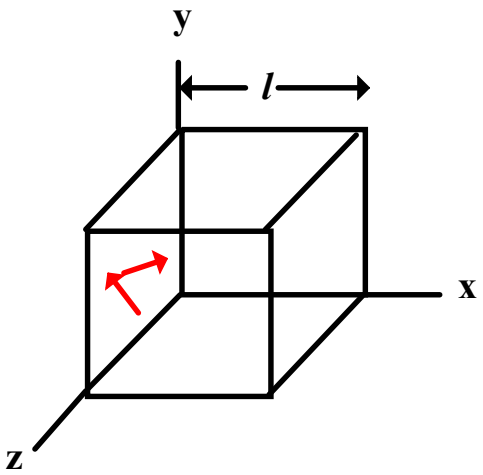

force

$$\Delta p = \Delta m v = m v - (-mv) = 2mv$$

$$v = d/t$$

$$t = \frac{d}{v} = \frac{2\ell}{v}$$

$$F t = \Delta m v$$

$$F = \frac{\Delta m v}{t}$$

$$F = \frac{2mv}{2\ell/v} = \frac{mv_x^2}{\ell}$$

one molecule

all molec. $F = \frac{m v_x^2}{\ell}$

$F = \frac{m}{\ell}\left(v_{x1}^2 + v_{x2}^2 \cdots v_{xN}^2\right)$

$\bar{v}_x^2 = \frac{v_{x1}^2 + v_{x2}^2 \cdots v_{xN}^2}{N}$

$\bar{v}_x^2 N = v_{x1}^2 + v_{x2}^2 \cdots v_{xN}^2$

$F = \frac{m}{\ell}\left(\bar{v}_x^2 N\right)$

$\bar{v}^2 = \bar{v}_x^2 + \bar{v}_y^2 + \bar{v}_z^2$

$\bar{v}^2 = 3\bar{v}_x^2$

$\bar{v}_x^2 = \frac{\bar{v}^2}{3}$

$$F = \frac{m}{\ell}\left(N\bar{v}_x^2\right)$$

$$\bar{v}_x^2 = \frac{\bar{v}^2}{3}$$

$$f = \frac{m}{\ell} N\left(\frac{\bar{v}^2}{3}\right) = \frac{N m \bar{v}^2}{3\ell}$$

$$P = \frac{F}{A} = \frac{N m \bar{v}^2}{3\ell} \Big/ A = \frac{N m \bar{v}^2}{3A\ell}$$

$$P = \frac{N m \bar{v}^2}{3V} = \frac{1}{3} N m v^2 / V$$

$$PV = \frac{1}{3} N m \bar{v}^2$$

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$$PV = \frac{1}{3} N m \bar{v}^2$$

express as $\bar{KE}$

$$PV = \frac{2}{3} N \left(\frac{1}{2} m \bar{v}^2\right)$$

$PV = NKT$

$$NKT = \frac{2}{3} N \left(\frac{1}{2} m \bar{v}^2\right)$$

$$KT = \frac{2}{3} \left(\frac{1}{2} m \bar{v}^2\right)$$

$KE = \frac{1}{2} m v^2$

$$\bar{KE} = \frac{3}{2} KT$$

$$PV = \frac{1}{3} N m \bar{v}^2$$

$$NkT = \frac{1}{3} N m \bar{v}^2$$

$$kT = \frac{1}{3} m \bar{v}^2$$

$$\bar{v}^2 = \frac{3kT}{m}$$

$$\bar{v} = \sqrt{\frac{3kT}{m}}$$

$$\bar{v} = \sqrt{\frac{3kT}{m}}$$

air $M = @ 29$

$t = 20^{\circ}C$

$\bar{v} = ?$

$29 \text{ part } (1.67 \times 10^{-27} kg) = 4.8 \times 10^{-26} kg$

$$\bar{v} = \sqrt{\frac{3(1.38 \times 10^{-23} J/k\,(293K)}{4.8 \times 10^{-26} kg}}$$

$$\bar{v} = 503 \text{ m/s}$$

$$\overline{KE} = 3/2\, kT$$

$t = 20^\circ$

$$\overline{KE} = 3/2\,(1.38 \times 10^{-23}\ J/K)\ 293\ K$$

$$\overline{KE}\quad 6.07 \times 10^{-21}\ J$$

$$KE = \frac{1}{2} m v^2$$

$$KE = 1/2\,(1.84 \times 10^{-26}\ kg)(5034\ m/s)^2$$

$$KE = 6.07 \times 10^{-21}\ J$$