

TABLE II.—RESULTS OF INDIRECT POTENTIOMETRIC TITRATIONS OF VARIOUS ALKALOIDS WITH THE Ag-W COUPLE.

| Alkaloid. | 0.1 N NaOH to Neutralize Excess HCl. | | Grams of Alkaloid. | |
|------------|---|----------------------|--------------------|------------|
| | Calc. NaOH cc. | Required NaOH cc. | Present. | Found. |
| Brucine | 2.05 cc. | 2.06 cc. | 0.1161 Gm. | 0.1157 Gm. |
| Cinchonine | 2.0 cc. | 2.1 cc. | 0.1177 Gm. | 0.1148 Gm. |
| Codeine | 5.0 cc. | 4.91 cc. | 0.0639 Gm. | 0.0696 Gm. |
| Cocaine | 2.0 cc. | 2.1 cc. | 0.1213 Gm. | 0.1183 Gm. |
| Morphine | 4.0 cc. | 4.0 cc. | 0.0628 Gm. | 0.0628 Gm. |
| Quinidine | 2.0 cc. | 2.2 cc. | 0.1297 Gm. | 0.1232 Gm. |
| Quinine | 2.0 cc. | 2.2 cc. | 0.1297 Gm. | 0.1232 Gm. |
| Strychnine | 2.0 cc. | 1.97 cc. | 0.1337 Gm. | 0.1347 Gm. |

nine was studied. A small amount of quinhydrone was added to the solution in the titrating vessel and the titration was carried out in the usual manner. The quinhydrone altered the difference of potential between the electrodes, but did not aid in the determination of the end-point, for it neither increased the magnitude nor the sharpness of the potential change. In fact the indication of the end-point was rather less satisfactory, so this effect was not studied further.

SUMMARY.

1. The bi-metallic electrodes Sb-C, W-C and Ag-W have been used in the indirect electrometric titration of strychnine.

2. The Ag-W pair was used in the titration of brucine, cinchonine, codeine, cocaine and morphine.

3. The titration of quinine and quinidine with the Ag-W couple was not satisfactory.

4. Quinhydrone does not enhance the value of the Ag-W and Sb-C couples in the titration of strychnine.

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THE SPECIFIC GRAVITY OF MIXTURES OF CHLOROFORM (U. S. P.)
AND BENZYL ALCOHOL.*

BY SAMUEL M. GORDON.

An examination of several proprietary remedies, exploited extensively to the dental profession as local anesthetics, revealed that they consisted of mixtures of benzyl alcohol and chloroform.

Benzyl alcohol has found limited use as a local anesthetic by injection or by infiltration in minor surgical operation, including the extraction of teeth. In ordinary doses it is stated to be practically non-irritant and non-toxic. In addition, pure benzyl alcohol is reported to possess antiseptic properties.¹

* Contribution from the American Dental Association Bureau of Chemistry and the American Medical Association Chemical Laboratory.

¹ A more complete description of benzyl alcohol may be found in "New and Nonofficial Remedies," 1930, published by the American Medical Association.

As an anodyne by topical application, for the relief of "toothache," its use in mixture with equal parts by volume of chloroform has been suggested.¹

The ready availability of the drug taken in conjunction with its possible uses in minor dental operations led to the marketing of the product in mixture with chloroform under secret, proprietary names, non-informative of the nature of the product.

Having definitely recognized the presence in a mixture of benzyl alcohol and chloroform, to the exclusion of other compounds, an accurate and readily available

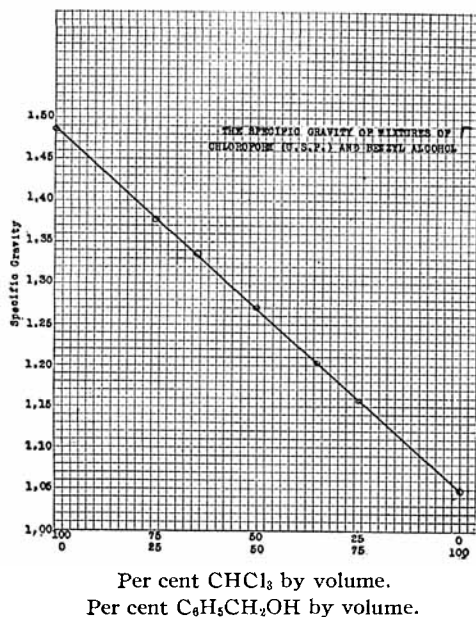


Fig. 1.

method for the determination of the proportions of each is desirable. On account of the inherent difficulties of the exact determination of the constituents by chemical means, the application of simple, physical methods suggested themselves.

It is well known that if the densities of pure liquids are plotted on cross-section paper and a line drawn connecting the points, the densities of mixtures of these two liquids will fall on a straight line. Thus, the specific gravity of several pure liquids and mixtures thereof are determined. The specific gravity of benzyl alcohol and chloroform and mixtures thereof were determined, and the graph prepared, as already explained.

By determining the specific gravity of the unknown, the percentage composition in terms of the two components can be readily estimated from the graph with a desirable degree of accuracy.

EXPERIMENTAL.

Benzyl alcohol—"highest purity Merck" and redistilled chloroform (U. S. P. X)² were used.

The volumes of each product were measured from a burette at a temperature of 23.5–24° C.

| PER CENT BY VOLUME. | | SPECIFIC GRAVITY. |
|---------------------|-------------|-------------------|
| Benzyl alcohol. | Chloroform. | |
| 100 | 0 | 1.0468 |
| 75 | 25 | 1.1591 |
| 65 | 35 | 1.2034 |
| 50 | 50 | 1.2692 |
| 35 | 65 | 1.3345 |
| 25 | 75 | 1.3780 |
| 0 | 100 | 1.4843 |

¹ D. I. Macht, *Jour. A. M. A.*, 75 (1920), 1205.

² Chloroform U. S. P. X "contains not less than 99.0 per cent and not more than 99.5 per cent of CHCl₃, the remainder consisting of alcohol."

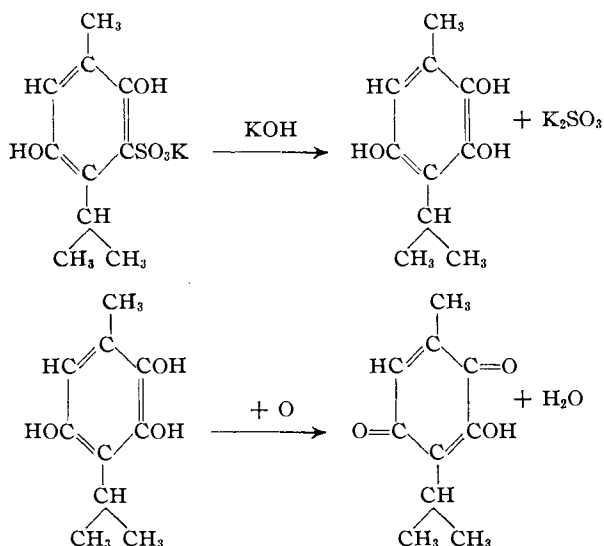
The specific gravities of the mixtures were determined at 20° C. \pm 0.5 in a pycnometer of the Geissler type.¹

The results are plotted on the foregoing graph, and yield as expected a straight line when the points are connected. Hence, by determining the specific gravity of a mixture containing chloroform and benzyl alcohol, and referring to the graph, the composition may be readily determined with a reasonable degree of accuracy.

RATE OF OXYGEN ABSORPTION BY CARSTANJEN'S COMPOUND UPON THE ADDITION OF AN ALKALI.*

BY A. A. HARWOOD.

It was observed by Carstanjen¹ that upon addition of an alkali to a solution of 1-methyl-4-isopropyl-2,5-hydroxy-3 or 6-potassium sulphone benzene, it assumed a dark red color. He believed this to be due to the absorption of oxygen from the air. The reaction possibly takes place in the following manner:



According to the above reactions one molecule of Carstanjen's compound in aqueous solution should absorb one-half molecule of oxygen.

Experimental Procedure.—An apparatus was constructed in which it was possible to introduce, without admitting air, first Carstanjen's compound in aqueous solution into a reaction chamber, then an equimolecular amount of KOH also in aqueous solution. The accompanying sketch of the apparatus will illustrate the manner of manipulation.

¹ See for example: "Food Analysis" by A. G. Woodman or any other standard work on analytical methods.

* Presented to the Scientific Section. Part of a thesis presented as one of the requirements for the doctor's degree, University of Wisconsin.

¹ *J. prakt. Chem.*, 123 (1877), 478.