Name _____ period _____ date _____

Charles' Law Laboratory (eduweblabs.com)

Introduction

Charles law describes the relationship between the temperature of a gas and its volume. In order to understand this relationship, one must imagine what happens to the particles in a gas when it is heated or cooled. The temperature of a gas measures the average kinetic energy of the moving gas particles – how fast they are moving. When a gas is heated, the average kinetic energy of the particles increases and they move faster. When a gas is cooled, the average kinetic energy of the particles decreases and they move slower.

Objectives

- Determine the volume of a gas in a container under various temperatures
- Graph temperature-volume data to discover how the variables are related
- Interpret graphs and verify Charles' Law

Log-on directions

1. Go to www.eduweblabs.com
2. Select the **General Chemistry** section and scroll down to "Charles' Law" lab
3. You will be required to enter the following information to begin the lab:
   Name:
   Student Id:
   Teacher's last name: Greenwood
   School abbreviation: **rbrhs**
   Class password: greenwood**chem** (case sensitive)
   Hour: (your honors chemistry block)

PROCEDURE:

1) You can adjust the background shading by clicking on the **"Special"** button to the right and selecting **"Background"**. Drag the small beaker of mineral oil above the cylinder and press the "P" key. The oil will then be poured into the cylinder and its volume will register in the close up view. Record this volume.

2) Drag the balloon up and drop it into the cylinder. The sum of the mineral oil volume and the balloon volume will be shown in the close up. Subtract the mineral oil volume from the sum of the volumes and record this as the initial volume.

3) Drag the thermometer above the cylinder and drop it in place. Since this is a high temperature thermometer, it is constructed of thick resistant glass and can take a moderate drop without breaking. The room temperature will be displayed in the close up. Record this value.

4) Click on the "record" button located in the upper left graph area. This will graphically show the starting volume and its temperature and store these data points.

5) Turn on the hot plate and move the variable temperature slide to the right, and release. The temperature will now climb and in accordance with Charles Law, so will the volume. Record this new temperature and its volume (don't forget to subtract the initial volume of the oil!).

6) Repeat the sliding of the hot plate lever at least 4 more times, recording the volume / temperature pairs that result, click the record button each time. CAUTION: producing a temperature of greater than about 750 K or a volume greater than 800 mL may result in bursting the balloon. The hotplate slide can be moved to the left to lower the temperature.

Data Table

Water Bath	Temperature, K	Volume of Air in the syringe, mL
Initial balloon conditions		
Data set 2		
Data set 3		
Data set 4		
Data set 5		

Data Analysis and conclusions

1. Plot a graph of volume versus temperature (Kelvin) on the graph paper provided. Temperature is plotted on the x-axis (independent variable) and volume is plotted on the y-axis (dependent variable). Make sure you label the axis and give the graph a title. Choose a suitable scale for each axis so that the data points fill the graph as completely as possible. Draw a best-fit straight line that goes through most of the points.

2. Describe the relationship between the temperature and volume of a gas.

3. From your results, calculate the temperature of your gas if your syringe read 150 mL. (Show work)

4. Would the results in this experiment be any different if the same quantity of helium was used in the syringe instead of air? Explain your answer.

5. What are some possible sources of error in this lab? In what ways can you minimize error?