Answer on Question #53783, Physics Quantum Mechanics

what is the velocity of a carbon dioxide molecule at 25 degrees centigrade in a one cubic foot box

Solution

The RMS velocity of a carbon dioxide molecule is given by Eq.(1)

$$\sqrt{\langle v^2 \rangle} = \sqrt{\frac{3RT}{\mu}} = \sqrt{\frac{3 \cdot 8.31 J / K \cdot mol \cdot 298K}{44 \cdot 10^{-3} kg / mol}} = 411 \ m/s$$

where $M = 44 \cdot 10^{-3} kg / mol$ is the molar mass; $R = 8.31 J / K \cdot mol$ is the gas constant; $T = 273 + 25 = 298K$ is the absolute temperature.