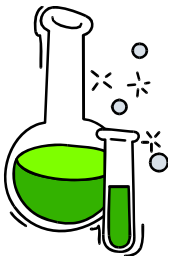
Name _____ AP Chemistry

Decomposition of Potassium Chlorate

Introduction:

In this lab we will decompose potassium chlorate ($KClO_3$) and collect the product of oxygen gas over water in a Erlenmeyer Flask. The oxygen gas product will be collected in a 250 mL E. Flask that is initially filled with water and inverted in a pneumatic pan. The volume of the gas collected in the 250mL E. Flask is measured by recording the displaced volume of water. The total pressure inside the 250 mL E. Flask is the sum of the gas collected and the pressure of water vapor in equilibrium with liquid water:



$$P_{total} = P_{O2} \text{ and } P_{H2O}$$

Prelab:

1. Write a balanced chemical equation for the decomposition of potassium chlorate.

2. Obtain and record the pressure exerted by water vapor P_{H2O} at various temperatures (found in Appendix B in your textbook) and the room pressure in torr.

3. Fill a trough with water and allow it to come to room temp. Record and convert to Kelvin.

4. Write the ideal gas equation in terms of number of moles present, pressure, temperature, gas constant and volume

Materials:

⇒ Large Test Tube
⇒ Ring stand and clamp
⇒ Bunsen Burner
⇒ Pneumatic pan and rubber tubing for overflow
⇒ 250 Erlenmeyer Flask
⇒ Stopper with hole, bent glass tube and rubber tubing

Procedure:

1. Place a pre-massed sample of $KClO_3$ in a large test tube
2. Attach a clamp to a ring stand and clamp the test tube at a 5 degree angle from the horizontal
3. Place a bunsen burner below the test tube
4. Obtain and fill a pneumatic pan 3/4 full with water and attach an overflow tube
5. Fill the 250 mL E. Flask and place inverted flask over the gas opening in the pan. Use a clear glass slide to ensure no water escapes (shown in pre-lab)
6. Attach a stopper with bent glass and tubing to the test tube and and to the bottom of the pneumatic pan
7. Ignite the burner and heat the potassium chlorate and observe the gas collection in the E. Flask; make sure to hold the E. Flask so it does not fall over!
8. Heat until gas formation stops

Data and Postlab:

Record the volume of water displaced (this is also your volume of gas produced) _____

1. Using the formula from the prelab, calculate the partial pressure of the oxygen gas. SHOW ALL WORK BELOW and make sure to convert pressure to atm.

2. Using the ideal gas equation from the prelab, calculate the number of moles of oxygen gas collected in the 250 mL E. Flask.

3. Using the balanced equation and the number of moles of oxygen gas collected, calculate the number of grams of $KClO_3$ that were decomposed.

4. Show your calculations to Mr. O'Leary and he will tell you the actual amount of $KClO_3$ that your group decomposed. Perform a percent yield calculation (not percent error) for the results and provide an explanation to account for the difference in masses.

5. What did you observe as the $KClO_3$ was heated? _____

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6. In a similar experiment, Ammonium nitrite decomposes upon heating to form N_2 gas and water. When a sample of ammonium nitrite is decomposed in a test tube, 511 mL of N_2 gas is collected over water at 26 degrees Celsius and 745 total torr pressure.

(a) Write a balanced chemical reaction for this process
(b) How many grams of ammonium nitrite were decomposed? SHOW ALL WORK FOR FULL CREDIT.