

Chemical Reaction Lab – Sodium BiCarbonate and Hydrochloric Acid/Magnesium Sulfate and Water

(100 pts.)



Team Names: _____ Date: _____

INTRODUCTION: In this lab you will complete two different experiments in which two different reactions will occur. Mr. Hanson will give you some instruction on the elements used in these two Chemical Reaction Experiments.

Problem: When Sodium BiCarbonate (NaHCO_3) and hydrochloric acid (HCl) are combined, Sodium Chloride (NaCl) and Water (H_2O) is produced. In addition, a gas is produced.

Hypothesis: What is the gas that is produced in this reaction?

Problem: When Magnesium Sulfate (MgSO_4) and Water (H_2O) are combined, MgO (s) Magnesium Oxide and H_2SO_4 (aq) Sulfuric Acid are produced. There is also a temperature change.

Hypothesis: Predict whether this will be an Endothermic Reaction or a Exothermic Reaction and why?

Materials:

- 250 ml flask
- Digital scale
- Hydrochloric Acid (HCl)
- 500 ml Beaker
- 250 mls Water (H_2O)
- 15 grams of (NaHCO_3)
- 200 grams of for MgSO_4
- Magnesium Sulfate (MgSO_4)
- Apron, gloves & Goggles
- Spoon
- Sodium BiCarbonate (NaHCO_3)
- Vernier LabQuest 2
- Temperature Probe
- Carbon Dioxide Probe
- Plastic Cup for Magnesium Sulfate
- Paper Cup for Sodium BiCarbonate
- One paper towel
- Small Beaker to wash Temp Probe off

Procedure:

Mr. Hanson will demonstrate how to use the materials and equipment.

CAUTION: HYDROCHLORIC ACID CAN BURN THE SKIN. HANDLE WITH CARE.

A. Sodium BiCarbonate (NaHCO_3) and hydrochloric acid (HCl) Reaction:

1. Be mindful of Laboratory Safety Rules at all times.
2. All materials are in your brown bin. Put on safety equipment. All students wear goggles. The student who works with the Hydrochloric Acid will use gloves and an apron also.
3. Go the lab station where the flasks of HCl and are located – they are labeled. Pour 10 mls of HCl in your flask and place a rubber stopper on the flask. If any spills immediately let Mr. Hanson know and he will immediately clean it up.
4. Take the flask back to your lab table and secure it in the plastic basin.
5. Measure out 15 grams of Sodium Bicarbonate in your paper cup, using the digital scales on the lab table or the Triple-Beam Balances, and bring the Sodium Bicarbonate back to your lab area.
6. Turn on the Vernier LabQuest 2 and measure the temperature of the HCl and record it in the Results section below. Then place the probe in the beaker of water and stir to clean it off – wipe off with a tissue. Keep the LabQuest 2 on.
7. Carefully drop 15 grams of Sodium Bicarbonate into the center of the flask with the HCl.
8. Immediately Take the temperature for 30 seconds and record this temperature. Then place the probe in the beaker of water and stir to clean it off – wipe off with a tissue. Keep the LabQuest 2 on.
9. Quickly take the temperature probe off and put the Carbon Dioxide Probe in Channel 1. For 1 minute measure the amount of CO_2 in the room and record this number.
10. Place the Carbon Dioxide Probe in the flask so it is completely in it. Hold it in place for 30 seconds and record the measurement of the amount of CO_2 that is being made.

11. Take out the Carbon Dioxide Probe and wipe it off.
12. Clean up and dispose of your products in the sink. Rinse out the flask at least 5 times and place it upside down on the drying rack at the sink. Insure everything is placed back in your brown bin, disconnect your Carbon Dioxide Probe and wipe it off, and that your LabQuest 2 is turned on.

B. Magnesium Sulfate (MgSO₄) and Water (H₂O) Reaction:

1. Measure out about 200 grams of MgSO₄ in your 250 ml beaker.
2. Fill your 500 ml beaker with 300 mls of lukewarm water that Mr. Hanson will run in the sink.
3. Turn on your Vernier LabQuest, connect the temperature probe, and when you have the room temperature displayed on the screen, place your temperature probe in the 500 ml beaker of water and take the initial temperature for one minute and record it.
4. Keep the temperature probe in the beaker for the entire experiment and the LabQuest turned on recording temperature.
5. Begin to slowly add the MgSO₄ in the beaker of water, and stir with spoon. Continue to add the MgSO₄ stirring with the spoon and recording the temperature. After 3 minutes of stirring take the lowest temperature you see on the LabQuest and record it.
6. Write down your observations of the solution in the beaker and the temperature change.
7. Clean up and dispose of your products in the sink. Rinse out the beaker at least 5 times and place it upside down on the drying rack at the sink. Insure everything is placed back in your brown bin, disconnect your temperature probe and wipe it off, and that your LabQuest 2 is turned off.

Results for HCl (aq) + NaHCO₃ (s) - - > NaCl (s) + H₂O (l) + CO₂ (g):

1. What happened when you combined the HCl with the Sodium BiCarbonate? Describe in detail what you saw.
2. What was the beginning room CO₂ number measurement using the Carbon Dioxide probe:
3. What was the ending CO₂ number measurement in the flask using the Carbon Dioxide probe:
4. What was the beginning temperature of the Hydrochloric Acid:

5. What was the ending temperature after the Sodium BiCarbonate was added to the flask:

6. Was this reaction exothermic or endothermic, and why?

Results for $\text{MgSO}_4 (\text{s}) + 7\text{H}_2\text{O} (\text{l}) \rightarrow \text{MgO} (\text{s}) + \text{H}_2\text{SO}_4 (\text{aq})$:

1. What happened when you combined the Magnesium Sulfate with Water? Describe in detail what you saw.

2. Did the Magnesium Sulfate completely dissolve in the water?

3. What was the beginning temperature of the water:

4. What was the ending temperature after you added all the Magnesium Sulfate to the water and stirred it up after 3 minutes:

5. Was this reaction exothermic or endothermic, and why?

Conclusion:

1. Write out the chemical equation for both the reactions that took place. Use only the symbols of the elements in the compounds and tell whether they are solids (s), liquids (l), gasses (g), or aqueous solutions (aq).

2. What were the reactants in both experiments?

3. What were the products in both experiments?

4. Describe the compound NaHCO_3 Sodium Bi-Carbonate and how it is used. What is the name of this compound?

5. Describe the compound MgSO_4 Magnesium Sulfate and how it is used. What is the name of this compound?

6. Is Sodium Chloride (NaCl) an element or a compound? How do you know?

7. What type of gas was produced in this lab? How do you know?

8. Was the gas produced a reactant or a product? Explain?

9. This lab showed a chemical change occurring. What do we mean by a chemical change?

10. How can you separate the NaCl from the water that was produced in this experiment?

11. In your own words, explain the following chemical reaction equation using the written names of the compounds and explain whether they are solids (s), liquids (l), gasses (g), or aqueous solutions (aq):



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