Pertemuan 5

fraksi : kerapatan suatu partikel yang bergerak

$$dN_{\theta\phi} = dN_{\theta\phi} = \frac{N}{V} \cdot \frac{r^2 \sin\theta \, d\theta \, d\phi}{4\pi r^2}$$

ket: $\frac{dN}{V}$: Elemen jumlah partikel dalam volume
N = Jumlah partikel
V = Volume (wadah)

$r^2 \sin\theta \, d\theta \, d\phi$ = Jarak titik lingkaran tengah bola ke pusat molekul tersebut.
$4\pi r^2$: luasan molekul yang menumbuk dinding

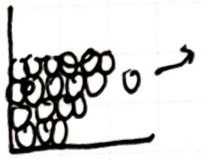
1. diket: $k = 1{,}38 \times 10^{-23}$ J/mol.k
$T = 300$ k
$m_{O_2} = 5{,}31 \times 10^{-26}$ kg

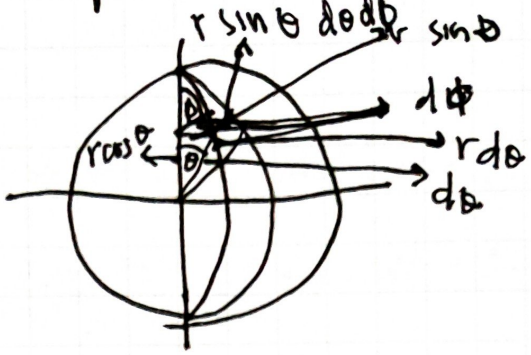
ditanya : $\bar{v}^2$ ...?
dijawab : $E = \frac{3}{2} \cdot k \cdot T$

$$E = \frac{3}{2} \cdot k \cdot T$$
$$= \frac{3}{2} \cdot (1{,}38 \times 10^{-23}) \cdot (300)$$
$$= \frac{3}{2} \cdot 1{,}58 \times 10^{-23} \text{ J/mol.k} \cdot 200 \text{ k}$$
$$= 6{,}21 \times 10^{-21} \text{ J/mol}$$

$$E = \frac{1}{2} m \bar{v}^2$$
$$\bar{v}^2 = \frac{E \times 2}{m}$$
$$= \frac{6{,}21 \times 10^{-21} \text{ J/mol} \times 2}{5{,}31 \times 10^{-26} \text{ kg}} = 2{,}33 \times 10^5$$

2. Sebuah molekul digambarkan seperti bola berikut!





Tentukanlah:
a). cari dA
b). cari dv
c). buktikan bahwa volume bola $\frac{4}{3}\pi r^3$

Jawaban:

a). $dA = p \times l$
$= r\,d\theta \times r \sin\theta\, d\phi$
$= r^2 \sin\theta\, d\theta d\phi$

b). $dv = p \times l \times tebal$
$= r\,d\theta \times r \sin\theta\, d\phi \times dr$
$= r^2 \sin\theta\, d\theta\, d\phi dr$

c). Bukti volume bola $= \frac{4}{3}\pi r^3$

$V = \iiint r^2 \sin\theta\, d\theta\, d\phi\, dr$

$V = \int_0^r \int_0^{2\pi} \int_0^{\pi} r^2 \sin\theta\, d\theta\, d\phi\, dr$

$= 2\pi \int_0^r \int_0^{\pi} r^2 \sin\theta\, d\theta\, dr$

$= 2\pi \frac{1}{3} r^2 \int_0^{\pi} \sin\theta\, d\theta$

$= \frac{2\pi}{3} r^3 \left[-\cos\theta\,|_0^{\pi}\right]$

$= \frac{2\pi}{3} r^3 [1+1]$

$= \frac{2}{3} \cdot 2\pi r^3$

$= \frac{4\pi r^3}{3}$ terbukti

$\theta = 2$
$\phi = 2\pi$
uk. molekul $= 10^{-10}$
$dr = 0 - r$
$d\phi = 0 - 2\pi$
$d\theta = 0 - \pi$