

### Charles' Law

It states that *the volume of a given mass of a gas increases or decreases by  $1/273.15$  of its volume at  $0^\circ\text{C}$  for each  $1^\circ\text{C}$  increase or decrease in temperature when the pressure of the gas remains constant.*

$$V_t = V_0 \left( 1 + \frac{t}{273.15} \right) = V_0 \left( \frac{273.15 + t}{273.15} \right)$$

$$273.15 + t = T_K = \text{Temperature in Kelvin scale} \therefore V_t = \left( \frac{V_0}{273.15} \right) T_K$$

**Charles' law** can also be stated as, volume of a given mass of a gas is directly proportional to its absolute temperature when pressure is constant

i.e.,  $V \propto T$

$$\text{or } \frac{V}{T} = K = \text{constant} \quad \text{or} \quad \frac{V_1}{T_1} = \frac{V_2}{T_2}$$

Thus, V-T graph in an isobaric process is a straight line passing through origin, or  $\frac{V}{T}$  versus V or T graph is a straight line parallel to V or T axis.

