Name: __________________

Stoichiometry Lab

Pre-Lab:
1. Think back to the balloon demonstration. Why were balloons 2 and 3 the same size?

2. How could you perform this procedure and make sure that baking soda was the limiting reactant?

3. What would the percent yield be if both reactants were perfectly used up?

4. Now think of the reaction you are getting ready to perform. Sodium bicarbonate and hydrochloric acid will react to produce sodium chloride, carbon dioxide gas, and water. Write the balanced chemical equation for this reaction in the space below.

5. Notice that the reactants are a gas (that will release into the air) water and a salt. How could you separate the salt from the water in order to know how much salt you produced?

6. Design a procedure to determine how much sodium chloride will be formed from adding hydrochloric acid to sodium bicarbonate. Your procedure must be approved before beginning the lab.

Here is a list of available materials:
- Ring stand and ring
- Triangle
- Evaporating dish
- Watch Glass
- Dropper of 1M HCl (density is 1.015g/ml)
- Up to 2 grams of NaHCO₃
- Bunsen burner
- Filter paper
- Funnel

You will then calculate the amount of product that should have been formed from the reaction you performed. Finally, you will use your actual value and theoretical value to calculate a percent yield to determine how efficient your reaction was.
7. What kind of data do you need in order to determine how much sodium chloride is produced? What kind of data do you need in order to calculate a theoretical value of sodium chloride produced?

8. Design your data table below to be filled in as you perform the lab.

Lab
After receiving approval for your lab procedure, gather your materials and begin. Observe all safety guidelines.

Safety
- Always wear safety goggles when handling chemicals in the lab.
- Wash your hands thoroughly before leaving the lab.
- Follow the teacher’s instructions for cleanup of materials and disposal of chemicals.
- Always use caution around open flames. Keep flames away from flammable substances.
- Always be aware of an open flame. Do not reach over it, tie back hair, and secure loose clothing.
- When working with acids and bases, if any solution gets on your skin immediately rinse the area with water.
Analyze Data
1. Using your *balanced* chemical equation (for the mole ratio), determine the theoretical amount of sodium chloride you should have produced from the amount of sodium bicarbonate you used.

2. Using your balanced chemical equation, determine the theoretical amount of sodium chloride you should have produced from the amount of hydrochloric acid you used.

3. Which reactant is the limiting reactant?

4. How many *moles* of sodium bicarbonate were used, and how many *moles* of sodium chloride were produced. Was the ratio 1:1 as the chemical equation suggests? Why or why not?

5. What was the actual amount of sodium chloride that you produced?

6. Now calculate the percent yield of your reaction using the equation below:
   \[
   \frac{\text{actual}}{\text{theoretical}} \times 100\% =
   \]

7. What information does the percent yield tell you?

8. What are some reasons (specific to this lab) that would have caused a percent yield of less than 100%?

9. What are some reasons (specific to this lab) that would have caused a percent yield of greater than 100%?

10. According to the law of conservation of mass, mass can neither be created nor destroyed. How is it possible that we could have a percent yield of anything other than 100%?