Formulae and Constants for Lecture Series "Stars"

$$B_\nu(T) = \frac{2h\nu^3}{c^2}\frac{1}{e^{\frac{h\nu}{kT}}-1}$$

$$\lambda_{max} = \frac{0.290\,\mathrm{K\,cm}}{T}$$

$$L_* = 4\pi R_*^2 \sigma T_{eff}^4$$

$$m - M = 5\log\left(\frac{d}{10}\right)$$

$$\rho > \rho_J = \left(\frac{5kT}{\mu m_H G}\right)^3\left(\frac{3}{4\pi M^2}\right)$$

$$R_J = \left(\frac{15kT}{4\pi\rho\mu m_H G}\right)^{1/2}$$

$$\frac{dP(r)}{dr} = -\rho(r)g(r)$$

$$k_\nu\rho = \frac{\pi e^2}{m_e c} f_{ij}\varphi_\nu n_i\left(1 - e^{\frac{-h\nu_{ij}}{kT}}\right)$$

$$\nabla_{rad} > \nabla_{adi} = \left(\frac{\gamma-1}{\gamma}\right)$$

$$P = K\rho^{\frac{n+1}{n}}$$

$$\frac{1}{\xi^2}\frac{d}{d\xi}\left(\xi^2\frac{d\theta(\xi)}{d\xi}\right) = -\theta^n(\xi)$$

where $\rho(r) = \rho_c\theta^n(r)$ and $\xi = \frac{r}{\alpha}$.

$$E = \Delta mc^2 = (m_{initial} - m_{final})c^2$$

$$M_{white\ dwarf} \leq 1.43\,M_\odot$$

$$\frac{n_{i+1}}{n_i} = \frac{1}{n_e}\left(\frac{2\pi m_e kT}{h^2}\right)^{\frac{3}{2}}\frac{2U_{i+1}}{U_i}e^{-\frac{E_{ion}}{kT}}$$

$$\frac{n_i}{n_j} = \frac{g_i}{g_j}e^{-\frac{(E_i-E_j)}{kT}}$$

$$m_1 - m_2 = 2.5\log\left(\frac{F_2}{F_1}\right)$$

$$2U + \Omega = 0$$

$$t_{ff} = \left(\frac{3\pi}{32G\rho}\right)^{1/2}$$

$$M > \left(\frac{5kT}{\mu m_H G}\right)^{3/2}\left(\frac{3}{4\pi\rho}\right)^{1/2} = M_J$$

$$\frac{u}{\rho}\frac{dI_\nu(z,u)}{dz} = -k_\nu I_\nu(z,u) + j_\nu$$

$$d\tau_\nu = -k_\nu\rho dz$$

$$W_\lambda = \int A_\lambda d\lambda$$

$$\frac{dP(r)}{dr} = -\frac{\rho(r)GM(r)}{r^2}$$

$$\frac{dM(r)}{dr} = 4\pi r^2\rho(r)$$

$$\frac{dT(r)}{dr} = -\frac{3k_R\rho}{64\pi r^2\sigma T^3}L(r)$$

$$\frac{dL(r)}{dr} = 4\pi r^2\rho(r)\varepsilon(r)$$

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

Speed of light	c	$2.99793458 \times 10^{10}$ cm/s
Gravitational constant	G	6.67259×10^{-8} cm^3/g/ s^2
Planck constant	h	$6.6260755 \times 10^{-27}$ erg s
Boltzmann constant	k	1.380658×10^{-16} erg/K
		8.617385×10^{-5} eV/K
Elementary charge	e	$4.8032068 \times 10^{-10}$ esu
Atomic mass unit	u	1.660540×10^{-24} g
		931.5 MeV/c^2
Mass of electron	m_e	$9.1093897 \times 10^{-28}$ g
		0.511 MeV/c^2
Mass of proton	m_p	$1.6726231 \times 10^{-24}$ g
		938.3 MeV/c^2
Mass of neutron	m_n	$1.6749286 \times 10^{-24}$ g
		939.6 MeV/c^2
Mass of ^{1}H atom	m_H	$1.6735344 \times 10^{-24}$ g
Stefan–Boltzmann constant	σ	5.67051×10^{-5} erg/cm^2/K/s
Thomson scattering constant	σ_T	6.6524×10^{-25} cm^2

Solar mass	$M_\odot$	1.9891×10^{33} g
Solar radius	$R_\odot$	6.95508×10^{10} cm
Solar luminosity	$L_\odot$	3.8458×10^{33} erg/s
Solar effective temperature	$T_{eff\odot}$	5777 K
Earth's mass	$M_\oplus$	5.9742×10^{27} g
Earth's radius	$R_\oplus$	6.378136×10^{8} cm
Astronomical unit	AU	$1.4959787066 \times 10^{13}$ cm
Light-year	ly	$9.460730472 \times 10^{17}$ cm
Parsec	pc	3.0856776×10^{18} cm
		3.26167 ly
Absolute Magnitude of the Sun	M_V (Sun)	+4.83