

Gay Lussacs' Law

It states that, *the pressure of a given mass of a gas increases or decreases by $1/273.15$ of its pressure at 0°C , for 1°C increase or decrease in temperature when the volume of the gas is constant.*

$$\text{Pressure at } t^\circ\text{C} = P_t = P_0 \left(1 + \frac{t}{273.15} \right) = P_0 \left(\frac{273.15 + t}{273.15} \right)$$

$$P_t = P_0 \times \frac{T}{T_0}; \quad \therefore \frac{P_t}{T} = \frac{P_0}{T_0} \quad \therefore \frac{P}{T} = \text{constant}$$

$\therefore P \propto T$ when volume of the gas is constant; \therefore Gay Lussac's law can also be stated as that the pressure of a given mass of a gas is directly proportional to its absolute temperature when volume of the gas is constant.

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

