Part 2

The Relative Stability of Phases

A phase is a form of matter that is uniform in chemical composition and physical state.

A transition temperature is the temperature at which two phases co-exist at equilibrium.

A phase diagram shows the regions or pressure and temperature at which various phases are thermodynamically stable.

A phase boundary is a line separating the areas of a phase diagram showing the values of p and T at which two phases co-exist in equilibrium.

The vapour pressure is the pressure of a vapour that is in equilibrium with a condensed phase.

The boiling temperature is the temperate which the vapour pressure of a liquid equals the ambient atmospheric pressure.

The boiling point is the boiling temperature under an atmospheric pressure of one standard atmosphere = 101325 Pa.

The normal boiling point is the boiling temperature under an atmospheric pressure of exactly 1 bar = 100000 Pa.

The melting temperature is the temperate which the solid and liquid co-exist in equilibrium under ambient atmospheric pressure.

The melting point is the melting temperate under an atmospheric pressure of one standard atmosphere = 101325 Pa.

The normal boiling point is the melting temperate under an atmospheric pressure of exactly 1 bar = 100000 Pa.

The critical temperature is the temperature at which a liquid surface disappears and above which a liquid does not exist no matter the pressure. The critical pressure is the pressure at the critical temperature.

A supercritical fluid is a dense fluid phase above the critical temperature.

The triple point is a point on a phase diagram at which all three phases co-exist in equilibrium.

The chemical potential μ of a substance is its molar Gibbs energy.

The chemical potential varies with temperature as: $(\partial\mu/\partial T)_p = -S_m$.

The chemical potential varies with pressure as: $(\partial\mu/\partial p)_T = V_m$.

The vapour pressure in the presence of an applied external pressure is $p = p^* e^{V_m \Delta P/RT}$

The temperature dependence of the vapour pressure is given by the Clapeyron Equation: $\mathrm{d}p/\mathrm{d}T = \Delta S/\Delta V$.

The temperature dependence of the variation of the vapour pressure of a condensed phase is given by the Claussius-Clapeyron Equation: $\mathrm{d}\ln p/\mathrm{d}T = \Delta H/RT^2$