**How Much Antacid Are You Really Getting?**

Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Alka-Seltzer brand antacid is a common effervescent medicine that has been used to reduce stomach acid for years. The tablets include aspirin, citric acid, and sodium bicarbonate. When the tablets are placed in water, they fizz (produce carbon dioxide), and dissolve. They are able to fizz and dissolve because the citric acid dissolves in the water which in turn reacts with the sodium bicarbonate to form CO2 using the following net ionic equation.

HCO3 - (aq) + H+ (aq) 🡪 CO2(g) + H2O(l)

Therefore, come of the sodium bicarbonate doesn’t actually reach your stomach since some of it is converted to CO2 and sodium citrate.

Goal: Calculate the amount (grams) of sodium bicarbonate that actually reacts with your stomach.

Methods:

The amount of sodium bicarbonate present in the tablet will be calculated by observing the loss of mass due to carbon dioxide.

1. According to the balanced equation, what is the molar ratio between bicarbonate and carbon dioxide?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Calculating the mass of sodium bicarbonate that converts to CO2 in a normal dose**.

1. Place approximately 40 mL of water in a 150 mL beaker.
2. Unwrap one of the tablets and weigh the dry tablet and the total mass of the beaker and water together. Record
3. Place the tablet in the water and allow it to fully dissolve.
4. Carefully swirl the beaker in order to assure that the reaction is complete.
5. Reweigh the beaker and solution. Record.
6. Calculate the mass of the CO2 lost during the reaction.
	1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g CO2 lost
7. Convert the mass of the CO2 lost into grams of NaHCO3 consumed in the reaction.
	1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_g NaHCO3 consumed.

|  |  |  |
| --- | --- | --- |
| Mass of beaker, water and tablet | Mass after reaction | Mass of carbon dioxide lost |
|  |  |  |

**Calculating the total mass of sodium bicarbonate in the tablet**.

1. Place approximately 40 mL of vinegar in a 250 mL beaker.
2. Unwrap one of the tablets and weigh the dry tablet and the total mass of the beaker and vinegar together. Record
3. Place the tablet in the vinegar and allow it to fully dissolve.
4. Carefully swirl the beaker in order to assure that the reaction is complete.
5. Reweigh the beaker and solution. Record.
6. Calculate the mass of the CO2 lost during the reaction.
	1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g CO2 lost
7. Convert the mass of the CO2 lost into grams of NaHCO3 consumed in the reaction.
	1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_g NaHCO3 consumed.

|  |  |  |
| --- | --- | --- |
| Mass of beaker, vinegar and tablet | Mass after reaction | Mass of carbon dioxide lost |
|  |  |  |

Interpreting Data

1. Using data from the two reactions, what was the limiting reagent in the first reaction between water and the tablet? How do you know?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Knowing the limiting reagent from the vinegar reaction, what is the total amount of sodium bicarbonate in the tablet?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Why does the vinegar reaction give a better calculation for the total amount of sodium bicarbonate in the tablet?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. The drug facts on the box list the amount of sodium bicarbonate as 1916 mg. Calculate the percent error from your calculation using the vinegar experiment.

% error = \_\_\_\_\_\_\_\_\_

1. Using your data from the two experiments, how much sodium bicarbonate actually reaches your stomach? Show your calculations.

g NaHCO3 reaching your stomach:\_\_\_\_\_\_\_\_\_\_\_

1. Design a different tablet that would allow a greater percentage of the sodium bicarbonate to reach your stomach. Explain why your design would work.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_