Lab: Conservation of Mass

1. What is the law of conservation of mass?

2. Why is it hard to prove the law when a gas is produced?

3. What is the difference between an "open" system & a "closed" system?

Reaction #1: Baking Soda & Vinegar

Materials: 2 beakers, balance, vinegar, baking soda, plastic bag

Part 1: Open System

1. Calibrate, or set the balance to 0.
2. Fill a beaker with 20 mL of vinegar.
3. Add one spoonful of baking soda into the second beaker.
4. Place both beakers on the balance & record the starting mass.
5. Dump the baking soda into the beaker. Do not stir.
6. Place the empty beaker back on the balance. Record the ending mass, including both beakers.
7. Calculate the amount of mass changed.

Baking Soda & Vinegar:
Open System

Starting mass: _____ g

Ending mass: _____ g

Amount Changed: _____ g

Part 2: Closed System

8. Clean & dry both beakers.
9. Fill a clean beaker with 30 mL of vinegar.
10. Add one spoonful of baking soda into a clean plastic bag.
11. Gently place the beaker with vinegar in the plastic bag. Do NOT spill the vinegar!
12. Try to push all air out of the bag. *Seal* the bag & place it on the balance without spilling the vinegar. Record the starting mass.
13. Without opening the bag, tip the beaker, mixing the vinegar with the baking soda.
14. Still without opening the bag, record the ending mass of the contents of the plastic bag.
15. Calculate the amount of mass changed.

Baking Soda & Vinegar:
Closed System

Starting mass: _____ g

Ending mass: _____ g

Amount Changed: _____ g

Analysis:

1. State the reactants & products of this reaction. (Use your lecture notes!)
   - The reactants are _____ & _____.
   - The products are _____, _____ & _____.

2. Compare part 1, the open system, to part 2, the closed system. What was the same? What was different?

3. How does the conservation of mass relate to this activity?

Reaction #2: Water & Effervescent Tablet

Materials: 1 Erlenmeyer flask, balance, water, 2 effervescent tablets, balloon

Part 1: Open System

1. Confirm that the balance is still calibrated.
2. Fill a clean Erlenmeyer flask with 50 mL of water.
3. Place the flask & an effervescent tablet on the balance & record the starting mass.
4. Place the tablet into the flask of water. Swirl & wait 3 minutes.
5. Once the reaction is complete, record the ending mass.
6. Calculate the amount of mass changed.

Water & Effervescent Tablet
Open System

Starting mass: _____ g

Ending mass: _____ g

Amount Changed: _____ g

Part 2: Closed System

7. Thoroughly clean the flask & fill with 50 mL of water
8. Place an effervescent tablet into a balloon. You may need to break the tablet in half.
9. Place the balloon around the rim of the flask, but do not let the tablet fall into the water.
10. Find & record the starting mass of the flask & balloon with tablet.
11. Lift the balloon, causing the tablet to fall into the water. Swirl & wait 3 minutes.
12. Once the reaction is complete, record the ending mass.
13. Calculate the amount of mass changed.

Water & Effervescent Tablet
Closed System

Starting mass: _____ g

Ending mass: _____ g

Amount Changed: _____ g

Analysis:

1. As you know, scientists write chemical reactions like mathematical formulas. The reactions are on the left of the arrow & the products are on the right of the arrow.

   Reactants → Products

   The effervescent tablet contains a chemical called sodium bicarbonate (baking soda!). This chemical reacts with water according to the following reaction:

   $$\mathbf{H_20 + NaHCO_3 \rightarrow NaOH + CO_2 + H_20}$$

   a. Count the number of each element, on each side of the equation, & record below. For example, there are 3 hydrogens on the reactant side.

Element	Hydrogen	Carbon	Oxygen	Sodium
Reactants	3			
Products				

   b. Is this reaction "balanced"? Explain.

2. Compare part 1 of this reaction, the open system, to part 2, the closed system. What did you notice?

3. How does this reaction compare to the reaction of baking soda & vinegar?