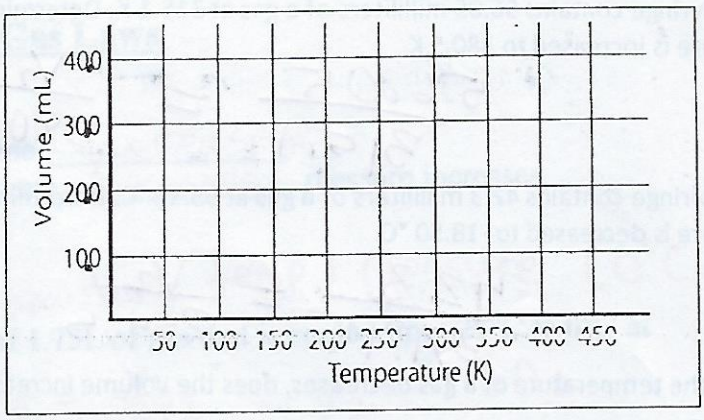
Charles Law

1. Using the online animation collect data on how the volume changes as the temperature changes. Graph the data when you are finished

Temp(K)	Volume(cm^3)



a) How would you describe the relationship between temperature and volume?

b) Based on the graph, estimate the volume at 400 K.

c) Based on the graph, estimate the temperature when the volume is 50 cm^3?

Given 300.0 mL of a gas at 17.0 °C. What is its volume at 10.0 °C? $\frac{300.0}{290} = \frac{V_2}{283}$ $V_2 = 293 mL$

A gas occupies 1.00 L at standard temperature. What is the volume at 333.0 °C? $\frac{1.00}{273} = \frac{V_2}{606}$ $V_2 = 2.22 L$

At 27.00 °C a gas has a volume of 6.00 L. What will the volume be at 150.0 °C? $\frac{6.00}{300} = \frac{V_2}{423}$ $V_2 = 8.46 L$

At 225.0 °C a gas has a volume of 400.0 mL. What is the volume of this gas at 127.0 °C? $\frac{400.0}{498} = \frac{V_2}{400}$ $V_2 = 321 mL$

At 210.0 °C a gas has a volume of 8.00 L. What is the volume of this gas at -23.0 °C? $\frac{8.00}{483} = \frac{V_2}{250}$ $V_2 = 4.14 L$

The temperature of a 4.00 L sample of gas is changed from 10.0 °C to 20.0 °C. What will the volume of this gas be at the new temperature if the pressure is held constant? $\frac{4.00}{283} = \frac{V_2}{293}$ $V_2 = 4.14 L$

Carbon dioxide is usually formed when gasoline is burned. If 30.0 L of CO_2 is produced at a temperature of 1.00×10^3 °C and allowed to reach room temperature (25.0 °C) without any pressure changes, what is the new volume of the carbon dioxide? $\frac{30.0}{1273} = \frac{V_2}{298}$ $V_2 = 7.02 L$

A 600.0 mL sample of nitrogen is warmed from 77.0 °C to 86.0 °C. Find its new volume if the pressure remains constant. $\frac{600}{350} = \frac{V_2}{359}$ $V_2 = 615 mL$

10. What volume change occurs to a 400.0 mL gas sample as the temperature increases from 22.0 °C to 30.0 °C?

11 mL change

$\frac{400.0}{295} = \frac{V_2}{303}$ $V_2 = 411\ mL$

11. A gas syringe contains 56.05 milliliters of a gas at 315.1 K. Determine the volume that the gas will occupy if the temperature is increased to 380.5 K

$\frac{56.05}{315.1} = \frac{V_2}{380.5}$ $V_2 = 67.7\ mL$

12. A gas syringe contains 42.3 milliliters of a gas at 98.15 °C. Determine the volume that the gas will occupy if the temperature is decreased to -18.50 °C.

$\frac{42.3}{371.15} = \frac{V_2}{254.5}$ $V_2 = 29.0\ mL$

13. When the temperature of a gas decreases, does the volume increase or decrease?

14. If the Kelvin temperature of a gas is doubled, the volume of the gas will increase by 2.

15. Solve the Charles' Law equation for V_2.

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

16. Solve the Charles' Law equation for T_2.

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

17. If 540.0 mL of nitrogen at 0.00 °C is heated to a temperature of 100.0 °C what will be the new volume of the gas?

$\frac{540.0}{273} = \frac{V_2}{373}$ $V_2 = 738\ mL$

18. A balloon has a volume of 2500.0 mL on a day when the temperature is 30.0 °C. If the temperature at night falls to 10.0 °C, what will be the volume of the balloon if the pressure remains constant?

$\frac{2500.0}{303} = \frac{V_2}{283}$ $V_2 = 2335\ mL$

19. When 50.0 liters of oxygen at 20.0 °C is compressed to 5.00 liters, what must the new temperature be to maintain constant pressure?

$\frac{50.0}{293} = \frac{5.00}{T_2}$ $T_2 = 29.3\ K$

20. If 15.0 liters of neon at 25.0 °C is allowed to expand to 45.0 liters, what must the new temperature be to maintain constant pressure?

$\frac{15.0\ L}{298} = \frac{45.0}{T_2}$ $T_2 = 894\ K$