

Part A

Charles's law states that the volume (V) of a fixed quantity of gas is directly proportional to its temperature (T) at a constant pressure.

$$V \propto T$$

You can verify this law by plotting the graph of a gas's volume versus its temperature.

To perform this analysis, pump the handle only once so that a fixed number of gas molecules enter the gas chamber. Set the number of "Heavy Species" gas molecules to 100 using the text box given in the tab named **Gas in chamber**. Once the pressure reaches the value of about 0.50 atm, click on the "Pressure" button under the tab **Constant Parameter**, which is at the top right corner of the simulation. Go to the panel named "Tools and Options." Select the ruler by checking off the option in the **Measurement Tools**. Observe that the height of the cylinder (as measured left to right) does not remain constant because the molecules exert pressure on the walls of the cylinder.

Set the temperature by using the heat control box to add or remove heat as given in the table below.

Temperature (K)	200.	250.	300.	350.
-----------------	------	------	------	------

Use the ruler to find the height of the cylinder as an average between two whole nanometer markings on the ruler. For example, if the value is fluctuating between 6.0 and 7.0 nm, consider 6.5 nm to be the height of the cylinder even if the ruler appears to hover closer to either marking.

Complete the table below with your raw data for the height of the cylinder at each temperature.

Drag the appropriate labels to their respective targets.

3.56.5

4.57.5

5.58.5

Temperature (K)	200.	250.	300.	350.
Height of cylinder (nm)	<input type="text" value="4.5"/>	<input type="text" value="5.5"/>	<input type="text" value="6.5"/>	<input type="text" value="7.5"/>

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