ΤΥΠΟΛΟΓΙΟ

$L_{\odot}$ = 3.85 × 10^{33}ergs^{-1}
$f_{\odot} \equiv S$ = 1.367 × 10^{6}ergs^{-1}cm^{-2} (ηλιακή σταθερά)
$M_{\odot}$ = 1.9891x10^{30} kg
$R_{\odot}$ = 6.957 × $10^{8} m$
$R_{\oplus}$ = 6.371 × $10^{6} m$
$r_{\oplus}$ = 1AU = 1.496 × $10^{11} m$
1Jy = 10^{-26}Wm^{-2}Hz^{-1}
1 Parsec = 3.0857 × 10^{16} m
h = 6.62607015 × 10^{-34}m^{2}kg/s
k_B = 8.6 10 − 5$eV\ K^{-1}$
m_e = 9.1093837 × 10^{-31} kg
m_p = 1,67262158 × 10^{-27} kg
e = 1.60217663 × 10^{-19}Cb
G = 6.6743 × 10^{-11} m^3 kg^{-1} s^{-2}
$\frac{dI_\nu}{ds} = -I_\nu(\alpha_\nu + \sigma_\nu) + \alpha_\nu B_\nu + \sigma_\nu J_\nu$ (για μέσο που εκπέμπει θερμικά, και για ελαστική σκέδαση)
$\tau_\nu(s) = \int_{s_o}^{s} a_\nu(s')ds'$
$B_\nu(T) = \frac{2h\nu^3/c^2}{\exp(h\nu/k_BT)-1}$
$x = 3(1-e^{-x}) \Rightarrow x = 2.82$, $y = 5(1-e^{-y}) \Rightarrow y = 4.97$, $\int_0^\infty \frac{x^3dx}{e^x-1} = \pi^4/15$
$g_1B_{12} = g_2B_{21} \quad A_{21} = \frac{2h\nu^3}{c^2}B_{21}$
$j_\nu = \frac{h\nu_0}{4\pi}n_2A_{21}\phi(\nu) \quad \alpha_\nu = \frac{h\nu}{4\pi}\phi(\nu)(n_1B_{12} - n_2B_{21}) \quad S_\nu = \frac{2h\nu^3}{c^2}\left(\frac{g_2n_1}{g_1n_2} - 1\right)^{-1}$
$\frac{n_1}{n_2} = \frac{g_1\exp(-E/k_BT)}{g_2\exp[-(E+h\nu_0)/k_BT]} = \frac{g_1}{g_2}\exp(h\nu_0/k_BT)$
$n_\upsilon d\upsilon = n\left(\frac{m}{2\pi k_BT}\right)^{3/2} e^{-m\upsilon^2/2k_BT}4\pi\upsilon^2 d\upsilon$
$\frac{N_{i+1}n_e}{N_i} = \frac{Z_eZ_{i+1}}{Z_i}\left(\frac{2\pi m_ek_BT}{h^2}\right)^{3/2} e^{-\chi_i/k_BT}$
$\frac{1}{\alpha_R} \equiv \frac{\int_0^\infty(\alpha_\nu+\sigma_\nu)^{-1}\frac{\partial B_\nu}{\partial T}d\nu}{\int_0^\infty\frac{\partial B_\nu}{\partial T}d\nu}$
$\alpha_{bf} = \frac{64\pi^4me^{10}}{3\sqrt{3}c^4h^6}z'^4\frac{g_{bf}}{n^5}\lambda^3 \propto \lambda^3 n^{-5}$ $(\lambda < \lambda_n)$ όπου $\lambda_n = \frac{ch^3n^2}{2\pi^2me^4z'^2}$
$a_{\rm ff}(\lambda, z', \upsilon) = \frac{4\pi}{3\sqrt{3}}\frac{e^6}{c^4hm^2}z'^2\frac{g_{\rm ff}}{\upsilon}\lambda^3$
$\alpha_e = \frac{8}{3}\pi\left(\frac{e^2}{mc^2}\right)^2$ = 6.654 × $10^{-29}m^2$
κ_R (ή σ_R) $= \kappa_e\left(\frac{\lambda_{\rm L}}{\lambda}\right)^4$, $\lambda_{\rm L}$=1026A
$\bar{\kappa}_{\rm ff}$ = 3.68 × $10^{18}\overline{g_{\rm ff}}(1-Z)(1+X)\frac{\rho}{T^{3.5}}$m^{2}kg^{-1}
$\bar{\kappa}_{\rm H^-} \approx 7.9 \times 10^{-34}(Z/0.02)\rho^{1/2}T^9$m^{2}kg^{-1}
$\bar{\kappa}_{\rm es}$ = 0.02$(1+X)$m^{2}kg^{-1}
Balmer series: $\frac{1}{\lambda} = R_H\left(\frac{1}{2^2} - \frac{1}{m^2}\right)$ *for* m = 3,4,5, ..., R_H = 1.09677583 × 10^7 m^{-1}
$2\Delta\lambda_{1/2} = \frac{2}{c}\sqrt{\frac{2kT}{m}ln2}\,\lambda_o$
$\alpha_\nu = \frac{\pi e^2}{mc}f\frac{\Gamma_{\rm rad}+\Gamma_{\rm coll}}{4\pi^2}\frac{1}{\{\nu-[\nu_0+\nu_0(v_l/c)]\}^2+[(\Gamma_{\rm rad}+\Gamma_{\rm coll})/4\pi]^2}$

$$t_{\mathrm{ff}} = \left(\frac{3\pi}{32}\frac{1}{G\rho_0}\right)^{1/2}$$

$$M_J \simeq \left(\frac{5kT}{G\mu m_H}\right)^{3/2}\left(\frac{3}{4\pi\rho_0}\right)^{1/2}$$

$$\frac{\mathrm{dP_{rad}}}{\mathrm{dr}} = -\frac{\overline{\kappa}\rho}{\mathrm{c}}\mathrm{F_{rad}}$$

$$\frac{dP}{dr} = -G\frac{M_r\rho}{r^2} \qquad \frac{dM_r}{dr} = 4\pi r^2\rho \qquad \frac{dL_r}{dr} = 4\pi r^2\rho\varepsilon$$

$$\frac{dT}{dr} = -\frac{3}{4ac}\frac{\bar{\kappa}\rho}{T^3}\frac{L_r}{4\pi r^2} \text{ για } \frac{dlnP}{dlnT} < \frac{\gamma}{\gamma-1}$$

$$= -\left(1-\frac{1}{\gamma}\right)\frac{\mu m_H}{k}\frac{GM_r}{r^2} \text{ για } \frac{dlnP}{dlnT} > \frac{\gamma}{\gamma-1}$$

$$\mathrm{t_{KA}} \sim \mathrm{M}^{-(\beta+7)/(\beta+1)}$$

$$P_{\mathrm{rad}} = \frac{1}{3}aT^4$$

$$P_{ic} = \frac{3}{4\pi R_{ic}^3}\left(\frac{M_{ic}kT_{ic}}{\mu_{ic}m_H} - \frac{1}{5}\frac{GM_{ic}^2}{R_{ic}}\right)$$

$$\left(\frac{M_{ic}}{M}\right)_{\mathrm{SC}} \simeq 0.37\left(\frac{\mu_{\mathrm{env}}}{\mu_{ic}}\right)^2$$

$$\mu = \frac{\sum_j N_j A_j}{\sum_j N_j}, \quad \mu = \frac{\sum_j N_j A_j}{\sum_j N_j(\mathrm{Z}_j+1)}$$

$$r_{ix} = \left(\frac{2}{kT}\right)^{3/2}\frac{n_i n_x}{(\mu_m\pi)^{1/2}}\int_0^\infty S(E)e^{-bE^{-1/2}}e^{-E/kT}dE \text{ , } b \equiv \frac{\pi\mu_m^{1/2}Z_1Z_2e^2}{2^{1/2}\epsilon_0 h}$$

$$\varepsilon_{pp} \simeq \varepsilon'_{0,pp}\rho X^2 f_{pp}\psi_{pp}C_{pp}T_6^4$$

$$\varepsilon_{\mathrm{CNO}} \simeq \varepsilon'_{0,\mathrm{CNO}}\rho X X_{\mathrm{CNO}}T_6^{19.9}$$

$$\varepsilon_{3\alpha} \simeq \varepsilon'_{0,3\alpha}\rho^2 Y^3 f_{3\alpha}T_8^{41.0}$$

$$E_b = \Delta mc^2 = \left[Zm_p + (A-Z)m_n - m_{\text{nucleus}}\right]c^2$$

^{44}Ti $\tau_{1/2}$ = 59.1y , ^{56}Ni $\tau_{1/2}$ = 6.1d, ^{65}Ni $\tau_{1/2}$ = 2.5h, ^{56}Co $\tau_{1/2}$ = 77.2d, ^{57}Co $\tau_{1/2}$ = 271.8d

^{55}Fe $\tau_{1/2}$ = 2.7y, ^{59}Fe $\tau_{1/2}$ = 44.5d

$$\varepsilon_F = \frac{h^2N^2}{8mL^2} = \frac{\hbar^2}{2m}(3\pi^2 n)^{2/3}$$

$$P_{\varepsilon\kappa\varphi,\mu\eta\ \sigma\chi\varepsilon\tau\iota\kappa\ e^-} = \frac{(3\pi^2)^{2/3}}{5}\frac{\hbar^2}{m_e}\left[\left(\frac{Z}{A}\right)\frac{\rho}{m_H}\right]^{5/3}$$

$$P_{\varepsilon\kappa\varphi,\sigma\chi\varepsilon\tau\iota\kappa\ e^-} = \frac{(3\pi^2)^{1/3}}{4}\hbar c\left[\left(\frac{Z}{A}\right)\frac{\rho}{m_H}\right]^{4/3}$$

$$P_{\varepsilon\kappa\varphi,\nu\varepsilon\tau\rho o\nu\iota\alpha} = K\rho^\gamma, \gamma = \frac{5}{3}, K = \frac{3^{2/3}\pi^{4/3}}{5}\frac{\hbar^2}{m_n^{8/3}}$$

$$B_p \sin\alpha = \left(\frac{12\mathrm{M}c^3\dot{\Omega}}{5R^4\Omega^3}\right)^{1/2}$$

$$r_g = \frac{2GM}{c^2}$$

$$\Delta\tau = \left(\frac{2}{9GM}\right)^{\frac{1}{2}}(r_1)^{\frac{3}{2}}$$

$$\mathrm{d}s^2 = c^2\left(1-\frac{2GM}{rc^2}\right)dt^2 - \left(1-\frac{2GM}{rc^2}\right)^{-1}dr^2$$