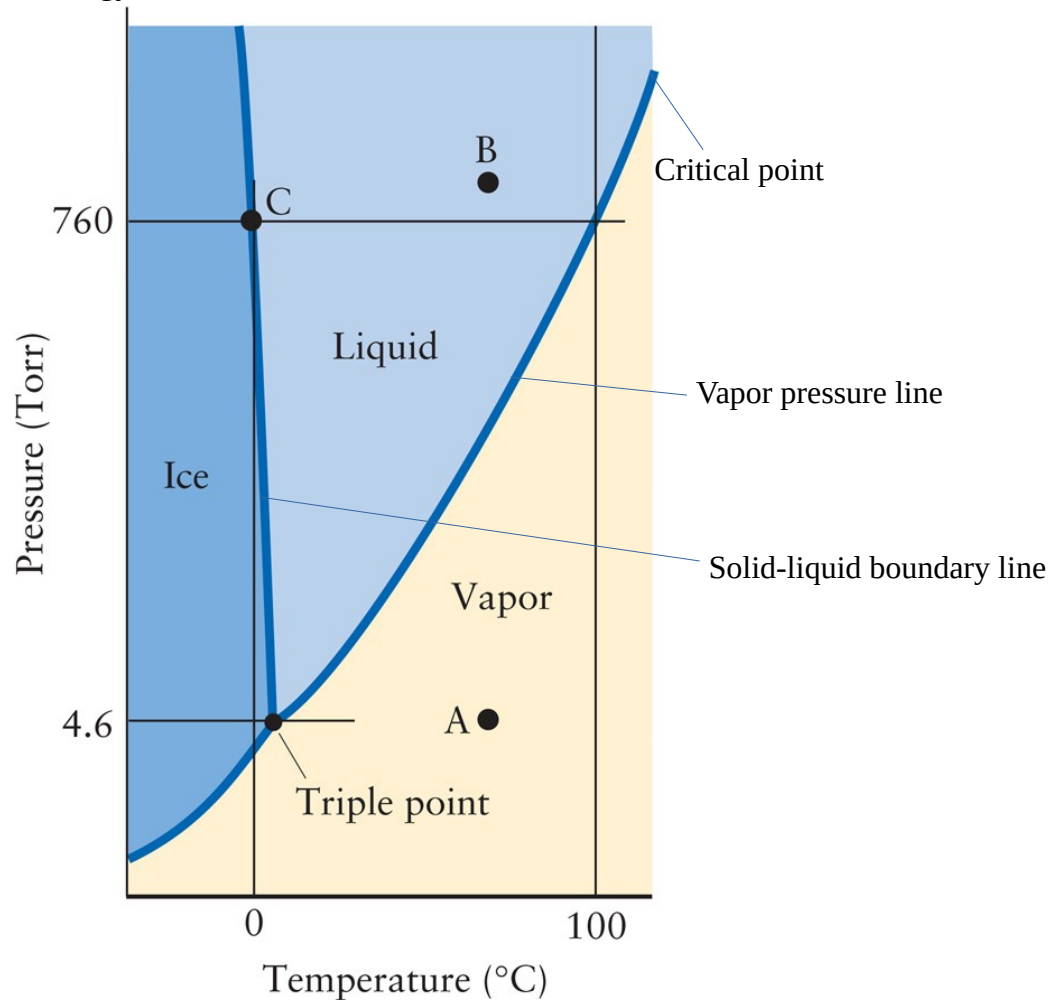


- Phase diagram terminology



- **Triple point:** 3 phase boundaries meet on a phase diagram. At this temperature and pressure, all 3 phases co-exist.
- **Critical point:** The point at which the particles are thought to be vaporizing at such a fast rate that the density of liquid and vapor are equal, and thus form a **supercritical fluid**. The distinction between the liquid and the gas can no longer be made.
- The **liquid-vapor boundary line** indicates the vapor pressure needed to achieve boiling. Given a phase diagram, you can find the vapor pressure at any given temperature on the graph.
- The **solid-liquid boundary line** indicates the melting point and indicates which phase is denser.
 - When the solid is more dense than liquid, the solid-liquid boundary line will have a positive slope. Higher pressure favors with the more dense (solid) phase and as a result, T_m increases with increasing pressure.
 - When the liquid is more dense than solid, the solid-liquid boundary line will have a negative slope (as seen above). Higher pressure favors the more dense (liquid) phase and as a result, melting point decreases with increasing pressure.
- Random info
 - solid → gas is **sublimation**
 - gas → solid is **deposition**

Thermodynamics of Melting and Freezing

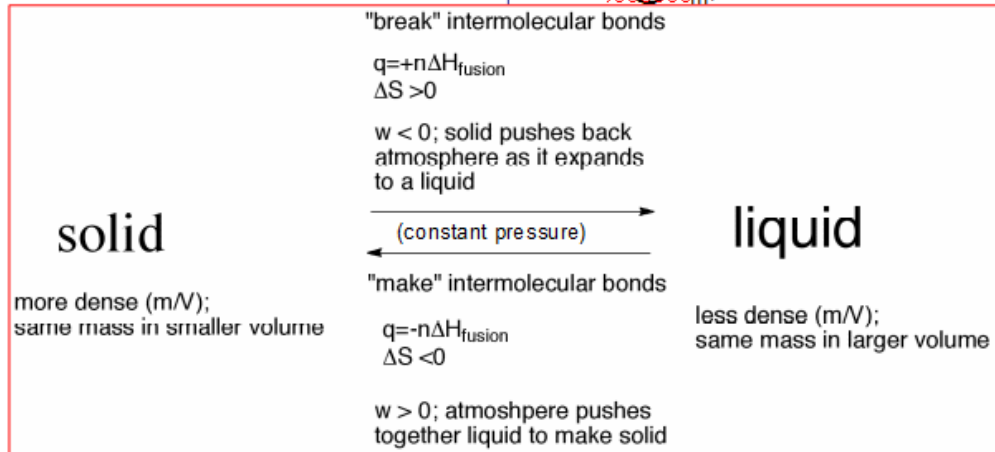
*measured at T_m not 298K

ΔH_{fus} : enthalpy of fusion
latent heat of fusion
specific melting heat

$$\Delta S_{fus} = \Delta H_{fus} / T_m$$

$$\Delta G_{T_m} = \Delta H_{fus} - T_m \cdot \Delta H_{fus} / T_m$$

$$= 0 @ T_m, K = 1$$



Thermodynamics of vaporizing/condensing

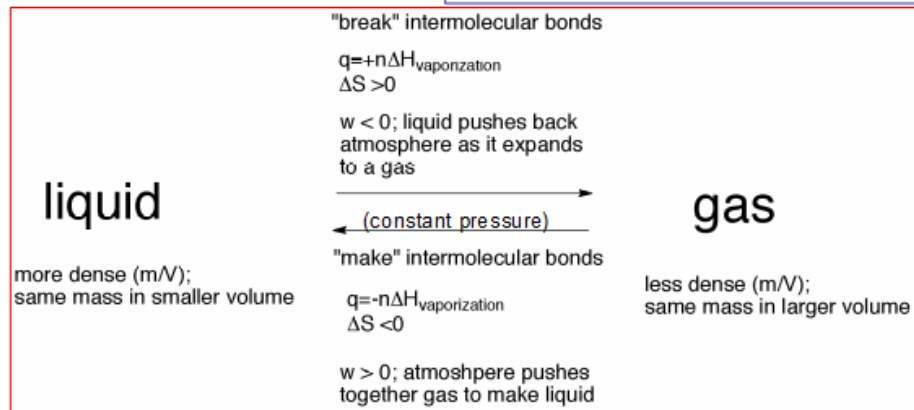
*measured at T_b not 298K

ΔH_{vap} : enthalpy (heat) of vaporization

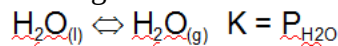
$$\Delta S_{vap} = \Delta H_{vap} / T_b$$

$$\Delta G_{T_b} = \Delta H_{vap} - T_b \cdot \Delta H_{vap} / T_b$$

$$= 0, K = 1$$



- Clausius-claperyon equation
 - The **clausius-claperyon equation** describes the quantitative changes in vapor pressure when temperature changes.



Clausius-Clapeyron Equation

$$\ln \frac{P_{2,vap}}{P_{1,vap}} = \frac{\Delta H_{vap,m}}{R} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$$

Pressures in same units

ΔH in kJ/mol

R in J/(K mol)

T in K

Convert to kJ or J