

The Law of Conservation of Matter

Strand	Matter
Topic	Investigating the Law of Conservation of Matter
Primary SOL	PS.5 The student will investigate and understand changes in matter and the relationship of these changes to the Law of Conservation of Matter and Energy. Key concepts include a) physical changes; b) chemical changes.
Related SOL	PS.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which b) length, mass, volume, density, temperature, weight, and force are accurately measured; d) triple beam and electronic balances, thermometers, metric rulers, graduated cylinders, probeware, and spring scales are used to gather data.

Background Information

Matter may undergo physical and chemical changes. In a physical change, matter changes shape or form but not chemical composition. A phase change, such as melting or boiling, indicates a physical change. In a chemical change, bonding patterns change and new substances form. All chemical reactions are chemical changes.

The Law of Conservation of Matter states that matter cannot be created or destroyed. In a physical change, substances can change form, but the total mass remains the same. In a chemical change, the total mass of the reactants always equals the total mass of the products.

Materials

- Sealable plastic bags
- Ice cubes
- Vinegar
- Baking soda
- Small paper cups
- Balance
- Graduated cylinder

Vocabulary

chemical change, Law of Conservation of Matter, physical change

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

In this lesson, students are asked to demonstrate the Law of Conservation of Matter in a physical and a chemical change.

Part One: Physical Change

1. Have students perform the following experiment:
 - Place one ice cube in a sealable plastic bag.
 - Measure the mass of the ice cube and bag.
 - Set aside the bag and wait until the ice cube melts. You can move onto Part Two of this lesson while you wait.
 - Once the ice cube has melted, measure the mass of the plastic bag again.
 - Compare the mass of the plastic bag before and after the ice cube melted.
2. Have students record the following data from the experiment:
 - Mass of ice cube in bag
 - Mass of melted ice cube in bag
 - Change in mass

Part Two: Chemical Change

1. Have students perform the following experiment:
 - Measure 20 ml of vinegar into a small cup.
 - Find the mass of the vinegar in the cup.
 - Measure 10 grams of baking soda into another cup.
 - Place the cup with baking soda in a sealable plastic bag.
 - Find the mass of the plastic bag with the cup inside without spilling the contents of the cup.
 - Carefully place the cup with vinegar inside the plastic bag with the other cup, but do not mix the contents of the cups.
 - Seal the bag.
 - While the cups are still inside the bag, pour the vinegar into the baking soda cup.
 - When the reaction stops, find the mass of the plastic bag without opening the plastic bag.
 - Compare the mass of the reactants and products.
2. Have students record the following data from the experiment:
 - Mass of vinegar
 - Mass of baking soda and plastic bag
 - Total mass of reactants
 - Total mass of products
 - Change in mass

Assessment

- **Questions**
 - What type of change occurred when the ice cube melted?
 - What type of change occurred when vinegar was mixed with baking soda? What evidence of that change was observed?
 - Why was it important to keep the vinegar and baking soda in the sealed plastic bag when mixing them together?
 - Did the mass change in Part One? Part Two?
 - For each of the following changes, indicate whether the change is physical or chemical:

- Glass breaks.
- Iron rusts.
- Water boils.
- Paper burns.
- **Journal/Writing Prompts**
 - In words or pictures, explain the Law of Conservation of Matter in terms of both the observed physical and chemical changes.

Extensions and Connections (for all students)

- Students should write chemical equations, using appropriate symbols for chemical reactions.
- Students should demonstrate the Law of Conservation of Matter in chemical reactions by balancing chemical equations.
- Students should write a balanced chemical equation for the reaction between vinegar and baking soda.

Strategies for Differentiation

- Prior to the lesson, students should be given examples of changes and complete a sorting activity to help them decide whether the change is physical or chemical.
- Demonstrate the experiments or have the students watch a video of the experiments.
- Students should create a model to represent the bonding-pattern changes that occur during a chemical reaction.