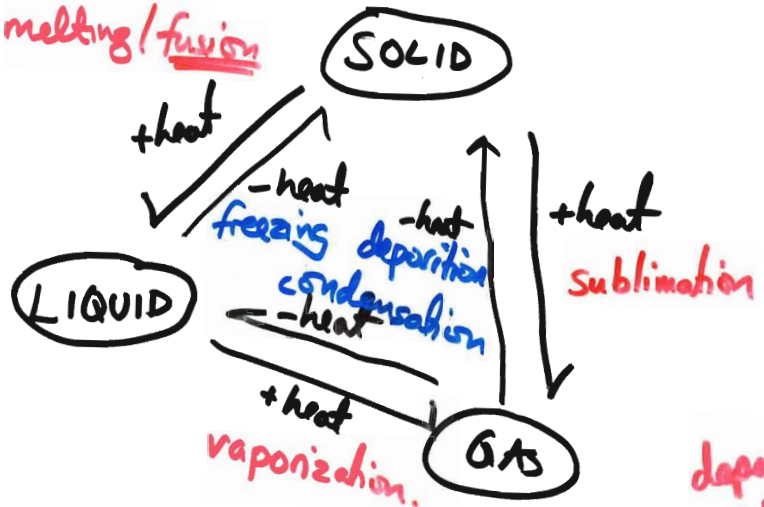
Phase Changes



Liquid-Vapor equilibrium

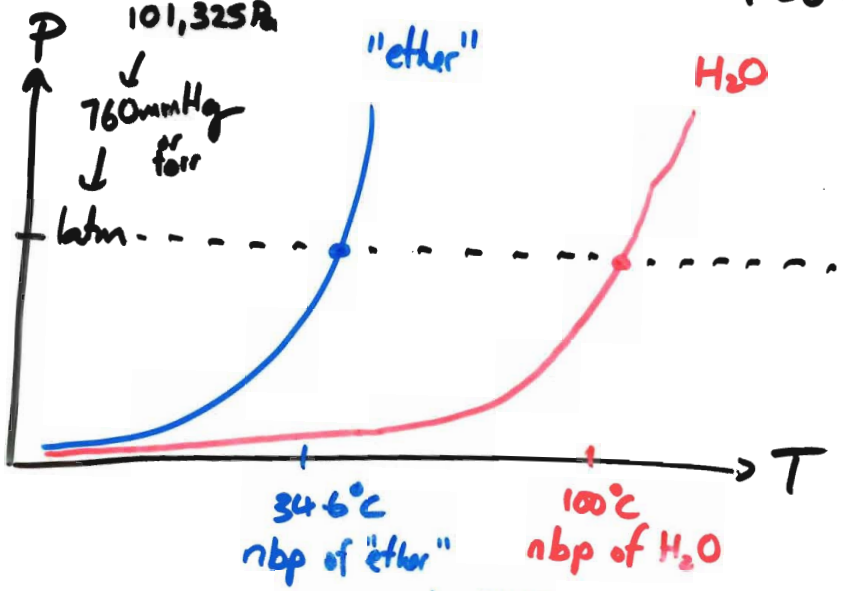
depends on T

P_A = vapor pressure of A.

Dynamic

rate of evap = rate of cond

1-28-15



Substances w/ large vp ~ volatile (weaker IMF, more)

" ——— " small vp ~ less-volatile, non-volatile

→ stronger IMF

@ boiling point: vapor pressure = atmospheric pressure.

when atmospheric p = 1 atm

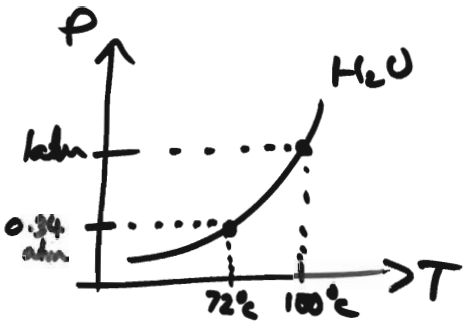
→ boiling pt = normal bp = nbp

ex: Boulder, CO P_{atm} = 0.83 atm bp_{H_2O} = 95°C

Mt Everest

$P_{air} \approx 0.34$ atm

$bp_{H_2O} = 72°C$.



Heat of vaporization, ΔH_{vap}

energy req'd to vaporize 1 mol liq → gas

ex: H_2O : $\Delta H_{vap} = +40.79$ kJ/mol

$40.79\text{ kJ} + H_2O(l) \longrightarrow H_2O(g)$

1 mol 1 mol

stronger IMF

H-Bond ✓✓

d-d

London-

endothermic.

ex: Ar : $\Delta H_{vap} = +6.3$ kJ/mol

weaker IMF

London-

$6.3\text{ kJ} + Ar(l) \longrightarrow Ar(g)$

1 mol 1 mol

Liquid-Solid Equilibrium

@ melting point (temp)

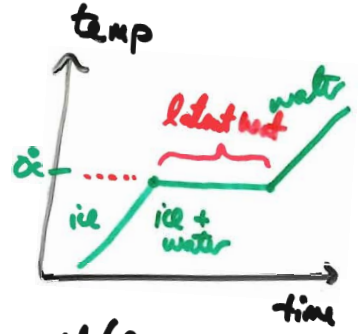
- liq + solid phases are in (dynamic) eqm

$$\text{solid} \rightleftharpoons \text{liquid}$$

below mp:

@ m.p

above mp:



- the energy required to melt/fuse 1 mol solid = ΔH_{fus}

- heat of fusion / enthalpy of fusion / latent heat of fusion.

H_2O $\Delta H_{fus} = +6.01$ kJ/mol

$6.01\text{ kJ} + H_2O(s) \longrightarrow H_2O(l)$

1 mol

notice: $\Delta H_{fus}(H_2O) = +6.01\ kJ/mol$

→ break some IMF

$\Delta H_{vap}(H_2O) = +40.79\ kJ/mol$

→ break all IMF.

Solid - Vapor eqm

solid → gas : sublimation

solid ⇌ gas.

ΔH_{sub} = heat req'd to sublime 1 mol solid → gas.

ex: $H_2O(s) \longrightarrow H_2O(g)$; $\Delta H_{sub} = +46.8 \frac{kJ}{mol}$

H ~ STATE FXN.

- changes don't depend on process!