Previous year JEE question 9

The average velocity at $T_1 K$, and the most probable velocity at $T_2 K$ of CO_2 gas is 9.0×10^4 cm sec^{-1}. Calculate the value of T_1 and T_2. *(1990 - 4 Marks)*

Average velocity $= \sqrt{\dfrac{8\,RT}{\pi M}}$

and Most probable velocity $= \sqrt{\dfrac{2\,RT}{M}}$

Given -For CO_2

Average velocity at T_1 = Most probable velocity at T_2

$$= 9 \times 10^4 \text{ cm/sec} = \dfrac{9 \times 10^4}{100} \text{ m/sec.}$$

$$= 9 \times 10^2 \text{ m/sec.}$$

$$\therefore\ 9 \times 10^2 = \sqrt{\dfrac{8 \times 8.314 \times T_1}{3.14 \times 44 \times 10^{-3}}} \quad ...(A)$$

[Average velocity at T_1K]

and $9 \times 10^2 = \sqrt{\dfrac{2 \times 8.314 \times T_2}{44 \times 10^{-3}}} \quad ...(B)$

[Most probable velocity at T_2K]

On solving, $T_1 = $ **1682.5 K,** $T_2 = $ **2143.4 K**