

Fundamental Physical Constants (six significant figures)

Avogadro's number	$N_A = 6.02214 \times 10^{23}/\text{mol}$
atomic mass unit	$\text{amu} = 1.66054 \times 10^{-27} \text{ kg}$
charge of the electron (or proton)	$e = 1.60218 \times 10^{-19} \text{ C}$
Faraday constant	$F = 9.64853 \times 10^4 \text{ C/mol}$
mass of the electron	$m_e = 9.10939 \times 10^{-31} \text{ kg}$
mass of the neutron	$m_n = 1.67493 \times 10^{-27} \text{ kg}$
mass of the proton	$m_p = 1.67262 \times 10^{-27} \text{ kg}$
Planck's constant	$h = 6.62607 \times 10^{-34} \text{ J}\cdot\text{s}$
speed of light in a vacuum	$c = 2.99792 \times 10^8 \text{ m/s}$
standard acceleration of gravity	$g = 9.80665 \text{ m/s}^2$
universal gas constant	$R = 8.31447 \text{ J}/(\text{mol}\cdot\text{K})$ $= 8.20578 \times 10^{-2} \text{ (atm}\cdot\text{L)}/(\text{mol}\cdot\text{K})$

SI Unit Prefixes

p	n	μ	m	c	d	k	M	G
pico-	nano-	micro-	milli-	centi-	deci-	kilo-	mega-	giga-
10^{-12}	10^{-9}	10^{-6}	10^{-3}	10^{-2}	10^{-1}	10^3	10^6	10^9

Conversions and Relationships

Length

SI unit: meter, m

1 km	= 1000 m
	= 0.62 mile (mi)
1 inch (in)	= 2.54 cm
1 m	= 1.094 yards (yd)
1 pm	= 10^{-12} m = 0.01 Å

Volume

SI unit: cubic meter, m³

1 dm ³	= 10^{-3} m ³
	= 1 liter (L)
	= 1.057 quarts (qt)
1 cm ³	= 1 mL
1 m ³	= 35.3 ft ³

Pressure

SI unit: pascal, Pa

1 Pa	= 1 N/m ²
	= 1 kg/m·s ²
1 atm	= 1.01325×10^5 Pa
	= 760 torr
1 bar	= 1×10^5 Pa

Mass

SI unit: kilogram, kg

1 kg	= 10^3 g
	= 2.205 lb
1 metric ton (t)	= 10^3 kg

Energy

SI unit: joule, J

1 J	= 1 kg·m ² /s ²
	= 1 coulomb·volt (1 C·V)
1 cal	= 4.184 J
1 eV	= 1.602×10^{-19} J

Math relationships

	$\pi = 3.1416$
volume of sphere	= $\frac{4}{3}\pi r^3$
volume of cylinder	= $\pi r^2 h$

Temperature

SI unit: kelvin, K

0 K	= -273.15°C
mp of H ₂ O	= 0°C (273.15 K)
bp of H ₂ O	= 100°C (373.15 K)
T (K)	= T ($^\circ\text{C}$) + 273.15
T ($^\circ\text{C}$)	= $[T$ ($^\circ\text{F}$) - 32] $\frac{5}{9}$
T ($^\circ\text{F}$)	= $\frac{9}{5}T$ ($^\circ\text{C}$) + 32

Useful Data and Information

Atomic and Molecular Properties

Atomic radii	Figure 8.8, p. 259
Bond energies and bond lengths	Table 9.2, p. 287
Ground-state electron configurations	Figure 8.5, p. 255
Electronegativity values	Figure 9.19, p. 294
Ionic radii	Figure 8.21, p. 270
First ionization energies	Figure 8.11, p. 262

Equilibrium Constants and Thermodynamic Data

K_a of hydrated metal ions	Appendix C, p. A-12
K_a of selected acids	Appendix C, pp. A-8 to A-10
Strengths of conjugate acid-base pairs	Figure 18.8, p. 591
K_b of amine bases	Appendix C, pp. A-11 to A-12
K_f of complex ions	Appendix C, p. A-12
K_{sp} of slightly soluble ionic compounds	Appendix C, p. A-13
Standard electrode potentials, $E^\circ_{\text{half-cell}}$	Appendix D, p. A-14
Standard free energies of formation, ΔG°_f	Appendix B, pp. A-5 to A-7
Standard heats of formation, ΔH°_f	Appendix B, pp. A-5 to A-7
Standard molar entropies, S°	Appendix B, pp. A-5 to A-7

Names and Formulas

Ligands	Table 22.6, p. 745
Metals in complex anions	Table 22.7, p. 746
Metals with more than one monatomic ion	Table 2.4, p. 55
Monatomic ions	Table 2.3, p. 54
Organic functional groups	Table 15.5, p. 475
Polyatomic ions	Table 2.5, p. 56

Properties of the Elements

Group 1A(1): Alkali metals	p. 428
Group 2A(2): Alkaline earth metals	p. 431
Group 3A(13): Boron family	p. 433
Group 4A(14): Carbon family	p. 435
Group 5A(15): Nitrogen family	p. 440
Group 6A(16): Oxygen family	p. 445
Group 7A(17): Halogens	p. 449
Group 8A(18): Noble gases	p. 453
Period 4 transition metals, atomic properties	Figure 22.3, p. 739
Period 4 transition metals, oxidation states	Table 22.2, p. 741

Miscellaneous

Rules for assigning an oxidation number	Table 4.3, p. 134
SI-English equivalent quantities	Table 1.3, p. 15
Solubility rules for ionic compounds in water	Table 4.1, p. 123
Vapor pressure of water	Table 5.2, p. 166