Some (potentially) useful formulas and numbers

1 AU = 1.496×10^8 km

1 ly = 9.46×10^{12} km = 63,240 AU

1 pc = 3.09×10^{13} km = 3.26 ly

distance = speed × time

$$D = \frac{\alpha d}{206{,}265}$$

$$P^2 = a^3$$

$$F = ma$$

$$F = G\left(\frac{m_1 m_2}{r^2}\right)$$

$G = 6.67 \times 10^{-11}$ newton–m^2/kg^2

$$P^2 = \left[\frac{4\pi^2}{G(m_1 + m_2)}\right] a^3$$

$$\frac{1}{P} = \frac{1}{E} + \frac{1}{S}$$

$$\frac{1}{P} = \frac{1}{E} - \frac{1}{S}$$

$c = 3 \times 10^5$ km/s = 3×10^8 m/s

$$\nu = \frac{c}{\lambda}$$

$$\lambda_{\max} = \frac{0.0029}{T}$$

$$F = \sigma T^4$$

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

$$E = \frac{hc}{\lambda}$$

$$E = h\nu$$

$h = 6.625 \times 10^{-34}$ J–s = 4.135×10^{-15} eV–s

$$\frac{1}{\lambda} = R\left(\frac{1}{N^2} - \frac{1}{n^2}\right)$$

$$\frac{\Delta\lambda}{\lambda_0} = \frac{v}{c}$$

$$T_F = \frac{9}{5} T_C + 32$$

$$T_C = \frac{5}{9}(T_F - 32)$$

$$\theta = 2.5 \times 10^5 \frac{\lambda}{D}$$

$$E_k = \frac{1}{2} mv^2$$

$$E_k = \frac{3}{2} kT$$

$$v = \sqrt{\frac{3kT}{m}}$$

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

$$v_{\text{escape}} = \sqrt{\frac{2GM}{R}}$$

1 atm = 14.7 lb/in.^{2} = 1.01×10^5 N/m^2

1 bar = 0.987 atm

Radius of the Earth = 6378 km

Radius of the Moon = 1738 km

Earth-Moon distance = 384,400 km

Radius of Mars = 3397 km

Radius of the Sun = 696,000 km

$$d = 1/p$$

$$b = \frac{L}{4\pi d^2}$$

$$L = 4\pi R^2 \sigma T^4$$

$$\frac{L_1}{L_2} = \left(\frac{d_1}{d_2}\right)^2 \frac{b_1}{b_2}$$

$$\frac{L_1}{L_2} = \left(\frac{R_1}{R_2}\right)^2 \left(\frac{T_1}{T_2}\right)^4$$

$$M_1 + M_2 = \frac{a^3}{P^2}$$

$$R_{\text{Sch}} = \frac{2GM}{c^2}$$

$$P = \frac{2\pi r}{v}$$

$$M = \frac{rv^2}{G}$$

$$z = \frac{\lambda - \lambda_0}{\lambda_0} = \frac{\Delta\lambda}{\lambda_0}$$

$$v = H_0 d$$

Area of a circle, radius R: $A = \pi R^2$

Surface area of a sphere, radius R: $A = 4\pi R^2$

Volume of a sphere, radius R: $V = \frac{4}{3}\pi R^3$