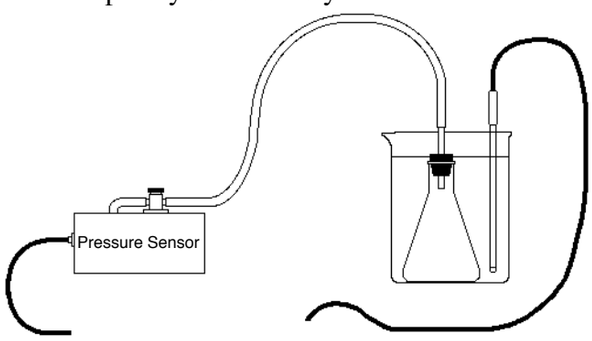
Name _____ Period _____
Partner_____ Date _____

Pressure, Temperature, and Absolute Zero

Procedure

This is the experimental set up for your lab today:



Prepare four water baths by putting 700 ml of water into a 1 liter beaker. You will have to coordinate with other groups to have enough beakers. One of them should be heated to near boiling, one should be hot, one should be at room temperature, and one a cold water bath.

Prepare the temperature probe and pressure sensor for data collection.

- Plug the temperature probe into an adapter cable in Channel 1 of the CBL.
- Plug the pressure sensor into an adapter cable in Channel 2 of the CBL. A 30-45 cm piece of heavy-wall plastic tubing is already connected to the end opening of the 3-way valve of the pressure sensor.
- Open the side arm of the pressure sensor valve to allow air to enter and exit.
- Insert a 1-hole stopper fitted with a glass tube into a 125-mL flask. Twist the stopper to ensure a tight fit. Attach the plastic tubing to the glass tube in the stopper.
- Close the side arm of the pressure sensor valve to prevent any gas from entering or leaving.

Turn on the CBL unit and the calculator. Start the CHEMBIO program and proceed to the MAIN MENU.

- Select SET UP PROBES from the MAIN MENU.
- Enter "2" as the number of probes.
- Select TEMPERATURE from the SELECT PROBE menu.
- Enter "1" as the channel number.
- Select USE STORED from the CALIBRATION menu.
- Select PRESSURE from the SELECT PROBE menu.
- Enter "2" as the channel number.
- Select USE STORED from the CALIBRATION menu.
- Select ATM from the PRESSURE UNITS menu.
- Select COLLECT DATA from the MAIN MENU.
- Select TRIGGER from the DATA COLLECTION menu.
- Place the flask completely into the nearly boiling-water bath.
- Place the temperature probe into the same water bath.
- Monitor pressure and temperature on the CBL screen by pressing the [CH VIEW] button on the CBL. When "CH1" in the upper-left corner of the CBL screen blinks, the *Channel 1* temperature (in °C) is displayed on the CBL. When you press [CH VIEW] again, "CH2" starts to blink—the *Channel 2* pressure (in atm) is now displayed on the CBL. Continue to press [CH VIEW] to alternate between the two readings.
- When the temperature and pressure readings displayed on the CBL screen have both stabilized, press [TRIGGER] on the CBL to store the pressure-temperature data pair.

Select MORE DATA from the Trigger menu. Repeat for the three other baths.

Data Table

Pressure (atm)	Temperature (°C)	Temperature (K)	Constant, k (P / T)

Post Lab Questions

1) In order to perform this experiment, what two experimental factors were kept constant?

2) Prepare of graph of pressure versus temperature using the Kelvin temperature. Attach it to this paper.

3) Prepare a graph of pressure (x axis) and temperature (y axis) using the Celsius scale. Extrapolate the line to find the y intercept of the line. This should be the value for absolute zero. What does it equal? Attach the graph

4) Based on the data and graph that you obtained for this experiment, express in words the relationship between gas pressure and temperature.

5) Explain this relationship using the concepts of molecular velocity and collisions of molecules.