Chemistry 1515L Week 11

Graduate Teaching Assistant

Contact Information

MOLAR GAS VOLUME

The volume occupied by one mole of a gas is its molar volume. For an ideal gas (from PV = nRT):

\[ V_m = \frac{RT}{P} \]

If we know R (constant), T (measured), and V (measured for a known sample), we can calculate \( V_m \) for the gas.

We generate the gas (O\(_2\)) by decomposing KClO\(_3\) (below); we weighed the KClO\(_3\), therefore we know how many moles of O\(_2\) we expect to be produced. Measuring the volume of gas given off allows us to find \( V_m \).

\[
\begin{align*}
2 \text{ KClO}_3 & \rightarrow 2 \text{ KCl} + 3 \text{O}_2 \\
\end{align*}
\]
MOLAR GAS VOLUME

\[
2 \text{ KClO}_3 \rightarrow 2 \text{ KCl} + 3\text{O}_2
\]

- You will weigh out a sample of KClO$_3$ accurately
- The sample will be decomposed by heating (like week 5)
- The O$_2$ evolved will displace water in a Florence flask
- You measure the weight of the solid left over (KCl)
- You measure the volume of the liquid displaced
- From this data you calculate the molar gas volume
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The set up is quite different from the book with the main difference being no trough and the Florence flask being upright. Refer to the picture above.

- Obtain the supplied pieces, fill the Florence flask with water, and seal the flask with the two-hole stopper. The tube with the second rubber stopper is attached to your test tube/sample and the other tube to a large beaker (600 or 800 mL).
- Before you continue, you must clear the line of air. Do so by blowing carefully into the tube with the rubber stopper close to the rim of the beaker, and then clamping the rubber stopper to stop gas from going into the beaker.
- Next, replace water in the Florence flask, replace stoppers into the flask and test tube and then remove clamps. If the setup is sealed properly you should have no loss of water.
- If it will probably be a good idea to preheat your Bunsen burner, set the burner so that you have slow heating. Don’t heat the sample rapidly as there is a chance of shocking the sample in to the air, and/or blowing the stopper out of the test tube, if the gas is worked too quickly.
- Make sure all connections are tight. Also, make sure that the line connecting to the beaker is free of air. You need TA approval before heating.

When the experiment is complete, dispose of the waste solid in the container provided, and clean the test tube with soap and water.

Detailed directions on web page
MOLAR GAS VOLUME

- Work in pairs and work together to get the setup right
- There are two sizes of stopper available for the Florence flask – make sure yours fits properly
- Be very careful when you are getting air out of the system
- Check with me that your apparatus is correct before heating
- You should have time to do the experiment at least twice

For Next Lab Session:

- Read all of the material available (Lab Manual and Website) related to the next experiment (Specific Heat)
- Email me with any questions.