

Periodic Table of the Elements

1A 1										2A 2										3A 13					4A 14	5A 15	6A 16	7A 17	8A 18
1 H 1.01																5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18								
3 Li 6.94	4 Be 9.01											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95												
11 Na 22.99	12 Mg 24.31	3B 3	4B 4	5B 5	6B 6	7B 7	8B 8	8B 9	8B 10	1B 11	2B 12	31 Ga 69.72	32 Ge 72.64	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80												
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29												
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 (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	81 Tl 204.38	82 Pb 207.20	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)												
55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59																		
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (281)	111 Rg (272)	112 Cn (285)																		

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	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
90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

Some Standard Properties of Water

property	symbol	value
density	ρ	1.00 g cm ⁻³ 1000 kg m ⁻³
specific heats		
ice	C_{ice}	2.09 J g ⁻¹ K ⁻¹
water	C_{water}	4.184 J g ⁻¹ K ⁻¹
steam	C_{steam}	2.03 J g ⁻¹ K ⁻¹
heat of fusion	ΔH_{fus} or L_f	334 J g ⁻¹
heat of vaporization	ΔH_{vap} or L_v	2260 J g ⁻¹
index of refraction	n	1.33

Pressure
1 atm = 760 torr = 101325 Pa = 14.7 psi
1 bar = 10 ⁵ Pa = 100 kPa

Energy
1 cal = 4.184 J
1 L atm = 101.325 J
1 Cal = 1 kcal
1 hp = 746 W

Various Physical Constants

property	symbol	value
universal gas constant	R	8.314 J mol ⁻¹ K ⁻¹
		62.36 L torr mol ⁻¹ K ⁻¹
		0.08206 L atm mol ⁻¹ K ⁻¹
		1.987 cal mol ⁻¹ K ⁻¹
Planck's constant	h	6.626 × 10 ⁻³⁴ J s
		4.136 × 10 ⁻¹⁵ eV s
Planck's reduced constant	$h/2\pi$	1.054 × 10 ⁻³⁴ J s
		6.582 × 10 ⁻¹⁶ eV s
Boltzmann constant	k_B	1.38 × 10 ⁻²³ J K ⁻¹
Stefan-Boltzmann	σ	5.67 × 10 ⁻⁸ W m ⁻² K ⁻⁴
speed of light	c	3.00 × 10 ⁸ m s ⁻¹
speed of sound (at 20°C)	v_{air}	343 m s ⁻¹
acceleration of gravity	g	9.80 m s ⁻²
gravitational constant	G	6.67 × 10 ⁻¹¹ N m ² kg ⁻²
Avogadro's number	N_A	6.022 × 10 ²³ mol ⁻¹
elementary charge	e	1.602 × 10 ⁻¹⁹ C
Faraday	F	96485 C mol ⁻¹
Coulomb's law constant	k	8.988 × 10 ⁹ N m ² C ⁻²

Various Physical Constants

property	symbol	value
electron rest mass	m_e	9.11 × 10 ⁻³¹ kg
		0.000549 u
		0.511 MeV c ⁻²
proton mass	m_p	1.6726 × 10 ⁻²⁷ kg
		1.00728 u
neutron mass	m_n	1.6749 × 10 ⁻²⁷ kg
		1.008665 u
		939.6 MeV c ⁻²
atomic mass unit	u	1.6605 × 10 ⁻²⁷ kg
		931.5 MeV c ⁻²
earth mass		5.972 × 10 ²⁴ kg
earth radius		6.371 × 10 ⁶ m
moon mass		7.348 × 10 ²² kg
sun mass		1.989 × 10 ³⁰ kg
distance earth-moon		3.844 × 10 ⁹ m
distance earth-sun		1.496 × 10 ¹¹ m
permittivity of free space	ϵ_0	8.85 × 10 ⁻¹² F m ⁻¹
permeability of free space	μ_0	4π × 10 ⁻⁷ T m A ⁻¹