Advanced Gas Laws Demo w/ Temperature

P1-2065

BACKGROUND:

Gas Pressure is a measurement of the amount of force the moving gas particles cause on a unit of area. Several factors can affect the pressure of a gas.

Temperature: Increasing the temperature of a gas causes the particles to move faster. Faster-moving particles can each exert a larger force when they collide with a surface. Increasing the temperature of a gas tends to increase its pressure.

Volume: Confining a number of particles to a smaller volume causes them to move faster, which in turn increases the pressure they exert. Decreasing a gas's volume, then, tends to increase its pressure.

The **Combined Gas Law** relates these three quantities in a way that is useful for solving and testing problems involving gases. If the amount of gas (number of particles) in a container is held constant, its pressure, volume and temperature are related as follows:

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

ASSEMBLY:

This unit comes fully assembled and ready for use.

EXPERIMENT:

1. Open the valve.

2. Turn the piston so that the gasket is at a high volume. Close the valve.

3. Record the initial volume, pressure, and temperature in a data table like the one below.

4. Turn the piston clockwise to decrease the volume by at least 5mL. Wait a few seconds for the temperature reading to stabilize.

5. Record the new volume, pressure, and temperature.

6. Repeat measurements as desired.

7. For each trial, calculate the relationship described in the Combined Gas Law (PV/T).

8. Compare the calculated result for each trial.

Students should observe that the calculated relationship between the variables was constant (or nearly so) for each trial. Students may wish to experiment with increasing the volume from the starting value. Let them predict what will happen in this case, and encourage them to test their idea!

SAMPLE DATA TABLE:

Trial	Volume	Pressure	PV
1			
2			
3			

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