

## CHM 115 Lab 7

### Molar Mass and Chemical Formula of a Volatile Liquid

The purpose of this experiment is to determine the molar mass of a compound that is a volatile liquid, and using the elemental analysis (provided) to determine its molecular formula. The mass of a known volume of vapor is determined and the Ideal Gas Law is used to calculate the molar mass. The Ideal Gas Law,  $PV = nRT$ , may be modified for our purposes to the form:  $PV = (\text{mass}) RT/\text{molar mass}$

With a partner, obtain these items from the Stockroom: 125 mL Erlenmeyer flask, thermometer, and numbered unknown.

#### Procedure:

1. Use the analytical balance to weigh the clean dry flask, aluminum foil, and rubber band.
2. Pour about 3 mL of the unknown into the flask, cover with the foil, and secure the foil with the rubber band.
3. With about 200 mL of water and a couple of boiling chips, float the flask in the beaker, and cover with the watch glass.
4. Heat slowly until the water boils. Continue boiling until there is no trace of the unknown liquid in the flask.
5. After all of the sample has been vaporized, measure the temperature of the boiling water and discontinue heating.
6. Carefully remove the flask, dry it well with a paper towel, and allow flask to cool to room temperature (about 20 minutes). (The flask must come to room temperature.) A few drops of liquid should form in the flask from the condensed vapor.
7. Record the barometric pressure in the lab. Convert to atm.
8. Weigh the flask with the foil and rubber band still in place and determine the mass of the vapor that had filled the flask.
9. Rinse out the flask and determine the volume by filling it carefully with water from a graduated cylinder.
10. Return the wet 125 mL flask to the stockroom and obtain a dry one and new piece of aluminum foil.  
Repeat the experiment for a second trial.
11. Be sure you copy down the elemental analysis data for your sample.