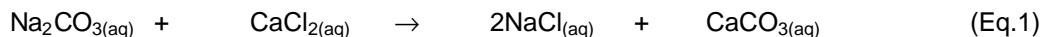


PRE-LAB DISCUSSION

Matter cannot be created or destroyed by a chemical change. This very important principle is known as the law of conservation of mass. This law applies to ordinary chemical reactions (as opposed to nuclear reactions, in which matter can be changed to energy). During a chemical change (reaction), the atoms of one or more substances (reactants) simply undergo some "rearrangements." The result of these rearrangements is the formation of new, different substances (products). All of the original atoms are still present. It is because of the law of conservation of mass that we are able to write balanced chemical equations. Such equations make it possible to predict the masses of reactants and products that will be involved in a chemical reaction.

In this experiment, aqueous solutions of three different compounds will be used to produce two separate and distinct chemical reactions. The fact that change occurs during each reaction will be readily observable. Balanced chemical equations for the two reactions are:



The combined masses of the three solutions (and their containers) will be measured before and after each reaction has occurred.

This experiment should give you a better understanding of the law of conservation of mass and its importance in chemistry.

PURPOSE

To recognize the law of conservation of mass and to learn the careful use of a balance in determining the masses of reactants and products.

EQUIPMENT

laboratory balance
labels
graduated cylinder, 10-mL

corks (to fit test tubes) (2)
rubber stopper (for flask)
lab apron or coat

Erlenmeyer flask, 125-mL
safety goggles
test tubes, 13 x 100-mm (2)

MATERIALS

1 M aqueous solutions of:
 Na_2CO_3 CaCl_2 H_2SO_4

SAFETY

Handle sulfuric acid with extra caution. Always wear safety goggles when handling acids. Report all acid spills to your teacher, and flush with cold water and a dilute solution of sodium bicarbonate (NaHCO_3).

Wear a lab apron or coat and safety goggles at all times when working in the lab.

PROCEDURE

1. In a graduated cylinder, measure exactly 10.0 mL of sodium carbonate (Na_2CO_3) solution. Pour into a clean, dry 125-mL Erlenmeyer flask. Stopper the flask. Rinse and dry the graduated cylinder.
2. Measure exactly 3.0 mL of 1 M calcium chloride (CaCl_2) solution and pour into a clean, dry test tube. Cork and label the tube. Rinse and dry the graduated cylinder.
3. Repeat step 2 with 3.0 mL of 1 M sulfuric acid (H_2SO_4) solution. **CAUTION:** Handle this acid with care.
4. Place the stoppered flask and the corked test tubes together on the pan of the laboratory balance. Tilt the test tubes to prevent liquids from touching the corks. Measure the combined mass of these containers, stoppers, and solutions. This will be mass a in your data table.
5. Remove the flask and the test tube containing the CaCl_2 solution from the balance pan. Pour the CaCl_2 solution into the Na_2CO_3 solution in the flask. Swirl the flask to thoroughly mix the two solutions. Record your observations.
6. Replace the stopper and cork in their proper containers. Once again, measure the combined mass of the three containers, stoppers, and contents (mass b in data table).

7. Remove the flask and the test tube containing H_2SO_4 from the balance. Carefully pour the H_2SO_4 solution into the flask. WITH THE STOPPER OFF, swirl the flask until all bubbling stops. Record your observations. Allow the flask to cool to room temperature.
8. Replace the stopper and cork. Measure again the mass of the three containers, stoppers, and contents (mass c in data table).

OBSERVATIONS AND DATA

Qualitative observations

Step5:

Step7:

Quantitative data

Mass a (before mixing)

_____ g

Mass b (after mixing Na_2CO_3 and CaCl_2)

_____ g

Mass c (after mixing H_2SO_4 with contents from step 5)

_____ g

CONCLUSION AND QUESTIONS

1. What indications that a chemical reaction was taking place did you observe in step5? In step7?
2. Why were you instructed to leave the flask opened after the H_2SO_4 solution was added? What might have happened if this were not done?
3. Compare masses a, b, and c. Account any differences.
4. In your opinion does this experiment verify the law of conservation of mass? How might the experiment be improved to bring its results more in line with that law?
5. When you burn a log in the fireplace, the resulting ashes have a mass less than that of the original log. Account for the differences in mass.