# Formulae and Constants

$c = \lambda\nu$

$\lambda = \lambda_0(1 \pm v/c)$

$\lambda = \lambda_0[(1 + v/c)/(1 - v/c)]^{1/2}$

$E = h\nu$

$E(n) = (2\pi^2 me^4 Z^2 h^{-2}) * (1 - n^{-2})$

$E(n = \infty) = 13.6$ eV

$E(n = 1) = 0$ eV

$1/\lambda_{ab} = Z^2 R(1/n_b^2 - 1/n_a^2)$

$N_B/N_A = (g_B/g_A)e^{(E_A - E_B)/kT}$

$N_{i+1}/N_i = (A/N_e)(kT)^{3/2}e^{-(\chi_i/kT)}$

$I_\lambda(T)\Delta\lambda = \frac{(2hc^2)}{\lambda^5}[1/(e^{hc/\lambda kT} - 1)]$

$\lambda_{MAX}T = 3$ mm K

$F = \sigma T^4$

$M_{bol}(\odot) - M_{bol}(*) = 2.5log(L*/L\odot)$

$M_{bol} = M_V + BC$

$r_1 = V_1 P/2\pi$

$R_p/a = \pi(t_2 - t_1)/P$

$M_V(\odot) = +5$ mag

$G = 6.7 \times 10^{-11}$ N m$^2$ kg$^{-2}$

$k = 1.38 \times 10^{-23}$ J K$^{-1}$

$M_\odot = 2.0 \times 10^{30}$ kg

$R_\odot = 7.0 \times 10^8$ m

s(m degree$^{-1}$) $= 0.01745\ f_{\rm meters}$

$\theta''_{min} = 1.22 \times 206,265 \times (\lambda/d)$

$c = 3.0 \times 10^8$ m s$^{-1}$

$sin(\theta) = (m\lambda)/L$

$\pi'' = 1/d_{pc}$

$m_1 - m_2 = -2.5log(F_1/F_2)$

$m - M = 5log(d) - 5$

$R = 10.96776\ \mu$m$^{-1}$

$m - M = -5log(\pi'') - 5$

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

$(M_1 + M_2)P^2 = a^3 = (a''/\pi'')^3$

$M_1 a_1 = M_2 a_2$

$P = (g/\kappa)\tau$

$log(L*/L\odot) = 1.89 - 0.4M_{bol}(*)$

$a = VP/2\pi$

$r_2 = V_2 P/2\pi$

$R_s/a = \pi(t_4 - t_2)/P$

1 eV $= 1.602 \times 10^{-19}$ Joules

$h = 6.6 \times 10^{-34}$ J s

$m_H = 1.67 \times 10^{-27}$ kg

$L_\odot = 3.9 \times 10^{26}$ W

$1AU = 1.5 \times 10^{11}$ m

$m_V(\odot) = -26.74$

$\lambda_V = 5500\mathring{A}$

$logN(m) = 0.6m + C$

$v_\odot^2/R_\odot = GM_G/R_\odot^2$

$v_t = d\ sin\mu \approx \mu d$

$v_t = 4.74\mu'' d = 4.74(\mu''/\pi'')$

$V^2 = v_r^2 + v_t^2$

$tan\theta = v_t/v_r$

$V = v_r/cos\theta$

$\pi'' = 4.74\mu''/v_r tan\theta$

$v_r = \Theta cos\alpha - \Theta_0 sin\ell$

$v_r = R_0(\omega - \omega_0)sin\ell$

$v_t = \Theta sin\alpha - \Theta_0 cos\ell$

$v_t = R_0(\omega - \omega_0)cos\ell - d\ \omega$

$A \equiv -(R_0/2)(d\omega/dR)_{R_0}$

$v_r = -2A(R - R_0)sin\ell$

$v_r = A\ d\ sin2\ell$

$v_t = d(A\ cos2\ell + B)$

$B \equiv A - \omega_0$

$R_{min} = R_0 sin\ell$

$\Theta(R_{min}) = v_{r,max} + \Theta_0 sin\ell$

$v_{r,max} = 2AR_0(sin\ell)(1 - sin\ell)$

$dP/dr = -GM(r)\rho(r)/r^2$

$dM/dr = 4\pi r^2 \rho(r)$

$P(r) = n(r)kT(r)$

$n(r) = \rho(r)/\mu(r)m_H$

$\mu = [2X + (3/4)Y + (1/2)Z]^{-1}$

$L(r) = [-64\pi\sigma r^2 T^3(r)]/[3\kappa(r)\rho(r)](dT/dr)$

$dL/dr = 4\pi r^2 \rho(r)\epsilon(r)$

$E = mc^2$

mass defect = 0.0286 AMU

$V^2/R = GM/R^2$

$m - M = 5log(d) - 5 + A$

$e^X = 1 + X$ (for $X << 1$)

1 Joule = $10^7$ ergs

1 pc = $3 \times 10^{16}$ m

1 Å = $10^{-8}$ cm

$m_e = 9.11 \times 10^{-31}$ kg

1 inch = 2.54 cm

$V_{cone} = (1/3)\ \pi R^2 H$

$R_{earth} = 6378$ km

$M_{earth} = 5.98 \times 10^{24}$ kg

$P^2 G(M_1 + M_2) = 4\pi^2 a^3$

$\Delta V = \sqrt{3kT/m}$

$A_V = 3.1E(B - V)$