

APPENDIX I: CONSTANTS, UNITS & CONVERSIONS

Physical and Chemical Constants

Speed of Light (c)	$2.998 \times 10^8 \text{ m/s}$
Planck's Constant (h)	$6.626 \times 10^{-34} \text{ J/Hz}$
Boltzmann's Constant (k)	$1.380 \times 10^{-23} \text{ J/K}$
Gravitational Constant (G)	$6.672 \times 10^{-11} \text{ N-m}^2/\text{kg}$
Avogadro's Number (N_A)	$6.022 \times 10^{23} \text{ mol}^{-1}$
Gas Constant (R)	8.314 J/mol-K $(1.987 \text{ cal/mol-K})$
Faraday Constant (F)	96.487 kJ/V-eq.
Electron Charge (e)	$1.602 \times 10^{-19} \text{ coulombs (C)}$
Permittivity in vacuum (ϵ)	$8.85 \times 10^{-12} \text{ C}^2/\text{J-m}$
Dielectric constant of water	78.54

THE EARTH

Mass of the Earth ($M_\oplus$)	$5.97 \times 10^{24} \text{ kg}$
Mantle	$4.0 \times 10^{24} \text{ kg}$
Core	$1.94 \times 10^{24} \text{ kg}$
Continental Crust	$2.2 \times 10^{22} \text{ kg}$
Oceans	$1.4 \times 10^{21} \text{ kg}$
Atmosphere	$5.1 \times 10^{18} \text{ kg}$
Mean Radius	$6.37 \times 10^6 \text{ m}$
Radius of Core	$3.47 \times 10^6 \text{ m}$
Radius of Orbit	$1.49 \times 10^{11} \text{ m}$
The Sun	
Mass ($M_\odot$)	$1.99 \times 10^{30} \text{ kg}$
Radius	$6.96 \times 10^8 \text{ m}$

SI UNITS AND CONVERSIONS

Mass	Kilogram (kg)
Pound	$1 \text{ lb} = 0.4535 \text{ kg}$ $(1 \text{ kg} = 2.205 \text{ lb})$
amu (atomic mass unit)	$1 \text{ amu} \equiv \text{mass of } ^{12}\text{C atom}$ $1 \text{ amu} = 1.66 \times 10^{-27} \text{ kg}$
Distance	Meter (m)
inch	$1 \text{ in} = .0254 \text{ m}$
ångstrom	$1 \text{ Å} \equiv 10^{-10} \text{ m}$
mile (US)	$1 \text{ mi} = 1609 \text{ m}$
astronomical unit (AU)	$1 \text{ AU} \equiv 1.49 \times 10^{11} \text{ m}$
parsec	$1 \text{ parsec} = 3.084 \times 10^{16} \text{ m}$ $= 2.07 \times 10^5 \text{ AU}$
light-year	$1 \text{ ly} = 6.35 \times 10^4 \text{ AU}$
Force	Newton (N)
	$1 \text{ N} \equiv 1 \text{ kg-m/s}^2$ $1 \text{ dyne} = 10^{-5} \text{ N}$ $1 \text{ dyne} \equiv 1 \text{ gm-cm/sec}^2$

APPENDIX I: CONSTANTS, UNITS & CONVERSIONS**Energy**

erg

calorie

liter-atmosphere

liter-Pascal

electron volt

Dalton

Volt

kilowatt-hour

Pressure

pascal

bar

atmosphere

Volume

U.S. gallon

Concentration

molarity

molality

Joule (J)

$$1 \text{ J} \equiv 1 \text{ kg-m}^2/\text{s}^2$$

$$1 \text{ erg} = 10^{-7} \text{ J}$$

$$1 \text{ erg} = 1 \text{ gm-cm}^2/\text{sec}^2$$

$$1 \text{ calorie} = 4.184 \text{ J}$$

$$1 \text{ l-atm} = 101.29 \text{ J}$$

$$1 \text{ l-Pa} = 99.98 \times 10^{-5} \text{ J}$$

$$1 \text{ eV} = 1.602 \times 10^{-19} \text{ J}$$

$$1 \text{ dalton} = 9.315 \times 10^2 \text{ MeV}$$

$$1 \text{ Volt-coloumb} = 1 \text{ J}$$

$$1 \text{ kWh} = 3.6 \times 10^6 \text{ J}$$

Pascal (Pa)

$$1 \text{ Pa} \equiv 1 \text{ N/m}^2$$

$$1 \text{ bar} = 10^5 \text{ Pa} (= 0.1 \text{ MPa})$$

$$1 \text{ atm} = 1.013 \times 10^5 \text{ Pa}$$

Liter (l)

$$1 \text{ l} \equiv 10^3 \text{ cm}^3$$

$$1 \text{ l} = 10^{-6} \text{ m}^3$$

$$1 \text{ gal} = 3.785 \text{ l}$$

moles/l (M)

moles/kg (m)

$$1 \mu\text{M (micromole)} = 10^{-6} \text{ M}$$

$$1 \text{ nM (nanomole)} = 10^{-9} \text{ M}$$

$$1 \text{ pM (picomole)} = 10^{-12} \text{ M}$$

$$1 \text{ fM (femtomole)} = 10^{-15} \text{ M}$$