Mass Changes in Chemical Reactions

In this lab, you will investigate the relationship between the mass of the reactants and the mass of the products in a chemical reaction. In part I, you will consider 2 reactions and compare the mass of the reactants to the mass of the products. In part II, you will use the mass of the reactants to make predictions about mass of the products in a reaction.

Part I:

Purpose: What happens to the mass in a chemical reaction?

Procedure:

Reaction 1:

1. Measure 10 mL of sodium carbonate solution with a graduated cylinder and transfer the liquid to your 125 mL flask.
2. Clean the graduated cylinder by rinsing 3 times with water.
3. Measure 3 mLof calcium chloride and transfer the liquid into a labeled vial.
4. Place both the flask and the vial on the pan of the balance and record the mass.
5. Record the appearance of the liquids in the data table.
6. Carefully pour the calcium chloride solution into the sodium carbonate solution.
7. Place the empty vial and the flask containing the reaction products onto the pan of the balance and record the mass.

Reaction 2:

8. Clean the flask by rinsing 3 times with water
9. Place a several scoops of calcium carbonate into the 125 mL flask
10. Measure 10 mL of sulfuric acid with a graduated cylinder and transfer the liquid to a labeled vial.
11. Place both the flask and the vial on the pan of the balance and record the mass.
12. Carefully pour the sulfuric acid into the flask with the calcium carbonate.
13. Observe the flask until there is no further evidence of reaction.
14. Place the empty vial and the flask containing the reaction products onto the pan of the balance and record the mass.

Data:

	Initial Mass	Final Mass	Observations
Reaction 1			
Reaction 2			

Analysis:

1. Determine the change in mass from the initial to after the first mixing. How much, if any, did the mass change during the first reaction?

2. Determine the change in mass that occurred after the second mixing. (Compare the second and third massings.)

3. Explain any observed changes in mass.

4. Is mass conserved in each of the two chemical reactions? Should mass be conserved in each of the two chemical reactions? Write the balanced equation for each reaction and prove mathmatically that mass is conserved.

How could you redesign this experiment to eliminate the seemingly contradictory results to the Law of Conservation of Mass? De specific and include diagrams of equipment. Try to keep it simple. (It is not acceptable to change the chemicals or chemical changes involved. It is acceptable to improve the equipment in a way that is safe for the experimenter.)

Part II:

Purpose: To calculate the number of moles of sodium carbonate and relate that to the number of moles of sodium chloride that are produced.

Prelab Questions:

1. How many moles are present in 585g of sodium carbonate?

2. How many moles are present in 115g of sodium chloride?

3. What is the mass of 0.67 moles of carbon dioxide?

Procedure:

1. Weigh a clean, dry, 250 mL erlenmeyer flask.
2. Place a sample sodium carbonate in the flask . (Use between 2 and 3 grams.)
3. Weigh the flask with the sodium carbonate.
4. Add three drops of methyl orange to the flask.
5. **Slowly** add 6M HCl to the flask. Do not exceed 10L. Swirl the mixture while adding the acid. Continue to add acid until the color is red.
6. Heat the flask gently on a ring stand until the water has evaporated completely leaving only the sodium chloride produced. The color will be white or pale yellow. Be sure that the wall of the flask are dry.
7. Weigh the flask and contents. Record the mass.
8. Re-heat the flask and sodium chloride for three minutes. Cool and re-weigh. Continue until the mass is constant.

Data:

Mass of flask _____

Mass of flask and sodium carbonate _____

Mass of beaker and sodium chloride (1st mass) _____

Mass of beaker and sodium chloride (2nd mass) _____

Calculations:

1. Calculate the mass of sodium carbonate reacted.

2. Calculate the moles of sodium carbonate reacted.

3. Calculate the mass of sodium chloride produced.

4. Calculate the moles of sodium chloride.

5. What is the ratio of moles in the reaction? (Compare the moles of Na_2CO3 to moles of NaCl)

Questions:

1. Write the balanced equation for the reaction between sodium carbonate and hydrochloric acid.

2. According to the balanced equation, what is the ratio of moles of sodium carbonate to sodium chloride?

3. How does your answer to question 2 compare to the observed ratio of moles in the lab found in calculation 5.

4. How many moles of carbon dioxide and moles of water were also be produced by your reaction? (Hint: look at your balanced equation.) How do you know?

5. How many moles of hydrochloric acid were used? How do you know?

6. Could you have predicted how much NaCl would be produced? How?