

Persamaan gas ideal

$$PV = nRT \text{ dengan } k = \frac{R}{N_0} = 1,38 \cdot 10^{-23} \text{ Joule/mol K}$$

dimana $PV = \frac{1}{3} Nm \bar{v}^2$

Energi dalam gas ideal $E = \frac{3}{2} kT$

Jika molekul tadi bergerak dengan kecepatan rata-rata ($\bar{v}$)
Maka $E = \frac{1}{2} m \bar{v}^2$

Contoh Soal :

Jika ada sebuah molekul O_2 dengan masa $5,31 \times 10^{-25} \text{ kg}$.
Hitung kecepatan rata-rata kuadrat molekul tersebut,
jika molekul O_2 berada pada suhu 300 K !

Jawab :

diketahui $m = 5,31 \times 10^{-25} \text{ kg}$

$T = 300 \text{ K}$

$k = 1,38 \times 10^{-23} \text{ mol/K}$

ditanya E ?

Jawab :

$$E = \frac{3}{2} k \cdot T$$

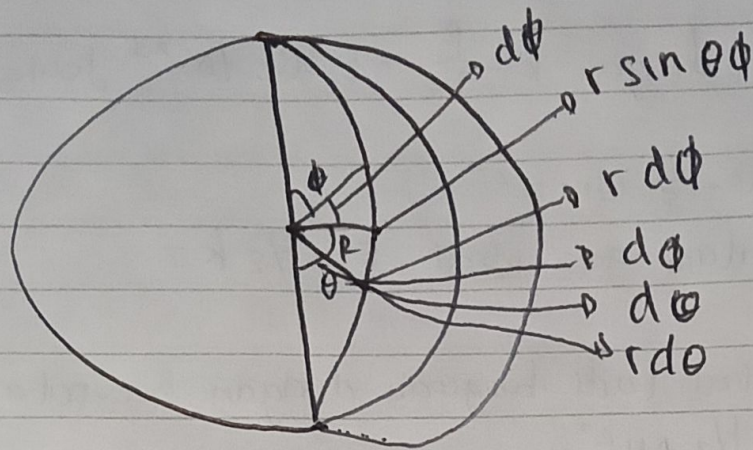
$$= \frac{3}{2} \cdot 1,38 \times 10^{-23} \text{ J/mol} \cdot 300 \text{ K}$$

$$= 6,21 \times 10^{-31} \text{ J/mol}$$

$$E = \frac{1}{2} m \bar{v}^2$$

$$6,21 \times 10^{-31} = \frac{1}{2} \cdot 5,31 \times 10^{-25} \text{ J} \cdot \bar{v}^2$$

$$\bar{v}^2 = \frac{6,21 \times 10^{-31}}{5,31 \times 10^{-25}} \times 2$$



$$\begin{aligned}
 dA &= r^2 \sin \theta \, d\theta \, d\phi \\
 &= R^2 \sin \theta \, d\theta \, d\phi \\
 &= R^2 \sin \theta \, d\theta \, d\phi
 \end{aligned}$$

$$\begin{aligned}
 dV &= r^2 \sin \theta \, dr \, d\theta \, d\phi \\
 &= R^2 \sin \theta \, dr \, d\theta \, d\phi
 \end{aligned}$$

$$V = \int_0^R \int_0^{2\pi} \int_0^\pi R^2 \sin \theta \, d\theta \, d\phi \, dr = \frac{4}{3} \pi R^3$$

$$\begin{aligned}
 &= 2\pi \int_0^R \int_0^\pi R^2 \sin \theta \, d\theta \, dr = 2\pi \frac{1}{3} R^3 \int_0^\pi \sin \theta \, d\theta \\
 &= \frac{2\pi}{3} R^3 \left[-\cos \theta \right]_0^\pi
 \end{aligned}$$