$pV = nRT$ id(g) $\quad p = nRT/(V-nb) - a(n/V)^2 \quad p_i = x_i p \quad v = k - f + 2$

$$H = U + pV \qquad A = U - TS \qquad G = H - TS$$

$\boxed{dU = dq + dw} \quad \boxed{dS \geq dq/T} \quad \boxed{(dG)_{T,p} \leq 0} \quad \Delta U = q_V \quad \Delta H = q_p \quad dw_{obj} = -p_{ex}\, dV$

$0 = \sum_J \nu_J J \qquad \Delta_r H = \sum_J \nu_J \Delta_f H_J \qquad \Delta_r H(T_2) = \Delta_r H(T_1) + \int_{T_1}^{T_2} \Delta_r C_p(T)\, dT \qquad \Delta_r C_p = \sum_J \nu_J C_{pJ}$

$(\partial z/\partial x)_y (\partial x/\partial z)_y = 1$

$(\partial x/\partial y)_z (\partial z/\partial x)_y (\partial y/\partial z)_x = -1$

$(\partial f/\partial x)_y = (\partial f/\partial x)_z + (\partial f/\partial z)_x (\partial z/\partial x)_y$

$(\partial f/\partial y)_x = (\partial f/\partial z)_x (\partial z/\partial y)_x$

$(\partial^2 f/\partial x \partial y) = (\partial^2 f/\partial y \partial x)$

$\Delta_r H = \Delta_r U + \Delta_r(pV) \qquad C_V = (\partial U/\partial T)_V \qquad \boxed{\mu_i = \left(\frac{\partial G}{\partial n_i}\right)_{T,p,n_{j\neq i}} = \mu_i^\circ + RT \ln a_i}$

$\Delta_r H = \Delta_r U + \Delta\nu_{gas} RT \qquad C_p = (\partial H/\partial T)_p$

$dU = TdS - p\,dV$

$\boxed{dG = Vdp - SdT} \qquad \left(\frac{\partial G}{\partial p}\right)_T = V \qquad \left(\frac{\partial G}{\partial T}\right)_p = -S \qquad dG = \sum_i \mu_i dn_i$ pro $dp = dT = 0.$

$S(T) = S(0) + \int_0^{T_t} (C_p^{(s)}/T)\, dT + \Delta H_t/T_t + \ldots \qquad \boxed{\Delta_r G^\circ = -RT \ln K; \quad K = \left\{\prod_J a_J^{\nu_J}\right\}_{ROV}}$

$\boxed{\Delta_r G = \Delta_r H - T\Delta_r S} \qquad dG = -\,dw'_{e,max}$

$\Delta_r G = \Delta_r G^\circ + RT \ln Q; \quad Q = \prod_J a_J^{\nu_J} \qquad \frac{d \ln K}{dT} = \frac{\Delta_r H^\circ}{RT^2}$

$\Delta_r G = \sum \nu_J \Delta_f G$ Gibbs-Helmholtz

$\lim_{T\to 0} \Delta S = 0 \qquad \left(\frac{\partial \Delta G/T}{\partial T}\right)_p = -\frac{\Delta H}{T^2} \qquad dp/dT = \Delta S_m/\Delta V_m \qquad p_A = x_A p^*_A \qquad p_{in} = p_{ex} + 2\gamma/r$

$\varepsilon_i = \varepsilon^{tr} + \varepsilon^{rot} + \varepsilon^{vib} + \varepsilon^{el} \Rightarrow q = q^{tr} q^{rot} q^{vib} q^{el} \qquad Q = q^N; \quad Q = q^N/N! \qquad A - A(0) = -kT \ln Q$

$\boxed{n_i^*/N = e^{-\beta\varepsilon_i}/q;\ \beta = 1/kT;\ q = \sum_i e^{-\beta\varepsilon_i}} \qquad S = -k\sum_i P_i \ln P_i = \frac{U-U(0)}{T} + k \ln Q \qquad K_p = \left\{\prod_J \left(q^\circ_{J,m}/N_A\right)^{\nu_J}\right\} e^{-\Delta E_0/RT}$

$\boxed{\log \gamma_\pm = -A|z_+ z_-|\sqrt{I}} \qquad I = 1/2 \sum_j (m_j/m^\circ) z_j^2 \qquad a_i = \gamma_i(m_i/m^\circ) \qquad r_D^2 = \varepsilon RT/(2\rho F^2 I m^\circ) \qquad \gamma_\pm = \left(\gamma_+^p \gamma_-^q\right)^{1/(p+q)}$

$\tilde{\mu}_i = \mu_i + z_i F\phi \qquad \Delta\phi = \Delta\phi^\circ + (RT/zF) \ln a_{M^{z+}} \qquad \Delta\phi = \Delta\phi^\circ + (RT/\nu F) \ln(a_{ox}/a_{red}) \qquad \boxed{\Delta_r G = -\nu FE}$

$(\mathrm{Pt})|Red_L, Ox_L||Red_P, Ox_P|(\mathrm{Pt}) \qquad Red_L + Ox_P \Leftrightarrow Red_P + Ox_L \qquad \boxed{E = E^\circ - \frac{RT}{\nu F} \ln \frac{Ox_L Red_P}{Red_L Ox_P}} \qquad \boxed{E^\circ = (RT/\nu F) \ln K}$

$\boxed{f(v_x) = \left(\frac{m}{2\pi kT}\right)^{1/2} \exp\left(-\frac{mv_x^2}{2}\frac{1}{kT}\right)} \qquad \bar{c} = (8kT/\pi m)^{1/2} \qquad \boxed{c = \langle v^2\rangle^{1/2} = (3kT/m)^{1/2}} \qquad z = \sqrt{2}\,\sigma\bar{c}(N/V) \quad \lambda = \bar{c}/z$

$\Lambda_m = \kappa/c \qquad \boxed{\Lambda_m = \Lambda_m^\circ - K\sqrt{c}} \qquad \Lambda_m^\circ = \nu_+\lambda_+ + \nu_-\lambda_- \qquad \Lambda_m^\circ = (z_+ u_+ \nu_+ + |z_-| u_- \nu_-)F \qquad \boxed{pH = -\log a_{H^+}} \qquad \vec{J} \propto -\mathrm{grad}$

$\frac{d\xi}{dt} = \frac{1}{\nu_J}\frac{dn_J}{dt} \qquad \boxed{-\frac{d[A]}{dt} = k[A]^\alpha[B]^\beta[C]^\gamma[D]^\delta \ldots} \qquad [A]_t = [A]_0 e^{-kt} \qquad \tau_{1/2} = \ln 2/k \qquad \boxed{k = Ae^{-E_a/RT}} \qquad J_z = -D(dN/dz)$

$D = kT/f, \ f = 6\pi\eta a$

$Z_{AB} = \sigma\left(\frac{8kT}{\pi\mu}\right)^{1/2} N_A^2 [A][B] \qquad k_a = \sigma\left(\frac{8kT}{\pi\mu}\right)^{1/2} N_A \exp\left(-\frac{E_a}{RT}\right) \qquad a = a_{max}\frac{Kc}{1+Kc} \qquad d\gamma = -\sum_J \Gamma_J d\mu_J \qquad \frac{\partial N}{\partial t} = D\left(\frac{\partial^2 N}{\partial x^2}\right)$

$\boxed{k_{ef} = \kappa\frac{kT}{h}K^\ddagger = \frac{kT}{h}\frac{RT}{p^\circ}\exp\left(\frac{\Delta S^\ddagger}{R}\right)\exp\left(-\frac{\Delta H^\ddagger}{RT}\right)} \qquad \boxed{j = j_0\left[\exp\left(\frac{(1-\alpha)F\eta}{RT}\right) - \exp\left(\frac{-\alpha\eta F}{RT}\right)\right]} \qquad \left(\frac{\partial \eta}{\partial c_D}\right)_T = -1\frac{RT}{D\,c_D}$