Name ______________________________ Class ______________ Date ____________

Inquiry

DATASHEET FOR IN-TEXT LAB

Conservation of Mass

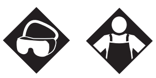
The law of conservation of mass states that matter is neither created nor destroyed during a chemical reaction. Therefore, the mass of a system should remain constant during any chemical process. In this experiment, you will determine whether mass is conserved by examining a simple chemical reaction and comparing the mass of the system before the reaction with its mass after the reaction.

OBJECTIVES

- **Observe** the signs of a chemical reaction.
- **Compare** masses of reactants and products.
- **Design** experiments.
- **Relate** observations to the law of conservation of mass.

MATERIALS

- 2 L plastic soda bottle
- 5% acetic acid solution (vinegar)
- balance
- clear plastic cups, 2
- graduated cylinder
- hook-insert cap for bottle
- microplunger
- sodium hydrogen carbonate (baking soda)



Always wear safety goggles and a lab apron to protect your eyes and clothing. If you get a chemical in your eyes, immediately flush the chemical out at the eyewash station while calling to your teacher. Know the locations of the emergency lab shower and the eyewash station and the procedures for using them.

PREPARATION

Use the data tables provided to record your data and observations for Part I and Part II.

PROCEDURE—PART I

1. Obtain a microplunger, and tap it down into a sample of baking soda until the bulb end is packed with a plug of the powder (4–5 mL of baking soda should be enough to pack the bulb).
2. Hold the microplunger over a plastic cup, and squeeze the sides of the microplunger to loosen the plug of baking soda so that it falls into the cup.
3. Use a graduated cylinder to measure 100 mL of vinegar, and pour it into a second plastic cup.

4. Place the two cups side by side on the balance pan, and measure the total mass of the system (before reaction) to the nearest 0.01 g. Record the mass in **Data Table-Part I.**

5. Add the vinegar to the baking soda a little at a time to prevent the reaction from getting out of control. Allow the vinegar to slowly run down the inside of the cup. Observe and record your observations about the reaction.

6. When the reaction is complete, place both cups on the balance, and determine the total final mass of the system to the nearest 0.01 g. Calculate any change in mass. Record both the final mass and any change in mass in **Data Table-Part I.**

7. Examine the plastic bottle and the hook-insert cap. Try to develop a modified procedure that will test the law of conservation of mass more accurately than the procedure in Part I.

8. Write the answers to items 1 through 3 in Analysis—Part I.

PROCEDURE—PART II

9. Your teacher should approve the procedure you designed in Procedure—Part I, step **7.** Implement your procedure with the same chemicals and quantities you used in Part I, but use the bottle and hook-insert cap in place of the two cups. Record your data in **Data Table-Part II.**

10. If you were successful in step **9** and your results reflect the conservation of mass, proceed to complete the experiment. If not, find a lab group that was successful, and discuss with them what they did and why they did it. Your group should then test the other group's procedure to determine whether their results are reproducible.

DISPOSAL

11. Clean your lab station. Clean all equipment, and return it to its proper place. Dispose of chemicals and solutions in the containers designated by your teacher. Do not pour any chemicals down the drain or throw anything in the trash unless your teacher directs you to do so. Wash your hands thoroughly after all work is finished and before you leave the lab.

Data Table-Part I			
Initial mass (g)	**Final mass (g)**	**Change in mass (g)**	**Observations**

Data Table-Part II			
Initial mass (g)	**Final mass (g)**	**Change in mass (g)**	**Observations**

Analysis

PART I

1. **Drawing Conclusions** What evidence was there that a chemical reaction occurred?

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2. **Organizing Data** How did the final mass of the system compare with the initial mass of the system?

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3. **Resolving Discrepancies** Does your answer to the previous question show that the law of conservation of mass was violated? (Hint: Another way to express the law of conservation of mass is to say that the mass of all of the products equals the mass of all of the reactants.) What do you think might cause the mass difference?

Analysis

PART II

1. **Drawing Conclusions** Was there any new evidence in Part II indicating that a chemical reaction occurred?

2. **Organizing Ideas** Identify the state of matter for each reactant in Part II. Identify the state of matter for each product.

Conclusions

1. **Relating Ideas** What is the difference between the system in Part I and the system in Part II? What change led to the improved results in Part II?

2. **Evaluating Methods** Why did the procedure for Part II work better than the procedure for Part I?

EXTENSIONS

1. **Applying Models** When a log burns, the resulting ash obviously has less mass than the unburned log did. Explain whether this loss of mass violates the law of conservation of mass.

2. Designing Experiments Design a procedure that would test the law of conservation of mass for the burning log described in Extension item 1.