sulphuric acid. The number of milligrams of potassium hydroxide used represents the acid number.

Iodine Absorption.—Weigh out 0.2 gram of the finely powdered resin into a glass-stoppered bottle and add 10 cc. chloroform. Add 40-50 cc. of Hübl's iodine solution, allow to stand eighteen hours, then titrate back with thiosulphate.

Color.—Dissolve 10 grams of the resin in 100 cc. of a mixture of half benzene and half acetone, allow to stand in a 4-ounce oil vial until it has settled bright, then compare the colors of the clear solutions.

The above methods, when applied to the comparison of similar grades of the same resin, give surprisingly accurate results. Other things being equal, a higher percentage of insoluble organic matter, which would char in the kettle and darken the melt, or a higher acid number and lower iodine value, which would show more complete oxidation and hence indicate a more porous structure in the resin, or a darker color in solution, indicating a corresponding darker color when melted—these are the points which condemn a sample.

In conclusion, the author would state that he hopes soon to extend this investigation to the melted copals—especially to study the oxidation of the same, which may have important bearing on the durability of varnishes made from these resins.

CHICAGO VARNISH CO.,
CHICAGO, March, 1903.

ON THE RELATION OF THE SPECIFIC GRAVITY OF URINE TO THE SOLIDS PRESENT. SECOND PAPER.

BY J. H. LONG.

Received June 18, 1903.

SOME months ago[1] I gave the results of experiments carried out on the determination of the relation between the total solids of urine and the specific gravity at 25° C. A factor was found here corresponding to the coefficient of Haeser, but considerably larger than the number usually given, on account of the higher temperature at which the specific gravities were observed.

It seemed desirable to separate the effect of sodium chloride in fixing this relation, inasmuch as this substance is not a product

[1] This Journal, **25**, 257.

of metabolism and is present in extremely variable amounts which have no relation to the urinary constituents of true metabolic origin. A new set of tests were therefore made in which the chlorine was accurately determined and calculated to sodium chloride. Then the specific gravities of correspondingly weak chloride solutions were found and these were subtracted from the observed specific gravities at 25° to find the specific gravity due to metabolic products. There are, of course, slight sources of error in this calculation, but they are not of great importance in the final result. In the first place, the chlorine is not always present as sodium chloride; sometimes there is more chlorine than the sodium will combine with, but the excess is never great. Secondly, the specific gravity of a mixed solution is not accurately equal to the sum of the factors for each component taken separately. The excess of the specific gravity over unity for the mixed solution is not exactly the sum of the excesses for solutions of the component substances taken separately in the same volume. But for the dilute solutions considered here the variations are not of material importance, and besides, this whole calculation is an arbitrary one which cannot lead to more than approximate results.

The determinations were made as described in the former paper and the coefficient or factor C was calculated by the expression

$$C = \frac{\text{Solids} - \text{NaCl}}{E_{\text{total}} - E_{\text{NaCl}}},$$

in which E_{total} represents the excess of the specific gravity of the urine over 1, and E_{NaCl} represents the excess of the specific gravity of salt solutions of the strength found over 1. The results obtained are given in the table.

No.	Solids per liter.	Sodium chloride per liter.	Specific gravity $\frac{25°}{4°}$.	Sp. gr. of sodium chloride solution.	Coefficient for total solids.	Coefficient for solids less salt.
1	70.83	16.07	1.0287	1.0079	0.247	0.263
2	40.88	13.77	1.0169	1.0063	0.239	0.261
3	60.35	10.26	1.0233	1.0040	0.255	0.259
4	52.99	12.47	1.0190	1.0054	0.278	0.298
5	43.87	15.72	1.0184	1.0077	0.238	0.263
6	50.58	18.43	1.0216	1.0097	0.233	0.270
7	50.69	16.91	1.0217	1.0085	0.234	0.256
8	67.13	15.25	1.0275	1.0072	0.244	0.256
9	29.68	15.04	1.0131	1.0071	0.226	0.244
10	50.69	13.99	1.0217	1.0064	0.233	0.240
11	34.34	11.48	1.0130	1.0048	0.264	0.278
12	58.72	16.63	1.0234	1.0084	0.251	0.280

No.	Solids per liter.	Sodium chloride per liter.	Specific gravity $\frac{25°}{4°}$.	Sp. gr. of sodium chloride solution.	Coefficient for total solids.	Coefficient for solids less salt.
13	63.79	13.87	1.0238	1.0065	0.267	0.288
14	65.43	15.51	1.0260	1.0076	0.251	0.271
15	56.77	13.65	1.0234	1.0062	0.243	0.251
16	61.50	15.19	1.0238	1.0072	0.259	0.278
17	44.34	13.56	1.0172	1.0062	0.258	0.280
18	51.52	17.64	1.0202	1.0092	0.255	0.308
19	59.96	18.97	1.0235	1.0102	0.255	0.306
20	40.09	11.55	1.0154	1.0048	0.263	0.269
21	58.92	15.13	1.0230	1.0071	0.256	0.275
22	52.18	14.64	1.0213	1.0069	0.245	0.261
23	52.99	10.25	1.0190	1.0040	0.278	0.285
24	55.03	15.24	1.0220	1.0073	0.250	0.257
Mean,	53.05	14.63	1.0211	1.0069	0.251	0.271

It will be observed that the coefficient for the total solids is 0.251 and slightly smaller than the mean value found before, 0.260. The coefficient for solids, less sodium chloride, is considerably larger and, contrary to expectations, is the mean of results which show wider variations than in the other case. Most of the individual results are, however, near the mean value and for certain classes of calculations, therefore, the coefficient may be used with only a small probable error. It will be noted that the urines tested showed a range of concentration between about 30 and 70 grams per liter of solids.

NORTHWESTERN UNIVERSITY,
CHICAGO, JUNE, 1903.

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THE ELECTROLYTIC PRODUCTION OF CALCIUM.

BY JOSEPH H. GOODWIN.

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SEVERAL suggestions have been offered during the past year for the preparation of metallic calcium in the electrolytic way. The attempts made by the writer, with various furnaces, were fruitless. After much experimentation, the furnace, pictured below, was devised, and as it gave an excellent yield of metal it was thought that perhaps it would be helpful to others, hence this communication. Its construction is evident from the sketch. The