Fundamental Physical Constants — Extensive Listing

Quantity	Symbol	Value	Unit	Relative std. uncert. u_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}
	$G/\hbar c$	$6.7087(10) \times 10^{-39}$	$(\mathrm{GeV}/c^2)^{-2}$	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_P	$2.176\,45(16) \times 10^{-8}$	kg	7.5×10^{-5}
Planck temperature $(\hbar c^5/G)^{1/2}/k$	T_P	$1.416\,79(11) \times 10^{32}$	K	7.5×10^{-5}
Planck length $\hbar/m_P c = (\hbar G/c^3)^{1/2}$	l_P	$1.616\,24(12) \times 10^{-35}$	m	7.5×10^{-5}
Planck time $l_P/c = (\hbar G/c^5)^{1/2}$	t_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_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_K	25 812.807 449(86)	Ω	3.3×10^{-9}
Bohr magneton $e\hbar/2m_e$	μ_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}
	μ_B/h	$13.996\,2458(12) \times 10^9$	Hz T^{-1}	8.6×10^{-8}
	μ_B/hc	46.686 4507(40)	m^{-1} T^{-1}	8.6×10^{-8}
	μ_B/k	0.671 7131(12)	K T^{-1}	1.8×10^{-6}
nuclear magneton $e\hbar/2m_p$	μ_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}
	μ_N/h	7.622 593 71(65)	MHz T^{-1}	8.6×10^{-8}
	μ_N/hc	$2.542\,623\,58(22) \times 10^{-2}$	m^{-1} T^{-1}	8.6×10^{-8}
	μ_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_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 $\alpha^2 m_e c/2h$	R_∞	$10\,973\,731.568\,525(73)$	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 $\alpha/4\pi R_\infty = 4\pi\epsilon_0\hbar^2/m_e e^2$	a_0	$0.529\,177\,2108(18) \times 10^{-10}$	m	3.3×10^{-9}
Hartree energy $e^2/4\pi\epsilon_0 a_0 = 2R_\infty hc$ $= \alpha^2 m_e c^2$	E_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	$h/2m_e$	$3.636\,947\,550(24) \times 10^{-4}$	$m^2\ s^{-1}$	6.7×10^{-9}
	h/m_e	$7.273\,895\,101(48) \times 10^{-4}$	$m^2\ s^{-1}$	6.7×10^{-9}
		Electroweak		
Fermi coupling constant[3]	$G_F/(\hbar c)^3$	$1.166\,39(1) \times 10^{-5}$	GeV^{-2}	8.6×10^{-6}
weak mixing angle[4] θ_W (on-shell scheme) $\sin^2\theta_W = s_W^2 \equiv 1 - (m_W/m_Z)^2$	$\sin^2\theta_W$	$0.222\,15(76)$		3.4×10^{-3}
		Electron, e^-		
electron mass	m_e	$9.109\,3826(16) \times 10^{-31}$	kg	1.7×10^{-7}
in u, $m_e = A_r(e)$ u (electron relative atomic mass times u)		$5.485\,799\,0945(24) \times 10^{-4}$	u	4.4×10^{-10}
energy equivalent	$m_e c^2$	$8.187\,1047(14) \times 10^{-14}$	J	1.7×10^{-7}
in MeV		$0.510\,998\,918(44)$	MeV	8.6×10^{-8}
electron-muon mass ratio	m_e/m_μ	$4.836\,331\,67(13) \times 10^{-3}$		2.6×10^{-8}
electron-tau mass ratio	m_e/m_τ	$2.875\,64(47) \times 10^{-4}$		1.6×10^{-4}
electron-proton mass ratio	m_e/m_p	$5.446\,170\,2173(25) \times 10^{-4}$		4.6×10^{-10}
electron-neutron mass ratio	m_e/m_n	$5.438\,673\,4481(38) \times 10^{-4}$		7.0×10^{-10}
electron-deuteron mass ratio	m_e/m_d	$2.724\,437\,1095(13) \times 10^{-4}$		4.8×10^{-10}
electron to alpha particle mass ratio	m_e/m_α	$1.370\,933\,555\,75(61) \times 10^{-4}$		4.4×10^{-10}
electron charge to mass quotient	$-e/m_e$	$-1.758\,820\,12(15) \times 10^{11}$	$C\ kg^{-1}$	8.6×10^{-8}
electron molar mass $N_A m_e$	$M(e), M_e$	$5.485\,799\,0945(24) \times 10^{-7}$	$kg\ mol^{-1}$	4.4×10^{-10}
Compton wavelength $h/m_e c$	λ_C	$2.426\,310\,238(16) \times 10^{-12}$	m	6.7×10^{-9}
$\lambda_C/2\pi = \alpha a_0 = \alpha^2/4\pi R_\infty$	$\bar{\lambda}_C$	$386.159\,2678(26) \times 10^{-15}$	m	6.7×10^{-9}
classical electron radius $\alpha^2 a_0$	r_e	$2.817\,940\,325(28) \times 10^{-15}$	m	1.0×10^{-8}
Thomson cross section $(8\pi/3)r_e^2$	σ_e	$0.665\,245\,873(13) \times 10^{-28}$	m^2	2.0×10^{-8}
electron magnetic moment	μ_e	$-928.476\,412(80) \times 10^{-26}$	$J\ T^{-1}$	8.6×10^{-8}
to Bohr magneton ratio	μ_e/μ_B	$-1.001\,159\,652\,1859(38)$		3.8×10^{-12}
to nuclear magneton ratio	μ_e/μ_N	$-1838.281\,971\,07(85)$		4.6×10^{-10}
electron magnetic moment anomaly $\|\mu_e\|/\mu_B - 1$	a_e	$1.159\,652\,1859(38) \times 10^{-3}$		3.2×10^{-9}
electron g-factor $-2(1 + a_e)$	g_e	$-2.002\,319\,304\,3718(75)$		3.8×10^{-12}

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Fundamental Physical Constants — Extensive Listing

Quantity	Symbol	Value	Unit	Relative std. uncert. u_r
electron-muon magnetic moment ratio	μ_e/μ_μ	$206.766\,9894(54)$		2.6×10^{-8}
electron-proton magnetic moment ratio	μ_e/μ_p	$-658.210\,6862(66)$		1.0×10^{-8}
electron to shielded proton magnetic moment ratio (H_2O, sphere, 25 °C)	μ_e/μ'_p	$-658.227\,5956(71)$		1.1×10^{-8}
electron-neutron magnetic moment ratio	μ_e/μ_n	$960.920\,50(23)$		2.4×10^{-7}
electron-deuteron magnetic moment ratio	μ_e/μ_d	$-2143.923\,493(23)$		1.1×10^{-8}
electron to shielded helion[5] magnetic moment ratio (gas, sphere, 25 °C)	μ_e/μ'_h	$864.058\,255(10)$		1.2×10^{-8}
electron gyromagnetic ratio $2\|\mu_e\|/\hbar$	γ_e	$1.760\,859\,74(15) \times 10^{11}$	$s^{-1}\ T^{-1}$	8.6×10^{-8}
	$\gamma_e/2\pi$	$28\,024.9532(24)$	MHz T^{-1}	8.6×10^{-8}
Muon, μ^-				
muon mass	m_μ	$1.883\,531\,40(33) \times 10^{-28}$	kg	1.7×10^{-7}
in u, $m_\mu = A_r(\mu)$ u (muon relative atomic mass times u)		$0.113\,428\,9264(30)$	u	2.6×10^{-8}
energy equivalent	$m_\mu c^2$	$1.692\,833\,60(29) \times 10^{-11}$	J	1.7×10^{-7}
in MeV		$105.658\,3692(94)$	MeV	8.9×10^{-8}
muon-electron mass ratio	m_μ/m_e	$206.768\,2838(54)$		2.6×10^{-8}
muon-tau mass ratio	m_μ/m_τ	$5.945\,92(97) \times 10^{-2}$		1.6×10^{-4}
muon-proton mass ratio	m_μ/m_p	$0.112\,609\,5269(29)$		2.6×10^{-8}
muon-neutron mass ratio	m_μ/m_n	$0.112\,454\,5175(29)$		2.6×10^{-8}
muon molar mass $N_A m_\mu$	$M(\mu), M_\mu$	$0.113\,428\,9264(30) \times 10^{-3}$	kg mol^{-1}	2.6×10^{-8}
muon Compton wavelength $h/m_\mu c$	$\lambda_{C,\mu}$	$11.734\,441\,05(30) \times 10^{-15}$	m	2.5×10^{-8}
$\lambda_{C,\mu}/2\pi$	$\bar{\lambda}_{C,\mu}$	$1.867\,594\,298(47) \times 10^{-15}$	m	2.5×10^{-8}
muon magnetic moment	μ_μ	$-4.490\,447\,99(40) \times 10^{-26}$	J T^{-1}	8.9×10^{-8}
to Bohr magneton ratio	μ_μ/μ_B	$-4.841\,970\,45(13) \times 10^{-3}$		2.6×10^{-8}
to nuclear magneton ratio	μ_μ/μ_N	$-8.890\,596\,98(23)$		2.6×10^{-8}
muon magnetic moment anomaly $\|\mu_\mu\|/(e\hbar/2m_\mu) - 1$	a_μ	$1.165\,919\,81(62) \times 10^{-3}$		5.3×10^{-7}
muon g-factor $-2(1 + a_\mu)$	g_μ	$-2.002\,331\,8396(12)$		6.2×10^{-10}
muon-proton magnetic moment ratio	μ_μ/μ_p	$-3.183\,345\,118(89)$		2.8×10^{-8}
Tau, τ^-				
tau mass[6]	m_τ	$3.167\,77(52) \times 10^{-27}$	kg	1.6×10^{-4}
in u, $m_\tau = A_r(\tau)$ u (tau relative atomic mass times u)		$1.907\,68(31)$	u	1.6×10^{-4}
energy equivalent	$m_\tau c^2$	$2.847\,05(46) \times 10^{-10}$	J	1.6×10^{-4}

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Fundamental Physical Constants — Extensive Listing

Quantity	Symbol	Value	Unit	Relative std. uncert. u_r
in MeV		$1776.99(29)$	MeV	1.6×10^{-4}
tau-electron mass ratio	m_τ/m_e	$3477.48(57)$		1.6×10^{-4}
tau-muon mass ratio	m_τ/m_μ	$16.8183(27)$		1.6×10^{-4}
tau-proton mass ratio	m_τ/m_p	$1.893\,90(31)$		1.6×10^{-4}
tau-neutron mass ratio	m_τ/m_n	$1.891\,29(31)$		1.6×10^{-4}
tau molar mass $N_A m_\tau$	$M(\tau), M_\tau$	$1.907\,68(31)\times10^{-3}$	kg mol^{-1}	1.6×10^{-4}
tau Compton wavelength $h/m_\tau c$	$\lambda_{C,\tau}$	$0.697\,72(11)\times10^{-15}$	m	1.6×10^{-4}
$\lambda_{C,\tau}/2\pi$	$\bar{\lambda}_{C,\tau}$	$0.111\,046(18)\times10^{-15}$	m	1.6×10^{-4}
		Proton, p		
proton mass	m_p	$1.672\,621\,71(29)\times10^{-27}$	kg	1.7×10^{-7}
in u, $m_p = A_r(p)$ u (proton relative atomic mass times u)		$1.007\,276\,466\,88(13)$	u	1.3×10^{-10}
energy equivalent	$m_p c^2$	$1.503\,277\,43(26)\times10^{-10}$	J	1.7×10^{-7}
in MeV		$938.272\,029(80)$	MeV	8.6×10^{-8}
proton-electron mass ratio	m_p/m_e	$1836.152\,672\,61(85)$		4.6×10^{-10}
proton-muon mass ratio	m_p/m_μ	$8.880\,243\,33(23)$		2.6×10^{-8}
proton-tau mass ratio	m_p/m_τ	$0.528\,012(86)$		1.6×10^{-4}
proton-neutron mass ratio	m_p/m_n	$0.998\,623\,478\,72(58)$		5.8×10^{-10}
proton charge to mass quotient	e/m_p	$9.578\,833\,76(82)\times10^{7}$	C kg^{-1}	8.6×10^{-8}
proton molar mass $N_A m_p$	M(p), M_p	$1.007\,276\,466\,88(13)\times10^{-3}$	kg mol^{-1}	1.3×10^{-10}
proton Compton wavelength $h/m_p c$	$\lambda_{C,p}$	$1.321\,409\,8555(88)\times10^{-15}$	m	6.7×10^{-9}
$\lambda_{C,p}/2\pi$	$\bar{\lambda}_{C,p}$	$0.210\,308\,9104(14)\times10^{-15}$	m	6.7×10^{-9}
proton rms charge radius	R_p	$0.8750(68)\times10^{-15}$	m	7.8×10^{-3}
proton magnetic moment	μ_p	$1.410\,606\,71(12)\times10^{-26}$	J T^{-1}	8.7×10^{-8}
to Bohr magneton ratio	μ_p/μ_B	$1.521\,032\,206(15)\times10^{-3}$		1.0×10^{-8}
to nuclear magneton ratio	μ_p/μ_N	$2.792\,847\,351(28)$		1.0×10^{-8}
proton g-factor $2\mu_p/\mu_N$	g_p	$5.585\,694\,701(56)$		1.0×10^{-8}
proton-neutron magnetic moment ratio	μ_p/μ_n	$-1.459\,898\,05(34)$		2.4×10^{-7}
shielded proton magnetic moment (H_2O, sphere, 25 °C)	μ'_p	$1.410\,570\,47(12)\times10^{-26}$	J T^{-1}	8.7×10^{-8}
to Bohr magneton ratio	μ'_p/μ_B	$1.520\,993\,132(16)\times10^{-3}$		1.1×10^{-8}
to nuclear magneton ratio	μ'_p/μ_N	$2.792\,775\,604(30)$		1.1×10^{-8}
proton magnetic shielding correction $1-\mu'_p/\mu_p$ (H_2O, sphere, 25 °C)	σ'_p	$25.689(15)\times10^{-6}$		5.7×10^{-4}
proton gyromagnetic ratio $2\mu_p/\hbar$	γ_p	$2.675\,222\,05(23)\times10^{8}$	s^{-1} T^{-1}	8.6×10^{-8}
	$\gamma_p/2\pi$	$42.577\,4813(37)$	MHz T^{-1}	8.6×10^{-8}
shielded proton gyromagnetic ratio $2\mu'_p/\hbar$ (H_2O, sphere, 25 °C)	γ'_p	$2.675\,153\,33(23)\times10^{8}$	s^{-1} T^{-1}	8.6×10^{-8}

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Fundamental Physical Constants — Extensive Listing

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	$\gamma'_p/2\pi$	$42.576\,3875(37)$	MHz T^{-1}	8.6×10^{-8}
Neutron, n				
neutron mass	m_n	$1.674\,927\,28(29) \times 10^{-27}$	kg	1.7×10^{-7}
in u, $m_n = A_r(n)$ u (neutron relative atomic mass times u)		$1.008\,664\,915\,60(55)$	u	5.5×10^{-10}
energy equivalent	$m_n c^2$	$1.505\,349\,57(26) \times 10^{-10}$	J	1.7×10^{-7}
in MeV		$939.565\,360(81)$	MeV	8.6×10^{-8}
neutron-electron mass ratio	m_n/m_e	$1838.683\,6598(13)$		7.0×10^{-10}
neutron-muon mass ratio	m_n/m_μ	$8.892\,484\,02(23)$		2.6×10^{-8}
neutron-tau mass ratio	m_n/m_τ	$0.528\,740(86)$		1.6×10^{-4}
neutron-proton mass ratio	m_n/m_p	$1.001\,378\,418\,70(58)$		5.8×10^{-10}
neutron molar mass $N_A m_n$	$M(n), M_n$	$1.008\,664\,915\,60(55) \times 10^{-3}$	kg mol^{-1}	5.5×10^{-10}
neutron Compton wavelength $h/m_n c$	$\lambda_{C,n}$	$1.319\,590\,9067(88) \times 10^{-15}$	m	6.7×10^{-9}
$\lambda_{C,n}/2\pi$	$\bar{\lambda}_{C,n}$	$0.210\,019\,4157(14) \times 10^{-15}$	m	6.7×10^{-9}
neutron magnetic moment	μ_n	$-0.966\,236\,45(24) \times 10^{-26}$	J T^{-1}	2.5×10^{-7}
to Bohr magneton ratio	μ_n/μ_B	$-1.041\,875\,63(25) \times 10^{-3}$		2.4×10^{-7}
to nuclear magneton ratio	μ_n/μ_N	$-1.913\,042\,73(45)$		2.4×10^{-7}
neutron g-factor $2\mu_n/\mu_N$	g_n	$-3.826\,085\,46(90)$		2.4×10^{-7}
neutron-electron magnetic moment ratio	μ_n/μ_e	$1.040\,668\,82(25) \times 10^{-3}$		2.4×10^{-7}
neutron-proton magnetic moment ratio	μ_n/μ_p	$-0.684\,979\,34(16)$		2.4×10^{-7}
neutron to shielded proton magnetic moment ratio (H_2O, sphere, 25 °C)	μ_n/μ'_p	$-0.684\,996\,94(16)$		2.4×10^{-7}
neutron gyromagnetic ratio $2\lvert\mu_n\rvert/\hbar$	γ_n	$1.832\,471\,83(46) \times 10^{8}$	s^{-1} T^{-1}	2.5×10^{-7}
	$\gamma_n/2\pi$	$29.164\,6950(73)$	MHz T^{-1}	2.5×10^{-7}
Deuteron, d				
deuteron mass	m_d	$3.343\,583\,35(57) \times 10^{-27}$	kg	1.7×10^{-7}
in u, $m_d = A_r(d)$ u (deuteron relative atomic mass times u)		$2.013\,553\,212\,70(35)$	u	1.7×10^{-10}
energy equivalent	$m_d c^2$	$3.005\,062\,85(51) \times 10^{-10}$	J	1.7×10^{-7}
in MeV		$1875.612\,82(16)$	MeV	8.6×10^{-8}
deuteron-electron mass ratio	m_d/m_e	$3670.482\,9652(18)$		4.8×10^{-10}
deuteron-proton mass ratio	m_d/m_p	$1.999\,007\,500\,82(41)$		2.0×10^{-10}
deuteron molar mass $N_A m_d$	$M(d), M_d$	$2.013\,553\,212\,70(35) \times 10^{-3}$	kg mol^{-1}	1.7×10^{-10}
deuteron rms charge radius	R_d	$2.1394(28) \times 10^{-15}$	m	1.3×10^{-3}
deuteron magnetic moment	μ_d	$0.433\,073\,482(38) \times 10^{-26}$	J T^{-1}	8.7×10^{-8}
to Bohr magneton ratio	μ_d/μ_B	$0.466\,975\,4567(50) \times 10^{-3}$		1.1×10^{-8}
to nuclear magneton ratio	μ_d/μ_N	$0.857\,438\,2329(92)$		1.1×10^{-8}

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deuteron-electron magnetic moment ratio	μ_d/μ_e	$-4.664\,345\,548(50) \times 10^{-4}$		1.1×10^{-8}
deuteron-proton magnetic moment ratio	μ_d/μ_p	$0.307\,012\,2084(45)$		1.5×10^{-8}
deuteron-neutron magnetic moment ratio	μ_d/μ_n	$-0.448\,206\,52(11)$		2.4×10^{-7}
		Helion, h		
helion mass[5]	m_h	$5.006\,412\,14(86) \times 10^{-27}$	kg	1.7×10^{-7}
in u, $m_h = A_r(h)$ u (helion relative atomic mass times u)		$3.014\,932\,2434(58)$	u	1.9×10^{-9}
energy equivalent	$m_h c^2$	$4.499\,538\,84(77) \times 10^{-10}$	J	1.7×10^{-7}
in MeV		$2808.391\,42(24)$	MeV	8.6×10^{-8}
helion-electron mass ratio	m_h/m_e	$5495.885\,269(11)$		2.0×10^{-9}
helion-proton mass ratio	m_h/m_p	$2.993\,152\,6671(58)$		1.9×10^{-9}
helion molar mass $N_A m_h$	$M(h), M_h$	$3.014\,932\,2434(58) \times 10^{-3}$	kg mol^{-1}	1.9×10^{-9}
shielded helion magnetic moment (gas, sphere, 25 °C)	μ'_h	$-1.074\,553\,024(93) \times 10^{-26}$	J T^{-1}	8.7×10^{-8}
to Bohr magneton ratio	μ'_h/μ_B	$-1.158\,671\,474(14) \times 10^{-3}$		1.2×10^{-8}
to nuclear magneton ratio	μ'_h/μ_N	$-2.127\,497\,723(25)$		1.2×10^{-8}
shielded helion to proton magnetic moment ratio (gas, sphere, 25 °C)	μ'_h/μ_p	$-0.761\,766\,562(12)$		1.5×10^{-8}
shielded helion to shielded proton magnetic moment ratio (gas/H_2O, spheres, 25 °C)	μ'_h/μ'_p	$-0.761\,786\,1313(33)$		4.3×10^{-9}
shielded helion gyromagnetic ratio $2\lvert\mu'_h\rvert/\hbar$ (gas, sphere, 25 °C)	γ'_h	$2.037\,894\,70(18) \times 10^{8}$	s^{-1} T^{-1}	8.7×10^{-8}
	$\gamma'_h/2\pi$	$32.434\,1015(28)$	MHz T^{-1}	8.7×10^{-8}
		Alpha particle, α		
alpha particle mass	m_α	$6.644\,6565(11) \times 10^{-27}$	kg	1.7×10^{-7}
in u, $m_\alpha = A_r(\alpha)$ u (alpha particle relative atomic mass times u)		$4.001\,506\,179\,149(56)$	u	1.4×10^{-11}
energy equivalent	$m_\alpha c^2$	$5.971\,9194(10) \times 10^{-10}$	J	1.7×10^{-7}
in MeV		$3727.379\,17(32)$	MeV	8.6×10^{-8}
alpha particle to electron mass ratio	m_α/m_e	$7294.299\,5363(32)$		4.4×10^{-10}
alpha particle to proton mass ratio	m_α/m_p	$3.972\,599\,689\,07(52)$		1.3×10^{-10}
alpha particle molar mass $N_A m_\alpha$	$M(\alpha), M_\alpha$	$4.001\,506\,179\,149(56) \times 10^{-3}$	kg mol^{-1}	1.4×10^{-11}
		PHYSICO-CHEMICAL		
Avogadro constant	N_A, L	$6.022\,1415(10) \times 10^{23}$	mol^{-1}	1.7×10^{-7}
atomic mass constant $m_u = \frac{1}{12}m(^{12}C) = 1$ u	m_u	$1.660\,538\,86(28) \times 10^{-27}$	kg	1.7×10^{-7}

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.

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Quantity	Symbol	Value	Unit	Relative std. uncert. u_r
$= 10^{-3}$ kg mol$^{-1}/N_A$				
energy equivalent	$m_u c^2$	$1.492\,417\,90(26) \times 10^{-10}$	J	1.7×10^{-7}
in MeV		$931.494\,043(80)$	MeV	8.6×10^{-8}
Faraday constant[7] $N_A e$	F	$96\,485.3383(83)$	C mol^{-1}	8.6×10^{-8}
molar Planck constant	$N_A h$	$3.990\,312\,716(27) \times 10^{-10}$	J s mol^{-1}	6.7×10^{-9}
	$N_A hc$	$0.119\,626\,565\,72(80)$	J m mol^{-1}	6.7×10^{-9}
molar gas constant	R	$8.314\,472(15)$	J mol^{-1} K^{-1}	1.7×10^{-6}
Boltzmann constant R/N_A	k	$1.380\,6505(24) \times 10^{-23}$	J K^{-1}	1.8×10^{-6}
in eV K^{-1}		$8.617\,343(15) \times 10^{-5}$	eV K^{-1}	1.8×10^{-6}
	k/h	$2.083\,6644(36) \times 10^{10}$	Hz K^{-1}	1.7×10^{-6}
	k/hc	$69.503\,56(12)$	m^{-1} K^{-1}	1.7×10^{-6}
molar volume of ideal gas RT/p				
$T = 273.15$ K, $p = 101.325$ kPa	V_m	$22.413\,996(39) \times 10^{-3}$	m^3 mol^{-1}	1.7×10^{-6}
Loschmidt constant N_A/V_m	n_0	$2.686\,7773(47) \times 10^{25}$	m^{-3}	1.8×10^{-6}
$T = 273.15$ K, $p = 100$ kPa	V_m	$22.710\,981(40) \times 10^{-3}$	m^3 mol^{-1}	1.7×10^{-6}
Sackur-Tetrode constant (absolute entropy constant)[8] $\frac{5}{2} + \ln[(2\pi m_u k T_1/h^2)^{3/2} k T_1/p_0]$				
$T_1 = 1$ K, $p_0 = 100$ kPa	S_0/R	$-1.151\,7047(44)$		3.8×10^{-6}
$T_1 = 1$ K, $p_0 = 101.325$ kPa		$-1.164\,8677(44)$		3.8×10^{-6}
Stefan-Boltzmann constant $(\pi^2/60)k^4/\hbar^3 c^2$	σ	$5.670\,400(40) \times 10^{-8}$	W m^{-2} K^{-4}	7.0×10^{-6}
first radiation constant $2\pi hc^2$	c_1	$3.741\,771\,38(64) \times 10^{-16}$	W m^2	1.7×10^{-7}
first radiation constant for spectral radiance $2hc^2$	c_{1L}	$1.191\,042\,82(20) \times 10^{-16}$	W m^2 sr^{-1}	1.7×10^{-7}
second radiation constant hc/k	c_2	$1.438\,7752(25) \times 10^{-2}$	m K	1.7×10^{-6}
Wien displacement law constant $b = \lambda_{max} T = c_2/4.965\,114\,231...$	b	$2.897\,7685(51) \times 10^{-3}$	m K	1.7×10^{-6}

[1] See the “Adopted values” table for the conventional value adopted internationally for realizing representations of the volt using the Josephson effect.

[2] See the “Adopted values” table for the conventional value adopted internationally for realizing representations of the ohm using the quantum Hall effect.

[3] Value recommended by the Particle Data Group (Hagiwara, *et al.*, 2002).

[4] Based on the ratio of the masses of the W and Z bosons m_W/m_Z recommended by the Particle Data Group (Hagiwara, *et al.*, 2002). The value for $\sin^2\theta_W$ they recommend, which is based on a particular variant of the modified minimal subtraction ($\overline{\mathrm{MS}}$) scheme, is $\sin^2\hat{\theta}_W(M_Z) = 0.231\,24(24)$.

[5] The helion, symbol h, is the nucleus of the ^{3}He atom.

[6] This and all other values involving m_τ are based on the value of $m_\tau c^2$ in MeV recommended by the Particle Data Group, (Hagiwara, *et al.*, 2002), but with a standard uncertainty of 0.29 MeV rather than the quoted uncertainty of -0.26 MeV, $+0.29$ MeV.

[7] The numerical value of F to be used in coulometric chemical measurements is $96\,485.336(16)$ $[1.7 \times 10^{-7}]$ when the relevant current is measured in terms of representations of the volt and ohm based on the Josephson and quantum Hall effects and the internationally adopted conventional values of the Josephson and von Klitzing constants K_{J-90} and R_{K-90} given in the “Adopted values” table.

[8] The entropy of an ideal monoatomic gas of relative atomic mass A_r is given by $S = S_0 + \frac{3}{2}R \ln A_r - R \ln(p/p_0) + \frac{5}{2}R \ln(T/\mathrm{K})$. [9] The relative atomic mass $A_r(\mathrm{X})$ of particle X with mass $m(\mathrm{X})$ is defined by $A_r(\mathrm{X}) = m(\mathrm{X})/m_u$, where $m_u = m(^{12}\mathrm{C})/12 = M_u/N_A = 1$ u is the atomic mass constant, N_A is the Avogadro constant, and u is the atomic mass unit. Thus the mass of particle X in u is $m(\mathrm{X}) = A_r(\mathrm{X})$ u and the molar mass of X is $M(\mathrm{X}) = A_r(\mathrm{X})M_u$.

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.

[10] This is the value adopted internationally for realizing representations of the volt using the Josephson effect.
[11] This is the value adopted internationally for realizing representations of the ohm using the quantum Hall effect. [a] This is the lattice parameter (unit cell edge length) of an ideal single crystal of naturally occurring Si free of impurities and imperfections, and is deduced from measurements on extremely pure and nearly perfect single crystals of Si by correcting for the effects of impurities.

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.