Conservation of Mass

Investigation Set Teaching Guide

This Investigation Set is designed for students to understand the conservation of mass and its validity as a universal scientific law. The instruction in this set encourages students to draw conclusions using evidence from their texts and data from their investigations and to evaluate whether or not their conclusions are valid.

Target Grades & Subject(s): Grades 6-12; Science

Learning Objectives

- Next Generation Science Standards (NGSS)
    - Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. (NGSS MS-PS1-5)
- Science and Engineering Practices (SEP)
    - Use and construct models for representing ideas and explanations. (NGSS, SEP 2)
    - Students select appropriate tools to collect appropriate data while performing experiments. (NGSS, SEP 3)
    - Use appropriate and sufficient evidence and scientific reasoning to defend claims and explanations about the natural world. (NGSS, SEP 7)

Before teaching Part 1: 2-02: Conservation of Mass [Download texts here]

- To introduce the investigation set, have students watch this video. As students are watching the video, have them record their observations and answer the following question: "Where did the water go?" Have students share out their responses in small groups and with the whole class.

Text 1: 2-02: Conservation of Mass (1 page)	
The first text in this set provides an overview of the conservation of mass, including examples that illustrate the law in action. As they read, students should consider applications of the conservation of mass beyond those described in the text.	Discussion Question: - What is an example of the conservation of mass from your own experience? - Think back to this video. Based on what you have read, where did the water go?

Before teaching Part 2: Investigation: Where'd It Go? [Download texts here]

- Plan for this activity to take 30-45 minutes.
- Students should know how to accurately measure mass using a triple beam or electronic balance.
- Reiterate and emphasize proper lab safety prior to beginning the investigation.
- Print a class set of the data table for the investigation (on 3rd page below).
- Ensure you have the following materials (enough for 30 students):

Lab Specific Materials*	Common Lab Materials
• Quart sized resealable plastic bags (1/group) • Vinegar (~120 mL/group) • Baking soda (~6 spoonfuls/group) • Spoon/spatula (1/group)	• Cups/Beakers (~50 mL, 2/group) • Triple beam/electronic balance

Text 2: Investigation: Where'd It Go? **Note: This is an assignment in Actively Learn** (2 pages)	
What This Could Look Like: In this activity students will collect data to explore the conservation of mass. First, have students answer the pre-reading question and read the background information in the assignment in Actively learn. Use their responses to generate a discussion on the conservation of mass. Model how each part of the procedure should be conducted and clearly state expectations for using equipment and materials safely and appropriately prior to releasing students to begin the investigation. *To make this an inquiry activity:* *Give your students the materials listed in the table above and ask them to design their own experiment and to collect data to prove/disprove the conservation of mass. Have them compare their results with other groups.*	Teaching Tips (Best Practices): - In Part 1, the mass should decrease after the substances mix, as some molecules will be released as a gas. In Part 2, the mass should remain constant, since the gas will be trapped in the bag. - Depending on the accuracy of your balances, students may not see a decrease in mass in Part 1 and there may be a very small decrease or increase in Part 2. Encourage students to compare results with another group to verify their results. - Have students assign roles to encourage collaboration as they work in small groups of 3-4 (e.g., a Facilitator is responsible for keeping the group focused on the current task). - Encourage students to model their observations as drawings at the atomic/molecular level in order to support their explanations and demonstrate deeper understanding.

Data Table

Part 1: Beakers

Record your observations (including a drawing/diagram of your experiment) in the space below:

Trial	Initial Mass (g)	Final Mass (g)	Change (Δ) in Mass (g)
1			
2			
3			
Average			

Part 2: Bag

Record your observations (including a drawing/diagram of your experiment) in the space below:

Trial	Initial Mass (g)	Final Mass (g)	Change (Δ) in Mass (g)
1			
2			
3			
Average			