

## Data Sheet

## Physical Constants and Conversion Factors

## Recommended values

Abstracted from the consistent set of constants in CODATA Bull. No. 63 (1986) by the Royal Society, the Institute of Physics, and the Royal Society of Chemistry.

The number in parenthesis after each value is the estimated uncertainty (standard deviation) of the last digit quoted.

speed of light in a vacuum	$c$	$2.997\,924\,58 \times 10^8 \text{ m s}^{-1}$ (exact)
permeability of a vacuum	$\mu_0$	$4\pi \times 10^{-7} \text{ H m}^{-1}$
permittivity of a vacuum, $[\mu_0 c^2]^{-1}$	$\epsilon_0$	$8.854\,187\,817\dots \times 10^{-12} \text{ F m}^{-1}$
elementary charge (of proton)	$e$	$1.602\,177\,33(49) \times 10^{-19} \text{ C}$
gravitational constant	$G$	$6.672\,59(85) \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
Planck constant	$h$	$6.626\,0755(40) \times 10^{-34} \text{ J s}$
Avogadro constant	$N_A$	$6.022\,1367(36) \times 10^{23} \text{ mol}^{-1}$
molar gas constant	$R$	$8.314\,510(70) \text{ J K}^{-1} \text{ mol}^{-1}$
Boltzmann constant	$k$	$1.380\,658(12) \times 10^{-23} \text{ J K}^{-1}$
unified atomic mass constant	$m_u$	$1.660\,5402(10) \times 10^{-27} \text{ kg}$
rest mass of electron	$m_e$	$9.109\,3897(54) \times 10^{-31} \text{ kg}$

## SI secondary units

astronomical unit	AU	$1.495\,978 \times 10^{11} \text{ m}$
parsec	pc	$3.0856 \times 10^{16} \text{ m} = 3.262 \text{ ly}$
Gregorian calendar year	y	$365.2425 \text{ days} = 31\,556\,952 \text{ s}$
jansky	Jy	$10^{-26} \text{ W m}^{-2} \text{ Hz}^{-1}$

## Indicative values

earth mass	$5.977 \times 10^{24} \text{ kg}$
solar mass, $M_\odot$	$1.989 \times 10^{30} \text{ kg}$
galaxy mass	$10^{11} M_\odot$
Hubble constant, $H_0$	$100 h \text{ km s}^{-1} \text{ Mpc}^{-1}$ (typically $h$ ranges from 1 to 0.5)

## Conversion factors

distance (light-year)	ly	$9.460 \times 10^{15} \text{ m} = 63\,240 \text{ AU}$
energy (erg)	erg	$10^{-7} \text{ J}$
magnetic field (gauss)	G	$10^{-4} \text{ T}$
wavelength (angstrom)	Å	$10^{-10} \text{ m}$