

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	$4\pi \times 10^{-7}$ $= 12.566\,370\,614\dots \times 10^{-7}$	N A^{-2} N A^{-2}	exact
electric constant $1/\mu_0 c^2$	ϵ_0	$8.854\,187\,817\dots \times 10^{-12}$	F m^{-1}	exact
characteristic impedance of vacuum $\mu_0 c$	Z_0	376.730 313 461...	Ω	exact
Newtonian constant of gravitation	G	$6.673\,84(80) \times 10^{-11}$	$\text{m}^3 \text{kg}^{-1} \text{s}^{-2}$	1.2×10^{-4}
	$G/\hbar c$	$6.708\,37(80) \times 10^{-39}$	$(\text{GeV}/c^2)^{-2}$	1.2×10^{-4}
Planck constant	h	$6.626\,069\,57(29) \times 10^{-34}$	J s	4.4×10^{-8}
		$4.135\,667\,516(91) \times 10^{-15}$	eV s	2.2×10^{-8}
$h/2\pi$	\hbar	$1.054\,571\,726(47) \times 10^{-34}$	J s	4.4×10^{-8}
		$6.582\,119\,28(15) \times 10^{-16}$	eV s	2.2×10^{-8}
	$\hbar c$	197.326 9718(44)	MeV fm	2.2×10^{-8}
Planck mass $(\hbar c/G)^{1/2}$	m_{P}	$2.176\,51(13) \times 10^{-8}$	kg	6.0×10^{-5}
energy equivalent	$m_{\text{P}} c^2$	$1.220\,932(73) \times 10^{19}$	GeV	6.0×10^{-5}
Planck temperature $(\hbar c^5/G)^{1/2}/k$	T_{P}	$1.416\,833(85) \times 10^{32}$	K	6.0×10^{-5}
Planck length $\hbar/m_{\text{P}} c = (\hbar G/c^3)^{1/2}$	l_{P}	$1.616\,199(97) \times 10^{-35}$	m	6.0×10^{-5}
Planck time $l_{\text{P}}/c = (\hbar G/c^5)^{1/2}$	t_{P}	$5.391\,06(32) \times 10^{-44}$	s	6.0×10^{-5}
ELECTROMAGNETIC				
elementary charge	e	$1.602\,176\,565(35) \times 10^{-19}$	C	2.2×10^{-8}
	e/h	$2.417\,989\,348(53) \times 10^{14}$	A J^{-1}	2.2×10^{-8}
magnetic flux quantum $h/2e$	Φ_0	$2.067\,833\,758(46) \times 10^{-15}$	Wb	2.2×10^{-8}
conductance quantum $2e^2/h$	G_0	$7.748\,091\,7346(25) \times 10^{-5}$	S	3.2×10^{-10}
inverse of conductance quantum	G_0^{-1}	12 906.403 7217(42)	Ω	3.2×10^{-10}
Josephson constant ¹ $2e/h$	K_{J}	$483\,597.870(11) \times 10^9$	Hz V^{-1}	2.2×10^{-8}
von Klitzing constant ² $h/e^2 = \mu_0 c/2\alpha$	R_{K}	25 812.807 4434(84)	Ω	3.2×10^{-10}
Bohr magneton $e\hbar/2m_{\text{e}}$	μ_{B}	$927.400\,968(20) \times 10^{-26}$	J T^{-1}	2.2×10^{-8}
		$5.788\,381\,8066(38) \times 10^{-5}$	eV T^{-1}	6.5×10^{-10}
	μ_{B}/h	$13.996\,245\,55(31) \times 10^9$	Hz T^{-1}	2.2×10^{-8}
	$\mu_{\text{B}}/\hbar c$	46.686 4498(10)	$\text{m}^{-1} \text{T}^{-1}$	2.2×10^{-8}
	μ_{B}/k	0.671 713 88(61)	K T^{-1}	9.1×10^{-7}
nuclear magneton $e\hbar/2m_{\text{p}}$	μ_{N}	$5.050\,783\,53(11) \times 10^{-27}$	J T^{-1}	2.2×10^{-8}
		$3.152\,451\,2605(22) \times 10^{-8}$	eV T^{-1}	7.1×10^{-10}
	μ_{N}/h	7.622 593 57(17)	MHz T^{-1}	2.2×10^{-8}
	$\mu_{\text{N}}/\hbar c$	$2.542\,623\,527(56) \times 10^{-2}$	$\text{m}^{-1} \text{T}^{-1}$	2.2×10^{-8}
	μ_{N}/k	$3.658\,2682(33) \times 10^{-4}$	K T^{-1}	9.1×10^{-7}
ATOMIC AND NUCLEAR				
General				
fine-structure constant $e^2/4\pi\epsilon_0\hbar c$	α	$7.297\,352\,5698(24) \times 10^{-3}$		3.2×10^{-10}
inverse fine-structure constant	α^{-1}	137.035 999 074(44)		3.2×10^{-10}
Rydberg constant $\alpha^2 m_{\text{e}} c/2\hbar$	R_{∞}	10 973 731.568 539(55)	m^{-1}	5.0×10^{-12}
	$R_{\infty} c$	$3.289\,841\,960\,364(17) \times 10^{15}$	Hz	5.0×10^{-12}
	$R_{\infty} \hbar c$	$2.179\,872\,171(96) \times 10^{-18}$	J	4.4×10^{-8}
		13.605 692 53(30)	eV	2.2×10^{-8}
Bohr radius $\alpha/4\pi R_{\infty} = 4\pi\epsilon_0\hbar^2/m_{\text{e}} e^2$	a_0	$0.529\,177\,210\,92(17) \times 10^{-10}$	m	3.2×10^{-10}
Hartree energy $e^2/4\pi\epsilon_0 a_0 = 2R_{\infty} \hbar c = \alpha^2 m_{\text{e}} c^2$	E_{h}	$4.359\,744\,34(19) \times 10^{-18}$	J	4.4×10^{-8}
		27.211 385 05(60)	eV	2.2×10^{-8}
quantum of circulation	$h/2m_{\text{e}}$	$3.636\,947\,5520(24) \times 10^{-4}$	$\text{m}^2 \text{s}^{-1}$	6.5×10^{-10}

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	h/m_e	$7.273\,895\,1040(47) \times 10^{-4}$	$\text{m}^2 \text{s}^{-1}$	6.5×10^{-10}
	Electroweak			
Fermi coupling constant ³	$G_F/(\hbar c)^3$	$1.166\,364(5) \times 10^{-5}$	GeV^{-2}	4.3×10^{-6}
weak mixing angle ⁴ θ_W (on-shell scheme)	$\sin^2 \theta_W = s_W^2 \equiv 1 - (m_W/m_Z)^2$	0.2223(21)		9.5×10^{-3}
	Electron, e^-			
electron mass	m_e	$9.109\,382\,91(40) \times 10^{-31}$	kg	4.4×10^{-8}
		$5.485\,799\,0946(22) \times 10^{-4}$	u	4.0×10^{-10}
energy equivalent	$m_e c^2$	$8.187\,105\,06(36) \times 10^{-14}$	J	4.4×10^{-8}
		0.510 998 928(11)	MeV	2.2×10^{-8}
electron-muon mass ratio	m_e/m_μ	$4.836\,331\,66(12) \times 10^{-3}$		2.5×10^{-8}
electron-tau mass ratio	m_e/m_τ	$2.875\,92(26) \times 10^{-4}$		9.0×10^{-5}
electron-proton mass ratio	m_e/m_p	$5.446\,170\,2178(22) \times 10^{-4}$		4.1×10^{-10}
electron-neutron mass ratio	m_e/m_n	$5.438\,673\,4461(32) \times 10^{-4}$		5.8×10^{-10}
electron-deuteron mass ratio	m_e/m_d	$2.724\,437\,1095(11) \times 10^{-4}$		4.0×10^{-10}
electron-triton mass ratio	m_e/m_t	$1.819\,200\,0653(17) \times 10^{-4}$		9.1×10^{-10}
electron-helion mass ratio	m_e/m_h	$1.819\,543\,0761(17) \times 10^{-4}$		
electron to alpha particle mass ratio	m_e/m_α	$1.370\,933\,555\,78(55) \times 10^{-4}$		4.0×10^{-10}
electron charge to mass quotient	$-e/m_e$	$-1.758\,820\,088(39) \times 10^{11}$	C kg^{-1}	2.2×10^{-8}
electron molar mass $N_A m_e$	$M(e), M_e$	$5.485\,799\,0946(22) \times 10^{-7}$	kg mol^{-1}	4.0×10^{-10}
Compton wavelength $h/m_e c$	λ_C	$2.426\,310\,2389(16) \times 10^{-12}$	m	6.5×10^{-10}
$\lambda_C/2\pi = \alpha a_0 = \alpha^2/4\pi R_\infty$	λ_C	$386.159\,268\,00(25) \times 10^{-15}$	m	6.5×10^{-10}
classical electron radius $\alpha^2 a_0$	r_e	$2.817\,940\,3267(27) \times 10^{-15}$	m	9.7×10^{-10}
Thomson cross section $(8\pi/3)r_e^2$	σ_e	$0.665\,245\,8734(13) \times 10^{-28}$	m^2	1.9×10^{-9}
electron magnetic moment	μ_e	$-928.476\,430(21) \times 10^{-26}$	J T^{-1}	2.2×10^{-8}
to Bohr magneton ratio	μ_e/μ_B	$-1.001\,159\,652\,180\,76(27)$		2.6×10^{-13}
to nuclear magneton ratio	μ_e/μ_N	$-1838.281\,970\,90(75)$		4.1×10^{-10}
electron magnetic moment anomaly $ \mu_e /\mu_B - 1$	a_e	$1.159\,652\,180\,76(27) \times 10^{-3}$		2.3×10^{-10}
electron g -factor $-2(1 + a_e)$	g_e	$-2.002\,319\,304\,361\,53(53)$		2.6×10^{-13}
electron-muon magnetic moment ratio	μ_e/μ_μ	206.766 9896(52)		2.5×10^{-8}
electron-proton magnetic moment ratio	μ_e/μ_p	$-658.210\,6848(54)$		8.1×10^{-9}
electron to shielded proton magnetic moment ratio (H_2O , sphere, 25 °C)	μ_e/μ'_p	$-658.227\,5971(72)$		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	$-2143.923\,498(18)$		8.4×10^{-9}
electron to shielded helion magnetic moment ratio (gas, sphere, 25 °C)	μ_e/μ'_h	864.058 257(10)		1.2×10^{-8}
electron gyromagnetic ratio $2 \mu_e /\hbar$	γ_e	$1.760\,859\,708(39) \times 10^{11}$	$\text{s}^{-1} \text{T}^{-1}$	2.2×10^{-8}
	$\gamma_e/2\pi$	28 024.952 66(62)	MHz T^{-1}	2.2×10^{-8}
	Muon, μ^-			
muon mass	m_μ	$1.883\,531\,475(96) \times 10^{-28}$	kg	5.1×10^{-8}
		0.113 428 9267(29)	u	2.5×10^{-8}
energy equivalent	$m_\mu c^2$	$1.692\,833\,667(86) \times 10^{-11}$	J	5.1×10^{-8}
		105.658 3715(35)	MeV	3.4×10^{-8}
muon-electron mass ratio	m_μ/m_e	206.768 2843(52)		2.5×10^{-8}
muon-tau mass ratio	m_μ/m_τ	$5.946\,49(54) \times 10^{-2}$		9.0×10^{-5}
muon-proton mass ratio	m_μ/m_p	0.112 609 5272(28)		2.5×10^{-8}

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muon-neutron mass ratio	m_μ/m_n	0.112 454 5177(28)		2.5×10^{-8}
muon molar mass $N_A m_\mu$	$M(\mu), M_\mu$	$0.113\,428\,9267(29) \times 10^{-3}$	kg mol ⁻¹	2.5×10^{-8}
muon Compton wavelength $h/m_\mu c$	$\lambda_{C,\mu}$	$11.734\,441\,03(30) \times 10^{-15}$	m	2.5×10^{-8}
$\lambda_{C,\mu}/2\pi$	$\lambda_{C,\mu}$	$1.867\,594\,294(47) \times 10^{-15}$	m	2.5×10^{-8}
muon magnetic moment	μ_μ	$-4.490\,448\,07(15) \times 10^{-26}$	J T ⁻¹	3.4×10^{-8}
to Bohr magneton ratio	μ_μ/μ_B	$-4.841\,970\,44(12) \times 10^{-3}$		2.5×10^{-8}
to nuclear magneton ratio	μ_μ/μ_N	$-8.890\,596\,97(22)$		2.5×10^{-8}
muon magnetic moment anomaly $ \mu_\mu /(e\hbar/2m_\mu) - 1$	a_μ	$1.165\,920\,91(63) \times 10^{-3}$		5.4×10^{-7}
muon g -factor $-2(1 + a_\mu)$	g_μ	$-2.002\,331\,8418(13)$		6.3×10^{-10}
muon-proton magnetic moment ratio	μ_μ/μ_p	$-3.183\,345\,107(84)$		2.6×10^{-8}
Tau, τ^-				
tau mass ⁵	m_τ	$3.167\,47(29) \times 10^{-27}$	kg	9.0×10^{-5}
		1.907 49(17)	u	9.0×10^{-5}
energy equivalent	$m_\tau c^2$	$2.846\,78(26) \times 10^{-10}$	J	9.0×10^{-5}
		1776.82(16)	MeV	9.0×10^{-5}
tau-electron mass ratio	m_τ/m_e	3477.15(31)		9.0×10^{-5}
tau-muon mass ratio	m_τ/m_μ	16.8167(15)		9.0×10^{-5}
tau-proton mass ratio	m_τ/m_p	1.893 72(17)		9.0×10^{-5}
tau-neutron mass ratio	m_τ/m_n	1.891 11(17)		9.0×10^{-5}
tau molar mass $N_A m_\tau$	$M(\tau), M_\tau$	$1.907\,49(17) \times 10^{-3}$	kg mol ⁻¹	9.0×10^{-5}
tau Compton wavelength $h/m_\tau c$	$\lambda_{C,\tau}$	$0.697\,787(63) \times 10^{-15}$	m	9.0×10^{-5}
$\lambda_{C,\tau}/2\pi$	$\lambda_{C,\tau}$	$0.111\,056(10) \times 10^{-15}$	m	9.0×10^{-5}
Proton, p				
proton mass	m_p	$1.672\,621\,777(74) \times 10^{-27}$	kg	4.4×10^{-8}
		1.007 276 466 812(90)	u	8.9×10^{-11}
energy equivalent	$m_p c^2$	$1.503\,277\,484(66) \times 10^{-10}$	J	4.4×10^{-8}
		938.272 046(21)	MeV	2.2×10^{-8}
proton-electron mass ratio	m_p/m_e	1836.152 672 45(75)		4.1×10^{-10}
proton-muon mass ratio	m_p/m_μ	8.880 243 31(22)		2.5×10^{-8}
proton-tau mass ratio	m_p/m_τ	0.528 063(48)		9.0×10^{-5}
proton-neutron mass ratio	m_p/m_n	0.998 623 478 26(45)		4.5×10^{-10}
proton charge to mass quotient	e/m_p	$9.578\,833\,58(21) \times 10^7$	C kg ⁻¹	2.2×10^{-8}
proton molar mass $N_A m_p$	$M(p), M_p$	$1.007\,276\,466\,812(90) \times 10^{-3}$	kg mol ⁻¹	8.9×10^{-11}
proton Compton wavelength $h/m_p c$	$\lambda_{C,p}$	$1.321\,409\,856\,23(94) \times 10^{-15}$	m	7.1×10^{-10}
$\lambda_{C,p}/2\pi$	$\lambda_{C,p}$	$0.210\,308\,910\,47(15) \times 10^{-15}$	m	7.1×10^{-10}
proton rms charge radius	r_p	$0.8775(51) \times 10^{-15}$	m	5.9×10^{-3}
proton magnetic moment	μ_p	$1.410\,606\,743(33) \times 10^{-26}$	J T ⁻¹	2.4×10^{-8}
to Bohr magneton ratio	μ_p/μ_B	$1.521\,032\,210(12) \times 10^{-3}$		8.1×10^{-9}
to nuclear magneton ratio	μ_p/μ_N	2.792 847 356(23)		8.2×10^{-9}
proton g -factor $2\mu_p/\mu_N$	g_p	5.585 694 713(46)		8.2×10^{-9}
proton-neutron magnetic moment ratio	μ_p/μ_n	$-1.459\,898\,06(34)$		2.4×10^{-7}
shielded proton magnetic moment (H ₂ O, sphere, 25 °C)	μ'_p	$1.410\,570\,499(35) \times 10^{-26}$	J T ⁻¹	2.5×10^{-8}
to Bohr magneton ratio	μ'_p/μ_B	$1.520\,993\,128(17) \times 10^{-3}$		1.1×10^{-8}
to nuclear magneton ratio	μ'_p/μ_N	2.792 775 598(30)		1.1×10^{-8}
proton magnetic shielding correction $1 - \mu'_p/\mu_p$ (H ₂ O, sphere, 25 °C)	σ'_p	$25.694(14) \times 10^{-6}$		5.3×10^{-4}

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proton gyromagnetic ratio $2\mu_p/\hbar$	γ_p	$2.675\,222\,005(63) \times 10^8$	$\text{s}^{-1} \text{T}^{-1}$	2.4×10^{-8}
	$\gamma_p/2\pi$	42.577 4806(10)	MHz T^{-1}	2.4×10^{-8}
shielded proton gyromagnetic ratio $2\mu'_p/\hbar$ (H ₂ O, sphere, 25 °C)	γ'_p	$2.675\,153\,268(66) \times 10^8$	$\text{s}^{-1} \text{T}^{-1}$	2.5×10^{-8}
	$\gamma'_p/2\pi$	42.576 3866(10)	MHz T^{-1}	2.5×10^{-8}
Neutron, n				
neutron mass	m_n	$1.674\,927\,351(74) \times 10^{-27}$	kg	4.4×10^{-8}
		1.008 664 916 00(43)	u	4.2×10^{-10}
energy equivalent	$m_n c^2$	$1.505\,349\,631(66) \times 10^{-10}$	J	4.4×10^{-8}
		939.565 379(21)	MeV	2.2×10^{-8}
neutron-electron mass ratio	m_n/m_e	1838.683 6605(11)		5.8×10^{-10}
neutron-muon mass ratio	m_n/m_μ	8.892 484 00(22)		2.5×10^{-8}
neutron-tau mass ratio	m_n/m_τ	0.528 790(48)		9.0×10^{-5}
neutron-proton mass ratio	m_n/m_p	1.001 378 419 17(45)		4.5×10^{-10}
neutron-proton mass difference	$m_n - m_p$	$2.305\,573\,92(76) \times 10^{-30}$	kg	3.3×10^{-7}
		0.001 388 449 19(45)	u	3.3×10^{-7}
energy equivalent	$(m_n - m_p)c^2$	$2.072\,146\,50(68) \times 10^{-13}$	J	3.3×10^{-7}
		1.293 332 17(42)	MeV	3.3×10^{-7}
neutron molar mass $N_A m_n$	$M(\text{n}), M_n$	$1.008\,664\,916\,00(43) \times 10^{-3}$	kg mol ⁻¹	4.2×10^{-10}
neutron Compton wavelength $h/m_n c$	$\lambda_{\text{C},n}$	$1.319\,590\,9068(11) \times 10^{-15}$	m	8.2×10^{-10}
$\lambda_{\text{C},n}/2\pi$	$\lambda_{\text{C},n}$	$0.210\,019\,415\,68(17) \times 10^{-15}$	m	8.2×10^{-10}
neutron magnetic moment	μ_n	$-0.966\,236\,47(23) \times 10^{-26}$	J T ⁻¹	2.4×10^{-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 72(45)		2.4×10^{-7}
neutron g -factor $2\mu_n/\mu_N$	g_n	-3.826 085 45(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 ₂ O, sphere, 25 °C)	μ_n/μ'_p	-0.684 996 94(16)		2.4×10^{-7}
neutron gyromagnetic ratio $2 \mu_n /\hbar$	γ_n	$1.832\,471\,79(43) \times 10^8$	$\text{s}^{-1} \text{T}^{-1}$	2.4×10^{-7}
	$\gamma_n/2\pi$	29.164 6943(69)	MHz T^{-1}	2.4×10^{-7}
Deuteron, d				
deuteron mass	m_d	$3.343\,583\,48(15) \times 10^{-27}$	kg	4.4×10^{-8}
		2.013 553 212 712(77)	u	3.8×10^{-11}
energy equivalent	$m_d c^2$	$3.005\,062\,97(13) \times 10^{-10}$	J	4.4×10^{-8}
		1875.612 859(41)	MeV	2.2×10^{-8}
deuteron-electron mass ratio	m_d/m_e	3670.482 9652(15)		4.0×10^{-10}
deuteron-proton mass ratio	m_d/m_p	1.999 007 500 97(18)		9.2×10^{-11}
deuteron molar mass $N_A m_d$	$M(\text{d}), M_d$	$2.013\,553\,212\,712(77) \times 10^{-3}$	kg mol ⁻¹	3.8×10^{-11}
deuteron rms charge radius	r_d	$2.1424(21) \times 10^{-15}$	m	9.8×10^{-4}
deuteron magnetic moment	μ_d	$0.433\,073\,489(10) \times 10^{-26}$	J T ⁻¹	2.4×10^{-8}
to Bohr magneton ratio	μ_d/μ_B	$0.466\,975\,4556(39) \times 10^{-3}$		8.4×10^{-9}
to nuclear magneton ratio	μ_d/μ_N	0.857 438 2308(72)		8.4×10^{-9}
deuteron g -factor μ_d/μ_N	g_d	0.857 438 2308(72)		8.4×10^{-9}
deuteron-electron magnetic moment ratio	μ_d/μ_e	$-4.664\,345\,537(39) \times 10^{-4}$		8.4×10^{-9}
deuteron-proton magnetic moment ratio	μ_d/μ_p	0.307 012 2070(24)		7.7×10^{-9}
deuteron-neutron magnetic moment ratio	μ_d/μ_n	-0.448 206 52(11)		2.4×10^{-7}
Triton, t				

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triton mass	m_t	$5.007\,356\,30(22) \times 10^{-27}$	kg	4.4×10^{-8}
		3.015 500 7134(25)	u	8.2×10^{-10}
energy equivalent	$m_t c^2$	$4.500\,387\,41(20) \times 10^{-10}$	J	4.4×10^{-8}
		2808.921 005(62)	MeV	2.2×10^{-8}
triton-electron mass ratio	m_t/m_e	5496.921 5267(50)		9.1×10^{-10}
triton-proton mass ratio	m_t/m_p	2.993 717 0308(25)		8.2×10^{-10}
triton molar mass $N_A m_t$	$M(t), M_t$	$3.015\,500\,7134(25) \times 10^{-3}$	kg mol ⁻¹	8.2×10^{-10}
triton magnetic moment	μ_t	$1.504\,609\,447(38) \times 10^{-26}$	J T ⁻¹	2.6×10^{-8}
to Bohr magneton ratio	μ_t/μ_B	$1.622\,393\,657(21) \times 10^{-3}$		1.3×10^{-8}
to nuclear magneton ratio	μ_t/μ_N	2.978 962 448(38)		1.3×10^{-8}
triton g -factor $2\mu_t/\mu_N$	g_t	5.957 924 896(76)		1.3×10^{-8}
Helion, h				
helion mass	m_h	$5.006\,412\,34(22) \times 10^{-27}$	kg	4.4×10^{-8}
		3.014 932 2468(25)	u	8.3×10^{-10}
energy equivalent	$m_h c^2$	$4.499\,539\,02(20) \times 10^{-10}$	J	4.4×10^{-8}
		2808.391 482(62)	MeV	2.2×10^{-8}
helion-electron mass ratio	m_h/m_e	5495.885 2754(50)		9.2×10^{-10}
helion-proton mass ratio	m_h/m_p	2.993 152 6707(25)		8.2×10^{-10}
helion molar mass $N_A m_h$	$M(h), M_h$	$3.014\,932\,2468(25) \times 10^{-3}$	kg mol ⁻¹	8.3×10^{-10}
helion magnetic moment	μ_h	$-1.074\,617\,486(27) \times 10^{-26}$	J T ⁻¹	2.5×10^{-8}
to Bohr magneton ratio	μ_h/μ_B	$-1.158\,740\,958(14) \times 10^{-3}$		1.2×10^{-8}
to nuclear magneton ratio	μ_h/μ_N	-2.127 625 306(25)		1.2×10^{-8}
helion g -factor $2\mu_h/\mu_N$	g_h	-4.255 250 613(50)		1.2×10^{-8}
shielded helion magnetic moment	μ'_h	$-1.074\,553\,044(27) \times 10^{-26}$	J T ⁻¹	2.5×10^{-8}
(gas, sphere, 25 °C)				
to Bohr magneton ratio	μ'_h/μ_B	$-1.158\,671\,471(14) \times 10^{-3}$		1.2×10^{-8}
to nuclear magneton ratio	μ'_h/μ_N	-2.127 497 718(25)		1.2×10^{-8}
shielded helion to proton magnetic moment ratio (gas, sphere, 25 °C)	μ'_h/μ_p	-0.761 766 558(11)		1.4×10^{-8}
shielded helion to shielded proton magnetic moment ratio (gas/H ₂ O, spheres, 25 °C)	μ'_h/μ'_p	-0.761 786 1313(33)		4.3×10^{-9}
shielded helion gyromagnetic ratio				
$2 \mu'_h /\hbar$ (gas, sphere, 25 °C)	γ'_h	$2.037\,894\,659(51) \times 10^8$	s ⁻¹ T ⁻¹	2.5×10^{-8}
	$\gamma'_h/2\pi$	32.434 100 84(81)	MHz T ⁻¹	2.5×10^{-8}
Alpha particle, α				
alpha particle mass	m_α	$6.644\,656\,75(29) \times 10^{-27}$	kg	4.4×10^{-8}
		4.001 506 179 125(62)	u	1.5×10^{-11}
energy equivalent	$m_\alpha c^2$	$5.971\,919\,67(26) \times 10^{-10}$	J	4.4×10^{-8}
		3727.379 240(82)	MeV	2.2×10^{-8}
alpha particle to electron mass ratio	m_α/m_e	7294.299 5361(29)		4.0×10^{-10}
alpha particle to proton mass ratio	m_α/m_p	3.972 599 689 33(36)		9.0×10^{-11}
alpha particle molar mass $N_A m_\alpha$	$M(\alpha), M_\alpha$	$4.001\,506\,179\,125(62) \times 10^{-3}$	kg mol ⁻¹	1.5×10^{-11}
PHYSICOCHEMICAL				
Avogadro constant	N_A, L	$6.022\,141\,29(27) \times 10^{23}$	mol ⁻¹	4.4×10^{-8}
atomic mass constant				
$m_u = \frac{1}{12}m(^{12}\text{C}) = 1\text{ u}$	m_u	$1.660\,538\,921(73) \times 10^{-27}$	kg	4.4×10^{-8}
energy equivalent	$m_u c^2$	$1.492\,417\,954(66) \times 10^{-10}$	J	4.4×10^{-8}
		931.494 061(21)	MeV	2.2×10^{-8}

Fundamental Physical Constants — Extensive Listing

Quantity	Symbol	Value	Unit	Relative std. uncert. u_r
Faraday constant ⁶ $N_A e$	F	96 485.3365(21)	C mol ⁻¹	2.2×10^{-8}
molar Planck constant	$N_A h$	$3.990\,312\,7176(28) \times 10^{-10}$	J s mol ⁻¹	7.0×10^{-10}
	$N_A h c$	0.119 626 565 779(84)	J m mol ⁻¹	7.0×10^{-10}
molar gas constant	R	8.314 4621(75)	J mol ⁻¹ K ⁻¹	9.1×10^{-7}
Boltzmann constant R/N_A	k	$1.380\,6488(13) \times 10^{-23}$	J K ⁻¹	9.1×10^{-7}
		$8.617\,3324(78) \times 10^{-5}$	eV K ⁻¹	9.1×10^{-7}
	k/h	$2.083\,6618(19) \times 10^{10}$	Hz K ⁻¹	9.1×10^{-7}
	k/hc	69.503 476(63)	m ⁻¹ K ⁻¹	9.1×10^{-7}
molar volume of ideal gas RT/p $T = 273.15$ K, $p = 100$ kPa	V_m	$22.710\,953(21) \times 10^{-3}$	m ³ mol ⁻¹	9.1×10^{-7}
Loschmidt constant N_A/V_m	n_0	$2.651\,6462(24) \times 10^{25}$	m ⁻³	9.1×10^{-7}
molar volume of ideal gas RT/p $T = 273.15$ K, $p = 101.325$ kPa	V_m	$22.413\,968(20) \times 10^{-3}$	m ³ mol ⁻¹	9.1×10^{-7}
Loschmidt constant N_A/V_m	n_0	$2.686\,7805(24) \times 10^{25}$	m ⁻³	9.1×10^{-7}
Sackur-Tetrode (absolute entropy) constant ⁷ $\frac{5}{2} + \ln[(2\pi m_u k T_1/h^2)^{3/2} k T_1/p_0]$				
$T_1 = 1$ K, $p_0 = 100$ kPa	S_0/R	-1.151 7078(23)		2.0×10^{-6}
$T_1 = 1$ K, $p_0 = 101.325$ kPa		-1.164 8708(23)		1.9×10^{-6}
Stefan-Boltzmann constant $(\pi^2/60)k^4/\hbar^3 c^2$	σ	$5.670\,373(21) \times 10^{-8}$	W m ⁻² K ⁻⁴	3.6×10^{-6}
first radiation constant $2\pi\hbar c^2$	c_1	$3.741\,771\,53(17) \times 10^{-16}$	W m ²	4.4×10^{-8}
first radiation constant for spectral radiance $2\hbar c^2$	c_{1L}	$1.191\,042\,869(53) \times 10^{-16}$	W m ² sr ⁻¹	4.4×10^{-8}
second radiation constant $\hbar c/k$	c_2	$1.438\,7770(13) \times 10^{-2}$	m K	9.1×10^{-7}
Wien displacement law constants				
$b = \lambda_{\max} T = c_2/4.965\,114\,231\dots$	b	$2.897\,7721(26) \times 10^{-3}$	m K	9.1×10^{-7}
$b' = \nu_{\max}/T = 2.821\,439\,372\dots c/c_2$	b'	$5.878\,9254(53) \times 10^{10}$	Hz K ⁻¹	9.1×10^{-7}

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 (Nakamura, *et al.*, 2010).

⁴ Based on the ratio of the masses of the W and Z bosons m_W/m_Z recommended by the Particle Data Group (Nakamura, *et al.*, 2010). The value for $\sin^2\theta_W$ they recommend, which is based on a particular variant of the modified minimal subtraction ($\overline{\text{MS}}$) scheme, is $\sin^2\hat{\theta}_W(M_Z) = 0.231\,22(15)$.

⁵ 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 (Nakamura, *et al.*, 2010), but with a standard uncertainty of 0.29 MeV rather than the quoted uncertainty of -0.26 MeV, $+0.29$ MeV.

⁶ The helion, symbol h, is the nucleus of the ³He atom.

⁷ The numerical value of F to be used in coulometric chemical measurements is $96\,485.3401(48)$ [5.0×10^{-8}] 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 $S = S_0 + \frac{3}{2}R \ln A_r - R \ln(p/p_0) + \frac{5}{2}R \ln(T/K)$.