2010 CODATA RECOMMENDED VALUES OF THE FUNDAMENTAL CONSTANTS OF PHYSICS AND CHEMISTRY NIST SP 959 (Dec 2012)

Values from: P. J. Mohr, B. N. Taylor, and D. B. Newell, *Rev. Mod. Phys.* **84**, 1527 (2012) and *J. Phys. Chem. Ref. Data* **41**, 043109 (2012). The number in parentheses is the one-sigma (1 σ) uncertainty in the last two digits of the given value.

Quantity	Symbol	Numerical value	Unit
speed of light in vacuum	c, c_0	299 792 458 (exact)	m s^{-1}
magnetic constant	μ_0	$4\pi \times 10^{-7}$ (exact)	N A^{-2}
electric constant $1/\mu_0 c^2$	ϵ_0	$8.854\,187\,817... \times 10^{-12}$	F m^{-1}
Newtonian constant of gravitation	G	$6.673\,84(80) \times 10^{-11}$	m^3 kg^{-1} s^{-2}
Planck constant	h	$6.626\,069\,57(29) \times 10^{-34}$	J s
$h/2\pi$	$\hbar$	$1.054\,571\,726(47) \times 10^{-34}$	J s
elementary charge	e	$1.602\,176\,565(35) \times 10^{-19}$	C
fine-structure constant $e^2/4\pi\epsilon_0\hbar c$	α	$7.297\,352\,5698(24) \times 10^{-3}$	
inverse fine-structure constant	α^{-1}	137.035 999 074(44)	
Rydberg constant $\alpha^2 m_e c/2h$	R_∞	10 973 731.568 539(55)	m^{-1}
Bohr radius $\alpha/4\pi R_\infty$	a_0	$0.529\,177\,210\,92(17) \times 10^{-10}$	m
Bohr magneton $e\hbar/2m_e$	μ_B	$927.400\,968(20) \times 10^{-26}$	J T^{-1}

Quantity	Symbol	Numerical value	Unit
electron mass	m_{e}	$9.109\,382\,91(40) \times 10^{-31}$	kg
proton mass	m_{p}	$1.672\,621\,777(74) \times 10^{-27}$	kg
proton-electron mass ratio	$m_{\mathrm{p}}/m_{\mathrm{e}}$	$1836.152\,672\,45(75)$	
Avogadro constant	N_{A}, L	$6.022\,141\,29(27) \times 10^{23}$	mol^{-1}
Faraday constant $N_{\mathrm{A}}e$	F	$96\,485.3365(21)$	$\mathrm{C\ mol}^{-1}$
molar gas constant	R	$8.314\,4621(75)$	$\mathrm{J\ mol}^{-1}\ \mathrm{K}^{-1}$
Boltzmann constant R/N_{A}	k	$1.380\,6488(13) \times 10^{-23}$	$\mathrm{J\ K}^{-1}$
Stefan-Boltzmann const. $\pi^2 k^4/60\hbar^3 c^2$	σ	$5.670\,373(21) \times 10^{-8}$	$\mathrm{W\ m}^{-2}\ \mathrm{K}^{-4}$
magnetic flux quantum $h/2e$	Φ_0	$2.067\,833\,758(46) \times 10^{-15}$	Wb
Josephson constant $2e/h$	K_{J}	$483\,597.870(11) \times 10^{9}$	$\mathrm{Hz\ V}^{-1}$
von Klitzing constant h/e^2	R_{K}	$25\,812.807\,4434(84)$	Ω
electron volt (e/C) J	eV	$1.602\,176\,565(35) \times 10^{-19}$	J
(unified) atomic mass unit $\frac{1}{12}m(^{12}\mathrm{C})$	u	$1.660\,538\,921(73) \times 10^{-27}$	kg

A more extensive listing of constants is available in the references given above and on the NIST Physical Measurement Laboratory Web site: physics.nist.gov/constants.

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