Flick Your Bic: Using the Ideal Gas Law Name: _____Pd: _____

Purpose: To determine the molar mass of butane.

Materials:

✓ Bic lighter ✓ Graduated cylinder ✓ Balance ✓ Thermometer

Pre-Lab: *Show your work for the calculations below.*

a.) At room temperature (20.0°C) and 760 mmHg of pressure, an unknown gas takes up 9.21 L. How many moles of this gas are present?

b.) If the gas in part (a) has a mass of 7.73g, what is the molar mass of that gas? Assuming that it is a noble gas, which one would it most likely be?

Procedure:

1.) Put the stopper in your sink and fill it about 2/3 full of water. Try to get the water temperature between 20-25 ^{o}C (approximate room temperature). Use a thermometer to record the exact temperature in degrees Celsius and record this in your data table.

2.) The current atmospheric pressure (minus the partial pressure of water vapor at room temperature) is listed on the board.

3.) Place your lighter underwater to get it wet, then shake off the excess water and dry it with a paper towel. Record the initial mass of the lighter in your data table.

4.) Place your graduated cylinder underwater and tilt it upward so that water fils the cylinder while all the air leaves the cylinder. Then invert the cylinder without letting any air back into it.

5.) Hold the lighter under the graduated cylinder and hold the button, allowing the gas to escape into the cylinder. Continue until the level of gas is between 75mL and 100 mL. (Do NOT go over 100 mL.) Record the volume of gas trapped in your graduated cylinder (Do NOT remove the cylinder from the water until you have read the volume!). (Remember, you are reading it upside down!)

6.) Remove your lighter and dry off the excess water. Then record the final mass in your data table.

7.) Empty the water and dry off all your equipment before returning it to its proper location.

Data: Bolded values will be used for analysis questions.

Item	Measurement (with units)
Temperature (^{o}C)	
Pressure (on the board or from your teacher)	
Initial Mass of Lighter (g)	
Final Mass of Lighter (g)	
Volume of butane used (mL)	

Calculations: Show your work for ***all*** calculations!

1.) Convert the temperature from your data table into Kelvin.

2.) Convert the pressure from your data table into atomospheres.

3.) Convert the volume of butane used from your data table into liters.

4.) Using the initial & final mass of the lighter from your data table, calculate the mass of butane collected.

5.) Use the ideal gas law to determine the number of moles of gas released from your graduated cylinder. (Be sure you choose the pressure, volume, and temperature with the correct units!)

6.) Based on the mass and number of moles of Butane present, calculate the molar mass of butane.

7.) Butane is C_4H_{10}. Using the periodic table, what is the actual molar mass of butane?

8.) Calculate the percent error for your data. The accepted molar mass is the answer from #7.

$$\% \text{ error} = \left| \frac{\text{accepted} - \text{observed}}{\text{accepted}} \right| \times 100$$

Analysis/Conclusion: *(Answer in complete sentences.)*

1.) Compare your percent error with other students around you. Overall does this lab seem to give good results or not? Why or why not?

2.) List **three** sources of error in this lab. Use complete sentences. You may NOT say "Not zeroing the scale." Think about things that happened during the lab that may have caused measurements or results to be inaccurate.