Name _____

Bags of Reactions Lab

Period-Box _____

Introduction

"Plop, plop, fizz, oh, what a relief it is," claims an old television ad for a popular antacid. Just what is in the tablet that is relieving the upset stomach? What reaction is causing the fizzing? Can you write a chemical equation for the process? With a bit of investigating, you will be able to discover answers to all these questions.

Antoine Lavoisier, in the eighteenth century, formulated the law of conservation of mass, which states that matter can neither be created nor destroyed. During a chemical reaction, the bonds of the reactants are broken and rearranged to form new substances. Because matter must be conserved, these new substances, or products, must contain the same number and type of atoms as the reactants.

In this investigation, you will first verify the law of conservation of mass. Then in the second part, you will be given some known compounds to react. You will write and balance a chemical equation for the reaction.

Pre-lab discussion

Read the entire laboratory investigation. Then answer the questions that follow.

Pre-lab questions

1. Define reactants.

2. Define products.

3. How can you tell when a chemical reaction has happened?

4. What is the point of using a resealable bag?

5. What is the density of water?

6. What is the common name for sodium hydrogen carbonate?

Materials

Chemical splash goggles
antacid tablet
Graduated cylinder, 50 mL
2 resealable plastic bags, 1-L
laboratory balance
scoopula or teaspoon
calcium chloride, $CaCl_2$
sodium hydrogen carbonate, $NaHCO_3$
phenol red indicator

Safety

Wear your goggles and apron at all times during the investigation. Note the caution alert symbols here and with certain steps of the Procedure.

Procedure

Part A

1. Put on your goggles. Measure 25 mL of tap water into a resealable plastic bag. Flatten the air out of the bag and seal it. Record its mass in data table 1.
2. Record the mass of the antacid tablet in data table 1.
3. Tip the bag sideways to get all of the liquid into one corner of the bag. While holding the bag this way, add the tablet so that the tablet and water do not mix. Do not trap any extra air in the bag. Reseal.
4. Let the tablet drop into the water. Observe the reaction until it comes to a complete stop. Record your observation.
5. When the reaction is complete, record the mass of the bag and its contents in data table 1.

Part B

6. Add 2 scoops of calcium chloride, $CaCl_2$, to the second plastic bag.
7. Add 1 scoop of sodium hydrogen carbonate, $NaHCO_3$, to the bag, and shake gently to mix.
8. Determine the mass of the bag and its contents. Record this value in Data Table 2.
9. Measure 25 mL of water into the graduated cylinder. Add 5 drops of phenol red indicator to the water.
10. Tip the bag sideways, and while holding the solids in the upper part of the bag, pour the water into the bag so that the water and solids do not mix.
11. Keeping the trapped air to a minimum, reseal the bag. Hold the bag and let the liquid move from one end of the bag to the other until the contents are mixed.
12. Observe the reaction until it comes to a complete stop. Record your observation.
13. Record the mass of the unopened bag in Data Table 2. Clean up your work area and wash your hands before leaving the laboratory.

Observations

Data Table 1 Antacid Tablet and Water		**Observations**
Mass of bag and water		
Mass of tablet		
Mass of bag and reactants		
Mass of bag and products		

Data Table 2 $CaCl_2$, $NaHCO_3$, and Water		**Observations**
Mass of bag and dry reactants		
Volume of water		
Mass of water		
Total mass of bag and reactants		
Mass of bag and products		

Calculations

1. Calculate the total mass of the bag and reactants in each reaction and record these values in the appropriate Data Table.

2. Using the formula for the density of water, calculate the mass of the water. Record the results in Data Table 2.

Critical Thinking: Analysis and Conclusions

1. How do the values for total mass before and after each reaction demonstrate the law of conservation of mass?

2. What were at least five observations you made that indicated a reaction had occurred in Part A?

3. Write an equation in words and then with formulas for the reaction that occurred in the bag in Part B. The products are sodium chloride, calcium hydroxide, and carbonic acid.

Critical Thinking: Applications

1. An indicator changes color when the acidity of a solution changes. What evidence is there that such a change occurred in Part B?

2. Judge whether the reaction mixture in Part B became more acidic or more basic. Explain.

3. Carbonic acid immediately decomposes into water and carbon dioxide. Write the balanced equation for this reaction.

4. What gas was produced in Part A? (Hint: sodium hydrogen carbonate is an active ingredient in the antacid.)