

Some Physical Constants

Quantity	Symbol	Value ^a
Atomic mass unit	u	1.660 538 73 (13) × 10 ⁻²⁷ kg 931.494 013 (37) MeV/c ²
Avogadro's number	N _A	6.022 141 99 (47) × 10 ²³ particles/mol
Bohr magneton	$\mu_B = \frac{e\hbar}{2m_e}$	9.274 008 99 (37) × 10 ⁻²⁴ J/T
Bohr radius	$a_0 = \frac{\hbar^2}{m_e e^2 k_e}$	5.291 772 083 (19) × 10 ⁻¹¹ m
Boltzmann's constant	$k_B = \frac{R}{N_A}$	1.380 650 3 (24) × 10 ⁻²³ J/K
Compton wavelength	$\lambda_C = \frac{h}{m_e c}$	2.426 310 215 (18) × 10 ⁻¹² m
Coulomb constant	$k_e = \frac{1}{4\pi\epsilon_0}$	8.987 551 788 × 10 ⁹ N·m ² /C ² (exact)
Deuteron mass	m _d	3.343 583 09 (26) × 10 ⁻²⁷ kg 2.013 553 212 71 (35) u
Electron mass	m _e	9.109 381 88 (72) × 10 ⁻³¹ kg 5.485 799 110 (12) × 10 ⁻⁴ u 0.510 998 902 (21) MeV/c ²
Electron volt	eV	1.602 176 462 (63) × 10 ⁻¹⁹ J
Elementary charge	e	1.602 176 462 (63) × 10 ⁻¹⁹ C
Gas constant	R	8.314 472 (15) J/mol·K
Gravitational constant	G	6.673 (10) × 10 ⁻¹¹ N·m ² /kg ²
Josephson frequency–voltage ratio	$\frac{2e}{h}$	4.835 978 98 (19) × 10 ¹⁴ Hz/V
Magnetic flux quantum	$\Phi_0 = \frac{h}{2e}$	2.067 833 636 (81) × 10 ⁻¹⁵ T·m ²
Neutron mass	m _n	1.674 927 16 (13) × 10 ⁻²⁷ kg 1.008 664 915 78 (55) u 939.565 330 (38) MeV/c ²
Nuclear magneton	$\mu_n = \frac{e\hbar}{2m_p}$	5.050 783 17 (20) × 10 ⁻²⁷ J/T
Permeability of free space	μ ₀	4π × 10 ⁻⁷ T·m/A (exact)
Permittivity of free space	$\epsilon_0 = \frac{1}{\mu_0 c^2}$	8.854 187 817 × 10 ⁻¹² C ² /N·m ² (exact)
Planck's constant	h	6.626 068 76 (52) × 10 ⁻³⁴ J·s
	$\hbar = \frac{h}{2\pi}$	1.054 571 596 (82) × 10 ⁻³⁴ J·s
Proton mass	m _p	1.672 621 58 (13) × 10 ⁻²⁷ kg 1.007 276 466 88 (13) u 938.271 998 (38) MeV/c ²
Rydberg constant	R _H	1.097 373 156 854 9 (83) × 10 ⁷ m ⁻¹
Speed of light in vacuum	c	2.997 924 58 × 10 ⁸ m/s (exact)

Note: These constants are the values recommended in 1998 by CODATA, based on a least-squares adjustment of data from different measurements. For a more complete list, see P. J. Mohr and B. N. Taylor, "CODATA recommended values of the fundamental physical constants: 1998." *Rev. Mod. Phys.* 72:351, 2000.

^aThe numbers in parentheses for the values represent the uncertainties of the last two digits.