Name: _____ Class: _____ Date: _____

The Law of Conservation of Mass *(Day 2)*

Pre-Lab Questions:

1. What is the Law of Conservation of Mass? Explain it in your own words.

2. Acetic acid reacts with baking soda by the following formula:

$$NaHCO_3 + C_2H_4O_2 \rightarrow C_2H_3O_2Na + H_2O + CO_2$$

(baking soda) (vinegar) (sodium acetate) (water) (carbon dioxide)

   i. What are the products and reactants in the equation above?

   ii. Which of the three products is known to be a gas at room temperature?

   iii. Is the reaction synthesis, decomposition, or replacement?

   iv. Is the equation above correctly balanced, or do we need to add coefficients?

Goal:

Explore why some chemical reactions seem to violate The Law of Conservation of Mass.

Materials:

- a scale
- baking soda
- a blue spoon
- a small beaker *(empty)*
- vinegar
- balloon
- pipette
- an Erlenmeyer Flask *(triangular shaped)*

Procedure (Part 1):

1. Take out your Erlenmeyer Flask. Fill it with 15ml (three scoops) of baking soda.
2. Put the flask (with baking soda) onto your scale. Record its mass in your data table.

3. Take out your small beaker. Use your pipette to fill it with 15 ml of vinegar.
4. Put the small beaker (with vinegar) onto your scale. Record its mass in your data table.

5. Put both the flask and the beaker on the scale together. Record the "Total Mass Before Reaction" in your data table.

6. Carefully pour the vinegar into the Erlenmeyer Flask. Observe the chemical reaction. Put **both** the flask and now-empty beaker onto the scale together. Record the "Total Mass After Reaction" in your data table.

Part 1 Data:

Flask With Baking Soda	Beaker With Vinegar	Total Mass Before Reaction	Total Mass After Reaction

Conclusions (Part 1):

1. Does it seem as though your experiment violated The Law of Conservation of Mass?

2. Where do you think the missing mass could have gone?

3. Which one of the products was the one that escaped?

Procedure (Part 2):

For Part 2, we will repeat the above experiment, but this time we will cover our flask with a balloon!

1. Rinse out the flask and the small beaker.

2. Take out your Erlenmeyer Flask. Fill it with 15ml (three scoops) of baking soda.
3. Put the flask (with baking soda) onto your scale. Record its mass in your data table.

4. Take out your balloon. Use your pipette to fill the balloon with 15 ml of vinegar (it's okay if your balloon holds slightly less).
5. Attach the balloon to the top your Erlenmeyer Flask without spilling any vinegar into the bottle (as seen in the picture).
6. Put the flask with the attached balloon onto your scale. Record the "Total Mass Before Reaction" in your data table.

7. Carefully lift the balloon vertically so that the vinegar falls into the flask. Observe the chemical reaction.
8. Record the "Total Mass After Reaction" in your data table.

Part 2 Data:

Flask With Just Baking Soda		Total Mass Before Reaction	Total Mass After Reaction

Conclusions (Part 2):

1. What compound was inside the balloon <u>after</u> the reaction?

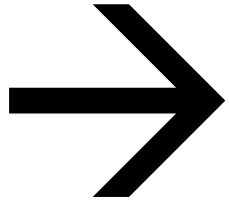
2. Because CO_2 has about the same density as air, the scale probably has trouble measuring the mass perfectly. But even so, was the mass before and after the reaction *closer* to equal this time?

3. Scientists often classify reactions as open or closed. Which half of today's experiment represented an "open system" and which half represented a "closed system?"

Baking Soda and Vinegar:

$$NaHCO_3 + C_2H_4O_2 \rightarrow C_2H_3O_2Na + H_2O + CO_2$$

(baking soda) *(vinegar)* *(sodium acetate)* *(water)* *(carbon dioxide)*



Draw the Reactant Molecules and Product Molecules on each side of the arrow.