

## Previous year JEE question 10

Calculate the average of kinetic energy, in Joules of the molecules in 8.0 g of methane at 27°C. (1982 - 2 Marks)

**TIPS/Formulae :**

$$\text{Total kinetic energy} = n(3/2 RT)$$

where  $n$  = Number of moles of the gas

$R$  = Gas constant

$T$  = Absolute temperature

Molecular weight of methane,

$$\text{CH}_4 = 12 + 4 \times 1 = 16$$

∴ Number of moles of methane in 8.0 gm of methane

$$= \frac{8.0}{16.0} = 0.5$$

$$R = 8.314 \text{ joules/K/mole, } T = 27 + 273 = 300 \text{ K}$$

∴ Total kinetic energy of the molecules in 8.0 gm of methane at 27°C =  $n \times 3/2 RT = 0.5 \times 3/2 \times 8.314 \times 300 = 1870.65$  joules

$$\begin{aligned} \therefore \text{Average kinetic energy} &= \frac{1870.65}{6.023 \times 10^{23} \times 0.5} \\ &= \mathbf{6.21 \times 10^{-21} \text{ joules/molecule}} \end{aligned}$$