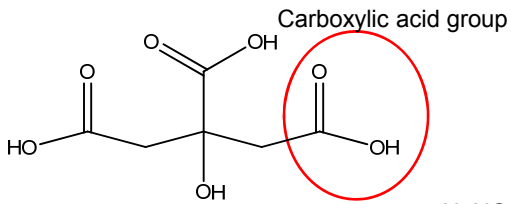


Alka-Seltzer had become the symbol of people who drank too much and ate too much, it had become the unforgivable symbol of a slob, a hangover cure. It was so déclassé to be seen taking Alka-Seltzer that people sneaked into their bathrooms to take it," Lawrence assessed of Alka-Seltzer when the job first came to Jack Tinker & Partners. Lawrence and the creative team changed it from an older slob's heartburn cure to "You're nobody if you don't take Alka-Seltzer." A breakthrough happened when Dorothy Carter, a doctor, informed the team that two aspirin work better at curing pain, and with one of the ingredients being aspirin, two Alka-Seltzers work better than one. With that information, plop plop fizz fizz came alive and packages containing two tablets instead of one were created and distributed in magazine stands, bars, fast-food restaurants, etc. Alka-Seltzer was selling twice as much.

Active Ingredients



Aspirin



Citric Acid



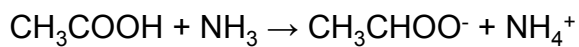
NaHCO_3
(Sodium Bicarbonate)



What's responsible for the fizz?

Clicker Question

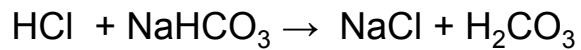
What is the Bronsted Lowry base in the following reaction?




- A. NH_3
- B. NH_4^+
- C. CH_3COOH
- D. CH_3COO^-

What is responsible for
neutralizing stomach acid?

Excess NaHCO_3




Stomach acid

Goals of the Experiment

- How are the amounts of reactants and products related?
- What is a limiting reactant?
- What is the mass % of sodium bicarbonate in an Alka Seltzer tablet?

Stoichiometry and Hamburgers

It is the end of the semester and you just checked your Final Exam grade for C103. It was 100% and to celebrate you and your housemates decide to have a barbeque.

Your roommate is so excited about the party that (he/she) runs out and buys 5 packs of hamburger buns (containing 10 buns each).

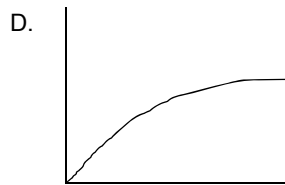
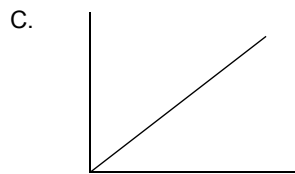
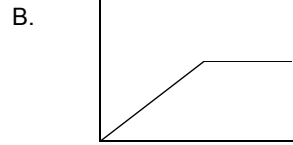
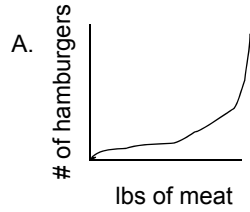
You volunteer to buy the ground beef. Assume each patty will weigh $\frac{1}{4}$ lb., how many lbs. of ground beef should you buy.



Draw a graph of the number of hamburgers produced vs. lbs. of ground beef (up to 15 lbs.)

Assume the number of buns is fixed at 50.

What is the shape of the plot you made?



Connection between hamburgers and chemistry

Hamburger "Reaction":

If you have 20 buns and 4 lbs. of ground beef, how many hamburgers can you make? What is the limiting reactant?

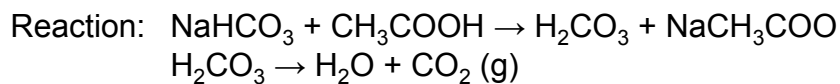
What is the mass % of sodium bicarbonate in an Alka Seltzer tablet?

Procedure:

1. Add 20mL water to a cup then drop in alka seltzer tablet.
2. Once it stops fizzing add vinegar.



CH₃COOH



What is an experimental variable that can be measured?

Sample Calculation

Example trial:

10 mL of vinegar + 25 mL of water were added to a cup. The total mass of the cup and liquid was 40.92 g. The mass of an alka seltzer tablet was 3.24 g. The tablet was added to the liquid in the cup and once the fizzing stopped the total mass was taken (43.26 g). What was the mass % of NaHCO₃ in tablet?

To solve:

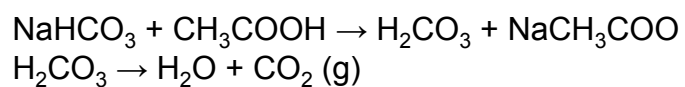
- 1) Find mass lost as CO₂.
- 2) Relate amount of CO₂ to amount of NaHCO₃.
- 3) Calculate % mass of NaHCO₃ in tablet.

How many grams of CO₂ produced?

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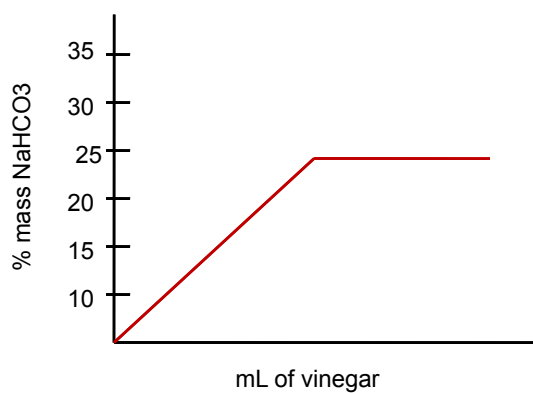
Enter a numeric answer to 2 decimal places.

Relate amount of CO₂ to amount of NaHCO₃.



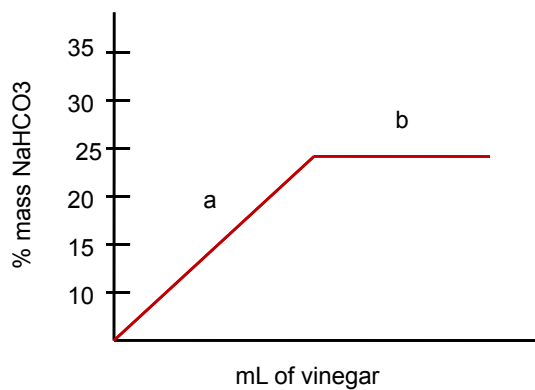
Calculate % mass of NaHCO_3 in tablet.

Sample Graph for the Experiment



What is % by mass of NaHCO_3 in the tablet?
A. 10% B. 20% C. 25% D. 30%

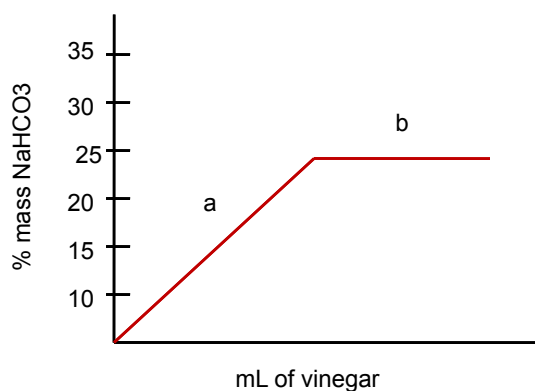
Sample Graph for the Experiment



What is the limiting reactant in region a?

- A. NaHCO₃ B. Vinegar C. Neither D. Both

Sample Graph for the Experiment



What is the limiting reactant in region b?

- A. NaHCO₃ B. Vinegar C. Neither D. Both

Recap

The goal is to measure the % of NaHCO_3 which neutralizes stomach acid
In an alka seltzer tablet.

In the lab, different alka seltzer tablets will be reacted with different amounts of
Vinegar and the resulting loss in mass measured.

The amount of CO_2 lost will be correlated to the % mass NaHCO_3 in the tablet.

A graph of % NaHCO_3 vs. volume of vinegar will be prepared the % determined.