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DETERMINATION OF ALCOHOL AND WATER IN OFFICIAL ETHER.

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A timely article by R. L. Perkins appeared in the May issue of the *Journal of Industrial and Engineering Chemistry* on the determination by specific gravity of the percent by volume of alcohol and water in official ether. The specific gravity (apparent) of the ether at $\frac{25^\circ}{25^\circ}$ is taken, also that of the same ether after dehydration by potassium carbonate. From these data, by aid of charts plotted from data obtained through accurate determinations of the specific gravity of a sufficient number of mixtures of ether, alcohol and water in known proportions, the percentages of alcohol and of water in any given sample are readily deduced.

Examination of the plotted "curves" shows that these for practical purposes may be considered to be straight lines so that, within the narrow range covered by the charts, a certain difference in specific gravity corresponds with a practically uniform difference in percentage of water or of alcohol, as the case may be—the two factors naturally being quite distinct. It is therefore possible to deduce simple formulas by which the proportions respectively of alcohol and of water in a given sample of ether may be deduced from the observed specific gravities of the sample before and after dehydration.

I have not gone into the question of the standard temperature assumed for the measurement of the respective fluids—a matter of some importance since these differ greatly in their coefficients of expansion. Neither have I considered the question of condensation of volume in the mixing of the fluids, which, of course, has its effect on the volume percentage of the several fluids. I have simply used the data as offered in Mr. Perkins' paper and embodied in his charts. From these I have deduced the following mathematical formulas which will give percentages sufficiently exact for all practical purposes.

The specific gravity of the sample is to be taken accurately at $\frac{25^\circ}{25^\circ}$ C., also the specific gravity after dehydration with dried potassium carbonate.

Let Dif. stand for the difference between these and Dif.′ for the difference between the specific gravity of the dehydrated sample and that of absolute ether, *viz.*, 0.70968. Then:

Dif. × 895 = Volume percent of alcohol.

Dif.′ × 185.5 = Volume percent of water.

Incidentally I have made comparison of Mr. Perkins' figures for sp. gr. of mixtures of ether and alcohol with those given by Dr. Squibb (*Ephemeris*, p. 598).

Dr. Squibb gives his specific gravities on the basis $\frac{25^\circ}{4^\circ}$ C., and his mixtures contained a small (known) quantity of water. Making due allowance for the water and bringing the data to the basis of $\frac{25^\circ}{25^\circ}$, the figures are approximately:

SPECIFIC GRAVITY OF MIXTURES OF "ABSOLUTE" ALCOHOL WITH "ABSOLUTE" ETHER.

Vol. percent. Ether.	According to Perkins.	According to Squibb.
100	0.70968	0.70958
99	0.71089	0.71079
98	0.71198	0.71199
97	0.71312	0.71317
96	0.71415	0.71432

Analysis of the figures shows that there is a distinct condensation of volume when ether is mixed with alcohol, amounting to about 0.060 volume percent for 1 percent of alcohol. Condensation between water and ether is greater, being something like 0.34 percent for 1 percent of water.

The requirements of pharmacy, however, do not demand a high degree of exactness in determinations of the small proportions of alcohol and of water contained in official ether. I believe that the formulas I have given will be found to give results practically correct within the limits of experimental error.

NOT NEW BUT WORTH KNOWING.

Every one who has used Fehling's solution for quantitative determinations knows the practical difficulty of fixing the end point of the titration. An expedient which overcomes the difficulty was taught me when I was a student, by whom devised I do not know, but it certainly works like magic.

All that is necessary is to add to the solution prepared in the usual manner for titration 0.5 to 1.0 gramme of calcium carbonate. In presence of this, the cuprous oxide formed separates from the solution promptly as it is formed so that the supernatant fluid becomes quickly clear and transparent after each successive addition of the reagent. The titration is thus concluded in a very short time, the end point (disappearance of the blue color) being certain and sharp.

The test should always be made in a flask rather than in an open dish, and should be concluded as rapidly as possible to avoid reabsorption of oxygen from the air. For exact results, it is well to make a preliminary titration to determine approximately the quantity of reagent that will effect reduction of the sugar; then in a second experiment, add rapidly nearly all of the reagent that will be required, finishing the titration then with as little delay as possible.