Standard Atomic Weights of the Elements 1995

[Scaled to $A_r(^{12}C) = 12$, where ^{12}C is a neutral atom in its nuclear and electronic ground state]

The atomic weights of many elements are not invariant but depend on the origin and treatment of the material. The standard values of $A_r(E)$ and the uncertainties (in parentheses, following the last significant figure to which they are attributed) apply to elements of natural terrestrial origin. The footnotes to this Table elaborate the types of variation which may occur for individual elements and which may be larger than the listed uncertainties of values of $A_r(E)$. Names have not yet been assigned to elements with atomic numbers 110, 111 and 112 (see p. 1280).

Name	Symbol	Atomic Number	Atomic Weight	Footnotes
Actinium*	Ac	89	(227)	
Aluminium	Al	13	26.981538(2)	
Americium*	Am	95	(243)	
Antimony	Sb	51	121.760(1)	g
Argon	Ar	18	39.948(1)	g r
Arsenic	As	33	74.92160(2)	
Astatine*	At	85	(210)	
Barium	Ba	56	137.327(7)	
Berkelium*	Bk	97	(247)	
Beryllium	Be	4	9.012182(3)	
Bismuth	Bi	83	208.98038(2)	
Bohrium	Bh	107	(264)	
Boron	B	5	10.811(7)	g m r
Bromine	Br	35	79.904(1)	
Cadmium	Cd	48	112.411(8)	g
Caesium	Cs	55	132.90545(2)	
Calcium	Ca	20	40.078(4)	g
Californium*	Cf	98	(251)	
Carbon	C	6	12.0107(8)	g r
Cerium	Ce	58	140.116(1)	g
Chlorine	Cl	17	35.4527(9)	m
Chromium	Cr	24	51.9961(6)	
Cobalt	Co	27	58.933200(9)	
Copper	Cu	29	63.546(3)	r
Curium*	Cm	96	(247)	
Dubnium	Db	105	(262)	
Dysprosium	Dy	66	162.50(3)	g
Einsteinium*	Es	99	(252)	
Erbium	Er	68	167.26(3)	g
Europium	Eu	63	151.964(1)	g
Fermium*	Fm	100	(257)	
Fluorine	F	9	18.9984032(5)	
Francium*	Fr	87	(223)	
Gadolinium	Gd	64	157.25(3)	g
Gallium	Ga	31	69.723(1)	
Germanium	Ge	32	72.61(2)	
Gold	Au	79	196.96655(2)	
Hafnium	Hf	72	178.49(2)	
Hassium	Hs	108	(269)	
Helium	He	2	4.002602(2)	g r
Holmium	Ho	67	164.93032(2)	
Hydrogen	H	1	1.00794(7)	g m r
Indium	In	49	114.818(3)	
Iodine	I	53	126.90447(3)	
Iridium	Ir	77	192.217(3)	
Iron	Fe	26	55.845(2)	
Krypton	Kr	36	83.80(1)	g m
Lanthanum	La	57	138.9055(2)	g
Lawrencium*	Lr	103	(262)	
Lead	Pb	82	207.2(1)	g m
Lithium	Li	3	[6.941(2)]†	g m r
Lutetium	Lu	71	174.967(1)	g
Magnesium	Mg	12	24.3050(6)	
Manganese	Mn	25	54.938049(9)	
Meitnerium	Mt	109	(268)	
Mendelevium*	Md	101	(258)	
Mercury	Hg	80	200.59(2)	
Molybdenum	Mo	42	95.94(1)	g
Neodymium	Nd	60	144.24(3)	g
Neon	Ne	10	20.1797(6)	g m
Neptunium*	Np	93	(237)	
Nickel	Ni	28	58.6934(2)	
Niobium	Nb	41	92.90638(2)	
Nitrogen	N	7	14.00674(7)	g r
Nobelium*	No	102	(259)	
Osmium	Os	76	190.23(3)	g
Oxygen	O	8	15.9994(3)	g r
Palladium	Pd	46	106.42(1)	g
Phosphorus	P	15	30.973762(4)	
Platinum	Pt	78	195.078(2)	
Plutonium*	Pu	94	(244)	
Polonium*	Po	84	(210)	
Potassium	K	19	39.0983(1)	
Praseodymium	Pr	59	140.90765(2)	
Promethium*	Pm	61	(145)	
Protactinium*	Pa	91	231.03588(2)	
Radium*	Ra	88	(226)	
Radon*	Rn	86	(222)	
Rhenium	Re	75	186.207(1)	
Rhodium	Rh	45	102.90550(2)	
Rubidium	Rb	37	85.4678(3)	g
Ruthenium	Ru	44	101.07(2)	g
Rutherfordium	Rf	104	(261)	
Samarium	Sm	62	150.36(3)	g
Scandium	Sc	21	44.955910(8)	
Seaborgium	Sg	106	(266)	
Selenium	Se	34	78.96(3)	
Silicon	Si	14	28.0855(3)	r
Silver	Ag	47	107.8682(2)	g
Sodium	Na	11	22.989770(2)	
Strontium	Sr	38	87.62(1)	g r
Sulfur	S	16	32.066(6)	g r
Tantalum	Ta	73	180.9479(1)	
Technetium*	Tc	43	(98)	
Tellurium	Te	52	127.60(3)	g
Terbium	Tb	65	158.92534(2)	
Thallium	Tl	81	204.3833(2)	
Thorium*	Th	90	232.0381(1)	g
Thulium	Tm	69	168.93421(2)	
Tin	Sn	50	118.710(7)	g
Titanium	Ti	22	47.867(1)	
Tungsten	W	74	183.84(1)	
Ununbium	Uub	112	(277)	
Ununnilium	Uun	110	(269)	
Unununium	Uuu	111	(272)	
Uranium*	U	92	238.0289(1)	g m
Vanadium	V	23	50.9415(1)	
Xenon	Xe	54	131.29(2)	g m
Ytterbium	Yb	70	173.04(3)	g
Yttrium	Y	39	88.90585(2)	
Zinc	Zn	30	65.39(2)	
Zirconium	Zr	40	91.224(2)	g

*Element has no stable nuclides; the value given in parentheses is the atomic mass number of the isotope of longest known half-life. However, three such elements (Th, Pa and U) do have a characteristic terrestrial isotopic composition, and for these an atomic weight is tabulated.

†Commercially available Li materials have atomic weights that range between 6.939 and 6.996; if a more accurate value is required, it must be determined for the specific material.

g Geological specimens are known in which the element has an isotopic composition outside the limits for normal material. The difference between the atomic weight of the element in such specimens and that given in the Table may exceed the stated uncertainty.

m Modified isotopic compositions may be found in commercially available material because it has been subjected to an undisclosed or inadvertent isotopic fractionation. Substantial deviations in atomic weight of the element from that given in the Table can occur.

r Range in isotopic composition of normal terrestrial material prevents a more precise $A_r(E)$ being given; the tabulated $A_r(E)$ value should be applicable to any normal material.

Recommended Consistent Values of Some Fundamental Physical Constants (1986)
(The numbers in parentheses are the standard deviation in the last digits of the quoted value.)

Quantity	Symbol	Value	Units	Uncertainty (ppm)
Permeability of vaccum	μ_0	$4\pi \times 10^{-7}$	$\mathrm{N\,A^{-2}}$	
		$= 12.566\,370\,614\ldots$	$10^{-7}\,\mathrm{N\,A^{-2}}$	(exact)
Speed of light in vaccum	c	299 792 458	$\mathrm{m\,s^{-1}}$	(exact)
Permittivity of vacuum	ε_0	$8.854\,187\,817\ldots$	$10^{-12}\,\mathrm{F\,m^{-1}}$	(exact)
Elementary charge	e	1.602 177 33(49)	$10^{-19}\,\mathrm{C}$	0.30
Planck constant	h	6.626 0755(40)	$10^{-34}\,\mathrm{J\,s}$	0.60
	$\hbar = h/2\pi$	1.054 572 66(63)	$10^{-34}\,\mathrm{J\,s}$	0.60
Avogadro constant	N_A	6.022 136 7(38)	$10^{23}\,\mathrm{mol^{-1}}$	0.59
(Unified) atomic mass unit $1\mathrm{u} = m_\mathrm{u} = \frac{1}{12}\,m(^{12}\mathrm{C})$	u	1.660 540 2(10)	$10^{-27}\,\mathrm{kg}$	0.59
Electron mass	m_e	9.109 389 7(54)	$10^{-31}\,\mathrm{kg}$	0.59
		0.510 999 06(15)	MeV	0.30
Proton mass	m_p	1.672 623 1(10)	$10^{-27}\,\mathrm{kg}$	0.59
		938.272 31(28)	MeV	0.30
Neutron mass	m_n	1.674 928 6(10)	$10^{-27}\,\mathrm{kg}$	0.59
		939.565 63(28)	MeV	0.30
Proton-election mass ratio	$m_\mathrm{p}/m_\mathrm{e}$	1836.152 701(37)		0.020
Faraday constant $N_\mathrm{A}e$	F	96 485.309(29)	$\mathrm{C\,mol^{-1}}$	0.30
Rydberg constant	R_∞	10 973 731.534(13)	$\mathrm{m^{-1}}$	0.0012
Bohr radius	a_o	0.529 177 249(24)	$10^{-10}\,\mathrm{m}$	0.045
Electron magnetic moment anomaly, $\mu_\mathrm{e}/\mu_{\mathrm{g}-1}$	a_e	1.159652 193(10)	10^{-3}	0.0086
Electron g-factor, $2(1 + a_\mathrm{e})$	g_e	2.002 319 304 386(20)		1×10^{-5}
Bohr magneton	μ_B	9.274 0154(31)	$10^{-24}\,\mathrm{J\,T^{-1}}$	0.34
Nuclear magneton	μ_N	5.050 7866(17)	$10^{-27}\,\mathrm{J\,T^{-1}}$	0.34
Electron magnetic moment	μ_e	928.477 01(31)	$10^{-26}\,\mathrm{J\,T^{-1}}$	0.34
Proton magnetic moment	μ_p	1.410 607 61(47)	$10^{-26}\,\mathrm{J\,T^{-1}}$	0.34
in Bohr magnetons	$\mu_\mathrm{p}/\mu_\mathrm{B}$	1.521 032 202(15)	10^{-3}	0.010
Electron-proton magnetic moment ratio	$\mu_\mathrm{e}/\mu_\mathrm{p}$	658.210 688 1(66)		0.010
Proton gyromagnetic ratio	γ_p	26 752.2128(81)	$10^4\,\mathrm{s^{-1}\,T^{-1}}$	0.30
Molar gas constant	R	8.314 510(70)	$\mathrm{J\,mol^{-1}\,K^{-1}}$	8.4
Molar volume (ideal gas)	V_m	22.414 10(19)	L/mol	8.4
Boltzmann constant R/N_A	k	1.380 658(12)	$10^{-23}\,\mathrm{J\,K^{-1}}$	8.5
Constant of gravitation	G	6.672 59(85)	$10^{-11}\,\mathrm{m^3\,kg^{-1}\,s^{-2}}$	128

Greek Alphabet

α	A	Alpha	η	H	Eta	ν	N	Nu	τ	T	Tau
β	B	Beta	θ	Θ	Theta	ξ	Ξ	Xi	υ	Y	Upsilon
γ	Γ	Gamma	ι	I	Iota	o	O	Omicron	ϕ	Φ	Phi
δ	Δ	Delta	κ	K	Kappa	π	Π	Pi	χ	X	Chi
ε	E	Epsilon	λ	Λ	Lambda	ρ	P	Rho	ψ	Ψ	Psi
ζ	Z	Zeta	μ	M	Mu	σ ς	Σ	Sigma	ω	Ω	Omega