

$$PV = nRT$$

$$c = \lambda \cdot \nu$$

$$P(V - nb) = nRT$$

$$E = h\nu$$

$$\left(P + a \frac{n^2}{V^2}\right)(V - nb) = nRT$$

$$E_k = \frac{1}{2}mv^2 = h\nu - \Phi$$

$$P_{\text{total}} = P_A + P_B + P_C + \dots$$

$$E_n = -\mathcal{R} \left(\frac{1}{n^2} \right)$$

$$x_A = \frac{P_A}{P_{\text{total}}}$$

$$\bar{\nu} = \mathcal{R} \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$$

$$E_k = U = \frac{3}{2}RT$$

$$\mathcal{R} = 1.097 \times 10^7 \text{ m}^{-1}$$

$$v_{\text{rms}} = \sqrt{\frac{3RT}{M}}$$

$$E_P \propto \frac{q_1 q_2}{r}$$

$$\Delta U = q + w$$

$$\Delta H_{\text{rxn}} = \Delta H_1 + \Delta H_2 + \Delta H_3 + \dots$$

$$w = -P\Delta V \quad w = -\Delta nRT$$

$$\Delta H_{\text{rxn}}^\circ = \sum n\Delta H_f^\circ(\text{prod}) - \sum n\Delta H_f^\circ(\text{react})$$

$$H = U + PV$$

$$\Delta H_{\text{rxn}}^\circ = \sum BE_{\text{breaking}} - \sum BE_{\text{making}}$$

$$\Delta U = \Delta H - P\Delta V$$

$$\Delta G_{\text{rxn}}^\circ = \sum n\Delta G_f^\circ(\text{prod}) - \sum n\Delta G_f^\circ(\text{react})$$

$$\Delta U = \Delta H - \Delta nRT$$

$$\Delta S_{\text{rxn}}^\circ = \sum nS^\circ(\text{prod}) - \sum nS^\circ(\text{react})$$

$$q_{\text{sys}} = -q_{\text{cal}}$$

$$G = H - TS \quad S = k \ln \Omega$$

$$q_{\text{cal}} = q_{\text{water}} + q_{\text{hardware}}$$

$$\Delta G = \Delta H - T\Delta S$$

$$\Delta U = q_v \quad \Delta H = q_p$$

$$\Delta S = \frac{q_{\text{rev}}}{T}$$

$$q = nC_m \Delta T \quad q = mC_s \Delta T$$

$$\Delta S_{\text{trans}} = \frac{\Delta H_{\text{trans}}}{T_{\text{trans}}}$$

$$q = n\Delta H_{\text{trans}} \quad q = m\Delta H_{\text{trans}}$$

$$\Delta S = nC \ln \left(\frac{T_2}{T_1} \right)$$