

**10.9 Gas Pressure Sensor: Pressure and temperature relationship of a gas**

**Subjects:** Properties of gases, temperature effect on pressure

**Description:** The relationship between pressure of a gas and temperature is explored using the pressure sensor. Data is displayed using the Logger Pro program.

**Materials:**

Gas pressure sensor  
Temperature probe  
Computer and LabQuest interface  
Logger Pro software  
Rubber stopper assembly  
Plastic tubing with connectors  
125 mL Erlenmeyer Flasks  
3 1-liter beakers  
Hot plate  
Ice  
Glove

**Procedure:**

1. Prepare a hot water bath, an ice bath and a room temperature bath.
2. Connect the Gas sensor to Channel 1 of the Labquest interface and connect the temperature probe to Channel 2.
3. Assemble the apparatus. Connect the white rubber stopper to the Gas Pressure Sensor with the clear tubing. (About one-half turn of the fittings will secure the tubing tightly.) Be sure the valve is open to the sensor. Twist the white stopper snugly into the neck of the Erlenmeyer flask to seal it. Be sure the valve to the unused connection is closed.
4. Open the file "30b Gases" from the Advanced Chemistry with Vernier folder. This file is set up to collect pressure and temperature data from the attached sensors using "Selected Events Mode". This mode allows you to collect a data pair simultaneously from the Gas Pressure Sensor and Temperature Probe by clicking the [Keep] button.
5. Place temperature probe in the ice water bath. Then place the flask in the bath making sure it is submerged up to the neck. When the readings stabilize click [Keep].
6. Repeat step 4 for the room temperature and hot water baths. Use a pair of insulated gloves for the hot water bath to avoid burns.
7. Compare the pressure of air in the flask at different temperatures.

**Discussion:**

This experiment demonstrates the relationship between absolute temperature of a gas sample and the pressure it exerts. As temperature increases, pressure of a gas also increases.

**Safety:** Use caution when handling boiling water to prevent spills and burns.

**Disposal:** None

**References:**

Demo adapted from:

1. Randall, J. et al. Advanced Chemistry with Vernier. 2nd Ed. 2007. Vernier Software and Technology. Experiment 30.

[http://www.vernier.com/files/sample\\_labs/CHEM-A-30-COMP-gas\\_laws.pdf](http://www.vernier.com/files/sample_labs/CHEM-A-30-COMP-gas_laws.pdf)