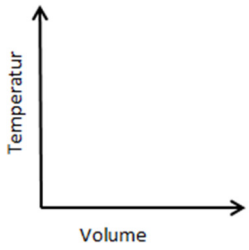
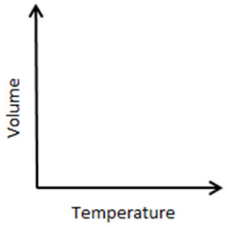
Gas Laws II – Charles's Law Name_____

Charles's law is a gas law that relates the volume and Kelvin temperature of a gas when the pressure is held constant. The relationship between volume and temperature at a constant pressure is a direct relationship, which means if temperature increases, then the volume must increase and if the temperature decreases the volume must decrease as well. The formula for Charles's law is below. You can use any volume units as you use the same volume units on both sides of the equation, but you must use temperature in Kelvin.

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



1. Measurements are taken in the lab to observe what happens to the temperature (y) of a gas as the volume (x) increases. Using Charles's law, draw a line on the coordinates to the right that predicts what you would observe as you increase volume.



2. Measurements are taken in the lab to observe what happens to the volume (y) of a gas as the temperature increases. Using Charles's law, draw a line on the coordinates to the right that predicts what you would observe as you increase temperature.

3. What is the formula to convert to Kelvin if you know the Celsius temperature?

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5. What are the STP conditions?

Solve the questions below and show your work to get full credit. *(Identify unknowns, plug into your equation, solve)*

6. A sample of nitrogen (N_2) occupies a volume of 250 mL at 25 °C. What volume will it occupy if the temperature if increased to 95 °C?

7. Oxygen (O_2) gas occupies 2.3 liters at a temperature of 40 °C. To what temperature should the gas sample be raised in order to occupy a volume of 6.5 liters?

8. Hydrogen gas (H_2) was cooled from 150°C to 50°C. Its new volume is 75 mL. What was its original volume?

9. Chlorine gas (Cl_2) occupies a volume of 25.0 mL at 310K. What volume will it occupy at 590 K?

10. A sample of neon gas at 52 °C and a volume of 2.5 liters is cooled to 25°C. What is the new volume?

11. A sample of fluorine gas at 330 K occupies a volume of 510 mL. To what new temperature should it be lowered to bring the volume to 290 mL?

12. Helium occupies a volume of 3.8 liters at -45°C. What volume will it occupy at 45°C?

13. A sample of argon gas was cooled and its volume went from 380 mL to 250 mL. If its final temperature was -55°C, what was its original temperature?

14. The temperature inside my refrigerator is about 4°C. If I place a balloon in my fridge that initially has a temperature of 26°C and a volume of 0.50 liters, what will be the volume of the balloon when it is fully cooled by my refrigerator?

15. How hot (in Celsius) will a 2.3 L balloon have to get to expand to a volume of 400 L? Assume that the initial temperature of the balloon is 25°C. (Hint: Convert to K to calculate and back to Celsius for your answer.)