

Introduction

The purpose of this experiment is to confirm the Law of Conservation of Mass. We will need to take special steps to catch the gas that is formed during the reaction. Further we will determine the mass of the gas formed to determine the percentage of the gas that was in the reactants. Helpful Hint: Measurements are in **bold**, and calculations are in *italics*.

PreLab –

Read the Procedure and Processing the Data sections and then make a Data/Results Table – please do this in a Google Spreadsheet. Title the document with your LAST name first, and share it with me with full permissions. All other labs in this course will also be in this very same document under a new tab. We will learn to set up embedded formulas for calculations.

Procedure Goggles will be worn at all times at the lab stations. Wash your hands after the lab.

1. Break the tablet gently in half, and measure the **mass of** the entire **tablet**.
2. Add approximately 50 ml of vinegar to the water bottle, **measure** the **mass of the reactants**: bottle with vinegar, cover and tablet all together on the balance.
3. Hold the bottle sideways as demonstrated in class, place the tablet just on the inside neck of the bottle, not allowing the tablet to drop into the vinegar, then carefully screw the cover on tightly.
4. With the cover screwed on tightly, tip the bottle up allowing the tablet and vinegar to react, shake vigorously, several times for 3-4 minutes. Observe, watching for evidence of a chemical reaction.
5. If the reaction appears to have stopped, **measure** the **mass of the products**: bottle with vinegar, cover on and contents in the bottle all together on the balance.
6. Make observations while unscrewing the cover and allowing the gas to escape. In fact, tip the bottle carefully to pour out any “heavy gas” that has formed, **BUT NOT SO MUCH THAT ANY LIQUID COMES OUT THE BOTTLE**.
7. Put the bottle and cap on the balance to **measure** the **mass of the products without gas**.

Disposal

Pour the contents of the bottle down the drain. Rinse the bottle out. Wipe the outside of the bottle, and the neck of the bottle on the inside as well. If time allows, run a second trial, making all the same measurements, and subsequent calculations. Put those data/results in a second column in your table. When finished, hang the bottle on the rack and leave the cap on the tray.

Processing the data

1. *Calculate the mass of the gas that was removed.* (This calculation is a simple subtraction.)
2. *Calculate the percentage of the gas that was in the tablet.* (Remember percentage is part out of total.) $Percent = \frac{part}{total} \times 100$
3. *Calculate the percent error between the mass of the reactants and mass of products.* (First do Post Lab Question #3)
 - Discuss with your mates about what measurement should be labeled the experimental value, and what measurement should be labeled the theoretical value.
 - On the lines below, label the formula (with the words: products and reactants) indicating what measurement in this lab is the experimental value, and what measurement is the theoretical value. Please be very clear.

$$PercentError = \frac{|Experimental - Theoretical|}{Theoretical} \times 100$$

$$PercentError = \frac{|did\ get - should\ get|}{should\ get} \times 100$$

Post-Lab Questions

1. What observations during the lab gave indication of a chemical reaction?
2. Dry ice is frozen carbon dioxide. Is the density of carbon dioxide vapor greater, smaller or the same as the density of air. What procedure during the lab causes you to answer the question above as you did?
 - If helium had been produced from the reaction would you have needed to do the same process to remove the helium as you did for carbon dioxide? Why or why not?
3. What two measurements in your first trial of this lab should we look at to verify the Law of Conservation of Mass? Put those two numbers on the lines below and under the line, write the exact label from your data table beside the numbers.
 - Learn to use the “fill button” in your data table and put yellow fill into the cells of your data table with these two numbers.

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4. State the Law of Conservation of Mass in your own words so it is both accurate and makes sense to you? (Be sure and use the words reactants, products, chemical reaction, mass.)
(Please do not say, “Matter is neither created nor destroyed.”)
5. The chemical reaction that occurred in this lab is written below in both words and chemical formulas.
 - Count up all of the atoms of each element to make sure the equation is balanced, and report the numbers of the atoms of each element on the lines below.

Sodium bicarbonate reacts with acetic acid (vinegar) to produce sodium acetate, water, and carbon dioxide



Na's _____ H's _____ C's _____ O's _____ → Na's _____ H's _____ C's _____ O's _____