

Chem11 Charles' Law : W.S. - 20

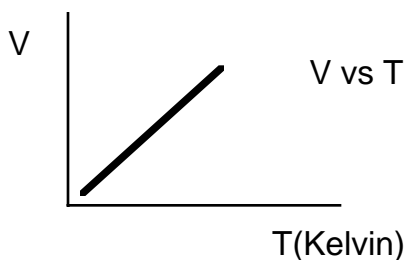
Jacques Charles noticed that at a constant pressure there is a linear relationship between the volume of a gas and its Celsius temperature. Later, scientists found that the relationship is true at very low temperatures. If the volume is decreased to near zero, then the Celsius temperature is -273°C . Lord Kelvin proposed the Kelvin scale. The zero for this scale is -273°C . So, $0^{\circ}\text{C} = +273\text{ K}$. The relationship between the Kelvin and Celsius scales is :

$$\mathbf{K = C + 273.}$$

Charles' Law became : $V/T = \text{a constant}$ or : $V_1/T_1 = V_2/T_2$

The volume is usually measured in **liters**. (One liter = $1000\text{ cm}^3 = 1000\text{ ml}$) The temperature is in degrees Kelvin. (note : The lowest possible temperature is 0 K , which is called **Absolute Zero**)

Scientists often speak of **S.T.P.** This means; standard temperature and pressure. That is : 0°C and 1.0 atmosphere of pressure.



Problems : **Assume constant pressure.**

1) Convert the following temperatures.

a) $37^{\circ}\text{C} = \underline{\hspace{2cm}}\text{ K}$ b) $150.^{\circ}\text{C} = \underline{\hspace{2cm}}\text{ K}$ c) $-70.^{\circ}\text{C} = \underline{\hspace{2cm}}\text{ K}$

d) $-300.^{\circ}\text{C} = \underline{\hspace{2cm}}\text{ K}$ e) $293\text{ K} = \underline{\hspace{2cm}}^{\circ}\text{C}$ f) $100.\text{ K} = \underline{\hspace{2cm}}^{\circ}\text{C}$

2) If the volume of a gas is $650.\text{ mL}$ at a temperature of $300.\text{ K}$, find the new volume if the temperature is decreased to 175 K .

3) The volume of a gas at S.T.P. is 2.00 L . Find the volume at 85.0°C .

4) If the Kelvin temperature of a gas is tripled, what happens to the volume ?

5) Find the final Celsius temperature of a gas, if the initial temperature is 15°C and the volume expands from 1.80 L to 2.70 L.

Answers : 1)a) 310., b) 423, c) 203, d) not possible, e) 20., f) -173.,
2) 379 mL, 3) 2.62 L, 4) It is tripled., 5) 159°C .