**Table 1.1.** Reviewed 2007 by P.J. Mohr and B.N. Taylor (NIST). Based mainly on the "CODATA Recommended Values of the Fundamental Physical Constants: 2006" by P.J. Mohr, B.N. Taylor, and D.B. Newell (to be published). The last group of constants (beginning with the Fermi coupling constant) comes from the Particle Data Group. The figures in parentheses after the values give the 1-standard-deviation uncertainties in the last digits; the corresponding fractional uncertainties in parts per $10^9$ (ppb) are given in the last column. This set of constants (aside from the last group) is recommended for international use by CODATA (the Committee on Data for Science and Technology). The full 2006 CODATA set of constants may be found at `http://physics.nist.gov/constants`

| Quantity | Symbol, equation | Value | Uncertainty (ppb) |
|---|---|---|---|
| speed of light in vacuum | $c$ | 299 792 458 m $s^{-1}$ | exact* |
| Planck constant | $h$ | $6.626\,068\,96(33)\times10^{-34}$ J s | 50 |
| Planck constant, reduced | $\hbar \equiv h/2\pi$ | $1.054\,571\,628(53)\times10^{-34}$ J s | 50 |
| | | $= 6.582\,118\,99(16)\times10^{-22}$ MeV s | 25 |
| electron charge magnitude | $e$ | $1.602\,176\,487(40)\times10^{-19}$ C $= 4.803\,204\,27(12)\times10^{-10}$ esu | 25, 25 |
| conversion constant | $\hbar c$ | 197.326 9631(49) MeV fm | 25 |
| conversion constant | $(\hbar c)^2$ | 0.389 379 304(19) $GeV^2$ mbarn | 50 |
| electron mass | $m_e$ | $0.510\,998\,910(13)$ MeV/$c^2$ $= 9.109\,382\,15(45)\times10^{-31}$ kg | 25, 50 |
| proton mass | $m_p$ | $938.272\,013(23)$ MeV/$c^2$ $= 1.672\,621\,637(83)\times10^{-27}$ kg | 25, 50 |
| | | $= 1.007\,276\,466\,77(10)$ u $= 1836.152\,672\,47(80)\ m_e$ | 0.10, 0.43 |
| deuteron mass | $m_d$ | 1875.612 793(47) MeV/$c^2$ | 25 |
| unified atomic mass unit (u) | (mass $^{12}$C atom)/12 = (1 g)/($N_A$ mol) | $931.494\,028(23)$ MeV/$c^2$ $= 1.660\,538\,782(83)\times10^{-27}$ kg | 25, 50 |
| permittivity of free space | $\epsilon_0 = 1/\mu_0 c^2$ | $8.854\,187\,817\ldots\times10^{-12}$ F $m^{-1}$ | exact |
| permeability of free space | $\mu_0$ | $4\pi\times10^{-7}$ N $A^{-2}$ $= 12.566\,370\,614\ldots\times10^{-7}$ N $A^{-2}$ | exact |
| fine-structure constant | $\alpha = e^2/4\pi\epsilon_0\hbar c$ | $7.297\,352\,5376(50)\times10^{-3} = 1/137.035\,999\,679(94)^\dagger$ | 0.68, 0.68 |
| classical electron radius | $r_e = e^2/4\pi\epsilon_0 m_e c^2$ | $2.817\,940\,2894(58)\times10^{-15}$ m | 2.1 |
| ($e^-$ Compton wavelength)/$2\pi$ | $\lambda\!\!\!^{-}_e = \hbar/m_e c = r_e\alpha^{-1}$ | $3.861\,592\,6459(53)\times10^{-13}$ m | 1.4 |
| Bohr radius ($m_{\rm nucleus} = \infty$) | $a_\infty = 4\pi\epsilon_0\hbar^2/m_e e^2 = r_e\alpha^{-2}$ | $0.529\,177\,208\,59(36)\times10^{-10}$ m | 0.68 |
| wavelength of 1 eV/$c$ particle | $hc$/(1 eV) | $1.239\,841\,875(31)\times10^{-6}$ m | 25 |
| Rydberg energy | $hcR_\infty = m_e e^4/2(4\pi\epsilon_0)^2\hbar^2 = m_e c^2\alpha^2/2$ | 13.605 691 93(34) eV | 25 |
| Thomson cross section | $\sigma_T = 8\pi r_e^2/3$ | 0.665 245 8558(27) barn | 4.1 |
| Bohr magneton | $\mu_B = e\hbar/2m_e$ | $5.788\,381\,7555(79)\times10^{-11}$ MeV $T^{-1}$ | 1.4 |
| nuclear magneton | $\mu_N = e\hbar/2m_p$ | $3.152\,451\,2326(45)\times10^{-14}$ MeV $T^{-1}$ | 1.4 |
| electron cyclotron freq./field | $\omega^e_{\rm cycl}/B = e/m_e$ | $1.758\,820\,150(44)\times10^{11}$ rad $s^{-1}$ $T^{-1}$ | 25 |
| proton cyclotron freq./field | $\omega^p_{\rm cycl}/B = e/m_p$ | $9.578\,833\,92(24)\times10^{7}$ rad $s^{-1}$ $T^{-1}$ | 25 |
| gravitational constant‡ | $G_N$ | $6.674\,28(67)\times10^{-11}$ $m^3$ $kg^{-1}$ $s^{-2}$ | $1.0\times10^5$ |
| | | $= 6.708\,81(67)\times10^{-39}\ \hbar c$ $(\mathrm{GeV}/c^2)^{-2}$ | $1.0\times10^5$ |
| standard gravitational accel. | $g_n$ | 9.806 65 m $s^{-2}$ | exact |
| Avogadro constant | $N_A$ | $6.022\,141\,79(30)\times10^{23}$ $mol^{-1}$ | 50 |
| Boltzmann constant | $k$ | $1.380\,6504(24)\times10^{-23}$ J $K^{-1}$ | 1700 |
| | | $= 8.617\,343(15)\times10^{-5}$ eV $K^{-1}$ | 1700 |
| molar volume, ideal gas at STP | $N_A k(273.15\ \mathrm{K})/(101\,325\ \mathrm{Pa})$ | $22.413\,996(39)\times10^{-3}$ $m^3$ $mol^{-1}$ | 1700 |
| Wien displacement law constant | $b = \lambda_{\rm max}T$ | $2.897\,7685(51)\times10^{-3}$ m K | 1700 |
| Stefan-Boltzmann constant | $\sigma = \pi^2 k^4/60\hbar^3 c^2$ | $5.670\,400(40)\times10^{-8}$ W $m^{-2}$ $K^{-4}$ | 7000 |
| Fermi coupling constant** | $G_F/(\hbar c)^3$ | $1.166\,37(1)\times10^{-5}$ $GeV^{-2}$ | 9000 |
| weak-mixing angle | $\sin^2\widehat{\theta}(M_Z)$ ($\overline{\rm MS}$) | 0.231 22(15)†† | $6.5\times10^5$ |
| $W^\pm$ boson mass | $m_W$ | 80.403(29) GeV/$c^2$ | $3.6\times10^5$ |
| $Z^0$ boson mass | $m_Z$ | 91.1876(21) GeV/$c^2$ | $2.3\times10^4$ |
| strong coupling constant | $\alpha_s(m_Z)$ | 0.1176(20) | $1.7\times10^7$ |

$\pi = 3.141\,592\,653\,589\,793\,238$ e $= 2.718\,281\,828\,459\,045\,235$ $\gamma = 0.577\,215\,664\,901\,532\,861$

1 in $\equiv 0.0254$ m  1 G $\equiv 10^{-4}$ T  1 eV $= 1.602\ 176\ 487(40)\times10^{-19}$ J  $kT$ at 300 K $= [38.681\ 685(68)]^{-1}$ eV

1 Å $\equiv 0.1$ nm  1 dyne $\equiv 10^{-5}$ N  1 eV/$c^2 = 1.782\ 661\ 758(44)\times10^{-36}$ kg  0 °C $\equiv 273.15$ K

1 barn $\equiv 10^{-28}$ $m^2$  1 erg $\equiv 10^{-7}$ J  $2.997\ 924\ 58\times10^9$ esu $= 1$ C  1 atmosphere $\equiv 760$ Torr $\equiv 101\ 325$ Pa

* The meter is the length of the path traveled by light in vacuum during a time interval of 1/299 792 458 of a second.

† At $Q^2 = 0$. At $Q^2 \approx m_W^2$ the value is $\sim 1/128$.

‡ Absolute lab measurements of $G_N$ have been made only on scales of about 1 cm to 1 m.

** See the discussion in Sec. 10, "Electroweak model and constraints on new physics."

†† The corresponding $\sin^2\theta$ for the effective angle is 0.23152(14).