Periodic Table of the Elements

IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII			IB	IIB	IIIA	IVA	VA	VIA	VIIA	0
1 H 1.008																	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.011	7 N 14.007	8 O 15.9994	9 F 18.998	10 Ne 20.18
11 Na 22.990	12 Mg 24.305											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.453	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.71	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.4	47 Ag 107.87	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.30
55 Cs 132.91	56 Ba 137.34	57* La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.22	78 Pt 195.09	79 Au 196.97	80 Hg 200.59	81 Tl 204.37	82 Pb 207.2	83 Bi 208.98	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.03	89† Ac (227)	104 (Ku)‡ (257)	105 (Ha) (260)													

‡ or Rf (in dispute)

*Lanthanide series:	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
†Actinide series:	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (254)	100 Fm (253)	101 Md (258)	102 No (255)	103 Lr (256)

Atomic weights are based on carbon-12. More exact values are listed on the inside back cover. Numbers in parentheses are mass numbers of most stable isotopes of radioactive elements.

TABLE OF ATOMIC MASSES (WEIGHTS) BASED ON CARBON-12

Name	Symbol	Atomic No.	Atomic Mass	Name	Symbol	Atomic No.	Atomic Mass
Actinium	Ac	89	(227)[a]	Molybdenum	Mo	42	95.94
Aluminum	Al	13	26.98154	Neodymium	Nd	60	144.24
Americium	Am	95	(243)[a]	Neon	Ne	10	20.179
Antimony	Sb	51	121.75	Neptunium	Np	93	237.0482[b]
Argon	Ar	18	39.948	Nickel	Ni	28	58.71
Arsenic	As	33	74.9216	Niobium	Nb	41	92.9064
Astatine	At	85	(210)[a]	Nitrogen	N	7	14.0067
Barium	Ba	56	137.34	Nobelium	No	102	(259)[a]
Berkelium	Bk	97	(247)[a]	Osmium	Os	76	190.2
Beryllium	Be	4	9.01218	Oxygen	O	8	15.9994
Bismuth	Bi	83	208.9804	Palladium	Pd	46	106.4
Boron	B	5	10.81	Phosphorus	P	15	30.97376
Bromine	Br	35	79.904	Platinum	Pt	78	195.09
Cadmium	Cd	48	112.40	Plutonium	Pu	94	(244)[a]
Calcium	Ca	20	40.08	Polonium	Po	84	(210)[a]
Californium	Cf	98	(251)[a]	Potassium	K	19	39.098
Carbon	C	6	12.011	Praseodymium	Pr	59	140.9077
Cerium	Ce	58	140.12	Promethium	Pm	61	(145)[a]
Cesium	Cs	55	132.9054	Protactinium	Pa	91	231.0359[b]
Chlorine	Cl	17	35.453	Radium	Ra	88	226.0254[b]
Chromium	Cr	24	51.996	Radon	Rn	86	(222)[a]
Cobalt	Co	27	58.9332	Rhenium	Re	75	186.2
Copper	Cu	29	63.546	Rhodium	Rh	45	102.9055
Curium	Cm	96	(247)[a]	Rubidium	Rb	37	85.4678
Dysprosium	Dy	66	162.50	Ruthenium	Ru	44	101.07
Einsteinium	Es	99	(252)[a]	Samarium	Sm	62	150.4
Erbium	Er	68	167.26	Scandium	Sc	21	44.9559
Europium	Eu	63	151.96	Selenium	Se	34	78.96
Fermium	Fm	100	(257)[a]	Silicon	Si	14	28.086
Fluorine	F	9	18.99840	Silver	Ag	47	107.868
Francium	Fr	87	(223)[a]	Sodium	Na	11	22.98977
Gadolinium	Gd	64	157.25	Strontium	Sr	38	87.62
Gallium	Ga	31	69.72	Sulfur	S	16	32.06
Germanium	Ge	32	72.59	Tantalum	Ta	73	180.9479
Gold	Au	79	196.9665	Technetium	Tc	43	98.9062[b]
Hafnium	Hf	72	178.49	Tellurium	Te	52	127.60
Helium	He	2	4.00260	Terbium	Tb	65	158.9254
Holmium	Ho	67	164.9304	Thallium	Tl	81	204.37
Hydrogen	H	1	1.0079	Thorium	Th	90	232.0381[b]
Indium	In	49	114.82	Thulium	Tm	69	168.9342
Iodine	I	53	126.9045	Tin	Sn	50	118.69
Iridium	Ir	77	192.22	Titanium	Ti	22	47.90
Iron	Fe	26	55.847	Tungsten	W	74	183.85
Krypton	Kr	36	83.80	Unnilhexium	Unh	106	(263)[a]
Lanthanum	La	57	138.9055	Unnilpentium	Unp	105	(262)[a]
Lawrencium	Lr	103	(260)[a]	Unnilquadium	Unq	104	(261)[a]
Lead	Pb	82	207.2	Uranium	U	92	238.029
Lithium	Li	3	6.941	Vanadium	V	23	50.9414
Lutetium	Lu	71	174.97	Xenon	Xe	54	131.30
Magnesium	Mg	12	24.305	Ytterbium	Yb	70	173.04
Manganese	Mn	25	54.9380	Yttrium	Y	39	88.9059
Mendelevium	Md	101	(258)[a]	Zinc	Zn	30	65.38
Mercury	Hg	80	200.59	Zirconium	Zr	40	91.22

[a]Mass number of most stable or best-known isotope

[b]Mass number of the isotope of longest half-life

NAMES, FORMULAS AND CHARGES OF COMMON IONS

Positive Ions (Cations)		
1+	Ammonium	NH_4^+
	Copper(I) (Cuprous)	Cu^+
	Hydrogen	H^+
	Potassium	K^+
	Silver	Ag^+
	Sodium	Na^+
2+	Barium	Ba^{2+}
	Cadmium	Cd^{2+}
	Calcium	Ca^{2+}
	Cobalt(II)	Co^{2+}
	Copper(II) (Cupric)	Cu^{2+}
	Iron(II) (Ferrous)	Fe^{2+}
	Lead(II)	Pb^{2+}
	Magnesium	Mg^{2+}
	Manganese(II)	Mn^{2+}
	Mercury(II) (Mercuric)	Hg^{2+}
	Nickel(II)	Ni^{2+}
	Tin(II) (Stannous)	Sn^{2+}
	Zinc	Zn^{2+}
3+	Aluminum	Al^{3+}
	Antimony(III)	Sb^{3+}
	Arsenic(III)	As^{3+}
	Bismuth(III)	Bi^{3+}
	Chromium(III)	Cr^{3+}
	Iron(III) (Ferric)	Fe^{3+}
	Titanium(III) (Titanous)	Ti^{3+}
4+	Manganese(IV)	Mn^{4+}
	Tin(IV) (Stannic)	Sn^{4+}
	Titanium(IV) (Titanic)	Ti^{4+}
5+	Antimony(V)	Sb^{5+}
	Arsenic(V)	As^{5+}

Negative Ions (Anions)		
1–	Acetate	$C_2H_3O_2^-$
	Bromate	BrO_3^-
	Bromide	Br^-
	Chlorate	ClO_3^-
	Chloride	Cl^-
	Chlorite	ClO_2^-
	Cyanide	CN^-
	Fluoride	F^-
	Hydride	H^-
	Hydrogen carbonate (Bicarbonate)	HCO_3^-
	Hydrogen sulfate (Bisulfate)	HSO_4^-
	Hydrogen sulfite (Bisulfite)	HSO_3^-
	Hydroxide	OH^-
	Hypochlorite	ClO^-
	Iodate	IO_3^-
	Iodide	I^-
	Nitrate	NO_3^-
	Nitrite	NO_2^-
	Perchlorate	ClO_4^-
	Permanganate	MnO_4^-
	Thiocyanate	SCN^-
2–	Carbonate	CO_3^{2-}
	Chromate	CrO_4^{2-}
	Dichromate	$Cr_2O_7^{2-}$
	Oxalate	$C_2O_4^{2-}$
	Oxide	O^{2-}
	Peroxide	O_2^{2-}
	Silicate	SiO_3^{2-}
	Sulfate	SO_4^{2-}
	Sulfide	S^{2-}
	Sulfite	SO_3^{2-}
3–	Arsenate	AsO_4^{3-}
	Borate	BO_3^{3-}
	Phosphate	PO_4^{3-}
	Phosphide	P^{3-}
	Phosphite	PO_3^{3-}

Useful Conversion Factors and Relationships

Length

SI unit: meter (m)

1 km = 0.621 37 mi
1 mi = 5280 ft
= 1.6093 km
1 m = 1.0936 yd
1 in. = 2.54 cm (exactly)
1 cm = 0.393 70 in.
1 Å = 10^{-10} m

Mass

SI unit: kilogram (kg)

1 kg = 10^3 g = 2.2046 lb
1 lb = 16 oz = 453.59 g
1 amu = 1.660 54 × 10^{-27} kg

Temperature

SI unit: Kelvin (K)

0 K = −273.15°C
= −459.67°F
K = °C + 273.15
°C = $\frac{5}{9}$ (°F − 32)
°F = $\frac{9}{5}$ (°C) + 32

Energy (derived)

SI unit: Joule (J)

1 J = 1 (kg·m²)/s²
1 J = 0.239 01 cal
= 1 C × 1 V
1 cal = 4.184 J
1 eV = 1.602 × 10^{-19} J

Pressure (derived)

SI unit: Pascal (Pa)

1 Pa = 1 N/m²
= 1 kg/(m·s²)
1 atm = 101,325 Pa
= 760 mm Hg (torr)
= 14.70 lb/in²
1 bar = 10^5 Pa

Volume (derived)

SI unit: cubic meter (m^3)

1 L = 10^{-3} m³
= 1 dm³
= 10^3 cm³
= 1.0567 qt
1 gal = 4 qt
= 3.7854 L
1 cm³ = 1 mL
1 in³ = 16.4 cm³

Fundamental Constants

Atomic mass unit	1 amu	= 1.660 539 × 10^{-27} kg
	1 g	= 6.022 142 × 10^{23} amu
Avogadro's number	N_A	= 6.022 142 × 10^{23}/mol
Boltzmann's constant	k	= 1.380 650 × 10^{-23} J/K
Electron charge	e	= 1.602 176 × 10^{-19} C
Faraday's constant	$\mathcal{F}$	= 9.648 534 × 10^4 C/mol
Gas constant	R	= 8.314 472 J/(mol·K)
		= 0.082 058 2 (L·atm)/(mol·K)
Mass of electron	m_e	= 5.485 799 × 10^{-4} amu
		= 9.109 382 × 10^{-31} kg
Mass of neutron	m_n	= 1.008 665 amu
		= 1.674 927 × 10^{-27} kg
Mass of proton	m_p	= 1.007 276 amu
		= 1.672 622 × 10^{-27} kg
Pi	π	= 3.141 592 653 6
Planck's constant	h	= 6.626 069 × 10^{-34} J·s
Speed of light	c	= 2.997 924 58 × 10^8 m/s

514.2 K

6.25