Constants:

R = $8.314\frac{J}{mol \cdot K}$, $0.08206\frac{Atm \cdot L}{mol \cdot K}$, $62.36\frac{torr \cdot L}{mol \cdot K}$

Water: C_p(solid) = $2.06\frac{J}{g \cdot C}$, C_p(liquid) = $4.18\frac{J}{g \cdot C}$, C_p(gas) = $2.03\frac{J}{g \cdot C}$

$H_f = 333\frac{J}{g}$, $H_v = 2260\frac{J}{g}$

Equations:

$$PV = nRT$$

$$z = \frac{PV_m}{RT}$$

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

$$C = \frac{dq}{dt}$$

$$C_P - C_V = nR$$

$$P_i V_i^g = P_f V_f^g$$

$$H = U + PV$$

$$w = -P_{ex}\Delta V$$

$$w = -P\Delta V$$

$$w = -nR\Delta T$$

$$w = \int C_V dT$$

$$w = -nRT\ln\left(\frac{V_f}{V_i}\right)$$

$\Delta U = q + w$

$H = U + PV$

$A = U - TS$

$G = H - TS$

ΔS (isothermal) = q_{rev}/T

$\Delta S = C_v \ln(T_f/T_i)$ (constant V)

$$dU = TdS - PdV$$
$$dH = TdS + VdP$$
$$dA = -SdT - PdV$$
$$dG = -SdT + VdP$$

$$\Delta G = \Delta G^q + (mole)RT \ln Q$$

$$\ln K' = \ln K - \left(\frac{\Delta H^q}{(mole)R} \right) \left(\frac{1}{T'} - \frac{1}{T} \right)$$

$$\frac{dP}{dT} = \frac{\Delta S_m}{\Delta V_m}$$

$$\ln\left(\frac{P_2}{P_1} \right) = \frac{-\Delta H_{sub}}{R} \left(\frac{1}{T_2} - \frac{1}{T_1} \right)$$

$$\ln\left(\frac{P_2}{P_1} \right) = \frac{-\Delta H_v}{R} \left(\frac{1}{T_2} - \frac{1}{T_1} \right)$$

$$P_2 - P_1 = \frac{\Delta H_f}{\Delta V_f} \ln\left(\frac{T_2}{T_1} \right)$$

$$m_A(l) = m_A^*(l) + RT \ln(X_A)$$

$$\frac{d \ln k}{dT} = \frac{\Delta H^q}{(mole)RT^2}$$

$$\Delta T = m \cdot i \cdot k$$

$$P = X \cdot k$$

$$\Pi = \Delta cRT$$

$$P = X \cdot P^*$$

$$\frac{1}{[A]} = kt + \frac{1}{[A]_0} \qquad \ln \frac{[A]}{[A]_0} = -kt \qquad [A] = -kt + [A]_0$$

$$k = Ae^{\frac{-E_A}{RT}}$$