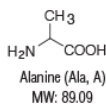
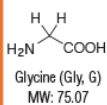
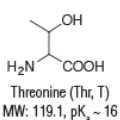
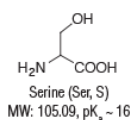


$[A] = -kt + [A]_o$	$\ln[A] = -kt + \ln[A]_o$	$\frac{1}{[A]} = kt + \frac{1}{[A]_o}$
$\ln(k) = -\frac{E_a}{R}\left(\frac{1}{T}\right) + \ln(A)$	$\ln\left(\frac{k_1}{k_2}\right) = \frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$	$\ln(P_{vap}) = -\frac{\Delta H_{vap}}{R}\left(\frac{1}{T}\right) + C$
$\ln\left(\frac{P_{vap}(T_1)}{P_{vap}(T_2)}\right) = \frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$	$n\lambda = 2d\sin\theta$	$q = C\Delta T$
$PV = nRT$	$\chi_A = \frac{n_A}{n_{total}}$	$\text{mass \% } A = \left(\frac{m_A}{m_{total}}\right) 100\%$
$m = \frac{n}{m}$	$M = \frac{n}{m}$	$P = k_H\chi$
$\Delta T_b = imK_b$	$\Delta T_f = imK_f$	$P_{solution} = \chi_{solvent}P_{solvent}^\circ$
$P_{solution} = \chi_{solvent}P_{solvent}^\circ + \chi_{solute}AP_{solute}^\circ + \dots$		$\pi = iMRT$
$E = h\nu$	$c = \lambda\nu$	$E = mc^2$

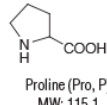
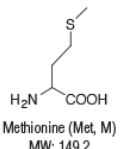
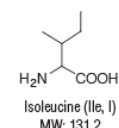
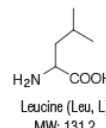
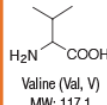
SMALL



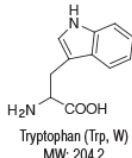
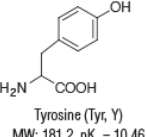
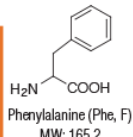
NUCLEOPHILIC



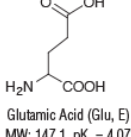
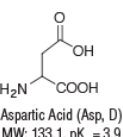
HYDROPHOBIC



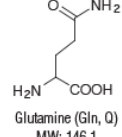
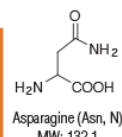
AROMATIC



ACIDIC



AMIDE



BASIC

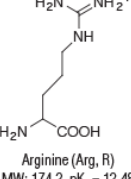
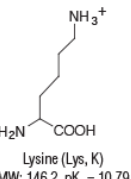
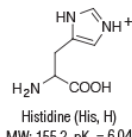


TABLE 21.8

Some Important Monosaccharides

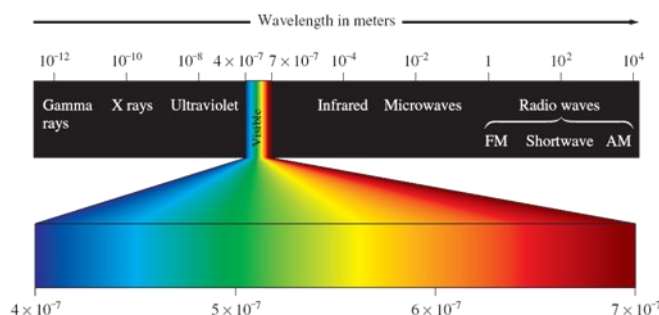
Pentoses			
D-Ribose	D-Arabinose	D-Ribulose	
<chem>O=C[C@@H](O)[C@H](O)[C@@H](O)CO</chem>	<chem>O=C[C@@H](O)[C@H](O)[C@@H](O)CO</chem>	<chem>O=C[C@@H](O)[C@H](O)[C@@H](O)CO</chem>	
Hexoses			
D-Glucose	D-Mannose	D-Galactose	D-Fructose
<chem>O=C[C@@H](O)[C@H](O)[C@@H](O)[C@@H](O)CO</chem>	<chem>O=C[C@@H](O)[C@H](O)[C@@H](O)[C@@H](O)CO</chem>	<chem>O=C[C@@H](O)[C@H](O)[C@@H](O)[C@@H](O)CO</chem>	<chem>O=C[C@@H](O)[C@H](O)[C@@H](O)[C@@H](O)CO</chem>

Vapor Pressure of H<sub>2</sub>O

T (°C)	P (torr)
0.0	4.579
10.0	9.209
20.0	17.535
25.0	23.756
30.0	31.824
40.0	55.324
60.0	149.4
70.0	233.7
90.0	535.8

## Boiling and Freezing Point Data

Solvent	Boiling Point (°C)	K <sub>b</sub> (°C·kg/mol)	Freezing Point (°C)	K <sub>f</sub> (°C·kg/mol)
H <sub>2</sub> O	100.0	0.51	0.0	1.86
CCl <sub>4</sub>	76.5	5.03	-22.99	30.
CHCl <sub>3</sub>	61.2	3.63	-63.5	4.70
C <sub>6</sub> H <sub>6</sub>	80.1	2.53	5.5	5.12
CS <sub>2</sub>	46.2	2.34	-111.5	3.83
C <sub>4</sub> H <sub>10</sub> O	34.5	2.02	-116.2	1.79
C <sub>10</sub> H <sub>16</sub> O	208.0	2.95	179.8	40.



1 H 1.0079																	18 He 4.0026
3 Li 6.941	4 Be 9.0122											13 B 10.811	14 C 12.011	15 N 14.007	16 O 15.999	17 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305	3	4	5	6	7	8	9	10	11	12	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.64	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.798
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.96	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-71 * #	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	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89-103 * #	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (270)	109 Mt (268)	110 Ds (281)	111 Rg (272)	112 Uub (285)	113 Uut (284)	114 Uuq (289)	115 Uup (288)	116 Uuh (291)		118 Uuo (294)

\* Lanthanide series

57 La 138.91	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 173.05	71 Lu 174.97
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# Actinide series

89 Ac (227)	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)
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Fundamental Constants		
Avogadro's number	$N_A$	$6.02214 \times 10^{23} \frac{1}{mol}$
Gas constant	R	$8.3145 \frac{J}{mol \cdot K}$ $0.08206 \frac{L \cdot atm}{mol \cdot K}$
Faraday's constant	F	$96,485 \frac{C}{mol}$
Planck's constant	h	$6.62608 \times 10^{-34} J \cdot s$
Boltzmann's constant	k	$1.38066 \times 10^{-23} \frac{J}{K}$
Speed of light	c	$2.9979246 \times 10^8 \frac{m}{s}$
Electron's mass		$9.10939 \times 10^{-31} kg$ $0.00054858 u$
Electron's charge	e	$-1.60218 \times 10^{-19} C$
Proton's mass		$1.672623 \times 10^{-27} kg$ $1.0073 u$
Proton's charge		$1.60218 \times 10^{-19} C$
Neutron's mass		$1.672493 \times 10^{-27} kg$ $1.0087 u$
Hydrogen-1 mass		$1.0078 u$

Volume Conversion Factors		
1 L	=	$10^3 cm^3$
1.000 gal	=	$3.785 \times 10^3 cm^3$
1.00 ft <sup>3</sup>	=	$2.83 \times 10^{-2} m^3$
1.00 qt	=	$9.46 \times 10^2 cm^3$

Energy Conversion Factors		
1 cal	=	4.184 J
1 eV	=	$1.62018 \times 10^{-19} J$
1 eV	=	$96.485 kJ \cdot mol^{-1}$
1 C·V	=	1 J
1 kWh	=	$3.600 \times 10^3 kJ$
1 L·atm	=	101.325 J

Pressure Conversion Factors		
1 atm	=	$1.01325 \times 10^5 Pa$
1 atm	=	760 Torr 760 mm Hg
1 atm	=	14.70 psi
1 bar	=	$10^5 Pa$

Molar Heat Capacities at 298K		
Substance	$C_V \left( \frac{J}{K \cdot mol} \right)$	$C_P \left( \frac{J}{K \cdot mol} \right)$
He, Ne, Ar	12.47	20.80
H <sub>2</sub>	20.54	28.86
N <sub>2</sub>	20.71	29.03
N <sub>2</sub> O	30.38	38.70
CO <sub>2</sub>	28.95	37.27
C <sub>2</sub> H <sub>6</sub>	44.60	52.92

Mass Conversion Factors		
2.205 lb	=	1.000 kg
1.000 lb	=	453.6 g
1.000 oz	=	28.35 g
1.000 ton	=	907.2 kg
1 u	=	$1.6605 \times 10^{-27} kg$

Length Conversion Factors		
1.094 yd	=	1.000 m
0.3937 in	=	1.000 cm
0.6214 mi	=	1.000 km
1 Å	=	$10^{-10} m$

Thermodynamic Values for Water	
$\Delta H_{vap}$	$40.6 \left( \frac{kJ}{mol} \right)$
$\Delta H_{fus}$	$6.01 \left( \frac{kJ}{mol} \right)$

Specific Heat Capacities at 298K	
Substance	$C \left( \frac{J}{g \cdot ^\circ C} \right)$
H <sub>2</sub> O(l)	4.18
H <sub>2</sub> O(s)	2.03
Al(s)	0.89
Fe(s)	0.45
Hg(l)	0.14
C(s)	0.71

Spectrochemical Series

$I^- < Br^- < Cl^- < F^- < OH^- < ox^- < H_2O < NH_3 < en < NO_2^- < CN^-$