Assignment

Q) A flask contains argon and chlorine in the ratio of 2:1 by mass. The temperature of the mixture is 27°C. Obtain the ratio of

(i) average kinetic energy permolecule, and

(ii) root mean square speed v_{rms} of the molecules of the two gases. Atomic mass of argon = 39.9 u

Molecular mass of chlorine = 70.9 u.

Ans) (i) In the mixture, temperature of both the gases is same and the velocity of gas molecules is same

as $E_K = \frac{3}{2} k_B T$

$\therefore E_1 = E_2$ or $E_1 : E_2 = 1 : 1$

(ii) $\because v_{rms} = \sqrt{\frac{3RT}{M}}$

$\because$ Temperature of both gases is same.

$$v_{rms} \propto \frac{1}{\sqrt{M}}$$

$$\therefore \frac{v_{Ar}}{v_{Cl}} = \sqrt{\frac{M_{Cl}}{M_{Ar}}} = \sqrt{\frac{70.94}{39.94}} = \sqrt{1.776164} = 1.33$$

$$\therefore v_{Ar} : v_{Cl} = 133 : 1$$