Thermodynamics

Change in inertial Energy $\boxed{\Delta U = q + W}$ (first law of thermodynamics)

Work $\boxed{W_{rev} = -\int_{V_i}^{V_f} P_{ex}\, dV}$ $\boxed{W_{rev} = -2.303\, nRT \log \frac{V_f}{V_i}}$

Free Expansion $\boxed{\Delta U = q - P_{ex}\Delta V}$

q = Heat
P_{ex} = External force

Enthalpy $\boxed{\Delta H = \Delta U + \Delta n_g RT}$

Heat Capacity $\boxed{q = C\Delta T}$ C = Heat capacity

Molar Heat Capacity $\boxed{C_m = \frac{C}{n}}$

Relation between Cp and Cv $\boxed{C_p - C_V = R}$

C_p = Heat capacity at constant Pressure
C_v = Heat capacity at constant Volume

Enthalpy Change

$$\boxed{\Delta_r H = \text{(sum of Enthalpies of products)} - \text{(sum of Enthalpies of reactants)}}$$

OR

$$\boxed{\Delta_r H = \sum a_i H_{product} - \sum b_i H_{Reactants}}$$

Relationship between standard Enthalpy to bond enthalpy

$$\boxed{\Delta_r H^\ominus = \sum \text{Bond Enthalpy}_{reactants} - \sum \text{Bond Enthalpy}_{products}}$$

Enthalpy of Solution $\boxed{\Delta_{sol} H^\ominus = \Delta_{lattice} H^\ominus + \Delta_{hyd} H^\ominus}$

Entropy change for reversable process $\boxed{\Delta S = \frac{q_{rev}}{T}}$

Total Entropy Change $\boxed{\Delta S_{total} = \Delta S_{system} + \Delta S_{surr} > 0}$

Gibbs function $\boxed{G = H - TS}$

Gibbs Energy $\boxed{\Delta_r G^\ominus = -RT\ln K}$ OR $\boxed{\Delta_r G^\ominus = -2.303\, RT\log K}$