

Initially a gas of diatomic molecules is contained in a cylinder of volume V_1 at a pressure P_1 and temperature 250 K. Assuming that 25% of the molecules get dissociated causing a change in number of moles. The pressure of the resulting gas at temperature 2000 K, when contained in a volume $2V_1$ is given by P_2 . The ratio $\frac{P_2}{P_1}$ is _____ (JEE MAIN 2020)

Given, $k_B = 1.38 \times 10^{-23} \text{ J/K}$; $V = 0.1 \text{ volt}$;
average translational K.E of N_2 molecules = K.E of electron

$$\Rightarrow \frac{3}{2} k_B T = eV$$

$$\Rightarrow \frac{3}{2} \times 1.38 \times 10^{-23} \times T = 1.6 \times 10^{-19} \times 0.1$$

$$\Rightarrow T = 773 \text{ K}$$
$$= (773 - 273)^\circ \text{C}$$

$$\Rightarrow \boxed{T = 500^\circ \text{C}}$$