Chemistry 11

Lab: Percent Yield

Name:

Block:

Introduction:

Part I:

Due to the widespread use of sodium bicarbonate (commonly called baking soda) in many food products, the thermal decomposition reaction has been studied extensively by food chemists. Baking soda is used to prepare cakes in order to ensure that cakes "rise" as they bake. As the temperature of the cake batter reaches approximately 50 °C, the baking soda decomposes and carbon dioxide is released. The use of baking soda is especially popular in pancakes and waffles since the high cooking temperatures of 175–230 °C causes the carbon dioxide to be liberated before the dough has set. Thus, the batter rises before it sets, and we get a light and tasty finished product.

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Part II:

The product produced in Part I will react with calcium chloride in the formation of a precipitate. In solution chemistry, the term precipitate is used to describe a solid that forms when a positive ion (cation) and a negative ion (anion) are strongly attracted to one another.

$$NaCO_3 + CaCl_2 \rightarrow CaCO_{3\,(s)} + NaCl_{\,(aq)}$$

Objectives:

1. To observe the decomposition reaction of sodium bicarbonate ($NaHCO_3$).
2. To calculate the percent yield of the products based on the recorded solid mass.
3. To use the calculated percent yield to predict the mass of the gases formed.
4. To observe the reaction between solutions of sodium carbonate and calcium chloride.
5. To calculate the percent yield of the precipitate formed.

PART I: Procedure

1. Record the mass of an empty test tube.
2. Carefully transfer about a spoonful of baking soda into the test tube.
3. Record the mass of the test tube and baking soda.
4. Attach the baking soda to a ring stand and clamp and have it positioned at an angle (see picture to the right).
5. Reposition the test tube containing the baking soda over the Bunsen burner so that it sits a few cm above the blue flame.
6. Light the Bunsen burner.

7. As the reaction is taking place, note down any qualitative observations.

8. Take a Q-tip and immerse it with universal indicator.

9. Record the colour and pH (initial)

10. Carefully place the Q-tip into the test tube, ensuring not to touch the inside walls of the test tube.

11. Record the colour and pH (final)

12. Move the test tube (still attached to the ring stand) so that the moisture is burned off.

13. Turn off the Bunsen burner.

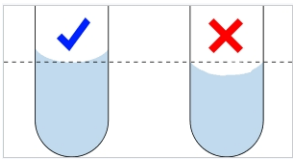
14. Record the mass of the test tube containing the product.

PART II: Procedure

1. Obtain a 100 mL volumetric flask and a funnel. Ensure the funnel fits into the mouth of the volumetric flask.

2. Take a wash bottle and add water to the product in the test tube.

3. As the solid starts to dissolve, pour the solution into the volumetric flask through the funnel. Dissolve all of the contents into the volumetric flask and top up with water, ensuring that the bottom of the meniscus is at the line. Place a rubber stopper on the volumetric flask and invert to mix several times.



4. Record the mass of two scoops of $CaCl_2$.

5. Dissolve the $CaCl_2$ into a second 100.mL volumetric flask. Dissolve and top up with water following the same steps as #3.

6. Using a graduated cylinder, measure and pour 25.0mL of each solution into a beaker

7. As a precipitate forms, record observations.

8. Record the mass of filter paper.

9. Set up filtering apparatus.

10. Carefully pour the contents of the beaker into the filter funnel. Use the wash bottle to rinse the remaining precipitate from the beaker.

11. Place your product in the drying area designated by your teacher.

12. THE NEXT DAY: Weigh and record the mass of the dry filter paper containing the final product.