Equations Table:

$N_A = 6.02 \times 10^{23} \, mol^{-1}$

$R = 8.314 \, J/mol \cdot K$

$k = 1.38 \times 10^{-23} \, J/K$

$\sigma = 5.67 \times 10^{-8} \, W/m^2 \cdot / K^4$

$\Big|$ $\begin{array}{l} \Delta L = \alpha L_0 \Delta T \\ \Delta V = \beta V_0 \Delta T \end{array}$ $\Big|$

$PV = nRT$

$PV = NkT$

$T(K) = T(^\circ C) + 273.15$

$1 \, cal = 4.186 J$

$P = P_0 + \rho g h$

$Q = mc\Delta T$

$Q = mL$

$dW = PdV; W = \int_i^f PdV$

$\Big|$ $\begin{array}{l} \Delta U = Q - W \\ dU = dQ - dW \end{array}$ $\Big|$

$W = nRT \ln(\frac{V_f}{V_i})$

$\dfrac{dQ}{dt} = kA \left| \dfrac{dT}{dx} \right|$

$\dfrac{\Delta Q}{\Delta t} = \sigma A e T^4$

$P = \dfrac{2}{3} \dfrac{N}{V} \left(\dfrac{1}{2} m \langle v^2 \rangle_{av} \right)$

$\dfrac{1}{2} m \langle v^2 \rangle_{av} = \dfrac{3}{2} kT$

$U = \dfrac{3}{2} NkT = \dfrac{3}{2} nRT$

$dU = nC_V dT$

$C_p - C_V = R$

$\gamma = C_P / C_V$

$PV^\gamma = \text{constant}$

$\Big|$ $f(v) = 4\pi \left(\dfrac{m}{2\pi kT} \right)^{3/2} v^2 e^{-mv^2/2kT}$

$W = |Q_h| - |Q_c|$

$e = \dfrac{W}{|Q_h|}$

$e_C = 1 - \dfrac{T_c}{T_h}$

$dS = \dfrac{dQ_r}{T}$

$\Big|$ $\Delta S = \int_i^f \dfrac{dQ_r}{T}$

$\Delta S = nC_V \ln(T_f / T_i) + nR \ln(V_f / V_i)$

$\Big|$ $\Delta S_{total} = \Delta S_{system} + \Delta S_{environment} \geq 0$