USEFUL SOLAR NUMBERS (v2.3)

$c =$	2.99E+10	cm/sec	$k_b =$	1.38E−16	erg/K	$G =$	6.67E−8	$\mathrm{erg\,cm\,g^{-2}}$
$m_e =$	0.911E−27	gm	$m_p =$	1.67E−24	gm	$e =$	4.80E−10	esu

SOLAR PROPERTIES

Mass	$M_\odot$	1.99E+33	gm	Luminosity	$L_\odot$	3.83E+33	erg/sec
Radius	$R_\odot$	6.96E+10	cm	surface gravity	$g_\odot$	2.74E+4	$\mathrm{cm/sec^2}$
1 AU	$D_\odot$	1.50E+13	cm	escape speed	v_∞	6.18E+7	cm/sec
Synodic period†		2.38E+6	sec	Siderial frequency†	$\Omega_\odot$	2.84E−6	rad/sec

† Equatorial; Synodic/siderial period: 27.56/25.62 days (doppler shift — Snodgrass [1984])

Definitions: $T = T_6 \times 10^6\,\mathrm{K}$, $n_e = n_i = n_9 \times 10^9\,\mathrm{cm^{-3}}$, $B = B_2 \times 100\mathrm{G}$

PLASMA PROPERTIES			electron	proton	×	units
plasma frequency	$\omega_{ps} =$	$\sqrt{4\pi n_s e^2/m_s}$	1.8E+9	4.2E+7	$n_9^{1/2}$	rad/sec
gyro-frequency	$\Omega_s =$	$eB/m_s c$	1.8E+9	.96E+6	B_2	rad/sec
Coulomb logarithm	$\ln\Lambda$		18 + $\ln(T_6^{3/2} n_9^{-1/2})$			—
thermal speed	$v_s =$	$\sqrt{k_b T_s/m_s}$	3.9E+8	.91E+7	$T_6^{1/2}$	cm/sec
gyro-radius	$\rho_s =$	v_s/Ω_s	0.22	9.5	$T_6^{1/2} B_2^{-1}$	cm
plasma skin depth	$d_s =$	c/ω_{ps}	17	718	$n_9^{-1/2}$	cm
Debeye length	$\lambda_s =$	v_s/ω_{ps}	0.22	0.22	$T_6^{1/2}\, n_9^{-1/2}$	cm
collision time	$\tau_s =$	$0.30\,(m_s^2/e^4) v_s^3/n \ln\Lambda$	1.5E−2	.93†	$T_6^{3/2}\, n_9^{-1}$	sec
collision frequency	$\nu_s =$	$1/\tau_s$	65	1.08	$T_6^{-3/2} n_9$	Hz
mean-free path	$\ell_s =$	$v_s \tau_s$	5.9E+6	8.4E+6	$T_6^2\, n_9^{-1}$	cm
Stopping column	$N =$	$E^2/6\pi e^4 \ln\Lambda$	1.4E+17		E_{keV}^2	$\mathrm{cm^{-2}}$

† $\tau_i = \sqrt{2}\sqrt{m_i/m_e}\tau_e$

MHD PROPERTIES			×	units
Alfvén speed	$v_\mathrm{A} =$	$B/\sqrt{4\pi\rho}$ 6.9E+8	$B_2\, n_9^{-1/2}$	cm/sec
sound speed	$c_\mathrm{s} =$	$\sqrt{2\gamma k_b T/m_p}$ 1.7E+7	$T_6^{1/2}$	cm/sec
plasma β	$\beta =$	$8\pi p/B^2$ 6.9E−4	$T_6\, n_9/B_2^2$	—
scale height	$H_p =$	$2k_b T/m_p g_\odot$ 6.0E+9	T_6	cm
electric conductivity†	$\sigma =$	$0.16\omega_e^2\tau_e$ 7.8E+15	$T_6^{3/2}$	$\mathrm{sec^{-1}}$
thermal conductivity†	$\kappa =$	$3.2\, k_b n_e\, v_e^2 \tau_e$ 1.0E+9	$T_6^{5/2}$	$\mathrm{erg\,(cm\,s\,K)^{-1}}$
Spitzer current (cgs)	$I_\mathrm{sp}/c =$	$\eta\sqrt{\rho/4\pi}$ 1.4E−4	$T_6^{-3/2}\, n_9^{1/2}$	G cm
(MKS)	$I_\mathrm{sp} =$	$\eta\sqrt{\rho/\mu_0}$ 1.4E−3	$T_6^{-3/2}\, n_9^{1/2}$	Amps
Dreicer field (cgs)	$E_\mathrm{D} =$	$e \ln\Lambda/\lambda_D^2$ 1.8E−7	n_9/T_6	G
(MKS)	$E_\mathrm{D} =$	$e \ln\Lambda/4\pi\epsilon_0\lambda_D^2$ 5.9E−3	n_9/T_6	Volts/m
conductive time	$\tau_\mathrm{cond} =$	$2n_e k_b L^2/\kappa$ 270	$n_9\, T_6^{-5/2} L_9^2$	sec
radiative time°	$\tau_\mathrm{rad} =$	$2k_b T/n_e \Lambda(T)$ 2.3E+3	$T_6^{3/2}/n_9$	sec
diffusion coefficients				
viscosity†	$\nu =$	$0.96\, v_i^2 \tau_i$ 7.3E+13	$T_6^{5/2}\, n_9^{-1}$	$\mathrm{cm^2/sec}$
magnetized viscosity‡	$\nu_\perp =$	$0.3\, \rho_i^2/\tau_i$ 29	$T_6^{-1/2}\, n_9\, B_2^{-2}$	$\mathrm{cm^2/sec}$
thermal conductivity†	$\tilde{\kappa} =$	$(\gamma-1)\kappa/k_b n_e$ 4.9E+15	$T_6^{5/2}\, n_9^{-1}$	$\mathrm{cm^2/sec}$
resistivity†	$\eta =$	$c^2/4\pi\sigma$ .92E+4	$T_6^{-3/2}$	$\mathrm{cm^2/sec}$

† Component $\parallel$ to $\mathbf{B}$; $\sigma_\perp = 0.51\sigma$ and $\eta_\perp = 1.96\eta$ ‡ Coupling rate-of-strain & stress $\perp$ to $\mathbf{B}$

∘ $\Lambda(T) = 1.2 \times 10^{-22}\, T_6^{-1/2}\,\mathrm{erg\,cm^3/s}$ good for $300,000\ \mathrm{K} < T < 30\ \mathrm{MK}$.