**Lab 3: Determination of the molar mass of carbon dioxide**

**Part 1. Purpose**

Calculate the molar mass of carbon dioxide gas using the ideal gas law.
List the relevant mathematical equations that you will be using.

Part 2. Materials and methods

**Materials needed:**
- 250 mL Erlenmeyer flask
- Electronic balance
- Barometer (attached to classroom wall)
- Small piece of dry ice
- Rubber stopper
- Thermometer
- 100 mL graduated cylinder

Equipment needed: **Sketch** the setup and **label** the various pieces of equipment.

Part 3. Procedure

We talked about this in class. Please write down the exact steps you used to arrive at your data (do not list “do the calculation” as a step). Include enough detail (certainly mention all of the glassware you used and when) so that a Chemistry 101 student can get the same results as you did. Also include the criterion for ending the experiment.

**Safety issue** — Dry ice is extremely cold (−77°C) and will cause frostbite with prolonged contact. Always use gloves or a piece of paper towel to handle dry ice.

Part 4. Original data

If you did not do this already, arrange all of your data in table form, ideally one table for both trials you ran.

Part 5. Calculated results

For one trial, show how you calculated the molar mass of CO₂, using your data. Pay attention to significant figures.

If you had two trials that resulted in molar masses within 5% of each other, calculate the mean.

Calculate a **percent error** between either your mean (if two good trials) or best value (if only one good trial) for the molar mass of CO₂ and the actual molar mass.

Part 6. Group results

Write your mean value for the carbon dioxide molar mass on the overhead and record all groups’ values. Calculate the mean and standard deviation, and comment about where your results fit in (for instance, are your results outliers? are there any outliers at all in the whole data set?). Finally comment on whether the class as a whole or your partnership was closer to the actual value and why this might be so.

Part 7. Questions
1. a. Why couldn’t you simply tare the flask and weigh the carbon dioxide directly after it sublimed?

b. Recalculate the molar mass of carbon dioxide if you had simply tared the flask and let the dry ice sublime.

c. (Tough question) What does this value represent?

2. What data value would have changed if you measured the mass of the flask and the sublimed carbon dioxide immediately after the dry ice had sublimed? How would your calculated molar mass have changed if you had not waited for the gas to reach room temperature?

3. By the way, what are you assuming about the behavior of the carbon dioxide?

Part 8. Conclusion

A sentence:

• To report the class’s molar mass mean (with standard deviation and proper units) and the percent error between that value and the actual molar mass of carbon dioxide.

• To comment on the size and direction (higher or lower?) of the error and to suggest a source(s) of either systematic or random error, as appropriate.

• To suggest a “fix” for the error source(s) you named.

• Comment on whether you have more confidence in your results or the class’s results.

Abstract

Remember to word-process this and put it on a separate page. Attach it to the front of your report

Your name and partner’s name, North Seattle Community College

DETERMINATION OF THE MOLAR MASS OF CARBON DIOXIDE USING THE IDEAL GAS LAW

Using the ideal gas law, we determined the molar mass of carbon dioxide to be _____ units?), which is _____ % off of the actual value. We have (strong/some/no) confidence in our result because (all obvious sources of error were eliminated/most sources of error were eliminated, except....). For future trials, we would (not change the procedure at all/change the following step(s):.....).