Chapter 31

Appendix G: Physical Constants and Conversion Factors

Selected Physical Constants	
Atomic mass unit	1 amu = $1.6605389 \times 10^{-24}$ g
	1 g = 6.022142×10^{23} amu
Avogadro's number	$N = 6.022142 \times 10^{23}$/mol
Boltzmann's constant	$k = 1.380651 \times 10^{-23}$ J/K
Charge on electron	$e = 1.6021765 \times 10^{-19}$ C
Faraday's constant	$F = 9.6485338 \times 10^{4}$ C/mol
Gas constant	$R = 0.0820575$ (L atm)/(mol K)
	= 8.31447 J/(mol K)
Mass of electron	$m_e = 5.485799 \times 10^{-4}$ amu
	= 9.109383×10^{-28} g
Mass of neutron	$m_n = 1.0086649$ amu
	= $1.6749273 \times 10^{-24}$ g
Mass of proton	$m_p = 1.0072765$ amu
	= $1.6726217 \times 10^{-24}$ g
Pi	$\pi = 3.1415927$
Planck's constant	$h = 6.626069 \times 10^{-34}$ J s
Speed of light (in vacuum)	$c = 2.99792458 \times 10^{8}$ m/s (exact)

Useful Conversion Factors and Relationships	
Length	**Energy (derived)**
Si unit: meter (m)	*Si unit: joule (J)*

Useful Conversion Factors and Relationships	
$1\ \text{km} = 0.62137\ \text{mi}$ $1\ \text{mi} = 5280\ \text{ft}$ $= 1.6093\ \text{km}$ $1\ \text{m} = 1.0936\ \text{yd}$ $1\ \text{in} = 2.54\ \text{cm}\ \ \text{(exact)}$ $1\ \text{cm} = 0.39370\ \text{in.}$ $1\ \text{Å} = 10^{-10}\ \text{m}$	$1\ \text{J} = 1\ \text{N} \cdot \text{m} = 1\ \left(\text{kg} \cdot \text{m}^2\right)/\text{s}^2$ $1\ \text{J} = 0.2390\ \text{cal}$ $= 1\ \text{V} \times 1\ \text{C}$ $1\ \text{cal} = 4.184\ \text{J}\ \ \text{(exact)}$ $1\ \text{eV} = 1.602 \times 10^{-19}\ \text{J}$
Mass	**Pressure (derived)**
SI unit: kilogram (kg)	*SI unit: pascal (Pa)*
$1\ \text{kg} = 2.2046\ \text{lb}$ $1\ \text{lb} = 453.59\ \text{g}$ $= 16\ \text{oz}$	$1\ \text{Pa} = 1\ \text{N/m}^2$ $= 1\ \text{kg}/\left(\text{m} \cdot \text{s}^2\right)$ $1\ \text{atm} = 101{,}325\ \text{Pa}$ $= 760\ \text{torr}$ $= 14.70\ \text{lb/in}^2$ $1\ \text{bar} = 10^5\ \text{Pa}$
Temperature	**Volume (derived)**
Si unit: kelvin (K)	*SI unit: cubic meter (m^3)*
$0\ \text{K} = -273.15°\text{C}$ $= 459.67°\text{F}$ $\text{K} = °\text{C} + 273.15°\text{C}$ $°\text{C} = \frac{5}{9}\ (°\text{F} - 32°)$ $°\text{F} = \frac{9}{5}\ °\text{C} + 32$	$1\ \text{L} = 10^{-3}\ \text{m}^3$ $= 1\ \text{dm}^3$ $= 10^3\ \text{cm}^3$ $1\ \text{gal} = 4\ \text{qt}$ $= 3.7854\ \text{L}$ $1\ \text{cm}^3 = 1\ \text{mL}$