Lab- The Language of Chemistry

Safety goggles must be worn at all times

Introduction: A chemical equation is a chemical "sentence" describing either a **chemical change** or a **physical change** and allows chemists to keep track of substances involved in a laboratory procedure. The **reactants** are the substances that come together in a chemical reaction & the **products** are the substances that form after a chemical reaction. Physical changes usually involve phase changes (like melting of ice), while chemical changes usually produce entirely new substances.
Compare how the chemical notation and verbal description below both describe the same reaction for the lab you are performing:

Chemical Equation (**Part 1**): $HCl\,(aq) + NaHCO_3\,(aq) \rightarrow NaCl\,(aq) + H_2O\,(l) + CO_2\,(g)$

Verbal description: A solution of hydrochloric acid reacts with a solution of sodium bicarbonate to produce a solution of sodium chloride, water, and bubbles of carbon dioxide gas.

Purpose: 1) To be able to read a chemical equation & understand the symbols that are used.
2) Carry out the chemical reaction between hydrochloric acid and sodium bicarbonate.
3) Analyze the products that form & determine if a chemical or physical change occurred.

Materials:

1 test tube	**Test tube rack**	**Bunsen Burner**
Test tube holder	**1.0 M HCl (hydrochloric acid)**	**1.0 M $NaHCO_3$**

Procedures:

Part 1-

1. Complete pre-lab questions **BEFORE** starting your lab.
2. Measure 2 mL of 1.0 M sodium bicarbonate ($NaHCO_3$), and add it to the test tube.
3. Measure 2 mL of 1.0 M HCl, and add it slowly to the test tube. Watch and listen to the reaction.
4. Gently shake the test tube after adding 1.0 M HCl.
5. Record your observations in the data table under **Observations During Reaction.**
6. Place your test tube into a test tube rack.
7. Describe the contents of the test tube in the data table under **Observations After Reaction**.

Part 2- Isolate the Salt

8. Gently heat the tube over the Bunsen burner. CAUTION!! DO NOT point the end of test tube at anyone in case contents of test tube shoot out. DO NOT leave test tube in flame but pass it back and forth frequently. Use the test tube holder to hold test tube over the flame.
9. Record your observations in the data table under **Observations During Heating**.
10. Heat the test tube until all of the liquid is removed from the test tube, including any drops that are on the sides.
11. Describe the contents of the test tube in the data table below under **Observations After Heating.**
12. Clean up.

Pre-Lab Questions:

1. Fill in the tables below to demonstrate you can read the chemical equation and understand the symbols used in the experiment we are performing. **(you may need to look back at the introduction for help!)**

$$HCl\ (aq) + NaHCO_3\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (l) + CO_2\ (g)$$

Symbol	What It Means
HCl	
(aq)	
+	
$NaHCO_3$	
→	

Symbol	What It Means
NaCl	
H_2O	
(l)	
CO_2	
(g)	

2. a) Identify the chemical **reactants** in part 1 of the lab & what they will visually look like in the lab.

   b) Identify the chemical **products** in part 1 lab & what they will visually look like in the lab.

Data Table/ Observations:

Part 1	Observations During Reaction	
	Observations After Reaction	
Part 2	Observations During Heating	
	Observations After Heating	

Calculations/ Analysis:

1. a) What lab evidence do you have that CO_2 (g) was formed?

   b) What lab evidence do you have that NaCl was formed in Part 1? In part 2?

2. a) Looking back at the chemical equation and the introduction, did a chemical change or a physical change happen during Part 1 of this lab? Explain.

   b) Write the chemical equation (reactants→ products) for Part 2 of this lab (it was not given to you).
   c) Did a physical change or a chemical change happen in part 2? Explain.

Questions for Discussion:

1. a. What did your observations from the lab tell you that were not included in the chemical equation?

   b. What information does the chemical equation tell you that you would not have known from your lab observations alone?

2. What was the purpose of heating the liquid after the reaction was completed?

3. If you saw a solid powder settling to the bottom of a liquid at the end of a reaction, could the reaction be the one described in Part 1 of this lab? Why or why not?

4. Write a chemical equation for the following reaction description:
   When you light a Bunsen burner, you are causing methane gas (CH_4) to react with oxygen in the air. This produces carbon dioxide and water.