Law of Conservation of Mass

A Carolina Essentials™ Investigation

Student Worksheet

Overview

The law of conservation of mass is commonly stated as mass can neither be created nor destroyed. Antoine Lavoisier hypothesized the law after extensive experimentation on many different reactions. Even though Lavoisier's work was done on reactions, the law of conservation of mass can be applied to physical changes as well as chemical changes. Physical changes never result in a new product being formed. Chemical changes, however, always result in new products with new properties and new identities. Chemical changes are chemical reactions and can be recognized by color change, formation of a gas, formation of a precipitate, or change in temperature.

SAFETY REQUIREMENTS

MATERIALS

Ice chips

Calcium chloride solution, $CaCl_2$, 0.1 M, 1.5 mL

Sodium carbonate solution, Na_2CO_3, 0.1 M, 1.5 mL

1 test tube with cap

2 test tubes

1 beaker or cup

2 graduated cylinders

1 balance

Essential Question

How can the law of conservation of mass be demonstrated for physical and chemical changes?

Investigation Objectives

1. Explain the law of conservation of mass for physical and chemical changes.
2. Demonstrate the law of conservation of mass mathematically.
3. Recognize the difference between physical and chemical changes.

Safety Precautions

Wear gloves and goggles and practice safe laboratory procedures.

Procedure A.

1. Place the beaker or cup on the balance, record the mass in grams, and then zero or tare the beaker.
2. Remove the cap from the test tube. Fill the test tube half full of chipped ice. Replace the cap.
3. Weigh the capped test tube in the beaker or cup on the balance. Record the mass in table A.
4. Place the test tube on your lab table and continue to make observations until the ice has melted.
5. Reweigh the capped tube in the beaker or cup after the ice has melted. Record the mass in table A.
6. To determine the change in mass, take the mass of the water with tube and subtract the mass of the ice with tube.
7. Record the change in mass in table A.

Procedure B.

1. Place the beaker or cup on the balance and zero or tare the balance.
2. Using a clean graduated cylinder, measure 1.5 mL of calcium chloride solution ($CaCl_2$).
3. Pour the calcium chloride into a test tube.
4. Wipe off the outside of the tube with a paper towel to remove any excess. Place the tube in the beaker or cup on the balance.
5. Using a clean graduated cylinder, measure 1.5 mL of sodium carbonate solution (Na_2CO_3).
6. Pour the sodium carbonate into a test tube.
7. Wipe off the tube with a paper towel to remove any excess. Place the tube in the beaker or cup on the balance.
8. Record the mass of both tubes with solutions in table B.
9. Pour the calcium chloride into the test tube that contains sodium carbonate and record your observations in table B.
10. After combining the calcium chloride and sodium carbonate, reweigh both test tubes in the beaker or cup. Record the mass in table B.
11. To determine the change in mass, take the final mass of the test tubes and subtract the beginning mass of the test tubes. Record the change of mass in table B.

Disposal

Dispose of all materials according to your teacher's instructions. Wash all glassware thoroughly. Wipe off the balance.

Procedure A: Ice Water			
Mass 1 (g)	Mass 2 (g)	Change in mass (g)	Observations

Procedure B: $CaCl_2$ and Na_2CO_3			
Mass 1 (g)	Mass 2 (g)	Change in mass (g)	Observations

Analysis and Discussion

1. Use the data to explain whether mass was conserved in procedures A and B.

2. Translate your explanation above into a mathematical statement.

3. Create a particle diagram for each process.

4. Identify the processes above as a chemical change or physical change, and state the observations used to make the identification.