Wls Phase Diagrams

1. Dynamic equilibrium is reached when the rate (speed) of the forward process (like vaporization) is exactly equal to the rate of the reverse process (like condensation).

2. Molar Heat of sublimation is the sum of the molar heats of fusion and vaporization.

3. Molar heat of vaporization is the energy required to vaporize (l->g) 1 mol of a substance at its boiling point. If the ΔH_vap is high, then it means the IMF's are strong (a lot of energy is required to overcome the IMF).

   \[ \Delta H_{vap} \uparrow \text{ IMF} \uparrow \text{ direct relationship} \]

   \[ \Delta H_{vap} \uparrow \text{ IMF} \uparrow \text{ Strength} \]

4. Boiling point - temp @ which the vapor pressure of a liq. is equal to the external pressure. If external pressure changes, so does BP.

   \[ \text{External Pressure} \uparrow \text{ BP} \uparrow \]

5. \( \Delta H_{fus} = 15.27 \text{ KJ/mol} \)
   \( \Delta H_{sub} = \Delta H_{fus} + \Delta H_{vap} \)
   \( \Delta H_{sub} = 62.30 \text{ KJ/mol} \)

   \( \frac{62.30 \text{ KJ}}{\text{mol}} = 15.27 \text{ KJ/mol} + \frac{\Delta H_{vap}}{\text{mol}} \)

   \( \Delta H_{vap} = 47.03 \text{ KJ/mol} \)
b) the sub w/ the lowest BP will have the highest vapor pressure (weakest IMF's)

highest vapor pressure = butane
lowest vapor pressure = toluene

7) a) solid  b) liquid  c) gas

b) the solid-liquid phase boundary has a neg slope compared to most sub. which it is positive. The neg slope is due to the fact that the molar volume of ice is greater than liq. water. ice is less dense than water

c) i) melt then vaporize
    ii) freeze
    iii) vaporize

8) a) 3  b) rhombic

c) @ 80°C & 1 atm the stable allotrope is rhombic sulfur. As temp is inc there is first a transition to the monoclinic allotrope & as temp is inc further the solid melts

9) B

10) a) solid  b) vapor

11) a) dec  b) no change  c) no change
12. a) 2 diamond/graphite/liquid
    graphite/liquid/vapor
    b) diamond    c) high pressure & high temp

13. Water will solidify into ice which will release heat and keep the fruit from freezing (insulates the fruit)

14. ![Graph of Pressure vs. Temp](attachment:graph.jpg)

   - Liquid
   - Vapor

   - Normal boiling point = temp @ which a liquid boils when external pressure is 1 atm

   - \( T_c \) * critical temp
   - \( P_c \) * critical pressure

   - Point in question lies on the liquid side, so yes if the gas is compressed to here it will condense

   * Plotting normal BP & \( T_c/P_c \) as two points on the graph w/a straight line gives us an idea of the liquid-vapor phase boundary (in reality, it's curved like the dashed line)