Today: Sections 11.1-11.3
Tuesday: problem club with Ali
Wednesday: ch 11
Friday: finish ch 11

Review:

$Cr_2O_4^{2-} + 12e^- \rightarrow 2Cr$ $E^\circ_{red} = -1.00V$ $\Delta G^\circ = -1158\ kJ$

$\frac{1}{2}Cr_2O_4^{2-} + 6e^- \rightarrow Cr$ $E^\circ_{red} = -1.00V$ $\Delta G^\circ = -579\ kJ$

$\Delta G^\circ = -nFE^\circ$ (does not vary) (varies based on n)

chapter 11:

gases, liquids and solids

· Intermolecular forces

· london dispersion forces $\propto$ MM

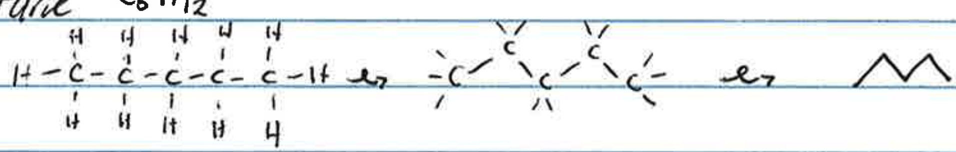
↳ all covalent-molecular molecules with MM > 300 are solids at RT

· Dipole-Dipole forces: Lewis dot → ABE formula → if E → polar (has dipole-dipole)

↳ if no E, probably non-polar

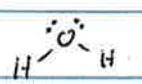
· H-bonding: have OH, N-H, or F-H that interact with another electron pair on O, N, or F

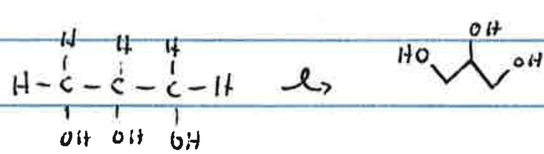
Pentane: C_5H_{12}



(how you will see it if you take orgo)

LDF, MM = 77g/mol

water: H_2O  LDF + H-bonding

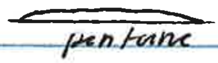
glycerine 

Surface tension

* when there is more intermolecular forces they tend to want to stay together and make droplets

surface tension $\propto$ intermolecular forces

also viscosity $\propto$ intermolecular forces



phase changes

for phase changes the sign will always be the same

$s \rightarrow l$ break intermolecular forces $\Delta H = (+)$, $\Delta S = (+)$

- melting point = fusion = $T_{melting}$ or T_{fusion}

$l \rightarrow g$ break all intermolecular forces $\Delta H = (+)$ $\Delta S = (+)$

- $T_{vaporization}$

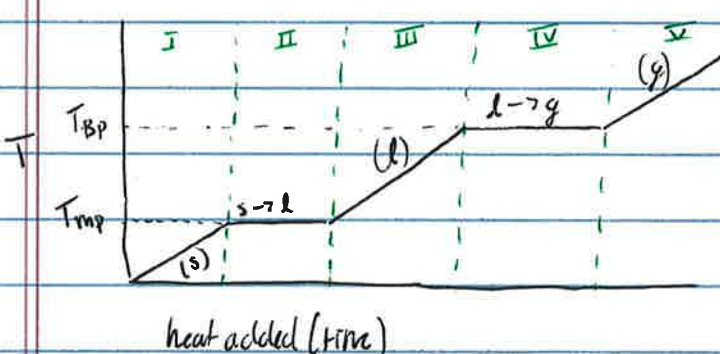
* when at equilibrium the rate of $l \rightarrow g$ is equal to rate of $g \rightarrow l$

* $\Delta G = 0$ at all phase changes

$H_2O(l) \rightleftarrows H_2O(g)$ $K_p = P_{H_2O(g)}$

at mp (fusion), $\Delta G = 0$, $T = \frac{\Delta H}{\Delta S} = \frac{6.0 kJ/mol}{22.0 J/mol\,k} = 273K \approx 0°C$

heating curve



- Taking an ice cube at -2°C and warming it to room temp
  ↳ goes through regions I, II, III

  $q_{total} = q_I + q_{II} + q_{III}$

- Tap water warmed from 20°C to 90°C.

  $q_{total} = q_{III}$

- Boiling water from ~~tub~~ tap to make all steam

  $q_{total} = q_{III} + q_{IV}$

$q_I = SH_{(s)} \times m \times \Delta T =$ J
(J/g·deg) (g) (deg)

$q_{III} = SH_{(l)} \times m \times \Delta T =$ J
(J/g·deg) (g) (deg)

$q_V = SH_{(g)} \times m \times \Delta T =$ J
(J/g·deg) (g) (deg)

$q_{II} = \Delta H_{fusion} \times n =$ kJ
(kJ/mol) (mol)

$q_{IV} = \Delta H_{vap} \times n =$ kJ
(kJ/mol) (mol)

all different

$SH_{H_2O(s)} = 36.7$ J/~~g~~mol K

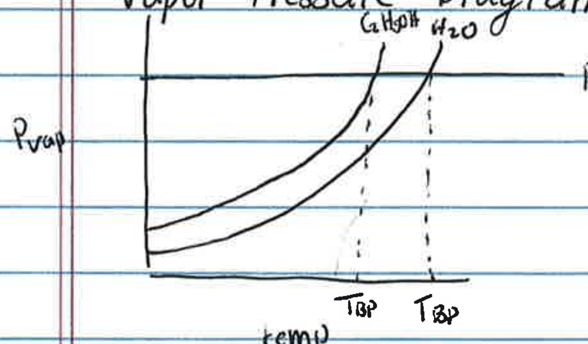
$SH_{H_2O(l)} =$ ~~4.184 J/g·deg~~ 75.4 J/mol K

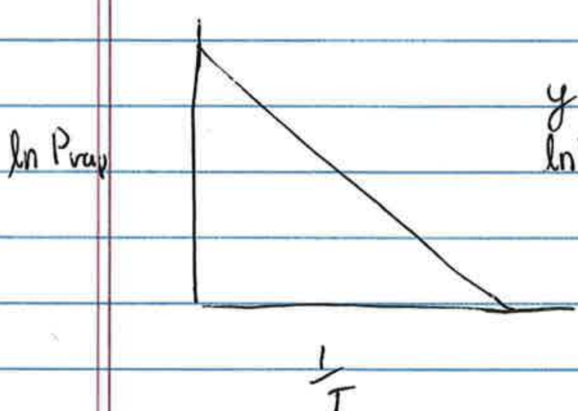
$SH_{H_2O(g)} = 33.6$ J/mol K

$\Delta H_{fusion} =$ ~~[illegible]~~ 6.0 kJ/mol

$\Delta H_{vap} = 40.67$ kJ/mol

Vapor Pressure Diagrams





$y = mx + b$

$\ln P_{vap} = \frac{-\Delta H_{vap}}{R}\left(\frac{1}{T}\right) + b$

at T_1, $\ln P_{vap_1} = \frac{-\Delta H_{vap}}{R}\left(\frac{1}{T_1}\right) + b$

at T_2, $\ln P_{vap_2} = \frac{-\Delta H_{vap}}{R}\left(\frac{1}{T_2}\right) + b$

-solve each for b and set them equal

$\ln P_{vap_1} + \frac{\Delta H_{vap}}{R}\left(\frac{1}{T_1}\right) = \ln P_{vap_2} + \frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2}\right)$

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

would be given on an exam

ΔH_{vap} is positive