Wed, Aug 22, 2018 ~~2017~~

- bring die
- HW#1 sol. ⇒

Read §1.4 & 1.5

HW#2 1.21, 1.23, 1.25 ← list all degrees of freedom (assume very low T-P) ← at room T-P, no vibr.

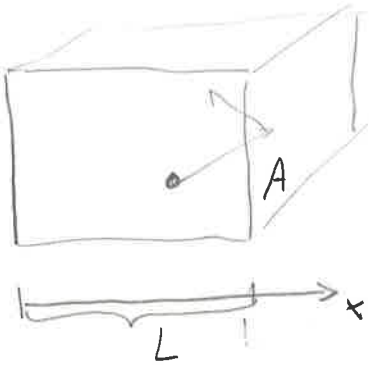
last class: $pV = iNkT$

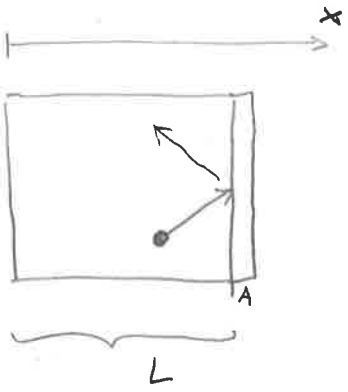
Outline for today: $T \overset{②}{\longleftrightarrow}$ macroscop. $p \overset{①}{\longleftrightarrow}$ microscopic $\bar{v}$

generalize: equipartition theorem

2017: {Eric: yes macroscopic T, pV is coll that is captures major info}

Ideal Gas: $p \overset{①}{\longleftrightarrow} \bar{v}$





Jeanine; yes similar for other walls (we assume symmetry)

for each collision:

$$p^{mol} = \frac{F_x^{mol}}{A} \underset{\text{Newton's 3rd law}}{=} -\frac{F_x^{wall\ on\ mol}}{A} = -\frac{m a_x}{A} = -m\frac{\frac{\Delta V_x}{\Delta t}}{A}$$

$$\underset{\text{elastic}}{=} -m\frac{(-|V_x| - |V_x|)/\Delta t}{A} = m\frac{2|V_x|/\Delta t}{A}$$

pick Δt, such that particle hits once (on average)

$$|V_x| = \frac{2L}{\Delta t}$$

$$p^{mol} = m\frac{2|V_x|/(2L/|V_x|)}{A}$$

$$= m\frac{V_x^2}{LA} = m\frac{V_x^2}{V}$$

average over time:

$$\bar{p}^{mol} = m\frac{\overline{V_x^2}}{V}$$

average all particles: $p = N\bar{p}^{mol} = Nm\frac{\overline{V_x^2}}{V}$

Jeanine: notice $\overline{V_x^2}$ and $\overline{V_x}^2$ not same yes.

$$m\overline{V_x^2} = \frac{pV}{N} \overset{②}{=}_{\text{ideal gas}} kT$$

$$\boxed{\frac{1}{2}m\overline{V_x^2} = \frac{1}{2}kT} \quad (1.15)$$