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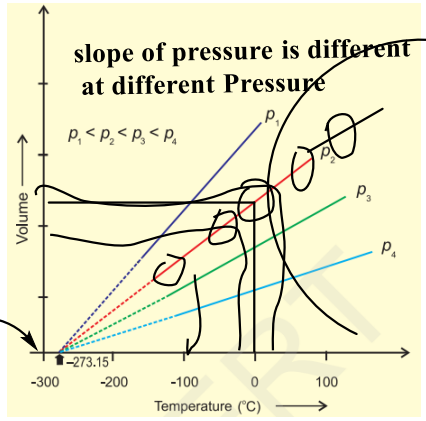
Volume vs Temperature (°C) graph from Charls Law

Mathematical expression for Charles' law, which states that pressure remaining constant, the volume of a fixed mass of a gas is directly proportional to its absolute temperature (273.15K)



0 volume

For a fixed mass of gass
when p is const

$V \alpha T$

$V = k_2 T$ ... (5.10)

$V \alpha$ 0°C

V α Absolute Temp.[273 K]

each line is called isobar

0°C + 273.15 = 273.15K

Isobars are straight line that represent constant pressure as a slope on plotting a graph [V vs T]

Charles found that for all gases, at any given pressure, graph of volume *vs* temperature (in celsius) is a straight line and on extending to zero volume, each line intercepts the temperature axis at – 273.15 °C. Slopes of lines obtained at different pressure are different but at zero volume all the lines meet the temperature axis at – 273.15 °C (Fig. 5.6).

All gases obey Charles' law at very low pressures and high temperatures

Observations of Charles can be interpreted if we put the value of t in equation (5.6) as – 273.15 °C. We can see that the volume of the gas at – 273.15 °C will be zero. This means that gas will not exist. In fact all the gases get liquified before this temperature is reached. The lowest hypothetical or imaginary temperature at which gases are supposed to occupy zero volume is called **Absolute zero**.

$$\Rightarrow V_t = V_0\left(\frac{273.15+t}{273.15}\right) \qquad (5.6)$$

$= 0$

= Absolute zero

at AZ gas will not exist