Consider a sample of oxygen behaving like an ideal gas. At 300 K, the ratio of root mean square (rms) velocity to the average velocity of gas molecule would be :

(Molecular weight of oxygen is 32g/mol; R = 8.3 J K^{-1} mol^{-1})

A $\sqrt{\frac{3\pi}{8}}$

B $\sqrt{\frac{3}{3}}$

C $\sqrt{\frac{8}{3}}$

D $\sqrt{\frac{8\pi}{3}}$

By Maxwell's velocity distribution of ideal gases,

$$V_{rms} = \sqrt{\frac{3RT}{M}} \quad ; \quad V_{average} = \sqrt{\frac{8RT}{\pi M}}$$

$\therefore$ For oxygen's given sample;

$T = 300K$, $R = 8.3\,J\,K^{-1}\,mol^{-1}$, $M = 32 \times 10^{-3}\,kg/mol$

$$\therefore \frac{V_{rms}}{V_{average}} = \frac{\sqrt{\frac{3RT}{M}}}{\sqrt{\frac{8RT}{\pi M}}} \Rightarrow \boxed{\sqrt{\frac{3\pi}{8}}}$$