Electrolysis of Water

Introduction

This activity involves breaking water into its basic elements. You will measure the volume of the parts and observe their properties.

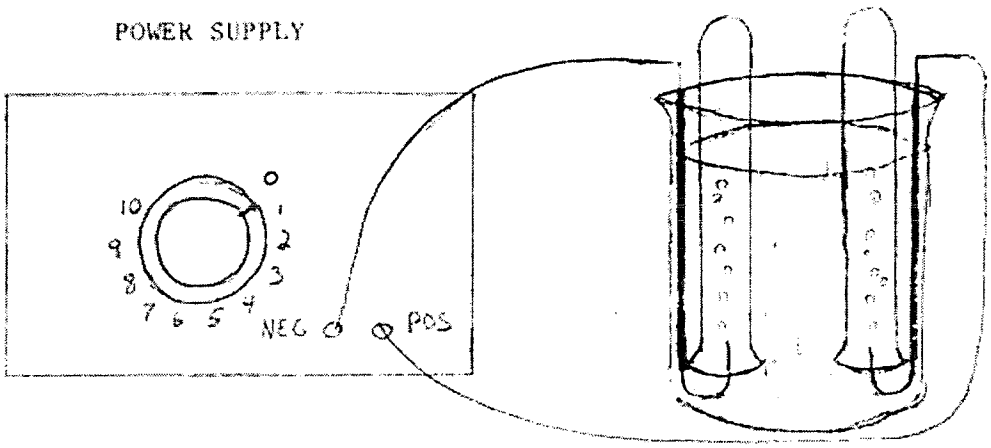
Objectives

Identify and describe properties of the elements of water.
Change water into its basic elements.
Compare your data to data of others.
Demonstrate that properties of matter can be changed by adding or removing energy to form compounds.
Recognize electrical properties of matter.

Part 1

Equipment and Materials

safety glasses	25 ml graduated cylinder
250 ml beaker	pegboard or ringstands and clamps
2 test tubes	saturated sodium carbonate solution
2 electrodes	2 wire leads with alligator clips
wood splints	marking pencil
matches	power supply



Procedure:

1. Fill a 250 ml beaker half full of tap water.

2. Fill a test tube with water and cover the top with a small piece of paper. Hold the piece of paper over the mouth of the test tube with your fingers and carefully turn the test tube upside down. The paper should stick to the test tube. Carefully lower the test tube into the beaker of water. If you did this step correctly, there should be no air in the test tube. If there is, try again! When successful, remove the paper.

3. Repeat step 2 with another test tube.

4. Carefully put the hooked end of an electrode into the mouth of each inverted test tube.

5. Clamp the test tubes and electrodes to a support so they are about 2 cm above the bottom of the beaker. Be sure some of the bare wire of the electrode is exposed below the test tube opening.

6. Connect the electrodes to the power supply terminals with the wire leads.

7. Set the power supply as directed by your instructor. Switch on the power supply and observe the surface of the electrodes. Answer questions 1 and 2 on page 4.3.

8. Add 15 ml of saturated sodium carbonate solution to the beaker. Answer question 3 on page 4.3.

9. Allow the reaction to proceed for 20 minutes or until one of the test tubes is about ¾ full of gas. Shut off the power supply.

10. Mark the level of gas in each tube with a marking pencil. Mark a (+) or (-) on each test tube as is appropriate.

11. Remove from the beaker the tube that was connected to the negative terminal of the power supply. Keep it upside down. Hold a burning splint near the mouth of the tube and slowly invert it. Note the reaction.

12. Remove the tube that was connected to the positive terminal of the power supply. Keep it upside down. Insert a glowing splint and note the reaction.

13. Add water to each of the test tubes to the mark made in step 10. Pour the water from the test tube into a graduated cylinder and record in Table I the volume of gas collected at the positive and negative terminals.

14. Consult with other lab teams in your class and complete Table I. Answer the questions on page 4.3.

Name _____

Section _____

Electrolysis of Water

Data Table: Volumes of Gases at Electrodes

	Volumes of gas collected		Whole Number Ratio of Gas Volumes (Negative/Positive)
Team Number	Negative Electrode	Positive Electrode	
Your Data 1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Questions:

1. What happens when you connect the power supply without sodium carbonate present?

2. Is water by itself a good conductor of electricity?

3. What happened to the production rate of the gases after adding sodium carbonate to the solution? If the production rate changed, why do you think adding sodium carbonate changes the production rate of the gases?

4. What gas was collected in the test tube connected to the positive terminal of the power supply? How do you know it was this gas?

5. What gas was collected in the tube connected to the negative terminal? How do you know it was this gas?

6. What do you think would be the ratio of gases collected if you decomposed a bathtub full of water? Why?

7. Why is it important to compare your results with those of the rest of the class?