

Phone: 417.374.7431  
Fax: 417.374.7442  
service@gosciencecrazy.com  
1747 North Deffer Drive  
Nixa, Missouri 65714



## Charles's Law Apparatus, Deluxe #CHRLW01

### Warning:

- **Not a toy; use only in a laboratory or educational setting.**
- **California Proposition 65 Warning: This product can expose you to chemicals including lead and arsenic, which are known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).**



### Introduction

The behaviors of gases in most conditions can be approximated using the **Ideal Gas Law**:

$$PV=nRT$$

This law of gas behavior is the combination of three separate discoveries – Boyle's Law, Avogadro's Law, and **Charles's Law**.

Of the variables covered by the Ideal Gas Law – pressure, volume, molecular quantity, and temperature – Charles's Law describes the relationship between the volume and the temperature of a gas at a given amount and pressure.

Charles's Law is written as follows:

$\frac{V}{T} = k$	<ul style="list-style-type: none"><li>• <b>V= Volume</b></li><li>• <b>T= Temperature (Kelvins)</b></li><li>• <b>k= Constant</b></li></ul>
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To compare the same quantity of the same gas under two different sets of conditions, the formula can also be written as follows:

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



## How to Use

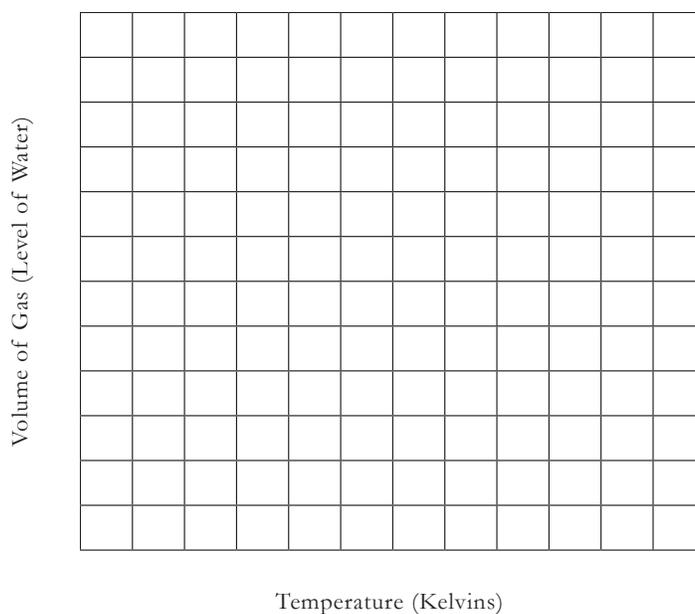
1. Assemble the apparatus as shown to the right. Place it on a level surface.
2. Fill the open ended glass tube with water. Set the slider holding the open-ended glass tube to a point where water will not cross the bend in the capillary tube and pass into the glass bulb.
3. Fill the provided can with water, and insert a thermometer. Place the can over a bunsen burner (not included) and beneath the glass bulb. **(Note: Do not let the bulb touch the boiling water. Heat only with steam.)**
4. As the steam heats up the bulb, take note of the temperature and the water-level in the open-ended glass tube.
5. Take at least 12 readings at different temperatures and record them in the table.
6. Draw a graph with your data with temperature on your x-axis and volume on your y-axis. What do you observe?



**Observation Table**

Temperature (Kelvins)	Volume of Gas (Level of Water)

**Graph**



## Care and Precaution

1. Do not immerse the bulb in boiling water.
2. Use caution when handling hot water and hot glassware.
3. Be careful that water doesn't rush into the bulb when you remove heat from the bulb.

