The main sequence[a]

Sp (V)	$U-V$	$B-V$	$V-R$	$V-I$	$V-J$	$V-K$	$V-L$	$V-M$	$V-N$	BC	T_e (K)
O5–7	−1.46	−0.32	−0.15	−0.47	−0.73	−0.94	−1.01	—	—	—	38 000
O8–9	−1.44	−0.31	−0.15	−0.47	−0.73	−0.94	−1.01	—	—	—	35 000[b]
O9.5	−1.40	−0.30	−0.14	−0.46	−0.73	−0.94	−1.00	—	—	−3.34	31 900
B0	−1.38	−0.30	−0.13	−0.42	−0.70	−0.93	−0.99	—	—	−3.17	30 000
B0.5	−1.29	−0.28	−0.12	−0.39	−0.66	−0.88	−0.93	—	—	−2.80	27 000[b]
B1	−1.19	−0.26	−0.11	−0.36	−0.61	−0.81	−0.86	—	—	−2.50	24 200
B2	−1.10	−0.24	−0.10	−0.32	−0.55	−0.74	−0.77	—	—	−2.23	22 100
B3	−0.91	−0.20	−0.08	−0.27	−0.45	−0.61	−0.63	—	—	−1.77	18 800
B5	−0.72	−0.16	−0.06	−0.22	−0.35	−0.47	−0.48	—	—	−1.39	16 400
B6	−0.63	−0.14	−0.06	−0.19	−0.30	−0.41	−0.41	—	—	−1.21	15 400
B7	−0.54	−0.12	−0.04	−0.17	−0.25	−0.35	−0.34	—	—	−1.04	14 500
B8	−0.39	−0.09	−0.02	−0.12	−0.17	−0.24	−0.22	—	—	−0.85	13 400
B9	−0.25	−0.06	0.00	−0.06	−0.09	−0.14	−0.11	—	—	−0.66	12 400
A0	0.00	0.00	+0.02	0.00	−0.01	−0.03	0.00	−0.03	−0.03	−0.40	10 800
A2	+0.12	+0.06	+0.08	+0.09	+0.11	+0.13	+0.16	+0.13	+0.13	−0.25	9730
A5	+0.25	+0.14	+0.16	+0.22	+0.27	+0.36	+0.40	+0.36	+0.36	−0.15	8620
A7	+0.30	+0.19	+0.19	+0.28	+0.35	+0.46	+0.52	+0.46	+0.46	−0.12	8190
F0	+0.37	+0.31	+0.30	+0.47	+0.58	+0.79	+0.86	+0.79	+0.79	−0.08	7240
F2	+0.39	+0.36	+0.35	+0.55	+0.68	+0.93	+1.07	+0.93	+0.93	−0.06	6930
F5	+0.43	+0.43	+0.40	+0.64	+0.79	+1.07	+1.25	+1.07	+1.07	−0.04	6540

F8	+0.60	+0.54	+0.47	+0.76	+0.96	+1.27	+1.45	+1.27	+1.27	−0.05	6200
G0	+0.70	+0.59	+0.50	+0.81	+1.03	+1.35	+1.53	+1.35	+1.35	−0.06	5920
G2	+0.79	+0.63	+0.53	+0.86	+1.10	+1.44	+1.61	+1.44	+1.44	−0.07	5780
G5	+0.86	+0.66	+0.54	+0.89	+1.14	+1.49	+1.67	—	—	−0.10	5610
G8	+1.06	+0.74	+0.58	+0.96	+1.24	+1.63	+1.85	—	—	−0.15	5490
K0	+1.29	+0.82	+0.64	+1.06	+1.38	+1.83	+2.00	—	—	−0.19	5240
K2	+1.60	+0.92	+0.74	+1.22	+1.57	+2.15	+2.24	—	—	−0.25	4780
K5	+2.18	+1.15	+0.99	+1.62	+2.04	+2.75	+2.84	—	—		
K7	+2.52	+1.30	+1.15	+1.93	+2.36	+3.21	+3.40	—	—	−0.65	4410
										−0.90	4160
M0	+2.67	+1.41	+1.28	+2.19	+2.71	+3.60	+3.78	—	—	−1.20	3920
M1	+2.70	+1.48	+1.40	+2.45	+3.06	+3.95	+4.15	—	—	−1.48	3680
M2	+2.69	+1.52	+1.50	+2.69	+3.37	+4.27	+4.47	—	—	−1.76	3500
M3	+2.70	+1.55	+1.60	+2.94	+3.66	+4.57	+4.79	—	—	−2.03	3360
M4	+2.70	+1.56	+1.70	+3.19	+3.97	+4.87	+5.20	—	—	−2.31	3230
M5	+2.80	+1.61	+1.80	+3.47	+4.28	+5.17	(+5.54)	—	—	−2.62	3120
M6	+2.99	+1.72	+1.93	+3.76	+4.63	+5.58	(+6.03)	—	—	—	—
M7	+3.24	+1.84	+2.20	+4.20	+5.20	+6.18	—	—	—	—	—
M8	(+3.50)	(+2.00)	(+2.50)	(+4.70)	(+5.80)	(+6.75)	—	—	—	−4.20	2660

Bolometric corrections, BC, effective temperatures, T_e, and colors for stars of various spectral types. $m_b = BC + V$, where m_b and V are the bolometric and visual magnitudes, respectively.

[a] Morgan & Keenan classification of spectral types.

[b] Interpolated values.

(Adapted from Johnson, H., *Ann. Rev. Astron. and Astrophys.*, **4**, 193, 1966 and for BC and T_e, Lang, K., *Astrophysical Formulae*, Springer-Verlag, 1974.)

Giant stars

Sp (III)	$U-V$	$B-V$	$V-R$	$V-I$	$V-J$	$V-K$	$V-L$	$V-M$	$V-N$	BC	T_e (K)
G5	+1.55	+0.92	+0.69	+1.17	+1.52	+2.08	+2.18	+2.02	+2.05	−0.20	5010
G8	+1.64	+0.95	+0.70	+1.18	+1.56	+2.16	+2.27	+2.09	+2.12	−0.21	4870
K0	+1.93	+1.04	+0.77	+1.30	+1.71	+2.35	+2.47	+2.25	+2.28	−0.30	4720
K1	+2.13	+1.10	+0.81	+1.37	+1.80	+2.48	+2.61	+2.36	+2.39	−0.36	4580
K2	+2.32	+1.16	+0.84	+1.42	+1.87	+2.59	+2.73	+2.45	+2.48	−0.42	4460
K3	+2.74	+1.30	+0.96	+1.61	+2.12	+2.92	+3.07	+2.75	+2.80	−0.59	4210
K4	+3.07	+1.41	+1.06	+1.81	+2.36	+3.24	+3.39	+3.05	+3.11	−0.79	4010
K5	+3.34	+1.54	+1.20	+2.10	+2.71	+3.67	+3.83	+3.47	+3.54	−1.08	3780
M0	+3.43	+1.55	+1.23	+2.17	+2.82	+3.79	+3.96	+3.59	+3.65	−1.17	3660
M1	+3.48	+1.56	+1.28	+2.27	+2.90	+3.92	+4.09	+3.72	+3.78	−1.25	3600
M2	+3.51	+1.59	+1.34	+2.44	+3.08	+4.11	+4.29	+3.91	+3.97	−1.41	3500
M3	+3.51	+1.60	+1.48	+2.79	+3.51	+4.58	+4.77	+4.39	+4.45	−1.80	3300
M4	+3.32	+1.59	+1.74	+3.39	+4.26	+5.24	+5.44	+5.10	+5.14	−2.44	3100
M5	+3.00	+1.55	+2.18	+4.14	+5.04	+6.06	+6.31	+6.00	+6.00	−3.23	2950
M6	+2.43	+1.54	+2.80	+5.06	+5.86	+7.01	+7.39			−4.15	2800

Bolometric corrections, BC, effective temperatures, T_e, and colors for stars of various spectral types. $m_b = BC + V$, where m_b and V are the bolometric and visual magnitudes respectively.

Classification and absolute magnitude of stars (M_v)

Sp	Supergiants Ia	Supergiants Ib	Bright giants II	Giants III	Sub-giants IV	Main sequence dwarfs V	ZAMS[a] V	White dwarfs VII	Population II: Sub-dwarfs VI	Population II: Red branch	Population II: Horiz. branch
O5	−6.4			−5.4		−5.7					
B0	−6.7	−6.1	−5.4	−5.0	−4.7	−4.1	−3.3	+10.2			
B5	−6.9	−5.7	−4.3	−2.4	−1.8	−1.1	−0.2	+10.7			+2.3
A0	−7.1	−5.3	−3.1	−0.2	+0.1	+0.7	+1.5	+11.3			+0.8
A5	−7.7	−4.9	−2.6	+0.5	+1.4	+2.0	+2.4	+12.2			+0.5
F0	−8.2	−4.7	−2.3	+1.2	+2.0	+2.6	+3.1	+12.9			+0.4
F5	−7.7	−4.7	−2.2	+1.4	+2.3	+3.4	+3.9	+13.6	+4.8	+4.8	+0.4
G0	−7.5	−4.7	−2.1	+1.1	+2.9	+4.4	+4.6	+14.3	+5.7	+4.1	+0.3
G5	−7.5	−4.7	−2.1	+0.7	+3.1	+5.1	+5.2	+14.9	+6.4	+2.0	−0.1
K0	−7.5	−4.6	−2.1	+0.5	+3.2	+5.9	+6.0	+15.3	+7.3	−0.2	−0.6
K5	−7.5	−4.6	−2.2	−0.2		+7.3	+7.3	+15	+8.4	−2.2	−2.2
M0	−7.5	−4.6	−2.3	−0.4		+9.0	+9.0	+15	+10	−3	−3
M2	−7		−2.4	−0.6		+10.0	+10.0		+12		
M5				−0.8		+11.8	+11.8		+14		
M8						+16			+16		

Relation between absolute magnitude M_v and emission line width W (FWHM in km s^{-1}):

Emission line	*Relation*
Ca II K	$M_v = 27.59 - 14.94 \log W$ (Wilson–Bappu)
Mg II K	$M_v = 34.93 - 15.15 \log W$
H Lα	$M_v = (40.2 \pm 4.5) - (14.7 \pm 1.6) \log W$

[a] Zero age main sequence.

(After Allen, C. W., *Astrophysical Quantities*, The Athlone Press, 1973.)

Stellar mass, luminosity, radius and density (luminosity and radius with mass; white dwarfs omitted)

$\log(M/M_\odot)$	$\log(L/L_\odot)$	M_{bol}	M_v	M_B	$\log(R/R_\odot)$ main seq.
−1.0	−2.9	+12.1	15.5	+17.1	−0.9
−0.8	−2.5	+10.9	13.9	+15.5	−0.7
−0.6	−2.0	+9.7	12.2	+13.9	−0.5
−0.4	−1.5	+8.4	10.2	+11.8	−0.3
−0.2	−0.8	+6.6	7.5	+8.7	−0.14
0.0	0.0	+4.7	4.8	+5.5	0.00
+0.2	+0.8	+2.7	2.7	+3.0	+0.10
+0.4	+1.6	+0.7	1.1	+1.1	+0.32
+0.6	+2.3	−1.1	−0.2	−0.1	+0.49
+0.8	+3.0	−2.9	−1.1	−1.2	+0.58
+1.0	+3.7	−4.6	−2.2	−2.4	+0.72
+1.2	+4.4	−6.3	−3.4	−3.6	+0.86
+1.4	+4.9	−7.6	−4.6	−4.9	+1.00
+1.6	+5.4	−8.9	−5.6	−6.0	+1.15
+1.8	+6.0	−10.2	−6.3	−6.9	+1.3

(After Allen, C. W., *Astrophysical Quantities*, Athlone Press, 1973.)

Stellar mass, luminosity, radius and density (mass, radius, luminosity, and mean density with spectral class)[a]

	$\log(M/M_\odot)$			$\log(R/R_\odot)$			$\log \bar{\rho}$ (g cm^{-3})			$\log(L/L_\odot)$		
Sp	I	III	V	I	III	V	I	III	V	I	III	V
O5	+2.2		+1.6			+1.25			−2.0			+5.7
B0	+1.7		+1.25	+1.3	+1.2	+0.87	−2.1		−1.2	+5.4		+4.3
B5	+1.4		+0.81	+1.5	+1.0	+0.58	−2.9		−0.78	+4.8		+2.9
A0	+1.2		+0.51	+1.6	+0.8	+0.40	−3.5		−0.55	+4.3		+1.9
A5	+1.1		+0.32	+1.7		+0.24	−3.8		−0.26	+4.0		+1.3
F0	+1.1		+0.23	+1.8		+0.13	−4.2		−0.01	+3.9		+0.8
F5	+1.0		+0.11	+1.9	+0.6	+0.08	−4.5		+0.03	+3.8		+0.4
G0	+1.0	+0.4	+0.04	+2.0	+0.8	+0.02	−4.9	−1.8	+0.13	+3.8	+1.5	+0.1
G5	+1.1	+0.5	−0.03	+2.1	+1.0	−0.03	−5.2	−2.4	+0.20	+3.8	+1.7	−0.1
K0	+1.1	+0.6	−0.11	+2.3	+1.2	−0.07	−5.7	−2.9	+0.25	+3.9	+1.9	−0.4
K5	+1.2	+0.7	−0.16	+2.6	+1.4	−0.13	−6.4	−3.4	+0.38	+4.2	+2.3	−0.8
M0	+1.2	+0.8	−0.33	+2.7		−0.20	−6.7	−4	+0.4	+4.5	+2.6	−1.2
M2	+1.3		−0.41	+2.9		−0.3	−7.2		+0.7	+4.7	+2.8	−1.5
M5			−0.67			−0.5			+1.0		+3.0	−2.1
M8			−1.0			−0.9			+1.8			−3.1

[a] I = supergiant, III = giant, V = dwarf.
A single column between III and V represents main sequence.
(After Allen, C. W., *Astrophysical Quantities*, Athlone Press, 1973.)

Present-day mass function (PDMF)

M_v	$\phi(M_v)$ (stars pc^{-3} mag^{-1})	$\log M/M_\odot$	$-\frac{dM_v}{d\log M}$	$2H$ (pc)	$\log T_{MS}$ (y)	f_{MS}	$\phi_{MS}(\log M)$ (stars pc^{-2} $\log M^{-1}$)
−6	1.49(−8)*	2.07	3.7	180	6.42	0.40	3.97(−6)*
−5	7.67(−8)	1.80	3.7	180	6.50	0.40	2.04(−5)
−4	3.82(−7)	1.53	3.7	180	6.58	0.41	1.04(−4)
−3	1.80(−6)	1.26	3.7	180	6.84	0.42	5.03(−4)
−2	7.86(−6)	0.99	3.7	180	7.19	0.43	2.25(−3)
−1	3.07(−5)	0.72	3.7	180	7.68	0.46	9.41(−3)
0	1.04(−4)	0.45	10.8	180	8.36	0.50	1.01(−1)
1	2.95(−4)	0.36	10.8	180	8.62	0.56	3.21(−1)
2	6.94(−4)	0.26	10.8	180	8.93	0.64	8.63(−1)
3	1.36(−3)	0.17	10.8	300	9.24	0.78	3.44(+0)
4	2.26(−3)	0.08	10.8	465	9.60	0.98	1.11(+1)
5	3.31(−3)	−0.02	10.8	630	9.83	1.00	2.25(+1)
6	4.41(−3)	−0.11	10.8	650	10.28	1.00	3.10(+1)
7	5.48(−3)	−0.20	10.8	650	—	1.00	3.85(+1)
8	6.52(−3)	−0.29	10.8	650	—	1.00	4.58(+1)
9	7.53(−3)	−0.39	10.8	650	—	1.00	5.29(+1)
10	8.52(−3)	−0.48	10.8	650	—	1.00	5.98(+1)

11	9.54(−3)	−0.57	10.8	650	—	1.00	6.70(+1)
12	1.06(−2)	−0.67	10.8	650	—	1.00	7.44(+1)
13	1.17(−2)	−0.76	10.8	650	—	1.00	8.21(+1)
14	1.29(−2)	−0.85	10.8	650	—	1.00	9.06(+1)
15	1.41(−2)	−0.94	10.8	650	—	1.00	9.90(+1)
16	1.41(−2)	−1.04	10.8	650	—	1.00	9.90(+1)

*Number in parenthesis is power of 10.
$\phi(M_v) \equiv$ luminosity function of field stars.
$\phi_{MS}(\log M) \equiv$ present-day mass function (PDMF) of *main-sequence* field stars in the solar neighborhood is given by

$$\phi_{MS}(\log M) = \phi(M_v)\left|\frac{dM_v}{d\log M}\right| 2H(M_v) f_{MS}(M_v), \text{ where}$$

$H(M_v)$ is the scale height assuming that stars are distributed as $\exp(-|z|/H)$, where z is the distance measured perpendicular to the Galactic plane.
The factor $f_{MS}(M_v)$ gives the fraction of stars at a given magnitude that are on the main sequence.
$T_{MS} =$ the main-sequence lifetime is given by

$$T_{MS} = \frac{\Delta X_{MS} ME}{L} \simeq 13 \times 10^9 (M/M_\odot)^{-2.5} \text{ yr}, \quad M \lesssim 10\, M_\odot,$$

where

$\Delta X_{MS} =$ the mass fraction of hydrogen burned during the main-sequence phase, ~ 0.13.
$E =$ energy released per gram in the nuclear fusion reaction, $H \rightarrow He$, $\simeq 6.4 \times 10^{18}$ erg g^{-1}.
$L =$ total luminosity of star.
(Adapted from Shapiro, S. L. & Teukolsky, S. A., *Black Holes, White Dwarfs, and Neutron Stars*, John Wiley and Sons, 1983.)