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Exp. 12 Molar Mass of a Volatile Liquid

# Purpose:

* Measure the physical properties of pressure, volume, and temperature for a gaseous substance.
* Determine the molar mass of a volatile liquid.

# Materials and Reactions (if any):

* 125 mL Erlenmeyer flask, unknown sample, 50mL, 100mL and 400mL graduated cylinder, aluminum foil, rubber band, boiling chips, utility clamp.

# Procedure:

* **Safety precautions**
  + Most unknowns are flammable, use a hot plate or moderate flame for heating.

1. Get a clean 125mL flask, cover it with an aluminum foil and secure it with a rubber band. Measure the mass of them three.
2. Put the unknown sample inside the flask, use an aluminum foil to cover and a rubber band to secure, and use a pin to pierce the foil several times.
3. Take a 400mL beaker and add some boiling chips inside it.
4. Put the flask inside the beaker and secure it with a utility clamp without touching the wall of it, then add some water high over the neck of the flask.
5. Heat the water gently until it reaches a gentle boil.

When the liquid in the flask and/or the vapors escaping from the holes in the aluminum foil are no longer visible, continuing heat for five minutes.

1. Measure the volume of the flask. Fill the water into the brim, the pour it out to the graduated cylinder to measure its volume.
2. Record the pressure of the vapor in the flask.
3. Calculate the molar mass from the data and determine the standard deviation(%RSD).

# Calculations (if any):

# Nvapor = PV / RT = P(atm) × V(L) / (0.08206 atm / mol × K) × T(K)

R is the universal gas constant, P is the barometric pressure in atmospheres, V is the volume in liters of the vessel into which the liquid is vaporized, and T is the temperature in kelvins of the vapor.

* Mcompound = mvapor / nvapor
* (P + n2a / V2) (V-nb) = nRT

a is an experimental value that is representative of the intermolecular forces of the vapor, and b is an experimental value (or size) of the molecules.