

Contents

	Page
Foreword.....	iii
1. Introduction.....	1
2. Chemical potentials, activities, and activity coefficients.....	1
3. Theoretical expressions for activity coefficients.....	2
4. Uncertainties.....	4
5. Other theoretical treatments.....	5
6. References.....	5

List of Tables

Table
No.

1. Relations between mean molality, mean activity coefficient, solute (or electrolyte) activity, and ionic strength! for various valence types of electrolytes.....	8
2. Dielectric constant and density of water.....	8
3. Values of the Debye-Hückel constants for activity coefficients for aqueous solutions from 0 to 100 °C.....	9

(a) Limiting law of Debye-Hückel
(on volume basis)

	Page
Table No.	
4. 1-1 electrolytes.....	10
5. 1-2 or 2-1 electrolytes.....	12
6. 1-3 or 3-1 electrolytes.....	14
7. 1-4, 4-1, or 2-2 electrolytes.....	16
8. 2-3 or 3-2 electrolytes.....	18
9. 2-4 or 4-2 electrolytes.....	20
10. 3-3 electrolytes.....	22
11. 3-4 or 4-3 electrolytes.....	24
12. 4-4 electrolytes.....	26

(b) Limiting law of Debye-Hückel
(on weight basis)

13. 1-1 electrolytes.....	28
14. 1-2 or 2-1 electrolytes.....	30
15. 1-3 or 3-1 electrolytes.....	32
16. 1-4, 4-1, or 2-2 electrolytes.....	34
17. 2-3 or 3-2 electrolytes.....	36
18. 2-4 or 4-2 electrolytes.....	38
19. 3-3 electrolytes.....	40
20. 3-4 or 4-3 electrolytes.....	42
21. 4-4 electrolytes.....	44

(c) Güntelberg equation
(on volume basis)

22. 1-1 electrolytes.....	46
23. 1-2 or 2-1 electrolytes.....	48
24. 1-3 or 3-1 electrolytes.....	50
25. 1-4, 4-1, or 2-2 electrolytes.....	52
26. 2-3 or 3-2 electrolytes.....	54
27. 2-4 or 4-2 electrolytes.....	56
28. 3-3 electrolytes.....	58
29. 3-4 or 4-3 electrolytes.....	60
30. 4-4 electrolytes.....	62

(d) Güntelberg equation
(on weight basis)

31. 1-1 electrolytes.....	64
32. 1-2 or 2-1 electrolytes.....	66
33. 1-3 or 3-1 electrolytes.....	68
34. 1-4, 4-1, or 2-2 electrolytes.....	70
35. 2-3 or 3-2 electrolytes.....	72

Table
No.

36. 2-4 or 4-2 electrolytes.....	74
37. 3-3 electrolytes.....	76
38. 3-4 or 4-3 electrolytes.....	78
39. 4-4 electrolytes.....	80

(e) Güntelberg extended (or modified) equation
(on volume basis)

40. 1-1 electrolytes.....	82
41. 1-2 or 2-1 electrolytes.....	84
42. 1-3 or 3-1 electrolytes.....	86
43. 1-4, 4-1, or 2-2 electrolytes.....	88
44. 2-3 or 3-2 electrolytes.....	90
45. 2-4 or 4-2 electrolytes.....	92
46. 3-3 electrolytes.....	94
47. 3-4 or 4-3 electrolytes.....	96
48. 4-4 electrolytes.....	98

(f) Güntelberg extended (or modified) equation
(on weight basis)

49. 1-1 electrolytes.....	100
50. 1-2 or 2-1 electrolytes.....	102
51. 1-3 or 3-1 electrolytes.....	104
52. 1-4, 4-1, or 2-2 electrolytes.....	106
53. 2-3 or 3-2 electrolytes.....	108
54. 2-4 or 4-2 electrolytes.....	110
55. 3-3 electrolytes.....	112
56. 3-4 or 4-3 electrolytes.....	114
57. 4-4 electrolytes.....	116

(g) Davies equation
(on volume basis)

58. 1-1 electrolytes.....	118
59. 1-2 or 2-1 electrolytes.....	120
60. 1-3 or 3-1 electrolytes.....	122
61. 1-4, 4-1, or 2-2 electrolytes.....	124
62. 2-3 or 3-2 electrolytes.....	126
63. 2-4 or 4-2 electrolytes.....	128
64. 3-3 electrolytes.....	130
65. 3-4 or 4-3 electrolytes.....	132
66. 4-4 electrolytes.....	134

Table No.	(h) Davies equation (on weight basis)	Page	Table No.	Page
67. 1-1 electrolytes.....	136	99. 2-4 or 4-2 electrolytes.....	200	
68. 1-2 or 2-1 electrolytes.....	138	100. 3-3 electrolytes.....	202	
69. 1-3 or 3-1 electrolytes.....	140	101. 3-4 or 4-3 electrolytes.....	204	
70. 1-4, 4-1, or 2-2 electrolytes.....	142	102. 4-4 electrolytes.....	206	
71. 2-3 or 3-2 electrolytes.....	144	(l) Scatchard extended (or modified) equation (on weight basis)		
72. 2-4 or 4-2 electrolytes.....	146	103. 1-1 electrolytes.....	208	
73. 3-3 electrolytes.....	148	104. 1-2 or 2-1 electrolytes.....	210	
74. 3-4 or 4-3 electrolytes.....	150	105. 1-3 or 3-1 electrolytes.....	212	
75. 4-4 electrolytes.....	152	106. 1-4, 4-1, or 2-2 electrolytes.....	214	
(i) Scatchard equation (on volume basis)		107. 2-3 or 3-2 electrolytes.....	216	
76. 1-1 electrolytes.....	154	108. 2-4 or 4-2 electrolytes.....	218	
77. 1-2 or 2-1 electrolytes.....	156	109. 3-3 electrolytes.....	220	
78. 1-3 or 3-1 electrolytes.....	158	110. 3-4 or 4-3 electrolytes.....	222	
79. 1-4, 4-1, or 2-2 electrolytes.....	160	111. 4-4 electrolytes.....	224	
80. 2-3 or 3-2 electrolytes.....	162	(m) Bjerrum equation (on volume basis)		
81. 2-4 or 4-2 electrolytes.....	164	113. 1-1 electrolytes.....	228	
82. 3-3 electrolytes.....	166	114. 1-2 or 2-1 electrolytes.....	230	
83. 3-4 or 4-3 electrolytes.....	168	115. 1-3 or 3-1 electrolytes.....	232	
84. 4-4 electrolytes.....	170	116. 1-4, 4-1, or 2-2 electrolytes.....	234	
(j) Scatchard equation (on weight basis)		117. 2-3 or 3-2 electrolytes.....	236	
85. 1-1 electrolytes.....	172	118. 2-4 or 4-2 electrolytes.....	238	
86. 1-2 or 2-1 electrolytes.....	174	119. 3-3 electrolytes.....	240	
87. 1-3 or 3-1 electrolytes.....	176	120. 3-4 or 4-3 electrolytes.....	242	
88. 1-4, 4-1, or 2-2 electrolytes.....	178	121. 4-4 electrolytes.....	244	
89. 2-3 or 3-2 electrolytes.....	180	(n) Bjerrum equation (on weight basis)		
90. 2-4 or 4-2 electrolytes.....	182	122. 1-1 electrolytes.....	246	
91. 3-3 electrolytes.....	184	123. 1-2 or 2-1 electrolytes.....	248	
92. 3-4 or 4-3 electrolytes.....	186	124. 1-3 or 3-1 electrolytes.....	250	
93. 4-4 electrolytes.....	188	125. 1-4, 4-1, or 2-2 electrolytes.....	252	
(k) Scatchard extended (or modified) equation (on volume basis)		126. 2-3 or 3-2 electrolytes.....	254	
94. 1-1 electrolytes.....	190	127. 2-4 or 4-2 electrolytes.....	256	
95. 1-2 or 2-1 electrolytes.....	192	128. 3-3 electrolytes.....	258	
96. 1-3 or 3-1 electrolytes.....	194	129. 3-4 or 4-3 electrolytes.....	260	
97. 1-4, 4-1, or 2-2 electrolytes.....	196	130. 4-4 electrolytes.....	262	
98. 2-3 or 3-2 electrolytes.....	198	131. Uncertainties (\pm) in activity coefficients for solutions having an ionic strength of 0.1 arising from the established limits of error in the physical constants used in the theoretical equations.....		264
132. Values of the Debye-Hückel constants for activity coefficients based on the values of the dielectric constant of water determined by Owen et al. [12].....		266		
133. Bjerrum's minimum ion parameter for uni-univalent electrolytes in aqueous solutions from 0 to 100 °C based on the dielectric constant of water determined by Owen et al. [12].....		267		
134. Differences in activity coefficients for solutions having an ionic strength of 0.1 from those given in the main tables, if the dielectric constant of water determined by Owen et al. [12] is used instead of the values of Malmberg and Maryott [5], on volume basis.....		268		
135. Differences in activity coefficients for solutions having an ionic strength of 0.1 from those given in the main tables if the dielectric constant of water determined by Owen et al. [12] is used instead of the values of Malmberg and Maryott [5], on weight basis.....		270		