

Possibly useful relations:

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

$$\Delta L = \alpha L_0 \Delta T$$

$$PV = nRT$$

$$\bar{K} = \frac{1}{2} m \bar{v}^2 = \frac{3}{2} kT$$

$$f(v) = 4\pi N \left(\frac{m}{2\pi kT}\right)^{\frac{3}{2}} v^2 e^{(\frac{1}{2}mv^2/kT)}$$

$$\text{monoatomic: } E_{\text{int}} = \frac{3}{2} nRT$$

$$Q = mc\Delta T$$

$$Q = mL_V$$

$$Q = \Delta E_{\text{int}} + W$$

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

$$\epsilon = \frac{|W|}{|Q_H|} = 1 - \frac{|Q_L|}{|Q_H|}$$

$$CP_{\text{ref}} = \frac{Q_L}{W}$$

$$CP_{\text{hp}} = \frac{Q_H}{W}$$

$$dS = \frac{dQ}{T}$$

$$\Delta S_{\text{closed}} \geq 0$$

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

$$R = kN_A = 8.315 \text{ J/mol} \cdot \text{K}$$

$$\text{one atmosphere} = 760 \text{ mm Hg} = 10^5 \text{ Pa}$$

$$\cos \theta = \text{adjacent/hypotenuse}$$

$$\tan \theta = \sin \theta / \cos \theta$$

$$T(^{\circ}F) = \frac{9}{5}T(^{\circ}C) + 32^{\circ}$$

$$\Delta V = \beta V_0 \Delta T$$

$$PV = NkT$$

$$v_{\text{rms}} = \sqrt{\frac{3kT}{m}}$$

$$\Delta N = f(v)dv$$

$$Q = \int_{T_1}^{T_2} mc dT$$

$$Q = mL_f$$

$$dW = PdV$$

$$\gamma = C_P/C_V$$

$$\epsilon_{\text{Carnot}} = 1 - \frac{T_L}{T_H}$$

$$CP_{\text{ref}}^{\text{Carnot}} = T_L/(T_H - T_L)$$

$$CP_{\text{hp}}^{\text{Carnot}} = 1/(1 - T_L/T_H)$$

$$\Delta S = \int \left(\frac{dQ}{T}\right)_{\text{reversible}}$$

$$S = k \ln W$$

$$N_A = 6.022 \times 10^{23}$$

$$R = 0.0821 \text{ atm} \cdot \text{L/mol} \cdot \text{K}$$

$$1 \text{ cal} = 4.186 \text{ J}$$

$$\sin \theta = \text{opposite/hypotenuse}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$