Fundamental Physical Constants — Extensive Listing

Quantity	Symbol	Value	Unit	Relative std. uncert. $u_{\rm r}$
		UNIVERSAL		
speed of light in vacuum	c, c_0	299 792 458	m s^{-1}	(exact)
magnetic constant	μ_0	$4\pi \times 10^{-7}$	N A^{-2}	
		$= 12.566\,370\,614... \times 10^{-7}$	N A^{-2}	(exact)
electric constant $1/\mu_0 c^2$	ϵ_0	$8.854\,187\,817... \times 10^{-12}$	F m^{-1}	(exact)
characteristic impedance of vacuum $\sqrt{\mu_0/\epsilon_0} = \mu_0 c$	Z_0	376.730 313 461...	Ω	(exact)
Newtonian constant of gravitation	G	$6.6742(10) \times 10^{-11}$	m^3 kg^{-1} s^{-2}	1.5×10^{-4}
	$G/\hbar c$	$6.7087(10) \times 10^{-39}$	$(GeV/c^2)^{-2}$	1.5×10^{-4}
Planck constant	h	$6.626\,0693(11) \times 10^{-34}$	J s	1.7×10^{-7}
in eV s		$4.135\,667\,43(35) \times 10^{-15}$	eV s	8.5×10^{-8}
$h/2\pi$	$\hbar$	$1.054\,571\,68(18) \times 10^{-34}$	J s	1.7×10^{-7}
in eV s		$6.582\,119\,15(56) \times 10^{-16}$	eV s	8.5×10^{-8}
$\hbar c$ in MeV fm		197.326 968(17)	MeV fm	8.5×10^{-8}
Planck mass $(\hbar c/G)^{1/2}$	$m_{\rm P}$	$2.176\,45(16) \times 10^{-8}$	kg	7.5×10^{-5}
Planck temperature $(\hbar c^5/G)^{1/2}/k$	$T_{\rm P}$	$1.416\,79(11) \times 10^{32}$	K	7.5×10^{-5}
Planck length $\hbar/m_{\rm P}c = (\hbar G/c^3)^{1/2}$	$l_{\rm P}$	$1.616\,24(12) \times 10^{-35}$	m	7.5×10^{-5}
Planck time $l_{\rm P}/c = (\hbar G/c^5)^{1/2}$	$t_{\rm P}$	$5.391\,21(40) \times 10^{-44}$	s	7.5×10^{-5}
		ELECTROMAGNETIC		
elementary charge	e	$1.602\,176\,53(14) \times 10^{-19}$	C	8.5×10^{-8}
	e/h	$2.417\,989\,40(21) \times 10^{14}$	A J^{-1}	8.5×10^{-8}
magnetic flux quantum $h/2e$	Φ_0	$2.067\,833\,72(18) \times 10^{-15}$	Wb	8.5×10^{-8}
conductance quantum $2e^2/h$	G_0	$7.748\,091\,733(26) \times 10^{-5}$	S	3.3×10^{-9}
inverse of conductance quantum	G_0^{-1}	12 906.403 725(43)	Ω	3.3×10^{-9}
Josephson constant[1] $2e/h$	$K_{\rm J}$	$483\,597.879(41) \times 10^9$	Hz V^{-1}	8.5×10^{-8}
von Klitzing constant[2] $h/e^2 = \mu_0 c/2\alpha$	$R_{\rm K}$	25 812.807 449(86)	Ω	3.3×10^{-9}
Bohr magneton $e\hbar/2m_{\rm e}$	$\mu_{\rm B}$	$927.400\,949(80) \times 10^{-26}$	J T^{-1}	8.6×10^{-8}
in eV T^{-1}		$5.788\,381\,804(39) \times 10^{-5}$	eV T^{-1}	6.7×10^{-9}
	$\mu_{\rm B}/h$	$13.996\,2458(12) \times 10^9$	Hz T^{-1}	8.6×10^{-8}
	$\mu_{\rm B}/hc$	46.686 4507(40)	m^{-1} T^{-1}	8.6×10^{-8}
	$\mu_{\rm B}/k$	0.671 7131(12)	K T^{-1}	1.8×10^{-6}
nuclear magneton $e\hbar/2m_{\rm p}$	$\mu_{\rm N}$	$5.050\,783\,43(43) \times 10^{-27}$	J T^{-1}	8.6×10^{-8}
in eV T^{-1}		$3.152\,451\,259(21) \times 10^{-8}$	eV T^{-1}	6.7×10^{-9}
	$\mu_{\rm N}/h$	7.622 593 71(65)	MHz T^{-1}	8.6×10^{-8}
	$\mu_{\rm N}/hc$	$2.542\,623\,58(22) \times 10^{-2}$	m^{-1} T^{-1}	8.6×10^{-8}
	$\mu_{\rm N}/k$	$3.658\,2637(64) \times 10^{-4}$	K T^{-1}	1.8×10^{-6}
		ATOMIC AND NUCLEAR		
		General		

Source: Peter J. Mohr and Barry N. Taylor, CODATA Recommended Values of the Fundamental Physical Constants: 2002, to be published in an archival journal in 2004.

Fundamental Physical Constants — Extensive Listing

Quantity	Symbol	Value	Unit	Relative std. uncert. $u_{\rm r}$
fine-structure constant $e^2/4\pi\epsilon_0\hbar c$	α	$7.297\,352\,568(24) \times 10^{-3}$		3.3×10^{-9}
inverse fine-structure constant	α^{-1}	$137.035\,999\,11(46)$		3.3×10^{-9}
Rydberg constant $\alpha^2 m_{\rm e} c/2h$	R_∞	$10\,973\,731.568\,525(73)$	$\rm m^{-1}$	6.6×10^{-12}
	$R_\infty c$	$3.289\,841\,960\,360(22) \times 10^{15}$	Hz	6.6×10^{-12}
	$R_\infty hc$	$2.179\,872\,09(37) \times 10^{-18}$	J	1.7×10^{-7}
$R_\infty hc$ in eV		$13.605\,6923(12)$	eV	8.5×10^{-8}
Bohr radius $\alpha/4\pi R_\infty = 4\pi\epsilon_0\hbar^2/m_{\rm e}e^2$	a_0	$0.529\,177\,2108(18) \times 10^{-10}$	m	3.3×10^{-9}
Hartree energy $e^2/4\pi\epsilon_0 a_0 = 2R_\infty hc$				
$= \alpha^2 m_{\rm e} c^2$	$E_{\rm h}$	$4.359\,744\,17(75) \times 10^{-18}$	J	1.7×10^{-7}
in eV		$27.211\,3845(23)$	eV	8.5×10^{-8}
quantum of circulation	$h/2m_{\rm e}$	$3.636\,947\,550(24) \times 10^{-4}$	$\rm m^2\ s^{-1}$	6.7×10^{-9}
	$h/m_{\rm e}$	$7.273\,895\,101(48) \times 10^{-4}$	$\rm m^2\ s^{-1}$	6.7×10^{-9}
	Electroweak			
Fermi coupling constant[3]	$G_{\rm F}/(\hbar c)^3$	$1.166\,39(1) \times 10^{-5}$	$\rm GeV^{-2}$	8.6×10^{-6}
weak mixing angle[4] $\theta_{\rm W}$ (on-shell scheme)				
$\sin^2\theta_{\rm W} = s_{\rm W}^2 \equiv 1 - (m_{\rm W}/m_{\rm Z})^2$	$\sin^2\theta_{\rm W}$	$0.222\,15(76)$		3.4×10^{-3}
	Electron, $\rm e^-$			
electron mass	$m_{\rm e}$	$9.109\,3826(16) \times 10^{-31}$	kg	1.7×10^{-7}
in u, $m_{\rm e} = A_{\rm r}({\rm e})$ u (electron relative atomic mass times u)		$5.485\,799\,0945(24) \times 10^{-4}$	u	4.4×10^{-10}
energy equivalent	$m_{\rm e}c^2$	$8.187\,1047(14) \times 10^{-14}$	J	1.7×10^{-7}
in MeV		$0.510\,998\,918(44)$	MeV	8.6×10^{-8}
electron-muon mass ratio	$m_{\rm e}/m_\mu$	$4.836\,331\,67(13) \times 10^{-3}$		2.6×10^{-8}
electron-tau mass ratio	$m_{\rm e}/m_\tau$	$2.875\,64(47) \times 10^{-4}$		1.6×10^{-4}
electron-proton mass ratio	$m_{\rm e}/m_{\rm p}$	$5.446\,170\,2173(25) \times 10^{-4}$		4.6×10^{-10}
electron-neutron mass ratio	$m_{\rm e}/m_{\rm n}$	$5.438\,673\,4481(38) \times 10^{-4}$		7.0×10^{-10}
electron-deuteron mass ratio	$m_{\rm e}/m_{\rm d}$	$2.724\,437\,1095(13) \times 10^{-4}$		4.8×10^{-10}
electron to alpha particle mass ratio	$m_{\rm e}/m_\alpha$	$1.370\,933\,555\,75(61) \times 10^{-4}$		4.4×10^{-10}
electron charge to mass quotient	$-e/m_{\rm e}$	$-1.758\,820\,12(15) \times 10^{11}$	$\rm C\ kg^{-1}$	8.6×10^{-8}
electron molar mass $N_{\rm A} m_{\rm e}$	$M({\rm e}), M_{\rm e}$	$5.485\,799\,0945(24) \times 10^{-7}$	$\rm kg\ mol^{-1}$	4.4×10^{-10}
Compton wavelength $h/m_{\rm e}c$	$\lambda_{\rm C}$	$2.426\,310\,238(16) \times 10^{-12}$	m	6.7×10^{-9}
$\lambda_{\rm C}/2\pi = \alpha a_0 = \alpha^2/4\pi R_\infty$	$\lambda\!\!\!^{-}_{\rm C}$	$386.159\,2678(26) \times 10^{-15}$	m	6.7×10^{-9}
classical electron radius $\alpha^2 a_0$	$r_{\rm e}$	$2.817\,940\,325(28) \times 10^{-15}$	m	1.0×10^{-8}
Thomson cross section $(8\pi/3) r_{\rm e}^2$	$\sigma_{\rm e}$	$0.665\,245\,873(13) \times 10^{-28}$	$\rm m^2$	2.0×10^{-8}
electron magnetic moment	$\mu_{\rm e}$	$-928.476\,412(80) \times 10^{-26}$	$\rm J\ T^{-1}$	8.6×10^{-8}
to Bohr magneton ratio	$\mu_{\rm e}/\mu_{\rm B}$	$-1.001\,159\,652\,1859(38)$		3.8×10^{-12}
to nuclear magneton ratio	$\mu_{\rm e}/\mu_{\rm N}$	$-1838.281\,971\,07(85)$		4.6×10^{-10}
electron magnetic moment anomaly $\lvert\mu_{\rm e}\rvert/\mu_{\rm B} - 1$	$a_{\rm e}$	$1.159\,652\,1859(38) \times 10^{-3}$		3.2×10^{-9}
electron g-factor $-2(1 + a_{\rm e})$	$g_{\rm e}$	$-2.002\,319\,304\,3718(75)$		3.8×10^{-12}

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