proven to him that hexamethylenamine should be taken inwardly with great caution. He thought that one thing might be stated in the paper by way of caution—a fact well known to chemists—that phenylhydrazine and sodium nitroprusside solutions should be freshly made, as they deteriorated very rapidly and that they should furthermore be protected from light.

METHODS OF ANALYSIS FOR CERTAIN PHARMACEUTICAL PREPARATIONS.

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In the course of a year's work in a laboratory devoted to the analysis of drugs and drug preparations, it often becomes necessary to devise new methods, or to modify old ones, for the analysis of certain drug products that do not have any commonly recognized methods.

So far as the author is aware, the following methods have not appeared in print, and my reason for calling your attention to them is the fact that perhaps someone else may have need for such methods.

DETERMINATION OF MORPHINE IN TABLETS.

Take a sufficient number of tablets to equal about four or five grains of morphine, place in a small Erlenmeyer flask of about 50 cc. capacity, add 10 cc. of water and a drop of dilute sulphuric acid and allow to dissolve. If the tablets are not entirely soluble, as determined by a previous test, place the powdered tablets in a 5.5 cm. plain folded filter and extract with distilled water, applied drop by drop, using if possible not more than 10 to 15 cc. of water.

Now add a few drops of cochineal or methyl red and sufficient ammonia to give neutral point, and then add ½ to 1 cc. of 10% ammonia in excess.

Place sample in an ice chest, preferably resting upon a cake of ice and allow to stand over night, when if precipitation has taken place properly, the morphine will appear as a fine crystalline precipitate. Filter into a weighed Gooch crucible, wash well with cold water, dry at 65° C. and weigh.

Place filtrate from above in a separatory funnel and extract five or six times with 30 cc. portions of a mixture of chloroform 3 parts, and alcohol 1 part, being careful to maintain a very slight excess of ammonia. Wash the united chloroform-alcohol solution of morphine twice with 5 cc. portions of water, and then extract the aqueous washings with an equal volume of chloroform.

Filter the chloroform-alcohol solution of morphine through a small filter wetted with chloroform, into a suitable flask and distill off all but about 10 cc. of the liquid, evaporate the remaining portion to dryness on the water bath, take up in neutral alcohol (2 or 3 cc.) add an excess of N/50 sulphuric acid (about 15 cc.), a few drops of methyl-red or cochineal as indicator and titrate excess of acid with N/50 KOH. Each cc. of N/50 acid consumed is equal to 0.006 gm. crystalized morphine.

Add weight of morphine found in filtrate by titration to that obtained by

gravimetric method and multiply this figure by 1.251 to get amount of morphine sulphate in sample used.

ASSAY OF EFFERVESCENT SOLUTION OF MAGNESIUM CITRATE.

In addition to such tests and observations as appearance, odor, precipitate, if any, gas pressure, sp. gr. at 25° C., volume of entire sample, sulphates, chlorides, etc., we make the following assay:

Free Citric Acid.

Having first determined the total volume of the sample, measure out exactly 15 cc., add an equal volume of water, and boil until free from CO_2, cool, add a few drops of phenolphthalein, and titrate with N/2 KOH.

Each cc. N/2KOH=.03475 gm. citric acid.

Total Citric Acid.

Evaporate the liquid remaining after determining "free citric acid" to dryness in a platinum dish, char thoroughly, take up residue in 20 cc. N/1 H_2SO_4, heat on water bath, filter through ashless filter, and wash filter thoroughly with hot distilled water, burn filter in same dish, and dissolve the small amount of ash in a portion of the filtrate, filter if necessary, wash thoroughly, cool, and titrate excess of N/1 H_2SO_4 with N/2 KOH, using methyl orange as the indicator.

Each cc. N/1 H_2SO_4 consumed=.0695 gm. total citric acid.

Each bottle of Solution Magnesium Citrate when made by the U. S. P. formula should contain 33.6 gm. U. S. P. citric acid, and 15 gm. magnesium carbonate, equivalent to not less than 5.76 gm. pure MgO., and 2.5 gm. potassium bicarbonate.

According to my calculations, we should have in a strictly U. S. P. preparation, 11.87 gm. free citric acid, 21.73 gm. combined citric acid, and 5.76 gm. MgO per bottle.

Determination of MgO.

Dilute 25 cc. of the sample with water to 100 cc. Measure out 25 cc. aliquots, place in wide mouthed Erlenmeyer flask, and determine MgO by A. O. A. C. method as given in Bulletin 107, revised, page 16.

Calculate to gm. MgO per bottle.

By means of the above method we obviate the disagreeable feature of precipitating the citrate as the lead salt and its subsequent manipulation as proposed by Street. (Report of Conn. Agric. Exp. Station, 1912, part 2, page 165.)

ASSAY OF SEIDLITZ POWDERS.

Weight of Powders.

Weigh each powder in the box, using as counterpoise a powder paper of the same kind used in sample, compute the average weight of both the "white" and "blue" powders, reporting maximum, minimum, and average weight.

Assay of "Blue" Powders.

(1) Determination of Sodium Bicarbonate. Place one or two of the "blue" powders in a mortar and reduce to very fine powder to thoroughly mix, transfer to weighing bottle, and weigh off duplicate samples of about 1.5 gm., transfer carefully to flask, add about 50 cc. of water and 10 cc. N/1 sulphuric acid,

and boil until free from CO_2, cool, add phenolphthalein and titrate excess of acid with N/1 KOH.

Each cc. N/1 sulphuric acid consumed equals 0.08343 gm. sodium bicarbonate.

(2) *Rochelle Salt.* Weigh off samples of exactly the same amount as were used in the bicarbonate determination, place in platinum dish and carefully ignite until all organic matter is thoroughly charred, cool, and thoroughly extract ash with hot water, filter, burn filter and dissolve residue, if any, in water and add to previous solution. Aqueous solution should be colorless and perfectly clear, otherwise sample has not been ignited enough and determination must be repeated. Add methyl orange to aqueous solution and titrate to neutrality with normal sulphuric acid.

Calculation. Owing to the fact that the soda bicarbonate has been determined along with the Rochelle salt in this method, a correction must be made for it.

If samples of the same weight have been used, subtract the amount of acid consumed in the bicarbonate determination, from the amount used in the last assay. This will give the amount of acid consumed by the alkalinity of the ash due to the Rochelle salt.

Each cc. N/1 sulphuric acid consumed in this determination after allowing for the bicarbonate is equivalent to 0.14009 gm. Rochelle salt U. S. P.

The "blue" powder should weigh 10.33 gm. and should contain 25% sodium bicarbonate and 75% Rochelle salt. Each "white" powder should weigh 2.25 gm. net, and consist of tartaric acid U. S. P.

TINCTURE OF IODINE.

It would seem, after all that has been said and written concerning this preparation, that little remains, however I wish to call your attention to a few methods that have given satisfaction in my hands.

Determination of Alcohol. A number of methods of procedure have been suggested for this determination, such as shaking with metallic mercury until iodine is decolorized, (Alcock, Proc. A. Ph. A., 1904, p. 583); adding sodium thiosulphate in slight excess and distilling from an alkaline solution, (Gane & Webster Chem. Abs., vol. 3, p. 2487); and Cameron (Analyst, 1902, p. 87), who suggests in place of caustic soda the use of iron filings.

As I have never seen the following method suggested I take the liberty of doing so, especially as the above mentioned methods have certain objections, such as slowness of action between the iodine and the mercury or iron filings, difficulty of distilling from an alkaline solution, contamination of distillate with iodoform and other volatile substances, etc.

Place about 70 cc. of distilled water in a 300 cc. Erlenmeyer flask, add about 1 gm. of "zinc dust" such as is used in Kjeldahl method for nitrogen, or sufficient to leave a decided excess after combining with the iodine, now add exactly 10 cc. of the tincture, observing the proper precautions as to temperature in measuring out sample, shake flask, and immediately connect up with a good condenser, worm condenser preferred, and provided with an efficient spray trap, and distill over nearly 50 cc. of distillate.

Make up to volume with distilled water at desired temperature, and determine

sp. gr. of distillate by means of a pycnometer, and from the sp. gr. thus obtained calculate the percent of alcohol.

The zinc dust serves two purposes, first it *immediately* combines with the iodine forming a colorless solution of zinc iodide, and second, the excess of zinc helps to make the solution boil smoothly.

Determination of Free Acid. After the titration of the iodine as in the U. S. P. method, add a few drops of phenolphthalein to the clear liquid and run in decinormal KOH until liquid has faint pink color. The use of starch solution in the determination of the iodine is not necessary, as the change from the yellow color of the iodine to the colorless solution is quite distinct, and the use of the starch paste interferes with the "free acid" titration.

In samples made with the full amount of potassium iodide, it should not require more than one or two drops of 1/10 normal KOH, while in a tincture made without potassium iodide, and a few weeks old it sometimes requires as much as 5.75 cc. of the solution for a 5 cc. sample, equivalent to 1.459 gm. absolute hydriodic acid per 100 cc. of tincture. Each cc. of decinormal KOH consumed equals 0.01269 gm. HI.

This process depends upon the fact that the products of the reaction between iodine and sodium thiosulphate are neutral, and the free hydriodic acid can be titrated with standard alkali.

Determination of Potassium Iodide. Measure out 10 cc. of sample into a weighed porcelain dish, and place on top of water bath, but not in direct contact with steam, and set fire to the alcohol vapors to prevent the iodine creeping over the edge of the dish. Allow to evaporate to dryness, moisten a few times with 2 or 3 cc. of dilute alcohol, evaporating to dryness each time, finally ignite at a low temperature, short of red heat, cool and weigh. Calculate grams potassium iodide per 100 cc.

This is essentially the same method as proposed by Lawall (Proc. A. Ph. A., 1907, p. 159) and is given here with a few modifications, simply to call attention to it as a satisfactory method for this determination.

Theoretically potassium iodide is the only non-volatile ingredient of tincture of iodine, though the iodine and alcohol may contain small amounts of non-volatile matter, sufficent to sometimes give a dark gray color to the residue. This, however, is not sufficiently great ordinarily to seriously interfere with its accuracy as a practical method. In case the residue is very impure, it should be dissolved in water and the iodide determined in the residue by means of Volhard's method.

DETERMINATION OF TOTAL ARSENIC IN FOWLER'S SOLUTION.

Owing to the fact that arsenic has a tendency to oxidize in alkaline solution, during the process of manufacture, or by age, it becomes necessary to know the total amount of arsenic present as well as that in the arsenious condition.

Weigh out sample of about 15 cc., add 5 cc. of dilute sulphuric acid (1:3) and 1 gm. of potassium iodide, dilute to 100 cc. and boil down to about 40 cc.; cool, add starch solution and remove excess of iodine by the careful addition of thiosulphate solution, neutralize excess of acid by the addition of sodium bicarbonate, and add 2 or 3 grams in excess.

Determine arsenic from this point by the U. S. P. method. The difference between the percent of As_2O_3 by the U. S. P. method and "total arsenic" calculated as As_2O_3 represents the amount of arsenic in oxidized form.

DISCUSSION.

Philip Asher, of New Orleans, referring to the method proposed by Mr. Brown of using both the gravimetric and the volumetric processes, asked, "Why not stop at the volumetric, and get the morphine content?" Referring to the author's method of determining the alcohol in iodine, he said he had used that method himself, and it was approximately correct, sufficiently so for all practical purposes, and it could be carried out in two minutes. He placed some alcohol in a graduated cylinder and added potassium carbonate. This was shaken thoroughly, and in a short while the alcohol was found lying out above the potassium carbonate, upon which he was making the determination.

Continuing, Mr. Asher said, referring to the author's determination of free acids by distillation, that, in the early '90s, he had carried on a series of experiments of this kind, and had gotten his free acids by determining the free iodine by the potassium iodate method. He started by adding sodium thiosulphate until all the free iodine was taken up, and then added a small amount of potassium iodate. The iodate, in the presence of hydriodic acid was split up into iodine. The number of cubic centimeters found, multiplied by five-sixths, and by the iodine coefficient gave the iodine that was converted into hydriodic acid. This gave an exact determination. The desired result was had, without going through the process of distillation.

Mr. Brown responded that in the determination of morphine by precipitation, and extraction of the residual morphine left in the "mother liquor," he got around the disadvantage of having to use a large amount of solvent, which would be necessary if *all* the morphine was extracted by means of an immiscible solvent.

He did not determine the "free acid" by distillation as had been suggested. If the titration method was used, all that was necessary to do was to add a little phenolphthalein indicator to the solution, after decolorizing with thiosulphate, and titrate with tenth normal alkali to get the free acid, the product of the reaction between the thiosulphate and the iodine being neutral.

THE STABILITY OF OUABAIN IN AQUEOUS SOLUTION.

CHAS. C. HASKELL AND W. A. DOEPPERS.

Galenical preparations and isolated pure principles of digitalis are comparatively slowly absorbed when administered by mouth to normal individuals. In patients suffering from cardiac disease, a condition of acute circulatory embarrassment often occurs, rendering it of the greatest importance to secure prompt drug action; but the venous stasis dependent upon the circulatory failure gives rise to engorgement of the gastro-intestinal mucosa and consequently, further delays absorption by this route.

In the treatment of such patients, clinicians have long desired some remedy that could be introduced directly into the blood stream and bring about full and prompt action. The infusion of digitalis has been employed in this way, but it would seem that it would be desirable to study upon lower animals the effect of