How Much Carbon Dioxide is in My Seltzer Water?

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Objectives:

1. Define properties of carbon dioxide.
2. Explain the effect of a catalyst.
3. Identify acids and bases using acid-base indicator.
4. Apply the law of conservation of mass to physical change.
5. Calculate moles of carbon dioxide produced.

Vocabulary:

* catalyst
* acid
* physical change
* law of conservation of mass
* mole calculation

Materials:

* 1.25 PT of Schweppes original Seltzer water
* original Mentos
* large container

* burning splints
* matches

Demonstration:

Add 2 to 3 mentos drops to Seltzer water

Observe reaction.

Test for carbon dioxide using a burning splint.

Summary 1:

1. List the properties of carbon dioxide.
2. Explain the role of the Mentos.

Group Activity:

Introduction:

Seltzer water is a solution of water with carbon dioxide and a few other ingredients. In this experiment you will determine the percentage of carbon dioxide in the Seltzer water. An acid base indicator, bromthymol blue will be used to indicate when almost all the carbon dioxide is released.

Group Members:

Group Leader: _____

Materials Manager: _____

Time Keeper: _____

Recorder: _____

Materials:

* Bottles Schweppes Seltzer water

* 2- 100 mL beakers, thermometer
* 50 mL graduated cylinder
* 1 dropper bottle bromthymol blue
* electronic balance
* tongs

Procedure:

1. Turn on the hot plate. Place a beaker with 80 ml of water with a thermometer on the hot plate.

2. Adjust the heat on the hot plate for the water to be at 75°C.

3. Measure the mass of the empty beaker. Record in data table.

4. Measure 25-mL of the Seltzer water using the graduated cylinder.

5. Pour the water into the empty beaker.

6. Add 5 drops of bromthymol blue to the water in the beaker. Record the color of the solution.

7. Record the mass of the beaker and water in the data table.

8. Place the beaker on a hot plate. Keep the temperature at 75˚C . Swirl the flask gently using the tongs for faster release of the carbon dioxide.

9. Continue to heat until you notice a color change.

10. Remove the beaker with Seltzer water from the hot plate.

11. Allow cooling for 5 minutes.

12. Measure the mass of beaker and soda without carbon dioxide. Record the mass.

Data

Mass of empty beaker: _____

Mass of beaker and 25 ml seltzer water: _____

Mass of beaker and seltzer water without carbon dioxide: _____

Calculations:

Calculate:

1. Mass of 25 mL Seltzer water:
2. Mass of carbon dioxide released:
3. Percentage of carbon dioxide by mass released:
4. Moles of carbon dioxide released.

Analysis and Conclusions:

1. Explain the first color of the solution.

2. Explain the second color change of the solution.

3. What error will be introduced if the seltzer water is heated at a very high temperature?

Summary 2: Chemistry Regents Questions

Base your answers to questions 1 through 4 on the article below and on your knowledge of chemistry.

Fizzies — A Splash from the Past

They're baaack . . . a splash from the past! Fizzies instant sparkling drink tablets, popular in the 1950s and 1960s, are now back on the market. What sets them apart from other powdered drinks is that they bubble and fizz when placed in water, forming an instant carbonated beverage. The fizz in Fizzies is caused by bubbles of carbon dioxide (CO_2) gas that are released when the tablet is dropped into water. Careful observation reveals that these bubbles rise to the surface because CO_2 gas is much less dense than water. However, not all of the CO_2 gas rises to the surface; some of it dissolves in the water. The dissolved CO_2 can react with water to form carbonic acid, H_2CO_3.

$$H_2O(\_) + CO_2(aq) \; H_2CO_3(aq)$$

The pH of the Fizzies drink registers between 5 and 6, showing that the resulting solution is clearly acidic. Carbonic acid is found in other carbonated beverages as well. One of the ingredients on any soft drink label is carbonated water, which is another name for carbonic acid. However, in the production of soft drinks, the CO2 is pumped into the solution under high pressure at the bottling plant.

— Brian Rohrig

Excerpted from “Fizzies—A Splash from the Past,”

Chem Matters, February 1998

1. What is the only positive ion in an aqueous solution of carbonic acid? [1]

2. CO2 is pumped into the soft drink solution under high pressure. Why is pressure necessary? [1]

3. Describe the solubility of CO2 gas in water. [1]

4. Explain your response to question 3 in terms of the molecular polarities of CO2(g) andH2O(_). [1]