Name _____

Molar Gas Lab

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Purpose

Students will be able to determine the grams of potassium chlorate in an unknown sample with an accuracy of at least 90%. After successful completion of the lab, each lab group will write a concise lab report using the computer.

Introduction

In this experiment you and your lab partner will be put to a new challenge. You will be given a sample of potassium chlorate ($KClO_3$). Your goal is to determine how many grams of potassium chlorate are in the sample. The following procedure has been developed to guide you through a process using the gas laws and stochiometry. The procedure is based on the decomposition reaction below:

$$2KClO_3 \rightarrow 2KCl + 3O_2$$

After following through the steps outlined in this procedure, you will submit your results for evaluation.

Safety

Lab goggles must be worn during this lab when the Bunsen burners are in use. Always aim the test tube you are heating away from yourself and other students.

Procedure

1) Determine the volume of a large acid bottle.
2) Obtain an unknown mixture of potassium chlorate with calayst.
3) Place a large test tube in the Erlynmeyer flask on the balance and zero out the test tube.
4) Pour your sample into the test tube and record its mass.
5) Set up the equipment like the station on the prep table.
6) Fill the acid bottle completely full of water and secure the stopper assembly.
7) Put the bottle in the ring clamp and secure the large test tube in a tube clamp.
8) Be sure the stoppers are secure and then release the hose clamps, a vacuum should be maintained.
9) Gently heat the contents of the test tube until the solid no longer boils and appears dry.
10) Allow the set up to cool until you are able to place your hand on the bottom of the test tube.
11) Close all the hose clamps.
12) Measure the height of the water column left in the bottle.
13) Determine the volume of water displaced by the oxygen gas.
14) Record the temperature of the water and the barometic pressure in the room.
15) From this information use the gas laws and stochiometry to complete the table.

You may use a barometic pressure sensor and temperature probe along with Easy Data and a TI-84 calculator to record pressure and temperature readings throughout this experiment. See also Gas Lab for pictures of the experimental setup. In the Molar Gas Lab a test tube containing potassium chlorate was heated to obtain the oxygen gas. This test tube was capped with a one-hole rubber stopper containing a latex tube that ran to the glass bottle. This was in place of the balloons full of gas as seen in the pictures.

	MOLAR GAS LAB DATA TABLE	.
#1	Volume of glass bottle in liters	L
#2	Mass of empty test tube	g
#3	Mass of potassium chlorate in mixture	g
#4	Theoretical mass of oxygen that can be produced from sample	g
#5	Theoretical mass of potassium chloride that can be produced from sample	g
#6	Height of water column in the glass bottle in millimeters of water	mm
#7	Height of water column in equivalent millimeters of Hg	mm
#8	Volume of water left in glass bottle in liters	L
#9	Temperature of the tap water in the bottle	°C
#10	Water vapor pressure in mm of Hg (See Table in CRC Handbook)	mm Hg
#11	Temperature in the lab in Kelvins	K
#12	Barometric pressure in the lab in mm of Hg	mm Hg
#13	V_1 = nonstandard volume of the oxygen gas in liters	L
#14	P_1 = nonstandard pressure of the oxygen gas in mm of Hg	mm Hg
#15	T_1 = nonstandard temperature of the lab in Kelvins	K
#16	T_2 = standard temperature in Kelvins (Constant)	K
#17	P_2 = standard pressure in mm of Hg (Constant)	mm Hg
#18	V_2 = standard volume of the oxygen gas in liters	L
#19	Moles of oxygen gas in the bottle	mol
#20	Mass of oxygen gas trapped in bottle	g
#21	Percent Error for oxygen gas (Compare #18 with #4)	%
#22	Mass of Test tube and contents after heating	g
#23	Mass of potassium chloride in test tube after heating	g
#24	Percent Error for potassium chloride (Compare #24 with #5	%