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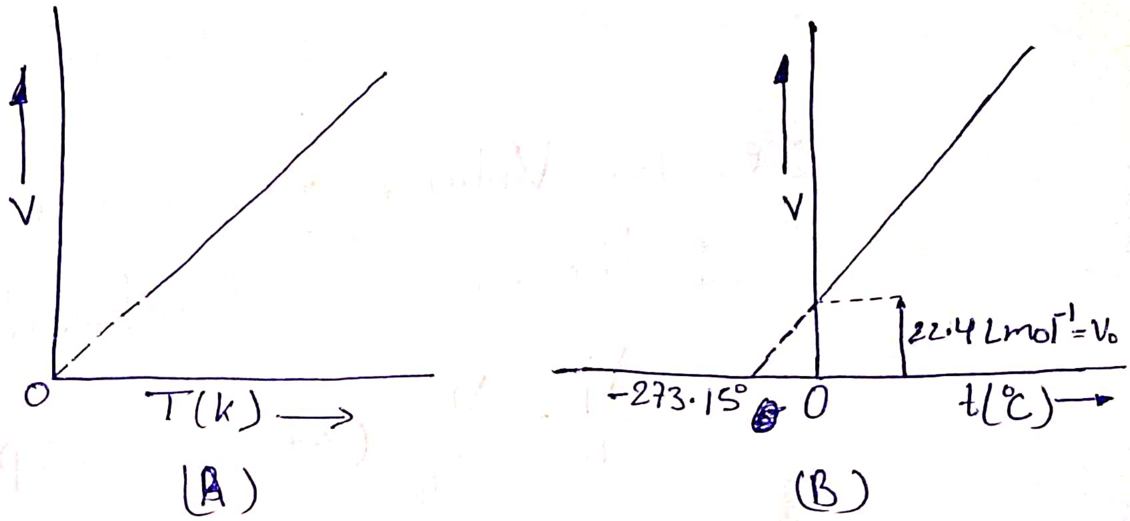
Part:- I

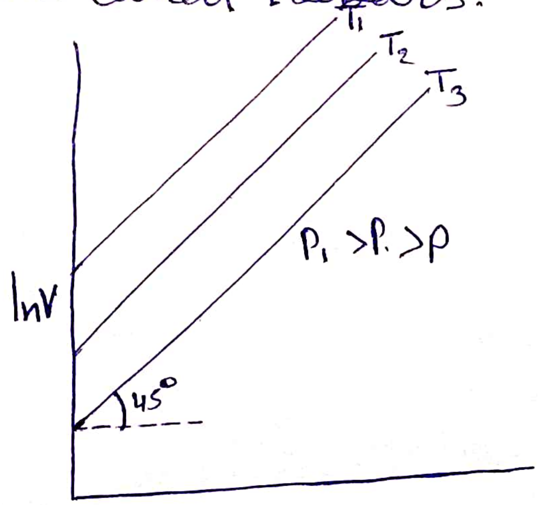
GASEOUS STATE (Sub)

- Graphical representation:



Graphs between V and T at Constant pressure are Called Isobars.

lnV vs lnT



$\frac{V}{T}$ = Constant(K)

$V = KT$

$\ln V = \ln K + \ln T$

$y = C + mx$

$m = 1$

(1) A gas occupies a volume of 580 ml at 17°C. It is heated to 100°C at constant pressure. Calculate the volume of the gas –

(A) 746 ml. (B) 760 ml. (C) 773 ml. (D) 780 ml.

Ans: A

Solⁿ: Initial Volume (V_1) = 580 ml,

$T_1 = 17 + 273 = 290K$

Final Volume (V_2) = ?

$T_2 = 100 + 273 = 373K$

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

$$\therefore V_2 = T_2 \times \frac{V_1}{T_1} = 373 \times \frac{580}{290} = 746 \text{ ml.}$$

(2.) A gas occupies 3 litres at 32°C and one atmospheric pressure. What volume will it occupy if the temperature is changed to 18°C, the pressure remaining constant –

(A) 2.91 litres (B) 2.86 litres (C) 2.30 litres (D) None of these

Ans. B

5.3 Gay-Lussac's Law

(a) It states that at constant volume, the pressure of a given mass of a gas is directly proportional to its absolute temperature.

(b) Mathematically $P \propto T$ (at constant volume)

where P = Pressure of gas

T = Absolute temperature

$$P = KT$$

or $$\frac{P}{T} = K$$

Hence, if the pressure of a gas is P_1 at temperature T_1 changes to P_2 at T_2, volume remaining constant.

then $$\frac{P_1}{T_1} = \frac{P_2}{T_2} = \text{Constant}$$

$$\log P - \log T = \text{Constant}$$

(c) $$P_t = P_0\left(1 + \frac{1}{273.15}\right)$$

where P_t = Pressure of gas at $t°C$

P_0 = Pressure of gas at $0°C$