**Name:**

**Date:**

**School:**

**Facilitator:**

3.03 Conservation of Mass Lab

**Complete the hands-on lab to demonstrate the Law of Conservation of Mass.**

# Part 1: Lab Preparation

For this lab, you will need the following materials.

* 1 empty plastic bottle (this can be an empty, clean, 16 oz. plastic water or soda bottle)
* Baking soda
* White vinegar (you cannot substitute apple cider vinegar)
* Balloons (you will need at least 1 balloon; extras might be needed if popping occurs)
* Tape (preferably electrical, duct, or masking tape; scotch tape will work)
* 1 small to medium-sized bowl
* Teaspoon
* 100 mL graduated cylinder (or a 1/3 cup measuring cup)
* 1 piece of paper
* Funnel
* Electronic balance or kitchen scale

**NOTE:** If you have trouble finding any of these materials, please ask your facilitator or teacher for assistance. The chemistry lab in your school should have an electronic balance or a triple-beam balance, a graduated cylinder, etc. Be sure to ask permission before using any school materials.

# Part 2: Trial 1

**Follow the procedure below to complete Trial 1.**

1. Place your bowl on top of the electronic balance or kitchen scale. Be sure the balance is turned on, set to “grams” and tared (zeroed out) so that the weight of the bowl will not be in your measurements.
2. Measure out 150 mL of vinegar using the graduated cylinder. This is equal to about 2/3 cup of vinegar, if you do not have a graduated cylinder.
3. Pour the vinegar into the empty, clean plastic bottle and place it in the bowl that’s on your electronic balance or kitchen scale.
4. Next, place your piece of paper on the balance next the bowl.
5. Measure out 1 tsp. of baking soda. Pour the baking soda onto the paper on the scale.
6. Record the total mass of the initial system in your data chart below.
	* The initial system includes the following: the bottle with the vinegar and the paper with the baking soda (remember, you should have tared or zeroed out the balance so that the weight of the bowl is not counted)
7. Carefully, pick up the paper with the baking soda and slowly pour it into the bottle. Be sure to place the paper back on the balance.
	* **NOTE:** The reaction may escape the bottle; that’s why the bowl is there – to catch any spillage!
	* Be sure to watch what occurs during the reaction.
8. Wait for the ingredients to stop reacting. Then, check the balance to see the total mass of the final system and record it in the chart below.
	* The final system includes: the bottle with the vinegar and the baking soda, plus the paper.
9. Using the information from the data table, calculate the change in mass for the reaction. This is the difference between the mass of the final system and the mass of the initial system. Record your calculation in your data chart.
10. Answer the following question:

Based on your data, did this reaction follow the Law of Conservation of Mass? Defend your answer using evidence from the investigation.

**Trial 1 Data Chart**

| **Object** | **Mass (g)** |
| --- | --- |
| **Total Mass of Initial System***Mass BEFORE reaction*  |       |
| **Total Mass of Final System***Mass AFTER reaction* |       |
| **Change in mass for the reaction***mass of initial system minus mass of final system* |       |

# Part 3: Trial 2

1. Clean up your materials from Trial 1 including:
	* Empty your plastic bottle and rinse it out
	* Empty the bowl, if needed
2. Place your bowl on top of the electronic balance or kitchen scale. Be sure the balance is turned on, set to “grams” and tared (zeroed out) so that the weight of the bowl will not be in your measurements.
3. Measure out 150 mL of vinegar using the graduated cylinder. This is equal to about 2/3 cup of vinegar, if you do not have a graduated cylinder.
4. Pour the vinegar into the empty, clean plastic bottle and place it in the bowl that’s on your electronic balance or kitchen scale.
5. Measure out 1 tsp. of baking soda.
6. Put the funnel into the opening of a deflated balloon. Pour the baking soda into the balloon. Be sure the baking soda gets all the way into the balloon.
7. Remove the funnel from the balloon opening. Next, cover the opening of the water bottle with the opening of the balloon.
	* **Be very careful that you don’t get any of the baking soda into the vinegar!**
	* **You might want to twist the stem of the balloon to keep the baking soda in the base of the balloon away from the opening.**
8. Wrap tape around the opening of the bottle to secure the balloon to the bottle.
9. Record the total mass of the initial system in your data chart below.
	* The initial system includes the following: the bottle with the vinegar and the balloon with the baking soda (remember, you should have tared or zeroed out the balance so that the weight of the bowl is not counted)
10. Carefully, pick up the base of the balloon and lift it above the bottle so that the baking soda inside the balloon falls into the bottle.
	* Be sure to watch what occurs during the reaction.
11. Wait for the ingredients to stop reacting. Then, check the balance to see the total mass of the final system and record it in the chart below.
	* The final system includes: the bottle with the vinegar and the baking soda and the balloon
12. Using the information from the data table below, calculate the change in mass for the reaction. This is the difference between the mass of the final system and the mass of the initial system. Record your calculation in your data chart.
13. Answer the following question:

Based on your data, did this reaction follow the Law of Conservation of Mass? Defend your answer using evidence from the investigation.

**Trial 2 Data Table**

| **Object** | **Mass (g)** |
| --- | --- |
| **Total Mass of Initial System***Mass BEFORE reaction*  |       |
| **Total Mass of Final System***Mass AFTER reaction* |       |
| **Change in mass for the reaction***mass of initial system minus mass of final system* |       |

# Part 4: Lab Analysis

**Answer the following questions about Trials 1 and 2 of this lab.**

## Questions about Trial 1

1. What evidence was there that a chemical change took place in Trial 1?

1. Why was there a loss of mass for the reaction in Trial 1?

1. Does the reaction actually violate the Law of Conservation of Mass? Explain.

1. How do the results from Trial 1 of this investigation indicate that gases have mass?

## Questions about Trial 2

1. What problems did you encounter in your new procedure and what could you have done to improve the procedure?

1. Why was the balloon included in Trial 2? What did it accomplish?

1. Using the characteristics of a gas, explain why you know that a gas was produced by the vinegar and baking soda reaction.