



Charles' Law

Lab #17

Charles Law describes the mathematical relationship between the volume of a confined gas and the temperature of that gas. In this lab you will heat a confined sample of gas in a small capillary tube and then monitor the change in volume that occurs as it cools.

Materials:

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| Capillary tube | High temperature thermometer | Small rubber bands |
| ruler | Paper towels | Hot oil |

Procedure:

Attach a capillary tube, open end down, to a thermometer using one or two small rubber bands. Be sure that the tip of the capillary and the end of the thermometer bulb are even.

Your teacher will have prepared a beaker of hot (approximately 200°C) oil. Place the capillary and thermometer into the hot oil. **Warning: Oil at this temperature can cause severe burns upon contact with skin.** You will see bubbles emerging from the capillary as the temperature rises. When the temperature has stabilized, slowly remove the thermometer and capillary from the oil. A small plug of oil will be drawn into the capillary tube as you do this. You will be determining the volume of that gas by measuring the length between the top (the closed end) of the capillary tube and the top edge of the oil plug.

Hold a paper towel under the thermometer and capillary to avoid dripping oil on the floor and take them back to your desk. Lay the thermometer and capillary on several paper towels on your desk next to the ruler.

Take as many simultaneous measurements of the temperature and the length of the gas trapped in the capillary as possible until the temperature drops below 50°C. If you have less than 20 measurements, repeat the procedure.

Calculations:

Graph the length of the oil v. temperature. Determine the equation of the line. Use this equation to calculate the value of absolute zero, that is the temperature at which the volume (or length) would become zero.