Student Sheet Name: Period:

Title: Serious Stoichiometry

Introduction: Stoichiometry can be used to predict the amount of product that will be formed in a reaction. In this lab, you will be observing the following chemical reaction:

$$HCl + NaHCO_3 \rightarrow H_2O + CO_2 + NaCl$$

Problem: What will happen when you combine two different chemicals? Assuming you get a reaction, what will the product(s) be, and how much of them *should* you get? How does that amount compare the amount you *actually* get?

Materials:
Baking soda ($NaHCO_3$) 3 M HCl Bunsen burner Balance with 0.01 g accuracy 3 test tubes

Prelab Questions:

1. Count the number of each type of atom on each side of the balanced equation above. Is the number of atoms on the product side the same, or different, from the number on the reactant side?

2. List the reactants in the equation. Based on what you know about the reactants, list the physical properties of each one.

3. List the products in the equation, then list the physical properties of each one.

4. Are the properties of the reactants similar to, or different from, the properties of the products? Explain.

5. In the balanced equation above, what is the mole ratio of baking soda to salt?

Hypotheis: How close will your actual yields be to your theoretical yields?

Procedure:

1. Label your test tubes #1 and #2, and weigh each, recording their masses in your table.

2. Fill the rounded bottom of each of your test tubes with baking soda. The amount isn't critical (although your accurate measurement of that amount IS critical.)

3. Weigh the combined test tube and baking soda precisely to as many significant figures as the balance will give you. Record this information in your data table and determine the mass of the baking soda in each test tube.

4. Add HCl to test tube #1, one drop at a time, until the reaction stops. Make observations of the reaction and of the appearance of the product(s).

5. Repeat steps 3 and 4 with test tube #2.

6. Evaporate off the fluid in each test tube by ***gently*** heating it over a Bunsen burner, using tongs to hold the test tube. It will help to keep your flame low and hold the test tube at an angle while swirling gently. Do NOT let any of the solution bubble or spit out of the test tube. (Make sure that the test tube opening isn't pointed at anyone. Also, hot glass looks EXACTLY like cool glass. Don't touch any glass that has recently been anywhere near flame!!!) Observe and describe the test tube contents again.

7. Hold a beaker or test tube over the mouth of your heated test tube to test to see if any more vapor is coming off. If so, continue to heat until no more vapor can be seen.

8. Measure and record the mass of each test tube and determine and record the mass of its contents.

Data:
Observations:

Table_____

	Measurement or Calculation	Test Tube #1	Test Tube #2	Average for Test Tubes #1 and #2
	Mass of empty test tube			
	Mass of test tube and baking soda			
1.	Mass of baking soda			
2.	Moles of baking soda			
	Mass of test tube and product			
	Mass of empty test tube (haven't I seen this somewhere before?)			
3.	Mass of product			
4.	Moles of product			
	Experimental mole ratio of baking soda to measured product			● ●
	Theoretical mole ratio of baking soda to measured product			● ●

Reduce by dividing both numbers by the smaller of the two numbers.

Calculations: In the space below, show the calculations for the rows marked 1-4 in your chart.

1.

2.

3.

4.

Analysis Questions:

1. List evidence that a chemical reaction occurred in your test tube.

2. Was energy absorbed or released in this reaction? (Support your claim with evidence.) What do you call this type of reaction?

3. Do you think mass was conserved in this reaction? Can you tell from this experiment? Explain why or why not.

Conclusion: On a separate piece of paper, write a conclusion paragraph. Make sure to restate your hypothesis, state whether or not it was correct, and give specific data from your lab that supports your conclusion. In this lab, your hypothesis is the theoretical mole ratio. Make sure you explain how you determined which of the three products in the reaction you were measuring. (Why salt? Why not carbon dioxide?) Be sure to do a thorough job in your discussion of errors. Remember that an "error" doesn't mean that you did something wrong (although you may have)…it just is a reason (or reasons) that your numbers might not agree with the expected numbers.