

## Experiment Round Instructions

**Abstract:** *Students will conduct an experiment that allows them to analyze the Law of Conservation of Mass. They will combine baking soda and vinegar resulting in the creation of sodium acetate, water, and carbon dioxide. Students will compare the results with the original masses, which should remain the same.*

**Background:** *When baking, people mix ingredients, bake them resulting in the appearance of a whole new item. Different combinations of ingredients create different baked goods. If you take this a step further, the different masses of the ingredients can result in different chemical reactions causing new foods to be formed. The total mass after baking should be the same as the ingredients prior to the reaction.*

*The goal of this experiment is to allow students to observe the Law of Conservation of Mass in a basic form. In this experiment you will combine baking soda and vinegar causing a reaction and the creation of sodium acetate (Solid), water (liquid), and carbon dioxide (gas). Granted, this will not create a delectable treat, but should represent the combination of compounds to create new combine while retaining the same mass throughout.*

**Problem:** *When combining vinegar and baking soda, a reaction occurs creating a solid, liquid and a gas. How can we determine that no atoms are lost in the reaction? Does the Law of Conservation of Mass apply to all states of matter?*

## Experiment Directions

Supplies:

- 150 grams of Vinegar
- 15 grams of Baking Soda (approx 1 tablespoon)
- 2 bowls
- A funnel
- A balloon
- Empty, clean water bottle
- scale

#### Step one: Note Masses

- Measure the mass of the water bottle without the lid. Make sure to write this down on your paper.
- Measure the mass of the balloon without air in it. Make sure to write this down on your paper.
- Label and measure the mass of the bowl #1. Make sure to write this down on your paper.
- Label and measure the mass of the bowl #2. Make sure to write this down on your paper.

#### Step Two: Vinegar

- Place bowl #1 on your scale, and zero it out. This will insure you get 150 grams of vinegar, rather than the mass of your bowl and an undetermined amount of vinegar.
- Using the funnel, carefully pour the vinegar into the water bottle. Make sure to seal it off. Dry the funnel.

#### Step Three: Baking Soda

- Place bowl #2 on your scale, and zero it out. This will insure you get 15 grams of baking soda, rather than the mass of your bowl and an undetermined amount of baking soda.
- Stick the funnel into the balloon. It must be completely dry.
- Using the dry funnel, carefully pour the baking soda into the balloon. Make sure to not spill the contents.

#### Step Four: Combine

- Take the lid off of the water bottle that is holding the vinegar.
- CAREFUL TO NOT SPILL, put the mouth of the balloon over the opening of the water bottle.
- Once you have ensured the balloon has covered the opening of the water bottle, lift the end of the balloon so that the baking soda falls into the vinegar.
- Gently rotate the water bottle to ensure that the baking soda and vinegar react completely.

#### Step Five: Measure

**\*\*DO NOT TAKE BALLOON OFF OF THE BOTTLE**

- Measure the mass of the final contraption. Make sure to write the mass down.
- subtract the mass of the water bottle and balloon from the mass of contraption.
- Your final mass should be equal to the mass of the vinegar and baking soda combined (165 grams)

#### Step Six: Accounted Mass

- Take total mass of the original vinegar and baking soda and add them together
- Divide the end mass from Step Five by the vinegar/baking soda mass (165 grams)
- Take the quotient and multiply that by 100
- This should give you the percent of mass accounted from the experiment

Example:

- Final Mass: 155 grams
- $155/165 = 0.939$
- $.939 \times 100 = 93.9 \%$