

**2014 CODATA RECOMMENDED VALUES OF THE FUNDAMENTAL
CONSTANTS OF PHYSICS AND CHEMISTRY NIST SP 959** (Apr 2017)

See: P. J. Mohr, D. B. Newell, and B. N. Taylor, Rev. Mod. Phys. **88**, 035009 (2016).
A more extensive listing of constants is available in the reference given above and on
the NIST Physical Measurement Laboratory Web site: physics.nist.gov/constants.

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	$6.674 08(31) \times 10^{-11}$	m ³ kg ⁻¹ s ⁻²
Planck constant	h	$6.626 070 040(81) \times 10^{-34}$	J s
$h/2\pi$	\hbar	$1.054 571 800(13) \times 10^{-34}$	J s
elementary charge	e	$1.602 176 6208(98) \times 10^{-19}$	C
fine-structure constant $e^2/4\pi\epsilon_0\hbar c$	α	$7.297 352 5664(17) \times 10^{-3}$	
inverse fine-structure constant	α^{-1}	137.035 999 139(31)	
Rydberg constant $\alpha^2 m_e c/2h$	R_∞	10 973 731.568 508(65)	m ⁻¹
Bohr radius $\alpha/4\pi R_\infty$	a_0	$0.529 177 210 67(12) \times 10^{-10}$	m
Bohr magneton $e\hbar/2m_e$	μ_B	$927.400 9994(57) \times 10^{-26}$	J T ⁻¹

Quantity	Symbol	Numerical value	Unit
electron mass	m_e	$9.109\,383\,56(11) \times 10^{-31}$	kg
proton mass	m_p	$1.672\,621\,898(21) \times 10^{-27}$	kg
proton-electron mass ratio	m_p/m_e	1836.152 673 89(17)	
Avogadro constant	N_A, L	$6.022\,140\,857(74) \times 10^{23}$	mol ⁻¹
Faraday constant $N_A e$	F	96 485.332 89(59)	C mol ⁻¹
molar gas constant	R	8.314 4598(48)	J mol ⁻¹ K ⁻¹
Boltzmann constant R/N_A	k	$1.380\,648\,52(79) \times 10^{-23}$	J K ⁻¹
Stefan-Boltzmann const. $\pi^2 k^4/60\hbar^3 c^2$	σ	$5.670\,367(13) \times 10^{-8}$	W m ⁻² K ⁻⁴
magnetic flux quantum $h/2e$	Φ_0	$2.067\,833\,831(13) \times 10^{-15}$	Wb
Josephson constant $2e/h$	K_J	$483\,597.8525(30) \times 10^9$	Hz V ⁻¹
von Klitzing constant h/e^2	R_K	25 812.807 4555(59)	Ω
electron volt (e/C) J	eV	$1.602\,176\,6208(98) \times 10^{-19}$	J
(unified) atomic mass unit $\frac{1}{12}m(^{12}\text{C})$	u	$1.660\,539\,040(20) \times 10^{-27}$	kg

The number in parentheses is the one-sigma (1σ) uncertainty in the last two digits of the given value.

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