# Astronomical and Physical Constants

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|---|---|
| Astronomical unit (AU) | $1.4960 \times 10^{11}$ m |
| Light year (ly) | $9.4605 \times 10^{15}$ m = 63 240 au |
| Parsec (pc) | $3.0860 \times 10^{16}$ m = 206 265 au |
| Jansky (Jy) | $10^{-26}$ W m$^{-2}$ Hz$^{-1}$ |
| 1 Sidereal year | 365.2564 solar days |
| 1 Tropical year | 365.2422 solar days |
| 1 Calendar year | 365.2425 solar days |
| 1 Sidereal day | $23^{\,h}\ 56^{\,m}\ 04^{\,s}.091$ |
| 1 Solar day | $24^{\,h}\ 03^{\,m}\ 56^{\,s}.555$ units of sidereal time |
| 1 Å | $10^{-10}$ m |
| 1 erg | $10^{-7}$ J |
| 1 dyne | $10^{-5}$ N |

| | |
|---|---|
| Mass of Earth | $5.9736 \times 10^{24}$ kg |
| Mean radius of Earth | $6.371 \times 10^{6}$ m |
| Equatorial radius of Earth | $6.378 \times 10^{6}$ m |
| Mean velocity of Earth on its orbit | 29.783 km s$^{-1}$ |
| Mass of Moon | $7.3490 \times 10^{22}$ kg |
| Radius of Moon | $1.737 \times 10^{6}$ m |
| Mass of Jupiter | $1.89813 \times 10^{27}$ kg |
| Mean Earth – Moon distance | $3.844 \times 10^{8}$ m |
| Mass of Sun | $1.98892 \times 10^{30}$ kg |
| Radius of Sun | $6.96 \times 10^{8}$ m |
| Effective temperature of the Sun | 5780 K |
| Luminosity of the Sun | $3.96 \times 10^{26}$ J s$^{-1}$ |
| Solar constant | 1366 W m$^{-2}$ |
| Brightness of the Sun in V-band | $-26.8$ mag. |
| Absolute brightness of the Sun in V-band | 4.75 mag. |
| Absolute bolometric brightness of Sun | 4.72 mag. |
| Angular diameter of the Sun | 30′ |
| Speed of light in vacuum (c) | $2.9979 \times 10^{8}$ m s$^{-1}$ |
| Gravitational constant (G) | $6.6738 \times 10^{-11}$ N m$^{2}$ kg$^{-2}$ |
| Boltzmann constant (k) | $1.381 \times 10^{-23}$ m kg s$^{-2}$ K$^{-1}$ |
| Universal gas constant (R) | 8.31 J K$^{-1}$ mol$^{-1}$ |
| Stefan–Boltzmann constant (σ) | $5.6704 \times 10^{-8}$ kg s$^{-3}$ K$^{-4}$ |
| Planck constant (h) | $6.6261 \times 10^{-34}$ J s |
| Wien's constant (b) | $2.8978 \times 10^{-3}$ m K |
| Hubble constant ($H_0$) | 70 km s$^{-1}$ Mpc$^{-1}$ |

| electron charge (e) | $1.602 \times 10^{-19}$ C |
| Mass of hydrogen atom | $1.67 \times 10^{-27}$ kg |
| Current inclination of the ecliptic ($\varepsilon$) | 23º 26.3' |
| Coordinates of the northern ecliptic pole for epoch 2000.0 ($\alpha_E$, $\delta_E$) | $18^h\, 00^m\, 00^s$, + 66º 33.6' |
| Coordinates of the northern galactic pole for epoch 2000.0 ($\alpha_G$, $\delta_G$) | $12^h\, 51^m$, + 27º 08' |

You can try to solve an equation $x = f(x)$ using iteration: $x_{n+1} = f(x_n)$.

Basic equations of spherical trigonometry

$$\sin a \sin B = \sin b \sin A$$
$$\sin a \cos B = \cos b \sin c - \sin b \cos c \cos A,$$
$$\cos a = \cos b \cos c + \sin b \sin c \cos A.$$
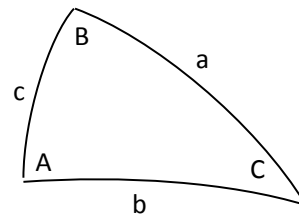


Rayleigh-Jeans formula (long wavelength approximation of Planck's Law):

$$B_\nu(T) = \frac{2kT\nu^2}{c^2}$$