APPENDIX A

FUNDAMENTAL CONSTANTS AND CONVERSION FACTORS

TABLE A.1 Fundamental Constants

Quantity	Symbol (Expression)	Value	SI Units	cgs Units
Speed of light in vacuum	c	2.99792458	10^{8} m s^{-1}	10^{10} cm s^{-1}
Elementary charge	e	4.8032068		10^{-10} esu
		1.60217733	10^{-19} C	10^{-20} emu
Planck constant	h	6.6260755	10^{-34} J s	10^{-27} ergs
(reduced)	h	1.05457266	10^{-34} J s	10^{-27} ergs
Boltzmann constant	k	1.380658	10^{-23} J K^{-1}	10^{-16} erg K^{-1}
Avogadro's number	N_A	6.0221367	10^{23} mol^{-1}	10^{23} mol^{-1}
Molar gas constant	R	8.314510	J mol^{-1} K^{-1}	10^{7} erg $mol^{-1}K^{-1}$
Rydberg constant	$R_\infty = m_e c\,\alpha^2/2h$	1.0973731534	10^{7} m^{-1}	10^{5} cm^{-1}

(*continued*)

Modern Nuclear Chemistry, by W.D. Loveland, D.J. Morrissey, and G.T. Seaborg

Gravitational Constant → $G = 6.673 \cdot 10^{-11} \frac{J \cdot m}{kg^2}$

TABLE A.1 *Continued*

Quantity	Symbol (Expression)	Value	SI Units	cgs Units
Bohr magneton	$\mu_B = eh[c]/2m_e c$	9.2740154	10^{-24} J T^{-1}	10^{-21} erg G^{-1}
Nuclear magneton	$\mu_N = eh[c]/2m_p c$	5.0507866	10^{-27} J T^{-1}	10^{-24} erg G^{-1}
Fine structure constant	$\alpha = [4\pi\varepsilon_0]^{-1}$ e^2/hc	7.29735308		
	α^{-1}	137.0359895		
Permittivity, free space	ε_0	8.854187817	10^{-12} C^2 N^{-1} m^{-2}	
Atomic mass unit	u	1.6605402	10^{-27} kg	10^{-24} g
Electron rest mass	m_e	9.10938974	10^{-31} kg	10^{-28} g
Proton rest mass	m_p	1.6726231	10^{-27} kg	10^{-24} g
Neutron rest mass	m_n	1.674929	10^{-27} kg	10^{-24} g
Muon rest mass	m_μ	1.8835327	10^{-28} kg	10^{-25} g
Pion rest mass	$m_\pi^\pm$	2.4880187	10^{-28} kg	10^{-25} g
	m_π^0	2.406120	10^{-28} kg	10^{-25} g
Bohr radius	$a_0 = r_e/\alpha^2$	5.29177249	10^{-11} m	10^{-9} cm
Compton wavelength				
Electron	$\lambda_{c,e} = h/m_e c$	2.42031058	10^{-12} m	10^{-10} cm
Proton	$\lambda_{c,p} = h/m_p c$	1.32141002	10^{-15} m	10^{-13} cm
Neutron	$\lambda_{c,n} = h/m_n c$	1.31959110	10^{-15} m	10^{-13} cm
Classical electron radius	$r_e = \alpha h/m_e c$	2.81794092	10^{-15} m	10^{-13} cm
Magnetic dipole moment				
Electron	μ_e	1.001159652193	μ_B	
Proton	μ_p	2.792847386	μ_N	
Neutron	μ_n	−1.91304275	μ_N	
Proton gyromagnetic ratio	γ_p	2.67522128	10^8 s^{-1} T^{-1}	10^4 s^{-1} G^{-1}

TABLE A.2 Conversion Factors and Handy Units

Quantity	Symbol	Value
Atomic mass unit	u	931.494 MeV
Electron mass	m_e	0.510999 MeV
Proton mass	m_p	938.272 MeV
Neutron mass	m_n	939.566 MeV
Electron volt	1 eV	1.602177×10^{-19} J
Electron volt/particle	1 eV/k	11604.45 K
Planck constant	h	6.582122×10^{-22} MeV · s
	hc	197.327053 MeV · fm
	$(hc)^2$	0.389380 GeV^2 · mb
Rydberg constant	$R_\infty hc$	13.605698 eV
Gas constant	R	1.987216 cal/mol
1 degree	°	1.7453×10^{-2} rad
1 calorie	cal	4.184 J
1 British thermal unit	Btu	1054.4 J
1 erg		10^{-7} J
1 ton (equivalent of TNT)		4.184×10^9 J
1 electron radius	r_e	2.8179×10^{-15} m
1 fermi		10^{-15} m
1 light year	ly	9.4605×10^{15} m
1 parsec	pc	3.0857×10^{16} m
1 atmosphere	atm	101325 Pa
1 torr (mm Hg, 0°C)		133.32 Pa
1 day	d	86400 s
1 year (365.25636 d)	y	3.1558150×10^7 s
1 Curie (Ci)		3.700×10^{10} Bq
1 rad		1.000×10^{-2} Gy
1 rem		1.000×10^{-2} Sv
1 Roentgen (R)		2.580×10^{-4} C/kg