

## Physical Constants

(Adapted from *Physics Formulary* by J.C.A. Wevers <johanw@vulcan.xs4all.nl>)

| Name                         | Symbol                                                                          | Value                        | Unit                                              |
|------------------------------|---------------------------------------------------------------------------------|------------------------------|---------------------------------------------------|
| Number $\pi$                 | $\pi$                                                                           | 3.14159265358979323846       |                                                   |
| Number e                     | e                                                                               | 2.71828182845904523536       |                                                   |
| Euler's constant             | $\gamma = \lim_{n \rightarrow \infty} \left( \sum_{k=1}^n 1/k - \ln(n) \right)$ | 0.5772156649                 |                                                   |
| Elementary charge            | $e$                                                                             | $1.60217733 \cdot 10^{-19}$  | C                                                 |
| Gravitational constant       | $G, \kappa$                                                                     | $6.67259 \cdot 10^{-11}$     | $\text{m}^3\text{kg}^{-1}\text{s}^{-2}$           |
| Fine-structure constant      | $\alpha = e^2/2hc\varepsilon_0$                                                 | $\approx 1/137$              |                                                   |
| Speed of light in vacuum     | $c$                                                                             | $2.99792458 \cdot 10^8$      | m/s (def)                                         |
| Permittivity of vacuum       | $\varepsilon_0$                                                                 | $8.854187 \cdot 10^{-12}$    | F/m                                               |
| Permeability of vacuum       | $\mu_0$                                                                         | $1.256637 \cdot 10^{-6}$     | H/m                                               |
| $(4\pi\varepsilon_0)^{-1}$   |                                                                                 | $8.9876 \cdot 10^9$          | $\text{Nm}^2\text{C}^{-2}$                        |
| Impedance of free space      | $\eta_0$                                                                        | 376.73                       | $\Omega$                                          |
| Planck's constant            | $h$                                                                             | $6.6260755 \cdot 10^{-34}$   | Js                                                |
| Dirac's constant             | $\hbar = h/2\pi$                                                                | $1.0545727 \cdot 10^{-34}$   | Js                                                |
| Bohr magneton                | $\mu_B = e\hbar/2m_e$                                                           | $9.2741 \cdot 10^{-24}$      | $\text{Am}^2$                                     |
| Bohr radius                  | $a_0$                                                                           | 0.52918                      | $\text{\AA}$                                      |
| Rydberg's constant           | $Ry$                                                                            | 13.595                       | eV                                                |
| Electron Compton wavelength  | $\lambda_{Ce} = h/m_e c$                                                        | $2.2463 \cdot 10^{-12}$      | m                                                 |
| Proton Compton wavelength    | $\lambda_{Cp} = h/m_p c$                                                        | $1.3214 \cdot 10^{-15}$      | m                                                 |
| Reduced mass of the H-atom   | $\mu_H$                                                                         | $9.1045755 \cdot 10^{-31}$   | kg                                                |
| Stefan-Boltzmann's constant  | $\sigma$                                                                        | $5.67032 \cdot 10^{-8}$      | $\text{Wm}^{-2}\text{K}^{-4}$                     |
| Wien's constant              | $k_W$                                                                           | $2.8978 \cdot 10^{-3}$       | mK                                                |
| Molar gas constant           | $R$                                                                             | 8.31441                      | $\text{J}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$  |
| Avogadro's constant          | $N_A$                                                                           | $6.0221367 \cdot 10^{23}$    | $\text{mol}^{-1}$                                 |
| Boltzmann's constant         | $k = R/N_A$                                                                     | $1.380658 \cdot 10^{-23}$    | J/K                                               |
| Electron mass                | $m_e$                                                                           | $9.1093897 \cdot 10^{-31}$   | kg                                                |
| Proton mass                  | $m_p$                                                                           | $1.6726231 \cdot 10^{-27}$   | kg                                                |
| Neutron mass                 | $m_n$                                                                           | $1.674954 \cdot 10^{-27}$    | kg                                                |
| Elementary mass unit         | $m_u = \frac{1}{12}m(^{12}_6\text{C})$                                          | $1.6605656 \cdot 10^{-27}$   | kg                                                |
| Nuclear magneton             | $\mu_N$                                                                         | $5.0508 \cdot 10^{-27}$      | J/T                                               |
| Diameter of the Sun          | $D_\odot$                                                                       | $1392 \cdot 10^6$            | m                                                 |
| Mass of the Sun              | $M_\odot$                                                                       | $1.989 \cdot 10^{30}$        | kg                                                |
| Rotational period of the Sun | $T_\odot$                                                                       | 25.38                        | days                                              |
| Radius of Earth              | $R_A$                                                                           | $6.378 \cdot 10^6$           | m                                                 |
| Mass of Earth                | $M_A$                                                                           | $5.976 \cdot 10^{24}$        | kg                                                |
| Rotational period of Earth   | $T_A$                                                                           | 23.96                        | hours                                             |
| Earth orbital period         | Tropical year                                                                   | 365.24219879                 | days                                              |
| Astronomical unit            | AU                                                                              | $1.4959787066 \cdot 10^{11}$ | m                                                 |
| Light year                   | lj                                                                              | $9.4605 \cdot 10^{15}$       | m                                                 |
| Parsec                       | pc                                                                              | $3.0857 \cdot 10^{16}$       | m                                                 |
| Hubble constant              | $H$                                                                             | $\approx (75 \pm 25)$        | $\text{km}\cdot\text{s}^{-1}\cdot\text{Mpc}^{-1}$ |