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JESSE H. JONES, Secretary

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CIRCULAR OF THE NATIONAL BUREAU OF STANDARDS C440

[Supersedes Circular C44]

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**POLARIMETRY, SACCHARIMETRY  
AND THE SUGARS**

By

FREDERICK J. BATES and ASSOCIATES

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TABLE 114.—*Brix, apparent density, apparent specific gravity, and grams of sucrose per 100 ml of sugar solutions*

Column 1 gives Brix or percentage of sucrose in the solution.

Column 2 gives apparent density, that is, the weight in air with brass weights of 1 ml of solution at 20° C. The values in this column correspond to the values of true density (table 113), having been obtained by means of the formula

$$M = W \left[ 1 + \frac{\rho}{d_2} \left( \frac{d_2 - d_1}{d_1 - \rho} \right) \right] = W \left( 1 + \frac{k}{1000} \right),^1$$

which may be utilized for converting apparent density into true density, and vice versa, by considering that  $M$ , the weight in vacuo, and  $W$ , the apparent weight, refer to 1 ml, since true density is defined as the weight in vacuo of 1 ml, and the apparent density as the weight of 1 ml of substance in air with brass weights.  $\rho$  is the density of air, which has been taken as 0.0012046;<sup>2</sup>  $d_1$  the density of the solution,  $d_2$  the density of the weights, which has been taken as 8.4.

Column 3 gives the apparent specific gravity at 20° C. The values in this column were obtained by dividing the apparent density in column 2 by the apparent density of water at 20° C., which was taken as 0.997174.<sup>3</sup>

Column 4 gives the grams sucrose (weighed in vacuo) per 100 ml of solution.

The values in the table were calculated in three sections by different individuals; thus from 40 to 60 Brix by Peters and Phelps (BS Tech. Paper T338, 1927); 60 to 83.9 Brix by Brewster and Phelps (NBS Research Paper RP536, 1933); and the remaining values, 0 to 40 and 84 to 95 Brix by Snyder, Saunders, and Golden of this Bureau. After the computations were completed, the tabulations were made by rounding off the values to the last figure given. The values are considered exact to  $\pm 1$  in the fifth decimal.

Percent- age of su- crose by weight (Brix) <sup>4</sup>	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo	Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo
1	2	3	4	1	2	3	4
0. 0	0. 99717	1. 00000	0. 000	2. 0	1. 00495	1. 00780	2. 012
. 1	. 99756	. 00039	. 100	. 1	. 00534	. 00819	. 113
. 2	. 99795	. 00078	. 200	. 2	. 00574	. 00859	. 215
. 3	. 99834	. 00117	. 300	. 3	. 00613	. 00898	. 317
. 4	. 99872	. 00156	. 400	. 4	. 00652	. 00937	. 418
. 5	. 99911	. 00194	. 500	. 5	. 00691	. 00977	. 520
. 6	. 99950	. 00233	. 600	. 6	. 00730	. 01016	. 622
. 7	. 99989	. 00272	. 701	. 7	. 00769	. 01055	. 724
. 8	1. 00028	. 00312	. 801	. 8	. 00809	. 01094	. 826
. 9	. 00067	. 00351	. 902	. 9	. 00848	. 01134	. 928
1. 0	1. 00106	1. 00390	1. 002	3. 0	1. 00887	1. 01173	3. 030
. 1	. 00145	. 00429	. 103	. 1	. 00927	. 01213	. 132
. 2	. 00184	. 00468	. 203	. 2	. 00966	. 01252	. 234
. 3	. 00223	. 00507	. 304	. 3	. 01006	. 01292	. 337
. 4	. 00261	. 00546	. 405	. 4	. 01045	. 01331	. 439
. 5	. 00300	. 00585	. 506	. 5	. 01084	. 01371	. 542
. 6	. 00339	. 00624	. 607	. 6	. 01124	. 01410	. 644
. 7	. 00378	. 00663	. 708	. 7	. 01163	. 01450	. 747
. 8	. 00417	. 00702	. 809	. 8	. 01203	. 01490	. 850
. 9	. 00456	. 00741	. 911	. 9	. 01243	. 01529	. 953

<sup>1</sup> NBS Circular C19, 6th ed., table 39, p. 55 (1924).

<sup>2</sup> NBS Circular C19, 6th ed., table 29 (1924).

<sup>3</sup> J. Domke, Z. ver. deut. Zuckerind. 62, 306 (1912); O. Schrefeld, p. 312.

<sup>4</sup> The apparent Brix, that is, grams of sucrose dry substance per 100 g of solution, weighed with brass weights in air, is approximately 0.01 percent greater than the true Brix in column 1.

TABLE 114.—*Brix, apparent density, apparent specific gravity, and grams of sucrose per 100 ml of sugar solutions—Continued*

Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo	Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo
1	2	3	4	1	2	3	4
4.0	1.01282	1.01569	4.056	9.0	1.03297	1.03590	9.306
.1	.01322	.01609	.159	.1	.03338	.03631	.413
.2	.01361	.01649	.262	.2	.03379	.03672	.521
.3	.01401	.01688	.365	.3	.03420	.03713	.628
.4	.01441	.01728	.468	.4	.03461	.03755	.735
.5	.01480	.01768	.571	.5	.03503	.03796	.843
.6	.01520	.01808	.675	.6	.03544	.03837	.950
.7	.01560	.01848	.778	.7	.03585	.03879	10.058
.8	.01600	.01888	.882	.8	.03626	.03920	.166
.9	.01640	.01928	.986	.9	.03667	.03961	.274
5.0	1.01680	1.01968	5.089	10.0	1.03709	1.04003	10.381
.1	.01719	.02008	.193	.1	.03750	.04044	.489
.2	.01759	.02048	.297	.2	.03791	.04086	.597
.3	.01799	.02088	.401	.3	.03833	.04127	.706
.4	.01839	.02128	.506	.4	.03874	.04169	.814
.5	.01879	.02168	.609	.5	.03916	.04210	.922
.6	.01919	.02208	.713	.6	.03957	.04252	11.031
.7	.01959	.02248	.818	.7	.03999	.04293	.139
.8	.01999	.02289	.922	.8	1.04040	.04335	.248
.9	.02040	.02329	6.027	.9	.04082	.04377	.356
6.0	1.02080	1.02369	6.131	11.0	1.04123	1.04418	11.465
.1	.02120	.02409	.236	.1	.04165	.04460	.574
.2	.02160	.02450	.340	.2	.04207	.04502	.683
.3	.02200	.02490	.445	.3	.04248	.04544	.792
.4	.02241	.02530	.550	.4	.04290	.04585	.901
.5	.02281	.02571	.655	.5	.04332	.04627	12.010
.6	.02321	.02611	.760	.6	.04373	.04669	.120
.7	.02362	.02652	.865	.7	.04415	.04711	.229
.8	.02402	.02692	.971	.8	.04457	.04753	.338
.9	.02442	.02733	7.076	.9	.04499	.04795	.448
7.0	1.02483	1.02773	7.181	12.0	1.04541	1.04837	12.558
.1	.02523	.02814	.287	.1	.04583	.04879	.667
.2	.02564	.02854	.392	.2	.04625	.04921	.777
.3	.02604	.02895	.498	.3	.04667	.04963	.887
.4	.02645	.02936	.604	.4	.04709	1.05005	.997
.5	.02685	.02976	.709	.5	.04750	.05047	13.107
.6	.02726	.03017	.815	.6	.04793	.05090	.217
.7	.02766	.03058	.921	.7	.04835	.05132	.327
.8	.02807	.03098	8.027	.8	.04877	.05174	.438
.9	.02848	.03139	.133	.9	.04919	.05216	.548
8.0	1.02888	1.03180	8.240	13.0	1.04961	1.05259	13.659
.1	.02929	.03221	.346	.1	1.05003	.05301	.769
.2	.02970	.03262	.452	.2	.05046	.05342	.880
.3	.03011	.03303	.559	.3	.05088	.05386	.991
.4	.03052	.03344	.665	.4	.05130	.05428	14.102
.5	.03093	.03385	.772	.5	.05172	.05470	.213
.6	.03133	.03426	.879	.6	.05215	.05513	.324
.7	.03174	.03467	.985	.7	.05257	.05556	.435
.8	.03215	.03508	9.092	.8	.05300	.05598	.546
.9	.03256	.03549	.199	.9	.05342	.05641	.657

TABLE 11—*Brix, apparent density, apparent specific gravity, and grams of sucrose per 100 ml of sugar solutions—Continued*

Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo	Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo
1	2	3	4	1	2	3	4
14. 0	1. 05385	1. 05683	14. 769	19. 0	1. 07549	1. 07853	20. 454
. 1	. 05427	. 05726	. 880	. 1	. 07593	. 07898	. 570
. 2	. 05470	. 05769	. 992	. 2	. 07637	. 07942	. 686
. 3	. 05512	. 05811	15. 103	. 3	. 07681	. 07986	. 803
. 4	. 05555	. 05854	. 215	. 4	. 07725	1. 08030	. 919
. 5	. 05598	. 05897	. 327	. 5	. 07769	. 08075	21. 036
. 6	. 05640	. 05940	. 439	. 6	. 07814	. 08119	. 152
. 7	. 05683	. 05982	. 551	. 7	. 07858	. 08164	. 269
. 8	. 05726	1. 06025	. 663	. 8	. 07902	. 08208	. 385
. 9	. 05768	. 06068	. 775	. 9	. 07947	. 08252	. 502
15. 0	1. 05811	1. 06111	15. 887	20. 0	1. 07991	1. 08297	21. 619
. 1	. 05854	. 06154	16. 000	. 1	1. 08035	. 08342	. 736
. 2	. 05897	. 06197	. 112	. 2	. 08080	. 08386	. 853
. 3	. 05940	. 06240	. 225	. 3	. 08124	. 08431	. 971
. 4	. 05983	. 06283	. 338	. 4	. 08169	. 08475	22. 088
. 5	1. 06026	. 06326	. 450	. 5	. 08213	. 08520	. 205
. 6	. 06069	. 06369	. 563	. 6	. 08258	. 08565	. 323
. 7	. 06112	. 06412	. 676	. 7	. 08302	. 08609	. 440
. 8	. 06155	. 06455	. 789	. 8	. 08347	. 08654	. 558
. 9	. 06198	. 06499	. 902	. 9	. 08392	. 08699	. 676
16. 0	1. 06241	1. 06542	17. 015	21. 0	1. 08436	1. 08744	22. 794
. 1	. 06284	. 06585	. 129	. 1	. 08481	. 08789	. 912
. 2	. 06327	. 06629	. 242	. 2	. 08526	. 08834	23. 030
. 3	. 06370	. 06672	. 356	. 3	. 08571	. 08879	. 148
. 4	. 06414	. 06715	. 469	. 4	. 08616	. 08923	. 266
. 5	. 06457	. 06759	. 583	. 5	. 08660	. 08968	. 385
. 6	. 06500	. 06802	. 697	. 6	. 08705	1. 09013	. 503
. 7	. 06544	. 06845	. 810	. 7	. 08750	. 09058	. 622
. 8	. 06587	. 06889	. 924	. 8	. 08795	. 09103	. 740
. 9	. 06630	. 06933	18. 038	. 9	. 08840	. 09149	. 859
17. 0	1. 06674	1. 06976	18. 152	22. 0	1. 08885	1. 09194	23. 978
. 1	. 06717	1. 07020	. 267	. 1	. 08930	. 09239	24. 097
. 2	. 06761	. 07063	. 381	. 2	. 08975	. 09284	. 216
. 3	. 06804	. 07107	. 495	. 3	1. 09020	. 09329	. 335
. 4	. 06848	. 07151	. 610	. 4	. 09066	. 09375	. 454
. 5	. 06891	. 07194	. 724	. 5	. 09111	. 09420	. 573
. 6	. 06935	. 07238	. 839	. 6	. 09156	. 09465	. 693
. 7	. 06978	. 07282	. 954	. 7	. 09201	. 09511	. 812
. 8	1. 07022	. 07325	19. 069	. 8	. 09247	. 09556	. 932
. 9	. 07066	. 07369	. 184	. 9	. 09292	. 09602	25. 052
18. 0	1. 07110	1. 07413	19. 299	23. 0	1. 09337	1. 09647	25. 172
. 1	. 07153	. 07457	. 414	. 1	. 09383	. 09693	. 292
. 2	. 07197	. 07501	. 529	. 2	. 09428	. 09738	. 412
. 3	. 07241	. 07545	. 644	. 3	. 09473	. 09784	. 532
. 4	. 07285	. 07589	. 760	. 4	. 09519	. 09829	. 652
. 5	. 07329	. 07633	. 875	. 5	. 09564	. 09875	. 772
. 6	. 07373	. 07677	. 991	. 6	. 09610	. 09921	. 893
. 7	. 07417	. 07721	20. 107	. 7	. 09656	1. 09966	26. 013
. 8	. 07461	. 07765	. 222	. 8	. 09701	1. 10012	. 134
. 9	. 07505	. 07809	. 338	. 9	. 09747	. 10058	. 255

TABLE 114.—*Brix, apparent density, apparent specific gravity, and grams of sucrose per 100 ml of sugar solutions—Continued*

Percentage of sucrose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo	Percentage of sucrose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo
1	2	3	4	1	2	3	4
24.0	1. 09792	1. 10104	26. 375	29.0	1. 12119	1. 12436	32. 545
.1	. 09838	. 10149	. 496	.1	. 12166	. 12484	. 671
.2	. 09884	. 10195	. 617	.2	. 12214	. 12532	. 797
.3	. 09930	. 10241	. 738	.3	. 12261	. 12579	. 923
.4	. 09976	. 10287	. 860	.4	. 12308	. 12627	33. 049
.5	1. 10021	. 10333	. 981	.5	. 12356	. 12674	. 176
.6	. 10067	. 10379	27. 102	.6	. 12404	. 12722	. 302
.7	. 10113	. 10425	. 224	.7	. 12451	. 12770	. 429
.8	. 10159	. 10471	. 345	.8	. 12499	. 12817	. 556
.9	. 10205	. 10517	. 467	.9	. 12546	. 12865	. 683
25.0	1. 10251	1. 10564	27. 589	30.0	1. 12594	1. 12913	33. 810
.1	. 10297	. 10610	. 710	.1	. 12642	. 12961	. 937
.2	. 10343	. 10656	. 833	.2	. 12690	1. 13009	34. 064
.3	. 10389	. 10702	. 955	.3	. 12737	. 13057	. 191
.4	. 10435	. 10748	28. 077	.4	. 12785	. 13105	. 318
.5	. 10482	. 10795	. 199	.5	. 12833	. 13153	. 446
.6	. 10528	. 10841	. 322	.6	. 12881	. 13201	. 574
.7	. 10574	. 10887	. 444	.7	. 12929	. 13249	. 701
.8	. 10620	. 10934	. 567	.8	. 12977	. 13297	. 829
.9	. 10667	. 10980	. 690	.9	1. 13025	. 13345	. 957
26.0	1. 10713	1. 11027	28. 813	31.0	1. 13073	1. 13394	35. 085
.1	. 10759	. 11073	. 935	.1	. 13121	. 13442	. 213
.2	. 10806	. 11120	29. 059	.2	. 13169	. 13490	. 341
.3	. 10852	. 11166	. 182	.3	. 13217	. 13538	. 470
.4	. 10899	. 11213	. 305	.4	. 13266	. 13587	. 598
.5	. 10945	. 11260	. 428	.5	. 13314	. 13635	. 727
.6	. 10992	. 11306	. 552	.6	. 13362	. 13683	. 855
.7	1. 11038	. 11353	. 675	.7	. 13410	. 13732	. 984
.8	. 11085	. 11400	. 799	.8	. 13459	. 13780	36. 113
.9	. 11131	. 11447	. 923	.9	. 13507	. 13829	. 242
27.0	1. 11178	1. 11493	30. 046	32.0	1. 13555	1. 13877	36. 371
.1	. 11225	. 11540	. 170	.1	. 13604	. 13926	. 500
.2	. 11272	. 11587	. 294	.2	. 13652	. 13974	. 630
.3	. 11318	. 11634	. 418	.3	. 13701	1. 14023	. 759
.4	. 11365	. 11681	. 543	.4	. 13749	. 14072	. 889
.5	. 11412	. 11728	. 667	.5	. 13798	. 14120	37. 018
.6	. 11459	. 11775	. 792	.6	. 13846	. 14169	. 148
.7	. 11506	. 11822	. 916	.7	. 13895	. 14218	. 278
.8	. 11553	. 11869	31. 041	.8	. 13944	. 14267	. 408
.9	. 11600	. 11916	. 165	.9	. 13992	. 14316	. 538
28.0	1. 11647	1. 11963	31. 290	33.0	1. 14041	1. 14364	37. 668
.1	. 11694	1. 12010	. 415	.1	. 14090	. 14413	. 798
.2	. 11741	. 12058	. 540	.2	. 14139	. 14462	. 929
.3	. 11788	. 12105	. 666	.3	. 14188	. 14511	38. 059
.4	. 11835	. 12152	. 791	.4	. 14236	. 14560	. 190
.5	. 11882	. 12199	. 916	.5	. 14285	. 14609	. 320
.6	. 11929	. 12247	32. 042	.6	. 14334	. 14658	. 451
.7	. 11977	. 12294	. 167	.7	. 14383	. 14708	. 582
.8	1. 12024	. 12341	. 293	.8	. 14432	. 14757	. 713
.9	. 12071	. 12389	. 419	.9	. 14481	. 14806	. 844

TABLE 114.—*Brix, apparent density, apparent specific gravity, and grams of sucrose per 100 ml of sugar solutions—Continued*

Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo	Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C, 20° C	Grams of sucrose per 100 ml weight in vacuo
1	2	3	4	1	2	3	4
34.0	1.14530	1.14855	38.976	39.0	1.17030	1.17362	45.682
.1	.14580	.14904	39.107	.1	.17081	.17413	.819
.2	.14629	.14954	.239	.2	.17132	.17464	.956
.3	.14678	1.15003	.370	.3	.17183	.17515	46.094
.4	.14727	.15052	.502	.4	.17234	.17566	.231
.5	.14776	.15102	.634	.5	.17285	.17618	.369
.6	.14826	.15151	.767	.6	.17336	.17669	.506
.7	.14875	.15201	.898	.7	.17387	.17720	.644
.8	.14925	.15250	40.030	.8	.17439	.17772	.782
.9	.14974	.15300	.162	.9	.17490	.17823	.920
35.0	1.15024	1.15350	40.295	40.0	1.17541	1.17874	47.058
.1	.15073	.15399	.427	40.1	.593	.926	.196
.2	.15123	.15449	.560	40.2	.644	1.17977	.334
.3	.15172	.15498	.692	40.3	.695	1.18029	.473
.4	.15222	.15548	.825	40.4	.747	.080	.611
.5	.15271	.15598	.958	40.5	1.17798	1.18132	.750
.6	.15321	.15648	41.091	40.6	.849	.183	47.889
.7	.15371	.15698	.224	40.7	.901	.235	48.028
.8	.15420	.15747	.358	40.8	1.17953	.287	.167
.9	.15470	.15797	.491	40.9	1.18004	.339	.306
36.0	1.15520	1.15847	41.625	41.0	1.18056	1.18390	48.445
.1	.15570	.15897	.758	41.1	.107	.442	.585
.2	.15620	.15947	.892	41.2	.159	.494	.724
.3	.15669	.15997	42.026	41.3	.211	.546	.864
.4	.15719	1.16047	.160	41.4	.263	.598	49.004
.5	.15769	.16098	.294	41.5	1.18314	1.18650	.143
.6	.15819	.16148	.428	41.6	.356	.702	.283
.7	.15869	.16198	.562	41.7	.418	.754	.424
.8	.15919	.16248	.697	41.8	.470	.806	.564
.9	.15970	.16298	.831	41.9	.522	.858	.704
37.0	1.16020	1.16349	42.966	42.0	1.18574	1.18910	49.845
.1	.16070	.16399	43.100	42.1	.626	1.18962	49.985
.2	.16120	.16449	.235	42.2	.678	1.19014	50.126
.3	.16170	.16500	.376	42.3	.730	.062	.267
.4	.16221	.16550	.500	42.4	.782	.119	50.408
.5	.16271	.16601	.645	42.5	1.18835	1.19171	.549
.6	.16321	.16651	.771	42.6	.587	.224	.690
.7	.16372	.16702	.911	42.7	.939	.276	.831
.8	.16422	.16752	44.017	42.8	.991	.329	50.973
.9	.16473	.16803	.182	42.9	1.19044	.381	51.114
38.0	1.16523	1.16853	44.318	43.0	1.19096	1.19434	51.256
.1	.16574	.16904	.454	43.1	.148	.486	.398
.2	.16624	.16955	.590	43.2	.201	.539	.539
.3	.16675	1.17006	.726	43.3	.253	.591	.681
.4	.16726	.17056	.862	43.4	.306	.644	.824
.5	.16776	.17107	.999	43.5	1.19358	1.19697	51.966
.6	.16827	.17158	45.135	43.6	.411	.749	52.108
.7	.16878	.17209	.272	43.7	.483	.802	.251
.8	.16929	.17260	.408	43.8	.516	.855	.393
.9	.16979	.17311	.545	43.9	.569	.908	.536

TABLE 114.—*Brix, apparent density, apparent specific gravity, and grams of sucrose per 100 ml of sugar solutions—Continued*

Percentage of sucrose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo	Percentage of sucrose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo
1	2	3	4	1	2	3	4
44. 0	1. 19622	1. 19961	52. 679	49. 0	1. 22306	1. 22652	59. 980
44. 1	674	1. 20013	822	49. 1	360	707	60. 129
44. 2	727	066	52. 965	49. 2	415	762	. 279
44. 3	780	119	53. 108	49. 3	470	817	. 428
44. 4	833	172	252	49. 4	525	872	. 578
44. 5	1. 19886	1. 20226	395	49. 5	1. 22580	1. 22927	. 728
44. 6	939	279	539	49. 6	634	1. 22932	60. 878
44. 7	992	332	683	49. 7	689	1. 23037	61. 028
44. 8	1. 20045	385	826	49. 8	744	092	. 178
44. 9	098	438	53. 970	49. 9	799	147	61. 328
45. 0	1. 20151	1. 20491	54. 114	50. 0	1. 22854	1. 23202	61. 478
45. 1	204	545	. 259	50. 1	909	1. 23257	. 629
45. 2	257	598	. 403	50. 2	1. 22964	313	. 780
45. 3	311	651	. 547	50. 3	1. 23019	368	. 930
45. 4	364	705	. 692	50. 4	074	423	62. 081
45. 5	1. 20417	1. 20758	. 837	50. 5	1. 23130	1. 23478	. 232
45. 6	470	812	54. 981	50. 6	185	534	. 383
45. 7	524	865	55. 126	50. 7	240	589	. 535
45. 8	577	919	. 272	50. 8	295	645	. 686
45. 9	630	1. 20972	. 417	50. 9	351	700	. 838
46. 0	1. 20684	1. 21026	55. 562	51. 0	1. 23406	1. 23756	62. 989
46. 1	737	080	. 708	51. 1	461	811	63. 141
46. 2	791	133	. 853	51. 2	517	867	. 293
46. 3	845	187	55. 999	51. 3	572	922	. 445
46. 4	898	241	56. 145	51. 4	628	1. 23978	. 597
46. 5	1. 20952	1. 21295	. 291	51. 5	1. 23683	1. 24034	. 750
46. 6	1. 21006	349	. 437	51. 6	739	089	. 902
46. 7	059	402	. 583	51. 7	794	145	64. 055
46. 8	113	456	. 729	51. 8	850	201	. 208
46. 9	167	510	56. 876	51. 9	906	257	. 360
47. 0	1. 21221	1. 21564	57. 022	52. 0	1. 23962	1. 24313	64. 513
47. 1	275	618	. 169	52. 1	1. 24017	369	. 666
47. 2	329	673	. 316	52. 2	073	425	. 820
47. 3	383	727	. 463	52. 3	129	481	. 973
47. 4	437	781	57. 610	52. 4	185	537	65. 127
47. 5	1. 21491	1. 21835	57. 757	52. 5	1. 24241	1. 24593	65. 280
47. 6	545	889	57. 904	52. 6	297	649	. 433
47. 7	599	943	58. 052	52. 7	353	705	. 588
47. 8	653	1. 21998	. 199	52. 8	409	761	. 742
47. 9	707	1. 22052	. 347	52. 9	465	818	. 896
48. 0	1. 21761	1. 22106	58. 495	53. 0	1. 24521	1. 24874	66. 050
48. 1	816	161	. 643	53. 1	577	930	. 205
48. 2	870	215	. 791	53. 2	633	987	. 359
48. 3	924	270.	58. 939	53. 3	690	1. 25043	. 514
48. 4	979	324	59. 087	53. 4	746	099	. 669
48. 5	1. 22033	1. 22379	. 236	53. 5	1. 24802	1. 25156	. 824
48. 6	088	434	. 385	53. 6	858	212	. 979
48. 7	142	488	. 533	53. 7	915	269	67. 134
48. 8	197	543	. 682	53. 8	971	325	. 290
48. 9	251	598	. 831	53. 9	1. 25028	382	. 445

TABLE 114.—*Brix, apparent density, apparent specific gravity, and grams of sucrose per 100 ml of sugar solutions—Continued*

Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo	Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo
1	2	3	4	1	2	3	4
54.0	1. 25084	1. 25439	67. 601	59.0	1. 27958	1. 28320	75. 555
54.1	141	495	. 757	59.1	1. 28017	379	. 718
54.2	197	552	. 912	59.2	075	437	. 880
54.3	254	609	68. 069	59.3	134	497	76. 043
54.4	311	666	. 225	59.4	193	556	207
54.5	1. 25367	1. 25723	. 381	59.5	251	614	. 369
54.6	424	780	. 537	59.6	309	672	. 533
54.7	481	836	. 694	59.7	367	731	. 696
54.8	538	893	. 851	59.8	426	789	. 860
54.9	594	950	69. 008	59.9	485	849	77. 024
55.0	1. 25651	1. 26007	69. 164	60.0	1. 28544	1. 28908	77. 188
55.1	708	064	. 322	60.1	602	966	. 351
55.2	765	122	. 479	60.2	661	1. 29025	. 515
55.3	822	179	. 636	60.3	720	084	680
55.4	879	236	. 794	60.4	779	143	. 844
55.5	1. 25936	1. 26293	69. 951	60.5	838	203	78. 009
55.6	1. 25993	350	70. 109	60.6	897	262	. 173
55.7	1. 26050	408	. 267	60.7	956	321	. 338
55.8	108	465	. 425	60.8	1. 29015	380	. 503
55.9	165	522	. 583	60.9	074	439	. 668
56.0	1. 26222	1. 26580	70. 742	61.0	1. 29133	1. 29498	78. 833
56.1	279	637	70. 900	61.1	193	559	. 999
56.2	337	695	71. 059	61.2	252	618	79. 165
56.3	394	752	. 217	61.3	311	677	. 330
56.4	452	810	. 376	61.4	370	736	. 496
56.5	1. 26509	1. 26868	. 535	61.5	430	796	. 662
56.6	566	925	694	61.6	489	855	. 828
56.7	624	1. 26983	71. 854	61.7	548	915	. 995
56.8	682	1. 27041	72. 013	61.8	608	975	80. 161
56.9	739	098	. 173	61.9	667	1. 30034	. 328
57.0	1. 26797	1. 27156	72. 332	62.0	1. 29726	1. 30093	80. 494
57.1	854	214	. 492	62.1	786	153	661
57.2	912	272	. 652	62.2	845	212	828
57.3	970	330	. 812	62.3	905	273	. 995
57.4	1. 27028	388	72. 973	62.4	966	334	81. 162
57.5	1. 27086	1. 27446	73. 133	62.5	1. 30025	393	. 329
57.6	143	504	. 293	62.6	085	453	. 497
57.7	201	562	. 454	62.7	145	513	. 665
57.8	259	620	. 615	62.8	205	573	. 833
57.9	317	678	. 776	62.9	265	633	82. 001
58.0	1. 27375	1. 27736	73. 937	63.0	1. 30325	1. 30694	82. 169
58.1	433	794	74. 098	63.1	385	754	. 337
58.2	492	853	. 260	63.2	446	815	. 506
58.3	550	911	. 421	63.3	506	875	. 674
58.4	608	1. 27969	. 583	63.4	566	936	. 843
58.5	1. 27664	1. 28028	744	63.5	626	994	83. 012
58.6	724	086	74. 906	63.6	686	1. 31055	. 180
58.7	782	145	75. 068	63.7	747	117	. 350
58.8	841	203	. 230	63.8	807	177	. 519
58.9	899	262	. 393	63.9	867	237	. 688



TABLE 114.—*Brix, apparent density, apparent specific gravity, and grams of sucrose per 100 ml of sugar solutions—Continued*

Percentage of sucrose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo	Percentage of sucrose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo
1	2	3	4	1	2	3	4
64.0	1.30927	1.31297	83.858	69.0	1.33992	1.34371	92.524
64.1	988	359	84.028	69.1	1.34054	433	.701
64.2	1.31048	418	.198	69.2	116	495	.878
64.3	108	479	.367	69.3	179	558	93.056
64.4	169	540	.538	69.4	241	621	.233
64.5	229	600	.708	69.5	304	684	.411
64.6	290	661	.879	69.6	366	746	.589
64.7	350	723	85.049	69.7	429	809	.767
64.8	412	784	.220	69.8	491	871	.945
64.9	473	845	.391	69.9	554	934	94.123
65.0	1.31533	1.31905	85.561	70.0	1.34616	1.34997	94.302
65.1	594	966	.733	70.1	679	1.35060	.481
65.2	655	1.32028	.904	70.2	742	123	.660
65.3	716	089	86.076	70.3	805	186	.839
65.4	777	150	.248	70.4	867	248	95.017
65.5	837	210	.419	70.5	930	311	.197
65.6	898	271	.591	70.6	993	375	.376
65.7	959	332	.763	70.7	1.35056	438	.556
65.8	1.32019	393	.935	70.8	119	501	.736
65.9	081	455	87.107	70.9	182	564	.916
66.0	1.32142	1.32516	87.280	71.0	1.35245	1.35627	96.096
66.1	203	577	.453	71.1	308	691	.276
66.2	264	638	.626	71.2	371	754	.456
66.3	325	699	.798	71.3	434	817	.636
66.4	385	759	.971	71.4	498	881	.817
66.5	446	820	88.142	71.5	561	944	.998
66.6	509	884	.318	71.6	625	1.36008	97.179
66.7	570	945	.492	71.7	688	072	.360
66.8	632	1.33007	.666	71.8	751	135	.541
66.9	693	068	.839	71.9	814	198	.722
67.0	1.32754	1.33129	89.012	72.0	1.35877	1.36261	97.904
67.1	816	192	.187	72.1	940	324	98.085
67.2	878	254	.361	72.2	1.36004	389	.268
67.3	939	315	.536	72.3	067	452	.449
67.4	1.33001	377	.711	72.4	131	516	.632
67.5	062	438	.885	72.5	194	579	.814
67.6	124	500	90.060	72.6	258	643	.997
67.7	186	562	.235	72.7	322	707	99.179
67.8	248	625	.411	72.8	385	771	.362
67.9	309	686	.585	72.9	450	836	.545
68.0	1.33371	1.33748	90.761	73.0	1.36514	1.36900	99.728
68.1	433	810	.937	73.1	578	964	.912
68.2	495	872	91.112	73.2	642	1.37028	100.095
68.3	557	935	.288	73.3	705	092	.278
68.4	619	997	.464	73.4	769	156	.462
68.5	681	1.34059	.641	73.5	833	220	.646
68.6	743	121	.817	73.6	896	283	.827
68.7	805	183	.993	73.7	960	347	101.014
68.8	867	245	92.169	73.8	1.37024	411	.198
68.9	930	309	.347	73.9	088	476	.383

TABLE 114.—*Brix, apparent density, apparent specific gravity, and grams of sucrose per 100 ml of sugar solutions—Continued*

Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo	Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo
1	2	3	4	1	2	3	4
74.0	1.37153	1.37541	101.568	79.0	1.40409	1.40806	111.002
74.1	217	605	.753	79.1	475	872	.195
74.2	281	669	.937	79.2	541	938	.388
74.3	345	733	102.122	79.3	607	1.41005	.581
74.4	410	798	.308	79.4	674	072	.775
74.5	475	864	.493	79.5	740	138	.968
74.6	539	928	.679	79.6	806	204	112.161
74.7	604	993	.865	79.7	872	270	.354
74.8	668	1.38057	103.050	79.8	939	337	.549
74.9	733	122	.237	79.9	1.41005	404	.743
75.0	1.37797	1.38187	103.423	80.0	1.41072	1.41471	112.938
75.1	862	252	.609	80.1	138	537	113.131
75.2	926	316	.796	80.2	204	603	.326
75.3	991	381	.983	80.3	271	670	.521
75.4	055	445	104.170	80.4	337	737	.715
75.5	1.38119	1.38510	104.356	80.5	404	804	.911
75.6	184	575	.543	80.6	472	872	114.106
75.7	249	640	.731	80.7	537	937	.301
75.8	314	705	.919	80.8	604	1.42004	.497
75.9	379	770	105.106	80.9	671	072	.692
76.0	1.38444	1.38835	105.294	81.0	1.41737	1.42138	114.888
76.1	510	902	.482	81.1	804	205	115.084
76.2	575	967	.670	81.2	871	272	.280
76.3	640	1.39032	.859	81.3	938	339	.477
76.4	705	097	106.047	81.4	1.42005	906	.673
76.5	770	162	.236	81.5	072	474	.870
76.6	835	228	.424	81.6	139	541	116.067
76.7	900	293	.613	81.7	206	608	.264
76.8	965	358	.802	81.8	273	675	.461
76.9	1.39030	423	.991	81.9	340	742	.658
77.0	1.39096	1.39489	107.181	82.0	1.42407	1.42810	116.856
77.1	161	554	.370	82.1	475	878	117.053
77.2	225	619	.560	82.2	543	946	.252
77.3	291	685	.750	82.3	610	1.43013	.449
77.4	356	750	.940	82.4	677	080	.647
77.5	422	816	108.130	82.5	744	148	.845
77.6	488	882	.320	82.6	811	214	113.044
77.7	554	949	.511	82.7	878	282	.243
77.8	619	1.40014	.701	82.8	946	350	.442
77.9	685	080	.892	82.9	1.43013	417	.641
78.0	1.39751	1.40146	109.084	83.0	1.43081	1.43486	118.840
78.1	816	211	.274	83.1	148	553	119.039
78.2	882	277	.466	83.2	216	621	.239
78.3	948	344	.657	83.3	283	688	.438
78.4	1.40013	409	.848	83.4	351	756	.638
78.5	079	475	110.041	83.5	419	824	.838
78.6	145	541	.232	83.6	488	894	120.039
78.7	211	607	.425	83.7	555	961	.238
78.8	277	674	.617	83.8	623	1.44029	.439
78.9	343	740	.809	83.9	691	097	.640

TABLE 114.—*Brix, apparent density, apparent specific gravity, and grams of sucrose per 100 ml of sugar solutions—Continued*

Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo	Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo
1	2	3	4	1	2	3	4
84. 0	1. 43758	1. 44165	120. 841	89. 0	1. 47199	1. 47616	131. 096
. 1	. 43826	. 44234	121. 042	. 1	. 47269	. 47686	. 305
. 2	. 43894	. 44302	. 243	. 2	. 47339	. 47756	. 515
. 3	. 43962	. 44370	. 444	. 3	. 47409	. 47826	. 725
. 4	1. 44030	. 44438	. 646	. 4	. 47479	. 47897	. 935
. 5	. 44098	. 44507	. 847	. 5	. 47548	. 47967	132. 145
. 6	. 44166	. 44575	122. 049	. 6	. 47618	1. 48037	. 355
. 7	. 44234	. 44643	. 251	. 7	. 47688	. 48107	. 565
. 8	. 44303	. 44712	. 453	. 8	. 47758	. 48177	. 776
. 9	. 44371	. 44780	. 655	. 9	. 47828	. 48247	. 987
85. 0	1. 44439	1. 44848	122. 858	90. 0	1. 47898	1. 48317	133. 198
. 1	. 44507	. 44917	123. 061	. 1	. 47968	. 48388	. 409
. 2	. 44576	. 44985	. 263	. 2	1. 48039	. 48458	. 620
. 3	. 44644	1. 45054	. 466	. 3	. 48109	. 48529	. 832
. 4	. 44712	. 45123	. 670	. 4	. 48179	. 48599	134. 043
. 5	. 44781	. 45191	. 873	. 5	. 48249	. 48669	. 255
. 6	. 44849	. 45260	124. 076	. 6	. 48320	. 48740	. 467
. 7	. 44918	. 45329	. 280	. 7	. 48390	. 48810	. 680
. 8	. 44986	. 45397	. 484	. 8	. 48460	. 48881	. 892
. 9	1. 45055	. 45466	. 688	. 9	. 48531	. 48951	135. 104
86. 0	1. 45124	1. 45535	124. 892	91. 0	1. 48601	1. 49022	135. 317
. 1	. 45192	. 45604	125. 096	. 1	. 48672	. 49093	. 530
. 2	. 45261	. 45673	. 301	. 2	. 48742	. 49164	. 743
. 3	. 45330	. 45741	. 505	. 3	. 48813	. 49234	. 956
. 4	. 45398	. 45810	. 710	. 4	. 48883	. 49305	136. 170
. 5	. 45467	. 45879	. 915	. 5	. 48954	. 49376	. 383
. 6	. 45536	. 45949	126. 121	. 6	1. 49024	. 49447	. 597
. 7	. 45605	1. 46018	. 326	. 7	. 49095	. 49518	. 811
. 8	. 45674	. 46087	. 531	. 8	. 49166	. 49588	137. 025
. 9	. 45743	. 46156	. 737	. 9	. 49236	. 49659	. 239
87. 0	1. 45812	1. 46225	126. 943	92. 0	1. 49307	1. 49730	137. 454
. 1	. 45881	. 46294	127. 149	. 1	. 49378	. 49801	. 668
. 2	. 45950	. 46364	. 355	. 2	. 49449	. 49872	. 883
. 3	1. 46019	. 46433	. 562	. 3	. 49520	. 49944	138. 098
. 4	. 46088	. 46502	. 768	. 4	. 49591	1. 50015	. 313
. 5	. 46157	. 46572	. 975	. 5	. 49662	. 50086	. 529
. 6	. 46227	. 46641	128. 182	. 6	. 49733	. 50157	. 744
. 7	. 46296	. 46710	. 389	. 7	. 49804	. 50228	. 960
. 8	. 46365	. 46780	. 596	. 8	. 49875	. 50299	139. 176
. 9	. 46434	. 46849	. 803	. 9	. 49946	. 50371	. 392
88. 0	1. 46504	1. 46919	129. 011	93. 0	1. 50017	1. 50442	139. 608
. 1	. 46573	. 46989	. 219	. 1	. 50088	. 50513	. 824
. 2	. 46643	1. 47058	. 426	. 2	. 50159	. 50585	140. 041
. 3	. 46712	. 47128	. 635	. 3	. 50230	. 50656	. 257
. 4	. 46782	. 47198	. 843	. 4	. 50302	. 50728	. 474
. 5	. 46851	. 47267	130. 051	. 5	. 50373	. 50799	. 691
. 6	. 46921	. 47337	. 260	. 6	. 50444	. 50871	. 908
. 7	. 46990	. 47407	. 468	. 7	. 50516	. 50942	141. 126
. 8	1. 47060	. 47477	. 677	. 8	. 50587	1. 51014	. 343
. 9	. 47130	. 47547	. 886	. 9	. 50659	. 51086	. 561

TABLE 114. *Brix, apparent density, apparent specific gravity, and grams of sucrose per 100 ml of sugar solutions—Continued*

Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo	Percent- age of su- crose by weight (Brix)	Apparent density at 20° C	Apparent specific gravity at 20° C/20° C	Grams of sucrose per 100 ml weight in vacuo
1	2	3	4	1	2	3	4
94.0	1.50730	1.51157	141.779	94.6	1.51160	1.51588	143.091
.1	.50802	.51229	.997	.7	.51231	.51660	.310
.2	.50873	.51301	142.216	.8	.51303	.51732	.529
.3	.50945	.51372	.434	.9	.51375	.51804	.749
.4	1.51016	.51444	.653				
.5	.51088	.51516	.872	95.0	1.51447	1.51876	143.968

TABLE 115.—*Increase in volume when sucrose is dissolved in water at 20° C (g/100 ml)*

[Example.—100 ml of water at 20° C is taken and 130 g of sucrose is dissolved therein. The resultant solution at 20° C has increased in volume 81.465 ml (column 4), the total volume being 100 + 81.465 = 181.465 ml]

Weight of su- crose dis- solved in 100 ml of water	Resultant solution			Weight of su- crose dis- solved in 100 ml of water	Resultant solution		
	Sucrose by weight (Brix)	Specific gravity 20°/4° C	Increase in volume		Sucrose by weight (Brix)	Specific gravity 20°/4° C	Increase in volume
1	2	3	4	1	2	3	4
<i>g</i>	<i>%</i>		<i>ml</i>	<i>g</i>	<i>%</i>		<i>ml</i>
5	4.7699	1.01694	3.078	90	47.4125	1.21546	56.174
10	9.1055	1.03446	6.165	100	50.0442	1.22981	62.483
15	13.0635	1.05093	9.259	110	52.4250	1.24301	68.802
20	16.6912	1.06645	12.357	120	54.5893	1.25520	75.130
25	20.0283	1.08109	15.461				
				130	56.5652	1.26649	81.465
30	23.1083	1.09491	18.570	140	58.3763	1.27696	87.808
35	25.9599	1.10799	21.683	150	60.0424	1.28671	94.157
40	28.6075	1.12037	24.801	160	61.5803	1.29579	100.513
45	31.0723	1.13212	27.922	170	63.0042	1.30429	106.873
50	33.3726	1.14327	31.048				
				180	64.3263	1.31225	113.239
55	35.5243	1.15387	34.177	190	65.5572	1.31972	119.609
60	37.5414	1.16396	37.310	200	66.7059	1.32675	125.984
65	39.4361	1.17356	40.447	210	67.7805	1.33337	132.362
70	41.2193	1.18273	43.587	220	68.7880	1.33961	138.744
75	42.9004	1.19147	46.729				
				230	69.7343	1.34551	145.129
80	44.4881	1.19983	49.874	240	70.6249	1.35110	151.517