

Prelab

1. In this experiment you will react baking soda (NaHCO_3) with hydrochloric acid (HCl). What type of reaction is this? Double Replacement Reaction

2. Write a balanced chemical equation for the reaction between NaHCO_3 and HCl .



3. Read through the entire procedure and make sure to ask your instructor any questions you have prior to starting the lab.

Materials

- Sodium bicarbonate (NaHCO_3)
- Hydrochloric Acid (3M)
- One 18 x 150 mm or larger test tube and a watch glass
- Balance with 0.01 g accuracy

PUT YOUR GOGGLES ON NOW!

Procedure

1. Measure and record in the data table the mass of your test tube to the nearest hundredth of a gram.
2. Add to the test tube just enough baking soda to fill the curved bottom of the test tube.
3. Measure and record in the data table the mass of the test tube and baking soda.
4. Determine the mass of baking soda in each test tube by recording the differences between the measurements in #3 and #1. If necessary, adjust the mass of baking soda so that it is greater than 0.25 grams, but not more than 0.50 grams.

CAUTION: HYDROCHLORIC ACID IS CAUSTIC AND CORROSIVE. AVOID CONTACT WITH SKIN AND EYES. IF ANY ACID SHOULD SPILL ON YOU, IMMEDIATELY FLUSH THE AREA WITH WATER AND THEN NOTIFY YOUR TEACHER.

5. Add to the test tube, 3 M HCl one drop at a time, allowing the drop to run down the inside wall of the test tube, listen and watch the reaction. Gently agitate the tube after each drop until the reaction stops. Continue to add drops until there is no evidence of any further reaction. Record your observations and describe the test tube contents.
6. Evaporate off the fluid in each test tube by gentle heating above the Bunsen burner flame, slowly circling in and out of the heat. **THERE MUST BE NO ERUPTION OF FLUID OUT OF YOUR TEST TUBE.** Proceed until dry. **MAKE SURE THE OPEN END OF THE TEST TUBE IS NOT POINTED AT ANYONE.**
7. Remove your test tube from the flame and test for water vapor by holding a watch glass near the opening of the tube. If you see condensation on the watch glass, then you must continue the drying procedure for an additional five minutes and test again. Describe the contents of your test tube.

CAUTION: HOT GLASS LOOKS LIKE COLD GLASS!

8. Allow the test tube to cool to the touch (should take about five minutes). Measure and record the mass. **CLEAN UP AROUND YOUR LAB BENCH.**

Observations

Step 5:

Step 7:

Data Table & Calculations Table

	Value	Calculations (Show Work!)
Mass of test tube and baking soda	19.4g	
Mass of empty test tube	19.0g	
Mass of baking soda	0.4g	$19.4 - 19.0 = 0.4g$
Moles of baking soda	0.0048 mol NaHCO ₃	$\frac{0.4g}{84.0 \text{ g NaHCO}_3} \times 1 \text{ mol} = 0.0048 \text{ mol}$
Mass of test tube & sodium chloride	19.2g	
Mass of empty test tube	19.0g	
Mass of sodium chloride	0.2g	$19.2 - 19.0 = 0.2g$
Moles of sodium chloride	0.0034 mol NaHCO ₃	$\frac{0.2g}{58.43 \text{ g NaCl}} \times 1 \text{ mol NaCl} = 0.0034 \text{ mol}$
Experimental mole ratio of NaHCO ₃ to NaCl	1.4	$\frac{0.0048 \text{ mol}}{0.0034 \text{ mol}} = 1.4$
Theoretical mole ratio of NaHCO ₃ to NaCl	1	$\frac{1 \text{ mol NaHCO}_3}{1 \text{ mol NaCl}} = 1$

Conclusion: Compare the experimental and theoretical mole ratio between NaHCO₃ and NaCl, and discuss possible sources of error that may account for any difference.

- 1 to 1.4, not very accurate!
- not enough HCl to fully react
 - inaccurate scales
 - boiling over → lost product