TABLE A.1 Physical Constants

Name	Symbol	Value	Units
Gravitational constant	G	6.673×10^{-11}	$m^3\,kg^{-1}\,s^{-2}$
Permittivity of the vacuum	ϵ_o	8.854×10^{-12}	$C^2\,N^{-1}\,m^{-2}$
Permeability of the vacuum	μ_o	$4\pi \times 10^{-7}$	W m
Elementary charge	e	1.602×10^{-19}	C
Speed of light in vacuum	c	2.998×10^{8}	$m\,s^{-1}$
Planck constant	h	6.626×10^{-34}	J s
Reduced Planck constant	$\hbar \equiv h/2\pi$	1.055×10^{-34}	J s
Boltzmann constant	k	1.381×10^{-23}	$m^2\,kg\,s^{-2}\,K^{-1}$
Stefan–Boltzmann constant	σ_{SB}	5.670×10^{-8}	$W\,m^{-2}K^{-4}$
Thomson cross-section	σ_e	6.652×10^{-29}	m^2
Proton mass	m_p	1.673×10^{-27}	kg
Electron mass	m_e	9.109×10^{-31}	kg

TABLE A.2 Astronomical Constants

Name	Symbol	Value	Units
Mass of Earth	$M_\oplus$	5.974×10^{24}	kg
Mass of Sun	$M_\odot$	1.989×10^{30}	kg
Mass of Moon		7.36×10^{22}	kg
Equatorial radius of Earth	$R_\oplus$	6378	km
Equatorial radius of Sun	$R_\odot$	6.955×10^{5}	km
Equatorial radius of Moon		1737	km
Mean density of Earth		5515	$kg\,m^{-3}$
Mean density of Sun		1408	$kg\,m^{-3}$
Mean density of Moon		3346	$kg\,m^{-3}$
Luminosity of Sun	$L_\odot$	3.839×10^{26}	W
Effective temperature of Sun		5778	K
Hubble constant	H_o	70 ± 5	$km\,s^{-1}\,Mpc^{-1}$
Light-year		9.461×10^{12}	km
Astronomical unit	AU	1.496×10^{8}	km
Parsec	pc	3.086×10^{13}	km

TABLE A.5 MK Spectral Types (Main Sequence Stars)

Type	M_V	$(B-V)_o$	$T_{\rm eff}$	BC	$M/M_\odot$ [a]	$R/R_\odot$ [b]	$\log(g/g_\odot)$ [c]
Main Sequence (luminosity class V)							
O5	−5.7	−0.33	42,000	−4.40	60	12	−1.5
B0	−4.0	−0.30	30,000	−3.16	17.5	7.4	−1.4
B5	−1.2	−0.17	15,200	−1.46	5.9	3.9	−1.00
A0	+0.65	−0.02	9790	−0.30	2.9	2.9	−0.7
A5	+1.95	+0.15	8180	−0.15	2.0	1.7	−0.4
F0	+2.7	+0.30	7300	−0.09	1.6	1.5	−0.3
F5	+3.5	+0.44	6650	−0.14	1.4	1.3	−0.2
G0	+4.4	+0.58	5940	−0.18	1.05	1.1	−0.1
G2	+4.7	+0.63	5790	−0.20	1.00	1.00	0.0
G5	+5.1	+0.68	5560	−0.21	0.92	0.92	−0.1
K0	+5.9	+0.81	5150	−0.31	0.79	0.85	+0.1
K5	+7.35	+1.15	4410	−0.72	0.67	0.72	+0.25
M0	+8.8	+1.40	3840	−1.38	0.51	0.60	+0.35
M5	+12.3	+1.64	3170	−2.73	0.21	0.27	+1.0
M8					0.06	0.10	+1.2

Appendix B | Physical and astronomical constants

Physical constants

speed of light	$c = 2.99792456 \times 10^{10}$ cm/s $= 2.99792456 \times 10^{5}$ km/s
gravitation constant	$G = 6.6732 \times 10^{-8}$ dyne cm^2/g^2
Boltzmann constant	$k = 1.3806 \times 10^{-16}$ erg/K
Planck's constant	$h = 6.6262 \times 10^{-27}$ erg s
Stefan–Boltzmann constant	$\sigma = 5.6696 \times 10^{-5}$ erg/cm^2 K^4 s
Wien displacement constant	$\lambda_{max}T = 2.89789 \times 10^{-1}$ cm K
Rydberg constant	$R = 1.097373 \times 10^{5}$/cm
Avogadro's number	$N_A = 6.022169 \times 10^{23}$/mol
atomic mass unit	$u = 1.66053 \times 10^{-24}$ g
mass of proton	$m_p = 1.6726 \times 10^{-24}$ g
mass of neutron	$m_n = 1.6749 \times 10^{-24}$ g
mass of electron	$m_e = 9.1096 \times 10^{-28}$ g
mass of hydrogen atom	$m_H = 1.6735 \times 10^{-24}$ g
charge of proton	$e = 4.8033 \times 10^{-10}$ esu
Bohr radius	$a_0 = 5.29177 \times 10^{-9}$ cm

Astronomical constants

astronomical unit	1 AU = 1.4959789×10^{13} cm $= 1.4959789 \times 10^{8}$ km
parsec	1 pc = 3.0856×10^{18} cm $= 3.0856 \times 10^{13}$ km = 3.2615 ly
light year	1 ly = 9.4605×10^{17} cm
solar mass	$M_\odot = 1.9891 \times 10^{33}$ g
solar radius	$R_\odot = 6.9598 \times 10^{10}$ cm $= 6.9598 \times 10^{5}$ km
solar luminosity	$L_\odot = 3.83 \times 10^{33}$ erg/s
Earth mass	$M_E = 5.977 \times 10^{27}$ g
Earth radius (equatorial)	$R_E = 6.37817 \times 10^{8}$ cm $= 6.37817 \times 10^{3}$ km
Earth–Moon distance	$R_{EM} = 3.84403 \times 10^{10}$ cm $= 3.84403 \times 10^{5}$ km
Moon mass	$M_M = 7.35 \times 10^{25}$ g
Moon radius	$R_M = 1.738 \times 10^{8}$ cm $= 1.738 \times 10^{3}$ km
galactic center–Sun distance	$R_0 = 8.5$ kpc
orbital speed of the Sun about the galactic center	$v_0 = 220$ km/s