CH 202

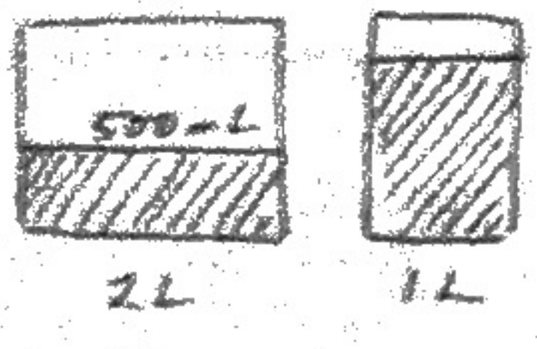
1/16/2014
4/17/20

Physical Equilibrium : Day 2

- w/ phase changes, the ΔH & ΔS always has the same sign, because they counteract each other
  - temperature keeps us in check

- if there were no IMFs, we would just have gases and covalent solids
  - ↳ this is entropy
- there's a distribution of energies (kinetic) at any given temperature
  - for example, Boltzmann distribution shows evaporation
    - small proportion have enough KE to overcome their IMFs
    - > as T ↑, this proportion grows
- there is still evaporation when the lid is on the container
  - but condensation
    - ↳ evaporation ⟷ condensation will equilibriate
  - **EQUILIBRIUM** when existing rate (e.g. evaporation) is equal to entering rate (e.g. condensation)
    - > no net movement

CW –



- Q: which container has the higher pressure?

A: Same

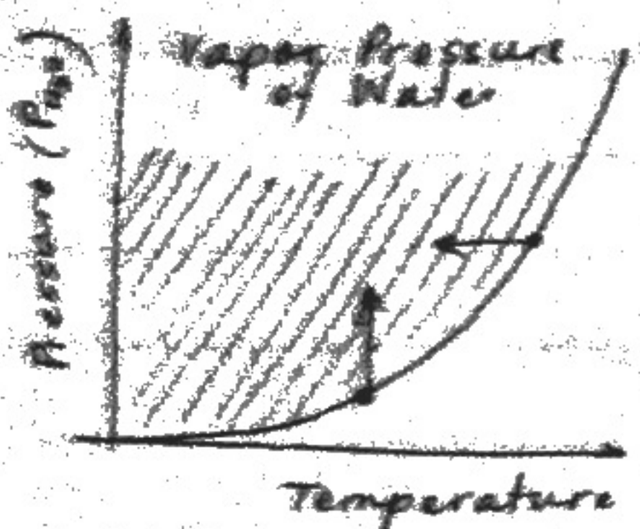
- Q: which container has the higher number of molecules in the gas phase?

A: The 2L container
(because it will requires more molecules to for the greater volume)

- vapor pressure & ΔH_{vap} have an inverse relationship
  - because if a substance requires ~~less vapor press~~ less energy to evaporate, it will ~~need greater pressure~~ have such high vapor pressure

Physical Equilibrium: Day 2 (cont.)

- The stronger the IMFs, the lower the VP



- this is the partial pressure of water
- have the same free energy (both are stable)
- liquid and gas coexist on the line
- shaded region = liquid more stable

- **Normal Boiling Point**: boiling point for a liquid at 1 atm external pressure (or 760 torr)
  - ⚠ Liquid boils when the vapor pressure equals the external pressure

- **Clausius – Clapeyron Equation**

$$\ln\left(\frac{P_2}{P_1}\right) = \frac{\Delta H_{vap}}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

* T in Kelvin
$R = 8.314 \frac{J}{K\,mol}$
$\Delta H = J/K$

- Phase diagram