SOME EQUATIONS of THERMODYNAMICS

Internal Energy = heat + work

$\Delta E = q + w$

$\Delta E = C_v \Delta T$

work$= -P_{final}\Delta V$

$\Delta V = V_{final} - V_{initial}$

Enthalpy $\Delta H = C_p \Delta T$

$\Delta E = \Delta H - \Delta n_{gas} RT$ Chemical Reaction

$\Delta H^0_{reaction} = \Delta H^0_{products} - \Delta H^0_{reactants}$

Entropy $\Delta S = \frac{q_{rev}}{T}$ $\Delta S = \frac{\Delta H}{T}$ (reversible phase change)

Ideal Gases

$\Delta S = C_v \ln \frac{T_2}{T_1}$ isochoric $\Delta S = C_p \ln \frac{T_2}{T_1}$ isobaric $\Delta S = R \ln \frac{V_2}{V_1}$ isothermal

$\Delta S^0_{reaction} = S^0_{products} - S^0_{reactants}$

Gibbs Free Energy

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

$\Delta G = \Delta G^0 + RT \ln Q$ $\Delta G^0_{reaction} = -RT \ln K_{eq}$

$\Delta G^0_{reaction} = \Delta G^0_{products} - \Delta G^0_{reactants}$