

STOICHIOMETRY LAB #1: Percent Yield; SC2 b,d



A balanced equation indicates the proportions between reactants and products. More specifically, the coefficients in the equation indicate the mole ratios between the chemical substances. Thus, it is possible to determine how much product will be produced from a given amount of reactant. This predicted amount can then be compared with the actual amount produced to determine the percent yield of the reaction. The purpose of this lab investigation is to calculate the theoretical and actual percentages as predicted from a balanced chemical equation.

In this experiment, you will investigate the following reaction:

1. Sodium bicarbonate and aqueous sulfuric acid produce aqueous sodium sulfate, water, and carbon dioxide gas.



SAFETY

- 2M sulfuric acid can cause burns. Avoid skin and eye contact. Rinse spills with copious water.

PROCEDURE

1. Obtain a transfer pipet containing 2M H₂SO₄. Read through the entire lab and create a data table suitable for your data set.
2. Obtain a clean, dry flask. The smaller the flask, the better (25-50 mL). Measure and record the mass. Place approximately 0.30g of NaHCO₃ into the small flask. Find the combined mass of the flask and sodium bicarbonate and record in a data table.
3. Determine the exact mass of sodium bicarbonate by subtraction. This mass must be between 0.20 and 0.40 g. Record the mass of sodium bicarbonate in a data table.
4. Record the TOTAL mass of all the components of the lab: sodium bicarbonate, flask, dropper and sulfuric acid. You may even want to record the individual masses for each component. (e.g., mass of a “full” dropper, mass of dropper and dropper bottle, etc.)
5. SLOWLY, drop by drop, add the sulfuric acid to the sodium bicarbonate to generate carbon dioxide gas. SWIRL the flask constantly. Continue releasing the acid in this manner until gas production ceases. One drop too many will give you inaccurate results.
6. Measure and record the TOTAL mass of all the components again.
7. Return the transfer pipet with the remainder of the sulfuric acid. Rinse the contents of the flask down the drain with water. Clean up your lab station.

DATA

Construct a data table for each reaction to display your laboratory measurements. Make sure that each value is clearly labeled. Be prepared to repeat trials as needed to ensure accuracy.

ANALYSIS

1. Write a balanced equation for the reaction.

2. Calculate the actual mass of carbon dioxide produced (“actual yield”).
3. Using the balanced equation, calculate the mass of carbon dioxide that should be produced from the mass of sodium bicarbonate that you used (“theoretical yield”).

CONCLUSIONS

4. Calculate the percent yield of the carbon dioxide using the equation below (show your work).

$$\% \text{ Yield} = 100 \times \frac{\text{Actual Yield}}{\text{Theoretical Yield}}$$

5. A perfect percent yield would be 100%. Comment on your degree of accuracy and suggest possible sources of measurement error. How could these errors be reduced in the future?