NOTE ON U. S. P. ASSAY FOR OIL OF PEPPERMINT.

BY A. B. LYONS.

The requirement of the U. S. P. for Oil of Peppermint is that it shall contain "not less than 5 percent of esters calculated as menthyl acetate and not less than 50 percent of total menthol, free and as esters." The assay for esters is sound, being made by the saponification process. The effect of saponification upon the oil is to increase its weight by 26 percent of the weight of menthyl acetate present. It is not a matter of serious consequence that the ester actually present does not consist wholly of menthyl acetate. For the purposes of such an assay the difference is quite negligible.

For the second determination an indefinite quantity (10 mils) of the oil is acetylized in the usual manner, washed and dried. Of this oil, containing the whole of the menthol in the form of menthyl acetate, a weighed portion is taken for saponification. The result of titration shows how much half-normal alkali is required to neutralize the acetic acid which exists in combination with menthyl, each mil of the standard alkali corresponding with 0.07808 Gm. of menthol or 0.09909 Gm. of menthyl acetate. The difference between these represents the difference in weight due to acetylization, *viz.*, 0.02101 Gm.

The formula given in the U. S. P. for calculating the result of this assay introduces this factor (0.021), but applies it to the whole of the menthol, making the weight of the oil taken = B — (A × 0.021), B being the weight of the acetylized oil taken and A the number of mils of volumetric (half-normal) alkali consumed in neutralizing the acid of acetylization, including that of the esters originally present. This formula will give the percentage of the oil after saponification of the esters naturally present—not that of the original sample. To find the true percent we must refer to the first step in the assay, which determines the percent of esters originally present in the oil—or by substituting for 9.909 the factor 7.808, the percent of menthol corresponding to those esters. We must therefore deduct from the (A × 0.021) of the formula a compensating correction, which in case of an oil containing about 50 percent of total menthol will make the expression (A — C ÷ 2.5) × 0.021. The compensating quantity will, however, vary with the percent of total menthol, so that this would serve only as an empirical formula, by which, however, we could determine with certainty whether or not a given sample contained "not less than 50 percent of total menthol." The amended formula would read:

$$\text{Percentage of total menthol} = \frac{A \times 7.808}{B - (A - C \div 2.5) \times 0.021}$$

If the percent of menthol differs materially from that of the pharmacopoeial standard the formula may be amended by substituting for the divisor 2.5 the expression 2 + M, in which M stands for the percent of total menthol in the sample by U. S. P. formula. The result reached is a trifle less than the correct figure, but the difference is negligible.

The following is a general formula which will seem simpler, and will give a

close approximation to the truth in samples containing a proportion of menthol not varying greatly from the pharmacopoeial standard:

Determine total menthol by the percent U. S. P. formula, then multiply the percent thus determined by $\frac{100 - (P \times 0.212)}{100}$, the symbol P standing for the percent of menthol present in the oil as ester. The full expression will read:

$$\text{Percentage of total menthol} = \frac{A \times 7.808}{B - (A \times 0.021)} \times \frac{100 - (P \times 0.212)}{100}.$$

Example: Ten Gm. of a given sample of oil consume in saponification 7 mils of half-normal alcoholic alkali, while 5 Gm. of the acetylized oil consume 30 mils. By the U. S. P. formula, the sample contains 53.48 percent total menthol. By either of the modified formulas here proposed the percentage is reduced to a little less than 52.9 percent.

All that has been said in criticism of the U. S. P. assay for oil of peppermint applies, *mutalis mutandis*, to that for oil of rosemary. The second of the two modified formulas given above requires only the change in the numerator from 7.808 to 7.707 when borneol instead of menthol is to be determined.

SOME VARIATIONS IN CINCHONA BARK AND ITS PREPARATIONS.*

BY HUGO H. SCHAEFER.

Ever since the outbreak of this great war much has been said of the low grade cinchona barks on the market. Numerous samples have been brought to the author's attention which failed to pass the U. S. P. requirements. This, of course, is largely due to the fact that owing to the derangement of shipping facilities the regular supply of Java Cinchona has been interfered with, thereby resulting in a shortage of this high grade bark. The result is that the price of bark has increased considerably and new sources of cinchona are being sought all over the world. Many of these barks have not been investigated and upon analysis are found to be very low in alkaloidal content. This, of course, is supposed to be taken care of in the U. S. P. IX by its requirement of 5% total alkaloids. Quinine, however, as we know is the most important alkaloid in cinchona bark. The U. S. P. VIII required 5% total alkaloids, and 4% ether-soluble, the latter representing an approximation of the quinine content. In the latest revision, however, this ether-soluble requirement was omitted, possibly due to the fact that in the usual cinchona barks the proportions of the various alkaloids do not vary greatly. In the last few years, however, the author has had occasion to assay a number of samples of cinchona bark and its preparations containing 5% or more of total alkaloids but comparatively little quinine or ether-soluble alkaloids. These barks, after being reduced to a No. 60 powder, were assayed according to the U. S. P. IX for total alkaloids using, however, double quantity of bark solvents, etc. The bark was extracted with the ether-chloroform mixture, the latter made alkaline with ammonia, the water added to cause the drug to settle and the aliquot portion of the solvent decanted. This was completely shaken out with weak sulphuric acid and the volume of this acid extract made up to exactly 100 mils with water. This then contained the alkaloids of 8 Gm. of drug. One-

* Read before Scientific Section, A. Ph. A., Chicago meeting, 1918.