JGRIFFIN
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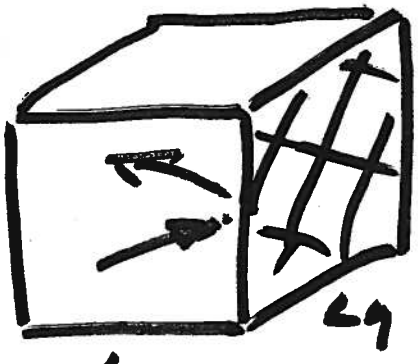
IDEAL GAS LAW: $\boxed{PV = N k_B T_A}$



COMPUTE P of IDEAL GAS from F_x/L_yL_z on Right Face of CUBE:

$$F_x = \sum_{i=1}^{N} F_{xi} = \sum \frac{\Delta p_{xi}}{\Delta t_i} = \sum \frac{2mv_{xi}}{2L_x/v_{xi}}$$

$$P = \frac{F_x}{A} = \frac{F_x}{L_yL_z} = \frac{1}{(L_xL_yL_z)} \sum m v_{xi}^2$$

i.e. $PV = P(L_xL_yL_z) = N \langle m v_{xi}^2 \rangle_{AVG.}$

& This MUST be $= N k_B T_A.$

CONCLUDE: $k_B T_A \equiv \langle m v_{xi}^2 \rangle_{AVG}$

OR $\frac{3}{2} k_B T_A \equiv \langle \frac{3}{2} m v_{ix}^2 \rangle_{AVG}$

$\equiv \langle KE \rangle_{AVG}$

(Since $\langle 3 \cdot \frac{m}{2} v_{xi}^2 \rangle = \langle KE \rangle_{AVG.}$)

Note: EQUI-PARTITION THEOREM says:
EACH Degree of Freedom gets $\frac{1}{2} k_B T_A$
of energy in Thermal EQUILIBRIUM