

## Biochemistry 404B Data Sheet

### Atomic Masses

Isotope	Atomic Weight	% Natural Abundance
<sup>1</sup> H	1.0078	99.98
<sup>2</sup> H	2.0140	0.015
<sup>12</sup> C	12.0000	98.89
<sup>13</sup> C	13.0034	1.11
<sup>14</sup> N	14.0031	99.64
<sup>15</sup> N	15.0001	0.36
<sup>16</sup> O	15.9949	99.76
<sup>18</sup> O	18.01	0.20
<sup>31</sup> P	30.9738	100
<sup>32</sup> S	31.9721	95.0
<sup>33</sup> S	32.9715	0.76
<sup>34</sup> S	33.9679	4.22
<sup>36</sup> S	35.9671	0.02

### Isotope-averaged values:

H	1.0080
C	12.0112
N	14.0067
O	15.9994
P	30.9738
S	32.064

### Ionic Mobilities (25°C)

Ion	m (cm <sup>2</sup> V <sup>-1</sup> sec <sup>-1</sup> )
H <sup>+</sup>	3.63 x 10 <sup>-3</sup>
NH <sub>4</sub> <sup>+</sup>	7.62 x 10 <sup>-4</sup>
Na <sup>+</sup>	5.19 x 10 <sup>-4</sup>
K <sup>+</sup>	7.62 x 10 <sup>-4</sup>
Mg <sup>2+</sup>	5.50 x 10 <sup>-4</sup>
Ca <sup>2+</sup>	6.17 x 10 <sup>-4</sup>
Cl <sup>-</sup>	-7.91 x 10 <sup>-4</sup>
Glycinate <sup>-</sup>	-3.21 x 10 <sup>-4</sup>
NO <sub>3</sub> <sup>-</sup>	-7.41 x 10 <sup>-4</sup>
Acetate <sup>-</sup>	-4.24 x 10 <sup>-4</sup>
HCO <sub>3</sub> <sup>-</sup>	-4.61 x 10 <sup>-4</sup>
HSO <sub>4</sub> <sup>-</sup>	-4.61 X 10 <sup>-4</sup>
SO <sub>4</sub> <sup>-2</sup>	-8.29 x 10 <sup>-4</sup>

### pKa Values

Protonated Species	pKa
<u>Inorganic Species:</u>	
H <sub>2</sub> CO <sub>3</sub>	6.38
HCO <sub>3</sub> <sup>-</sup>	10.32
H <sub>3</sub> PO <sub>4</sub>	2.13
H <sub>2</sub> PO <sub>4</sub> <sup>-</sup>	7.21
HPO <sub>4</sub> <sup>-2</sup>	12.38
H <sub>2</sub> SO <sub>4</sub>	< 0.0
HSO <sub>4</sub> <sup>-</sup>	2.00
NH <sub>4</sub> <sup>+</sup>	9.25
H <sub>3</sub> BO <sub>3</sub>	9.14

### Organic Buffers:

Glycinium <sup>+</sup>	2.34
CH <sub>3</sub> COOH	4.76
MOPS-H <sup>+</sup>	7.20
HEPES-H <sup>+</sup>	7.55
Tris-H <sup>+</sup>	8.10
Glycine <sup>0</sup>	9.60

### Amino Acid Side Chains:

Arginine <sup>+</sup>	12.48
Aspartate <sup>-</sup>	3.86
Cysteine <sup>0</sup>	8.5
Glutamate <sup>-</sup>	4.25
Histidine <sup>+</sup>	6.0
Lysine <sup>+</sup>	10.53
Tyrosine <sup>0</sup>	10.07

### Properties of Water

Temp.	Density (g cm <sup>-3</sup> )	Viscosity (poise)
0°C	0.9999	0.01787
4°C	1.0000	0.01567
5°C	1.0000	0.01519
10°C	0.9997	0.01307
20°C	0.9982	0.01002
25°C	0.9971	0.00890
30°C	0.9957	0.00798
37°C	0.9934	0.00692

Properties of Aqueous Solutions at 20°C

Solution	$\rho$ (g cm <sup>-3</sup> )	$\eta$ (poise)
Glycerol:		
10%	1.0233	0.01291
20%	1.0478	0.01737
40%	1.1003	0.03653
60%	1.1551	0.1068
80%	1.2106	0.5990
Sucrose:		
10%	1.0400	0.01336
20%	1.0829	0.01945
40%	1.1683	0.06162
60%	1.2887	0.5849

Perrin Factors

(b/a)	F(prolate)	F(oblate)
1.0	1.0000	1.0000
1.1	1.0008	1.0008
1.2	1.0030	1.0029
1.3	1.0062	1.0061
1.5	1.0148	1.0144
1.7	1.0255	1.0247
2.0	1.0439	1.0419
2.5	1.0755	1.0730
3	1.1125	1.1046
4	1.1824	1.1661
5	1.2497	1.2234
6	1.3139	1.2767
8	1.4334	1.3728
10	1.5429	1.4576
12	1.6444	1.5339
14	1.7394	1.6034
16	1.8290	1.6674
18	1.9141	1.7269
20	1.9952	1.7827
25	2.1840	1.9086
30	2.3570	2.0199
40	2.6684	2.2117
50	2.9466	2.3751
60	3.2009	2.5187
80	3.6580	2.7649
100	4.0661	2.9737

Gyromagnetic Ratios

Nucleus	$\gamma$ (rad) G <sup>-1</sup> sec <sup>-1</sup>
<sup>1</sup> H	26751
<sup>13</sup> C	6726
<sup>15</sup> N	-2711
<sup>19</sup> F	25167
<sup>31</sup> P	10829

Useful Constants

$$k = 1.38 \times 10^{-16} \text{ erg } (^{\circ}\text{K})^{-1}$$

$$h = 6.63 \times 10^{-27} \text{ erg sec}$$

$$\begin{aligned} R &= 8.314 \times 10^7 \text{ erg mol}^{-1} (^{\circ}\text{K})^{-1} \\ &= 1.987 \text{ cal mol}^{-1} (^{\circ}\text{K})^{-1} \\ &= 8.314 \text{ J mol}^{-1} (^{\circ}\text{K})^{-1} \end{aligned}$$

$$F = 96520 \text{ amp sec mol}^{-1}$$

$$\begin{aligned} 1 \text{ erg} &= 1 \text{ gm cm}^2 \text{ sec}^{-2} \\ &= 10^{-7} \text{ J} \end{aligned}$$

$$1 \text{ poise} = 1 \text{ g cm}^{-1} \text{ sec}^{-1}$$