SUMMARY AND CONCLUSIONS

(1) The substance or substances causing the characteristic fluorescence of alcoholic extracts of ipecac in ultraviolet light is alkaloidal in nature as proved by the disappearance of the fluorescence after alkaloidal precipitation has been effected.

(2) The alkaloid responsible is not emetine or cephalline, because removal of these from the extract in no way alters the color or intensity of fluorescence.

(3) The substance responsible for the fluorescence is not a decomposition product produced by heating at steam-bath temperature because non-heat treated extracts show the same color as the others.

(4) The alkaloid may be psychotrine, *o*-methyl psychotrine or emetamine. Of these, the first two are the more likely suspects because emetamine and solutions of its salts are non-fluorescent in daylight; this argues against the likelihood of their showing such an intense fluorescence as displayed by the extracts of ipecac under quartz light.

(5) Solutions of the unknown substance darken on standing, and deposit a brown substance. Psychotrine solutions are said to act in this manner.

(6) Ether extracts of ipecac do not display the same type of fluorescence that alcoholic extracts show. Psychotrine is insoluble in ether and soluble in alcohol.

(7) Chloroform will extract the fluorescently active material from ipecac. Psychotrine is soluble in chloroform.

(8) Psychotrine or *o*-methyl psychotrine or both are apparently responsible for the fluorescence of the alcoholic extracts of ipecac.

Incompatibilities in Prescriptions

IV. The Use of Inert Powders in Capsules to Prevent Liquefaction Due to Deliquescence*,†

By William J. Husa‡ and Charles H. Becker

In a previous paper (1) a study was made of the effectiveness of various inert powders in capsules in which the contents liquefy due to formation of a eutectic mixture. In the present paper a report is made on the relative efficiency of various inert powders in preventing liquefaction of the contents of capsules due to deliquescence.

EXPERIMENTAL

Prescription No. 1

℞ Salol	℈ ii
Sodii Nitrite	grs. xx
Sodii Bromid	℈ iv

M. ft. caps. no. xxiv.
Sig.: Take one after meals.

On the above prescription as obtained from the file of a pharmacy, there appeared a notation indicating that the dispenser had added 40 grs. of lactose.

Upon mixing the ingredients of this prescription as written, a dry powder was obtained and single doses were put in No. 2 capsules. After four days the capsules in a beaker liquefied and acquired a rusty-red color. After a week, the capsules were entirely colored and adhered to the bottom of the container. On longer standing, the capsules hardened, and upon observing the interior, the ingredients were found dry and white in color except for a thin colored layer where the powder was in contact with the capsule. The capsules stored in a tightly stoppered jar had undergone no changes after three weeks. Similar results were obtained when 40 grs. of lactose were added for 24 capsules. The results show that lactose did not prevent liquefaction of the capsules when placed in an open container, whereas, in a tightly stoppered container, lactose was not necessary since the capsules had undergone no change.

The prescription was also filled using various amounts of inert powders. In all cases of compounding, the sodium bromide and sodium nitrite were first triturated together to obtain a fine powder. The inert powder and salol were then added in the order named. The temperature during the time of compounding was between 72° and 73° F. When using from 1 to 5 grs. of each absorbent per individual dose, the size of the capsule ranged from No. 2 to No. 00.

The results on capsules stored in open containers were as follows:

Light Magnesium Oxide and Magnesium Carbonate.—When using as much as 5 grs. of the absorbents per individual dose, the capsules developed a rusty-red color and became soggy and sticky after standing two weeks; the contents were dry.

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† This paper is based on part of a thesis presented to the Graduate Council of the University of Florida by Charles H. Becker, in partial fulfilment of the requirements for the degree of Master of Science in Pharmacy.

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Lactose.—When using as much as 5 grs. of the absorbent per capsule, liquefaction occurred. All capsules developed a rusty-red color and became soft and sticky after standing several days.

Talc and Heavy Magnesium Oxide.—When using 1 gr. of the absorbents per individual dose, the capsules developed a rusty-red color and became soggy and sticky after standing two weeks; the contents were damp. The use of 2, 3, 4 and 5 grs. of the absorbents per individual dose gave similar results as to the condition of the capsule, but the contents were dry.

Starches Dried at 100° C., Corn Starch, Wheat Starch and Potato Starch.—When using 1 gr. of the absorbents per individual dose, the contents liquefied. The capsules developed a rusty-red color and became soggy and sticky. Using 2, 3, 4 and 5 grs. of the absorbents per individual dose, similar results were observed but the contents were damp.

The results on capsules stored in open containers indicate that none of the inert powders used prevented discoloration and disintegration of the capsules. When stored in closed vials, all capsules containing from one to five grs. of the inert powders remained stable over a period of two weeks. The results indicate that in this prescription it is important to dispense the capsules in tightly closed vials and when this is done it is unnecessary to add an inert powder.

Prescription No. 2

℞ Sodium Nitrite
Sodium Iodide aa gr. iiss
Misce et fiat capsules no. xx.
Sig.: One t. i. d. 1st week then b. i. d. as directed.

This prescription (2), (3), (4) contains two deliquescent drugs. Sodium iodide alone in capsules turned dark, absorbed water and dissolved the capsules within several days. Capsules of sodium iodide in closed containers remained stable over a period of two weeks. Sodium nitrite alone in capsules gave no sign of deterioration after standing two weeks. On compounding the prescription as written and putting individual doses in No. 3 capsules, the contents turned yellow and liquefied after standing two days. Capsules placed in closed containers developed a light yellow color after standing two weeks; the contents, however, were dry.

The prescription as written was also filled using various amounts of inert powders. In all cases of compounding, the sodium iodide was triturated first with the absorbent and then the sodium nitrite was added. The temperature during compounding was between 72° and 73° F. When using from 1 to 5 grs. of each absorbent per individual dose, the size of the capsule ranged from No. 3 to No. 00.

The results on capsules stored in open containers were as follows:

Light and Heavy Magnesium Oxide.—Capsules containing from 1 to 5 grs. of the absorbents per individual dose turned yellow after several days of standing. When using 1 gr. of the absorbents per capsule, the contents liquefied after standing a few days. When using 2 grs. of the absorbents per capsule, the contents developed into a damp mass, but liquefaction did not take place even after standing two weeks; the gelatin capsule itself swelled and became soft and sticky. The contents of the capsule containing 3, 4 and 5 grs. of the absorbents per individual dose remained dry over a period of two weeks, but the gelatin capsule itself became soft and sticky.

Magnesium Carbonate.—Capsules containing from 1 to 5 grs. of magnesium carbonate per individual dose turned yellow after several days of standing. Although the absorbent prevented liquefaction, even when using 1 gr. of the inert powder per capsule, the gelatin capsule itself swelled and became soft and sticky; the contents were dry over a period of two weeks.

Lactose.—As much as 5 grs. of lactose per capsule did not prevent liquefaction. All the capsules turned yellow and, likewise, became soft and sticky.

Talc.—Capsules containing from 1 to 5 grs. of talc per individual dose turned yellow after several days of standing. As much as 3 grs. of the absorbent per capsule did not prevent liquefaction. Five grains of the absorbent per capsule gave a damp mass when standing over a period of two weeks and the gelatin capsule itself swelled and became soft and sticky.

Air-Dried Starches and Starches Dried at 100° C., Corn Starch, Wheat Starch and Potato Starch.—Capsules containing from 1 to 5 grs. of the absorbents per individual dose turned blue after a few days. After standing two weeks, the contents of the capsules developed a rusty-red color. When 1 and 2 grs. of the absorbents per capsule were used, the contents liquefied after standing a few days. When using 3, 4 and 5 grs. of the absorbents per capsule, the contents became damp and the gelatin capsule itself swelled and became damp and sticky after standing two weeks.

The results on capsules stored in closed vials were as follows:

Magnesium Carbonate and Lactose.—Capsules containing up to 5 grs. of the absorbents per individual dose turned yellow after standing a few days. The contents were dry over a period of two weeks.

Talc, Light and Heavy Magnesium Oxides, Air-Dried Starches and Starches Dried at 100° C., Corn Starch, Wheat Starch and Potato Starch.—Capsules containing 1 gr. of the absorbents per individual dose remained stable over a period of two weeks.

None of the inert powders prevented discoloration and deterioration of capsules stored in open containers. However, the prescription can be filled satisfactorily by adding one gr. of starch or magnesium oxide per capsule and dispensing in a closed capsule vial.

Prescription No. 3

℞ Strych. Sulph. gr. 1/40
Ferr. et Ammon. Citrate gr. vii
Ft. caps. Tal. ds. xx.
Sig.: One capsule t. i. d. p. c.

On the above prescription as obtained from the file of a pharmacy, there appeared a notation to the effect that the dispenser had added five grs. of heavy magnesium oxide per capsule, presumably because iron and ammonium citrate is deliquescent in moist air.

Using iron and ammonium citrate from an old stock and filling the prescription as written, the chemicals in the mortar gummed up. It was also noticed that this sample had an ammoniacal odor. When using a fresh stock of iron and ammonium citrate and triturating it with the strychnine sulfate, a fine powder was obtained which was easily put in No. 2 capsules. After four days of standing, the ingredients of the capsules in the open container absorbed water and developed into a soft mass. Upon further standing, the mass shrunk, and after standing two weeks, the mass was dark brown in color, half of the original size and hard as cement.

The capsules in the closed container had undergone no changes after three weeks.

When filling the prescription with 5 grs. of heavy magnesium oxide per capsule, a No. 00 capsule had to be used. Although this made a bulky capsule there was no change in either type of container after standing three weeks. The prescription was also filled using 2 grs. of heavy magnesium oxide per capsule and using a No. 1 capsule. This made a capsule which was stable in both types of containers over a period of three weeks.

In conclusion, heavy magnesium oxide was found to be necessary in preventing the formation of a soft mass when the capsules were placed in an open container, although the inert powder was not necessary to stabilize the capsules when storing them in a closed container.

The prescription was also filled using various amounts of inert powders. In all cases of compounding, the iron and ammonium citrate and the strychnine sulfate were triturated first to obtain a fine powder and then the absorbent was added. The temperature during compounding was between 72° and 73° F. A No. 1 capsule was used for individual doses containing 1 gr. of magnesium carbonate, light and heavy magnesium oxides and talc. When using from 1 to 5 grs. of lactose and the various dried starches per individual dose, the size of the capsule was either No. 1 or No. 0.

For capsules stored in open containers, the results were as follows:

Magnesium Carbonate, Talc and Light and Heavy Magnesium Oxides.—When using 1 gr. of the absorbents per individual dose, the capsules remained stable over a period of two weeks.

Lactose and Starches Dried at 100° C., Corn Starch, Wheat Starch and Potato Starch.—All capsules containing from 1 to 5 grs. of the absorbents per individual dose developed into a mass of cement-like hardness after two weeks of standing. The contents shrunk considerably in all capsules.

When stored in closed vials, all capsules containing from 1 to 5 grs. of the inert powders remained stable over a period of two weeks.

Prescription No. 4

℞ Methenamine
Potassium Acetate
Prepare thirty capsules, containing two grs. of each component.

When filled as written, this prescription (5) yields a damp powder which liquefies in capsules within a few days. Due to removal of moisture from the gelatin capsules by the deliquescent potassium acetate, the capsules become brittle and crack within a few minutes after filling. The contents of capsules stored in closed vials were dry over a period of two weeks; however the capsules become brittle and cracked.

The prescription as written was filled using various amounts of inert powders. In all cases of compounding, the methenamine was first triturated to obtain a fine powder and then the absorbent and potassium acetate were added in the order named. The temperature during compounding was between 72° and 73° F. When using from 1 to 5 grs. of each absorbent per individual dose, the size of the capsule ranged from No. 1 to No. 00.

The results on capsules stored in open containers were as follows:

Magnesium Carbonate and Light Magnesium Oxide.—When using 1 and 2 grs. of the absorbents per individual dose, the capsules became brittle within a few minutes after compounding and cracked. After standing a few days, the contents liquefied, and the gelatin capsule itself became soggy and sticky. The contents of capsules containing 3, 4 and 5 grs. of the absorbents per individual dose remained dry over a period of two weeks, but the gelatin capsule itself became sticky.

Heavy Magnesium Oxide.—When using 1 and 2 grs. of the absorbent per individual dose, the capsules became brittle within a few minutes after compounding and cracked. After standing a few days the contents liquefied, and the gelatin capsule itself became soft and sticky. Using 3 grs. of the absorbent per capsule, similar results were observed, except that the contents were slightly damp after standing two weeks. The contents of capsules containing 4 and 5 grs. of the absorbent per individual dose remained dry over a period of two weeks, but the gelatin capsule itself became soft and sticky.

Lactose.—As much as 5 grs. of the absorbent per individual dose did not prevent liquefaction and the gelatin capsule itself became soft and sticky.

Talc, Air-Dried Starches and Starches Dried at 100° C., Corn Starch, Wheat Starch and Potato Starch.—When using from 1 to 4 grs. of the absorbents per individual dose, the capsules became brittle

within a few minutes after compounding and cracked. After standing a few days the contents resulted in a pasty mass, and the gelatin capsule itself became soggy and sticky. Five grains of the absorbents per capsule gave similar results, except that the contents were damp after standing two weeks.

When the capsules were kept in closed vials, the following results were obtained:

Lactose.—When using from 1 to 3 grs. of the absorbent per capsule, the contents became damp and developed into a mass of cement-like hardness after standing two weeks; the gelatin capsule itself became brittle and cracked. Capsules containing 4 and 5 grs. of the absorbent per individual dose remained stable over a period of two weeks.

Talc, Light and Heavy Magnesium Oxides, Magnesium Carbonate, Air-Dried Starches and Starches Dried at 100° C., Corn Starch, Wheat Starch and Potato Starch.—All capsules containing from 1 to 5 grs. of absorbent per capsule remained stable over a period of two weeks, with the exception that, when smaller amounts of the absorbents were used, some of the capsules were brittle and cracked.

To stabilize prescription No. 4 it is thus necessary to use an inert powder and to dispense the capsules in a tightly closed capsule vial.

Prescription No. 5

℞	Acetophenetidin	ʒ ss
	Fldext. Gelsemium	♏ iii
	Citrated Caffeine	gr. xii
	Sodium Bromide	ʒ ss

Mix. Make 12 capsules.

On compounding this prescription as written, the capsules in an open container remained stable for several days but on longer standing the contents became slightly damp and the capsule itself became soft and sticky. Capsules placed in a closed vial remained stable over a period of two weeks. Capsules of sodium bromide alone gave similar results.

The prescription was also filled using various amounts of inert powders. In all cases of compounding, the sodium bromide was triturated first to obtain a fine powder and then the absorbent, fluidextract of gelsemium, citrated caffeine and acetophenetidin were added in the order named. The temperature during compounding was between 70° and 71° F. When using 1 gr. of magnesium carbonate and light magnesium oxide per individual dose, a No. 1 capsule was used. When using from 1 to 5 grs. of talc, lactose, heavy magnesium oxide and the various dried starches per individual dose, the size of the capsule was either No. 1 or No. 0.

The results on capsules stored in open containers were as follows:

Light Magnesium Oxide and Magnesium Carbonate.—Capsules containing 1 gr. of the absorbents per individual dose were stable over a period of two weeks.

Lactose.—Although lactose prevented liquefaction even when using 1 gr. of the absorbent per individual dose, as much as 5 grs. per capsule did not prevent the contents from developing into a pasty mass after standing two weeks; also, the gelatin capsule itself became very soggy and sticky.

Talc, Heavy Magnesium Oxide and Starches Dried at 100° C., Corn Starch, Wheat Starch and Potato Starch.—When using 1 gr. of the absorbents per individual dose, the contents remained dry over a period of two weeks, but the gelatin capsule itself became soggy and sticky. Even when using 5 grs. of the absorbents per capsule, similar results were obtained.

All capsules remained stable over a period of two weeks when kept in a closed vial.

To stabilize prescription No. 5, it is necessary to add one gr. per capsule of magnesium carbonate or light magnesium oxide but such addition is unnecessary if the capsules are dispensed in a tightly closed vial.

Prescription No. 6

℞	Sodium Bromide	gr. xl
	Antipyrine	gr. xxvi
	Camphor	gr. iv
	Citrated Caffeine	gr. vi
	Tinct. Aconite	gtt. xii

Mix and make 12 capsules.

Sig.: One capsule every three or four hours.

This prescription contains two ingredients, antipyrine and citrated caffeine, which result in a sticky mass on standing a few hours and also contains a deliquescent chemical, sodium bromide. On compounding the prescription as written, a damp powder was obtained and individual doses were put in No. 1 capsules. After standing four days exposed to the air, the gelatin capsule itself became sticky and the contents, likewise, were of a pasty nature. Capsules placed in closed containers remained stable over a period of two weeks.

The prescription was filled using various amounts of inert powders. In compounding the prescription, the camphor and tincture of aconite were triturated until most of the alcohol was volatilized and then the inert powder was added. The antipyrine, sodium bromide and citrated caffeine were added, having first been triturated to a fine powder, and the final mixture was mixed lightly. The temperature at the time of compounding was between 78° and 80° F.

Table I shows that talc, lactose and the various dried starches were inefficient as inert powders. The interior of the capsules containing various amounts of these inert powders was of a pasty consistence after standing two weeks, and the gelatin capsule itself was rubber-like in texture and sticky. The contents of capsules containing 2 and 3 grs. of heavy magnesium oxide per capsule, developed into a mass of cement-like hardness and the gelatin capsule itself was sticky. The contents of capsules containing 1 and 2 grs. of light magnesium oxide and magnesium carbonate were dry, but the gelatin capsule itself became sticky after standing two weeks; when 3 grs. of these inert powders per cap-

Table I.—Prescription No. 6 with Inert Powders Capsules Stored in Open Containers

Abbreviations: L. = Liquid of Soft Mass; P. = Dry Powder; D. = Damp Powder; S. D. = Slightly Damp Powder; C. M. = Cement-Like Mass.

Inert Powder, Grs.	Size of Capsule	Time in Days: 0	1	2	4	14
Heavy Magnesium Oxide						
1	1	S. D.	S. D.	S. D.	L.	D.
2	1	P.	C. M.	C. M.	C. M.	C. M.
3	0	P.	P.	C. M.	C. M.	C. M.
Light Magnesium Oxide						
1	1	S. D.	S. D.	S. D.	L.	D.
2	0	P.	P.	P.	P.	P.
3	0	P.	P.	P.	P.	P.
Magnesium Carbonate						
1	1	S. D.	S. D.	S. D.	L.	L.
2	0	P.	P.	P.	P.	P.
3	0	P.	P.	P.	P.	P.
Talc						
1	1	S. D.	D.	D.	L.	L.
2	1	S. D.	D.	D.	L.	L.
3	0	S. D.	S. D.	S. D.	L.	L.
Lactose						
1	1	S. D.	D.	D.	L.	L.
2	1	S. D.	S. D.	D.	L.	L.
3	0	S. D.	S. D.	S. D.	L.	L.
Dried Corn Starch						
1	1	S. D.	D.	D.	L.	L.
2	1	S. D.	D.	D.	L.	L.
3	0	S. D.	S. D.	S. D.	L.	L.
Dried Wheat Starch						
1	1	S. D.	D.	D.	L.	L.
2	1	S. D.	S. D.	D.	L.	L.
3	0	S. D.	S. D.	S. D.	L.	L.
Dried Potato Starch						
1	1	S. D.	D.	D.	L.	L.
2	1	S. D.	D.	D.	L.	L.
3	0	S. D.	S. D.	S. D.	L.	L.

sule were used, the capsules remained in a stable condition over a period of two weeks.

Capsules stored in closed vials were still in good condition after two weeks.

A question arose as to whether traces of powder adhering to the outside of capsules had any effect in hastening liquefaction. To obtain data on this point prescription No. 6 was filled as written and a little of the powder was sprinkled on the outside of some of the capsules while others were cleaned thoroughly to remove any particles that might have adhered to them. In open containers, capsules having powder on the outside absorbed water and became sticky within a day; after two days the contents were damp and the capsules themselves were sticky and soft. Capsules having no adhering powder were stable for three days; after four days the contents were pasty and the capsule was sticky. These results indicate that, in case of capsules containing deliquescent substances, the presence of powder adhering on the outside of the capsule hastens deterioration.

DISCUSSION OF RESULTS

The present study was devoted to capsules containing deliquescent drugs. The cause of liquefaction in such cases is primarily the absorption of moisture by the deliquescent substance. If some of the ingredients are soluble in water, liquefaction is hastened. Some deliquescent drugs are capable of absorbing so much moisture from the gelatin capsule that the capsules become brittle and crack. Usually, however, the chief factor is the absorption of moisture from the air; the fact that an airtight container stabilized almost all of the capsules verifies this.

Capsules containing deliquescent drugs should be dispensed in glass capsule vials and, if this is done, it is usually unnecessary to add an inert powder. In most instances, none of the inert powders used were effective in stabilizing capsules placed in open containers. However, the addition of an inert powder sometimes makes the capsules more stable. As to the relative efficiency of the various powders, magnesium carbonate and light magnesium oxide were best, heavy magnesium oxide and talc ranked next, and lactose and the starches were poorest. Drying of the starches at 100° C. did not seem to be of any practical advantage.

It is of interest to note that magnesium carbonate and light magnesium oxide, which were the most efficient inert powders for capsules containing deliquescent drugs, were also the most efficient powders in capsules in which the contents liquefied due to formation of a eutectic mixture (1).

The use of glass capsule vials is imperative in dispensing capsules containing deliquescent substances but, if liquefaction is due to formation of a eutectic mixture, the type of container is of no importance as far as stability of the capsule is concerned (1).

SUMMARY

A study was made of the effects of the use of inert powders in capsules in which liquefaction occurs due to deliquescence of the ingredients. In some cases the addition of an inert powder increased the stability of the capsules to a certain extent; best results were obtained with magnesium carbonate and light magnesium oxide, next best results were secured with heavy magnesium oxide and talc, and poorest results were given by lactose and starch.

In most instances the use of inert powders did not stabilize capsules stored in open containers. However, in most cases it was found unnecessary to add any inert powder in prescriptions for capsules containing deliquescent drugs, provided that the capsules were dispensed in airtight glass containers. Hence it is imperative to use an airtight container, such as a screw-top glass capsule vial, in dispensing capsules containing deliquescent substances.

In case of capsules containing deliquescent substances, the presence of powder adhering on the outside of the capsule hastens deterioration.

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A Micro-Colorimetric Method for the Determination of Copper in Ampules of Iron, Arsenic and Copper

By Roland A. Bosee and Paul Fehder†*

INTRODUCTION

In the course of control analysis of ampule products containing organic combinations of iron, arsenic and copper, used in the treatment of hypochromic anemias, a reliable method for separating and estimating micro-quantities of copper was devised and corroborated. The original procedure worked out by a former associate[1] was based on a micro-colorimetric method (1) for determining traces of copper in blood and milk. This procedure was modified by a simple preliminary treatment to separate the copper-ion from the organic compounds of iron and arsenic. The copper was determined by the development of the cupric sulfocyanate-pyridine complex, soluble in chloroform and possessing a characteristic green color.

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EXPERIMENTAL

Procedure.—Measure an exact aliquot of the sample solution equivalent to approximately 0.40 or 0.45 mg. of copper, into a small beaker, add 0.5 cc. of concentrated hydrochloric acid and dilute with distilled water to a volume of about 25 cc. Saturate the solution with hydrogen sulfide at room temperature until the mixture turns milky and a deposit of copper sulfide and sulfur is formed. Filter through a small retentive filter paper (C. S. & S. No. 595). Wash the residue with several portions of hot distilled water. Reject the filtrate and washings which contain the iron and arsenic.

Dissolve the copper sulfide by pouring several portions of boiling 25% nitric acid into the filter. Collect the filtrate (containing cupric nitrate) in a 100-cc. beaker. Wash the filter several times with hot distilled water, collecting the washings in the beaker containing the filtrate. Evaporate the filtrate, at first on a hot plate to a small volume, and finally on a steam-bath. Keep the beaker covered with a ridged watch glass during the evaporation to avoid contamination with dust or cinders. To the residue of cupric nitrate, add 5 cc. of concentrated hydrochloric acid and again evaporate to dryness on a steam-bath.

Dissolve the cupric chloride residue in several drops of $N/1$ hydrochloric acid. A clear solution should be formed. Add 2 cc. of distilled water and transfer the mixture to a 25-cc. glass-stoppered volumetric flask. Rinse the beaker with four 2-cc. portions of distilled water and transfer the rinsings to the flask. The total volume of solution should not exceed 10 cc.

Prepare a copper standard solution by measuring exactly 5 cc. of a Standard Copper Solution, containing 0.1 mg. Cu in each 1 cc. of solution, into a second 25-cc. glass-stoppered volumetric flask. Add to this flask the same number of drops of $N/1$ hydrochloric acid as added to the cupric chloride residue. Dilute with distilled water to the same volume (not more than 10 cc.). The Standard Copper Solution is prepared by dissolving exactly 392.8 mg. of clear, *uneffloresced* crystals of reagent grade cupric sulfate, $CuSO_4.5H_2O$, in exactly 1000 ml. of distilled water.

Now add 2 drops of phenolphthalein T.S. to both flasks and titrate each with $N/1$ sodium hydroxide to a pink end-point. Following this, add to each flask, in succession, exactly 10 cc. of chloroform, 1 cc. of glacial acetic acid, 1 cc. of 10% potassium sulfocyanate solution and 15 drops of pyridine, medicinal grade. Dilute both flasks to the mark with distilled water, stopper and agitate thoroughly. When the chloroform fractions containing the dissolved copper