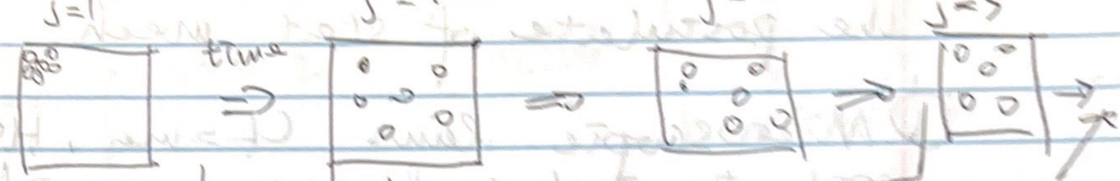
Last Time: Stat Mech - average behaviour of molecules.

States of an isolated system:

ex: $j=1$ time $\Rightarrow$ $j=1$ $\Rightarrow$ $j=2$ $\Rightarrow$ $j=3$



macrostate I
particle occupy small V

macrostate 2
particles occupy larger V

μ-state $j = 1, 2, 3, \ldots$
where you know position and momentum of every particle.

Characterized by "collective" variables called "extensive state function" eg energy = E, volume = V, number of particle N, ...

Number of accessible μ-state in a microstate (size of the ensemble).

Today: The 2 postulates of stat mech

1st. some more definition

Ensemble: Collection of all μ-states consistent with a macrostate.

ex: let's take dots on a rolled die = "energy"
N = 2 die, E = 5

Partition function W:

ensemble of μ-state

ex: W = 4.

easy to explain.

Extensive: Scale linearly with size V

Intensive: Independent with size. P.

The postulate of stat mech.

① Microscopic laws ($F = ma$, $H\psi = E\psi$) apply to isolated system specified by their extensive state variable, E, V, N, ...

ex: if I roll 1 die and it's fair ⇒ rolling a mole of die should also be fair.

Def: 1 mole ≡ $6.02214076 \cdot 10^{23}$ particles

② Principle of equal probability:

Weak form:

(i) All microstates of a system satisfying ① have equal probability (density):

$P_j = \frac{1}{W}$. These microstate are the "microcanonical ensemble"

Strong form "ergodic principle"

(ii) for an esemble that satisfy ②(i).

⇒ $\langle P_j \rangle_{ensemble} = \langle P_j \rangle_{time}$.

Averaging and counting

ex. counting (Hwk §2.2)

|△|○|□|

|△|□|○|

⋮

$6 = 3 \cdot 2$

|○|△|△|

|△|○|△|

⋮

$3 = \frac{3!}{2! \cdot 1!}$

|○|○|○|

$1 = \frac{3!}{3!}$