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CHEMICAL SOLUTIONS

Reagents Useful to the Chemist, Biologist, and Bacteriologist

By

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PREFACE

Every practicing chemist and teacher of chemistry is constantly required to prepare special solutions and reagents of all kinds as a fundamental part of his work. These solutions, which include indicators, standard acids and bases, solutions of salts, special test reagents, stains, fixatives, culture media, etc., are among the basic materials which are essential to all laboratory work. The directions for preparing these solutions are not always conveniently available, and are usually found only in a reasonably complete chemical library. Since most laboratories do not have adequate library facilities, a book of formulas for the more commonly used solutions is an extremely useful addition to the laboratory shelf.

The purpose of this book is simply to collect in one place for convenient reference the methods for preparing those solutions most frequently required by the chemist. In order to increase its usefulness, however, much additional information has been included for each of the solutions to supplement the preparative methods. This includes (a) the uses of each solution; (b) the procedure for use of each in all cases where this is practicable; (c) a list of those substances which interfere in making special tests; (d) the sensitiveness of test reagents; and (e) general remarks regarding the keeping qualities, methods of storage, etc., of the various reagents. In addition to this practical information, one or more references has been included for each solution in all cases where a useful citation is available. The purpose of this list is intended to be purely utilitarian rather than historically complete, and so in many cases no reference to the original publication is included. Rather, an effort has been made to refer where possible only to standard and easily available books and periodicals, preferably in the English language. The subject matter has been selected from the literature covering all phases of chemical laboratory work, and is designed to serve chemists engaged in all branches of their profession.

The solutions are listed in alphabetical order under the name by which they are best known. When a reagent is known by more than one name, the various names are included in their proper place in the alphabetical tabulation with proper cross-reference. An index of the reagents, which are classified according to their uses, is provided to assist the chemist in locating solutions whose functions are known, but which are not listed by the name known to him. This index is also of value in suggesting reagents for various tests with which the chemist is not familiar, or for which known reagents are not suitable. Solutions of acids, bases, and salts are not included in the index since, for the most part, they are general solutions of wide application, and are not intended for any special purpose.

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FRANK WELCHER

Indiana University
August, 1941

FOREWORD

Only those solutions commonly used in routine experimental work in laboratories devoted to organic chemistry, bio-chemistry, metallurgy and metallography, food chemistry, bacteriology, gas and fuel analysis, college and high school instruction in chemistry, general testing, water analysis, etc., are included in this book. No claim is made for the completeness of this work; special solutions, used only in certain rare experiments, and which may be prepared in various ways and used with essentially the same results, do not appear. Trade formulas, such as those used in photography, cosmetic preparations, metal plating baths, polishes, cleaning agents, etc., are left to technical works devoted to these special fields.

Solutions of acids, bases, and salts are prepared in so many different concentrations and expressed in so many different units that it is impossible to anticipate the individual needs of the chemist. The plan adopted here is to include the directions for preparing solutions of salts expressed in three different units of concentration: (a) molarity; (b) normality; and (c) as mg. of anion or cation per ml. of solution. Other methods of expressing concentration are too obvious or too little used to require special directions. Only one solution of a definite molarity and one of definite normality is included, since it is a comparatively simple matter to calculate the quantities of materials required for solutions of concentrations other than those given in this book.

Since it is assumed that this book will be used only by chemists, teachers, or students who have had previous laboratory training, the detailed directions for carrying out such operations as filtration, crystallization, refluxing, digestion, preparation of saturated solutions, neutralization, etc., are not given.

CHEMICAL SOLUTIONS

ABRAHAMSON'S TUNGSTIC ACID REAGENT

Use: Reagent for precipitating proteins from blood.

Preparation: Dissolve 11.11 grams of sodium tungstate dihydrate and 5 grams of sodium citrate in about 700 ml. of water. Dissolve 13.6 grams of fused sodium hydrogen sulfate in about 200 ml. of water and mix with the tungstate-citrate solution. Dilute to 1 liter with water and allow to stand for 1 week and filter.

Procedure for Use: Add 9 volumes of this reagent to 1 volume of blood to precipitate proteins. This reagent is quite stable.

Ref. Am. J. Clin. Path., Tech. Suppl. **4**, 75-77 (1940) C. A. **34**, 6665 (1940)

ACETALDEHYDE SOLUTION (STANDARD) (VASEY)

Use: For the determination of aldehydes in distilled liquors.

Preparation: Grind 3-4 grams of aldehyde ammonia in a mortar with anhydrous ether and decant the ether. Repeat this operation several times, and then dry the purified product, first in a current of air, and then in vacuo over concentrated sulfuric acid. Dissolve 1.386 grams of the pure aldehyde ammonia in 50 ml. of 95 per cent alcohol, and add 22.7 ml. of *N* alcoholic sulfuric acid. Then make up to 100 ml. and add 0.8 ml. of alcohol for the volume of ammonium sulfate which is precipitated. Allow to stand over night and filter.

Remarks: This solution contains 1 gram of acetaldehyde in 100 ml. of solution. Solution retains its strength.

Ref. Jacobs, pp. 382-383

ACETIC ACID SOLUTIONS

Reagent: Glacial acetic acid, mol. wt. = 60.03.

Preparation:

6.0 Normal:	Dilute 350 ml. of glacial acetic acid with 650 ml. of distilled water.
1.0 Molar:	Dissolve 58 ml. of glacial acetic acid in enough distilled water to make 1 liter of solution.

ACETIC THIONIN (FROST)

Use: Staining solution.

Preparation: Dissolve 1 gram of thionin in 1200 ml. of hot distilled water and filter, and to the filtrate add 60 ml. of glacial acetic acid.

Ref. Biol. Stains, Conn p. 75

ACETOACETIC ACID

See: Diacetic acid solution.

ACETO-CARMINE (SCHNEIDER)

Use: Staining solution.

Preparation: Boil an excess of powdered carmine in 45 per cent acetic acid and filter.

Ref. Biol. Stains, Conn p. 179

ACETYLACETONE REAGENT

Use: Reagent for the determination of iron.

Preparation: Dissolve 0.5 g. of freshly distilled acetylacetone in 100 g. of water or alcohol.

Remarks: This reagent gives an orange-red color with ferric iron, and can be used whenever the thiocyanate reagent can. The test is made in a slightly acid solution. The oxides of nitrogen interfere. Reagent must be freshly prepared.

Sensitiveness: 0.003 mg. iron.

Ref. J. Am. Chem. Soc. **26**, 967 (1904); Snell I, p. 303; Yoe I, pp. 245-248

ACID-FERRIC CHLORIDE SOLUTION (CURRAN)

Use: Reagent to show the structure of stainless steel.

Preparation: Dissolve 10 g. of ferric chloride and 30 ml. of hydrochloric acid in enough water to make 120 ml. of solution.

Remarks: This solution is ordinarily used diluted with an equal amount of water.

Ref. Williams and Homerberg, p. 317

ACID FUCHSIN SOLUTION

Use: Staining solution.

Preparation: Dissolve 0.5-1.0 g. of acid fuchsin (70% dye content) in 100 ml. of water.

This solution is sometimes used after adding 0.1 ml. of dilute hydrochloric acid to each 100 ml. Used in Van Gieson's connective tissue stain.

Ref. Krajian, p. 79

ACID HEMATOXYLIN

See: Ehrlich's acid hematoxylin.

ACRIDINE YELLOW 5G REAGENT

See: Titan yellow reagent.

ADAMS-HALL-BAILEY REAGENT

Use: Test reagent for sodium and potassium.

Preparation: Prepare a saturated solution of both cobalt and zinc acetate, and into this pass a stream of nitrogen oxide gas prepared by the action of nitric acid on copper.

Procedure for Test: Mix 50 ml. of this solution with an equal volume of the solution to be tested and allow to stand for 15 minutes. A yellow precipitate forms if potassium is present.

To test for sodium, filter, and to the filtrate add a little uranyl acetate solution. A greenish-yellow precipitate forms if sodium is present.

Ref. Ind. Eng. Chem., Anal. Ed. 7, 310 (1935)

AGULHON'S REAGENT

Use: Test reagent for reducing substances.

Preparation: Dissolve 0.5 g. of potassium dichromate in 100 ml. of nitric acid (sp. gr. 1.33).

Remarks: Reagent gives a blue-violet color (changes to green when heated) with easily oxidized substances: *e.g.*, alcohols, aldehydes, glycerol, carbohydrates, etc.

Ref. C. A. **6**, 204 (1912); Snell I, pp. 23-24

ALBERT'S DIPHTHERIA STAIN

Use: Staining solution.

Preparation:

Staining Solution: Mix the following:

Toluidine blue (commission certified)	0.15 g.
Methyl green (55% dye content)	0.20 g.
Glacial acetic acid	1.00 ml.
Alcohol, 95%	2.00 ml.
Distilled water	100.00 ml.

Allow mixture to stand 24 hours and then filter.

Iodine Solution: Mix the following:

Iodine	2 g.
Potassium iodide	3 g.
Distilled water	300 ml.

Remarks: Stain the dried, heat-fixed film for 5 minutes. Drain, and without washing, apply the iodine solution for 1 minute. Wash lightly and dry.

Ref. Kolmer and Boerner, pp. 397-398; Biol. Stains, Conn p. 87

ALCOHOL-ACETIC ACID

See: Carnoy's fluid 3:1.

ALCOHOL AND ACID SOLUTION IN ACETIC ANHYDRIDE (KOURBATOFF)

Use: Etching reagent to show structure of hardened steel.

Preparation: Mix the following:

Methyl alcohol	1 part
Ethyl alcohol	1 part
Amyl alcohol	1 part

To this mixture add 1 part of 4 per cent nitric acid in acetic anhydride just before use.

Remarks: Colors troostite and troosto-sorbite.

Ref. Williams and Homerberg, p. 315

ALIZARIN REAGENT (ALUMINUM)

Use: Test reagent for aluminum.

Preparation: Dissolve 0.01 g. of alizarin in 100 ml. of 95 per cent alcohol.

Procedure for Test: Add a drop of the reagent to a small particle of precipitated aluminum hydroxide. The dye is adsorbed by the hydroxide to form a turkey-red lake. Ferric hydroxide gives a violet lake and chromic hydroxide a maroon lake.

Ref. C. A. 15, 2598 (1921)

ALIZARIN SOLUTION (MORRES)

Use: Reagent to determine the keeping qualities of milk.

Preparation: This reagent is a 1 per cent solution of alizarin paste in alcohol.

Remarks: Reagent is used for alizarol test.

ALIZARIN INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of alizarin in 100 ml. of alcohol.

Remarks: pH: yellow 5.5-6.8 red.

ALIZARIN S REAGENT

Use: Reagent for the detection and determination of aluminum.

Preparation: Dissolve 0.5 g. of alizarin S (Sodium Alizarin-sulfonate) in 100 ml. of water.

Procedure for Test: Impregnate filter paper with the reagent, and then add 1 drop of the solution to be tested. Hold the paper in ammonia fumes. If aluminum is present, a bright red lake is formed.

The reagent may be added to a slightly acid solution to be tested. This solution should contain not more than 0.05 mg. of aluminum. Allow to stand and add a little more acetic acid. Manganese, chromium, cobalt, and iron interfere.

Ref. Engelder, p. 149; C. A. 9, 3186 (1915), 24, 1818 (1930)

ALIZARIN S SOLUTION

Use: Test reagent for aluminum.

Preparation: Dissolve 0.1 g. of alizarin S in 100 ml. of water and filter.

Procedure for Test: Add 1 ml. of the reagent to 5 ml. of the neutral or acid solution of the material to be tested, and then add ammonium hydroxide solution until a purple color appears. Boil, and allow to cool. If aluminum is present, a red color or precipitate remains when the mixture is acidified with acetic acid. Iron, chromium, cobalt, and manganese must be absent.

Ref. J. Soc. Chem. Ind. **34**, 936 (1915), **50**, 745 (1928)

ALIZARIN S SOLUTION

Use: Stain for cell nuclei and cytoplasm.

Preparation: This is a 1.0 per cent solution of Alizarin S in physiological salt solution.

ALIZARIN S INDICATOR SOLUTION

See: Sodium Alizarinsulfonate indicator solution.

ALIZARIN YELLOW GG INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of alizarin yellow GG or salicyl yellow (sodium m-nitrobenzeneazosalicylate) in 100 ml. of 50 per cent alcohol.

Remarks: pH : yellow 10.0-12.0 lilac.

ALIZARIN YELLOW R INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g of alizarin yellow R (sodium p-nitrobenzeneazosalicylate) in 100 ml. of warm water.

Remarks: pH: red 1.9-3.3 yellow.

ALKALINE CRYSTAL (GENTIAN) VIOLET

Use: Staining solution.

Preparation:

Solution A: Dissolve 1 g. of crystal violet in 100 ml. of distilled water.

Solution B: Dissolve 1 g. of sodium bicarbonate in 20 ml. of distilled water.

Immediately before use, mix 1.5 ml. of *solution A* with 0.4 ml. of *solution B*.

ALKALINE METHYLENE BLUE

See: Loeffler's methylene blue solution.

ALKALINE PYROGALLOL SOLUTION

See: Potassium Pyrogallate Solution.

ALKANNIN PAPER

Use: Indicator.

Preparation: Impregnate white paper with a 1.0 per cent alcoholic solution of alkanet root and allow to dry.

Remarks: Colors: Acids: reds.
Bases: green or blue.

ALLOXAN REAGENT

Use: Test reagent for magnesium, cadmium, ferrous iron, zinc, and other metals.

Preparation: Mix 2 g. of uric acid with 2 ml. of nitric acid (sp. gr. 1.40) and allow the mixture to stand until the reaction has ceased. Then add 2 ml. of water and heat until the mixture is clear. Finally, dilute with water to 100 ml.

Remarks: This reagent gives color reactions with the above-mentioned metals. See reference.

Ref. J. Pharm. Chim. 1901, II, 530

Additional Use: Colorimetric determination of glycine. Snell II, pp. 261-262.

ALLOXANTIN REAGENT

Use: Reagent for ferric salts.

Preparation: Dissolve 1 g. of alloxantin in 100 ml. of *N* sodium hydroxide solution. Destroy any color in the reagent by boiling, and cool rapidly.

Remarks: This reagent gives a blue color with solutions of ferric salts. This reaction may be used for the colorimetric determination of ferric iron.

Ref. C. A. 19, 1674 (1925); Snell I, p. 310

ALLYL IODOUROTROPINE SOLUTION

See: Hexamethylenetetramine allyliodide solution.

ALLYLTHIOUREA SOLUTION

Use: Test reagent for cadmium.

Preparation: Dissolve 5 g. of allylthiourea in 100 ml. of distilled water.

Procedure for test: Place a drop of solution to be tested on a glass slide or spot plate and add 1 drop of the reagent and 1 drop of 30 per cent sodium hydroxide. Warm gently. If cadmium is present a yellow precipitate forms. A blank must be run, since the reagent itself may give a yellow precipitate. Copper does not interfere.

Ref. C. A. 23, 4644 (1929); Engelder, p. 128

ALMÉN'S SOLUTION (ALBUMIN)

Use: Test reagent for albumin in urine.

Preparation: Dissolve 5 g. of tannic acid in 10 ml. of 25 per cent acetic acid and 240 ml. of 50 per cent ethyl alcohol.

Remarks: Urine containing albumin produces a turbidity or precipitate with this reagent. Reagent is also used for nucleoproteins.

Ref. Zeitschr. anal. Chem. **30**, 108 (1891); Hawk and Bergeim, p. 758

ALMÉN'S SOLUTION (GLUCOSE)

Use: Test reagent for glucose in urine.

Preparation: Dissolve 10 g. of Rochelle salt and 5 g. of bismuth subnitrate in 250 ml. of a 35 per cent solution of potassium hydroxide.

Remarks: A black precipitate forms when this solution is boiled with urine which contains glucose.

Sensitiveness: 1 : 10,000.

Ref. Zeitschr. anal. Chem. **9**, 494 (1870)

ALMÉN-SCHOENBEIN'S SOLUTION

Use: Reagent for blood.

Preparation: Mix 50 ml. of fresh tincture of guaiac with 50 ml. of oil of turpentine that has been ozonized by long exposure to air. Solution should be shaken vigorously before use.

Procedure for Test: When liquid to be tested is poured carefully onto the solution so as to form separate layers, a blue ring forms at the zone of contact if blood is present.

ALOY'S REAGENT

Use: Test reagent for alkaloids.

Preparation: Dissolve a little uranium nitrate or acetate in water.

Remarks: This solution precipitates many alkaloids. Morphine reduces the uranium compound, thus producing a beautiful red color.

Ref. Bull. soc. chim. **29**, 610 (1903)

ALOY-LAPRADE'S REAGENT

Use: Test reagent for phenols.

Preparation: Dissolve 10 g. of uranium nitrate or acetate in 60 ml. of water, and then add a dilute solution of ammonium hydroxide until a slight precipitate persists. Filter, and dilute the filtrate to 100 ml. with water.

Procedure for Test: Neutralize the liquid to be tested, and then add the reagent drop by drop. A red color appears if phenols are present.

Sensitiveness: 1 : 1000-1 : 10,000.

Ref. Bull. soc. chim. **33**, 860 (1905)

ALOY-VALDIGUIE'S REAGENT (ALKALOIDS)

Use: Test reagent for codeine, morphine, and ethyl morphine.

Preparation: Add 1 ml. of 0.1 per cent formaldehyde solution to 100 ml. of 1.0 per cent uranium acetate solution.

Procedure for test: Add 3 or 4 drops of the reagent to 2 ml. of concentrated sulfuric acid, and then add a little codeine or its salt. A blue color is a positive test. Ethyl morphine also gives test. A violet color appears with morphine.

Sensitiveness: 0.03 mg. codeine.

Ref. C. A. 21, 2358 (1921)

ALOY-VALDIGUIE'S REAGENT (STRYCHNINE)

Use: Test reagent for strychnine.

Preparation: Dissolve 1 g. of uranic oxide or 2 g. of ammonium uranate in 100 g. of concentrated sulfuric acid.

Procedure for Test: Dissolve a few mg. of the alkaloid in a little of the reagent. On exposure to strong light, the solution first turns a violet color and finally a cherry red.

Sensitiveness: 0.01 mg.

Ref. C. A. 20, 2952 (1926)

ALTMANN'S ACID FUCHSIN SOLUTION

Use: Staining solution.

Preparation: Saturate 100 ml. of water with aniline, and dissolve in this solution 20 g. of acid fuchsin.

ALTMAN'S FLUID

Use: Fixative.

Preparation: Mix the following:

Potassium dichromate, 5% aq. soln.	1 part
Osmic acid, 2% aq. soln.	1 part

ALUMINON SOLUTION

Use: Reagent for the detection and colorimetric estimation of aluminum.

Preparation: Dissolve 1 g. of aluminon (ammonium salt of aurintricarboxylic acid) in 1 liter of distilled water and shake well.

Remarks: This reagent causes the formation of a red lake with solutions of aluminum salts. For best results, the pH of the solution to be tested should be between 4.5 and 5.5, buffered with ammonium acetate, and maintained at an elevated temperature. Then add ammonium hydroxide and ammonium carbonate to raise the pH to 7.1-7.3. Many metals give a similar color reaction, but iron is the only one likely to interfere if conditions are properly controlled.

Ref. A.O.A.C., p. 188; Snell I, pp. 260-266; Yoe I, pp. 109-119; J. Am. Chem. Soc. 47, 142 (1925)

ALUMINUM CHLORIDE SOLUTIONS

Reagent:

$AlCl_3$, mol. wt. = 133.34, or
$AlCl_3 \cdot 6H_2O$, mol. wt. 241.44.

Preparation:

0.5 Molar: Dissolve 66.7 g. of $AlCl_3$ or 120.7 g. of $AlCl_3 \cdot 6H_2O$ in water and dilute to 1 liter.

1.0 Normal: Dissolve 44.4 g. of $AlCl_3$ or 80.5 g. of $AlCl_3 \cdot 6H_2O$ in water and dilute to 1 liter.

10 mg. of aluminum ion per ml. of solution: Dissolve 48.8 grams of $AlCl_3$ or 89 g. of $AlCl_3 \cdot 6H_2O$ in water and dilute to 1 liter.

ALUMINUM ETHYLATE SOLUTION

See: Henle's reagent.

ALUMINUM NITRATE SOLUTIONS

Reagent: $Al(NO_3)_3 \cdot 9H_2O$, mol. wt. = 375.14.

Preparation:

0.5 Molar: Dissolve 187.6 g. of aluminum nitrate in water and dilute to 1 liter.

1.0 Normal: Dissolve 125 g. of aluminum nitrate in water and dilute to 1 liter.

10 mf. of aluminum ion per ml. of solution: Dissolve 139 g. of aluminum nitrate in water and dilute to 1 liter.

ALUMINUM SULFATE SOLUTIONS

Reagent: $Al_2(SO_4)_3 \cdot 18H_2O$, mol. wt. = 666.41.

Preparation:

0.3 Molar: Dissolve 200 g. of aluminum sulfate in water and dilute to 1 liter.

1.0 Normal: Dissolve 111 g. of aluminum sulfate in water and dilute to 1 liter.

10 mg. of aluminum ion per ml. of solution: Dissolve 123.5 g. of aluminum sulfate in water and dilute to 1 liter.

ALVAREZ'S REAGENT

Use: Test reagent for nickel, cobalt, and zinc.

Preparation: Cool 100 ml. of boiled water to 0° C., and then saturate with sulfur dioxide gas. Dissolve in this solution 10 grams of cobalt chloride, and add potassium cyanide until the precipitate which first forms just dissolves.

Remarks: Zinc salts cause an orange precipitate which is soluble in an excess of the reagent; nickel salts give a yellow precipitate which is soluble in an excess of the reagent; and cobalt salts produce a red precipitate soluble in an excess of the reagent.

Ref. C. A. **4**, 1438 (1910); Zeitschr. anal. Chem. **70**, 257 (1927)

ALVAREZ'S REAGENT (CHOLIC ACID)

Use: Test reagent for cholic acid.

Preparation: Dissolve 0.1 g. of diphenylamine and 0.1 g. of β-naphthol in 10 ml. of concentrated sulfuric acid.

Ref. Bull. soc. chim. **33**, 717 (1905)

ALVAREZ'S REAGENT (NITRITE AND NITRATE)

Use: Test reagent for nitrites and nitrates.

Preparation: Dissolve 1 g. of diphenylamine and 1 g. of resorcinol in 100 ml. of concentrated sulfuric acid.

Procedure for Test: Add 5-6 drops of the reagent to a crystal of nitrate or nitrite. A yellowish-green color with a blue margin develops if nitrate is used. The mixture dissolves in alcohol to form an orange-yellow solution. A dark blue color with a red margin appears if nitrite is used, and this mixture dissolves in alcohol to give a red-colored solution.

Ref. Chem. News **91**, 155 (1905)

AMANN'S REAGENT

Use: Test reagent for albumin.

Preparation: Dissolve 2 g. of mercuric chloride, 2 g. of sodium chloride, and 4 g. of succinic acid in a solution prepared by mixing 10 ml. of glacial acetic acid, 40 ml. of water, and 50 ml. of 90 per cent alcohol.

Ref. Pharm. Zentralhalle 1900, 557

p-AMINOACETOPHENONE SOLUTION

Use: Reagent for micro-test for palladium.

Preparation: Dissolve 1 g. of p-aminoacetophenone in 40 ml. of warm 0.6 *N* hydrochloric acid and allow to cool. Then dilute to 100 ml.

Procedure for Test: Mix 5 ml. of the solution to be tested with 5 ml. of the reagent. A yellow precipitate or turbidity appears if palladium is present. This is a specific test for palladium.

Sensitiveness: 0.005 mg. $PdCl_2$.

Ref. Mikrochemie **24**, 20 (1938)

α-AMINO-n-CAPROIC ACID REAGENT (LYLE-CURTMAN-MARSHALL)

Use: Test reagent for copper.

Preparation: Dissolve 0.67 g. of α-amino-n-caproic acid in 100 ml. of water.

Procedure for Test: Mix 1 ml. of the solution to be tested with 1 ml. of 40 per cent sodium acetate solution and add 1 ml. of the reagent. A blue-gray precipitate forms if copper is present.

Sensitiveness: 0.004 mg. of copper per ml.

Ref. J. Am. Chem. Soc. 37, 1471 (1915); C. A. 9. 1729 (1915)

p-AMINODIMETHYLANILINE REAGENT

Use: Test reagent for free halogens in water.

Preparation: Dissolve 5 g. of purified p-aminodimethylaniline in 100 ml. of absolute alcohol.

Procedure for Test: Add 2-3 drops of the reagent to 5 ml. of water, and add the solution to be tested slowly. Add just enough of the solution to produce a clear pink color.

Sensitiveness: Chlorine: 1:65,000.
Bromine: 1:1,300,000.
Iodine: 1:400,000.

Ref. Ind. Eng. Chem., Anal. Ed. 1931, 225

1-AMINO-2-NAPHTHOL-4-SULFONIC ACID REAGENT

Use: Reagent for colorimetric determination of phosphate and calcium in blood, water, etc.

Preparation: Prepare two solutions as follows:

Sodium Sulfite Solution: Dissolve 2 g. of sodium sulfite in 10 ml. of distilled water.

Sodium Bisulfite Solution: Dissolve 30 g. of sodium bisulfite ($Na_2S_2O_5$) in 200 ml. of distilled water.

Now grind 0.5 g. of 1-amino-2-naphthol-4-sulfonic acid in a mortar, and add 5 ml. of the sodium sulfite solution. Dissolve this mixture in 195 ml. of the bisulfite solution. The mixture may be heated to 50°-60° to hasten solution.

Remarks: Keep in tightly stoppered dark bottle. Prepare fresh every two weeks. Ammonium phosphomolybdate is reduced by this reagent to give a color suitable for colorimetric determination. Calcium is determined indirectly.

Ref. A.P.H.A., pp. 109-111; Yoe I, p. 348 (2); Snell I, pp. 455-456

p-AMINOPHENOL HYDROCHLORIDE SOLUTION

Use: Test reagent for copper and iron.

Preparation: Dissolve 3 g. of p-aminophenol hydrochloride in 120 ml. of alcohol.

Remarks: Reagent yields a blue-violet precipitate with solutions containing copper or iron salts. Other ions do not interfere.

Sensitiveness: Cu: 0.0002 mg.
Fe: 0.000069 mg.

Ref. Mikrochemie 17, 118 (1935)

AMINOPYRINE REAGENT

See: Pyramidone Reagent.

AMMONIA-FREE WATER

Use: For the determination of nitrogen with Nessler's reagent.

Preparation:

Method 1: Treat distilled water with bromine and allow to stand overnight. Redistill. The product is ammonia-free.

Method 2: Shake distilled water with Folin's ammonia permutit. This water is satisfactory for most purposes.

Ref. Sutton, p. 487; A.P.H.A., p. 128

AMMONIUM ACETATE SOLUTIONS

Reagent: $NH_4C_2H_3O_2$, mol. wt. = 77.08.

Preparation:

0.5 Molar: Dissolve 38.5 g. of ammonium acetate in water and dilute to 1 liter.

1.0 Normal: Dissolve 77 g. of ammonium acetate in water and dilute to 1 liter.

10 mg. of ammonium ion per ml. of solution: Dissolve 42.8 g. of ammonium acetate in water and dilute to 1 liter.

AMMONIUM CARBONATE SOLUTION

Reagent: Mixture of $(NH_4)_2CO_3 \cdot H_2O$ and $NH_4CO_2NH_2$.

Preparation:

1.0 Molar: Dissolve 96 g. of commercial ammonium carbonate in 500 ml. of 3 *N* ammonium hydroxide and dilute to 1 liter.

AMMONIUM CHLORIDE SOLUTIONS

Reagent: NH_4Cl, mol. wt. = 53.46.

Preparation:

3.0 Molar: Dissolve 160 g. of ammonium chloride in water and dilute to 1 liter.

0.5 Normal: Dissolve 26.7 g. of ammonium chloride in water and dilute to 1 liter.

10 mg. of ammonium ion per ml. of solution: Dissolve 29.8 g. of ammonium chloride in water and dilute to 1 liter.

AMMONIUM DITHIOCARBAMATE SOLUTION (PARRI)

Use: Test reagent for metals.

Preparation: Add 35 ml. of concentrated ammonium hydroxide to 10 ml. of carbon disulfide and warm slightly. Allow to stand, and decant the solution from the unchanged carbon disulfide.

Remarks: When a few drops of the reagent are added to solutions of metallic salts, the following colors or precipitates are formed:

Cobalt:	green	Uranium:	light yellow
Lead:	red	Iron:	red to reddish brown
Silver:	black	Tin:	orange-red
Zinc:	white	Nickel:	bright red
Aluminum:	white	Bismuth:	orange-yellow
Copper:	brown	Manganese:	yellow changing to brown

Ref. C. A. **18**, 3569 (1924)

AMMONIUM HYDROXIDE SOLUTIONS

Reagent: Concentrated ammonium hydroxide (sp. gr. 0.90 and 28-29% NH_3).

Preparation:

6.0 Molar: Dilute 400 ml. of concentrated ammonium hydroxide to 1 liter with distilled water.

6.0 Normal: Same as 6.0 Molar.

1.0 Molar: Dilute 67 ml. of concentrated ammonium hydroxide to 1 liter with distilled water.

1.0 Normal: Same as 1.0 Molar.

AMMONIUM HYDROXIDE AND HYDROGEN PEROXIDE SOLUTION

Use: An etching solution for copper and many of its alloys.

Preparation: Mix the following:

Ammonium hydroxide	5 parts
Water	5 parts
Hydrogen peroxide, 3%	2–5 parts

Ref. Metals Handbook, p. 1472

AMMONIUM MOLYBDATE SOLUTION

Use: Analytical reagent for the determination of phosphorus and arsenic

Preparation:

Method 1: (0.5 Molar solution). Mix thoroughly 72 g. of pure molybdenum trioxide (MoO_3) with 200 ml. of water, and add 60 ml. of concentrated ammonium hydroxide. When the oxide has completely dissolved, filter, and pour the filtrate very slowly and with rapid stirring into a mixture of 270 ml. of concentrated nitric acid and 400 ml. of water. Allow to stand for one day, filter, and dilute the filtrate to 1 liter.

Method 2: Prepare two solutions as follows:

Solution A: Dissolve 100 g. of ammonium molybdate in 400 ml. of water and add 80 ml. of 15 *M* ammonium hydroxide. Filter if a precipitate appears.

Solution B: Mix 400 ml. of concentrated nitric acid with 600 ml. of water.

When ready to use, mix the proper quantity of *Solution A* with twice its volume of *Solution B*. *Solution A* should be added to *Solution B* very slowly and with rapid stirring.

Ref. Kolthoff and Sandell, pp. 373-375; Treadwell and Hall, p. 384; Handbook of Chem. and Physics, 24th Ed., p. 1303

AMMONIUM MOLYBDATE REAGENT

Use: Catalyst for iodometric bromate titrations.

Preparation: Dissolve 3 g. of ammonium molybdate in 100 ml. of distilled water.

Remarks: The oxidation of iodides by bromates proceeds very slowly unless ammonium molybdate is added. A few drops of the 3 per cent solution is sufficient for a titration.

Ref. Kolthoff and Sandell, pp. 593-594

AMMONIUM MOLYBDATE REAGENT (ARSENIC AND TIN)

Use: Reagent used for the colorimetric determination of arsenic and tin.

Preparation: Dissolve 2.5 g. of ammonium molybdate in distilled water and dilute to 100 ml.

Remarks: Arsenic reacts with this reagent to form the arsenomolybdate which is reduced with stannous chloride, or other reducing agents, to molybdenum blue. Tin is also determined in this way.

Ref. Ind. Eng. Chem., Anal. Ed. 1, 136-139 (1929); Snell I, pp. 244-6

Additional Uses:

Determination of vanadium, J. Am. Chem. Soc. 23, 105 (1901)

AMMONIUM MOLYBDATE REAGENT (BALLONI)

Use: Test reagent for albumin in urine.

Preparation: Dissolve 5 g. of ammonium molybdate in 100 ml. of water and add 5 drops of glacial acetic acid.

Procedure for Test: Acidify 10 ml. of urine with 10 per cent acetic acid, and then very carefully pour onto the surface a little of the reagent. A ring forms at the junction of the two liquids if albumin is present.

Sensitiveness: 1 : 35,000.

Ref. C. A. **29**, 2989 (1935)

AMMONIUM MOLYBDATE REAGENT (DENIGÈS)

Use: Test reagent for phosphate and arsenate.

Preparation: Mix 50 ml. of 10 per cent ammonium molybdate with 50 ml. of concentrated sulfuric acid.

Procedure for Test: Add a few drops of the reagent to 5 ml. of the solution to be tested, and follow this with 1 or 2 drops of freshly prepared

stannous chloride solution. Both arsenates and phosphates produce a blue color; hence one ion interferes with the other.

Sensitiveness: Phosphate: 1 mg. per liter.
Arsenate: 2 mg. per liter.

Ref. C. A. **15**, 218 (1921)

AMMONIUM MOLYBDATE REAGENT (HAGER-GAWALOWSKI)

Use: Reagent for glucose.

Preparation: Dissolve a little ammonium molybdate in water. The solution must be neutral.

Procedure for Test: Heat reagent with the solution to be tested to 100° C. A blue color forms if glucose is present. This color also appears with acid solutions of dextrin.

Ref. Pharm. Prax. 1880, II, 855

AMMONIUM MOLYBDATE REAGENT (SILICA)

Use: Reagent for the colorimetric estimation of silica in water.

Preparation: Dissolve 30 g. of ammonium molybdate in 200 ml. of 1:1 hydrochloric acid and 400 ml. of water.

Remarks: Dissolved silica reacts with this reagent to form an intensely yellow-colored heteropoly acid. The color of this complex is similar to that of solutions of potassium chromate, and so potassium chromate solutions are used as permanent color standards for the colorimetric determination of silica.

Ref. Kolthoff and Sandell, pp. 638-639

AMMONIUM MOLYBDATE REAGENT (ZAGORSKIKH)

Use: Reagent for salicylic acid and salicylic acid derivatives.

Preparation: Dissolve 1 g. of ammonium molybdate in 100 ml. of sulfuric acid.

Remarks: Reagent gives color reactions as follows:

Acetylsalicylic Acid:	Blue changing to violet.
Salol:	Violet changing to green.
Salicylic Acid:	Violet changing to green.

Ref. C. A. **27**, 1593 (1933)

AMMONIUM NITRATE SOLUTIONS

Reagent: NH_4NO_3, ml. wt. = 80.05.

Preparation:

0.5 Molar: Dissolve 40 g. of ammonium nitrate in water and dilute to 1 liter.

1.0 Normal: Dissolve 80 g. of ammonium nitrate in water and dilute to 1 liter.

10 mg. of ammonium ion per ml. of solution: Dissolve 44.4 g. of ammonium nitrate in water and dilute to 1 liter.

AMMONIUM NITRATOCERATE REAGENT

Use: Reagent for rapid qualitative test for alcoholic hydroxyl group.

Preparation: Dissolve 400 g. of ammonium nitratocerate in 1 liter of 2 *N* nitric acid.

Procedure for Test: Mix 1 ml. of the reagent, 2 ml. of water, and 1 drop of the sample (or sample dissolved in dioxane if insoluble in water). A red color indicates the presence of an alcohol. Amines and aromatic phenols interfere. Reducing agents may also interfere.

Ref. Ind. Eng. Chem., Anal. Ed. 12, 201-3 (1940)

AMMONIUM OXALATE SOLUTIONS

Reagent: $(NH_4)_2C_2O_4 \cdot H_2O$, mol. wt. = 142.12.

Preparation:

0.1 Molar: Dissolve 14.2 g. of ammonium oxalate in water and dilute to 1 liter.

0.5 Normal: Dissolve 35.5 g. of ammonium oxalate in water and dilute to 1 liter.

10 mg. of oxalate ion per ml. of solution: Dissolve 16.2 g. of ammonium oxalate in water and dilute to 1 liter.

AMMONIUM OXALATE-CRYSTAL (GENTIAN) VIOLET SOLUTION

Use: Staining solution.

Preparation: Dissolve 2 g. of crystal violet (85% dye content) in 20 ml. of alcohol, and mix with a solution prepared by dissolving 0.8 g. of ammonium oxalate in 80 ml. of distilled water. Filter to obtain a clear solution.

This procedure is varied somewhat by adding alcohol to the dilute dye solution as desired, and then adding 20 ml. of this diluted dye solution to the solution of ammonium oxalate.

Ref. Biol. Stains, Conn., p. 127

AMMONIUM PERCHLORATE REAGENT (SALVADORI)

Use: Test reagent for cadmium.

Preparation: Dissolve 20 g. of ammonium perchlorate in 80 g. of concentrated ammonium hydroxide.

Remarks: This reagent precipitates cadmium salts from aqueous solutions.

Ref. Analyst 41, 147 (1916)

AMMONIUM PERSULFATE SOLUTION

Use: Reagent to show structure of stainless steel.

Preparation: Mix the following:

Hydrochloric acid, 50% aq. soln.	2 parts
Ammonium persulfate, 15% aq. soln.	2 parts
o-Nitrophenol, concentrated, alcoholic soln.	1 part

Ref. Williams & Homerberg, p. 317

AMMONIUM PHOSPHOMOLYBDATE REAGENT (FONTES-THIVOLLE)

Use: Reagent for molybdomanganimetric determination of iron.

Preparation: Add 40 g. of ammonium molybdate to 60 ml. of 33 per cent sodium hydroxide solution, and then boil until all ammonia is expelled. Cool, and add 200 ml. of water and 200 ml. of 50 per cent phosphoric acid. Again boil, this time for 15 minutes, and then dilute to 1 liter.

Ref. C. A. 17, 3003 (1923)

AMMONIUM STEARATE REAGENT

Use: Reagent for the determination of lithium.

Preparation: Prepare ammonium stearate as follows: Dissolve 20 g. of stearic acid in 1 liter of ether, and pass ammonia through this solution until no further precipitation takes place. Keep the volume of the solution constant by the occasional addition of ether. Pour the suspension into a tray, and allow the ether to evaporate.

Dissolve 2 g. of the ammonium stearate in 100 ml. of warm amyl alcohol. Avoid heating the amyl alcohol above 50° C., since ammonium stearate is partially decomposed. This solution keeps for only 1 day.

Remarks: Lithium stearate differs from the other alkali stearates in that it is relatively insoluble.

Ref. J. Am. Chem. Soc. **52**, 2754-2758 (1930); Snell I, p. 447

AMMONIUM SULFATE SOLUTIONS

Reagent: $(NH_4)_2SO_4$, mol. wt. = 132.14.

Preparation:

0.5 Molar: Dissolve 66.1 g. of ammonium sulfate in water and dilute to 1 liter.

1.0 Normal: Dissolve 66.1 g. of ammonium sulfate in water and dilute to 1 liter.

10 mg. of ammonium ion per ml. of solution: Dissolve 36.8 g. of ammonium sulfate in water and dilute to 1 liter.

AMMONIUM SULFIDE (COLORLESS)

Use: Reagent.

Preparation:

3.0 Molar: Cool 200 ml. of concentrated ammonium hydroxide and treat with hydrogen sulfide until the solution is saturated. Keep cold during the addition of the hydrogen sulfide. Then add 200 ml. of concentrated ammonium hydroxide and dilute to 1 liter.

6.0 Molar: Completely fill a liter bottle with 6 *N* ammonium hydroxide and surround with ice. Then pass washed hydrogen sulfide into this solution until it is saturated. This operation requires from 24 to 36 hours. Keep the ammonium hydroxide solution surrounded with ice until saturation is complete.

Remarks: Preserve in dark, glass-stoppered bottles which are completely filled with the solution.

Ref. Handbook of Chem. and Physics, p. 1303

AMMONIUM SULFIDE (YELLOW)

Use: Analytical reagent.

Preparation: Cool 150 ml. of concentrated ammonium hydroxide and saturate with hydrogen sulfide. Next add 250 ml. of concentrated ammonium hydroxide and 10 g. of powdered sulfur. Shake the mixture until the sulfur is dissolved and then dilute with water to 1 liter.

Ref. Handbook of Chem. and Physics, p. 1304

AMMONIUM THIOCYANATE SOLUTIONS

Reagent: NH_4SCN, mol. wt. = 76.12.

Preparation:

0.5 Molar: Dissolve 38 g. of ammonium thiocyanate in water and dilute to 1 liter.

1.0 Normal: Dissolve 76.1 g. of ammonium thiocyanate in water and dilute to 1 liter.

10 mg. of thiocyanate ion per ml. of solution: Dissolve 13.1 g. of ammonium thiocyanate in water and dilute to 1 liter.

AMMONIUM THIOCYANATE (VOLUMETRIC REAGENT)

Reagent: NH_4SCN, mol. wt. = 76.12.

Preparation:

0.1 Normal: Dissolve 7.612 g. of ammonium thiocyanate in water and dilute to exactly 1 liter. This solution must be standardized by titrating against a standard silver nitrate solution, using a ferric alum indicator.

Ref. Lange's Handbook of Chemistry, p. 962

AMMONIUM URANATE REAGENT

Use: Test reagent for alkaloids.

Preparation: Dissolve 1 g. of ammonium uranate in 20 ml. of concentrated sulfuric acid.

Remarks: Reagent gives color reactions as follows:

Imperatorine:	blue
Codeine:	blue
Morphine:	dirty green
Chelidonine:	green

Ref. Zeitschr. anal. Chem. 37, 62 (1898)

AMMONIUM VANADATE REAGENT (MANDELIN)

Use: Test reagent for alkaloids.

Preparation: Dissolve 0.5 g. of ammonium vanadate in 100 ml. of monohydrated sulfuric acid.

Remarks: Reagent yields green, red, or brown color reactions with alkaloids.

Ref. Kolmer and Boerner, p. 794

AMODEL'S REAGENT

Use: Test reagent for bismuth in urine.

Preparation: Dissolve 1 g. of quinine sulfate in 40 ml. of glycerol, and add a solution prepared by dissolving 2 g. of potassium iodide in 50 ml. of water.

Procedure for Test: Evaporate the urine to be examined to dryness, and then ignite the residue. Dissolve the residue in water acidified with nitric acid and add a little of the reagent. An orange precipitate forms if bismuth is present.

ANCHUSIN PAPER

See: Alkannin paper.

ANDRADE'S INDICATOR

Use: Indicator used in the preparation of culture media.

Preparation: To a 0.5 per cent aqueous solution of acid fuchsin, add 1.0 *N* sodium hydroxide until the color just changes from red to orange to yellow. Do not add the alkali too rapidly as the color change takes place rather slowly. Allow some time to elapse between the addition of successive portions of the sodium hydroxide solution. Approximately 16 ml. of this solution is required for each 100 ml. of the acid fuchsin solution.

Sterilize in an autoclave at 15 pounds pressure for 20 minutes.

Remarks: Use 1 ml. of the indicator for each 100 ml. of medium.

Ref. Stitt, p. 39

ANILINE ACETATE REAGENT (LAMPITT-HUGHES-TRACE)

Use: Test reagent for furfural in vinegar.

Preparation: Dissolve 6 ml. of redistilled aniline in 24 ml. of glacial acetic acid and add amyl alcohol until the total volume of the mixture is 60 ml.

Procedure for Test: Mix 10 ml. of the reagent with 20 ml. of vinegar. Shake well and allow to stand in the dark for 15 minutes. If furfural is present, the amyl alcohol layer is colored red.

Ref. Analyst **52**, 260 (1927)

ANILINE BLUE COLLAGEN STAIN (MALLORY)

See: Mallory's Triple Stain.

ANILINE BLUE W. S. STAINING SOLUTION

Use: Staining solution.

Preparation: Dissolve 0.2 to 1.0 g. of aniline blue in 100 ml. of water or 90 per cent alcohol.

Ref. Biol. Stains, Conn., pp. 135-136

ANILINE CRYSTAL (GENTIAN) VIOLET (EHRLICH)

Use: Staining solution.

Preparation: Shake 2 ml. of aniline with 98 ml. of distilled water and allow the mixture to stand for several minutes. Filter until clear. Mix the filtrate with a solution prepared by dissolving 1.2 g. of crystal violet (85% dye content) in 12 ml. of alcohol.

Ref. Biol. Stains, Conn., p. 126

ANILINE CRYSTAL (GENTIAN) VIOLET (STIRLING)

Use: Staining solution.

Preparation: Dissolve 2 ml. of aniline in 10 ml. of 95 per cent alcohol and add 5 g. of crystal violet (85% dye content). When solution is complete, add 88 ml. of distilled water. Mix well and allow to stand for at least 24 hours. Filter.

Ref. Conn., p. 430

ANILINE HYDROCHLORIDE REAGENT (LEVINE-SHAUGHNESSY)

Use: Reagent for furan and furan derivatives.

Preparation: Add 10 ml. of concentrated hydrochloric acid to 150 ml. of aniline.

Procedure for Test: Add a little of the material to be tested to 5 ml. of the reagent. Furan and its derivatives give characteristic color reactions.

Ref. Biochem. J., 27, 2047 (1933)

ANILINE-PHENOL MIXTURE

Use: Test reagent for nitrites.

Preparation: Add 1 ml. of aniline and 1 g. of phenol to 15 ml. of concentrated hydrochloric acid and add 150 ml. of water.

Remarks: Solution causes an intense yellow color when added to an alkaline solution of nitrite.

Ref. Chemist Analyst, J. T. Baker, January, 1933

ANILINE REAGENT (SHEAR)

Use: Reagent for vitamin D.

Preparation: Mix 3 ml. of concentrated hydrochloric acid with 45 ml. of aniline.

Procedure for Test: Mix 2 ml. of the reagent with 2 ml. of the oil to be tested. A red color develops if vitamin D is present.

Ref. Proc. Soc. Exptl. Biol. Med. **23**, 546 (1926)

ANILINE SULFATE REAGENT

Use: Test reagent for chlorates.

Preparation:

Method 1: Dissolve 67 g. of aniline sulfate in 1 liter of water.

Method 2: Mix 45 ml. of aniline with 85 ml. of 6 *N* sulfuric acid, and then add 1 liter of water and shake until solution is complete. Add more water if necessary.

Remarks: Reagent produces a blue color with chlorates in the presence of concentrated sulfuric acid.

Ref. Treadwell and Hall I, p. 425

ANILINE THIOCYANATE REAGENT (DWYER-MURPHY)

Use: Reagent for copper.

Preparation: Mix 20 ml. of 5 per cent ammonium thiocyanate solution with 18.6 g. of aniline, and add 5 *N* hydrochloric acid until the emulsion clears. Then add 3-4 drops more of aniline and dilute to 100 ml. with water. Finally, add alcohol drop by drop until the solution is clear. 1-3 drops of this reagent should dissolve in 5 ml. of water without cloudiness.

Procedure for Test: Add 3-4 drops of the reagent to 5 ml. of unknown solution. A yellowish-brown precipitate or coloration appears if copper is present. Silver, lead, mercury, bismuth, chromium, aluminum, cadmium, zinc, cobalt, nickel, and manganese interfere.

Sensitivity: 1 γ of copper.

Ref. C. A. **32**, 73 (1938)

ANISALDEHYDE REAGENT (MINOVICI)

Use: Reagent for picrotoxin.

Preparation: Dissolve 20 g. of anisaldehyde in 80 g. of absolute alcohol.

Procedure for Test: Add 2 drops of sulfuric acid to a little picrotoxin and allow to stand 1 minute. Next add 1 drop of the reagent and note the color changes. An indigo-blue color first appears and this gradually changes to blue. The test is made more sensitive by heating the mixture to 80° C., although at lower concentrations the color may be pale red.

Sensitiveness: 1 : 5000.

Ref. Zeitschr. Untersuch. Nahr.-u. Genussm. 1900, 687

ANTHONY'S STAIN

Use: Staining solution for capsules.

Preparation:

Solution I: Dissolve 1 g. of crystal violet (85% dye content) in 100 ml. of water.

Solution II: Dissolve 20 g. of cupric sulfate in 80 ml. of water.

Remarks: Dry the smear in air, and, without fixing, stain for 2 minutes with *Solution I*. Wash with *Solution II* and blot dry.

ANTIMONY PENTACHLORIDE IN CARBON TETRACHLORIDE (HILPERT-WOLF)

Use: Test reagent for aromatic hydrocarbons.

Preparation: Dissolve 10 ml. of antimony pentachloride in 20 ml. of carbon tetrachloride.

Procedure for Test: Dissolve about 0.1 g. of the hydrocarbon in 2 ml. of carbon tetrachloride and add the reagent drop by drop and note the appearance of the mixture. Color reactions are obtained as follows:

Benzene (pure)	yellow or yellowish-red
Benzene (commercial)	yellow or green
Naphthalene	lilac
Anthracene	green precipitate
Carbazole	pale green precipitate
Indene	dark red precipitate
Fluorene	green precipitate
Di- and triphenylmethane	green precipitate.

Ref. C. A. 7, 3332 (1913)

ANTIMONY TRICHLORIDE SOLUTIONS

Reagent: $SbCl_3$, mol. wt. = 228.13.

Preparation:

0.5 Molar: Dissolve 114 g. of antimony trichloride in sufficient 6 *N* hydrochloric acid to make 1 liter of solution.

1.0 Normal: Dissolve 76 g. of antimony trichloride in sufficient 6 *N* hydrochloric acid to make 1 liter of solution.

10 mg. of antimonous ion per ml. of solution: Mix 18.7 g. of antimony trichloride with about 900 ml. of water, and add enough concentrated hydrochloric acid to dissolve the white precipitate. Then make up to 1 liter. Add more concentrated hydrochloric acid if the precipitate forms on dilution.

Remarks: Antimony oxychloride precipitates when antimony chloride is added to water, but this is prevented by the addition of hydrochloric acid.

ANTIMONY TRICHLORIDE REAGENT

See: Sabetay's Reagent.

ANTIMONY TRICHLORIDE REAGENT (BROCKMANN AND CHEN)

Use: Reagent for vitamin D.

Preparation: Add dry chloroform to about 25 g. of antimony trichloride until a saturated solution is obtained.

Remarks: Vitamins D_2 and D_3 give an orange-yellow color with this reagent. Tachysterol reacts in a similar manner. This reaction has been made the basis for a method of determining vitamin D.

Ref. Jacobs, p. 459

ANTIMONY TRICHLORIDE REAGENT (CARR-PRICE)

Use: Reagent for the determination of vitamin A in foods.

Preparation: Wash antimony trichloride with a little chloroform and allow to dry. Weigh, and dissolve in enough chloroform to form a 30 per cent solution. The resulting solution is allowed to stand until clear, after which the supernatant liquid is decanted and used from a burette. The reagent is standardized with 0.1 *N* iodine solution. The reagent must contain between 21-23 g. of antimony trichloride per 100 ml. of solution.

Procedure for Use: Dissolve the oil in chloroform to make a 30 per cent solution, and to 0.2 ml. of this solution add exactly 2 ml. of the reagent. Shake the solution gently during the addition of the reagent. A brilliant blue color appears with vitamin A. This color is suitable for the colorimetric determination of vitamin A.

Ref. Biochem. J. 20, 497 (1926); Jacobs, p. 448; Snell, pp. 615-621

ANTIPYRINE SOLUTION (CURTMAN)

Use: Test reagent for nitrite.

Preparation: Dissolve 1 g. of antipyrine in 100 g. of 10 per cent acetic acid.

Procedure for Test: Add 5 ml. of the above reagent to 5 ml. of the solution to be tested. A green color appears if nitrite is present.

Sensitiveness: 1 : 20,000.

Ref. Yoe I, p. 311; Pharm. Zentralhalle, 1897, 4

ANTIPYRINE-POTASSIUM IODIDE REAGENT (CAILLE-VIEL)

Use: Test reagent for antimony and bismuth in biological liquids.

Preparation: Dissolve 2 g. of antipyrine and 4 g. of potassium iodide in 60 ml. of water.

Remarks: Reagent gives golden-yellow precipitate with solutions containing antimony. Blood and iron must be absent. Bismuth gives a brick-red precipitate.

Sensitiveness: 1 : 20,000 $SbCl_3$.

Ref. C. A. 17, 3518-3519 (1923)

APPELIUS-SCHMIDT REAGENT

Use: Test reagent for sulfite-cellulose in leather and tanning extracts.

Preparation: Mix 5 g. of cinchonine with 100 ml. of water, and then add concentrated sulfuric acid drop by drop until solution is complete. Finally, dilute with water to 1 liter.

Procedure for Test: Add 5 ml. of 25 per cent hydrochloric acid to 100 ml. of the tanning extract and heat to boiling. Allow to cool, and if a precipitate forms filter through kaolin on a filter paper. Add 20 ml. of the reagent to 50 ml. of the filtrate. If sulfite-cellulose is present a characteristic dark brown precipitate forms when the mixture is boiled vigorously.

Ref. C. A. **9**, 251 (1915)

AQUA REGIA

Use: Solvent for gold and platinum. Also an oxidizing agent.

Preparation:

When to be used immediately: Mix 1 volume of concentrated nitric acid with 3 volumes of concentrated hydrochloric acid.

When to be stored for some time: Mix 1 volume of concentrated nitric acid with 3 volumes of concentrated hydrochloric acid and 1 volume of water. The addition of the water reduces the quantity of chlorine and other objectionable gases which are evolved.

Ref. Handbook of Chem. and Physics, p. 1304

ARNOLD'S SOLUTION

Use: Test reagent for acetoacetic acid in urine.

Preparation:

Solution A: Dissolve 1 g. of p-aminoacetophenone and 2 ml. of concentrated hydrochloric acid in 100 ml. of water.

Solution B: Dissolve 1 g. of sodium nitrite in 100 ml. of water.

To use, mix 1 volume of *Solution b* with 2 volumes of *Solution a.*

Procedure for Test: Mix 5 ml. of the liquid to be tested with 5 ml. of the reagent and add ammonium hydroxide. A brown-red color or precipitate appears if acetoacetic acid is present; and, on adding an excess of concentrated hydrochloric acid, the color changes to a purplish-violet.

Ref. Zeitschr. anal. Chem. **40**, 565 (1901)

ARNOLD-MENTZEL'S OZONE REAGENT

See: Benzidine paper (Arnold-Mentzel).

ARNOLD-MENTZEL'S SOLUTION

Use: Test reagent for hydrogen peroxide.

Preparation: Dissolve 1 g. of vanadic acid in 100 g. of dilute sulfuric acid.

Remarks: Solution gives a red color with hydrogen peroxide.

Sensitiveness: 0.0006 per cent.

Ref. Leach, pp. 168-169

ARNY'S STANDARD COLORIMETRIC SOLUTIONS

Preparation:

Series I:

(a) Dissolve 59.497 g. of cobalt chloride ($CoCl_2 \cdot 6H_2O$) in enough 1 per cent hydrochloric acid to make 1 liter of solution.
(b) Dissolve 62.430 g. of cupric sulfate ($CuSO_4 \cdot 5H_2O$) in enough 1 per cent hydrochloric acid to make 1 liter of solution.
(c) Dissolve 45.054 g. of ferric chloride ($FeCl_3 \cdot 6H_2O$) in enough 1 per cent hydrochloric acid to make 1 liter of solution.

Series II:

(a) This is a 0.02 *N* solution of roseo-cobaltic chloride in 2.8 per cent ammonia.
(b) This is a 0.02 *N* solution of ammonium chromate in 2.8 per cent ammonia.
(c) This is a 0.02 *N* solution of cupric sulfate in 2.8 per cent ammonia.

Series III:

(a) This is a 0.001 *N* solution of potassium permanganate in water.
(b) This is a 0.01 *N* solution of potassium dichromate in water.

Remarks: These solutions are used for the preparation of artificial color standards for a number of different colorimetric procedures. These are illustrated by the following examples:

COBALT-IRON-COPPER SERIES (SERIES I)

	Parts by Volume of			
	Cobalt	*Iron*	*Copper*	*Water*
Standard caramel	4	7	1	0
Nitrogen (Nessler) 1:500,000	3	9	0	12
Nitrate (Phenoldisulfonic acid) 1:500,000	0	12	0	6

COBALT-CHROMATE-COPPER SERIES (SERIES II)

	Parts by Volume of			
	Cobalt	*Chromate*	*Copper*	*Water*
Phosphoric acid (molybdate method) 1:20,000	0	12	0	68
Vanillin (Folin) 1:100,000	3	3	10	0
Uric acid (Riegler) 1:40,000	2	2	8	0
Salicylic acid (ferric chloride method) 1:50,000	7	1	5	6

CHROMATE-PERMANGANATE SERIES (SERIES III)

	Parts by Volume of		
	Chromate	*Permanganate*	*Water*
Nitrite 1:10,000,000	15	1	13

Ref. Snell I, pp. 66-69; J. Am. Pharm. Assoc. 2, 76-80 (1913); J. Am. Pharm. Assoc. 4, 1294-1299 (1915); J. Am. Pharm. Assoc. 12, 839-849 (1923)

ARSENITE, ALKALINE, DECINORMAL (VOLUMETRIC REAGENT)

See: Sodium Arsenite (Volumetric Reagent).

ARSENOMOLYBDIC ACID REAGENT (STERKIN-HELFGAT)

Use: Test reagent for quinine.

Preparation: Mix the following:

Sodium arsenate, 0.12% aq. soln.	25 ml.
Ammonium molybdate, 2% aq. soln.	25 ml.
Hydrochloric acid, 2% aq. soln.	25 ml.

Procedure for Test: Add 1 ml. of reagent to 5 ml. of slightly acidified quinine solution. A permanent opalescence is a positive test.

Sensitiveness: 1 : 2,000,000.

Ref. C. A. **23**, 3050 (1929)

ARSENOPHOSPHOTUNGSTIC ACID REAGENT

Use: Reagent used for the colorimetric determination of cobalt.

Preparation: Dissolve 100 g. of sodium tungstate in 600 ml. of water contained in a Pyrex flask. Add 50 g. of pure arsenious oxide, 25 ml. of syrupy phosphoric acid, and 20 ml. of concentrated hydrochloric acid. Boil for 20 minutes, cool, and dilute to 1 liter.

Remarks: This solution keeps indefinitely.

This reagent yields a blue reduction product with cobalt in the presence of cyanide. Stannous, ferrous, mercurous, manganous, cupric and sulfide ions interfere. Manganese and chromium interfere with color readings. Nickel does not interfere.

Sensitiveness: 0.25 mg. cobalt.

Ref. J. Am. Chem. Soc. **52**, 464-465 (1930); Snell I, pp. 328-329

Additional Uses:

Determination of Glutathione, J. Biol. Chem. **51**, 187-207 (1922); **99**, 729-740 (1933).

Determination of Glucose, Snell II, pp. 462-463.

ARSENOPHOSPHOTUNGSTIC ACID REAGENT (URIC ACID)

See: Benedicts Reagent For Uric Acid.

ARSENOTUNGSTIC REAGENT (APOMORPHINE)

See: Palet's Reagent.

ARSENOTUNGSTIC REAGENT (BENEDICT)

Use: Used with Fishel's copper ketose reagent for the determination of ketose sugars by micro-modification of Fishel's method.

Preparation: Dissolve 10 g. of sodium tungstate in 60 ml. of water. Add 5 g. of pure arsenic pentoxide and 2.5 ml. of 85 per cent phosphoric

acid. Next add 2 ml. of hydrochloric acid and boil for 20 minutes. Add water as needed to make up for the loss due to evaporation. Cool and add the following:

Formalin	6.0 ml.
Hydrochloric acid	4.5 ml.
Sodium chloride	4.0 g.

Dissolve and then dilute to 100 ml.

Procedure for Determination: See reference.

Ref. J. Biol. Chem. **68**, 759 (1926); Jacobs, p. 258

ARSENOTUNGSTIC ACID REAGENT (MORRIS-MACLEOD)

Use: Reagent for uric acid.

Preparation: Mix 100 g. of hydrated sodium tungstate, 125 g. of arsenic pentoxide, and 650 ml. of water and boil for 3-4 hours. If the solution is blue or green in color, add bromine water and boil until a yellow or yellow-brown mixture is obtained. Boil off the excess bromine and dilute with distilled water to 1 liter.

Procedure for Test: Make solution to be tested alkaline with sodium carbonate, and precipitate with a 2.5 per cent solution of zinc chloride. Dissolve the precipitate in a little hydrochloric acid and add 10 per cent sodium cyanide solution and the test reagent. A blue color appears if uric acid is present.

Ref. J. Biol. Chem. **50**, 55 (1922)

Additional Use: A variation of this solution is used for the determination of tannic acid in grain. J. Agr. Res. **26**, 257-258 (1923).

ARSENOTUNGSTIC REAGENT (PHENOLS)

See: Guglialmelli's Reagent.

ARSENOTUNGSTIC ACID REAGENT (URIC ACID)

See: Benedict's Reagent for uric acid.

ARSENOTUNGSTOMOLYBDIC REAGENT (APOMORPHINE)

See: Palet's Reagent.

ARSENOTUNGSTOMOLYBDIC REAGENT (PHENOL)

See: Guglialmelli's Reagent.

ARTHAUD-BUTTE'S REAGENT

Use: Reagent for uric acid.

Preparation: Dissolve 1.484 g. of cupric sulfate, 20 g. of sodium thiosulfate, and 40 g. of Rochelle salt in 1 liter of water.

Remarks: One ml. of this solution precipitates 0.001 g. of uric acid.

Ref. Compt. rend. soc. Biol. 1889, 625

ASCITIC AGAR MEDIUM

Use: Culture medium.

Preparation: Place 100 ml. of sterile agar (pH: 7.4 – 7.8) in a vessel and heat until it is melted. Cool to 48°-50° C. Use a sterile pipette to add 20 ml. of sterile, bile-free ascitic fluid and mix well. Pour this mixture into plates or tubes and allow to stand until hard.

Ref. Kolmer and Boerner, p. 370

AUBRY'S REAGENT

Use: Test reagent for bismuth in urine.

Preparation: Dissolve 1 g. of quinine sulfate in 20 ml. of water acidified with 3 or 4 drops of sulfuric acid, and add a solution prepared by dissolving 2 g. of potassium iodide in 10 ml. of water. Finally, dilute the mixture with water to 100 ml.

Procedure for Test: Evaporate the urine to be examined to dryness and then ignite the residue. Dissolve the residue in water that has been acidified with nitric acid and add the test reagent. An orange precipitate forms if bismuth is present.

Sensitiveness: 1 : 600,000 Bi_2O_3.

Ref. Analyst 1922, 129; C. A. **16**, 2343 (1922)

AUCHE-DENIGÈS REAGENTS

Use: Test reagents for bile pigments in blood.

Preparation:

Solution A: Dissolve 1 g. of zinc sulfate in 10 ml. of water and add ammonium hydroxide solution drop by drop until the precipitate which forms just dissolves. Dilute to 50 ml. with a 1.5 per cent solution of potassium cyanide.

Solution B: Dissolve 1 g. of iodine and 2 g. of potassium iodide in 100 ml. of water.

Procedure for Test: Mix 5 ml. of alcohol and 5 or more drops of blood serum, and add 20 drops of *Solution A*, 20 drops of *Solution B*, and 20 drops of ammonium hydroxide. Filter. Filtrate shows a green fluorescence, and also characteristic absorption bands.

Ref. J. méd. Bordeaux 1920, 24

AURANTIA SOLUTION

Use: Test reagent for potassium.

Preparation: Add 1 g. of aurantia dye and 10 ml. of *N* sodium carbonate solution to 100 ml. of water, and boil until solution is complete.

Procedure for Test: Add 1 ml. of the reagent to 1 ml. of the solution to be tested. An orange-red precipitate forms if potassium is present. Ammonium ions interfere, but metals of the alkali and alkaline earth groups do not.

Sensitiveness: 0.003 mg. of potassium.

Ref. Mikrochemie **14**, 265 (1934); C. A. **28**, 2642 (1934)

AURIN SOLUTION

See: Rosolic acid Indicator Solution.

AURIN TRICARBOXYLIC ACID SOLUTION

See: Aluminon solution.

AVERY'S BROTH

Use: Culture medium.

Preparation: Add aseptically 5 ml. of sterile 20 per cent aqueous solution of glucose and 5 ml. of sterile, defibrinated rabbit blood to 100 ml. of sterile beef infusion broth (pH: 7.4-7.8). Mix and transfer aseptically to sterile tubes.

Ref. Kolmer and Boerner, p. 453

AYMONIER'S REAGENT

Use: Test reagent for α-naphthol.

Preparation: Dissolve 1 g. of potassium dichromate and 1 ml. of nitric acid in 100 ml. of water.

Remarks: Reagent produces a black precipitate with solutions of α-naphthol. β-naphthol, naphthalene, and thymol interfere with this reaction.

AYRES' MEDIUM

Use: Culture medium.

Preparation: Add 10 g. of peptone and 2 g. of disodium phosphate ($Na_2HPO_4 \cdot 2H_2O$) to 500 ml. of beef infusion and heat until dissolved. Adjust the reaction to pH 7.8. Next add 5 g. of casein and 2 g. of disodium phosphate to 150 ml. of distilled water and heat until dissolved. Now mix the two solutions and add 10 g. of gelatin. Heat in an autoclave at 15 pounds pressure for 10 minutes. Cool, and adjust the reaction to pH 7.6. Add 0.5 g. of glucose and filter the mixture through paper or absorbent cotton.

Dissolve 7.5 g. of agar in 250 ml. of distilled water by heating in an autoclave and add 3 g. of sodium citrate. Mix this solution with the one prepared by the directions given above, and then add enough water to make the total volume 1 liter. The final reaction should be pH 7.5. Tube and sterilize in an autoclave.

AZOLITMIN PAPER

Use: Indicator.

Preparation: Dissolve 1 g. of azolitmin and 0.6 g. of sodium carbonate in 1 liter of water and neutralize with dilute sulfuric acid. Impregnate white paper with this solution and dry.

Remarks: Colors:

Base	blue
Acid	red

AZOLITMIN INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 1 g. of azolitmin in 100 ml. of feebly alkaline solution, and then carefully neutralize with dilute acid to a violet color.

Remarks: pH: red 4.5-8.3 blue.

Ref. Kolthoff and Furman, p. 60

AZOLITMIN SOLUTION

Use: Indicator for the preparation of culture media.

Preparation: Dissolve 1 g. of azolitmin in 80 ml. of distilled water and add 20 ml. of alcohol.

AZO-XYLIDIC REAGENT

Use: Reagent for the detection of nitrites.

Preparation:

Solution I: Dissolve 1.8 g. of xylidine acetate in 10 ml. of acetic acid and dilute with water to 1 liter.

Solution II: Dissolve 2.65 g. of β-naphthol and 10 g. of sodium hydroxide in water and dilute to 1 liter.

Procedure for Test: Place 50 ml. of the sample in a Nessler tube and add 1 ml. of *Solution I.* Shake and allow to stand for 5 minutes, and then add 5 ml. of *Solution II.* An orange color forms with nitrites, and this color may be used for the determination of nitrites.

Sensitiveness: 0.00000284 g. $NaNO_2$ per ml.

Ref. C. A. **34**, 4010 (1940)

AZURE I (AZURE A) SOLUTION

Use: Staining solution.

Preparation: Dissolve from 0.1 to 1.5 g. of azure A in 100 ml. of water.

Remarks: This solution is used alone as a nuclear stain, or it is used in combination with other dyes.

AZURE II SOLUTION

Use: Staining solution.

Preparation: Mix equal parts of azure I and methylene blue.

Remarks: This stain is used principally in combination with other dyes.

Ref. Biol. Stains, Conn., p. 216

AZURE II-EOSIN SOLUTION

Use: Staining solution.

Preparation: Mix equal parts of azure I and methylene blue eosinate.

Remarks: This and azure I are the basic dyes in Giemsa's stain.

Ref. Biol. Stains, Conn., pp. 75 and 216

BACH'S REAGENT

Use: Test reagent for hydrogen peroxide.

Preparation: Dissolve 0.03 g. of potassium dichromate and 5 drops of aniline in 1 liter of water.

Procedure for Test: Add 1 or 2 drops of 5 per cent oxalic acid solution to 5 ml. of the above reagent and then add 5 ml. of the liquid to be tested. A reddish-violet color appears within 30 minutes if hydrogen peroxide is present.

Sensitiveness: 1 : 1,400,000.

Ref. Compt. rend. **119**, 1218 (1894)

BAEMES REAGENT

Use: Test reagent for tannin.

Preparation: Dissolve 10 g. of sodium tungstate and 20 g. of sodium acetate in 100 ml. of water.

Remarks: This reagent produces a straw-colored precipitate when added to a solution of tannin.

BAGINSKI'S REAGENT

Use: Reagent for histochemical detection of adrenaline.

Preparation: Mix the following:

Ammonium chromate, 2% aq. sol.	30.0 ml.
Silver nitrate, 1.25% aq. sol.	20.0 ml.
Ammonium hydroxide, concentrated	0.3 ml.

Remarks: Natural adrenaline, in a neutral solution, gives a black precipitate with this reagent.

Sensitiveness: 0.1 p.p.m.

Ref. C. A. **23**, 1920 (1929)

BAINE'S REAGENT

Use: Test reagent for soluble bromides.

Preparation:

Solution A: Mix the following:

Sodium hydroxide, 10% aq. soln.	30 ml.
Glacial acetic acid	20 ml.
Sodium fluoresceinate, 0.25% aq. sol.	1 ml.
Water	49 ml.

Solution B: An approximately 0.0001 *N* solution of chlorine water.

Procedure for Test: Add 5 drops of *Solution A* to 1 ml. of the solution to be tested, and then add drop by drop with constant shaking *Solution B*. If bromide is present a pink color appears, but this is bleached when an excess of chlorine is added.

Ref. J. Soc. Chem. Ind. **47**, 11 T (1928)

BALL'S REAGENT (CESIUM AND RUBIDIUM)

Use: Test reagent for cesium and rubidium.

Preparation: Dissolve 50 g. of sodium nitrite in 100 ml. of water. If the solution is alkaline, acidify with nitric acid, and add 10 g. of powdered bismuth nitrate. Shake and filter. Acidify with nitric acid before use.

Remarks: This reagent produces yellow precipitates with solutions of cesium and rubidium salts.

Ref. J. Chem. Soc. **95**, 2126 (1909)

BALL'S REAGENT (SODIUM)

Use: Test reagent for sodium.

Preparation: Dissolve 50 g. of sodium-free potassium nitrite in 100 ml. of water. If the solution is alkaline, acidify with nitric acid and add 10 g. of powdered bismuth nitrate. Shake and filter. To the filtrate add 25 ml. of 10 per cent cesium nitrate solution and allow to stand for several hours. Filter, and acidify with nitric acid before use.

Remarks: Reagent causes a yellow crystalline precipitate with solutions of sodium salts.

Ref. J. Chem. Soc. **95**, 2126 (1909)

BLANCHETIÈRE'S REAGENT

See: Magnesium uranyl acetate solution.

BANG'S SOLUTIONS

Use: Reagent for the quantitative determination of glucose in blood.

Preparation:

Solution A: Dissolve 16 g. of potassium acid carbonate in 70 ml. of water, and add 0.44 g. of crystalline cupric sulfate, 6.6 g. of potassium chloride, and 10 g. of potassium carbonate. When solution is complete, dilute with water to 100 ml.

Solution B: Add 0.15 ml. of 25 per cent hydrochloric acid to 136 ml. of a saturated solution of potassium chloride, and then dilute with water to 200 ml.

Solution C: Dilute 5 ml. of 0.1 *N* hydrochloric acid to 100 ml., and add to 1-2 ml. of 2 per cent potassium iodate solution containing 2 g. of potassium iodide.

Solution D: Dissolve 1 g. of soluble starch in 10 ml. of boiling water, and add enough saturated potassium chloride solution to make 100 ml.

Ref. C. A. **3**, 919 (1909); Browne, pp. 434-435

BARBERIO'S SOLUTION

Use: Test reagent for indican in urine.

Preparation: Dissolve 0.5 g. of sodium nitrite in 1 liter of distilled water.

Procedure for Test: Add 3 drops of test solution to 5 ml. of filtered urine and acidify with 5 ml. of concentrated hydrochloric acid. A blue color indicates the presence of indican. This can be extracted with chloroform.

Ref. C. A. **6**, 2059 (1912)

BARBET-JANDRIER'S SOLUTION

Use: Test reagent for aldehydes in alcohol.

Preparation: Dissolve 0.05 g. of phenol in 2 ml. of alcohol and 1 ml. of sulfuric acid. Hydroquinone, phloroglucinol, or betanaphthol may be used in place of phenol. Phloroglucinol is recommended.

Remarks: Various aldehydes give color reactions with test solution.

Ref. J. Pharm. Chim. 1896, II, 428

BARFF'S BOROGLYCERIN

Use: A preservative for plant and animal specimens.

Preparation: Heat boric acid with glycerol until a saturated solution is obtained.

BARFOED'S REAGENT

Use: Test reagent for glucose.

Preparation: Dissolve 13.3 g. of cupric acetate in 200 ml. of 1.0 per cent acetic acid.

Procedure for Test: Boil the solution to be tested with a few drops of the reagent. A red precipitate of cuprous oxide forms if glucose is present. Other reducing agents give a similar test.

Sensitiveness: 0.1% glucose in dextrin.

Ref. J. Am. Chem. Soc. **29**, 1744 (1907); **37**, 2227 (1915)

BARIUM ACETATE SOLUTIONS

Reagent: $Ba(C_2H_3O_2)_2 \cdot H_2O$, mol. wt. = 273.46.

Preparation:

0.5 Molar: Dissolve 136.7 g. of barium acetate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of barium ion per ml. of solution: Dissolve 19.9 g. of barium acetate in water and dilute to 1 liter.

BARIUM CHLORIDE SOLUTIONS

Reagent: $BaCl_2 \cdot 2H_2O$, mol wt. = 244.31.

Preparation:

0.5 Molar: Dissolve 122.1 g. of barium chloride in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of barium ion per ml. of solution: Dissolve 17.8 g. of barium chloride in water and dilute to 1 liter.

BARIUM HYDROXIDE SOLUTIONS

Reagent: $Ba(OH)_2 \cdot 8H_2O$, mol wt. = 315.51.

Preparation:

Saturated Solution: Dissolve about 35 g. of barium hydroxide in 1 liter of water. Filter to obtain a clear solution.

0.1 Normal: Dissolve 15.77 g. of barium hydroxide in water and dilute to 1 liter.

BARIUM NITRATE SOLUTIONS

Reagent: $Ba(NO_3)_2$, mol. wt. = 261.38.

Preparation:

0.3 Molar: Dissolve 78.4 g. of barium nitrate in warm water and dilute to 1 liter.

0.5 Normal: Dissolve 65.4 g. of barium nitrate in warm water and dilute to 1 liter.

10 mg. of barium ion per ml. of solution: Dissolve 19 g. of barium nitrate in water and dilute to 1 liter.

BARNARD'S REAGENT

Use: Test reagent for aldehydes.

Preparation: Dissolve 0.42 g. of hydrazine in 1 liter of water, and add 7.5 ml. of 2 per cent acid fuchsin solution. Allow to stand for two hours.

Remarks: The brown solution turns pink when added to solutions of aldehydes.

Sensitiveness: 1 : 100,000 acetaldehyde.

Ref. J. Lab. Clin. Med. **14**, 62 (1928)

BARRESWILL'S SOLUTION

Use: Test reagent for glucose.

Preparation: Follow directions for Fehling's solution, but replace the sodium hydroxide with potassium hydroxide.

Ref. Browne, p. 388

BARRETT'S REAGENT

Use: Test reagent for nitrogen retention in blood.

Preparation: Add 25 ml. of 10 per cent potassium iodide solution to 100 ml. of Nessler's reagent.

Procedure for Test: Add 5 ml. of the reagent to 5 ml. of tungstic acid-blood filtrate. A light gray turbidity indicates a nitrogen retention.

BASIC FUCHSIN SOLUTION

Use: Staining solution.

Preparation: Dissolve 0.6 g. of basic fuchsin (90% dye content) in 1 liter of water.

Ref. Krajian, p. 77

BASIC LEAD ACETATE SOLUTION

Use: Clarifier for sugar solutions in sugar analysis.

Preparation: Mix 430 g. of neutral lead acetate, 130 g. of lead monoxide, and 1 liter of water, and then boil for 30 minutes. Allow to cool and set aside until the mixture has settled. Draw off the supernatant liquid and dilute with recently boiled water to a specific gravity of 1.25.

Remarks: This reagent is used primarily for dark colored solutions of sucrose that are to be determined polarimetrically. From 1.5 to 10 ml. of the reagent are used.

Ref. Jacobs, pp. 238-239

BASIC LEAD ACETATE SOLUTION (STANDARD)

Use: Standard solution for determining the Canadian lead number of maple syrup (Fowler modification).

Preparation: Heat 60-70 g. of litharge for 2.5 to 3 hours in a muffle at 650-670° C. and allow to cool. When cool the material should be a lemon-yellow color. Place 80 g. of normal lead acetate, 40 g. of the litharge, and 250 ml. of water in a 500 ml. flask equipped with a reflux condenser and boil for 45 minutes. When the mixture is cool, filter, and dilute the filtrate with freshly boiled water to a density of 1.25 at 20° C.

Ref. Jacobs, p. 271-272

BASIC LEAD NITRATE SOLUTION (HERLE)

Use: Clarifier for sugar solution in sugar analysis.

Preparation:

(a) Dissolve 250 g. of lead nitrate in water and dilute to 500 ml.
(b) Dissolve 25 g. of sodium hydroxide in water and dilute to 500 ml.

Procedure for Use: Add equal volumes of *Solutions a* and *b* to the solution to be clarified and shake. About 3 ml. of each reagent is required, but if clarification is not complete, add more of each reagent and again shake.

Ref. Jacobs, p. 239

BASSETT-SNYDER'S ETCHING SOLUTION

Use: Etching reagent for lead and lead alloys.

Preparation: Mix the following:

Glacial acetic acid	3 parts
Nitric acid	4 parts
Water	16 parts

Remarks: Use at 40°-42° C.

Ref. Metals Handbook, p. 1558

BATTELLI-STERN'S REAGENT

Use: Test reagent for peroxidases in animal tissue.

Preparation: Mix 50 ml. of a 1 per cent potassium iodide solution with 100 ml. of 3 per cent starch solution, and then acidify with 0.2 ml. of 10 per cent acetic acid. Reagent must be freshly prepared.

Procedure for Test: Mix 1 ml. of the reagent with 1 drop of tissue extract and 2 drops of 0.1 per cent of ethyl hydroperoxide solution, and then add water until the total volume is 2 ml. Prepare a blank in which the tissue extract is not used and compare the times required for the appearance of the blue color. The development of the color is accelerated by the presence of peroxidases in the tissue extract.

Ref. Biochem. Zeitschr. **13**, 48 (1908)

BAUDISCH'S REAGENT

See: Cupferron solution.

BAUDISCH-ROTHSCHILD'S REAGENT

See: Nitrosophenol solution (Baudisch-Rothschild).

BAUDOUIN'S SOLUTION

Use: Test reagent for sesame oil.

Preparation: Dissolve 1 g. of sugar in 100 ml. concentrated hydrochloric acid (sp. gr. = 1.18).

Procedure for Test: Shake 5 ml. of reagent with 10 ml. of oil to be tested. A red color indicates the presence of sesame oil.

Ref. Leach, p. 538; A.O.A.C., p. 922.

BEALE'S AMMONIA-CARMINE

Use: A stain for bone and nerve tissues.

Preparation: Mix the following:

Carmine	1 g.
Ammonium hydroxide	5 ml.
Water	110 ml.
Glycerol	80 ml.
Alcohol, absolute	30 ml.

BECHI'S SOLUTION

Use: Test reagent for cottonseed oil in olive oil.

Preparation: Dissolve 1 g. of silver nitrate in 100 ml. of 98 per cent alcohol.

Procedure for Test: Add 5 ml. of olive oil and 5 ml. of test solution to 25 ml. of 98 per cent alcohol and heat to 85° C. The solution turns dark if cottonseed oil is present.

Ref. Zeitschr., anal. Chem. 23, 97 (1884)

BECHI-HEHNER'S REAGENT

Use: Test reagent for cottonseed oil.

Preparation: Dissolve 1 g. of silver nitrate in 250 ml. of alcohol, and add 53 ml. of ether and 0.1 ml. of concentrated nitric acid.

Procedure for Test: Mix 10 ml. of oil or fat to be tested with 5 ml. of the reagent and heat in a steam bath for 15 minutes. Shake frequently. A reddish-brown or dark color develops if cottonseed oil is present.

Ref. J. Am. Chem. Soc. 27, 263 (1905)

BEEF EXTRACT AGAR

Use: Culture medium.

Preparation: Soak 15 g. of shredded agar in cold water for 15 minutes and drain, and then add to 1 liter of beef extract broth. Heat gently with a free flame or in an autoclave until the agar is dissolved. Adjust pH to 7.6. Filter through cotton while still hot. Repeat the filtration if the filtrate is not clear. Fill into flasks or test tubes and heat in an autoclave at 15 pounds pressure for 20 minutes.

If powdered agar is used, this should be mixed with the broth to form a paste before the heating process.

Ref. Kolmer and Boerner, p. 366

BEEF EXTRACT AGAR

Use: For the examination of water and milk.

Preparation: Add 15 g. of agar to 800 ml. of distilled water, and heat in an autoclave at 121° C. for 30 minutes until dissolved. Dissolve 5 g. of peptone and 3 g. of beef extract in 200 ml. of distilled water, and mix this solution with the agar solution. Adjust the reaction to pH 6.6-7.0 after the final sterilization. Heat to 100° C. and filter through cheese cloth and cotton. Fill into flasks or tubes and sterilize in an autoclave at 15 pounds pressure for 20 minutes.

Ref. Standard Methods of Milk Analysis, 1934; Standard Methods of Water Analysis, 1936

BEEF EXTRACT BROTH

Use: Culture medium.

Preparation: Add 3 g. of beef extract, 10 g. of peptone, and 5 g. of sodium chloride (optional) to 975 ml. of distilled water and heat until solu-

tion is complete. Add 1.0 *N* sodium hydroxide solution until the pH is 7.4 Filter through cotton and filter paper. Add sufficient water to the filtrate to make the total volume 1 liter. Sterilize in an autoclave at 15 pounds for 20 minutes.

Ref. Kolmer and Boerner, p. 358

BEHREN'S GLYCERIN-ISINGLASS

Use: Preservative for plant specimens.

Preparation: Dissolve 60 g. of isinglass (fish glue) in 100 ml. of water and 100 ml. of glycerol. Use heat if necessary.

BEHREN'S REAGENT

Use: A reagent for the microscopic determination of cellulose in botanical studies.

Preparation: Dissolve 25 g. of zinc chloride, 8 g. of potassium iodide, and an excess of iodine in 8.5 ml. of water.

Ref. Behrens' Tabellen 1887, 54

BELL'S REAGENT

Use: Test reagent for Curcuma in vegetable drug powders.

Preparation: Dissolve 1 g. of diphenylamine in 20 ml. of alcohol and 25 ml. of concentrated sulfuric acid.

Ref. Pharm. J. **15**, 551

BELLIER'S REAGENT (COCONUT OIL)

Use: Test reagent for coconut oil in butter.

Preparation: Dissolve 21.85 g. of cupric sulfate and 50 g. of sodium sulfate in 1 liter of water.

Procedure for Test: Saponify the butter to be tested with normal alcoholic potassium hydroxide solution, and then neutralize the mixture. Next add the reagent and heat the mixture to 80° C. Filter, and to the clear filtrate add a little more of the reagent. A flocculent turbidity appears if coconut oil is present.

Ref. Ann. chim. applicata, 412

BELLIER'S REAGENT (FLOUR)

Use: Reagents for wheat flour.

Preparation:

Solution 1: Dissolve 5 g. of potassium hydroxide (61% KOH) in a mixture consisting of 15 ml. of glycerol and 85 ml. of water.

Solution 2: Add 5 ml. of glycerol to 100 ml. of *Solution 1.*

Solution 3: Add 90 ml. of water to 30 ml. of *Solution 1.*

Remarks: Various types of starch exhibit different swelling capacities with these reagents.

BENDA'S SOLUTION

Use: Fixative.

Preparation: Mix the following:

Chromic acid, 1.0% aq. soln.	15 parts
Osmic acid, 2.0% aq. soln.	4 parts
Acetic acid, glacial	0.2 ml.

Remarks: Prepare fresh solutions as needed.

BENDA'S STAIN

Use: Staining solution.

Preparation: Add 80 ml. of distilled water to 1 ml. of a saturated aqueous solution of alizarin red S.

Ref. Biol. Stains, Conn, p. 68

BENEDICT'S ARSENOTUNGSTIC REAGENT

See: Arsenotungstic Reagent (Benedict).

BENEDICT'S MOLYBDATE REAGENT

See: Tauber's reagent (Monose Sugars).

BENEDICT'S REAGENT (ACETATE)

Use: Test reagent for acetate.

Preparation: Saturate 20 ml. of *N* cobalt nitrate solution with hydrogen sulfide, and then acidify with 20-30 drops of *N* acetic acid.

Procedure for Test: The solution to be tested must be free from heavy metals. Neutralize this solution with sodium carbonate, and then treat with an excess of silver nitrate and filter. Add sodium chloride to the neutral filtrate to remove the excess silver and again filter. Saturate the filtrate with hydrogen sulfide and add the test reagent. A black precipitate forms if acetates are present.

Ref. Am. Chem. J. **32**, 480 (1904)

BENEDICT'S REAGENT (URIC ACID)

Use: Reagent for uric acid.

Preparation:

Method 1: Add 100 g. of sodium tungstate and 30 g. of pure arsenic pentoxide to 700 ml. of water and 50 ml. of concentrated hydrochloric acid and boil for 20 minutes. Cool, and dilute to 1 liter.

Method 2: Dissolve 100 g. of sodium tungstate in 600 ml. of water, and add 50 g. of pure arsenic pentoxide, 25 ml. of 85 per cent phosphoric acid, and 20 ml. of concentrated hydrochloric acid. Boil for 20 minutes, cool, and dilute to 1 liter.

Procedure for Test: Add 2 ml. of the reagent and 5-10 ml. of saturated sodium carbonate solution to 2 ml. of the solution of uric acid. A blue color forms in the presence of uric acid.

Ref. J. Biol. Chem. **51**, 187 (1922); **54**, 233 (1923)

BENEDICT'S SOLUTION (QUALITATIVE)

Use: Test reagent for glucose.

Preparation: Dissolve 173 g. of sodium citrate and 100 g. of anhydrous sodium carbonate in about 800 ml. of water. Heat until solution is complete, and then filter into a graduated liter cylinder. Make up to 850 ml. with water and transfer the solution to a large beaker. Dissolve 17.3 g. of cupric sulfate in about 100 ml. of water, and pour this solution slowly and with constant stirring into the citrate-carbonate solution. Make up to 1 liter.

This solution keeps well.

Procedure for Test: Boil a few ml. of the solution to be tested with about 1 ml. of the reagent. A red precipitate of cuprous oxide forms if glucose is present. Other reducing agents give a similar test.

Ref. J. Biol. Chem. **5**, 485 (1908); Jacobs, p. 248

BENEDICT'S SOLUTION (QUANTITATIVE)

Use: Reagent for the determination of reducing sugars.

Preparation: Dissolve 200 g. of crystalline sodium carbonate, 200 g. of sodium citrate, and 125 g. of potassium thiocyanate in about 800 ml. of water. Use heat and filter if necessary. Now dissolve 18.0 g. of crystallized cupric sulfate in about 100 ml. of water, and pour this solution into the citrate-carbonate-thiocyanate solution slowly and with constant stirring. Add 5 ml. of a 5 per cent potassium ferrocyanide solution, cool, and dilute to exactly 1 liter. It is necessary only to weigh the cupric sulfate accurately.

Remarks: Twenty-five ml. of the above reagent is reduced by 50 mg. of glucose.

Ref. J. Biol. Chem.. **5**, 485 (1909); J. Am. Med. Assoc., **57**, 1193 (1911); Hawk and Bergeim, p. 846

BENEDICT'S SULFUR REAGENT

Use: Determination of sulfur in urine.

Preparation: Dissolve 200 g. of sulfur-free cupric sulfate and 50 g. of sodium or potassium chlorate in distilled water and make up to 1 liter. Cupric sulfate of known sulfur content may be used.

Ref. J. Biol. Chem., **6**, 363 (1909); Hawk and Bergeim, p. 872

BENEDICT-DENIS' SULFUR REAGENT

Use: Reagent for the determination of sulfur.

Preparation: Dissolve the following in 100 ml. of water.

Ammonium nitrate	10 g.
Cupric nitrate	25 g.
Sodium chloride	25 g.

Ref. J. Biol. Chem., **6**, 363 (1909)

BENEDICT-HOPKINS-COLE REAGENT

See: Hopkins-Cole reagent.

BENSLEY'S FLUID

Use: Fixative.

Preparation: Mix the following:

Formaldehyde solution (neutral)	10.0 ml.
Potassium dichromate	2.5 g.
Mercuric chloride	5.0 g.
Water	90.0 ml.

Remarks: Prepare frequently.

BENSLEY'S OSMIC ACID FLUID

Use: Fixative.

Preparation: Mix the following:

Osmic acid, 2% aq. soln.	2 ml.
Potassium dichromate, 10% aq. soln.	2 ml.
Acetic acid, glacial	1 drop
Distilled water	6 ml.

Ref. Krajian, p. 187

BENZIDINE INDICATOR SOLUTION

Use: Indicator for oxidimetric determinations.

Preparation: Dissolve 1 g. of benzidine in 4 ml. of 4 *N* hydrochloric acid and dilute with water to 100 ml.

Remarks: In feebly acid or neutral solutions (pH 6.0) the indicator is oxidized transiently to a deep greenish-blue compound. The color soon disappears. In acid solutions the indicator is oxidized to an intensely yellow compound that is stable.

Ref. Kolthoff and Furman, pp. 275-276

BENZIDINE PAPER (ARNOLD-MENTZEL)

Use: Reagent for ozone.

Preparation: Impregnate filter paper with a saturated solution of benzidine in alcohol and allow to dry.

Remarks: Ozone colors this paper brown; nitrites and bromine, blue; and chlorine, a blue which turns to red-brown.

Ref. Ber. 1902, 2902

BENZIDINE REAGENT (FLUORIDES)

Use: Reagent for fluorides.

Preparation: Dissolve 0.25 g. of benzidine in 100 ml. of 10 per cent alcohol.

Procedure for Test: Convert the fluoride to hydrogen fluoride by warming with sulfuric acid, and hold a drop of nitric acid-ammonium molybdate solution in the fumes arising from the hot mixture. Transfer the drop to a spot plate containing 2 drops of the reagent. Add 1 drop of sodium acetate

as a buffer. A blue color forms if fluoride was present in the original material.

Remarks: Phosphates, arsenates, and silicates react similarly.

Ref. C. A. 23, 4160 (1929)

BENZIDINE REAGENT (GOLD)

Use: Test reagent for gold and platinum.

Preparation: Dissolve 2 g. of benzidine in 20 ml. of acetic acid and 100 ml. of water.

Remarks: Gold and platinum salts give a blue color or precipitate with this reagent.

Ref. C. A. 8, 1397 (1914)

BENZIDINE REAGENT (LYLE-CURTMAN-MARSHALL)

Use: Reagent for the detection of blood.

Preparation: Measure 4.33 ml. of glacial acetic acid into a small flask and warm to 50° C. Now add 0.5 g. of benzidine and heat for 10 minutes in water at 50° C. To the solution so formed add 19 ml. of redistilled water. This solution should be stored in a dark place, and may be kept for several days without deterioration.

Procedure for Test: In a clean test tube mix 1.4 ml. of benzidine reagent, 0.2 ml. of water, and 1 ml. of the solution to be tested, and finally add 0.4 ml. of 3 per cent hydrogen peroxide. A blue color is a positive test.

Ref. J. Biol. Chem. 19, 445 (1914)

BENZIDINE REAGENT (MANGANESE)

Use: Test reagent for manganese.

Preparation: Dissolve 0.05 g. of benzidine in 10 ml. of glacial acetic acid and 90 ml. of water.

Procedure for Test: Add a drop of the solution to be tested to a strip of filter paper. Before the paper is completely dry, add a drop of sodium hydroxide, and after standing for a few seconds, 1 drop of tartaric acid and a drop of the benzidine reagent. A blue color which fades after a few minutes is a test for manganese.

Remarks: Chromates give the same test.

Ref. C. A. 24, 1035 (1930); C. A. 15, 2599 (1921)

BENZIDINE REAGENT (ROQUES)

Use: For histological detection of levulosans in vegetables.

Preparation: Dissolve 1 g. of benzidine in 10 ml. of acetic acid and 30 ml. of water, and boil for a few minutes. Cool, and dilute with water to 50 ml.

Procedure for Test: Immerse sections in this solution and allow to stand. Spheroidal masses of levulosans can be detected in the tissue after some time.

Ref. C. A. 21, 2146 (1927)

BENZIDINE REAGENT (TAUBER)

Use: Reagent for pentose sugars.

Preparation: Dissolve 4 g. of benzidine in 100 ml. of glacial acetic acid. This reagent keeps for 4 days.

Procedure for Test: Add 1 drop of the solution to be tested to 0.5 ml. of the reagent and boil. A red color which forms when the mixture cools indicates the presence of pentose sugars.

Sensitiveness: 1.2 mg. per ml.

Ref. Proc. Soc. Exptl. Biol. Med. **37**, 600 (1937)

BENZIDINE ACETATE-CUPRIC ACETATE SOLUTION

Use: Reagent for the detection of hydrogen cyanide.

Preparation:

Solution A: Prepare a saturated solution of benzidine acetate, and dilute 47.5 ml. of this solution to 100 ml.

Solution B: Dissolve 0.286 g. of cupric acetate in water and dilute to 100 ml.

Remarks: A blue color forms when a mixture of *Solution A* and *Solution B* is placed on a spot paper and exposed to hydrocyanic acid gas.

Ref. Dennis, p. 276; C. A. **7**, 3292 (1913)

BENZIDINE HYDROCHLORIDE REAGENT (SULFATES)

Use: Determination of sulfates in water analysis.

Preparation: Dissolve 11.2 g. of benzidine hydrochloride in 400 ml. of distilled water, and then add 100 ml. of 5 per cent hydrochloric acid.

Remarks: This reagent precipitates sulfate. Phosphate must be removed.

Ref. Ind. Eng. Chem. Anal. Ed., **5**, **6**, 403 (1933); A.P.H.A., p. 106

α-BENZILDIOXIME SOLUTION

Use: Test reagent for nickel.

Preparation: Dissolve about 0.05 g. of α-benzildioxime in 125 ml. of alcohol.

Remarks: Reagent gives a voluminous red precipitate with solutions of nickel salts.

The reagent is used for the quantitative estimation of nickel.

Sensitiveness: Reagent detects 1 part of nickel in 5 million parts of water.

Ref. J. Chem. Soc. **103**, 1317 (1913); Analyst, **38**, 316 (1913)

BENZOAZURINE G SOLUTION

Use: Test reagent for magnesium.

Preparation: Dissolve 0.1 g. of benzoazurine (sodium dianisidine-disazobi-1-naphthol-4-sulfonate) in 100 ml. of water.

Remarks: Reagent gives a blue precipitate with an ammoniacal solution of magnesium salts. Anions which precipitate magnesium in neutral or alkaline solutions interfere with this test.

Ref. C. A. **31**, 2961 (1937)

α-BENZOINOXIME REAGENT (COPPER)

See: Cupron solution.

α-BENZOINOXIME REAGENT (MOLYBDENUM)

Use: Reagent for the determination of molybdenum in steel.

Preparation: Dissolve 2 g. of α-benzoinoxime in 100 g. of 95 per cent ethyl alcohol.

Remarks: Molybdenum is quantitatively precipitated by this reagent in an acid solution. Other elements which are precipitated in an acid solution are tungsten, tantalum, palladium, quinquevalent vanadium, and sexivalent chromium.

Ref. Bureau of Standards J. of Research, **9**, 1 (1932)

BENZOPURPURINE 4 B INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.10 g. of benzopurpurpine 4B in 100 ml. of water.

Remarks: pH: blue violet 1.3-4.0 red.

BENZOPURPURPIN 4 B REAGENT

Use: Test reagent for mercury and silver.

Preparation: Dissolve 0.2 g. of benzopurpurpin 4 B in 100 ml. of water.

Remarks: The reagent gives a brown ring surrounding a red spot when added to a drop of solution containing silver ion. Mercuric ion gives a bluish-gray ring, and mercurous ion a reddish-violet test.

Sensitiveness:

Silver:	0.03 mg.
Mercury (ous):	0.04 mg.
Mercury (ic):	0.015 mg.

Ref. C. A. **34**, 51 (1940)

o-BENZOQUINONE SOLUTION

Use: Test reagent for cystine and cysteine.

Preparation: Prepare *o*-benzoquinone as follows: Mix 0.4 g. of catechol, 1.5 g. of anhydrous cadmium sulfate, 1.5 g. of silver oxide, and 10 ml. of anhydrous ether and shake for 35 seconds. Filter immediately and cool the filtrate in a freezing mixture. Pour off the ether and wash the crystals once with 2 ml. of ether, and then dissolve them in 8 ml. of chloroform.

Procedure for Test: Mix 2 ml. of the reagent with 2 ml. of an equeous solution of cysteine and then shake for 2 minutes. The chloroform layer turns a deep red.

Add 1 ml. of hydrochloric acid and a few pieces of tin to 1 ml. of the solution to be tested and heat for 2 minutes. Filter, and dilute the filtrate to 15 ml., and then saturate this mixture with hydrogen sulfide. Add about 0.2 g. of charcoal and shake well. Again filter and boil the filtrate until all hydrogen sulfide is expelled. Cool and acidify, and then add 4 ml. of the reagent. Shake well. A deep red color forms if cystine is present.

Ref. J. Biol. Chem. **95**, 483 (1932)

BERGÉ'S REAGENT (WOOD FIBER)

Use: Test reagent for wood fiber in paper.

Preparation: Dissolve 0.2 g. of p-nitraniline in a mixture of 20 g. of concentrated sulfuric acid and 80 ml. of water.

Remarks: Reagent gives an orange to red color with paper containing wood fiber.

Ref. C. A. **1**, 1320 (1907)

BERNEDE'S REAGENT

Use: Test reagent for coal tar colors in wine.

Preparation: Liquefy 12 g. of phenol with 0.1 of its volume of alcohol, and then mix with 60 g. of ether.

Procedure for Test: Shake 5 ml. of the reagent with twice its volume of wine and observe the color of the ethereal layer. If fuchsin is present the ether layer is colored red, and if gentian violet is present the color is reddish-violet.

Sensitiveness: Fuchsin: 1 : 10,000 liters.
Gentian violet: 1 : 1,000 liters.

Ref. J. Pharm. Chim. **5**, 15, 29

BERTRAND'S REAGENT (BLOOD)

Use: Test reagent for preparation of hemin crystals from blood stains.

Preparation: Mix the following:

Magnesium chloride, cryst.	1 g.
Glycerol (30%)	5 g.
Water	1 g.
Glacial acetic acid	20 g.

Procedure for Test: Mix 1 drop of the reagent and the substance to be examined on a slide. Cover with a glass and warm. Microscopic crystals of hemin are formed when the diameter of the stain is no greater than 0.1 mm.

Ref. C. A. **26**, 1952 (1932)

BERTRAND'S REAGENT (GLUCOSE)

Use: Reagent for the quantitative determination of glucose in urine.

Preparation:

Solution A: Dissolve 40 g. of crystalline cupric sulfate in water and dilute to 1 liter.

Solution B: Dissolve 200 g. of Rochelle salt and 150 g. of sodium hydroxide in about 800 ml. of water and dilute to 1 liter.

Solution C: Mix 200 ml. of concentrated sulfuric acid and 400 ml. of water, and into this mixture pour a solution prepared by dissolving 50 g. of ferric sulfate in 200 ml. of water. Finally, dilute to 1 liter.

Solution D: Dissolve 5 g. of potassium permanganate in a little water and dilute to 1 liter. This solution should be standardized against a solution of 0.25 g. of ammonium oxalate dissolved in 100 ml. of water containing 2 ml. of concentrated sulfuric acid.

Ref. Browne, pp. 426-427

BERTRAND'S REAGENT (MOLYBDENUM)

Use: Reagent for the colorimetric determination of molybdenum in steel.

Preparation: Mix 11.4 g. of ammonium tungstate (70% tungsten) with 20 ml. of water and 20 ml. of 20 per cent sodium hydroxide solution, and then warm slightly until solution is complete. Add 70 ml. of 30 per cent tartaric acid and 5 ml. of concentrated hydrochloric acid, and then dilute to 500 ml. with water. Pass hydrogen sulfide through this solution for one-half hour, and then allow to stand for 12 hours. Filter and boil until all the hydrogen sulfide is expelled. Finally, dilute to 2 liters with water.

Remarks: For procedure, see reference. Vanadium interferes with this determination.

Sensitiveness: 1 : 8,000,000.

Ref. C. A. **25**, 3268 (1931)

BEST'S CARMINE STAIN

Use: Stain for glycogen.

Preparation: Mix the following:

Carmine	2 parts
Potassium carbonate	1 part
Potassium chloride	5 parts
Distilled water	60 parts

Boil for a few minutes, but do not over-heat. Cool, and add 20 parts of ammonium hydroxide. Filter before use.

Ref. Biol. Stains, Conn, p. 179

BETTENDORFF'S SOLUTION (WINKLER)

Use: Test reagent for arsenic.

Preparation: Dissolve 100 g. of pure stannous chloride in enough concentrated hydrochloric acid to make 1 liter of solution. Allow to stand for 24 hours, and add 1 g. of powdered glass. Stopper, shake well, and allow to stand for another 24 hours. Finally, decant the clear liquid, which is the reagent to be used.

Procedure for Test: Mix 2 ml. of the solution to be tested with 10 ml. of the reagent. Arsenic causes a brown coloration or precipitation.

Sensitiveness: 0.001 g. of As_2O_3 per liter.

Ref. C. A. **7**, 2026-7 (1913)

BETTINK-VAN DISSEL'S REAGENT

Use: Test reagent for ptomaines.

Preparation: Add 0.5 g. of chromic acid to a solution prepared by dissolving 2 g. of ferric chloride and 2 ml. of 1 per cent hydrochloric acid in 98 ml. of water.

Procedure for Test: To 1 mg. of the ptomaine dissolved in 1 drop of 1 per cent hydrochloric acid, add 1 drop of the reagent and then a little potassium ferrocyanide solution. A positive test is the appearance of a blue color.

Morphine is the only substance other than ptomaines which gives this reaction.

Ref. Ber. 17, Rep. 379 (1884)

BIAL'S REAGENT

Use: Test reagent for pentoses.

Preparation: Dissolve 1.0 g. of orcinol in 500 ml. of 30 per cent hydrochloric acid and add 25 drops of 10 per cent ferric chloride solution.

Procedure for Test: Heat 5 ml. of the reagent to boiling and remove the flame. Then add 0.5-1.0 ml. of the solution to be tested. A green precipitate or color appears if pentoses are present. This green compound can be extracted with amyl alcohol.

Ref. Jacobs, pp. 251-252

BIEBRICH'S SCARLET W. S.

Use: Staining solution.

Preparation: Dissolve 1 g. of Biebrich's scarlet in 100 ml. of water.

Remarks: This solution is used as a plasma stain.

Ref. Biol. Stains, Conn, pp. 58-59

BIELING'S REAGENT

Use: Test reagent for living tissue.

Preparation: Dissolve 2 g. of nitroanthraquinone in 100 ml. of water. Before use, dilute 1 ml. of test reagent with 9 ml. of physiological salt solution.

Remarks: Living tissue develops a pink color when treated with this reagent, while dead tissue causes no change.

BILE-BRILLIANT GREEN BROTH

See: Brilliant Green Bile.

BILE SALT AGAR

Use: Culture medium.

Preparation: Add 2 per cent lactose and 0.5 per cent sodium taurocholate to a nutrient agar. Sterilize by heating in an autoclave at 15 pounds pressure for 15 minutes.

Ref. A.P.H.A., p. 263; J. Hyg., 8, 322 (1908)

BIONDI-HEIDENHAIN TRIACID MIXTURE

Use: For staining sections.

Preparation: Prepare saturated aqueous solutions of fuchsin S, methyl green, and orange G. Now mix 4 ml. of the fuchsin S solution, 10 ml. of the methyl green solution, and 20 ml. of the orange G solution.

BISMARCK BROWN SOLUTION

Use: Staining solution.

Preparation: Dissolve 0.2 g. of Bismarck brown (50-60% dye content) in 100 ml. of boiling water and filter.

Ref. Biol. Stains, Conn, p. 430

BISMUTH CHLORIDE SOLUTIONS

Reagent: $BiCl_3$, mol. wt. = 315.37.

Preparation:

0.2 Molar: Dissolve 63.1 g. of bismuth chloride in a solution prepared by diluting 1 volume of concentrated hydrochloric acid with 5 volumes of water, and then make up to a total volume of 1 liter with this dilute acid.

0.5 Normal: Dissolve 52.6 g. of bismuth chloride in the 1 : 5 hydrochloric acid and dilute to 1 liter with this acid.

10 mg. of bismuth ion per ml. of solution: Dissolve 15.1 g. of bismuth chloride in 1 :5 hydrochloric acid and dilute to 1 liter with this acid.

Remarks: Bismuth oxychloride precipitates when bismuth chloride is added to water. This is prevented by the addition of hydrochloric acid.

BISMUTH NITRATE SOLUTIONS

Reagent: $Bi(NO_3)_3 \cdot 5H_2O$, mol. wt. = 485.11.

Preparation:

0.2 Molar: Dissolve 97 g. of bismuth nitrate in sufficient 3 *N* nitric acid to make 1 liter of solution.

1.0 Normal: Dissolve 161.7 g. of bismuth nitrate in sufficient 3 *N* nitric acid to make 1 liter of solution.

10 mg. of bismuth ion per ml. of solution: Dissolve 23.1 g. of bismuth nitrate in sufficient 3 *N* nitric acid to make 1 liter of solution.

Remarks: Bismuth forms insoluble bismuth subnitrate when added to water, but this is prevented by the addition of nitric acid.

BIURET PAPER (KANTOR AND GIES)

Use: Test for protein.

Preparation: Impregnate filter paper with biuret reagent (Gies) and allow to dry.

Procedure for Test: Immerse the paper in the liquid to be tested. It may also be used for the examination of moist, neutral or alkaline powders. A pink-violet or purple-violet color is a positive test.

Ref. J. Biol. Chem., 7, 11 (1910); Hawk and Bergeim, p. 131

BIURET REAGENT (GIES)

Use: Test reagent for proteins.

Preparation: Add 25 ml. of a 3 per cent solution of cupric sulfate to 1 liter of a 10 per cent solution of potassium hydroxide.

Remarks: Reagent gives a pink-violet to purple-violet color with proteins.

Ref. J. Biol. Chem., 7, 60 (1910); Hawk and Bergeim, p. 131

BIZZOZERO'S PICROCARMINE

Use: Double staining.

Preparation: Dissolve 1 g. of carmine in 6 ml. of ammonium hydroxide and 100 ml. of water. Mix this solution with a second solution prepared by dissolving 1 g. of picric acid in 100 ml. of water. Now evaporate this mixture to 100 ml. and add 20 ml. of alcohol.

Remarks: Colors as follows: muscular fiber, brownish-red; elastic fibers and keratin, yellow; nuclei, red; connective tissue, rose-red.

BLACK'S REAGENT

Use: Reagent for β-hydroxybutyric acid in urine.

Preparation: Dissolve 5 g. of ferric chloride and 0.4 g. of ferrous chloride in 100 ml. of water.

Procedure for Test: Evaporate 10 ml. of urine in an evaporating dish to about 3-4 ml. and acidify with a few drops of hydrochloric acid. Now add sufficient plaster of Paris to form a thick paste, and allow to stand until the mixture begins to harden. Stir the mass well, and extract twice with ether by stirring and decantation. Evaporate the ether extract, dissolve the residue in water, and neutralize with barium carbonate. Shake 5 ml. of this neutral extract with 2-3 drops of hydrogen peroxide, and then add a few drops of Black's reagent. Allow the mixture to stand. If β-hydroxybutyric acid is present a pink or rose color develops and then gradually fades.

Ref. J. Biol. Chem. 5, 207 (1907)

BLOM'S REAGENTS

Use: Test reagents for hydroxylamine.

Preparation:

Method I: Dissolve 1 g. of diacetylmonoxime in 10 ml. of concentrated ammonium hydroxide, and add 1 ml. of this solution to 10 ml. of a second solution prepared by dissolving 0.48 g. of nickel sulfate in 100 ml. of water. Filter and test the filtrate for further precipitation with a few drops of nickel sulfate solution. The addition of more of the nickel sulfate solution must cause no further precipitation.

Procedure for Test: Add 2 ml. of the reagent to 10 ml. of the neutral solution to be investigated. If hydroxylamine is present, a red precipitate of nickel diacetyldioxime (nickel dimethylglyoxime) is formed.

Sensitiveness: 2 mg. per liter.

Method II: Prepare the following solutions:

(a) Dissolve 0.37 g. of *p*-bromonitrosobenzene in 1 liter of 96 per cent alcohol.
(b) Dissolve 0.29 g. of α-naphthol in 1 liter of water and add 5 drops of concentrated hydrochloric acid.
(c) Prepare a 0.5 *N* solution of sodium hydroxide.
(d) Dissolve a few g. of magnesium chloride or sulfate in 100 ml. of water.

Procedure for Test: Neutralize 20 ml. of the solution to be tested, and to this add 2 ml. of *c* and 2 ml. of a freshly prepared mixture consisting of 3 ml. of *a* and 2 ml. of *b*. If hydroxylamine is not present the mixture appears yellowish, but with hydroxylamine an orange-red color is obtained. A red color is produced on the addition of 1 or 2 drops of *d*.

Sensitiveness: 1 mg. per liter.

Ref. C. A. 22, 2725 (1928)

BLOOD CULTURE MEDIUM (KRACKE)

Use: Culture medium.

Preparation:

Solution A: Mix 500 g. of fresh, fat-free and minced beef heart tissue with 1 liter of distilled water and allow to stand overnight in an icebox. Filter through 4 layers of gauze and press out the fluid. Heat to boiling and filter through small mesh copper gauze.

Solution B: Mix 250 g. of minced beef brain with 500 ml. of distilled water and allow to stand overnight in an icebox. Filter through 4 layers of gauze. Heat the filtrate slowly to boiling with constant stirring. Do not filter.

Now mix 800 ml. of *Solution A* with 110 ml. of *Solution B*, and dissolve in this mixture the following, using heat if necessary:

Sodium citrate ($Na_3C_6H_5O_7.5\frac{1}{2}\ H_2O$)	1 g.
Disodium phosphate ($Na_2HPO_4.12H_2O$)	2 g.
Sodium chloride	4 g.
Peptone	10 g.
Glucose	10 g.

Adjust the pH to 7.4 and distribute in containers in volumes of 50 ml. Heat in an autoclave at 15 pounds pressure for 20 minutes.

Ref. J. Lab. Clin. Med. 16, 169 (1930)

BLOOD OR BLOOD SERUM AGAR

Use: Culture medium.

Preparation: Collect under sterile conditions 5 to 10 ml. of defibrinated or citrated horse, sheep, or human blood or blood serum. Melt 90-95 ml. of beef infusion agar (containing 2% agar) and then cool to 50° C. Heat the

blood or blood serum to 50° C. and add to the liquefied agar at the same temperature. Mix thoroughly. All operations should be performed under aseptic conditions. Pour into Petri dishes or tubes as desired.

Ref. Kolmer and Boerner, p. 370

BLOOD OR BLOOD SERUM BROTH

Use: Culture medium.

Preparation: Perform the following operations under aseptic conditions: add 50-100 ml. of sterile blood (defibrinated or citrated) or sterile blood serum to 950-900 ml. of sterile nutrient broth. Mix well and pour into sterile containers.

BLOOD OR BLOOD SERUM GLUCOSE-CYSTINE AGAR

Use: Culture medium.

Preparation: Add 0.5 g. of cystine to 500 ml. of liquefied sterile glucose agar. Heat to 100° C. for 15 minutes and cool to 45° C. Aseptically add 25 ml. of blood or blood serum. Mix by rotation. Prevent all contamination.

Ref. Kolmer and Boerner, p. 371

BLUM'S REAGENT

Use: Reagent for albumin in urine.

Preparation: Dissolve 10 g. of metaphosphoric acid in 95 ml. of water. Then add 2 or 3 g. of lead peroxide, and a solution prepared by dissolving 0.05 g. of manganous chloride in dilute hydrochloric acid. Filter.

Reagent: Reagent produces a turbidity with urine containing albumin.

Ref. Chem-Ztg. 1887, 24

BOAS REAGENT (BLOOD)

Use: Test reagent for blood in feces.

Preparation: Dissolve 1 g. of thymolphthalein and 25 g. of potassium hydroxide in 100 ml. of water, and then heat with 10 g. of powdered zinc until the solution becomes colorless. Filter and store the solution over zinc shavings.

Procedure for Test: Extract the feces with a 1:3 glacial acetic acid-ether mixture, and add 25 drops of this extract to a mixture consisting of 20 drops of the reagent and 15 drops of 3 per cent hydrogen peroxide. A blue or violet color or precipitate forms if blood is present.

Ref. Zentr. inn. Med. 1906, 24

BOAS SOLUTIONS (FREE HYDROCHLORIC ACID)

Use: Reagent for free hydrochloric acid in gastric juice.

Preparation:

Solution A: Dissolve 0.1 g. of tropaeoline 00 in 100 ml. of alcohol.

Solution B: Dissolve 10 g. of resorcinol, 3 g. of cane sugar, and 3 ml. of alcohol in 100 ml. of water.

Procedure for Test: Mix a few drops of *Solution A* with a little gastric juice and place in a porcelain dish. Heat cautiously with a free flame, and if free hydrochloric acid is present in the gastric juice, a violet color appears.

Repeat using 3 drops of *Solution B* and 6 drops of gastric juice. A pink to red color, which fades on cooling, indicates free hydrochloric acid.

Sensitiveness: 0.05 per cent.

Ref. Deut. med. Wochschr. 1887, 39

BÖESEKEN'S REAGENT

Use: Reagent for aldehydes and ketones.

Preparation: Mix 2 g. of phenylhydrazine with 20 ml. of water, and then pass washed sulfur dioxide through this mixture until any crystals which form redissolve. Add more water if necessary, and then filter to obtain a clear solution.

Remarks: This reagent reacts at once in the cold with aldehydes and ketones, and on warming, with insoluble carbonyl compounds to form pure hydrazones.

Ref. C. A. 5, 2078 (1911)

BOETTGER'S PAPER

See: Alkannin paper.

BOHLIG'S SOLUTION

Use: Test reagent for ammonia and ammonium salts.

Preparation:

Solution A: Dissolve 3 g. of mercuric chloride in 90 ml. of water.

Solution B: Dissolve 2 g. of potassium carbonate in 100 ml. of water.

Remarks: Ammonia and ammonium carbonate form white precipitates with *Solution A*. Other ammonium salts precipitate when *Solution B* is added.

Ref. Zeitschr. anal. Chem. 32, 188 (1893)

BOHME'S REAGENT

Use: Test reagent for indole.

Preparation:

Solution A: Dissolve 4 g. of p-dimethylaminobenzaldehyde in 380 g. of 96 per cent alcohol and 80 g. of hydrochloric acid.

Solution B: Prepare a saturated solution of potassium persulfate in water.

Procedure for Test: Add 5 ml. of *Solution A* and 5 ml. of *Solution B* to 10 ml. of the liquid to be tested. A red color develops if indole is present.

Ref. Zentr. Bakt. Parasitenk. 1905, 131

BÖHMER'S HEMATOXYLIN

Use: Basis for other staining solutions.

Preparation: Dissolve 10 g. of hematoxylin in 90 g. of alcohol.

BÖHMER'S HEMATOXYLIN-ALUM

Use: A stain for nuclei.

Preparation: Dissolve 1 g. of hematoxylin in 10 ml. of alcohol, and mix with a solution prepared by dissolving 10 g. of potassium alum in 200 ml. of water.

Ref. Biol. Stains, Conn p. 184

BOKARIUS' REAGENT

Use: Reagent for sperm.

Preparation:

Solution 1: Dissolve 2 g. of gum arabic and 3 g. of cadmium iodide in 25 g. of a concentrated solution of picric acid in water.

Solution 2: Add picric acid to 50 per cent acetic acid until the solution is saturated.

Solution 3: Prepare a concentrated aqueous solution of phosphotungstic acid. Acidify with acetic acid if necessary.

Ref. Apoth. Ztg. 1907, 302

BORAX-CARMINE

See: Grenacher's alcoholic borax-carmine.

BORDEAUX INDICATOR SOLUTION

Use: Indicator for the titration of bromide by bromate.

Preparation: Dissolve 0.1 g. of the dye in 100 ml. of water.

Remarks: The free bromine formed at the end-point of the titration of bromide by bromate decolorizes the dye. This is not a reversible indicator since the dye is destroyed by free bromine.

Ref. J. Am. Chem. Soc. **53**, 2091 (1931)

BORDEAUX RED SOLUTION

Use: Staining solution.

Preparation: Dissolve 1 g. of Bordeaux red in 100 ml. of water.

Remarks: This solution is used as a plasma stain.

Ref. Biol. Stains, Conn p. 50

BORDE'S REAGENTS

Use: Reagents for the determination of the iodine number.

Preparation:

Solution A: Dissolve 18.8 g. of antipyrine in 1 liter of 75 to 95 per cent alcohol.

Solution B: Dissolve 5 g. of iodine in 100 ml. of 95 per cent alcohol, and standardize against the antipyrine solution.

Solution C: Dissolve 6 g. of mercuric chloride in 100 ml. of 80 to 95 per cent alcohol.

Remarks: One ml. of antipyrine solution = 0.0254 g. of iodine.

Ref. Bull, trav. soc. pharm. Bordeaux 16, 654 (1909)

BORDET-GENGOU MEDIUM

Use: For the cough-plate method of isolating B. pertussis.

Preparation: Grind 500 g. of peeled potatoes in a meat grinder and add to 1 liter of distilled water. Now add 80 ml. of glycerol and mix well in a flask. Place in an Arnold sterilizer for 1 hour. After sterilization, place the material in a cheese-cloth bag or a small press and separate the fluid. To each 500 ml. of the fluid add 1500 ml. of 0.6 per cent sodium chloride solution and 60 g. of agar. Heat until the agar is dissolved. An autoclave may be used for this purpose. Place in a steam sterilizer at 100° C. for 1 hour on each of three successive days. After the final heating period, cool to 42° C. and add from 5 to 10 per cent of fresh, sterile citrated horse blood. The blood should not be more than 72 hours old. Defibrinated rabbit blood may also be used.

Ref. Kolmer and Boerner, p. 370

BORIC ACID TITRATION MIXTURE

See: Gilmour's reagent.

BORINSKI'S REAGENT

Use: Reagent for peroxidases in milk.

Preparation: Dissolve 0.85 g. of finely powdered guaiac resin in 85 g. of 70 per cent alcohol by shaking from ½ to 1 hour, and then add 10 ml. of dilute phenol and 5 ml. of 3 per cent hydrogen peroxide.

Procedure for Test: Mix 10 drops of the reagent with 5 ml. of raw milk. Peroxidases cause the appearance of a bright blue color.

Sensitiveness: 1 part of raw milk in 10 parts of pasteurized milk can be detected.

Ref. C. A. **20**, 3752 (1926)

BORNEOLGLYCURONIC ACID REAGENT

Use: Test reagent for zinc.

Preparation: Dissolve 5 g. of borneolglycuronic acid in 100 ml. of water.

Remarks: This reagent precipitates zinc. Cadmium is about the only common metal that interferes.

Sensitiveness: 0.03% zinc.

Ref. Ind. Eng. Chem., Anal. Ed. **5**, 26 (1933)

BÖTTGER'S REAGENT

Use: Test reagent for nitrites.

Preparation: Dissolve 1 g. of starch in 200 ml. of water containing 1 g. of hydrochloric acid, and add 10 g. of calcium carbonate. Then add 10 g. of sodium chloride and 0.5 g. of cadmium iodide. Finally, dilute to 250 ml.

Remarks: Reagent is colored blue by nitrites.

Ref. The Merck Index, p. 656

BOUGAULT'S REAGENT (ARSENIC)

Use: Reagent for the nephelometric determination of arsenic.

Preparation: Dissolve 20 g. of sodium hypophosphite in 20 ml. of distilled water, add 200 ml. of concentrated hydrochloric acid, and filter through cotton. Allow to stand in a cool place and again filter. The reagent must be clear.

Remarks: This reagent reduces arsenic pentachloride in a strongly acid solution. It also reduces many organic substances to give a brown color, and so can be used only in the absence of these substances.

Ref. Snell I, pp. 243-4

BOUGAULT'S REAGENT (SODIUM)

Use: Test reagent for sodium.

Preparation: Heat 1 g. of antimony trichloride with 10 ml. of 33 per cent potassium carbonate solution and 45 ml. of 3 per cent hydrogen peroxide. Cool and filter.

Remarks: Reagent precipitates sodium.

Ref. J. pharm. chim. 1905, 437

BOUIN'S FLUID

Use: Fixative.

Preparation: Mix the following:

Picric acid, sat. aq. soln.	75 ml.
Formaldehyde soln.	25 ml.
Acetic acid, glacial	4 ml.

Ref. Kolmer and Boerner, p. 807

BOUMAN'S REAGENT

Use: Reagent for the estimation of indican in urine.

Preparation: Dissolve 0.02 g. of isatin in 1 liter of iron-free hydrochloric acid.

Ref. Zeitsch. physiol. Chem. **32**, 82

BOUREAU'S REAGENT

Use: Test reagent for albumin in urine.

Preparation: Dissolve 6 g. of phenolsulfonic acid and 2 g. of sulfosalicylic acid in 40 ml. of water.

Procedure for Test: Add 1 drop of the reagent to 1 ml. of urine. A white precipitate forms if albumin is present.

Ref. Bull. soc. chim. 17, 674

BOUTRON-BOUDET'S SOAP SOLUTION

Use: Determination of hardness of water.

Preparation:

Solution A: Dissolve 40 g. of pure castile soap in 1 liter of 56 per cent alcohol.

Solution B: Dissolve 0.59 g. of barium nitrate in 1 liter of water.

Adjust the soap solution so that 2.4 ml. gives a permanent lather with 40 ml. of the barium nitrate solution. 2.4 ml. of such soap solution is equivalent to 220 parts per million of hardness (calculated as calcium carbonate for a 40 ml. sample).

Ref. Handbook of Chem. and Physics, p. 1308

BRAIN ASCITIC AGAR

Use: Culture medium.

Preparation: Dissolve 8 g. of agar in 1 liter of glucose broth. Use heat if necessary, and then sterilize in an autoclave at 15 pounds pressure for 20 minutes. Place 3 cubes of calf brain (cut into 1 cm. cubes) into each of several 200-mm. tubes and add a few fragments of marble to each. Sterilize in an autoclave at 15 pounds pressure for 20 minutes.

Now liquefy the agar and cool to 50° C. Add aseptically 200 ml. of ascitic fluid and mix well. Pour this mixture aseptically into the previously sterilized tubes until each is about half filled.

BRAIN HEART INFUSION BROTH

Use: Culture medium.

Preparation: Mix 200 g. of finely minced calf brain, free from fat, and 250 g. of beef heart, also finely minced and free from fat, with 1 liter of distilled water. Place this mixture in a refrigerator for 12-24 hours. Skim off any fat that may be present and strain through cheese-cloth. Squeeze the meat as dry as possible. Approximately 1 liter of the liquid should be recovered. Add to this liquid 10 g. of peptone, 5 g. of sodium chloride, and 2.5 g. of disodium phosphate ($Na_2HPO_4 \cdot 12H_2O$), and heat gently until solution is complete. Finally, add 2 g. of glucose, and add distilled water, if necessary, to make the total volume of the solution 1 liter. Adjust the reaction to pH 7.6. Filter and heat in an autoclave at 15 pounds pressure for 20 minutes. The final pH should be 7.4.

Ref. Arch. Internal Med. 32, 828 (1923)

BRANT'S REAGENT

Use: Reagent for solanine and solanidine.

Preparation: Dissolve 3 g. of sodium selenate in 80 ml. of water and 60 ml. of sulfuric acid.

Procedure for Test: Add a little solanine or solanidine to 15 ml. of the reagent and warm until a reddish color appears. When the flame is removed the color deepens to a raspberry-red.

Sensitiveness: Solanine: 0.025 mg.
Solanidine: 0.01 mg.

Ref. Zeitschr. anal. Chem. 1882, 620

BRAZILIN PAPER

Use: Indicator.

Preparation: Impregnate filter paper with an alcoholic or aqueous solution of brazilin and then dry.

Remarks: Store in the dark.

Colors: Acids: Yellow.
Bases: Red.

BRAZILIN SOLUTION (MAWAS)

Use: Reagent for iron in tissues.

Preparation: Dissolve 0.5 g. of brazilin in 100 g. of water or alcohol.

Remarks: Iron produces a dark brown color. Nuclei are stained violet-red.

Ref. C. A. 13, 2689 (1919)

BREINL'S REAGENT

See: Fleig's reagent (blood).

BRILLIANT GREEN AGAR

Use: For the isolation of B. Typhosus and B. Paratyphosus.

Preparation:

Solution A: Dissolve 30 g. of agar in 1 liter of distilled water.

Solution B: Mix the following and heat in a sterilizer until solution is complete:

Meat extract	6 g.
Sodium chloride	10 g.
Peptone	20 g.
Distilled water	1 liter

Mix *Solution A* and *Solution B* and boil for 30 minutes. Then add 1 *N* sodium hydroxide solution until the reaction is neutral to Andrade's indicator. Cool, and add beaten egg white and then boil. Filter the resulting liquid until clear. Bottle in 100 ml. portions and heat in an autoclave at 15 pounds pressure for 20 minutes.

To Use: Melt the contents of the bottles and to each add aseptically the following:

Andrade's indicator, sterile	1 ml.
Aqueous solution containing 2% glucose and 20% lactose, sterile	5 ml.
Brilliant green solution, 0.1% aq. soln.	0.2 ml.

Mix well and pour thick into plates. These should be dry, and no more than 6 should be prepared from each 100 ml. (1 bottle).

Ref. J. Infectious Diseases **18**, 1 (1916); **23**, 275 (1918)

BRILLIANT GREEN BILE

Use: Culture medium for colon bacilli in milk and water.

Preparation: Mix 50 g. of dried ox-gall and 10 g. of peptone with 1 liter of distilled water and boil in a double boiler for 1 hour. Next add 10 g. of powdered lactose and 10 ml. of a 1 per cent solution of brilliant green. Tube and heat in an autoclave at 10 pounds pressure for 15 minutes.

Ref. Am. J. Public Health **10**, 874 (1920); Stain Tech. **1**, 129 (1926)

BRILLIANT GREEN LACTOSE BILE AGAR

Use: Culture medium.

Preparation: Add 20.3 g. of Difco Special Agar to 947 ml. of distilled water and heat until melted. Make up any loss in volume due to evaporation with distilled water, and to each liter of the melted agar add the following ingredients:

Lactose C. P.	3.80 g.
Peptone, Difco	10.50 g.
Ox-gall, Difco, 0.05% aq. soln.	11.80 ml.
Sodium sulfite, anhyd. C. P., fresh 10% aq. soln.	4.10 ml.
Basic fuchsin, 4.25% soln.	3.65 ml.
Brilliant green, 0.001% soln	5.90 ml.
Ferric chloride, 1.0% soln.	5.90 ml.
Phosphate buffer soln.	0.90 ml.
Erioglaucine, 2.2% aq. soln.	5.90 ml.

When the ingredients listed above have dissolved in the agar, bottle and heat in an autoclave at 15 pounds pressure for 15 minutes. Cool and store in an ice-box.

Note: Preparation of the phosphate buffer solution: Dissolve 34 g. of potassium dihydrogen phosphate in 500 ml. of distilled water, and adjust the reaction to pH 7.2 with *N* sodium hydroxide solution. Dilute this solution to 1 liter with distilled water.

Ref. J. Am. W. W. Assoc., **27**, 108 (1935); A.P.H.A. pp. 263-266

BROMCHLOROPHENOL BLUE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of bromchlorophenol blue (dibromodichlorophenolsulphonphthalein) in 8.6 ml. of *N*/50 sodium hydroxide solution and dilute with water to 250 ml.

Remarks: pH: yellow 3.2-4.8 blue.

BROMCRESOL GREEN INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of bromcresol green (tetrabromo-m-cresolsulphonphthalein) in 7.15 ml. of *N*/50 sodium hydroxide solution and dilute with water to 250 ml.

Remarks: pH: yellow 3.8-5.4 blue.

Ref. U. S. Public Health Repts. **41**, 3051

BROMCRESOL GREEN INDICATOR SOLUTION

Use: Adsorption indicator for titration of chloride with standard mercurous nitrate.

Preparation: Dissolve 0.1 g. of bromcresol green in 100 ml. of 20 per cent alcohol.

Ref. J. Am. Chem. Soc. **56**, 1891 (1934)

BROMCRESOL PURPLE MILK

See: Litmus milk.

BROMCRESOL PURPLE INDICATOR SOLUTION

Use: Indicator for the preparation of culture media.

Preparation: Dissolve 1.6 g. of bromcresol purple in 100 ml. of alcohol.

Remarks: Use 1 ml. of indicator with each liter of medium unless otherwise indicated.

Ref. Stitt, pp. 39-40

BROMCRESOL PURPLE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of bromcresol purple (dibromo-o-cresolsulphonphthalein) in 9.25 ml. of *N*/50 sodium hydroxide solution and dilute with water to 250 ml.

Remarks: pH: yellow 5.2-6.8 purple.

Ref. Kolthoff and Furman, p. 60

BROMINE IN CARBON TETRACHLORIDE

Use: Test reagent for unsaturated hydrocarbons.

Preparation: Dissolve 2 ml. of bromine in 50 ml. of carbon tetrachloride.

Remarks: Solution is decolorized by unsaturated hydrocarbons.

BROMPHENOL BLUE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of bromphenol blue (tetrabromophenolsulphonphthalein) in 7.45 ml. of *N*/50 sodium hydroxide solution and dilute with water to 250 ml.

Remarks: pH: yellow 3.0-4.6 blue.

BROMPHENOL RED INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of bromphenol red (dibromophenolsulphonphthalein) in 9.75 ml. of $N/50$ sodium hydroxide solution and dilute with water to 250 ml.

Remarks: pH: yellow 5.2-7.0 red.

Ref. U. S. Public Health Repts. **41**, 3051

BROMTHYMOL BLUE INDICATOR SOLUTION

Use: Indicator.

Preparation:

Aqueous: Dissolve 0.1 g. of bromthymol blue (dibromothymolsulphonphthalein) in 8.0 ml. of $N/50$ sodium hydroxide and dilute with water to 250 ml.

Alcoholic: Dissolve 0.1 g. of bromthymol blue in 100 ml. of 50 per cent alcohol.

Remarks: pH: yellow 6.0-7.6 blue.

Ref. Kolthoff and Furman, p. 60

BROMTHYMOL BLUE INDICATOR SOLUTION

Use: Indicator for the preparation of culture media.

Preparation: Dissolve 1.6 g. of bromthymol blue in 100 ml. of alcohol.

Remarks: Use 1 ml. of the indicator solution for each liter of the medium unless otherwise indicated.

Ref. Kolthoff and Furman, p. 60

BRONSTEIN-GRUNBLATT'S REAGENT

Use: Reagent for differentiating between diphtheria and pseudodiphtheria.

Preparation:

Solution A: Dissolve 2 g. of indigo-carmine in 100 ml. of water.

Solution B: Dissolve 10 g. of fuchsin S in 100 ml. of 1 per cent potassium hydroxide solution.

Procedure for Test: Mix 2 ml. of *A* with 1 ml. of *B* and 22 ml. of distilled water. Now add 3 drops of the reagent to 5 ml. of nutrient bouillon. A neutral bouillon is colored blue by the reagent, but if diphtheria bacilli are present the bouillon turns a ruby-red. With pseudodiphtheria a green color is obtained.

Ref. Zentr. Bakt. Parasitenk., Abt. I, 32, 425 (1902)

BRUCINE REAGENT (NITRATE)

Use: Reagent for the determination and detection of nitrates.

Preparation:

Qualitative Reagent: Dissolve 0.02 g. of brucine in 100 g. of concentrated sulfuric acid.

Quantitative Reagent: Dissolve 5 g. of brucine in 100 g. of chloroform.

Remarks: Brucine is very poisonous, *handle carefully.*

Procedure for Use: Add 1 drop of the reagent to 1 drop of the solution to be tested on a spot plate. With nitrate a deep red color appears, but this changes to yellow in a short time. This yellow color may be used for the colorimetric determination of nitrates. The addition of stannous chloride causes a violet color.

Ref. Snell I, p. 635; C. A. 23, 4645 (1929); 27, 5022 (1933)

BRUCINE SOLUTION (TIN)

Use: Test reagent for stannous tin.

Preparation: Dissolve 0.1 g. of brucine in 1 ml. of cold nitric acid and 50 ml. of water, and then heat to boiling for 15 minutes. A yellow solution is obtained.

Remarks: Test reagent is colored reddish-violet by solutions of stannous salts.

Ref. Rev. intern. falsific. 1895, 98

BRÜCKE'S REAGENT (PROTEIN)

See: Potassium mercuric iodide reagent (Brücke).

BRÜCKNER'S REAGENT

Use: Reagent for glycogen.

Preparation: Saturate a hot 10 per cent solution of potassium iodide with mercuric iodide. Cool and decant the liquid from the crystals and add a little potassium iodide.

Remarks: Protect this solution from light.

Ref. Biochem. Zeitschr. 270, 346 (1934)

BRUNN'S GLUCOSE MEDIUM

Use: Medium for mounting sections on slides.

Preparation: Dissolve 240 g. of glucose in 840 ml. of distilled water with gentle heating, and add 60 ml. of spirit of camphor and 60 ml. of glycerol. Filter.

Ref. Kolmer and Boerner, p. 805

BRUNNER'S REAGENT

Use: Test reagent for urine.

Preparation:

Solution A: Dissolve 0.5 g. of p-aminoacetophenone in 50 ml. of hydrochloric acid and 1 liter of water.

Solution B: Dissolve 1 g. of sodium nitrite in 200 ml. of water.

Procedure for Test: To use, mix 100 ml. of *A* with 2 ml. of *B*. Now mix 10 ml. of the urine to be examined with 10 ml. of the reagent and shake with 2.5 ml. of ammonia. A ruby-red color develops if the urine is taken from a person having typhus fever or abdominal typhoid.

Ref. Chem.-Ztg. 1899, Rep. 304

BUFFER SOLUTIONS[1]

Use: For the determination of pH values of solutions.

Reagents:

M/5 Potassium Chloride: Recrystallize pure potassium chloride three or four times from water and dry at 120° C. for two days. Dissolve 14.912 g. of the salt in sufficient distilled water to make exactly 1 liter of solution.

M/5 Acid Potassium Phthalate Solution: Use Bureau of Standards grade acid potassium phthalate, standard sample No. 84. Dry to constant weight at 110-115° C. Dissolve 40.836 g. of the salt in sufficient distilled water to make 1 liter of solution.

M/5 Potassium Dihydrogen Phosphate: Recrystallize the salt three times from water and dry to constant weight at 110° C. Dissolve 27.232 g. of the salt in sufficient distilled water to make exactly 1 liter of solution. This solution should be distinctly red to methyl red and blue to bromphenol blue.

M/5 Boric Acid +M/5 Potassium Chloride: Recrystallize pure boric acid four times from distilled water and air-dry in thin layers between filter paper. Dissolve 12.405 g. of the acid and 14.912 g. of potassium chloride in sufficient distilled water to make exactly 1 liter of solution.

M/5 Sodium Hydroxide Solution: Dissolve 100 g. of pure caustic soda in 100 ml. of distilled water contained in a Pyrex Erlenmeyer flask. Cover the mouth of the flask with tinfoil and allow to stand overnight. Select a hardened filter paper to fit a Buchner funnel and treat with 1 : 1 caustic soda. After 10 minutes wash the paper, first with absolute alcohol, then with dilute alcohol, and finally with a large quantity of distilled water. Now fit the paper in the funnel and apply suction until most of the water is removed. Then by means of a glass rod pour the solution onto the paper. Dilute the filtrate to 2.5 liters, which makes the solution approximately normal. Titrate 10 ml. of this solution with standard acid, and then dilute the remainder to *N*/5 strength. Finally, titrate against 1.6 g. quantities of purified acid potassium phthalate, using phenolphthalein as an indicator until a faint but permanent pink color is obtained. A current of carbon dioxide-free air should be passed through the solution during the titration. Through-

[1]From: *The Determination of Hydrogen Ions*, W. M. Clark, Williams and Wilkins Company.

out the preparation of this solution avoid so far as possible contamination with carbon dioxide. Store the solution in a paraffined bottle. This is prepared as follows: in a bottle place a little paraffin and warm until it is melted. Then roll the bottle until the liquid is evenly distributed; and then, as the wax begins to solidify, turn the bottle upright so that a thick layer forms on the bottom.

M/5 Hydrochloric Acid: Dilute constant-boiling hydrochloric acid (See: Hydrochloric acid, volumetric reagent) to approximately *M*/5 and standardize with *M*/5 caustic soda.

Distilled Water: Use boiled and cooled redistilled water.

Preparation of Buffer Solutions: The reagents prepared above are used to make up the following solutions of definite pH values at 22° C.:

COMPOSITION OF MIXTURES GIVING VARIOUS pH VALUES

From Clark (1928), pp. 200-201

In all cases add boiled and cooled redistilled water to make 200 ml.

pH	1.2	M/5 KCl	50 ml.	M/5 HCl	64.5 ml.
"	1.4	"	50 ml.	"	41.5 ml.
"	1.6	"	50 ml.	"	26.3 ml.
"	1.8	"	50 ml.	"	16.6 ml.
"	2.0	"	50 ml.	"	10.6 ml.
"	2.2	"	50 ml.	"	6.7 ml.
pH	2.2	M/5 KH Phthalate	50 ml.	M/5HCl	46.70 ml.
"	2.4	"	50 ml.	"	39.60 ml.
"	2.6	"	50 ml.	"	32.95 ml.
"	2.8	"	50 ml.	"	26.42 ml.
"	3.0	"	50 ml.	"	20.32 ml.
"	3.2	"	50 ml.	"	14.70 ml.
"	3.4	"	50 ml.	"	9.90 ml.
"	3.6	"	50 ml.	"	5.97 ml.
"	3.8	"	50 ml.	"	2.63 ml.
pH	4.0	M/5 KH Phthalate	50 ml.	M/5 NaOH	0.40 ml.
"	4.2	"	50 ml.	"	3.70 ml.
"	4.4	"	50 ml.	"	7.50 ml.
"	4.6	"	50 ml.	"	12.15 ml
"	4.8	"	50 ml.	"	17.70 ml.
"	5.0	"	50 ml.	"	23.85 ml.
"	5.2	"	50 ml.	"	29.95 ml.
"	5.4	"	50 ml.	"	35.45 ml.
"	5.6	"	50 ml.	"	39.85 ml
"	5.8	"	50 ml.	"	43.00 ml.
"	6.0	"	50 ml.	"	45.54 ml.
"	6.2	"	50 ml.	"	47.00 ml.
pH	5.8	M/5 KH_2PO_4	50 ml.	M/5 NaOH	3.72 ml.
"	6.0	"	50 ml.	"	5.70 ml.
"	6.2	"	50 ml.	"	8.60 ml.
"	6.4	"	50 ml.	"	12.60 ml
"	6.6	"	50 ml.	"	17.80 ml.
"	6.8	"	50 ml.	"	23.65 ml.
"	7.0	"	50 ml.	"	29.63 ml.
"	7.2	"	50 ml.	"	35.00 ml.
"	7.4	"	50 ml.	"	39.50 ml.
"	7.6	"	50 ml.	"	42.80 ml.
"	7.8	"	50 ml.	"	45.20 ml.
"	8.0	"	50 ml.	"	46.80 ml.

COMPOSITION OF MIXTURES GIVING VARIOUS pH VALUES

From Clark (1928), pp. 200-201

In all cases add boiled and cooled redistilled water to make 200 ml.

pH					
7.8	M/5 H_3BO_3 + M/5 KCl	50 ml.	M/5 NaOH	2.61 ml.
8.0	"	50 ml.	"	3.97 ml.
8.2	"	50 ml.	"	5.90 ml.
8.4		50 ml.	"	8.50 ml.
8.6	"	50 ml.	"	12.00 ml.
8.8	"	50 ml.	"	16.30 ml.
9.0	"	50 ml.	"	21.30 ml.
9.2	"	50 ml.	"	26.70 ml.
9.4	"	50 ml.	"	32.00 ml.
9.6	"	50 ml.	"	36.85 ml.
9.8	"	50 ml.	"	40.80 ml.
10.0	"	50 ml.	"	43.90 ml.

BUFFER SOLUTIONS, McILVAINE'S SERIES

Use: Solutions for the determination of the hydrogen ion concentration of solutions.

Preparation:

0.2 M Disodium Phosphate Solution: Dissolve 145 g. of C.P. clear crystals of disodium phosphate in 2 liters of carbon dioxide-free water. To 10 ml. of this solution add 1 drop of methyl orange indicator and titrate with 0.1 *N* hydrochloric acid until the color matches that shown by 30 ml. of a solution prepared by dissolving 2.28 g. of monopotassium phosphate and 1 g. of C.P. sodium chloride in 250 ml. of water. Adjust the disodium phosphate solution to require 20 ml. of 0.1 *N* hydrochloric acid.

0.1 M Citric Acid Solution: Dissolve 45 g. of C.P. clear crystals of citric acid in water and dilute to 2 liters. To 10 ml. of this solution add phenolphthalein indicator and titrate with carbonate-free 0.1 N sodium hydroxide solution. Adjust the strength of the citric acid solution so that 30 ml. of the sodium hydroxide solution is required.

The above solutions may be preserved by adding about 0.1 per cent toluene.

To prepare the buffer mixtures of given pH, mix the two solutions as indicated in the following table:

BUFFER MIXTURES FOR pH 2.2-8.0

pH	ml. of 0.2 M Disodium Phosphate	ml. of 0.1 M Citric Acid
2.2	0.40	19.60
2.4	1.24	18.76
2.6	2.18	17.82
2.8	3.17	16.83
3.0	4.11	15.89
3.2	4.94	15.06
3.4	5.70	14.30
3.6	6.44	13.56
3.8	7.10	12.90
4.0	7.71	12.29

BUFFER MIXTURES FOR pH 2.2-8.0

pH	ml. of 0.2 M Disodium Phosphate	ml. of 0.1 M Citric Acid
4.2	8.28	11.72
4.4	8.82	11.18
4.6	9.35	10.65
4.8	9.86	10.14
5.0	10.30	9.70
5.2	10.72	9.28
5.4	11.15	8.85
5.6	11.60	8.40
5.8	12.09	7.91
6.0	12.63	7.37
6.2	13.22	6.78
6.4	13.85	6.15
6.6	14.55	5.45
6.8	15.45	4.55
7.0	16.47	3.53
7.2	17.39	2.61
7.4	18.17	1.83
7.6	18.73	1.27
7.8	19.15	0.85
8.0	19.45	0.55

Ref. J. Biol. Chem. **49**, 183-186 (1921); Chemist-Analyst **19**, No. 3, 8 (1930); Snell I, p. 677

BUFFER SOLUTIONS

Sørensen's Standard Buffer Solutions.

See: Standard phosphate solutions (Sørensen).

Palitzsch's Standard Buffer Solutions.

Ref. Clark, p. 213

McIlvaine's Standard Buffer Solutions.

Ref. Clark, p. 214

Cohn's System of Buffer Standards.

Ref. Clark, pp. 216-220

Kolthoff and Vleeschouwer Buffer Solutions.

Ref. Snell I, pp. 673-674

BURGESS REAGENT

Use: Reagent for aromatic compounds.

Preparation: Dissolve 10 g. of mercuric sulfate in 25 per cent sulfuric acid and then make up to 100 ml. with that reagent.

Procedure for Test: Place 2 ml. of the material to be tested in a small bottle and add 5 ml. of the reagent. Fit the bottle with a cork and shake vigorously. Note the color immediately after shaking and then after ten minutes.

Color reactions are obtained as follows:

Citral:	transient bright red color.
Anisaldehyde:	no reaction.
Cinnamaldehyde:	no reaction.
Benzaldehyde:	no reaction.
Citronella:	permanent yellow color.
Limonene:	flesh color which disappears.
Linalyl acetate:	brilliant violet color.
Linalool.	deep violet color.
Eugenol:	pale violet after a time.
Terpineol:	flesh color and precitate.
Oil of cassia:	yellow precipitate which floats.
Oil of cinnamon:	a brown substance.
Oil of cloves	a violet aqueous layer.

Ref. Analyst **25**, 265 (1900)

CACOTHELINE SOLUTION

Use: Test reagent for tin.

Preparation:

Synthesis of Cacotheline from Brucine: Add 4 g. of brucine to 10 ml. of concentrated nitric acid and 100 ml. of water and heat to boiling for 15 minutes. Cool and filter. Wash the residue, first with water, and then with alcohol, and finally dry over sulfuric acid in a vacuum desiccator.

Qualitative Reagent: This is a saturated aqueous solution of cacotheline.

Quantitative Reagent: Dissolve 0.25 g. of cacotheline in 100 ml. of water.

Procedure for Test: Place a drop of the reagent on drop-reaction paper and allow to dry a little. The spot should not become completely dry. Now place a drop of the solution to be tested in the center of the spot. A lavender color appears with stannous tin. Mercuric mercury, lead, bismuth, copper, cadmium, arsenic, and antimony do not interfere with this test. Sulfite and hydrosulfite ions give the same color. This color reaction is the basis of a method for the colorimetric determination of tin. Use a fresh solution.

Sensitiveness: 2: 1,000,000 in water.

Ref. C. A. **23**, 4644 (1929); Ind. Eng. Chem., Anal. Ed. **7**, 26 (1935); Snell I, p. 258

CADION 2(β) SOLUTION

Use: Test reagent for magnesium and cadmium.

Preparation: Dissolve 0.01 g. of cadion 2 β in 100 g. of 0.01 per cent alcoholic potassium hydroxide solution.

Procedure for Test: Make 10 ml. of the solution to be tested slightly acid with acetic acid and then add about 5 drops of the reagent. Now add 2 *N* potassium hydroxide until the mixture is distinctly alkaline. A blue precipitate or bluish-green color forms if magnesium is present.

Both cadmium and magnesium can be detected in the same solution by changing the conditions somewhat. Add 0.25 g. of sodium potassium tartrate to 10 ml. of the solution to be tested and then add 5 drops of the reagent. This is followed by the addition of 2 *N* potassium hydroxide. A pink color appears if cadmium is present. The color caused by cadmium is destroyed by boiling, but if magnesium is present a bluish-green color appears.

Ref. C. A. 32, 6578 (1938)

CADMIUM ACETATE IN ACETIC ACID

See: Heyn-Bauer's reagent.

CADMIUM CHLORIDE SOLUTIONS

Reagent: $CdCl_2$, mol. wt. = 183.32, or
$CdCl_2 \cdot 2\frac{1}{2}H_2O$, mol. wt. = 228.36.

Preparation:

0.5 Molar: Dissolve 91.7 g. of $CdCl_2$ or 114.2 g. of the hydrated salt in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of cadmium ion per ml. of solution: Dissolve 16.5 g. of $CdCl_2$ or 20.2 g. of the hydrated salt in water and dilute to 1 liter.

CADMIUM NITRATE SOLUTIONS

Reagent: $Cd(NO_3)_2 \cdot 4H_2O$, mol. wt. = 308.49.

Preparation:

0.5 Molar: Dissolve 154.5 g. of cadmium nitrate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of cadmium ion per ml. of solution: Dissolve 27.5 g. of cadmium nitrate in water and dilute to 1 liter.

CADMIUM SULFATE SOLUTIONS

Reagent: $CdSO_4 \cdot 4H_2O$, mol. wt. = 280.53.

Preparation:

0.5 Molar: Dissolve 140.3 g. of cadmium sulfate in water and dilute to 1 liter.

1.0 Normal: Same as 0 5 Molar.

10 mg. of cadmium ion per ml. of solution: Dissolve 24.9 g. of cadmium sulfate in water and dilute to 1 liter.

CALCIUM ACETATE SOLUTIONS

Reagent: $Ca(C_2H_3O_2)_2$, mol. wt. = 158.17 or $Ca(C_2H_3O_2)_2 \cdot H_2O$, mol. wt. = 176.18.

Preparation:

0.5 Molar: Dissolve 79.1 g. of $Ca(C_2H_3O_2)_2$ or 88.1 g. of the hydrated salt in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of calcium ion per ml. of solution: Dissolve 39.6 g. of $Ca(C_2H_3O_2)_2$ or 44 g. of the hydrated salt in water and dilute to 1 liter.

CALCIUM CARBONATE BROTH

Use: Culture medium.

Preparation: To 100 ml. of meat infusion broth (pH 7.6) in small flasks, add 1 per cent of powdered calcium carbonate and 1 per cent glucose. The calcium carbonate should previously be sterilized by heating in a hot air oven at 160° C. for 1 hour.

The powdered calcium carbonate may be replaced by small pieces of marble. These should be sterilized at 100° C. for 15 minutes on each of three successive days.

Ref. Lab. Methods, U. S. Army, p. 580

CALCIUM CHLORIDE SOLUTIONS

Reagent: $CaCl_2$, mol. wt. = 110.99, or $CaCl_2 \cdot H_2O$, mol. wt. = 129.01, or $CaCl_2 \cdot 6H_2O$, mol. wt. = 219.09.

Preparation:

0.5 Molar: Dissolve 55.5 g. of $CaCl_2$, 64.5 g. of $CaCl_2 \cdot H_2O$ or 109.5 g. of $CaCl_2 \cdot 6H_2O$ in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of calcium ion per ml. of solution: Dissolve 27.8 g. of $CaCl_2$, 32.1 g. of $CaCl_2 \cdot H_2O$, or 54.8 g. of $CaCl_2 \cdot 6H_2O$ in water and dilute to 1 liter.

CALCIUM FERROCYANIDE REAGENT (GASPAR AND ARNAL)

Use: Test reagent for aluminum.

Preparation: Dissolve 20 g. of calcium ferrocyanide in 670 ml. of water and 400 ml. of either methyl or ethyl alcohol (96 per cent) and filter.

Remarks: This reagent precipitates aluminum, but does not precipitate beryllium.

Sensitiveness: 0.0002 g. of aluminum per ml.

Ref. C. A. 29, 1029 (1935)

CALCIUM HYDROXIDE SOLUTION

Reagent: $Ca(OH)_2$, mol. wt. = 74.09.

Preparation:

Saturated Solution: Dissolve about 1.7 g. of calcium hydroxide in 1 liter of water. Filter if not clear.

Remarks: Keep in tightly stoppered bottle.

CALCIUM NITRATE SOLUTIONS

Reagent: $Ca(NO_3)_2$, mol. wt. = 164.1 or
$Ca(NO_3)_2 \cdot 4H_2O$, mol. wt. = 236.16.

Preparation:

0.5 Molar: Dissolve 82 g. of $Ca(NO_3)_2$ or 118.1 g. of the hydrated salt in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of calcium ion per ml. of solution: Dissolve 41 g. of $Ca(NO_3)_2$ or 59 g. of the hydrated salt in water and dilute to 1 liter.

CALEY'S REAGENT

Use: Test reagent for sodium.

Preparation:

Solution A: Dissolve 4 g. of uranyl acetate and 3 g. of glacial acetic acid in water and dilute to 50 ml. Warm to 75° C. until solution is complete.

Solution B: Dissolve 20 g. of cobaltous acetate and 3 g. of glacial acetic acid in water and dilute to 50 ml. Warm to 75° C. until solution is complete.

Mix these warm solutions and allow to cool to 20° C. Let stand for 2 hours at room temperature and filter. Preserve the filtrate in a dry bottle.

Procedure for Test: Shake 20 ml. of the reagent with 1 ml. of the solution to be tested. A yellow precipitate forms if sodium is present.

Ref. J. Am. Chem. Soc. **51**, 1965 (1929)

CANDUSSIO'S REAGENT

Use: Test reagent for phenols.

Preparation: Dissolve 1 g. of potassium ferricyanide in 100 ml. of water, and add to this solution 10-20 per cent ammonia.

Remarks: Reagent gives colors and precipitates with various phenolic compounds.

Ref. Chem.-Ztg. **24**, 299 (1900)

CANFIELD'S REAGENT

Use: To show phosphorus segregation in steel.

Preparation: Dissolve the following in 12 ml. of hot water:

Nickel nitrate	5.0 g.
Cupric chloride	1.5 g.
Ferric chloride	6.0 g.

To this solution add 1 ml. of nitric acid and 150 ml. of methyl alcohol.

Ref. Metals Handbook, p. 729

CARBAZOLE SOLUTION (DISCHE)

Use: Reagent for lactic acid, methylglyoxal, and carbohydrates.

Preparation: Dissolve 0.5 g. of carbazole in 100 g. of ethyl alcohol.

Procedure for Test: Mix 1 ml. of lactic acid and 4 ml. of sulfuric acid and heat for 10 minutes in boiling water and then cool. Add 1 ml. of water and 0.1 ml. of the carbazole reagent. Again heat for 10 minutes. An olive-green color is produced.

Remarks: Aldehydes, α-hydroxy acids, and other compounds also give characteristic color reactions. Hexoses gives a red color.

Sensitiveness: Hexoses: 0.001%.
Lactic acid: 0.005%.

Ref. C. A. **22**, 559 (1928)

CARBOL CRYSTAL (GENTIAN) VIOLET (NICOLLE)

Use: Staining solution.

Preparation: Dissolve 1 g. of crystal violet (85% dye content) in 10 ml. of 95 per cent alcohol, and then add 100 ml. of 1 per cent phenol solution. Mix well and filter.

Ref. Muir, p. 104; Biol. Stains, Conn p. 126

CARBOL FUCHSIN (KINYOUN)

Use: Staining solution.

Preparation: Mix the following:

Basic fuchsin	4.0 g.
Phenol	8.0 g.
Alcohol, 95 per cent	20.0 ml.
Distilled water	100.0 ml.

Ref. Kolmer and Boerner, p. 396

CARBOL FUCHSIN (ZIEHL-NEELSEN)

Use: Staining solution for tubercle bacilli, leprosy bacilli, etc.

Preparation: Dissolve 0.3 g. of basic fuchsin (90% dye content) in 10 ml. of 95 per cent alcohol, and add 100 ml. of a 5 per cent aqueous solution of phenol. Mix well.

Ref. Kolmer and Boerner, pp. 395-396

CARBOL METHYLENE BLUE

See: Kühne's carbolic methylene blue.

CARBOL THIONIN (ROMEIS)

Use: Staining solution.

Preparation: Mix the following:

Thionin (90% dye content)	1.0 g.
Phenol	5 0 g.
Distilled water	100 ml.

Remarks: Filter before use, and dilute with an equal quantity of water.

Ref. Biol. Stains, Conn p. 75

CARBON MONOXIDE REAGENT (VAN SLYKE)

Use: Determination of carbon monoxide in blood (gasometric method of Van Slyke).

Preparation: Dissolve the following in water and dilute to 1 liter.

Saponin	3.0 g.
Potassium ferricyanide	8.0 g.
Lactic acid C. P.	4 0 ml.
Caprylic alcohol	3 0 ml.

Ref. Hawk and Bergeim, p. 513; J. Biol. Chem. **40**, 103 (1919), **49**, 1 (1921), **61**, 523 (1924)

CARLETTI'S REAGENT

Use: Reagent for mineral acids in vinegar or wine.

Preparation:

Solution A: Dissolve 5 g. of aniline in 20 ml. of glacial acetic acid and 75 ml. of water.

Solution B: Dissolve 1 g. of furfural in 100 ml. of 95 per cent ethyl alcohol.

Procedure for Test: Add 25 ml. of alcohol and a little activated charcoal to 50 ml. of material to be tested and shake well. Filter, and to 10 ml. of the decolorized filtrate add 5 drops of *Solution A*. Shake and add 5 drops of *Solution B*. No color change occurs if free mineral acids are present. A pink color develops if they are absent.

Ref. Zeitschr. anal. Chem. 1909, 310

CARMALUM (MAYER)

Use: Staining solution.

Preparation: Dissolve 1 g. of carminic acid and 10 g. of potassium alum in 200 ml. of distilled water, using heat if necessary. Filter, and add a few crystals of thymol, 1 ml. of formaldehyde, or 0.2 g. of salicylic acid as a preservative.

Ref. Biol. Stains, Conn p. 179

CARMINE RED REAGENT (ZORKIN)

Use: Reagent for boric acid.

Preparation: Dissolve 0.05 g. of carmine red in 100 g. of concentrated sulfuric acid.

Remarks: The red color of this solution is changed to blue by boric acid. Test is applicable to neutral salt solutions and minerals.

Sensitiveness: 0.018 mg. of boric acid per ml.

Ref. C. A. **31**, 2124 (1937)

CARMINIC ACID REAGENT (ALBUMIN)

Use: Test reagent for albumin.

Preparation: Dissolve 1 g. of carminic acid in 2 ml. of water.

Remarks: Solution produces black or red precipitates with albuminoses.

Sensitiveness: 1 : 90,000.

Ref. Petersburger med. Wochschr. 1897, 294

CARMINIC ACID REAGENT (LEAD)

Use: Test reagent for lead.

Preparation: Dissolve 0.5 g. of carminic acid in 100 ml. of dilute ammonium hydroxide solution.

Procedure for Test: Place two drops of the reagent on drop-reaction paper some distance apart and allow to dry. Add 1 drop of the solution to be tested to one drop and leave the other as a blank. Now develop both drops over ammonium hydroxide. If lead is present, a violet-blue colored spot remains after drying. It is best to add a few drops of water to the spot after the development with ammonia. Copper prevents this test, and silver, bismuth, and cadmium interfere, although the latter can be removed.

Sensitiveness: 0.001 mg.

Ref. C. A. **24**, 3965 (1930); Engelder, p. 113

CARNOY'S ALCOHOL-ACETIC ACID

Use: For fixing animal organisms and sections before staining with hematoxylin and other stains.

Preparation: Mix 25 ml. of glacial acetic acid with 75 ml. of absolute alcohol.

CARNOY'S FLUID 3:1

Use: Fixative.

Preparation: Mix 3 parts of absolute alcohol and 1 part glacial acetic acid.

Ref. (Farmer's Sol.) Biol. Stains, Conn p. 278

CARNOY'S FLUID 6:3:1

Use: Fixative.

Preparation: Mix the following:

Alcohol, absolute or 95%	6 parts
Chloroform	3 parts
Glacial acetic acid	1 part

Ref. Biol. Stains, Conn p. 278

CARNOY'S HARDENING SOLUTION

Use: For hardening microscopic preparations.

Preparation: Dissolve 2 g. of chromic acid, 0.6 g. of osmic acid, and 6 g. of acetic acid in 130 ml. of water.

CARNOY-LeBRUN'S FLUID

Use: Fixative.

Preparation: Saturate with mercuric chloride a mixture composed of equal parts of absolute alcohol, glacial acetic acid, and chloroform.

CARO'S SOLUTION

Use: Oxidizing agent.

Preparation: Dissolve potassium persulfate in concentrated sulfuric acid until the solution is saturated.

CARPENÉ'S SOLUTION

Use: Reagent for the determination of tannin in wine.

Preparation: Dissolve 20 g. of zinc acetate in 80 ml. of water and add 12 ml. of a solution prepared by neutralizing glacial acetic acid with ammonium hydroxide. Finally, add 8 ml. of ammonium hydroxide.

Remarks: With tannin this reagent forms a precipitate which is insoluble in water and ammonium hydroxide.

Ref. Sutton, p. 423

CARREL-DAKIN SOLUTION

Use: A surgical antiseptic, germicide, and disinfectant.

Preparation: Mix 15.4 g. of chlorinated lime *U.S.P.* (30% available chlorine), 7.7 g. of anhydrous sodium carbonate, and 6.4 g. of sodium bicarbonate with 1 liter of water.

Ref. C. A. 11, 1857 (1917)

CASARES-GIL FLAGELLA STAIN (PLIMMER-PAINE)

Use: Staining solution.

Preparation:

Mordant: Mix the following in a beaker:

Tannic acid	10.0 g.
Aluminum chloride, hydrated	18.0 g.
Zinc chloride	10.0 g
Basic fuchsin	1.5 g.

Add 10 ml. of 60 per cent alcohol, and then slowly add an additional 30 ml. of alcohol until the solids have dissolved.

Stain: Use carbol fuchsin.

Remarks: Place a drop of the bacterial suspension on a warm slide which is so inclined that the liquid runs down it and is so dried. Dilute the mordant with an equal quantity of water. Filter off the precipitate and collect the filtrate on the slide. Allow it to act for 60 seconds, after which the slide is flooded with carbol fuchsin for 5 minutes. Wash and dry.

Ref. Kolmer and Boerner, p. 399

CASEIN SOLUTION

Use: Experiments on casein. Also used for the determination of peptic activity by the method of Volhard and Löhlein.

Preparation: Place 100 g. of casein in a 2 liter flask and add 1 liter of water. Shake well and allow to stand for several hours. Next add 80 ml. of 1.0 *N* sodium hydroxide solution, make up to 2 liters with water, and then warm slowly until the solution is clear. Heat rapidly to 85°-90° C., and preserve in stoppered bottles with a little toluene. The purpose of the rapid heating is to destroy proteases.

Ref. Hawk and Bergeim, p. 301

CASOLORI'S REAGENT

Use: Test reagent for thiosulfate.

Preparation: Dissolve 5 g. of sodium nitroprusside in 95 ml. of water and allow to stand exposed to light and air until the solution is brown in color. The standing period may be eliminated by adding 2 drops of a solution of potassium ferricyanide and 1 drop of sodium hydroxide solution.

Procedure for Test: Filter the reagent and add a few drops to the solution to be tested. A blue color forms with 0.1 *N* thiosulfate. With 0.01 *N* thiosulfate the color is green and does not appear for 30 minutes. Sulfites and tetrathionates do not give this reaction.

Ref. C. A. 6, 2632 (1911)

CASPARIS' REAGENT

Use: Test reagent for lignified cell membranes.

Preparation: Dissolve cobalt thiocyanate in water (a mixture of cobalt chloride and potassium thiocyanate may be used) and dilute with water until the color of the solution is between violet and violet-red.

Remarks: Lignified cell membranes are stained blue with this reagent.

Ref. C. A. 15, 1333 (1921)

CAUSSE'S REAGENT

Use: Reagent for the determination of reducing sugars.

Preparation: To 10 ml. of Fehling's solution, add 4 ml. of a 5 per cent solution of potassium ferrocyanide and 20 ml. of water.

Remarks: When the sugar solution is run into the boiling reagent, the cuprous oxide dissolves as rapidly as it is formed, thus permitting an accurate observation of the point of decolorization.

Ref. Bull. soc. chim. **50**, 625 (1899)

CAVALLI'S REAGENT

Use: Test reagent for cottonseed oil in olive oil.

Preparation: Mix 15 ml. of concentrated sulfuric acid with 20 ml. of water, and in this solution dissolve 2 g. of resorcinol.

Procedure for Test: Mix 5 ml. of the reagent with 5 ml. of the olive oil to be tested and shake well. Then warm to 50° C. If cottonseed oil is present the following color changes occur: first the liquid is colored pink, then green, and finally blue. Pure olive oil eventually becomes gray when treated with the reagent. Mixtures of the oils turn violet.

Ref. Zeitschr. Untersuch. Nahr.-u Genussm. 1898, 119

CAZENEUVE'S REAGENT (METALS)

See: Diphenylcarbazide reagent.

CAZENEUVE'S REAGENT (OXYGEN)

See: *m*-Phenylenediamine solution.

CELSI'S REAGENT

Use: Test reagent for potassium.

Preparation:

Solution A: Dissolve 7 g. of cobalt nitrate in 50 ml. of 80 per cent methyl alcohol.

Solution B: Dissolve 19 g. of sodium thiosulfate in 50 ml. of water.

Procedure for Test: Add 1 drop of *Solution A* and 1 drop of *Solution B* to 10 ml. of methyl alcohol and wait until a violet color develops. Then add a few drops of the solution to be tested. A sky-blue precipitate indicates the presence of potassium.

Ref. C. A. **28**, 3026 (1934)

CERDEIRAS REAGENT

Use: Reagent for volatile oils.

Preparation: Dissolve 0.5 g. of vanillin in a little ethyl alcohol and then add hydrochloric acid (sp. gr. 1.10) until the total weight is 100 g.

Procedure for Test: Add 1 drop of the oil to be tested to 5 ml. of the reagent and shake well. Allow to stand at room temperature for 15 minutes in a dark place. Next heat for 5 minutes in a bath of boiling water and allow to cool. Shake the mixture with a little chloroform and observe the color of the chloroform layer.

Remarks: The reagent must be freshly prepared.

Ref. C. A. 8, 2774 (1914)

CERIC SULFATE SOLUTION (VOLUMETRIC REAGENT)

Reagent: $Ce(SO_4)_2 \cdot 2(NH_4)_2SO_4 \cdot 2H_2O$, mol. wt. = 632.53, or
$Ce(SO_4)_2$, mol. wt. = 332.25, or
CeO_2, mol. wt. = 172.13.

Preparation:

0.1 Normal (standardized):

Method 1: Dissolve 65 g. of ceric ammonium sulfate or 34 g. of ceric sulfate in a solution prepared by mixing 28 ml. of concentrated sulfuric acid with 500 ml. of water. Stir until solution is complete and add 500 ml. of distilled water.

Method 2: Place 35 g. of ceric oxide in a 600 ml. beaker and add 46 ml. of concentrated sulfuric acid. Carefully add 50 ml. of water and boil for 5 minutes. Cool a little and carefully add 450 ml. of distilled water. Allow to stand until solution is complete. Filter if the solution is not clear and dilute to 1 liter.

To Standardize: The solutions prepared above are only approximately 0.1 *N* and must be standardized before use. Arsenious oxide is usually used for this purpose. The standardization is carried out as follows:

Weigh accurately 0.15 to 0.20 g. of pure dry arsenious oxide, and transfer completely to a 250 ml. Erlenmeyer flask. Add 15 ml. of 2 *N* sodium hydroxide solution and heat gently to hasten solution. Cool to room temperature and add 25 ml. of 1 : 5 sulfuric acid. Now dilute to 100 ml. and add 3 drops of 0.01 *M* osmium tetroxide solution as a catalyst and 1 drop of ferrous-phenanthroline indicator solution. Finally, titrate this solution with the 0.1 *N* ceric sulfate solution (prepared by either *Method 1* or *2*) until the orange color changes sharply to colorless or pale blue.

Iodine monochloride may be used as a catalyst as follows: dissolve the arsenious oxide as described above, and add 20 ml. of concentrated hydrochloric acid. Dilute to 100 ml. and add 2.5 ml. of the iodine monochloride solution and 1 drop of the ferrous-phenanthroline indicator. Titrate until the orange color begins to fade and returns only slowly after the addition of each drop of ceric sulfate solution. Now heat the solution to 50° C. and continue the addition of the ceric sulfate drop by drop until the color is completely discharged and does not return within one minute.

Directions for preparing the osmium tetroxide and iodine monochloride solutions are given elsewhere in this book.

Ref. Kolthoff and Sandell, pp. 581-583; Kolthoff and Furman, pp. 491-495; J. Am. Chem. Soc. 50, 755, 1222, 1334, 1368, 1372, 1379, 1675 (1928)

CESIUM CADMIUM IODIDE REAGENT (ALKALOIDS)

See: Kerbosch's Reagent.

CESIUM CHLORIDE SOLUTION (KRATZMAN)

Use: Reagent for micro-test for aluminum in plants.

Preparation: Mix 1 ml. of 33.6 per cent cesium chloride solution with 1 ml. of 39.2 per cent sulfuric acid.

Procedure for Test: Ash the plant and add a few drops of the reagent to the residue. Characteristic cesium alum crystals form if aluminum is present in the ash.

Ref. Mikrokosmos **28**, 60 (1924-1925)

CHAMPY'S FLUID

Use: Fixative.

Preparation: Mix the following:

Potassium dichromate, 3% aq. soln.	7 parts
Chromic acid, 1% aq. soln.	7 parts
Osmic acid, 2% aq. soln.	4 parts

Ref. Biol. Stains, Conn p. 278

CHIAROTTINO'S REAGENT

Use: Test reagent for cobalt.

Preparation: Dissolve 0.5 g. of benzidine and 0.25 g. of dimethylglyoxime in 100 ml. of 95 per cent alcohol.

Remarks: This reagent causes a beautiful orange-red color with solutions of cobalt salts.

Nickel, copper, and chromium, interfere since they give precipitates with the reagent.

Sensitiveness: As little as 0.01 mg. of cobalt can be detected with this reagent.

Ref. C. A. **27**, 2396 (1933)

CHLORAL HEMATOXYLIN SOLUTION

Use: Staining solution.

Preparation: Add 8 g. of potassium alum and 0.2 g. of hematoxylin to 250 ml. of distilled water and boil for 5-10 minutes. Cool, and add 6 g. of chloral hydrate. Pour into a bottle and allow to stand for a week or two while the hematoxylin is oxidized. This may be hastened by the addition of 1-2 ml. of hydrogen peroxide.

Remarks: Solutions that have been prepared for some time often contain a precipitate which should be filtered off before use.

CHLORAL HYDRATE REAGENT (ROSSI)

Use: Reagent for the alkaloid yohimbine.

Preparation: Dissolve 2 g. of chloral hydrate in 10 ml. of alcohol and add 20 ml. of concentrated sulfuric acid.

Procedure for Test: Add 3 drops of the reagent to a small quantity of the alkaloid on a watch glass and warm on a water bath. A blue color forms if yohimbine is present.

Ref. C. A. **26**, 5703 (1932), **26**, 146-148 (1932)

CHLORAMINE T SOLUTION (BERTHELOT-MICHEL)

Use: Test reagent for dihydroxybenzene.

Preparation: Dissolve 15 g. of chloramine T in 85 ml. of cold water. The solution must be kept cold.

Procedure for Test: Add 1 ml. of this reagent to 4 ml. of a 10 per cent aqueous solution of the dihydroxybenzenes (resorcinol, pyrocatechol, and hydroquinone). The following color reactions are obtained: resorcinol turns green and then yellow; pyrocatechol gives an amethyst-red color; and hydroquinone yields a red color which rapidly changes to a brownish-red.

Sensitiveness: Colors are detected in dilutions as follows:

Resorcinol: 1 : 10,000.
Pyrocatechol: 1 : 50,000.
Hydroquinone: 1 : 1000.

Ref. C. A. **14**, 3386 (1920)

CHLOROPHENOL RED INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of chlorophenol red (dichlorophenolsulphonphthalein) in 11.8 ml. of $N/50$ sodium hydroxide solution and dilute with water to 250 ml.

Remarks: pH: yellow 5.0-6.6 red.

Ref. U. S. Pub. Health Repts. **41**, 3051

CHLOROPHENOL RED INDICATOR SOLUTION

Use: Adsorption indicator for the titration of chloride with a standard mercurous nitrate solution.

Preparation: Dissolve 0.1 g. of chlorophenol red in 100 ml. of 20 per cent alcohol.

Ref. J. Am. Chem. Soc. **56**, 1891 (1934)

CHLOROPLATINIC ACID SOLUTIONS

Reagent: $H_2PtCl_6 \cdot 6H_2O$, mol. wt. = 518.09.

Preparation:

0.1 Molar: Dissolve 5.2 g. of chloroplatinic acid in water and dilute to 100 ml.

0.1 Normal: Dissolve 2.6 g. of chloroplatinic acid in water and dilute to 100 ml.

10 mg. of platinum per ml. of solution: Dissolve 2.65 g. of chloroplatinic acid in water and dilute to 100 ml.

CHLOROPLATINIC ACID SOLUTION (POTASSIUM)

Use: Reagent for potassium.

Preparation: Dissolve 0.265 g. of chloroplatinic acid in water and dilute to 100 ml. This solution contains 1 mg. of platinum per ml. of solution.

Remarks: Potassium chloroplatinate is insoluble in 80 per cent by volume ethyl alcohol, while sodium chloroplatinate dissolves readily. Chloroplatinic acid is used for the quantitative determination of potassium.

Ref. Kolthoff and Sandell, pp. 390-393

CHOCOLATE AGAR

Use: Culture medium.

Preparation: This is prepared in much the same manner as blood agar (cf.) with the following changes:

Add the blood to the liquefied agar. Mix well but in such manner as to avoid the formation of air bubbles. Slowly raise the temperature to 95° C. until the color of the medium is chocolate brown. Tube and slant while still hot.

Ref. Kolmer and Boerner, p. 370

CHRISTENSEN'S REAGENT

Use: Reagent for quinine.

Preparation: Mix 1 g. of 50 per cent hydroiodic acid with 0.8 g. of sulfuric acid and 50 g. of 70 per cent ethyl alcohol, and dissolve in this solution 1 g. of iodine.

Remarks: Characteristic crystals are obtained when this reagent is added to alcoholic solutions of quinine.

Ref. Ber. deut. pharm. Ges. 1906, 442

CHROM-ACETIC-FORMALIN

Use: Fixative.

Preparation: Mix 16 parts of a 1 per cent aqueous solution of chromic acid with 1 part of glacial acetic acid. Just before use add 2 volumes of this mixture to 1 volume of formaldehyde solution.

CHROME REGIA ETCHING SOLUTION (NEWELL)

Use: Etchant for heat treated 18-8 stainless steels.

Preparation: Add 5-50 ml. of a 10 per cent aqueous solution of chromic acid to 25 ml. of hydrochloric acid.

Remarks: The activity of the etchant is controlled by the amount of chromic acid solution used.

Ref. Metals Handbook, p. 722

CHROMIC ACID REAGENT (SILK)

See: Höhnels reagent.

CHROMIC ACID SOLUTION

Use: Fixative.

Preparation: Mix the following:

Chromium trioxide	10 g.
Distilled water	To make 100 ml.

Dilute with water as desired.

CHROMIC ACID AND NITRIC ACID (STRAUSS)

Use: Etching solution for aluminum bronze.

Preparation:

Formula I:

Nitric acid	50 ml.
Chromic acid (H_2CrO_4)	20 g.
Water	30 ml.

Formula II:

Nitric acid	5 ml.
Chromic acid (H_2CrO_4)	20 g.
Water	75 ml.

Remarks: Film from polishing is removed by 10 per cent hydrofluoric acid.

Ref. Metals Handbook, p. 1472

CHROMIC CHLORIDE SOLUTIONS

Reagent: $CrCl_3$, mol wt. = 158.38, or
$CrCl_3 \cdot 6H_2O$, mol. wt. = 266.48.

Preparation:

0.5 Molar: Dissolve 79.2 g. of $CrCl_3$ or 133.5 g. of $CrCl_3 \cdot 6H_2O$ in water and dilute to 1 liter.

1.0 Normal: Dissolve 52.8 g. of $CrCl_3$ or 68 8 g. of $CrCl_3 \cdot 6H_2O$ in water and dilute to 1 liter.

10 mg. of chromic ion per ml. of solution: Dissolve 30.4 g. of $CrCl_3$ or 51.5 g. of $CrCl_3 \cdot 6H_2O$ in water and dilute to 1 liter.

CHROMIC NITRATE SOLUTIONS

Reagent: $Cr(NO_3)_3$, mol. wt. = 238.01, or $Cr(NO_3)_3 \cdot 9H_2O$, mol. wt. = 400.18.

Preparation:

0.2 Molar: Dissolve 47.6 g. of $Cr(NO_3)_3$ or 80 g. of $Cr(NO_3)_3 \cdot 9H_2O$ in water and dilute to 1 liter.

1.0 Normal: Dissolve 79.3 g. of $Cr(NO_3)_3$ or 133.4 g. of $Cr(NO_3)_3 \cdot 9H_2O$ in water and dilute to 1 liter.

10 mg. of chromic ion per ml. of solution: Dissolve 45.8 g. of $Cr(NO_3)_3$ or 77 g. of $Cr(NO_3)_3 \cdot 9H_2O$ in water and dilute to 1 liter.

CHROMIC SULFATE SOLUTIONS

Reagent: $Cr_2(SO_4)_3$, mol. wt. = 392.2; or $Cr_2(SO_4)_3 \cdot 18H_2O$, mol. wt. = 716.49.

Preparation:

0.2 Molar: Dissolve 78.4 g. of $Cr_2(SO_4)_3$ or 143.4 g. of $Cr_2(SO_4)_3 \cdot 18H_2O$ in water and dilute to 1 liter.

0.5 Normal: Dissolve 32.7 g. of $Cr_2(SO_4)_3$ or 59.7 g. of $Cr_2(SO_4)_3 \cdot 18H_2O$ in water and dilute to 1 liter.

10 mg. of chromic ion per ml. of solution: Dissolve 37.7 g. of $Cr_2(SO_4)_3$ or 68.9 g. of $Cr_2(SO_4)_3 \cdot 18H_2O$ in water and dilute to 1 liter.

CHROMOTROPE 2 B SOLUTION

See: p-Nitrobenzeneazochromotropic acid solution.

CHROMOTROPIC ACID SOLUTION (CHROMIUM)

Use: Reagent for the colorimetric determination of chromium in steel.

Preparation: Dissolve 1 g. of the reagent in 100 ml. of distilled water.

Remarks: A pink to red color develops when this reagent is added to solutions containing small quantities of chromate. This reagent is used with steels containing less than 0.6 per cent chromium. Vanadium interferes if present in quantity. Reaction is carried out in strongly acid solution containing phosphoric acid.

Ref. Ind. Eng. Chem. 5, 298 (1913); Snell I, p. 278; Yoe I, p. 165

CHROMOTROPIC ACID REAGENT (IRON)

Use: Test reagent for ferric iron.

Preparation: Dissolve 2 g. of chromotropic acid in 100 ml. of water.

Remarks: Reagent gives a green color with ferric ion, but this color is discharged by a solution of stannous chloride. No other ions in this or following groups interfere with this test.

Ref. Belcher and Williams, p. 99

CHRYSOIDINE R INDICATOR SOLUTION

Use: Indicator for bromate titrations.

Preparation: Dissolve 0.1 g. of the dye in 100 ml. of water.

Remarks: Free bromine formed at the end-point of bromate titrations decolorizes the dye. This is not a reversible indicator since the dye is destroyed by the bromine.

Ref. J. Am. Chem. Soc. **53**, 2091 (1931)

CINCHONINE SOLUTION (SULFITE-CELLULOSE REAGENT)

See: Appelius-Schmidt reagent.

CINCHONINE SOLUTION (TUNGSTEN)

Use: Reagent for the determination of tungsten.

Preparation: Dissolve 125 g. of cinchonine in 1 liter of a solution prepared by diluting 500 ml. of concentrated hydrochloric acid with 500 ml. of water.

Remarks: This reagent is used to increase the rapidity and completeness of precipitation of WO_3.

Ref. Hillebrand and Lundell, pp. 548 ff.

CINCHONINE-POTASSIUM IODIDE REAGENT

Use: Reagent for the detection and colorimetric determination of bismuth.

Preparation: Mix 10 g. of cinchonine with just enough concentrated nitric acid to form a thick paste, and then dissolve this paste in water and dilute to about 100 ml. Prepare another solution by dissolving 20 g. of potassium iodide in 500 ml. of water, and to this add the cinchonine solution. Dilute the resulting mixture to 1 liter. Allow to stand for 48 hours and filter.

Remarks: This solution keeps indefinitely in glass bottles. Filter off any suspended material before use.

Procedure for Use: Place a drop of solution to be tested on a spot plate and add 1 drop of the reagent. The test solution should be slightly acidic. A red precipitate forms if bismuth is present. Copper, lead, and mercury give color reactions but do not necessarily interfere. Cadmium does not interfere at all.

Ref. C. A. 17, 2687 (1923); Engelder, p. 120; Snell I, pp. 218-219

CITRO-MOLYBDIC ACID PAPER

Use: Reagent to detect water in alcohol, ether and air.

Preparation: Fuse together 2 g. of molybdic acid and 4 g. of citric acid, and dissolve the product in water. Impregnate white paper with this solution and allow to dry.

Remarks: The dry, blue paper is decolorized by moisture.

CITRO-PICRIC ACID PAPER (GEISSLER-OLIVER)

Use: Reagent to detect albumin in urine.

Preparation: Impregnate white paper with a solution of citric and picric acids and then dry.

Remarks: Albumin is precipitated when a strip of this paper is immersed in urine.

CITRO-POTASSIUM FERROCYANIDE PAPER (GEISSLER-OLIVER)

Use: Reagent to detect albumin in urine.

Preparation: Impregnate filter paper with a solution of potassium ferrocyanide and picric acid and allow to dry.

Remarks: Albumin is precipitated when a strip of this paper is immersed in urine.

CITRO-POTASSIUM MERCURIC IODIDE PAPER (GEISSLER-OLIVER)

Use: Reagent to detect albumin in urine.

Preparation: Impregnate filter paper with a solution of potassium mercuric iodide and citric acid and allow to dry.

Remarks: Albumin is precipitated when a strip of this paper is immersed in urine.

CITRO-SODIUM TUNGSTATE PAPER (GEISSLER-OLIVER)

Use: Test reagent for albumin, uric acid, mucin, peptones, and creatinine in urine.

Preparation: Impregnate filter paper with a solution of sodium tungstate and citric acid and allow to dry.

Remarks: A precipitate forms when a strip of this paper is immersed in urine if any of the above mentioned materials are present.

CLARK-LUB MEDIUM

Use: For the Voges-Proskauer and methyl red tests.

Preparation: Mix the following and dissolve by heating:

Peptone	5 g.
Glucose	5 g.
Dipotassium phosphate	5 g.
Distilled water	1 liter

Filter through paper, and replace any water that was lost during the filtration. Tube in 10 ml. volumes, and sterilize in a steam sterilizer at 100° C. for 20 minutes on each of three successive days.

Ref. J. Infectious Diseases 17, 169 (1915); J. Bact. 3, 231 (1918)

CLARKE'S SOAP SOLUTION

Use: Reagent for the estimation of the hardness of water.

Preparation:

Solution A: Dissolve 100 g. of pure powdered castile soap in 1 liter of 80 per cent ethyl alcohol and allow the solution to stand about 12 hours and decant.

Solution B: Dissolve 0.5 g. of pure calcium carbonate in concentrated hydrochloric acid and neutralize with ammonium hydroxide. Make slightly alkaline to litmus, and then dilute to 500 ml. One ml. of this solution is equivalent to 1 mg. of calcium carbonate.

Remarks: Titrate *Solution A* against *Solution B,* and dilute the former with 80 per cent alcohol until 1 ml. of the resulting solution is equivalent to 1 ml. of *Solution B* after allowing for a lather factor. By the lather factor we mean the amount of standard soap solution required to produce a permanent lather with 50 ml. of distilled water. Thus, 1 ml. of adjusted soap solution, less the lather factor, is equivalent to 1 mg. of calcium carbonate.

Ref. A.P.H.A. pp. 59-62

CLAUDIUS' REAGENT

Use: Test reagent for albumin.

Preparation: Dissolve 2 g. of trichloroacetic acid, 0.5 g. of tannic acid, and 0.1 g. of acid fuchsin in 100 ml. of water.

Remarks: This solution precipitates albumin.

Ref. C. A. **6,** 2494 (1912)

CLAYTON YELLOW REAGENT

See: Titan yellow reagent.

CLEANING SOLUTION

Use: Solution for cleaning laboratory glassware.

Preparation: Dissolve 10 or 15 g. of sodium dichromate in the smallest possible quantity of water and add 500 ml. of concentrated sulfuric acid.

Ref. Kolthoff and Sandell, p. 222

COBALTICYANIDE PAPER

Use: Rinmann's test for zinc.

Preparation: Soak filter paper in a solution prepared by dissolving 1 g. of potassium chlorate and 4 g. of potassium cobalticyanide in 100 ml. of water. Remove the paper and dry at 100° C.

Procedure for Test: Place 1 drop of zinc solution on a piece of test paper and ignite in an evaporating dish. A green disc indicates the presence of zinc in the solution.

Sensitiveness: 0.00006 mg. zinc.

Ref. Engelder, p. 162

COBALTOTHIOCYANATE REAGENT (PEYER)

Use: Reagent for the detection of lignified membranes.

Preparation: Dissolve 9 g. of cobalt nitrate in 6 ml. of water and add 2.5 g. of potassium thiocyanate dissolved in 2.5 ml. of water.

Remarks: This reagent is more sensitive than the phloroglucinol-hydrochloric acid reagent.

Ref. C. A. 23, 2676 (1929)

COBALT THIOCYANATE REAGENT

See: Casparis' reagent.

COBALTOUS CHLORIDE SOLUTIONS

Reagent: $CoCl_2 \cdot 2H_2O$, mol. wt. = 165.89, or
$CoCl_2 \cdot 6H_2O$, mol. wt. = 237.95.

Preparation:

0.5 Molar: Dissolve 82.9 g. of $CoCl_2 \cdot 2H_2O$ or 119 g. of $CoCl_2 \cdot 6H_2O$ in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of cobaltous ion per ml. of solution: Dissolve 28.1 g. of $CoCl_2 \cdot 2H_2O$ or 40.5 g. of $CoCl_2 \cdot 6H_2O$ in water and dilute to 1 liter.

COBALTOUS NITRATE SOLUTIONS

Reagent: $Co(NO_3)_2 \cdot 6H_2O$, mol. wt. = 291.05.

Preparation:

0.5 Molar: Dissolve 145.5 g. of cobaltous nitrate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of cobaltous ion per ml. of solution: Dissolve 49.3 g. of cobaltous nitrate in water and dilute to 1 liter.

COBALTOUS SULFATE SOLUTIONS

Reagent: $CoSO_4 \cdot 7H_2O$, mol. wt. = 281.11.

Preparation:

0.5 Molar: Dissolve 140.6 g. of cobaltous sulfate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of cobaltous ion per ml. of solution: Dissolve 47.7 g. of cobaltous sulfate in water and dilute to 1 liter.

COCAINE-MOLYBDATE SOLUTION

Use: Determination of pentavalent arsenic.

Preparation: Mix 1 part by volume of 1 per cent potassium molybdate solution with 2 parts of 0.1 *N* hydrochloric acid and 1 part of 2 per cent cocaine solution.

Remarks: Reagent produces a turbidity with pentavalent arsenic in a solution slightly acid with HCl. Phosphate must be absent.

Sensitiveness: 0.0005 mg.

Ref. Yoe II, pp. 107-116; C. A. 21, 3853 (1927)

COCHINEAL, ALCOHOLIC (MAYER)

Use: Staining solution.

Preparation:

Method 1: Macerate coarsely powdered cochineal with 8-10 parts of alcohol for several days and then filter.

Method 2: Triturate 5 g. of powdered cochineal with 5 g. of calcium chloride and 0.5 g. of alumium chloride. Add 100 ml. of 50 per cent alcohol containing 8 drops of nitric acid (sp. gr. 1.20). Heat this mixture to boiling and then cool. Allow to stand for several days with frequent shaking and then filter.

Ref. Biol. Stains, Conn pp. 176-177

COCHINEAL ALUM

Use: Staining solution.

Preparation: Add 6 g. of potassium alum and 6 g. of powdered cochineal to 90 ml. of distilled water and boil for 30 minutes. Allow to settle and decant the supernatant liquid, and then add more water. Boil down to 90 ml. and filter. Add a little thymol or salicylic acid as a preservative.

Ref. Biol. Stains, Conn pp. 176-177

COCHINEAL PAPER

Use: Indicator.

Preparation: Impregnate white paper with an aqueous solution of cochineal and allow to dry.

Remarks:

Colors: Acids: red.
Bases: violet.

COCHINEAL SOLUTION

Use: Coloring agent; stain for nuclei; indicator in volumetric determination of alkaloids; indicator; and reagent for lead, uranium, and aluminum.

Preparation: Extract 10 g. of cochineal for 4 or 5 days with 200 ml. of alcohol and 600 ml. of distilled water. Filter.

COLE'S REAGENT

Use: Test reagent for gold.

Preparation: Dissolve 10 g. of stannous chloride in 95 ml. of water and add 5 ml. of concentrated hydrochloric acid. Filter, and to the filtrate add 10 g. of pyrogallol. Immerse viscose silk fibers in this solution and heat for 10 minutes on a water bath. Remove the fibers, wash with water, and dry between filter paper.

Remarks: These fibers give a violet to red color when placed in gold solutions. Reducing and oxidizing agents interfere.

Sensitiveness: 0.05 g. of gold per liter.

Ref. C. A. 17, 506 (1923)

COLOR STANDARDS FOR SUGAR IN URINE (BENEDICT'S PICRATE METHOD)

Use: Determination of sugar in urine.

Preparation: The following solutions are required:

Ferric Chloride (Merck's Analyzed): Dissolve 200 g. of ferric chloride ($FeCl_3 \cdot 6H_2O$) in 300 ml. of distilled water. Transfer to a 500 ml. volumetric flask and dilute to the mark with distilled water. Mix well and filter through a dry paper.

Cobalt Chloride (Analyzed Grade): Dissolve 159 g. of cobaltous chloride ($CoCl_2 \cdot H_2O$) in 300 ml. of distilled water. Transfer to a 500 ml. volumetric flask and dilute to the mark with distilled water. Mix well and filter through a dry paper.

Dilute Hydrochloric Acid: Dilute 5 ml. of concentrated hydrochloric acid to 50 ml. with distilled water.

Using the above solutions, prepare the following color standards:

% Sugar	ml. of $FeCl_3$ solution	ml. of $CoCl_2$ solution	ml. of dil. HCl	Water
0.1	18 0	7.0	8.0	Dilute to 100 ml.
0.2	28.0	13.0	8.0	" " "
0.3	22.0	22 0	8 0	" " "
0.4	16 0	30.0	8.0	" " "
0.5	14.0	40.0	8.0	" " "

Ref. Hawk and Bergeim, p. 853

CONDAMINE'S REAGENT

Use: Reagent for the absorption of carbon monoxide.

Preparation: Mix 5 g. of water with 95 g. of sulfuric acid and add 5 g. of cuprous chloride and 10 g. of naphthol. Shake for 3 or 4 hours and filter.

Ref. Chem.-Ztg. 1925, 405

CONE-CADY'S REAGENT

Use: Test reagent for zinc.

Preparation:

Solution A: Dissolve 0.5 g. of potassium ferricyanide in 100 ml. of water.

Solution B: Dissolve 1 g. of diphenylamine in 100 g. of glacial acetic acid.

Procedure for Test: Acidify solution to be tested with acetic acid and add 5 drops of *Solution B* and 5 ml. of *Solution A*. A brown, green, or deep purple precipitate forms if zinc is present.

Ref. J. Am. Chem. Soc. **49**, 2214 (1927)

CONGO RED PAPER

Use: Reagent for free hydrochloric acid in gastric juice. Also used as a test reagent for pyridine, and as an indicator.

Preparation: Soak filter paper in an aqueous solution of congo red and allow to dry.

Remarks:

Colors: Acids: Blue.
Bases: Red.

CONGO RED INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of congo red (sodium tetrazodiphenylnaphthionate) in 100 ml. of water.

Remarks: pH: blue 3.0-5.2 red.

Ref. Kolthoff and Furman, p. 59

CONN'S STAIN

Use: Staining solution for bacteria in soil.

Preparation: Dissolve 1 g. of rose bengal and 0.01 g. of calcium chloride in 100 ml. of a 5 per cent aqueous solution of phenol.

Ref. Biol. Stains, Conn p. 157

CONRADI-DRIGALSKI CRYSTAL VIOLET LITMUS AGAR

Use: Culture medium.

Preparation: Mix the following and dissolve by heating in an autoclave:

Agar	20 g.
Sodium chloride	5 g.
Peptone	10 g.
Nutrose	10 g.
Beef extract, Liebig's	4 g.
Sodium hydroxide, 1.0 *N*	50 ml.
Distilled water	1 liter

Cool, and clarify this solution with the whites of eggs. Adjust the reaction to a slight but definite alkalinity to litmus.

To each liter of the above solution add the following:

Litmus solution, Kubel and Thiemann	130 ml.
Crystal violet, 1:1000 soln.	10 ml.
Lactose	15 g.

Heat in a sterilizer for 10 minutes, and fill into bottles or tubes. Sterilize in a steam sterilizer at 100° C. for 20 minutes on each of three successive days.

Remarks: The crystal violet may be omitted if the medium is to be used for dysentery.

Bromcresol purple (0.03 g. per liter of medium) may be used in place of litmus as an indicator.

Ref. Muir pp. 49-50

COOPER'S REAGENT

See: 2,4-dihydroxyacetophenone solution.

COPPER COMPOUNDS

See: Cupric and cuprous compounds.

COPPER KETOSE REAGENT (FISHEL KETOSE REACTION)

Use: Reagent for the detection and determination of levulose in the presence of glucose.

Preparation: Place the following in a 1 liter volumetric flask and add about 900 ml. of water:

Sodium carbonate, anhyd.	15 g.
Cupric sulfate, cryst.	5 g.
Rochelle salt	300 g.
Disodium phosphate ($Na_2HPO_4.12H_2O$)	100 g.

Allow to stand for some time, and finally complete solution by heating on a water bath. Leave the flask in the bath for 1 hour. Then cool and dilute to 1 liter. Mix with 2 teaspoonsful of activated charcoal and filter.

Remarks: Store in a dark, glass-stoppered bottle. Solution should be kept for only a short time as it deteriorates on standing.

Ref. Jacobs, pp. 256-258

CORALLIN SOLUTION

See: Rosolic acid indicator solution.

CORN MEAL AGAR

Use: Culture medium for fungi.

Preparation: Mix 62.5 g. of corn meal with 1500 ml. of water and heat for 1 hour at 60° C. Filter through paper and add water until the volume of the filtrate is 1500 ml. Now add 19 g. of agar and heat in a steam sterilizer at 100° C. for about 75 minutes. Filter through cotton, tube, and heat in an autoclave at 15 pounds pressure for 20 minutes.

Ref. Kolmer and Boerner, p. 367

CORPER'S MEDIUM

Use: Medium for the isolation of tubercle bacilli.

Preparation: Secure a number of large potatoes, free from surface defects, and with the aid of a cork borer cut these potatoes into a number of cylinders about 3 inches long and about ⅝ inch in diameter. Cut each of these cylinders longitudinally into two equal sections, and soak then in a 1 per cent solution of sodium carbonate to which is added (just before use) 0.0015 per cent crystal violet. Continue this treatment until the potatoes acquire a bluish tint. This requires from 1 to 2 hours. Remove the sections from the dye solution and wipe them with a clean towel. Finally, place them in sterile tubes (6" x ¾") containing 1.5 ml. of 6 per cent glycerol solution, and then heat in an autoclave at 15 pounds pressure for 20 minutes. Avoid excessive heat.

Note: The following simpler medium may be used for carrying pure cultures of the organism:

Mashed, autoclaved potatoes	250 g.
Glycerol	25 g.
Agar	15 g.
Water	710 ml.

Prepare in the usual manner.

Ref. J. Am. Med. Assoc. **91**, 371 (1928); J. Lab. Clin. Med. **14**, 393 (1929)

CORZO'S REAGENT

Use. Reagent for albumin in urine.

Preparation: Dissolve 1 g. of ammonium molybdate and 4 g. of tartaric acid in 20 ml. of water.

Remarks: With albumin this reagent causes the formation of a precipitate which does not dissolve on warming.

CRAMER'S REAGENT

Use: Test reagent for reducing sugars.

Preparation: Dissolve 4 g. of mercuric oxide and 60 g. of potassium iodide in 1 liter of water. Adjust the alkalinity so that 10 ml. of the solution are neutralized by 2.5 ml. of 0.1 *N* hydrochloric acid, using phenolphthalein as an indicator.

Procedure for Test: Place 3 ml. of the reagent in a test tube and heat to boiling. Then add 0.3 ml. of the solution to be tested and again heat to boiling. If reducing sugars are present a black precipitate of finely divided mercury is formed.

Ref. Biochem. J. **9**, 156 (1915)

o-CRESOLPHTHALEIN INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of o-cresolphthalein in 250 ml. of alcohol.

Remarks: pH: colorless 8.2-10.4 red.

CRESOL RED INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of cresol red (o-cresolsulphonphthalein) in 13.1 ml. of $N/50$ sodium hydroxide solution and dilute with water to 250 ml.

Remarks: pH: yellow 7.2-8.8 red.

Ref. Kolthoff and Furman, p. 61

CRISWELL'S REAGENT

Use: Test reagent for glucose.

Preparation: Dissolve 35 g. of cupric sulfate in a mixture of 100 ml. of water and 200 g. of glycerol. Next add 450 ml. 20 per cent sodium hydroxide solution and boil for 15 minutes. Cool, and dilute to 1 liter.

Remarks: The action of this solution is similar to other glucose-copper reagents.

Ref. J. Am. Med. Assoc. **74**, 301 (1920)

CROSS AND BEVAN'S REAGENT

Use. A solvent for cellulose.

Preparation: Dissolve 21 g. of zinc chloride in 42 ml. of concentrated hydrochloric acid (sp. gr. 1.19).

Ref. Chem. News **42**, 77 (1880)

CRYSTAL VIOLET LACTOSE BROTH

Use: Culture medium.

Preparation: Dissolve the following in 1 liter of distilled water:

Peptone	5 g.
Dipotassium phosphate	5 g.
Potassium dihydrogen phosphate	1 g.
Lactose	5 g.

Heat slowly and with constant stirring until solution is complete. Cool, and adjust the reaction so that the pH after sterilization will be 7.3-7.5. Now add 10 ml. of a solution prepared by dissolving 0.143 g. of crystal violet in 1 liter of distilled water. Make the total volume 1 liter with distilled water if necessary. Finally, distribute in fermentation tubes and sterilize.

Ref. J. Amer. W. W. Assoc., 27, 1732 (1935); J. Bact., XX, 381 (1930)

CUPFERRON REAGENT

Use: Reagent used in the determination of iron.

Preparation: Dissolve 3 g. of cupferron (ammonium salt of nitrosophenylhydroxylamine) in 50 ml. of water.

Remarks: Store this solution, for not longer than one week, in a dark bottle.

This reagent is used for separating iron from aluminum, beryllium, phosphorus, manganese, nickel, and hexavalent uranium. Vanadium, zir-

conium, titanium, tin, columbium, and tantalum can be similarly separated with the same reagent. Precipitation is carried out in an acid solution.

Ref. Ind. Eng. Chem. 3, 629 (1911) ; Hillebrand and Lundell, pp. 109-114

CUPRIC ACETATE-CHLORIDE REAGENT

See: Ripard-Petit liquid.

CUPRIC-AMMONIUM REAGENT

See: Heyn's reagent. Humfrey's reagent.

CUPRIC CHLORIDE SOLUTIONS

Reagent: $CuCl_2 \cdot 2H_2O$, mol. wt. = 170.52.

Preparation:

0.5 Molar: Dissolve 85.3 g. of cupric chloride in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of cupric ion per ml. of solution: Dissolve 26.9 g. of cupric chloride in water and dilute to 1 liter.

CUPRIC NITRATE SOLUTIONS

Reagent: $Cu(NO_3)_2 \cdot 3H_2O$, mol. wt. = 241.63, or
$Cu(NO_3)_2 \cdot 6H_2O$, mol. wt. = 295.68.

Preparation:

0.5 Molar: Dissolve 120.8 g. of $Cu(NO_3)_2 \cdot 3H_2O$ or 147.8 g. of $Cu(NO_3)_2 \cdot 6H_2O$ in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of cupric ion per ml. of solution: Dissolve 37.9 g. of $Cu(NO_3)_2 \cdot 3H_2O$ or 46.6 g. of $Cu(NO_3)_2 \cdot 6H_2O$ in water and dilute to 1 liter.

CUPRIC SULFATE SOLUTIONS

Reagent: $CuSO_4 \cdot 5H_2O$, mol. wt. = 249.71.

Preparation:

0.5 Molar: Dissolve 124.8 g. of cupric sulfate in water, to which 5 ml. of sulfuric acid has been added, and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. cupric ion per ml. of solution: Dissolve 39.3 g. of cupric sulfate in water and dilute to 1 liter.

CUPRIC SULFATE SOLUTION

Use: Clarifier for lactose solutions obtained from milk and milk products.

Preparation:

Solution A: Dissolve 34.639 g. of crystalline cupric sulfate in water and dilute to 500 ml. Filter through an asbestos mat.

Solution B: Dissolve 10 g. of sodium hydroxide in water and dilute to 500 ml.

Procedure for Use: Add *Solutions A* and *B* in the ratio of 10 ml. cupric sulfate solution to 8.8 ml. of the sodium hydroxide solution.

Ref. Jacobs, p. 239

CUPRIC SULFATE ETCHING SOLUTION (MARBLE)

Use: Reagent to show the structure of stainless steel.

Preparation: Dissolve 4 g. of cupric sulfate in 20 ml. of hydrochloric acid and 20 ml. of water.

Ref. Metals Handbook, p. 723

CUPRIC SULFATE IN GLYCEROL-POTASSIUM HYDROXIDE

Use: Reagent for silk.

Preparation: Dissolve 10 g. of crystalline cupric sulfate in 100 ml. of water and add 5 g. of glycerol. Now add slowly a solution of potassium hydroxide until a deep blue solution is formed.

Ref. H. Harper, p. 146

CUPROHYDROCYANIC REAGENT (MESNARD)

Use: Reagent for methylene blue.

Preparation: Mix 50 ml. of 5 per cent cupric sulfate solution with 50 ml. of 5 per cent potassium cyanide solution and neutralize with sulfuric acid. Filter.

Remarks: Reagent gives a violet-blue precipitate with aqueous solutions of methylene blue.

Ref. C. A. **30**, 6300 (1936)

CUPRO-LACTIC REAGENT (CARREZ)

Use: Test reagent for glucose.

Preparation: Mix 180 g. of lactic acid (sp. gr., 1.21) with 200 ml. of potassium hydroxide solution (sp. gr., 1.332) and 200 ml. of water. Boil and neutralize with lactic acid or potassium hydroxide as required. Cool, and add 34.65 g. of crystalline cupric sulfate dissolved in 250 ml. of water. Finally, dilute with water to 1 liter.

Remarks: Reagent is similar in action to other copper-glucose reagents.

Ref. C. A. **3**, 2879 (1909)

CUPRON SOLUTION

Use: Test reagent for copper.

Preparation: Dissolve 5 g. of cupron (α-benzoinoxime) in 100 ml. of 95 per cent alcohol.

Procedure for Test: Add 1 drop of test solution to 1 drop of the reagent on spot paper and develop with ammonia. A green color forms with ammonia. This reagent also precipitates copper from an ammoniacal solution. The addition of tartrate prevents the precipitation of iron and aluminum and other insoluble metallic hydroxides. This reagent may be used for the gravimetric determination of copper.

Ref. Engelder, p. 123; C. A. **18**, 30 (1924); **18**, 1624 (1924)

CUPROSODIC REAGENT

Use: Reagent for the determination of glucose.

Preparation: Dissolve 1 g. of powdered cupric sulfate ($CuSO_4 \cdot 5H_2O$) in 10 ml. of water, and add this solution drop by drop to 100 ml. of sodium hydroxide solution (sp. gr. 1.332) with constant shaking.

Remarks: One ml. of this solution is equivalent to 0.0013 g. of glucose.

Ref. J. pharm. **24**, 18 (1936)

CUPROUS CHLORIDE SOLUTION (ACIDIC)

Use: Reagent for carbon monoxide in gas analysis.

Preparation:

Method 1: Cover the bottom of a 1 liter flask with a layer of cupric oxide or cupric sulfate about one-quarter of an inch deep. Now suspend in the flask a quantity of copper wire, which reaches from the bottom to the top, and then fill the flask with 20 per cent hydrochloric acid (sp. gr. 1.10). Shake from time to time until the solution becomes nearly colorless, and then transfer to a bottle which contains copper wire. More hydrochloric acid may then be added to the flask until the copper oxide or wire is dissolved.

Method 2: Dissolve 170 g. of cupric chloride ($CuCl_2 \cdot 2H_2O$) in 300 ml. of concentrated hydrochloric acid. Next treat about 150 g. of metallic tin with concentrated hydrochloric acid until the tin is dissolved, and then add about 95 ml. of this solution to the cupric chloride-hydrochloric acid solution until the latter is nearly colorless.

Method 3 (Winkler Method): Mix 86 g. of cupric oxide and 17 g. of finely divided copper (prepared by reducing cupric oxide with hydrogen), and add slowly with stirring to a solution prepared by diluting 650 ml. of concentrated hydrochloric acid with 325 ml. of water. Place in a bottle in which is suspended a spiral of copper wire that reaches all of the way to the bottom. Shake until the solution is nearly colorless.

Ref. Dennis pp. 240-246; Handbook of Chem. and Physics, p. 1309

CUPROUS CHLORIDE SOLUTION (AMMONIACAL)

Use: Reagent for carbon monoxide in gas analysis.

Preparation:

Method 1: Prepare an acid solution of cuprous chloride as directed above in *Method 1* or *3*, and then neutralize with ammonium hydroxide until the odor of ammonia persists. Store in a bottle containing a spiral of copper wire.

Method 2: Prepare 800 ml. of acidic cuprous chloride according to the Winkler method, and add to 4 liters of water. Collect the precipitate and transfer to a 250 ml. graduated cylinder with water. Allow to stand until the solid has settled, and then siphon off the liquid above the 50 ml. mark. Dilute 50 ml. of concentrated ammonia with 150 ml. of water and add this solution to the residue in the cylinder. Shake well and allow to stand for several hours. The solution should have a faint odor of ammonia.

Ref. Dennis, pp. 240-246

CURCUMIN INDICATOR SOLUTION

Use: Acid-base indicator.

Preparation: Dissolve 0.1 g. of curcumin in 100 ml. of alcohol.

Remarks: pH range: yellow 6.0-8.0 brown-red.

Ref. Kolthoff and Furman, p. 61

CURCUMIN SOLUTION

Use: Test reagent for beryllium.

Preparation: Dissolve 0.1 g. of curcumin in 100 ml. of alcohol.

Remarks: This reagent forms an orange-red lake when added to a faintly alkaline solution containing beryllium ions. Iron and aluminum must be removed by the addition of sodium fluoride.

Ref. J. Am. Chem. Soc. **50**, 393-395 (1928)

CUTOLO'S REAGENT

Use: Reagent to show the presence of seed oils in cottonseed oil.

Preparation: Heat 1 g. of gelatin with 10-15 ml. of 65 per cent nitric acid on a water bath until solution is complete. Dilute to 100 ml. with nitric acid.

Procedure for Test: Mix 5 ml. of the oil with 1 ml. of the reagent, and then heat nearly to the boiling point over a free flame. Cool quickly. Various seed oils give color reactions. The usual color is orange or orange-red.

Ref. Snell II, pp. 661-662

CYANIN SOLUTION

See: Quinoline blue indicator solution.

CYANIN STAIN (QUINOLINE BLUE)

Use: Staining solution.

Preparation: Dissolve 1 g. of cyanin (quinoline blue) in 100 ml. of 50 per cent alcohol.

Remarks: This solution is used as a cytological stain.

CYANOGEN IODIDE SOLUTION

See: Kastle-Clark's reagent.

CZOKOR'S ALUM-COCHINEAL

Use: Nuclear stain.

Preparation: Add 1 g. of cochineal to 100 ml. of a 1 per cent solution of potassium alum and boil until the volume is only 50 ml. Then add 0.5 g. of phenol.

Ref. Biol. Stains, Conn pp. 176-177

DAMIEN'S REAGENT

Use: Reagent for the absorption of carbon monoxide in gas analysis.

Preparation: Dissolve 5 g. of cuprous oxide in 100 ml. of sulfuric acid (Be. 66°).

Ref. C. A. **19**, 950 (1925)

DANCHAKOFF'S FLUID

Use: Fixative.

Preparation: Add the following to 1000 parts of water, and dissolve with the aid of heat:

Mercuric chloride	50 parts
Potassium dichromate	25 parts
Sodium sulfate	10-12 parts

Just before use, add 5 per cent formaldehyde solution for soft tissues and a 10 per cent solution for dense tissues.

DANHEISER'S SOLUTION

Use: Test reagent for nickel in steel.

Preparation: Dissolve 0.1 g. of dimethylglyoxime in 10 g. of alcohol, and to this add a solution prepared by dissolving 5 g. of citric acid in 90 ml. of ammonia (sp. gr. 0.90).

Procedure for Test: Warm a few small pieces of the steel to be examined on a watch glass with a few drops of concentrated nitric acid, and then add 1 drop of the reagent. The mixture turns a rose-red color if nickel is present.

Ref. Chem. and Met. Eng. **23**, 770 (1920)

DAVY'S REAGENT

See: Molybdic Acid reagent (Davy).

DE GIACOMO'S REAGENTS

Use: Reagent for the detection of guanine in plant tissues.

Preparation:

Solution A: Dissolve 1.73 g. of sulfanilic acid in 100 ml. of 1 per cent sodium hydroxide solution.

Solution B: Dissolve 0.8 g. of sodium nitrite in 100 ml. of water.

Solution C: Dissolve 5-10 g. of concentrated sulfuric acid in 100 ml. of water.

Solution D: Dissolve 4 g. of sodium hydroxide in enough water to make 100 ml. of solution.

Procedure for Test: Prepare diazobenzenesulfonic acid from *Solutions A, B, and C,* and treat tissue with this solution. After 10 minutes carefully add *Solution D.* A red coloration appears if guanine is present.

Ref. C. A. **6**, 874 (1912)

DELAFIELD'S HEMATOXYLIN

Use: Stains nuclei intense blue and protoplasm pale blue.

Preparation: Dissolve 1 g. of hematoxylin in 6 ml. of alcohol, and mix with 100 ml. of a saturated solution of ammonium alum. Expose the mixture to air and light for several days, and add 25 ml. of glycerol and 25 ml. of methyl alcohol.

Ref. Kolmer and Boerner, p. 1814

DELFF'S REAGENTS

Use: Test reagents for alkaloids.

Preparation:

Reagent 1: An aqueous solution of potassium platinocyanide.

Reagent 2: Same as Mayer's reagent except that mercuric iodide is substituted for mercuric chloride.

Remarks: These reagents precipitate most alkaloids.

DENIGÈS' REAGENT (ACETYLENE)

Use: Test reagent for acetylene.

Preparation: Dissolve 50 g. of ammonium chloride, 25 g. of cupric sulfate, and 0.5 ml. of hydrochloric acid in enough water to make 250 ml. of solution.

Procedure for Test: Boil about 5 ml. of this solution with 0.3 g. of copper turnings until nearly colorless, and then add 1 ml. of water and cool in ice water. Dip pieces of filter paper in this solution and use while wet. Acetylene turns this paper red.

Ref. C. A. **16**, 395 (1922)

DENIGÈS' REAGENT (ALDOSE AND KETOSE SUGARS)

Use: Test reagent for aldose and ketose sugars.

Preparation: Dissolve 10 g. of crystalline sodium acetate in 5 ml. of glacial acetic acid and 100 ml. of water, and to 20 ml. of this solution add 3 ml. of glacial acetic acid. Mix well and add 1 ml. of phenylhydrazine and 1 ml. of 10 per cent sodium bisulfite solution.

Remarks: This solution is very stable.

Ref. The Merck Index, p. 684

DENIGÈS' REAGENT (ARSENIC MIRROR)

Use: Reagent to distinguish between arsenic and antimony mirrors in the Marsh test.

Preparation: Heat 10 g. of ammonium molybdate and 25 g. of ammonium nitrate with 100 ml. of water until solution is complete. Then cool and add 100 ml. of nitric acid (sp. gr. 1.20). Again heat, this time on a steam bath for 10 minutes, and then allow to stand for 48 hours. Filter.

Procedure for Test: Treat spot to be tested with nitric acid and warm. Next add a few drops of the reagent. A yellow precipitate forms if the spot was arsenic.

Sensitiveness: 0.01 mg. arsenic.

Ref. Compt. rend. **111**, 824 (1890)

DENIGÈS' REAGENT (BENZOYL GROUP)

Use: Test reagent for the benzoyl group.

Preparation: Mix 2 ml. of 37 per cent formaldehyde and 100 ml. of concentrated sulfuric acid.

Procedure for Test: Heat a little of the substance to be tested with 3 ml. of the reagent and heat to 120° C. Compounds containing the benzoyl group cause a brownish-red color. Benzene and phenol give the same color reactions but at a lower temperature.

Ref. Chem. News **79**, 206

DENIGÈS' REAGENT (SELENATE AND TELLURATE)

Use: Test reagent for selenates, selenites, and tellurates.

Preparation: Dissolve 10 g. of mercurous nitrate in 10 ml. of nitric acid (sp. gr. 1.40) and 100 ml. of water.

Remarks: When reagent is mixed with an equal volume of a solution containing one of the above ions, a white crystalline precipitate is formed.

Sensitiveness: Selenate: 1 : 1000.
Selenite. 1 : 10000.
Tellurate: 4 : 100.

Ref. C. A. **9**, 1287 (1915)

DENIGÈS' REAGENT (SULFATE ION IN INSOLUBLE SULFATES)

Use: Test reagent for sulfate ion in calcium, strontium, barium, and lead sulfates.

Preparation: Dissolve 10 g. of mercuric nitrate in 100 ml. of water and 1 ml. of concentrated nitric acid.

Procedure for Test: Place about 0.02 g. of the substance to be tested in a small test tube and add 2-3 ml. of the reagent. Color reactions are obtained as follows:

Calcium sulfate:	Immediate yellow color.
Strontium sulfate:	Yellow color appears slowly in cold, but immediately on warming.
Lead sulfate:	Color forms immediately.

The halogens interfere with these reactions.

Ref. C. A. **12**, 889 (1918)

DENIGÈS'-CHELLE REAGENT

Use: Test reagent for free chlorine and free bromine.

Preparation: Dissolve 0.01 g. of fuchsin in 10 ml. of water and add this solution to 100 ml. of a 5 per cent solution of sulfur dioxide. Allow to stand until the mixture is colorless. To 50 ml. of this colorless solution add 50 ml. of glacial acetic acid and 2 ml. of sulfuric acid.

Procedure for Test: Add 1 drop of the liquid to be tested to 5 ml. of the reagent and shake well. In the presence of free bromine the reagent turns violet-red, but with chlorine a yellow color appears.

Ref. C. A. **7**, 746 (1913)

DENIS-REED'S REAGENT

Use: Reagent for non-protein sulfur in blood.

Preparation: Dissolve 10 g. of ammonium chloride, 25 g. of sodium chloride, and 25 g. of zinc nitrate in 100 ml. of water. Filter to obtain a clear solution.

Ref. J. Biol. Chem. **71**, 191 (1926)

DESOXYCHOLATE AGAR

Use: Culture medium for the isolation of intestinal pathogens.

Preparation: Dissolve 10 g. of peptone in 1 liter of distilled water by gently heating and titrate to pH 7.5. Boil, and filter if necessary. Next dissolve 16 g. of powdered agar in the peptone solution by boiling. Then add the following ingredients in the order given and dissolve:

Sodium desoxycholate	1 g.
Sodium chloride	5 g.
Dipotassium phosphate	2 g.
Lactose	10 g.
Ferric ammonium citrate	2 g.

Adjust the volume to 1 liter and titrate to pH 7.5 and add 3.3 ml. of a 1 per cent alcoholic solution of neutral red (certified). Distribute in tubes or flasks and sterilize in an Arnold sterilizer for 15 minutes.

Ref. Kolmer and Boerner, p. 375

DE VRIJ'S SOLUTION

Use: Test reagent for quinine.

Preparation: Dissolve a little quinodine iodide in alcohol.

Remarks: A sulfuric acid solution of quinine alkaloid yields a brownish-red precipitate when treated with test solution.

DEXTROSE AGAR

Use: Culture medium.

Preparation: This medium is prepared like beef infusion agar or beef extract agar except that 10 g. of glucose (dextrose) is added to each liter of the medium just before the final heating. Sterilize by the fractional method at 100° C. for 20 minutes on each of three successive days.

Ref. Kolmer and Boerner, p. 368

DEXTROSE BRAIN BROTH AGAR

Use: Culture medium.

Preparation: Dissolve 10 g. of glucose (dextrose) in 1 liter of nutrient broth. Filter into suitable containers and sterilize in a steam sterilizer.

Ref. Kolmer and Boerner, p. 362

DEXTROSE GELATIN

Use: Culture medium.

Preparation: This medium is prepared like gelatin medium except that 10 g. of glucose (dextrose) is dissolved in each liter of medium. Sterilize by the fractional method at 100° C. for 20 minutes on each of three successive days.

DIACETIC ACID SOLUTION (ACETOACETIC ACID)

Use: To be added to urine for student work when urines containing this acid are not available.

Preparation: Mix 13 g. of ethylacetoacetate with 500 ml. of 0.2 *N* sodium hydroxide solution, and allow to stand for 48 hours to hydrolyze the ester.

Ref. Hawk and Bergeim, p. 765

1, 2-DIAMINOANTHRAQUINONE-3-SULFONIC ACID SOLUTION

Use: Test reagent for copper.

Preparation: Dissolve 0.5 g. of the reagent in 100 ml. of concentrated ammonia, 360 ml. of water, and 40 ml. of sodium hydroxide (sp. gr. 0.824).

This solution may also be prepared by dissolving 0.5 g. of the reagent in 500 ml. of water and 40 ml. of 35 per cent sodium hydroxide solution.

Remarks: Reagent gives an intense blue color with solutions containing copper salts. This is a very sensitive test.

Sensitiveness: 1 : 8,000,000.

Ref. C. A. **23**, 4644 (1929) ; C. A. **27**, 5021 (1933)

p-DIAMINOBENZENE SOLUTION

Use: Test reagent for magnesium.

Preparation: Dissolve 0.5 g. of p-diaminobenzene in 100 ml. of water.

Procedure for Test: Add a few drops of the reagent to a solution containing magnesium salts, and then add a concentrated solution of potassium hydroxide drop by drop. A reddish-violet precipitate is formed.

Ref. C. A. **27**, 1840 (1933)

p, p-DIAMINODIPHENYLAMINE INDICATOR SOLUTION

Use: Indicator for the titration of barium with chromate.

Preparation: Recrystallize the reagent several times from hot water containing animal charcoal until the final product is nearly colorless. Dissolve 0.1 g. of the crystals in a mixture consisting of 0.4 g. of very pure tartaric acid, 0.1 g. of salicylic acid, and 20 ml. of water. This solution should be a pale lilac color. Now impregnate squares of filter paper with this solution, and dry them as rapidly as possible in an atmosphere absolutely free from acids and dust. Store in dark tightly-stoppered bottles.

Remarks: This paper is pale gray in color, and becomes darker on standing, but this does not affect its action or sensitiveness. The paper turns blue with the slightest trace of chromate.

Ref. Kolthoff and Furman, pp. 258-259

p-DIAMINODIPHENYLAMINE SULFATE SOLUTION (LEJEUNE)

Use: Reagent for benzoyl peroxide in bleached flour.

Preparation: Shake 2.5 g. of p-diaminodiphenylamine sulfate with 250 ml. of alcohol for one hour, and then allow the mixture to stand overnight.

Procedure for Test: Mix 0.7 g. of flour, 2.5 ml. of petroleum ether, and 1 ml. of the reagent and shake. The supernatent liquid turns bluish-green in the presence of peroxides.

Ref. C. A. **23**, 4276 (1929)

DIAMOND INK

Use: Glass etching ink.

Preparation: Mix the following:

Ammonium bifluoride	15 g.
Oxalic acid	8 g.
Ammonium sulfate	10 g.
Glycerol	40 g.
Barium sulfate	15 g.
Hot water	12 g.

Remarks: The quality of the ink may be improved by the addition of 2 g. of sodium fluoride. If the ink does not adhere readily, add a small amount of water to lower the viscosity of the mixture.

To use, warm the glass slightly and apply the ink with an ordinary steel pen. Allow the ink to act for two minutes and wash the surface thoroughly with hot water and dry.

Store the ink in lead or hard rubber bottles.

DIAZINE GREEN S SOLUTION

Use: Test reagent for tin.

Preparation: Dissolve 0.01 g. of diazine green S in 100 ml. of water and add hydrochloric acid drop by drop until the solution turns pure blue.

Remarks: A violet, and finally a red coloration forms when the reagent is added to a solution of stannous tin. Antimony does not interfere.

Ref. C. A. 3859 (1928)

DIAZOAMINOBENZENE REAGENT

Use: Test reagent for cadmium.

Preparation: Dissolve 0.5 g. of diazoaminobenzene in 100 ml. of acetone.

Procedure for Test: In a small test tube place 1 drop of the neutral solution to be tested, and add 0.5 ml. of a 15 per cent solution of sodium carbonate dihydrate, 0.25 ml. of the reagent, and a few drops of chloroform. Shake and observe the chloroform layer. An orange yellow color appears if cadmium is present. Copper, silver, cobalt, and nickel interfere.

Sensitiveness: 0.2 γ cadmium.

DIAZOBENZENESULFONIC ACID REAGENT

See: Ehrlich's diazo reagent.

DIAZOBENZENESULFONIC ACID SOLUTION (PENZOLDT)

Use: Reagent for glucose in urine.

Preparation: Dissolve 1.5 g. of crystalline diazobenzenesulfonic acid in 60 ml. of water.

Procedure for Test: Neutralize 3 ml. of the reagent with potassium hydroxide solution and then add to an equal volume of urine that has been made strongly alkaline. If glucose is present in moderate quantity the solution turns yellowish-red, but if there is a high concentration of glucose in the urine the solution turns dark red and is opaque.

Remarks: This reagent can be used to test for aldehydes.

Sensitiveness: 1 : 10,000.

Ref. Ber. 16, 657 (1883)

DIAZOTIZED SULFANILIC ACID REAGENT

Use: Reagent for determination of Vitamin C.

Preparation: Mix 4.5 g. of sulfanilic acid with 45 ml. of concentrated hydrochloric acid and dilute to 500 ml. Next dissolve 22.5 g. of pure sodium

nitrite in water and dilute to 500 ml. Place a 50 ml. volumetric flask in an ice bath, and to this add 1.5 ml. of each of the above solutions. Cool for 5 minutes and add 6 ml. more of the sodium nitrite solution and cool for an additional 5 minutes. Dilute to the mark and leave in the ice bath for 15 minutes. The reagent is ready for use. Prepare reagent each day from the stock solutions.

Procedure for Use: Make the pH of the solution to be tested less than 4.0. Mix 100 ml. of *N* sodium hydroxide with a solution prepared by dissolving 5.76 g. of sodium bicarbonate in 100 ml. of water. To 1.25 ml. of this reagent, add 0.5 ml. of the diazotized sulfanilic acid. Let the mixture stand 1 minute, and add 1 drop of 40 per cent formaldehyde solution. Mix well and immediately add 0.1-0.3 ml. of the vitamin sample. Mix well. With vitamin C a pink color develops for about 1 hour. This color is suitable for the colorimetric determination of vitamin C.

Ref. Snell II, pp. 624-625; Biochem. J. 22, 419-433 (1928)

Additional Uses: This reagent is used for the colorimetric determination of the following:

Histamine, J. Biol. Chem. 39, 497-519, 521-538 (1919); J. Biol. Chem. 66, 475-88 (1925)

Phenol in water and Biological fluids, Snell II, pp. 353-357

DIAZOTIZED SULFANILIC ACID REAGENT

See: Ehrlich's Diazo Reagent; also, Diazobenzenesulfonic acid solution.

DIBROMOPHENOLTETRABROMOPHENOLSULFONPHTHALEIN INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of the reagent in 1.21 ml. of 0.1 *N* sodium hydroxide solution and dilute with water to 250 ml.

Remarks: pH: yellow 5.6-7.2 purple.

2, 6-DIBROMQUINONECHLORIMIDE SOLUTION

Use: An indicator for the colorimetric estimation of phenol.

Preparation:

Alcoholic Solution: Dissolve 0.1 g. of 2,6-dibromquinonechlorimide in 25 ml. of 95 per cent ethyl alcohol. Store in a dark, glass-stoppered bottle. Solution will keep 3 or 4 days in a cool, dark place. To use, dilute 5 ml. of this solution to 100 ml. with distilled water. This solution must be used immediately.

Aqueous Solution: Grind 0.04 g. of the indicator in a mortar with 10 ml. of distilled water, and transfer the powder to a brown bottle with the aid of water. Dilute to 100 ml. and shake for 10 minutes. Filter, and use within 20 minutes, as the solution decomposes very rapidly.

Remarks: Either solution may be used as desired.

Ref. A.P.H.A., pp. 247-249; W. Wks. and Sew., 79, 341 (1932)

DICHLOROFLUORESCEIN INDICATOR SOLUTION

Use: Adsorption indicator for precipitation analysis.

Preparation:

Alcoholic Solution: Dissolve 0.1 g. of dichlorofluorescein in 110 ml. of 70 per cent alcohol.

Aqueous Solution: Dissolve 0.1 g. of sodium dichlorofluoresceinate in 100 ml. of water.

Remarks: This indicator is used to titrate chloride by means of silver nitrate solution. At the end-point the precipitate suddenly becomes reddish.

Ref. Kolthoff and Sandell, p. 542

DICHROMATE-ACETIC ACID

See: Tellyesnicky's Fluid.

DICHROMATE-OSMIC ACID FLUID

See: Altman's fluid.

DICKENSON'S REAGENT

Use: Reagent to show segregation in steel.

Preparation: Mix the following:

Ferric chloride	40 g.
Cupric chloride	3 g.
Hydrochloric acid	40 ml.
Water	500 ml.

Remarks: To use, material is first etched with 10 per cent nitric acid and then re-etched with the above solution.

Ref. Williams and Homerberg, p. 313

DICKERT'S REAGENT

Use: Reagent for the determination of sulfur in illuminating gas.

Preparation: Mix 10 ml. of 30 per cent hydrogen peroxide with 75 ml. of 25 per cent sodium hydroxide solution.

Remarks: When illuminating gas is passed through this solution, sulfur is oxidized to sulfate which can be determined gravimetrically.

Ref. C. A. 5, 1989 (1911)

DI-p-DIAMINODIPHENYLAMINE SULFATE REAGENT (ROTHENFUSSER)

Use: Test reagent for benzoyl peroxide in flour.

Preparation: Place 1 g. of the reagent in a mortar and rub with a small quantity of alcohol, and then wash into a flask with alcohol. Add alcohol until the volume is 100 ml., and then reflux the mixture for 30 minutes. Shake before using.

Procedure for Test: Shake about 0.7 g. of the flour with 2.5 ml. of petroleum ether, and then add 1 ml. of the reagent. Shake again and allow to stand a few minutes. A green color is produced if benzoyl peroxide is present.

Sensitiveness: 1 : 10,000.

Ref. C. A. **19**, 1740 (1925)

DIETRICH'S FLUID

Use: Fixative.

Preparation: Mix the following:

Alcohol, 95%	30 ml.
Formaldehyde soln.	10-12 ml.
Glacial acetic acid	2 ml.
Distilled water	60 ml.

DIGITONIN REAGENT

Use: Reagent used for the determination of cholesterol.

Preparation: Dissolve 1 g. of digitonin in water and dilute to 1 liter. Place in a refrigerator for 24 hours and centrifuge. Decant and filter the supernatant liquid, and then concentrate to 500 ml. by passing steam through the flask which is heated in boiling water. If a precipitate forms, filter again.

Remarks: This reagent is used for the precipitation of cholesterol as the digitonide, which is then determined colorimetrically by acetic anhydride and sulfuric acid.

Ref. J. Biol. Chem. **106**, 745-760 (1934); Snell II, pp. 44-45

DIGITONIN SOLUTION (BRUNSWICK)

Use: Test reagent for phytosterol.

Preparation: Dissolve 0.5 g. of digitonin in 100 g. of 85 per cent alcohol.

Remarks: White crystals are formed when this reagent is added to phytosterol.

2, 4-DIHYDROXYACETOPHENONE SOLUTION

Use: Test reagent for ferric iron.

Preparation: Dissolve 10 g. of 2,4-dihydroxyacetophenone in 100 ml. of 95 per cent alcohol.

Remarks: This reagent gives a red color with ferric iron.

Sensitiveness: 2 : 1,000,000 if no other metallic salts are present.

Ref. Ind. Eng. Chem., Anal. Ed. **9**, 334 (1937)

1, 5-DIHYDROXYANTHRAQUINONE REAGENT (WILSON)

Use: Test reagent for nitric acid in sulfuric acid.

Preparation: Dissolve 0.21 g. of 1,5-dihydroxyanthraquinone in 250 ml. of nitric acid-free concentrated sulfuric acid.

Remarks: One drop of this reagent causes a yellow color when added to sulfuric acid containing nitric acid.

Ref. C. A. 19, 3071 (1925)

DIIODOFLUORESCEIN INDICATOR SOLUTION

Use: Adsorption indicator for precipitation analysis.

Preparation: Dissolve 0.5 g. of diiodofluorescein in 110 ml. of 70 per cent alcohol.

Remarks: This indicator is used for the titration of iodide in the presence of chloride using silver nitrate solution. During the titration the color changes from orange-red to blush-red.

Ref. Kolthoff and Sandell, p. 543

DIIODOPHENOL-p-SULFONIC ACID SOLUTION

Use: Test reagent for mercurous mercury.

Preparation: Dissolve 2 g. of diiodophenol-p-sulfonic acid in 100 ml. of water.

Procedure for Test: Place 1 drop of the solution to be tested on a spot plate and add 1 drop of the reagent. Bright yellow, needle-like crystals form if mercurous ions are present. This precipitate is insoluble in nitric and sulfuric acids. Lead gives a pale yellow precipitate with this reagent, but all other metals form white precipitates.

Sensitiveness: 0.005 mg.

Ref. C. A. 30, 6672 (1936); Belcher and Williams, p. 75

DIISONITROSOACETONE SOLUTION (DUBSKY-KURAS)

Use: Test reagent for ferrous iron.

Preparation: Dissolve 1 g. of diisonitrosoacetone in 100 g. of ethyl alcohol.

Procedure for Test: Add 1 ml. of the reagent to 5 ml. of the solution to be tested, and then neutralize with ammonium acetate. An intense blue color appears if ferrous iron is present. Some time may elapse before the formation of the blue color if the concentration of the iron is very low. Cobalt and nickel interfere.

Ref. C. A. 24, 801 (1930)

DIMERCAPTOTHIODIAZOLE SOLUTION

Use: Test reagent for bismuth.

Preparation: Dissolve 2 g. of dimercaptothiodiazole in 100 ml. of 0.1 *N* sodium hydroxide.

Remarks: Reagent yields a red precipitate in acid solution containing bismuth ions. All members of first 2 analytical groups give colored precipitates.

Ref. C. A. **29**, 3935 (1935)

p-DIMETHYLAMINOBENZALDEHYDE REAGENT

Use: Reagent for urinalysis (infectious-toxic diseases).

Preparation: Dissolve 2 g. of p-dimethylaminobenzaldehyde in 100 ml. of 20 per cent hydrochloric acid.

Procedure for Test: This reagent may be used to detect certain infectious-toxic diseases. Place equal volumes of urine in each of two test tubes, and add 8 or 10 drops of the test solution to each. Now to one tube add a few drops of formaldehyde. The solution so treated retains its original color, but the solution in the other tube becomes red in positive cases. Diseases indicated are: pneumonia, pulmonary tuberculosis, scarlet fever, and endocarditis.

Ref. Kolmer and Boerner, pp. 158-159; Snell II, pp. 695-697

p-DIMETHYLAMINOBENZALDEHYDE REAGENT (AMINES-PROCAINE)

Use: Test reagent for amines and procaine.

Preparation: Dissolve 4 g. of p-dimethylaminobenzaldehyde in a mixture prepared by adding 80 ml. of concentrated hydrochloric acd to 480 ml. of alcohol.

Procedure for Test: Place a tiny particle of the material to be tested on a glass plate and add 1 drop of the test reagent. Procaine and primary amines cause the appearance of a yellowish-green color.

Ref. Analyst **62**, 603 (1937)

p-DIMETHYLAMINOBENZALDEHYDE REAGENT (INDICAN)

See: Ehrlich's solution (Indican).

p-DIMETHYLAMINOBENZALDEHYDE REAGENT (INDOLE)

See: Kovac's reagent.

p-DIMETHYLAMINOBENZALDEHYDE REAGENT (JOACHIMOWITZ)

Use: Test reagent for certain aromatic hydroxy compounds.

Preparation: Dissolve 0.5 g. of p-dimethylaminobenzaldehyde in 8.5 g. of concentrated sulfuric acid and 8.5 ml. of water.

Remarks: Aromatic hydroxy compounds give color reactions as follows:

Phloroglucinol:	pink and then red.
Orcin:	pink and then violet-red.
Catechol:	pink and then red.
Thymol:	red within 30 minutes.

Ref. C. A. **12**, 165 (1918)

p-DIMETHYLAMINOBENZALDEHYDE REAGENT (SALKOWSKI)

Use: Test reagent for pyrrole and indole.

Preparation: Dissolve 2 g. of p-dimethylaminobenzaldehyde in 100 g. of *N* hydrochloric acid.

Procedure for Test: A red color appears when a few drops of the reagent are added to a very dilute solution of pyrrole or indole, and this color changes to violet when the mixture is heated.

Sensitiveness: Pyrrole: 1 : 4000.
Indole: 1 : 1000.

Ref. C. A. **14**, 2603 (1920)

p-DIMETHYLAMINOBENZALDEHYDE REAGENT (STEENSMA)

Use: Reagent for antipyrine.

Preparation: Dissolve 1 g. of p-dimethylaminobenzaldehyde in 5 ml. of 25 per cent hydrochloric acid and 95 ml. of absolute alcohol.

Procedure for Test: A red spot remains if a small quantity of antipyrine is evaporated to dryness on a water bath with a few ml. of the reagent.

Ref. C. A. **2**, 1600 (1908)

p-DIMETHYLAMINOBENZALDEHYDE REAGENT (TRAVAILLE)

Use: Test reagent for bile pigments in urine.

Preparation: Dissolve 2 g. of p-dimethylaminobenzaldehyde in 50 g. of hydrochloric acid and 50 ml. of water.

Procedure for Test: Add 4 ml. of the reagent to 10 ml. of the urine to be tested. A green color forms if bile pigments are present.

Ref. J. Am. Med. Assoc. **83**, 564 (1924)

Additional Uses: Variations of this reagent are used for the following determinations:

Menthol, Snell II, pp. 31-32
Ergot alkaloids, Arch. Pharm. **268**, 499-520 (1930)
Indole, Snell II, pp. 419-421
Proline, Snell II, pp. 269-271
Pyrroline, Mikrochemie **17**, 141-154 (1935)
Urobilinogen, Snell II, pp. 695-697

p-DIMETHYLAMINOBENZYLIDINERHODANINE SOLUTION

Use: Test reagent for silver and copper.

Preparation: Dissolve 0.03 g. of the reagent in 110 ml. of acetone.

Remarks: Cuprous ions give a reddish-violet precipitate in a dilute neutral or slightly acid solution of cuprous ions. Silver gives a similar reaction. Concentrated solution of cupric ions also gives color reactions as do lead and mercury.

Sensitiveness: Cuprous ion: 1 : 5 million.

Ref. Engelder, p. 107; C. A. **22**, 4080 (1928)

DIMETHYLCYCLOHEXANEDIONE REAGENT

Use: Detection of formaldehyde in foods.

Preparation: Dissolve 5-10 g. of dimethylcyclohexanedione in 90 g. of alcohol.

Remarks: This reagent causes a precipitate in neutral or slightly acid solutions of aldehydes.

Ref. Ind. Eng. Chem., Anal. Ed. 3, 365 (1931); Jacobs, pp. 113-114

DIMETHYLGLYOXIME REAGENT

Use: Reagent for the detection and determination of nickel.

Preparation: (0.1 *N* solution): Dissolve 3 g. of dimethylglyoxime in 250 ml. of 95 per cent alcohol.

Procedure for Test: Add 1 drop of the reagent to 1 drop of the solution to be tested on a spot plate, and then make alkaline with dilute ammonium hydroxide. A voluminous red precipitate forms if nickel is present. Cobalt forms a brown colored solution. Copper, iron and bismuth give similar reactions. Palladium is likely to interfere.

For quantitative precipitation of nickel with this reagent, the solution containing the nickel ions is made slightly acid, and then sodium acetate or dilute ammonium hydroxide added to make the pH approximately 7.0. Lead is the only metal likely to interfere.

Ref. Hillebrand and Lundell, pp. 313-318; Yoe I, p. 295; Snell I, pp. 314-317

DIMETHYLHYDRORESORCIN SOLUTION

See: Dimethylcyclohexanedione reagent.

DIMETHYL-p-PHENYLENEDIAMINE SOLUTION (JUILLET)

Use: Reagent for olive pits in nux vomica powder.

Preparation: Dissolve 0.5 g. of dimethyl-p-phenylenediamine in 100 ml. of water.

Procedure for Test: Shake a small quantity of the powder with 10 ml. of the reagent, and warm in a water bath at 30° C. for 20 minutes. Nux vomica adulterated with olive pits yields a red or reddish-brown sediment, while the pure powder gives a grey sediment.

Ref. C. A. 3, 2853 (1909)

DIMETHYL-p-PHENYLENEDIAMINE HYDROCHLORIDE SOLUTION (ALFTHAN)

Use: Determination of free chlorine in water.

Preparation: Dissolve 0.1 g. of dimethyl-p-phenylenediamine hydrochloride in 100 ml. of water.

To Make Determination: Add 1 ml. of the above solution to 100 ml. of the water to be examined and compare the resulting red color with a standard prepared as follows: Dissolve 1.15 g. of methyl red in 5 ml. of *N* sodium hydroxide solution and dilute to 100 ml. with water and add 5 ml. of 0.01 *N*

sodium thiosulfate solution. For use, dilute this stock solution with 100 volumes of distilled water.

Ref. Snell I, p. 542; C. A. 25, 2071 (1931)

DIMETHYL-p-PHENYLENEDIAMINE HYDROCHLORIDE SOLUTION (MALERBA)

Use: Test reagent for acetone and uric acid.

Preparation: Dissolve 5 g. of dimethyl-p-phenylenediamine hydrochloride in 100 ml. of water.

Procedure for Test: Add a few drops of the reagent to the solution to be tested. Acetone causes a violet coloration, but this color changes to pink on standing overnight. The solution is decolorized when made alkaline with sodium hydroxide.

To test for uric acid, acidify the unknown solution with nitric acid and evaporate to dryness. If uric acid is present, a blue color appears when a few drops of the reagent are added to the residue.

Ref. Arch. ital. biol. 22, 86

DIMETOL SOLUTION

See: Dimethylcyclohexanedione solution.

DI-(9, 10-MONOHYDROXYPHENANTHRYL)AMINE SOLUTION

Use: Test reagent for nitrate.

Preparation: Dissolve 0.1 g. of the reagent in 1 liter of concentrated sulfuric acid.

Remarks: Nitrates cause reagent to turn blue-red or wine red.

Ref. Ber. 1910, 794

DI-(1-NAPHTHYLMETHYL)-AMINE ACETATE REAGENT (RUPE-BECHERER)

Use: Reagent for gravimetric determination of nitric acid.

Preparation: Dissolve 10 g. of di-(1-naphthylmethyl)-amine acetate in 90 g. of 50 per cent acetic acid.

Remarks: Reagent precipitates nitrate from boiling solution acidified with sulfuric acid. Mineral acids other than sulfuric and phosphoric acids must be absent.

Ref. C. A. 17, 3465 (1923)

m-DINITROBENZENE REAGENT

Use: Test reagent for glucose and other reducing sugars.

Preparation: Dissolve 1 g. of m-dinitrobenzene in 100 ml. of alcohol and add 100 ml. of 33 per cent sodium hydroxide solution.

Procedure for Test: Add 1 ml. of the liquid to be tested to 20 ml. of the above reagent. A violet color appears if glucose or other reducing sugar is present.

Ref. Compt. rend. soc. biol. II, 174 (1906)

DINITRODIPHENYLAMINESULFOXIDE REAGENT

Use: Reagent for the colorimetric determination of tin in foods.

Preparation: Dissolve 0.2 g. of dinitrodiphenylaminesulfoxide in 100 g. of 0.1 *N* sodium hydroxide solution.

Remarks: Solutions containing tin give a violet color when treated with this reagent and a few drops of ferric chloride, and this color can be compared with standard solutions containing tin.

Ref, Jacobs, p. 140

2, 4-DINITRO-1-NAPHTHOL-7-SULFONIC ACID (SODIUM OR POTASSIUM SALT)

See: Naphthol yellow S (potassium reagent).

2, 4-DINITRO-1-NAPHTHOL-7-SULFONIC ACID-FORMALDEHYDE REAGENT

Use: Reagent for the colorimetric determination of glucose in urine.

Preparation: Add 37.5 g. of sodium carbonate, 25 g. of sodium sulfite, and 5 g. of 2, 4-dinitro-1-naphthol-7-sulfonic acid to 450 ml. of water and heat to boiling. Cool, and dilute to 500 ml. Filter, and store the clear filtrate in a bottle. This solution keeps indefinitely. To use, add 5 ml. of freshly prepared 10 per cent formaldehyde to 100 ml. of the above solution. This mixture should be prepared daily.

Remarks: Urea and creatinine are the only substances commonly present in urine which interfere with this determination. Homogentisic acid, which affects the copper and picric acid methods, is without effect when the above reagent is used.

Ref. Snell II, pp. 474-475

2, 4-DINITROPHENOL INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 1.0 g. of 2, 4-dinitrophenol in 5 ml. of alcohol and dilute with water to 100 ml.

Remarks: pH: colorless 2.6-4.0 yellow.

2, 5-DINITROPHENOL INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of 2, 5-dinitrophenol in 20 ml. of alcohol and dilute with water to 100 ml.

Remarks: pH: colorless 4.0-5.8 yellow.

2, 6-DINITROPHENOL INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of 2, 6-dinitrophenol in 5 ml. of alcohol and dilute with water to 100 ml.

Remarks: pH: colorless 2.4-4.0 yellow.

2, 4-DINITRORESORCINOL SOLUTION

Use: Test reagent for ferrous salts.

Preparation: Heat 100 ml. of water and add 2,4-dinitroresorcinol until the solution is distinctly brown in color. Continue to heat until solution is complete. If the solution is too dark, add more water.

Procedure for Test: Add a few drops of the reagent to a nearly neutral solution to be tested. A green to bluish-green color appears if ferrous iron is present. This reagent is more sensitive than potassium ferricyanide. Cobalt and copper also react.

Ref. C. A. **19**, 23 (1925); J. Am. Chem. Soc. **47**, 1268 (1925)

DINITROSALICYLIC ACID SOLUTION

Use: Quantitative determination of glucose in urine (Summer's method).

Preparation:

Solution A: Add 22 ml. of 10 per cent sodium hydroxide solution to 10 g. of crystallized phenol. Dissolve in a little water and dilute to 100 ml.

Solution B: Dissolve 6.9 g. of sodium bisulfite in 69 ml. of *Solution A.*

Solution C: Mix 300 ml. of 4.5 per cent sodium hydroxide solution with 255 g. of Rochelle salt and 880 ml. of 1 per cent dinitrosalicylic acid solution.

The finished reagent is prepared by mixing *Solution B* and *Solution C.*

Remarks: Keep in well-filled, stoppered bottle.

Ref. J. Biol. Chem., **65**, 383 (1925); **47**, 5 (1921)

DIPHENYLAMINE INDICATOR SOLUTION

Use: Oxidation-reduction indicator.

Preparation: Dissolve 1 g. of diphenylamine in 100 g. of concentrated sulfuric acid (free from nitrogen).

Remarks: This indicator is used for the titration of such oxidizing agents as permanganate, dichromate, vanadate, and ceric cerium with ferrous sulfate. It cannot be used in the presence of tungstate. The reduced form is colorless and the oxidized form violet in color.

Ref. J. Am. Chem. Soc. **46**, 263 (1924); Kolthoff and Sandell, pp. 470-472; Kolthoff and Furman, p. 256

DIPHENYLAMINE REAGENT (CARON)

Use: Test reagent for nitrate.

Preparation: Dissolve 0.005 g. of diphenylamine in 100 ml. of concentrated sulfuric acid, and then add 40 ml. of water (care) and 2-3 ml. of 0.1 *N* hydrochloric acid.

Procedure for Test: Add 5 ml. of the reagent to about 2 ml. of the solution to be tested. A blue color appears if nitrates are present.

Ref. C. A. **5**, 2792 (1911)

DIPHENYLAMINE REAGENT (CURCUMA)

See: Bell's reagent.

DIPHENYLAMINE REAGENT (GRÄFE)

Use: Reagent for formaldehyde.

Preparation: Dissolve 1 g. of diphenylamine in 100 g. of concentrated sulfuric acid.

Remarks: A green ring or zone is formed when a solution containing formaldehyde is poured onto the reagent.

Ref. C. A. **2**, 638 (1908)

DIPHENYLAMINE REAGENT (KOPP)

Use: Test reagent for nitrites and nitrates.

Preparation: Dissolve 0.1 g. of diphenylamine in 5 ml. of concentrated sulfuric acid and 5 ml. of water, and then dilute to 1 liter with concentrated sulfuric acid.

Remarks: A blue color forms when 5 ml. of the reagent is added to 5 ml. of water containing nitrites or nitrates. Hypochlorites and other oxidizing substances give this reaction.

Ref. Ber. **5**, 284 (1872); Snell I, pp. 637-641

DIPHENYLAMINE REAGENT (LIGNIN)

See: Wolesky's solution.

DIPHENYLAMINE REAGENT (MEAURIO)

Use: Test reagent for vanadium in water.

Preparation: Mix 0.2 g. of diphenylamine with 100 ml. of distilled water. Warm on a water bath and filter when cool.

Procedure for Test: Add 1 ml. of the clear filtrate from above and 1 ml. of hydrochloric acid to 5 ml. of the water to be tested. If vanadium is present a violet color develops in the mixture.

Ref. Analyst **43**, 179 (1918); Yoe, I, p. 715

DIPHENYLAMINE REAGENT (TRUCHOT)

Use: Reagent for nitrocellulose silk.

Preparation: Dissolve 0.2 g. of diphenylamine in 100 ml. of concentrated sulfuric acid.

Remarks: Nitrocellulose silk gives a blue color when dissolved in this reagent because of the presence of the nitrate group.

DIPHENYLAMINE REAGENT (WITHERS AND RAY)

Use: Test reagent for nitrite and nitrates.

Preparation: Dissolve 0.7 g. of diphenylamine in 60 ml. of concentrated sulfuric acid and 28.8 ml. of water. Allow to cool and add 11.3 ml. of concentrated hydrochloric acid.

Procedure for Test: Add 1 drop of the reagent to 1 ml. of the solution to be tested, and carefully float the mixture on concentrated sulfuric acid. Now heat for 20 minutes at 40° C. on a water bath. A blue color forms if nitrites or nitrates are present.

Sensitiveness: Nitric acid: 1 : 44,000,000.
Nitrous acid: 1 : 32,000,000.

Ref. J. Am. Chem. Soc. **33**, 708 (1911)

DIPHENYLAMINE BLUE SOLUTION

Use: Indicator for the volumetric determination of chlorine, bromine, and silver by the precipitation method.

Preparation: Dissolve 1 g. of diphenylamine in 100 ml. of sulfuric or phosphoric acid, and to 3 drops of this solution add 10 ml. of 5 *N* sulfuric acid and 1 ml. of 0.1 *N* potassium dichromate.

Remarks: If the indicator is added to the solution in which chloride is being precipitated the solution appears green, but when precipitation is complete the solution becomes clear and violet.

Ref. C. A. **24**, 4240 (1930)

DIPHENYLAMINE SULFONATE SOLUTION

Use: Oxidation-reduction indicator for the titration of iron with potassium dichromate, and zinc with potassium ferrocyanide.

Preparation: Dissolve 0.32 g. of barium diphenylamine sulfonate in 100 ml. of water, and add 0.5 g. of sodium sulfate. Filter to remove the precipitated barium sulfate.

Remarks: Oxidized form is reddish-violet in color. Color is largely destroyed on standing.

Ref. J. Am. Chem. Soc. **53**, 2902, 2906 (1931); Ind. Eng. Chem., Anal. Ed. **5**, 154 (1933); Kolthoff and Sandell, pp. 470-472

DIPHENYLBENZIDINE INDICATOR SOLUTION

Use: Oxidation-reduction indicator.

Preparation: Dissolve 0.1 g. of diphenylbenzidine in 100 g. of concentrated sulfuric acid.

Remarks: This indicator is similar to diphenylamine.

Ref. J. Am. Chem. Soc. **49**, 356 (1927)

DIPHENYLCARBAZIDE INDICATOR SOLUTION

Use: Indicator for the titration of chloride and bromide with mercuric nitrate.

Preparation: Saturate 50 ml. of alcohol with diphenylcarbazide and allow the solution to stand for several days until it turns red.

Remarks: The use of this reagent depends on the formation of slightly ionized mercuric chloride as long as chloride ions remain in solution, and

then the formation of a deep blue-violet complex from the indicator and mercuric ions when the latter is added in excess.

Ref. Ind. Eng. Chem., Anal. Ed. **8**, 365 (1937); Jacobs, pp. 477-478

DIPHENYLCARBAZIDE REAGENT (METALS)

Use: Test reagent for metals.

Preparation: Dissolve 0.1 g. of diphenylcarbazide in 100 ml. of 50 per cent alcohol.

Remarks: Reagent gives color reactions with solutions of metallic salts.

Ref. J. Am. Chem. Soc. **50**, 2363 (1928)

DIPHENYLCARBAZIDE REAGENT (CHROMATE)

Use: Test reagent for the chromate ion.

Preparation: Add enough diphenylcarbazide to 100 ml. of alcohol to form a saturated solution.

Procedure for Test: Acidify a few ml. of solution to be tested with acetic acid and add 1 ml. of the reagent. A violet color is formed with chromate ion. Iron does not interfere.

Sensitiveness: 1 : 100,000,000.

Ref. C. A. 1818 (1930); Chemist Analyst, J. T. Baker, January, 1936

DIPHENYLCARBAZIDE REAGENT (MERCURY)

Use: Test reagent for mercury.

Preparation: Dissolve enough diphenylcarbazide in 100 ml. of 90 per cent alcohol to form a saturated solution. Then saturate with ammonium thiocyanate and add a few crystals of potassium iodide.

Procedure for Test: Place a few drops of solution to be tested on a spot plate, neutralize with sodium carbonate solution, and add 1 drop of the test reagent. A violet color appears if mercuric ions are present. Zinc, iron, cobalt, nickel, lead, copper, silver, bromide, cyanide, and iodide interfere. The solution obtained by dissolving mercuric sulfide in aqua regia in the usual analytical procedure may be used as described above.

Sensitiveness: 1 : 1,000,000.

Ref. J. Am. Chem. Soc. **51**, 3351 (1929); Chemist Analyst, J. T. Baker, January, 1936

as-DIPHENYLHYDRAZINE SOLUTION

Use: Test reagent for selenium.

Preparation: Dissolve 1 g. of *as*-diphenylhydrazine in 100 g. of glacial acetic acid.

Procedure for Test: Place 4 drops of the reagent on a white spot plate, and add 1 drop of 2 *N* hydrochloric acid and 1 drop of the solution to be tested. If selenium is present a red coloration appears.

Ref. C. A. **31**, 8428 (1937)

DIPHENYLTHIOCARBAZONE REAGENT

See: Dithizone reagent.

p-DIPICRYLAMINE REAGENT

See: Aurantia solution.

α, α'-DIPYRIDYL REAGENT (IRON)

Use: Reagent for the detection and determination of ferrous iron.

Preparation: Dissolve 0.5 g. of α,α'-dipyridyl in 100 ml. of water.

Procedure for Test: Add a few drops of the reagent to a slightly acid solution of ferrous salt. A bright red color is a specific test for ferrous ions.

Ref. Snell I, pp. 310-311; C. A. **25**, 5866 (1931)

α, α'-DIPYRIDYL REAGENT (MOLYBDENUM)

Use: Reagent for molybdenum.

Preparation: Dissolve 3 g. of α,α'-dipyridyl in 100 g. of alcohol.

Procedure for Test: Add 2 drops of the reagent to a few ml. of the solution to be tested, and then add 1 drop of a solution prepared by dissolving 5 g. of stannous chloride in 10 ml. of concentrated hydrochloric acid. An intense violet color or precipitate forms if molybdenum is present. Tungstates interfere.

Sensitiveness: 1 : 100,000.

Ref. C. A. **31**, 6137 (1937)

DISODIUM-1, 8-DIHYDROXYNAPHTHALENE-3, 6-DISULFONIC ACID SOLUTION

See: Chromotropic acid (chromium).

DITHIOOXAMIDE SOLUTION

See: Rubeanic acid solution.

DITHIZONE REAGENT

Use: Reagent for the detection and determination of lead.

Preparation: Dissolve 0.05 g. of dithizone (diphenylthiocarbazone) in 1 liter of chloroform.

Procedure for Test: Add a drop of neutral solution to be tested to a spot plate, and add a drop of the reagent. A brick-red precipitate forms if lead is present. If test solution is acid, neutralize with sodium carbonate. If silver, nickel, zinc, cadmium, or antimony are present, add a drop of potassium cyanide to the solution before the addition of the test reagent. Tin, bismuth, and thallium interfere. Hydroxylamine prevents interference by oxidizing agents.

Remarks: Commercial diphenylthiocarbazone is purified as follows: Dissolve about 1 g. of the commercial product in 50-60 ml. of chloroform, and filter if any insoluble material is present. Extract in a separatory funnel with four 100 ml. portions of metal-free, redistilled ammonium hydroxide solution (1:99). Filter the aqueous extracts into a separatory funnel through cotton inserted in the stem of a funnel. Make this solution acid with dilute hydrochloric acid, and extract the precipitated dithizone with three 20 ml. portions of chloroform. Combine the chloroform extracts in a separatory funnel, and wash three times with water. Finally, evaporate the chloroform solution to dryness on a water bath with gentle heat. Heat the residue at 40°-50° in vacuo for 1 hour, and then store the dried product in a dark, tightly stoppered bottle.

Sensitiveness: 0.002 mg. of lead.

Ref. Snell I, pp. 202-204; A.P.H.A., pp. 241-245; C. A. **25**, 893 (1931)

DITTMAR'S REAGENT

Use: Test reagent for alkaloids.

Preparation:

Reagent 1: Dissolve a little potassium iodide and sodium nitrite in hydrochloric acid.

Reagent 2: Pass chlorine through an aqueous solution of iodine.

Remarks: These reagents yield yellow or brown precipitates with solution of alkaloids.

Ref. Ber. **18**, 1612 (1885)

DOBBIN'S SOLUTION

Use: Test reagent for caustic alkalies in carbonates.

Preparation: Dissolve 1 g. of potassium iodide in 50 ml. of water, and add a 5 per cent solution of mercuric chloride until the precipitate which forms no longer dissolves on shaking. Filter, and to the filtrate add 0.2 g. of ammonium chloride, and then a dilute solution of sodium hydroxide until a precipitate appears. Again filter, and dilute the filtrate to 200 ml. with water.

Remarks: Small quantities of sodium hydroxide in sodium carbonate cause a yellow color when the test reagent is added.

Ref. Zeitschr. angew. Chem. 1890, 417

DODSWORTH-LYONS REAGENT

Use: Test reagent for formaldehyde in alcohol.

Preparation:

Solution A: Dissolve 30 mg. of ferric ammonium sulfate in 1 ml. of distilled water and add to 100 ml. of concentrated sulfuric acid.

Solution B: Dissolve 0.1 g. of dried egg albumin in 10 ml. of water.

Procedure for Test: Add 0.3 ml. of *Solution B* to 10 ml. of the alcohol to be tested and shake thoroughly. With the aid of a pipette carefully underlay this solution with 1 ml. of *Solution A*. A purple ring forms at the junction of the two liquids if formaldehyde is present.

Ref. J. Am. Pharm. Assoc. **11**, 13 (1922); **12**, 698 (1923)

DOEBNER'S REAGENT

Use: Test reagent for hydrogen peroxide, cyanide, and blood.

Preparation: Dissolve 0.5 g. of guaiaconic acid in 100 g. of alcohol and 100 ml. of water.

Remarks: Solution must be freshly prepared.

The above reagent is used instead of tincture of guaiac in many common tests.

Ref. Arch. Pharm. **234**, 619 (1896)

DOHMÉE'S REAGENT

Use: Test reagent for albumin.

Preparation:

Method 1: Dissolve 0.5 g. of picric acid, 1 g. of trichloroacetic acid, and 2.5 g. of citric acid in sufficient water to make 100 ml. of solution.

Method 2: Dissolve 1 g. of picric acid, 1 g. of trichloroacetic acid, and 10 ml. of glacial acetic acid in sufficient water to make 100 ml. of solution.

Remarks: This reagent precipitates albumin.

Ref. J. pharm. chim. 1916, 241

DONALDSON'S REAGENT

Use: Test reagent for glucose in body fluids.

Preparation: Dissolve 4 g. of cupric sulfate, 6 g. of potassium bitartrate, 5 g. of potassium hydroxide, and 5 g. of sodium carbonate in 32 ml. of water.

Remarks: This reagent is used like Fehling's solution.

Ref. J. chim. méd. **7**, 641 (1852);

DORNER'S NIGROSIN

Use: Staining solution for spores.

Preparation: Add 10 g. of nigrosin to 100 ml. of distilled water and boil for 30 minutes. Add 0.5 ml. of 37 per cent formaldehyde solution and filter twice through a double filter paper.

Remarks: This solution should be stored in 5 ml. quantities in serological test tubes.

This solution is used instead of Burri India ink in the negative demonstration of bacteria.

Ref. Kolmer and Boerner, p. 399; Biol. Stains, Conn pp. 103-104

DORSET'S EGG MEDIUM

Use: Culture medium.

Preparation: Wash 4 eggs, first with water, and then with a 5 per cent phenol solution. Allow to dry, and then open and place in a sterile flask. Add 25 ml. of sterile distilled water and mix thoroughly. Avoid foaming. Tube the medium and sterilize in the manner described for the preparation of Loeffler's serum.

Ref. Am. Med. **3**, 555 (1902); J. Med. Research **22**, 517 (1910)

DRAGENDORFF'S REAGENT (ALKALOIDS)

Use: Test reagent for alkaloids.

Preparation: Dissolve 8 g. of bismuth subnitrate in 20 ml. of concentrated nitric acid (sp. gr. 1.18), and pour slowly into a solution prepared by dissolving 27.7 g. of potassium iodide in about 25 ml. of water. Allow to stand until the potassium nitrate has precipitated. Filter, and dilute the filtrate with water to 100 ml.

Remarks: Keep in a dark, well-stoppered bottle. With most alkaloids this solution forms a reddish-yellow, flocculent precipitate.

Ref. C. A. **19**, 223 (1925)

DRAGENDORFF'S REAGENT (HELLEBOREIN)

Use: Reagent for helleborein.

Preparation: Mix the following:

Potassium iodide solution, 10% aq.	0.1 ml.
Alcohol	7.0 ml.
Sulfuric acid	10.0 ml.

Remarks: This reagent dissolves helleborein within 15 minutes, and the resulting solution is dark pink in color.

Ref. Arch. Pharm. **234**, 72 (1896)

DUBSKY-WAGNER REAGENTS

Use: Test reagents for magnesium.

Preparation:

Solution 1: Dissolve 0.05 g. of alkannin in 100 g. of alcohol.

Solution 2: Dissolve 0.03 g. of naphthazarin in 100 g. of alcohol.

Procedure for Test: Add 5 drops of either of the above reagents to 50 ml. of the solution to be tested, and then add drop by drop, a slight excess of 2.5 *N* sodium hydroxide solution. A blue precipitate forms if magnesium is present. If the precipitate does not form at once, warm the mixture.

Solution 3: Mix 50 ml. of 0.03 per cent naphthazarin solution and 10 ml. of 10 per cent ethylenediamine solution. A blue color is produced when this solution is added to solutions of magnesium salts.

Sensitiveness: 1 : 66,000.

Ref. Mikrochemie **17**, 186 (1935)

DUDLEY'S REAGENT

Use: Test reagent for glucose.

Preparation: Dissolve 5 g. of bismuth subnitrate in the least possible quantity of nitric acid and then add an equal volume of acetic acid. Finally, add 10 volumes of water, and filter if a precipitate forms.

Procedure for Test: Add sodium hydroxide solution to the liquid to be tested until strongly alkaline, and then add a few drops of the reagent. Boil for a few minutes. A gray or black color appears if glucose is present.

Ref. Am. Chem. J. **2**, 47 (1880)

DUNHAM'S PEPTONE WATER MEDIUM

Use: Culture medium for indole test.

Preparation: Mix the following and heat carefully until solution is complete.

Peptone	10 g.
Sodium chloride	5 g.
Distilled water	1 liter

Adjust the reaction of the solution to pH 7.6. Filter if necessary. Fill into flasks or tubes, and heat in an autoclave at 15 pounds pressure for 20 minutes.

Ref. Am. J. Med. Sci. **105**, 75 (1893)

DUPASQUIER'S SOLUTION

Use: Test reagent for organic matter in water.

Preparation: Dissolve a little gold chloride in distilled water.

Remarks: When water containing organic matter is boiled with this solution, a bluish-violet color appears, and the organic matter is precipitated.

DUYK'S REAGENT

Use: Test reagent for glucose.

Preparation: Mix the following:

Nickel sulfate, 20% aq. soln.	25 ml.
Sodium hydroxide, 25% aq. soln.	20 ml.
Tartaric acid, 6% aq. soln.	50 ml.

Remarks: When this reagent is boiled with a solution containing glucose, the color changes from green to brown or black.

Ref. Ann. chim. anal. chim. appli. **6**, 364 (1901)

DWYER'S REAGENT

See: *p*-nitrodiazoaminoazobenzene reagent.

DYER-BAUDISCH REAGENT

See: *o*-benzoquinone solution.

EBER'S SOLUTION

Use: Test reagent for spoiled sausage.

Preparation: Mix the following:

Hydrochloric acid	10 g.
Ether	10 g.
Alcohol	30 g.

Remarks: Hold a piece of sausage over test solution. A cloud, caused by ammonia, appears if the sausage is decomposing.

EHRLICH'S SOLUTION (BILIRUBIN)

Use: Test reagent for bilirubin.

Preparation:

Solution A: Dissolve 2.5 g. of sulfanilic acid and 25 ml. of hydrochloric acid in 100 ml. of water.

Solution B: Dissolve 0.5 g. of sodium nitrite in 100 ml. of water.

Procedure for Test: Mix 49 ml. of *Solution A* with 1 ml. of *Solution B*. Mix this solution with the solution to be tested and acidify with acetic acid. A blue or violet color indicates the presence of bilirubin.

Ref. Zeitschr. anal. Chem. **23**, 275 (1884)

EHRLICH'S SOLUTION (INDICAN)

Use: Test reagent for indican in urine.

Preparation: Dissolve 0.33 g. of dimethylaminobenzaldehyde in a solution prepared by dissolving 50 ml. of concentrated hydrochloric acid in 50 ml. of water.

Remarks: Boil 2 ml. of urine with 2 ml. of test reagent. Cool, and make alkaline with ammonium hydroxide. A red color indicates the presence of indican.

Ref. Pharm. Zentralhalle 1905, 89

EHRLICH'S ACID HEMATOXYLIN

Use: Staining solution.

Preparation: Dissolve 2 g. of hematoxylin in 100 ml. of absolute alcohol and add 10 ml. of glacial acetic acid. Add 100 ml. of glycerol and 100 ml. of water. Next, saturate this solution with alum, and then allow to ripen in an open flask in the light until the solution is dark red in color.

EHRLICH'S DIAZO REAGENT

Use: Test reagent for pathological urine.

Preparation: Method I: Prepare two separate solutions as follows:

Solution A: Dissolve 5 g. of sodium nitrite in sufficient distilled water to make 1 liter of solution.

Solution B: Dissolve 5 g. of sulfanilic acid and 50 ml. of hydrochloric acid in sufficient distilled water to make 1 liter of solution.

Remarks: Preserve these solutions separately in stoppered bottles, and when ready for use, mix 1 ml. of *Solution A* with 50 ml. of *Solution B.*

The sodium nitrite solution deteriorates on standing, and may be kept only for a few weeks.

Method II: Dissolve 1 g. of sulfanilic acid, 15 ml. of hydrochloric acid, and 0.1 g. of sodium nitrite in a little water and dilute to 1 liter.

Procedure for Test: Mix 5 ml. of urine with an equal volume of the reagent and make alkaline with ammonium hydroxide. Shake well. If the urine is pathological, the mixture, and foam which forms on shaking, are colored red.

Ref. Hawk and Bergeim, pp. 779 and 890

Additional Uses: Determination of urea in blood serum or urine.

Snell II, pp. 395-396

Determination of phenols in water and biological fluids.

J. Soc. Chem. Ind., **39**, 260T (1920); Snell II, pp. 353-357

EHRLICH'S HEMATOXYLIN-GLYCERIN

Use: Stain for nuclei and schizomycetes.

Preparation: Add 6 g. of glacial acetic acid and 120 g. of glycerol to 120 ml. of water and saturate with alum. Then mix the solution with a second solution prepared by dissolving 3 g. of hematoxylin in 90 g. of alcohol.

Ref. Biol. Stains, Conn p. 185

EHRLICH'S NEUTRAL RED STAIN

Use: Stain for bacteria.

Preparation: Dissolve 1 g. of neutral red in 100 ml. of a very dilute solution of sodium chloride.

Remarks: Color changes to yellowish-orange in slightly alkaline media.

Ref Biol. Stains, Conn p. 95

EHRLICH'S STAIN (BACTERIA)

Use: Staining solution for bacteria.

Preparation: Dissolve 3 g. of methylene blue in 100 ml. of water.

EHRLICH'S STAIN (TUBERCLES)

Use: Stain for tubercles.

Preparation:

Solution A: Mix 5 g. of aniline with 100 ml. of water and filter.

Solution B: A concentrated solution of fuchsin in alcohol.

Solution C: A concentrated solution of gentian violet in alcohol.

Solution D: A concentrated solution of methyl violet in alcohol.

When ready to use, mix 100 parts of *Solution A* with 11 parts of either *Solution B, Solution C,* or *Solution D.*

Remarks: Solution must be freshly mixed for cover-glass preparations. For staining sections solution must be perfectly clear. Such solutions may be obtained by allowing to stand for 24 hours.

EHRLICH'S TRIACID STAIN

Use: Staining solution.

Preparation: Mix the following:

Orange *G*, sat. aq. soln.	120-125 ml.
Acid fuchsin, sat. aq. soln.	80-165 ml.
Methylene green, sat. aq. soln.	125 ml.
Water	300 ml.
Alcohol, absolute	200 ml.
Glycerol	100 ml.

Allow to stand for at least one week before using.

Ref. Biol. Stains, Conn p. 169

EHRLICH-BIONDI'S TRIACID MIXTURE

Use: Polystaining of microscopic sections.

Preparation: Mix the following:

Ruby *S*, sat. aq. soln.	3 parts
Methyl green 00, sat. aq. soln	5 parts
Orange *G*, sat. aq. soln.	10 parts

Remarks: Useful in pathological examination of intestines.

EICHLER'S REAGENT (AMINES)

Use: Test reagent for primary amines and diazonium salts.

Preparation: Dissolve 2 g. of resorufin and 2 g. of sodium carbonate in 1 liter of water.

Procedure for Test: Filter the solution to be tested and make the filtrate slightly acid, and then add to a second solution prepared by adding the test reagent drop by drop to 10 ml. of water until a distinct fluorescence is produced. Mix well and make slightly alkaline with sodium carbonate. A brown dye which shows no fluorescence is formed if a diazonium salt is present, but if diazonium salts are absent the fluorescence returns. The test for a primary amine is based on its conversion to a diazonium salt with nitrous acid and subsequently testing by the above procedure.

Ref. C. A. **29**, 1362-1363 (1935)

EICHLER'S REAGENT (NITRITE)

Use: Reagent to detect nitrite in the presence of nitrate.

Preparation: Dissolve 0.1 g. of Magadala red in 100 ml. of either acetic or formic acid.

Procedure for Test: Dilute 5 ml. of the above solution with water until a fluorescence appears, and then add a little of the solution to be tested. If nitrite is present the fluorescence disappears and a blue color is produced. Nitrates do not give this test.

Ref. C. A. **29**, 3259 (1935)

EIJKMAN BROTH

Use: Culture medium.

Preparation: Dissolve the following in sufficient distilled water to make 1 liter of solution:

Peptone	15.0 g.
Glucose	3.0 g.
Dipotassium phosphate	4.0 g.
Monopotassium phosphate	1.5 g.
Sodium chloride	5.0 g.

Ref. A.P.H.A. pp. 261-262; J. Bact., **26**, 419 (1933); **30**, 479 (1935)

ELLRAM'S REAGENT

Use: Test reagent for alkaloids and resins.

Preparation: Dissolve 1 g. of vanillin in 100 g. of sulfuric acid.

Ref. Chem.-Ztg. 1899, Rep. 171

ELTESTE'S REAGENT

Use: Reagent for carbon dioxide.

Preparation: Impregnate filter paper with a solution prepared by adding 10 ml. of 0.1 per cent phenolphthalein to 100 ml. of 0.1 *N* barium hydroxide solution.

Remarks: The moistened paper is decolorized when exposed to carbon dioxide, but if allowed to stand in air the color returns.

Ref. C. A. **22**, 4409 (1928)

EMANUEL'S REAGENT

Use: Reagent used for the study of cerebrospinal fluid.

Preparation:

Solution 1: Dissolve 10 g. of mastic in 100 ml. of absolute alcohol and filter. When ready to use, mix 1 ml. of the mastic solution with 9 ml. of alcohol, and blow the mixture rapidly into 40 ml. of water.

Solution 2: Dissolve 1.25 g. of sodium chloride in 100 ml. of water.

Remarks: Reagent is used in a manner similar to that employed in making Lange's test.

Ref. C. A. **10**, 617 (1916)

ENDO'S MEDIUM

Use: For standard water analysis.

Preparation:

Basic Stock Agar: This is a 3 per cent solution of agar which contains 1 per cent peptone and 0.5 per cent beef extract. It is sterilized and the reaction adjusted to pH 7.4 after sterilization.

Medium: To 100 ml. of the liquefied stock agar, add the following in the order given:

Lactose solution, 20%, warm and sterile	5 ml.
Basic fuchsin, 3% alcoholic soln.	1 ml.
Sodium sulfite, anhydrous, dissolved in 5 ml. of hot distilled water	0.125 g.

Mix well and pour into sterile Petri dishes. Allow to set to room temperature. Place in an incubator overnight and test for sterility.

Ref. A.P.H.A., pp. 201-202; Am. J. Pub. Health, **2**, 979 (1912)

ENDO'S MEDIUM (LEVINE)

Use: Culture medium.

Preparation: Prepare the following solutions:

Solution 1: Dissolve 1 g. of anhydrous sodium carbonate in 10 ml. of water.

Solution 2: Dissolve 0.5 g. of basic fuchsin (90% dye content) in 5 ml. of alcohol.

Solution 3: Dissolve 2.5 g. of sodium bisulfite in 25 ml. of water.

Solution 4: Dissolve 10 g. of lactose and 3.5 g. of dipotassium phosphate in 960 ml. of hot, liquefied nutrient agar.

Add *Solutions 1, 2,* and *3* separately, and with thorough mixing, to *Solution 4,* which is still hot and liquid. Place in suitable containers and sterilize in a steam sterilizer for 20 minutes on each of three successive days.

Remarks: This medium is pink or red when hot, and pale flesh or colorless when cool.

This medium should be freshly prepared as needed.

Ref. Military Surgeon, **57**, 280 (1925)

EOSIN, AQUEOUS

Use: Staining solution.

Preparation: Dissolve 0.1-0.25 g. of eosin *Y* (85% dye content) in 100 ml. of distilled water.

Ref. Kolmer and Boerner, p. 815

EOSIN INDICATOR SOLUTION

Use: Adsorption indicator for precipitation analysis.

Preparation:

Alcoholic Solution: Dissolve 0.1 g. of eosin in 110 ml. of 70 per cent alcohol.

Aqueous Solution: Dissolve 0.1 g. of sodium eosinate in 100 ml. of water.

Remarks: This indicator is used to titrate bromide in an alkali bromide using silver nitrate solution. At the end-point the precipitate turns intensely red.

Ref. Kolthoff and Sandell, p. 542

EOSIN METHYLENE BLUE AGAR (LEVINE)

Use: Culture medium for intestinal pathogens.

Preparation: Mix the following and dissolve with the aid of heat:

Dipotassium phosphate	2 g.
Peptone	10 g.
Agar	15 g.
Distilled water	1 liter

Replace any water lost by evaporation and distribute in 100 ml. portions in flasks and heat in an autoclave at 15 pounds pressure for 20 minutes.

To use: liquefy, and to each 100 ml. add the following:

Lactose, sterile 20% aq. soln.	5 ml.
Eosin *Y*, sterile 2% aq. soln.	2 ml.
Methylene blue, sterile 0.5% aq. soln.	2 ml.

Mix well and pour into Petri dishes. Incubate and test for sterility.

Remarks: The above solution is used for the determination of organisms of the colon-aerogenes group in water. When employed for the isolation of pathogens from stools, reduce the dye content to one-half that indicated above. The medium should be tested before use with known cultures of the Eberthella and Shigella organisms.

Ref. A.P.H.A., pp. 202-203; Iowa State College of Agri. and Mech. Arts, Bull. 62, 117 (1921)

EPHRAIM'S REAGENT

See: Salicylaldoxime reagent.

ERDMANN'S SOLUTION

Use: Test reagent for alkaloids.

Preparation: Add 1 ml. of dilute nitric acid to 60 ml. of concentrated sulfuric acid and mix well.

Remarks: This reagent gives color reactions as follows:

Morphine:	reddish
Brucine:	red then yellow
Thebaine:	blood red
Digitalin:	brown then red
Papaverine:	violet

Ref. Ann. 120, 188 (1861)

ERIOCHROMCYANINE R REAGENT

Use: Reagent for the detection and determination of aluminum.

Preparation: Dissolve 0.1 g. of eriochromcyanine *R* in 100 ml. of distilled water.

Procedure for Test: To 0.5 ml. of a solution containing the ions of the aluminum group, add an equal volume of sodium hydroxide solution and filter. Acidify the filtrate with acetic acid and add 1 drop of the reagent. The orange-red reagent turns bluish-red in the presence of aluminum. Chromate, ferricyanide, phosphate, fluoride, tartrate, silicofluoride, oxalate silicate, and beryllium interfere. Copper, thallium, and vanadium also interfere.

Sensitiveness: 1-15 γ.

Ref. Snell I, pp. 271-272; C.A. 31, 3814 (1937), 32, 6970 (1938)

ERIOGLAUCINE INDICATOR SOLUTION

Use: Oxidation-reduction indicator.

Preparation: Dissolve 0.1 g. of erioglaucine in 100 ml. of water.

Remarks: The oxidized form of this reagent is bluish-red in color.

Ref. Kolthoff and Sandell, p. 474; C. A. 23, 3871 (1929)

ERIOGREEN INDICATOR SOLUTION

Use: Oxidation-reduction indicator.

Preparation: Dissolve 0.1 g. of eriogreen in 100 ml. of water.

Remarks: Oxidized form of the reagent is orange-yellow in color.

Ref. Kolthoff and Sandell, p. 474; C. A. 23, 3871 (1929)

ERLICKI'S HARDENING SOLUTION

Use: Reagent for fixing and hardening organic specimens.

Preparation: Dissolve 1 g. of crystalline cupric sulfate and 2.5 g. of potassium dichromate in 100 ml. of water.

ERLICKI'S STAIN

Use: A stain for tissue from the central nervous system.

Preparation: Dissolve 2.5 g. of methyl green in 100 ml. of 1 per cent acetic acid.

ESBACH'S REAGENT

Use: Test reagent for albumin in urine.

Preparation:

Method I: Dissolve 10 g. of picric acid and 20 g. of citric acid in 1 liter of water.

Remarks: Reagent gives a yellow precipitate with albuminous urine acidified with acetic acid.

Method II: A new reagent is prepared as follows:

Trichloroacetic acid	100 g.
Water	900 ml.

Remarks: Effect of temperature and specific gravity are reduced to a minimum with this reagent.

Ref. Kolmer and Boerner, p. 141; Hawk and Bergeim, p. 856

ETHYL EOSIN, ALCOHOLIC (HARRIS)

Use: Staining solution.

Preparation: Dissolve 1 g. of ethyl eosin (80% dye content) in 100 ml. of 95% alcohol.

Ref. J. Infectious Dis., **5**, 566-569

N-ETHYL-8-HYDROXYTETRAHYDROQUINOLINE HYDROCHLORIDE

Use: Test reagent for trivalent arsenic.

Preparation: Dissolve 0.5 g. of the reagent in 100 ml. of water.

Procedure for Test: Place a drop of the solution to be tested on filter paper and allow to dry. Then moisten with a drop of hydrochloric acid and a drop of the test reagent, and then add 1 drop of ferric chloride solution. If arsenic (ous) is present in the original solution, a reddish-brown coloration appears when the spot is warmed. Lead, mercury, and copper interfere.

Sensitiveness: 0.0000006 mg.

Ref. C. A. **29**, 5037 (1935)

EXTON'S REAGENT

Use: Test reagent for albumin in urine.

Preparation: Dissolve 20 g. of sodium sulfate ($Na_2SO_4 \cdot 10H_2O$) in 80 ml. of water. Cool to 35° C. and add 5 g. of sulfosalicylic acid. Dilute with water to 100 ml.

Remarks: This reagent precipitates albumin.

Ref. J. Am. Med. Assoc. **80**, 529 (1923); **85**, 388 (1925); J. Lab. Clin. Med. **10**, 695 (1925)

EXTON'S QUANTITATIVE REAGENT

Use: Estimation of albumin in urine.

Preparation: Dissolve 50 g. of sulfosalicylic acid (Eastman) and 10 g. of cryst. sodium sulfate in 500 ml. of water, and add 25 ml. of a 0.4 per cent aqueous solution of bromphenol blue. Make up to 1 liter and filter. Heat gently.

Ref. Kolmer and Boerner, pp. 139-140

EXTRACT BROTH

See: Beef extract broth.

FARMER'S SOLUTION

See: Carnoy's fluid 3:1.

FARRANT'S SOLUTION

Use: A preservative for microscopic specimens.

Preparation: Dissolve 50 g. of gum acacia and 2 g. of arsenious oxide in a mixture prepared by adding 50 ml. of glycerol to 50 ml. of water.

FEARON'S REAGENT

Use: Reagent for glyoxylic acid.

Preparation: Dissolve 1 g. of pyrogallol in 100 g. of nitrous acid-free sulfuric acid.

Remarks: Glyoxylic acid or salts of the acid produce a deep blue color when warmed with this reagent. The color is changed to carmine when the mixture is diluted with water.

Ref. Biochem. J. 14, 548 (1920)

FEDER'S REAGENT

Use: Test reagent for aldehydes.

Preparation: Dissolve 1 g. of sodium thiosulfate and 0.8 g. of sodium hydroxide in 10 ml. of water, and then add this mixture to 10 ml. of a 2 per cent solution of mercuric chloride.

Remarks: This solution becomes turbid immediately in the presence of aldehydes.

The reagent must be freshly prepared.

Sensitiveness: 0.05 mg. formaldehyde.

Ref. C. A. 2, 977 (1908)

FEHLING'S SOLUTION

Use: Test reagent for glucose.

Preparation: Fehling's solution consists of two separate solutions, which are preserved separately. These are prepared as follows:

Solution A: (Cupric sulfate solution.) Dissolve 34.65 g. of pure cupric sulfate in distilled water and dilute to 500 ml.

Solution B: (Alkaline tartrate solution.) Dissolve 173 g. of Rochelle salt and 125 g. of potassium hydroxide in distilled water and dilute to 500 ml.

Remarks: Mix *Solutions A* and *B* in equal volumes just before use. Add a little of the solution to be tested to 5 ml. of the test solution and boil. A red precipitate forms with reducing sugars.

Ref. Jacobs, p. 248; Hawk and Bergeim, p. 53

FERNAMBUCO PAPER

See: Brazilin paper.

FERREIRA DA SILVA'S SOLUTION

Use: Test reagent for alkaloids.

Preparation: Dissolve 0.5 g. of ammonium selenite in 10 g. of concentrated sulfuric acid.

Remarks: This reagent gives characteristic color reactions with many alkaloids.

FERRIC ALUM INDICATOR

Use: Determination of chloride by Volhard's method.

Preparation: Dissolve 28 g. of ferric alum (ferric ammonium sulfate) in 80 ml. of hot water and allow to cool. Filter, and dilute the filtrate to 100 ml. with 6 *N* nitric acid.

FERRIC CHLORIDE SOLUTIONS

Reagent: $FeCl_3 \cdot 6H_2O$, mol wt. = 270.31.

Preparation:

0.5 Molar: Dissolve 135.1 g. of ferric chloride in water containing 20 ml. of concentrated hydrochloric acid and dilute with water to 1 liter.

1.0 Normal: Dissolve 90.1 g. of ferric chloride in water containing 20 ml. of concentrated hydrochloric acid and dilute with water to 1 liter.

10 mg. of ferric ion per ml. of solution: Dissolve 47.6 g. of ferric chloride in water containing 20 ml. of concentrated hydrochloric acid and dilute with water to 1 liter.

FERRIC CHLORIDE ETCHING SOLUTION

Use: Reagent to show structure of austenitic nickel steels.

Preparation: Mix the following:

Ferric chloride	5 g.
Hydrochloric acid	50 ml.
Water	100 ml.

Ref. Metals Handbook, p. 722

FERRIC CHLORIDE REAGENT

Use: Reagent for detecting 3-indolacetic acid in the presence of tryptophane.

Preparation: Add 0.01 ml. of concentrated ferric chloride solution (d. 1.453) to 100 ml. of concentrated hydrochloric acid.

Remarks: This reagent gives a scarcely visible yellow color with a 1 : 2,000 solution of tryptophane, but gives a strong pink to yellow color with a 1 : 1,000,000 solution of 3-indolacetic acid.

Ref. C. A. 33, 8651 (1939)

FERRIC CHLORIDE SOLUTION, ACID

See: Acid ferric chloride.

FERRIC NITRATE SOLUTIONS

Reagent: $Fe(NO_3)_3 \cdot 9H_2O$, mol. wt. = 404.01.

Preparation:

0.5 Molar: Dissolve 202 g. of ferric nitrate in water and dilute to 1 liter.

1.0 Normal: Dissolve 134.7 g. of ferric nitrate in water and dilute to 1 liter.

10 mg. ferric ion per ml. of solution: Dissolve 72.5 g. of ferric nitrate in water and dilute to 1 liter.

FERRIC SULFATE SOLUTIONS

Reagent: $Fe_2(SO_4)_3 \cdot 9H_2O$, mol. wt. = 562.01.

Preparation:

0.5 Molar: Dissolve 281 g. of ferric sulfate in water containing 100 ml. of concentrated sulfuric acid and dilute to 1 liter.

1.0 Normal: Dissolve 93.7 g. of ferric sulfate in water containing 25 ml. of concentrated sulfuric acid and dilute to 1 liter.

10 mg. of ferric ion per ml. of solution: Dissolve 50.3 g. of ferric sulfate in water containing 25 ml. of concentrated sulfuric acid and dilute to 1 liter with water.

FERRICYANIDE SOLUTION

Use: Etching reagent for alloy steels.

Preparation: Dissolve 30 g. of potassium ferricyanide and 30 g. of potassium hydroxide in 60 ml. of water.

Remarks: This solution must be fresh. Use boiling.

Ref. Metals Handbook, p. 723

FERROCYANIDE-CITRATE AGAR

Use: Culture medium for coli-aerogenes group.

Preparation:

Solution A: Dissolve the following in 757 ml. of sterile distilled water:

Sodium sulfite, C. P., anhyd.	3.8 g.
Monopotassium phosphate C. P.	7.5 g.
[illegible]um ammonium hydrogen phosphate C. P.	45.4 g.
[illegible]c fuchsin, 4% alcoholic soln.	18.0 ml.
[illegible]ssium ferrocyanide, 9% aq. soln.	25.0 ml.
[illegible]tose, 20% aq. soln.	200.0 ml.

The lactose solution should be heated in streaming steam for 15 minutes.

Solution B: Dissolve 1.33 g. of ferric citrate (U.S.P. soluble) in 100 ml. of distilled water, and heat in streaming steam for 15 minutes.

To Use: Add 10 ml. of *Solution A* to 100 ml. of melted 1.75 per cent Difco special agar and shake. Then add 3 ml. of *Solution B* and again shake. It is not necessary to adjust the pH.

Ref. A.P.H.A., pp. 266-267

FERROIN SOLUTION

See: Phenanthroline-ferrous ion indicator.

FERRON SOLUTION

Use: Reagent for the colorimetric determination of iron.

Preparation: Dissolve 2 g. of ferron (7-iodo-8-hydroxyquinoline-5-sulfonic acid) in 100 ml. of water.

Remarks: Make solution acid to methyl orange and add a few drops of the reagent. The color changes to green in the presence of ferric ions. Fluoride interferes.

Sensitiveness: 1 : 10,000,000.

Ref. J. Am. Chem. Soc. **54**, 4139-43 (1932); **59**, 872 (1937); Snell I, p. 302

FERROUS AMMONIUM SULFATE SOLUTIONS

Reagent: $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$, mol wt. = 391.95.

Preparation:

0.5 Molar: Dissolve 196 g. of ferrous ammonium sulfate in water containing 10 ml. of concentrated sulfuric acid and dilute with water to 1 liter.

1.0 Normal: (Acting as a salt) Same as 0.5 Molar.

10 mg. of ferrous ion per ml. of solution: Dissolve 70.3 g. of ferrous ammonium sulfate in water containing 10 ml. of concentrated sulfuric acid and dilute with water to 1 liter.

Remarks: Solutions do not keep well, and should be freshly prepared.

FERROUS SULFATE SOLUTIONS

Reagent: $FeSO_4 \cdot 7H_2O$, mol. wt. = 278.01.

Preparation:

0.5 Molar: Dissolve 139 g. of ferrous sulfate in water containing 10 ml. of concentrated sulfuric acid and dilute with water to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of ferrous ion per ml. of solution: Dissolve 49.9 g. of ferrous sulfate in water containing 10 ml. of concentrated sulfuric acid and dilute with water to 1 liter.

FISHEL'S REAGENT

See: Sodium benzidenemonosulfonate reagent (Fishel).

FISCHER'S BLOOD GELATIN REAGENT

Use: Reagent for the microscopic detection of saponins.

Preparation: Dissolve 8 g. of gelatin in 92 g. of *M*/30 phosphate buffer solution of pH 7.4. Add 0.9 per cent sodium chloride and neutralize with sodium bicarbonate if necessary. Sterilize.

Remarks: To use: melt 2 or 3 ml. of the gelatin (do not heat above 40° C.) and mix with 2-3 drops of defibrinated ox-blood.

Ref. Pharm. Monatsh. 1928, 4

FISCHER'S REAGENT

Use: Reagent for the determination of water.

Preparation: Place 1000 g. of specially purified pyridine [No. 2-A refined, Barrett Co., or No. 214-II Pyridine (for Karl Fischer reagent) Eastman Kodak Co.] in a flask and add 203 g. of liquid sulfur dioxide. This can best be done by attaching a rubber tube to the outlet of a cylinder of sulfur dioxide and allowing the gas to flow into the liquid until the proper amount has been added. To transfer the sulfur dioxide, extend the free end of the tube below the surface of the pyridine, invert the cylinder, and then open the valve. This stock solution of sulfur dioxide in pyridine must be stored in glass-stoppered bottles.

Weigh 679.5 grams of the pyridine-sulfur dioxide solution into a two liter flask and add 893 grams of pure synthetic methanol (a good grade is supplied by E. I. du Pont de Nemours and Co., Inc.). Cool to room temperature and add 226.8 grams of C.P. resublimed iodine. Stopper the flask and cool in running water before shaking. Then alternately shake and cool until solution is complete. It is important that the mixture be kept cool until all of the iodine has dissolved. Finally mix the solution thoroughly and store in glass-stoppered bottles. Allow to stand at least 24 hours before use.

For accurate determinations the above solution must be standardized against an accurately weighed quantity of pure water. The details of a satisfactory method are described by Almy, Griffin, and Wilcox, J. Ind. Eng. Chem., Anal. Ed. 12, 392-396 (1940). The reagent must be standardized daily since the factor changes markedly over a considerable period of time.

The proportions used in the above solution are: iodine 1 mole, sulfur dioxide 2 moles, and pyridine 8 moles.

Remarks: Fischer's reagent is used for determining water in both liquids and solids, such as benzene, petroleum fractions, liquid sulfur dioxide, hydrated copper sulfate, Fuller's earth, and calcium carbonate. It can also be used in analytical determinations of reactions in which water is formed or used, such as reactions of esterification or hydrolysis. Because of the various modifications and uses of this reagent, a complete list of references is given below.

Ref. Angew. Chem. **48**, 394-396, 776 (1935); J. Am. Chem. Soc. **61**, 2407, 2409 (1939); **62**, 1 and 4, 608, 3504 (1940); **63**, 573 (1941); Ind. Eng. Chem., Anal. Ed. **12**, 392-396 (1940)

FLEIG'S REAGENT (BLOOD)

Use: Test reagent for blood in urine.

Preparation: Dissolve 0.25 g. of fluorescein in a solution prepared by dissolving 20 g. of potassium hydroxide in 100 ml. of water. Next add 10 g. of powdered zinc and heat to boiling for 1 minute. Filter, and to the filtrate add a little powdered zinc.

Procedure for Test: Mix 2 ml. of urine with 0.25 ml. of the reagent and add 3 drops of hydrogen peroxide. If blood is present an intense fluorescence develops.

Ref. C. A. **5**, 310 (1911)

FLEIG'S REAGENT (SESAME OIL)

Use: Test reagent for sesame oil.

Preparation: Mix 0.4 ml. of a 2 to 4 per cent alcoholic solution of an aromatic aldehyde (*p*-hydroxybenzaldehyde, vanillin, piperonal, or anisaldehyde) with 10 ml. of hydrochloric acid.

Remarks: Reagent gives a red to violet color with sesame oil.

Ref. C. A. **3**, 100-101 (1909)

FLEMMING'S CHROMO-ACETIC ACID

Use: Fixative for animal and vegetable tissues which are to be stained with hematoxylin and carmine.

Preparation: Dissolve 2 g. of chromium trioxide and 1 g. of glacial acetic acid in 1 liter of water.

FLEMMING'S CHROMO-ACETO-OSMIC ACID

Use: Fixative for animal and vegetable preparations.

Preparation:

Weak Solution: Mix the following:

Acetic acid, 1% aq. soln.	20 ml.
Osmic acid, 1% aq. soln.	20 ml.
Chromium trioxide, 1% aq. soln.	50 ml.
Water	110 ml.

Strong Solution: Mix the following:

Glacial acetic acid	2 ml.
Osmic acid, 2% aq. soln.	8 ml.
Chromium trioxide, 1% aq. soln.	30 ml.

Ref. Kolmer and Boerner, p. 806; Krajian, p. 127; Biol. Stains, Conn p. 278

FLEMING'S REAGENT

Use: Test reagent for cysteine.

Preparation:

Solution A: Dissolve 0.2 g. of dimethyl-*p*-phenylenediamine hydrochloride in 100 ml. of water.

Solution B: Dissolve 1 g. of ferric chloride in 20 ml. of water.

Procedure for Test: Mix 1 ml. of the solution to be tested with 0.5 ml. of *Solution A* and then add 1 drop of *Solution B*. A deep blue color is produced if cysteine is present. The color can be salted out with sodium chloride.

Ref. Biochem. J. **24**, 965 (1930)

FLESCH'S CHROMO-OSMIC ACID

Use: Fixative for anatomical specimens.

Preparation: Dissolve 1 g. of osmic acid and 2.5 g. of chromium trioxide in 1 liter of water.

FLICK'S ETCHING SOLUTION

Use: Reagent for macroscopic examination of aluminum.

Preparation: Mix the following:

Hydrofluoric acid, conc.	10 ml.
Hydrochloric acid, conc.	15 ml.
Water	90 ml.

Remarks: Immerse in reagent for 10-20 sec., and wash in warm water. Finally, dip in concentrated nitric acid.

Ref. Metals Handbook, p. 1291

FLORENCE'S REAGENT

Use: Test reagent for urobilin, urobilinogen, and blood in urine.

Preparation: Mix the following:

Zinc acetate	7.5 g.
Alcohol	50.0 g.
Chloroform	50.0 g.
Pyridine	50.0 g.

Procedure for Test: Mix 2 ml. of urine with 4 ml. of reagent and allow to stand until two layers are formed. Color reactions occur in the lower layer as follows:

If urobilin is present, lower layer assumes a greenish fluorescent color. With urobilinogen, fluorescence develops gradually. If blood is present, lower layer turns pink to cherry-red. If none of the above are present, lower layer is colorless.

Ref. C. A. **5**, 1609 (1911)

FLUOBORIC ACID

Use: Analytical reagent.

Preparation: Place 35 g. of boric acid in a hard-rubber vessel and add 100 g. of 48 per cent hydrofluoric acid. Stir well and allow to stand. Remove a few ml. of the reagent, dilute with a little water, and add a few drops of calcium nitrate solution. If a precipitate forms, add more boric acid until the hydrofluoric acid is completely reacted. Dilute the mixture to 600 ml. with distilled water.

Remarks: Solution must be stored in a wax or rubber container.

Ref. Briscoe, p. 265

FLUORESCEIN INDICATOR SOLUTION

Use: Adsorption indicator for precipitation analysis.

Preparation:

Alcoholic Solution: Dissolve 0.1 g. of fluorescein in 110 ml. of 70 per cent alcohol.

Aqueous Solution: An aqueous solution is prepared by dissolving 0.1 g. of sodium fluoresceinate in 100 ml. of water.

Remarks: This indicator is used to titrate chloride by means of silver nitrate solution. At the end-point the precipitate suddenly becomes reddish.

Ref. Kolthoff and Sandell, p. 542

FLUORESCEIN PAPER

Use: Test reagent for alkalies and ammonia.

Preparation: Dye paper with a black, substantive, neutral dye, and then impregnate with an alcoholic fluorescein solution and allow to dry.

Remarks: This reagent provides an extremely sensitive test. It may be used with dark or strongly colored solutions.

FLUORESCEIN REAGENT (BROMATE)

Use: Test reagent for bromate.

Preparation: Dissolve 0.1 g. of fluorescein in 5 ml. of 0.1 *N* sodium hydroxide solution and dilute with water to 1 liter.

Procedure for Test: To 1 ml. of the solution to be tested, add 0.1 ml. of the reagent and a few crystals of oxalic acid. Heat to boiling, cool, and add 2 drops of 0.1 *M* chloramine. Make a blank determination and compare the color change. Metallic hydroxides interfere with this test. Chlorate does not interfere.

Sensitiveness: 0.01 mg. of potassium bromate.

Ref. C. A. **30**, 7494 (1936)

FLUORESCEIN REAGENT (OZONE)

Use: Reagent used for the colorimetric determination of ozone.

Preparation: Dissolve 0.001 g. of fluorescein in 1 ml. of 10 per cent sodium hydroxide solution and add 10 ml. of a saturated sodium hydroxide solution. Shake with 1 g. of zinc dust until the solution no longer fluoresces. Filter.

Remarks: The leuco-base of fluorescein, formed above, is oxidized by ozone to fluorescein.

Ref. Snell I, p. 142

FLUOSILICIC ACID

Use: Reagent for sodium.

Preparation: Place 35 g. of infusorial earth in a hard-rubber vessel, and add 90 g. of hydrofluoric acid and 250 ml. of water. Mix well and allow to stand for some time. Test a little of the diluted mixture with a few drops of a solution of calcium nitrate; and, if a precipitate forms, add more infusorial earth. When the reaction is complete, add 500 ml. of water.

Remarks: Reagent forms precipitates with solutions of sodium salts. The solution must be stored in wax or rubber vessels.

Ref. Briscoe, p. 265

FOLIN'S MIXTURE

Use: Test reagent for uric acid.

Preparation: Add 500 g. of ammonium sulfate, 5 g. of uranium acetate, and 6 g. of glacial acetic acid to 650 ml. of water, and dilute with water to 1 liter.

Ref. Handbook of Chem. & Physics, p. 1310

FOLIN AND CIOCALTEU PHENOL REAGENT

Use: Reagent for colorimetric determination of phenols.

Preparation: Place the following in a 1.5 liter flask and reflux gently for 10 hours:

Sodium tungstate ($Na_2WO_4 \cdot 2H_2O$)	100 g.
Sodium molybdate ($Na_2MoO_4 \cdot 2H_2O$)	25 g.
Phosphoric acid, 85%	50 ml.
Hydrochloric acid, conc.	100 ml.
Water	700 ml.

Now add 150 g. of lithium sulfate, 50 ml. of water, and 5-6 drops of bromine. Boil the mixture for 15 minutes, cool, dilute to 1 liter, and filter. The reagent should not have a greenish color. Dilute with 2 volumes of water when ready for use.

Remarks: Reagent gives a blue color with phenol. Protect from dust.

Ref. Jacobs, p. 160

Additional Uses: This reagent is also used for the colorimetric determination of the following substances: Albumin, Snell II, pp. 318-319; Globulin, Snell II, pp. 320-321; Cholesterol, Snell II, pp. 48-50; Polypeptides, Snell II, pp. 323-324; Proteins, Snell II, pp. 304-306; Urea, Snell II, pp. 394-395.

FOLIN-DENIS REAGENT (PHENOLS)

Use: Test reagent for phenols.

Preparation: Mix 20 g. of phosphomolybdic acid, 100 g. of sodium tungstate, and 50 ml. of 85 per cent phosphoric acid with 750 ml. of water, and heat in a flask equipped with a reflux condenser for two hours. Cool, and dilute with water to 1 liter.

Remarks: This reagent is colored blue by phenols.

Ref. J. Biol. Chem. **12**, 239 (1912)

Additional Uses: This reagent is used for the colorimetric determination of the following: Zinc, Z. anal. Chem. 82, 366-374 (1930); Aluminum, *ibid.;* Antimony, Snell I, pp. 254-255; Calcium, Snell I, pp. 459-461.

FOLIN AND DENIS REAGENT (TYROSINE) (SPECIAL REAGENT)

Use: Test reagent for tyrosine.

Preparation: This reagent contains 2 per cent phosphomolybdic acid, 10 per cent sodium tungstate, and 10 per cent phosphoric acid.

Procedure for Test: Mix 1-2 ml. of solution to be tested with an equal volume of reagent and 3-10 ml. of saturated sodium carbonate solution. A blue color indicates tyrosine.

Ref. J. Biol. Chem., **12**, 245 (1912)

FOLIN-DENIS REAGENT (URIC ACID)

Use: Test reagent for uric acid.

Preparation: Add 10 g. of sodium tungstate and 80 ml. of 85 per cent phosphoric acid to 750 ml. of water, and then heat under a reflux condenser for 2 hours. Cool, and dilute to 1 liter.

Procedure for Test: Mix 2 ml. of reagent with 2 ml. of solution to be tested, and add 5-10 ml. of saturated sodium carbonate. A blue color forms with uric acid.

Ref J. Biol. Chem **12**, 239 (1912), **13**, 263 (1912)

FOLIN-McELLORY REAGENT

Use: Test reagent for glucose.

Preparation: Dissolve 13 g. of cupric sulfate in about 200 ml. of water, and pour into a second solution having the following composition:

Sodium pyrophosphate	100 g.
Disodium phosphate	30 g.
Sodium carbonate, dry	50 g.
Water	1 liter

Use gentle heat to effect complete solution.

Procedure for Test: Add not more than 5 or 6 drops of urine to 5 ml. test reagent and boil for 1 or 2 minutes. If glucose is present a greenish-yellow or red precipitate forms.

Ref. J. Biol. Chem. **33**, 513 (1918); **38**, 287 (1919)

FONTANA'S SOLUTIONS

Use: Staining solution for spirochetes.

Preparation:

The Fixative: Mix the following:

Glacial acetic acid	1 ml.
Formaldehyde soln.	20 ml.
Distilled water	100 ml.

The Mordant: Mix the following:

Tannic acid	5 g.
Phenol	1 g.
Distilled water	100 ml.

The Staining Solution: Dissolve 5 g. of silver nitrate in 100 ml. of distilled water. Set aside 5 ml. of this solution, and to the remainder add ammonia drop by drop until the precipitate which first forms just dissolves. Then add drop by drop the portion of the silver nitrate solution which was reserved until a slight cloudy precipitate forms and persists after shaking. This solution keeps for a long time.

Procedure for Use: Cover the dry smear with the *fixative* for 1 minute. Wash well with distilled water and pour on the *mordant*. Steam for 30 seconds. Wash again and cover with the *staining solution*. Finally steam and allow the hot solution to act for 20-30 seconds. Wash and blot dry.

Ref. Kolmer and Boerner, p. 401; Krajian, pp. 158-159

FORMALDOXIME REAGENT (DENIGÈS)

Use: Test reagent for nickel, cobalt, copper, and manganese.

Preparation: Mix 3 g. of trioxymethylene with 7 g. of hydroxylamine hydrochloride and 15 ml. of water and boil until clear.

Procedure for Test: Add 1 drop of the reagent and 2 drops of *N* sodium hydroxide to 10 ml. of the solution to be tested. Color reactions are obtained as follows: manganous ion—orange-red; ferric ion—violet-red; nickel ion—green to yellow; cupric ion—violet; and cobalt ion—yellow.

Sensitiveness:

Manganese:	0.05 mg. per liter
Copper:	0.10 mg. per liter
Nickel:	0.10 mg. per liter
Iron	0.10 mg. per liter
Cobalt:	0.20 mg. per liter

Ref. C. A. 26, 2935 (1932)

FORMALDEHYDE-AZO TEST REAGENTS (KENNERSLEY-PETERS)

Use: Reagent for vitamin B_1.

Preparation:

Solution 1: Dissolve 4.5 g. of sulfanilic acid and 45 ml. of concentrated hydrochloric acid in a little water and dilute to 500 ml.

Solution 2: Dissolve 25 g. of sodium nitrite (90%) in water and dilute to 500 ml.

Diazotized Sulfanilic Acid: Add 1.5 ml. of *Solution 1* to 1.5 ml. of *Solution 2* and place the mixture on ice for 5 minutes. Now add an additional 6 ml. of *Solution 2* to the mixture, and again place on ice for 5 more minutes. Finally, dilute to 50 ml. and allow to stand on ice for 15 minutes before use.

Solution 3: Dissolve 5.76 g. of sodium bicarbonate in water and dilute to 100 ml., and to this solution add 100 ml. of 1*N* sodium hydroxide solution.

Procedure for Determination: Add 0.5 ml. of the diazotized sulfanilic acid to 1.25 ml. of *Solution 3,* and after 1 minute add 0.3 ml. of 40 per cent formaldehyde. Finally, add 0.1-0.3 ml. of the vitamin B_1 solution. The vitamin solution must have a pH greater than 4.0. A pink color forms slowly in the mixture, and reaches a maximum intensity after about 1 hour. This color may be used for the colorimetric determination of vitamin B_1.

Ref. Biochem. J. **28**, 667 (1934); Jacobs, pp. 452-453

FORMALINIZED CRYSTAL VIOLET SOLUTION

Use: Staining solution.

Preparation: Mix 75 ml. of 5 per cent formaldehyde with 25 ml. of a saturated alcoholic solution of crystal violet.

FORMATE-RICINOLEATE BROTH

Use: Culture medium.

Preparation: Add the following to 1 liter of distilled water:

Peptone	5 g.
Lactose	5 g.
Sodium formate	5 g.
Sodium ricinoleate	1 g.

Heat slowly on a water bath with constant stirring until solution is complete. Add distilled water to make the total volume 1 liter, and adjust the reaction so that after sterilization the pH will be 7.3-7.5. Distribute in fermentation tubes and sterilize at 12 pounds pressure for 15 minutes in an autoclave.

Ref. J. Am. W. W. Assoc., **27**, 1732 (1935); J. Bact. **29**, 26 (1935); A.P.H.A., p. 204.

FORMOL REAGENT (JOLLES)

Use: Reagent for the quantitative determination of albumin.

Preparation: Dissolve 15 g. of sodium chloride in 50 ml. of 37 per cent formaldehyde and 50 ml. of 1 per cent acetic acid.

Remarks: Reagent precipitates albumin quantitatively from a solution made acid with acetic acid.

Ref. C. A. **3**, 930 (1909)

FORMOL-ALCOHOL SOLUTION

Use: Fixative.

Preparation: Mix the following:

Formaldehyde, solution, 40%	18 ml.
Alcohol, 95%	60 ml.
Glacial acetic acid	3 ml.
Distilled water	39 ml.

Ref. Kolmer and Boerner, p. 806

FORMOL-ALCOHOL

Use: Fixative.

Preparation: Add 1 part of formaldehyde solution to 9 parts of alcohol.

Ref. Muir, p. 94

FORMOL-DICHROMATE

See: Orth's fluid.

FORMOL-SUBLIMATE FLUID

See: Worcester's fluid.

FORMOL-ZENKER FLUID

See: Helly's fluid, and Maximow's fluid.

FORNITROL SOLUTION

Use: Test reagent for nitrates.

Preparation: Dissolve 1 g. of nitron and 1 g. of formic acid in 100 ml. of water.

Remarks: Nitron forms a white precipitate with nitrate ion. Precipitation is quantitative.

Ref. Engelder, p. 214; C. A. **15**, 3431 (1921)

FOUCHÉ'S REAGENT

Use: Test reagent for bile pigments in urine.

Preparation: Mix the following:

Ferric chloride, 10% aq. soln.	10 ml.
Trichloroacetic acid	25 g.
Distilled water	100 ml.

Procedure for Test: Pour 5 ml. of urine over a layer of talc in a suction funnel, and add 1 drop of the reagent to the center of the talc layer. A distinct blue color appears if bilirubin is present. The color fades slowly after 1-2 hours.

Sensitiveness: 0.3 mg. bilirubin per 100 ml.

Ref. Kolmer and Boerner, p. 157

FOULGER'S REAGENTS

Use: Test reagents for hexose sugars.

Preparation:

Reagent I. Dissolve 40 g. of urea in 80 ml. sulfuric acid (40% by volume) and add 2 g. of stannous chloride. Boil until clear and dilute with 40 per cent by volume sulfuric acid to 100 ml.

Reagent II: Dissolve 25 g. of quinidine in 100 ml. of 40 per cent sulfuric acid and saturate the mixture with stannous chloride.

Procedure for Test:

Reagent I: Add 3 ml. of the reagent to 1 ml. of the sugar solution and boil for 45 seconds. Shake well. A blue-green color develops with a ketohexose sugar, and this color deepens as the solution cools. With an aldose sugar the color is either yellow or olive-green.

Reagent II: Add 3 ml. of the reagent to 1 ml. of the solution to be tested and boil for 1 minute. The hexose sugars cause red to blue-red colors with each sugar causing a characteristic color.

Ref. J. Biol. Chem. **99**, 207 (1933)

FRANÇOIS REAGENT

Use: Reagent for ammonia in methylamine.

Preparation: Dissolve the following in 1 liter of water:

Mercuric iodide	22.7 g.
Potassium iodide	33.0 g.
Sodium hydroxide	35.0 g.

Procedure for Test: Dissolve 0.1 g. of the methylamine salt in 15 ml. of water and add 5 ml. of the reagent. Now heat slowly until small bubbles of gas appear. A brown-red precipitate forms if ammonia is present.

Sensitiveness: 0.2% NH_4Cl.

Ref. Compt. rend. **144**, 857 (1907)

FRANZEN'S REAGENT

Use: Reagent for oxygen absorption in gas analysis.

Preparation: Dissolve 50 g. of sodium hydrosulfite in 250 ml. of water and add a solution prepared by dissolving 30 g. of sodium hydroxide in 40 ml. of water.

Ref. Dennis, p. 187

FRAUDE'S SOLUTION

Use: Test reagent for alkaloids.

Preparation: Dissolve 25 g. of perchloric acid in 100 ml. of water.

Procedure for Test: Boil material to be tested with reagent. Color reactions are as follows: aspidospermine, red; brucine, madeira red; strychnine, reddish-yellow.

Ref. Ber. **12**, 1558 (1879)

FRAZIER'S MEDIUM

Use: Culture medium to determine the effect of bacteria on gelatin.

Preparation: Dissolve the following in 100 ml. of distilled water:

Sodium chloride	5.0 g.
Dipotassium phosphate	1.5 g.
Monopotassium phosphate	0.5 g.

Next dissolve 4 g. of bacto gelatin in 400 ml. of distilled water and add the following:

Glucose	0.05 g.
Bacto peptone	0.10 g.
Beef infusion	5.00 ml.

Pour the two solutions together and heat for a few minutes.

Dissolve 15 g. of agar in 500 ml. of water by heating in an autoclave, and then add the melted agar to the gelatin mixture. Adjust the reaction to pH 7.0. Distribute in small flasks or tubes and sterilize in an autoclave.

Ref. J. Infectious Diseases, **39**, 302

FRIEDENWALD-EHRLICH DIAZO TEST REAGENT

Use: Test reagent for pathological urine.

Preparation:

Solution A: Dissolve 0.5 g. of sodium nitrite in 100 ml. of water.

Solution B: Dissolve 0.5 g. of *p*-aminoacetophenone and 50 ml. of concentrated hydrochloric acid (sp. gr. 1.19) in 1 liter of water.

When ready to use, mix 1 ml. of *Solution A* with 50 ml. of *Solution B*.

Procedure for Test: Mix 2 ml. of urine with 2 ml. of test reagent and make alkaline with ammonium hydroxide. If urine is pathological, a red color appears.

Ref. Zeitschr. anal. Chem. **39**, 734 (1900)

FRIEDIGER'S REAGENT

Use: Test reagent for fat (stain for gastric contents).

Preparation: Mix the following:

Dimethylaminoazobenzene, conc. alcoholic soln.	2 ml.
Absolute alcohol	2 ml.
Eosin, 0.5% alcoholic soln.	2 ml.
Glacial acetic acid	2 ml.
Lugol's solution	20 drops
Musicarmine, conc. aq. soln.	20 drops

Remarks: Solution must be clear and absolutely homogeneous.

Ref. C. A. 7, 1522 (1913)

FRIEDLÄNDER'S HEMATOXYLIN-ALUM-GLYCERIN

Use: For rapid staining of materials for microscopy.

Preparation: Dissolve 2 g. of hematoxylin in 100 ml. of alcohol, and add to a solution prepared by dissolving 2 g. of alum in 100 ml. of glycerol and 100 ml. of water.

FRIEDLÄNDER'S PICROCARMINE

Use: Double staining.

Preparation: Dissolve 1 g. of carmine and 1 ml. of ammonium hydroxide in 50 ml. of water, and add enough saturated solution of picric acid to cause a permanent turbidity. Then add 2 drops of phenol.

Remarks: Color reactions occur as follows: nuclei, red; connective tissue, rose-red; keratin and elastic fibers, yellow; muscular fibers, brownish-red.

FRIEDLÄNDER'S REAGENT

See: Sodium alizarin sulfonate solution.

FRÖHDE'S SOLUTION

Use: Test reagent for alkaloids.

Preparation: Dissolve 0.1 g. of sodium molybdate in 100 ml. of concentrated sulfuric acid.

Remarks: Reagent gives color reactions with alkaloids.

Ref. Kolmer and Boerner, p. 794

FROMMHERZ'S SOLUTION

Use: Test reagent for glucose.

Preparation: Dissolve 20.88 g. of potassium bitartrate and 10.44 g. of potassium hydroxide in about 600 ml. of water. Now dissolve 41.76 g. of crystalline cupric sulfate in 200 ml. of water, and add this solution slowly to the bitartrate solution with constant stirring. Make up to 1 liter with water.

Remarks: This reagent is reduced by glucose. Reagent is used in a manner similar to other copper-glucose reagents.

FRY'S REAGENT

Use: Etching solution used to bring out strain lines in mild steel.

Preparation: Mix the following:

Cupric chloride, cryst.	90 g.
Hydrochloric acid, conc.	120 ml.
Water	100 ml.

Ref. Metals Handbook, p. 729

FUCHSIN REAGENT (GRIGGI)

Use: Test reagent for mineral acids in vinegar.

Preparation: Dissolve 5 g. of fuchsin in 200 ml. of alcohol.

Procedure for Test: Add 1 drop of the reagent to 1 ml. of the vinegar to be tested and mix well. If the vinegar is pure, the red color of the fuchsin is not changed, but if mineral acids are present the mixture is yellow in color.

Ref. Chem.-Ztg. 17, Rep. 276 (1893)

FUCHSIN REAGENT (JORISSEN)

Use: Test reagent for nitrites.

Preparation: Dissolve 0.01 g. of fuchsin in 100 ml. of glacial acetic acid.

Remarks: The following color changes occur when this reagent is added to a solution of a nitrite: violet, blue, green, and yellow.

Ref. Zeitschr. anal. Chem. 21, 210 (1882)

FUCHSIN REAGENT (MONTEQUI-PUNCEL)

Use: Test reagent for bromate.

Preparation: Dissolve 25 mg. of fuchsin and 25 ml. of hydrochloric acid in 100 ml. of water.

Procedure for Test: Add 2-3 drops of the solution to be tested to 3 ml. of the reagent. A red-violet color appears if bromate is present.

Sensitiveness: 0.002 mg.

FUCHSIN-BISULFITE REAGENT

Use: Test reagent for bromides.

Preparation: Dissolve 1 g. of fuchsin in 100 ml. of water, and then decolorize with sodium bisulfite.

Remarks: Free bromine forms a blue or violet dye with the colorless solution. Chlorides and iodides do not interfere.

Ref. Snell I, pp. 544-545

FUCHSIN LACTOSE BROTH

Use: Culture medium.

Preparation: Add 3 g. of beef extract, 5 g. of peptone, and 5 g. of lactose to 1 liter of distilled water. Heat slowly on a water bath to 65° C., and stir constantly until solution is complete. Cool, and adjust the reaction so that after sterilization the pH will be 6.6-7.0. Now add 15 ml. of a 0.1 per cent aqueous solution of basic fuchsin (85% dye content). Add sufficient distilled water to make the total volume of the solution 1 liter. Distribute in fermentation tubes and heat in an autoclave at 15 pounds pressure for 20 minutes.

Ref. J. Am. W. W. Assoc., 27, 1732 (1935); 24, 413 (1932) A.P.H.A., p. 204

FUCHSIN PAPER

Use: To detect sulfur dioxide.

Preparation: Impregnate filter paper with an alcoholic solution of fuchsin and allow to dry.

Remarks: Paper is decolorized by sulfur dioxide.

Procedure for Test: Moisten a piece of filter paper with the reagent and expose to the gas to be tested. Hydrogen sulfide causes an intense violet coloration.

Ref. Dennis, p. 279

GARBY'S REAGENT

Use: Reagent for the determination of biguanide.

Preparation: Dissolve 10 g. of mannite in 90 ml. of water and add 40 ml. of concentrated ammonia and 15 ml. of 25 per cent potassium hydroxide solution. To this mixture add 40 g. of nickel nitrate and shake until dissolved.

Ref. Ind. Eng. Chem. **18**, 819 (1926)

GELATIN MEDIUM

Use: Culture medium.

Preparation: Mix the following and heat gently until the gelatin is dissolved:

Gelatin	100-150 g.
Beef extract	3 g.
Peptone	5 g.
Distilled water	1000 ml.

Keep the temperature between 95° and 100° C. for 15 minutes and adjust the reaction to pH 7.0. Filter through cotton and tube. Sterilize in a steam sterilizer for 20 minutes on each of three successive days. Place in a refrigerator immediately after removing from the sterilizer.

Ref. A.P.H.A., p. 201

GENLIS' REAGENT

See: Zinc oxide-starch.

GERMUTH'S REAGENTS

Use: Reagents for the detection of nitrites.

Preparation:

Solution A: Dissolve 1 g. of sulfanilic acid in a little hot water and when cool dilute to 100 ml.

Solution B: Dissolve 5.25 g. of dimethyl-α-naphthylamine in 1 liter of 4 *N* acetic acid in 95 per cent methanol.

Procedure for Test: Acidify the solution to be tested with sulfuric acid and then add a few ml. of the sulfanilic acid solution. Allow to stand for a few minutes and then add a little of the dimethyl-α-naphthylamine reagent. If nitrites are present a purple-red color appears. This reaction is made the basis for a colorimetric method for the determination of nitrites.

Ref. Ind. Eng. Chem. **19**, 852 (1927); Jacobs, pp. 480-481

GERRARD'S SOLUTION

Use: Reagent for glucose.

Preparation: Add slowly to Fehling's solution a 50 per cent solution of potassium cyanide until the color just disappears. Pour into this mixture an equal volume of untreated Fehling's solution.

Remarks: When boiled with glucose, this solution is decolorized without the precipitation of cuprous oxide.

Ref. Sutton, p. 415

GIBBE'S STAIN

Use: For double-staining bacteria.

Preparation:

Solution A: Dissolve 1 g. of methylene blue, 2 g. of fuchsin and 3 ml. of aniline in a mixture of 15 ml. of alcohol and 15 ml. of water.

Solution B: Dissolve 1 g. of methylene blue, 1.2 g. of magenta, and 3 ml. of aniline in 15 ml. of alcohol and 15 ml. of water.

GIEMSA'S REAGENT

Use: Test reagent for quinine.

Preparation: Prepare two solutions as follows:

Solution A: Dissolve 27 g. of mercuric chloride in 1500 ml. of water.

Solution B: Dissolve 10 g. of potassium iodide in 50 ml. of water.

Mix *Solution A* and *B* and then add 2 ml. of glacial acetic acid.

Remarks: This reagent produces an opalescence with solutions containing quinine.

Sensitiveness: 1 : 400,000.

Ref. Biochem. Zeitschr. **9**, 207 (1927)

GIEMSA'S SOLUTION FOR ROMANOWSKY STAIN

Preparation: Dry separately about 5 g. of azure II-eosine and 1.0 g. of azure II in a dessicator over sulfuric acid. Reduce each to a fine powder, and pass through a fine silk sieve. Dissolve 3 g. of the azure II-eosine and 0.8 g. of the azure-II in 250 g. of glycerol (sp. gr. 1.23, reagent) by shaking at 60° C. Now heat 250 g. of methyl alcohol (reagent) to 60° C. and add with shaking to the glycerol solution. Let stand for 24 hours at room temperature and filter.

Ref. Muir, p. 113

GIEMSA'S STAIN

Use: A stain for microscopic sections.

Preparation:

Solution A: Mix 20 ml. of 0.005 per cent aqueous solution of eosin (potassium) with 2 ml. of 0.008 per cent aqueous solution of azure II.

Solution B: Dissolve 0.3 g. of azure II-eosine and 0.8 g. of azure II in a mixture consisting of 250 ml. of glycerol and 250 ml. of methyl alcohol (U.S.P. IX.).

Ref. Krajian, p. 82; Biol. Stains, Conn pp. 173-174

GILMOUR'S REAGENT

Use: Reagent for boric acid titration.

Preparation: Dissolve 31.75 g. of sugar in 100 ml. of distilled water and boil until the solution is clear. Remove from the source of heat and quickly add 2.5 ml. of 3 *N* sulfuric acid. Stir for 30 seconds, and then add 150 ml. of water to which has been added 2.5 ml. of 3*N* sodium hydroxide solution.

Remarks: 3 ml. of this solution is sufficient for the titration of 10 ml. of 0.1 *N* boric acid.

Ref. Analyst **46**, 3 (1921); **49**, 576 (1924)

GILSON'S FLUID

Use: Fixative.

Preparation: Mix the following:

Mercuric chloride	5.00 g.
Acetic acid, glacial	1.00 ml.
Nitric acid, 80%	3.75 ml.
Alcohol, 95%	15.00 ml.
Distilled water	230.00 ml.

Ref. Biol. Stains, Conn p. 277

GIRI'S REAGENTS

Use: Test reagent for vitamin C.

Preparation: The following solutions are needed:

(1) Dissolve 0.6 g. of potassium ferricyanide in 100 ml. of water.

(2) Dissolve 10 g. of trichloroacetic acid in 90 ml. of water.

(3) Dissolve 2.5 g. of ammonium molybdate in 100 g. of 5 *N* sulfuric acid.

Procedure for Test: Mix 0.5 ml. of the trichloroacetic acid solution with 0.5 ml. of the potassium ferricyanide solution and then add 1 ml. of the material to be tested. Mix well and add 1 ml. of the ammonium molybdate solution. Allow to stand for 3 minutes and note the color. A dark red-brown precipitate forms if vitamin C is present.

Gluthathione, cysteine, tannins, and pigments interfere with this test, but they can be removed with mercuric acetate.

Ref. Mikrochemie **23**, 283 (1938)

GLUCOSE AGAR

See: Dextrose agar.

GLUCOSE-BRAIN AGAR

See: Rosenow's glucose-brain agar.

GLUCOSE-BRAIN BROTH

See: Rosenow's glucose-brain broth.

GLUCOSE GELATIN

See: Dextrose gelatin.

GLYCEROL AGAR

Use: Culture medium for tubercle bacilli.

Preparation: Prepare in the same manner as beef extract agar or beef infusion agar except that from 3 to 6 per cent glycerol is added. The medium is sterilized by the fractional method at 100° C. for 30 minutes on each of three successive days, or in an autoclave at 15 pounds pressure for 20 minutes.

Ref. Kolmer and Boerner, p. 368

GLYCEROL BROTH

Use: Culture medium.

Preparation: Add 3-6 per cent glycerol to a neutral or slightly acid beef infusion broth or beef extract broth. Sterilize in a steam sterilizer at 100° C. for 30 minutes on each of three successive days, or heat in an autoclave at 15 pounds pressure for 20 minutes.

GLYCEROL-POTATO MEDIUM

Use: Culture medium.

Preparation: Scrub a few large white potatoes thoroughly, pare completely, and wash well in running water. Then with a cork borer cut the potatoes into cylinders, and finally cut each cylinder obliquely into wedge-shaped pieces. Soak these pieces overnight in water, or in 1 : 1000 sodium carbonate solution for 3-4 hours. Drain and soak 24 hours in a 5 per cent glycerol solution. Adjust the reaction to pH 7.2 and tube. Add sufficient 5 per cent glycerol to cover the butts. Heat in an autoclave at 15 pounds pressure for 30 minutes.

Ref. Muir, pp. 47-48

"GLYCOL ETCH"

Use: Etching solution for magnesium.

Preparation: Mix the following:

Ethylene glycol	75 ml.
Water, distilled	24 ml.
Nitric acid, conc.	1 ml.

Ref. Metals handbook, p. 1591

GOADBY'S SOLUTION

Use: A preservative for lower forms of marine organisms.

Preparation: Dissolve 0.33 g. of mercuric chloride, 200 g. of sodium chloride, and 100 g. of alum in water and dilute to 5 liters.

GOLD CHLORIDE REAGENT

Use: Reagent for the detection of bromide and iodide.

Preparation: Heat 80 ml. of distilled water to 90° C., and then add 1 g. of soluble starch dissolved in 20 ml. of cold water. Cool, and decant the supernatant liquid. To this solution add an equal volume of 2 per cent gold chloride.

Procedure for Test: Neutralize 0.1-1.0 per cent solution of the substance to be tested and add 0.5-1.0 ml. of the reagent. Bromide ion gives an orange-red to yellow-red coloration, while the iodide ion gives a blue coloration. If both ions are present proceed as follows: add 1 ml. of the reagent to 1 ml. of the solution to be tested. A blue color forms indicating the presence of iodide, but on heating, the solution turns orange-yellow. The blue color returns on cooling.

Sensitiveness: Bromide: 1 : 10,000
Iodide: 1 : 50,000.

Ref. C. A. **33**, 4904 (1939)

GOLDSMITH'S FLUID

Use: Fixative.

Preparation: Mix the following:

Chromic acid, 1.0% aq. soln.	15 parts
Potassium dichromate, 2.0% aq. soln.	4 parts
Glacial acetic acid	1 part

GOLDSTEIN'S REAGENT

Use: Reagent for glycogen.

Preparation: Dissolve 2 g. of iodine and 6 g. of potassium iodide in 120 ml. of water.

Remarks: An intense brown color is formed when this reagent is mixed with glycogen.

Ref. Zeitschr. anal. Chem. **20**, 597 (1881)

GOLGI'S OSMIC SILVER NITRATE

Use: To show proliferation of ganglia cells.

Preparation:

Solution A: Dissolve 3.2 g. of potassium dichromate and 0.2 g. of osmium tetroxide in 180 ml. of water.

Solution B: Dissolve 0.75 g. of silver nitrate in 100 ml. of distilled water.

GOODMAN-SUZANNE'S REAGENT

Use: Test reagent for albumin in urine.

Preparation: Dissolve 1.5 g. of phosphoric acid and 5 g. of hydrochloric acid in 93.5 g. of 95 per cent alcohol.

Ref. J. Am. Med. Assoc. **51**, 1

GOODPASTURE'S STAIN

Use: Stain for bacteria in tissues.

Preparation: Mix the following:

Basic fuchsin	0.59 g.
Aniline oil	1.00 ml.
Phenol, cryst.	1.00 g.
Alcohol	100.00 ml.

Ref. Kolmer and Boerner, pp. 402-403

GOODPASTURE'S ACID POLYCHROME METHYLENE BLUE

Use: Staining solution.

Preparation: Add 1 g. of methylene blue and 1 g. of potassium carbonate to 400 ml. of distilled water and boil for 30 minutes. Cool, and add 3 ml. of glacial acetic acid and shake. Boil until the solution has evaporated to 200 ml. and cool.

Remarks: This solution keeps well.

Ref. Krajian, p. 80; Biol. Stains, Conn p. 84

GOUVER'S SOLUTION

Use: Reagent for albumin.

Preparation: Dissolve a little potassium iodide and mercuric cyanide in water.

Remarks: Reagent gives a white precipitate with albumin.

GRAHAM-MENTEN'S REAGENT

Use: Test reagent for oxidases.

Preparation: Dissolve 0.5 g. of benzidine in 100 g. of 75 per cent alcohol and add 0.2 g. of hydrogen peroxide before use.

GRAM'S SOLUTION (STAIN)

Use: For staining bacteria.

Preparation: Dissolve 0.5 g. of iodine and 1 g. of potassium iodide in 100 ml. of water.

Ref. A.P.H.A., pp. 274-276

GRAM'S SOLUTION

Use: For counter-staining bacteria.

Preparation: Mix 10 ml. of absolute alcohol, 15 ml. of aniline, and 7 ml. of a saturated solution of methyl violet 6B in alcohol, and then add water to make 100 ml.

Ref. A.P.H.A., pp. 274-276.

GRANDMOUGIN-HAVAS REAGENT

Use: Reagent for the titrimetric determination of azo dyes.

Preparation: Boil 1 liter of water for a few minutes and then cool. When cool add 3 g. of sodium hydrosulfite and 5 ml. of sodium hydroxide solution.

Ref. C. A., 7, 43 (1913)

GRAY'S FLAGELLA STAIN

Use: Staining solution.

Preparation:

Mordant:

Solution A: Mix the following:

Potassium alum, sat. aq. soln.	5 ml.
Tannic acid, 20% aq. soln.	2 ml.
Mercuric chloride, sat. aq. soln.	2 ml.

Solution B:

Basic fuchsin, sat. alcoholic soln.	0.4 ml.

Less than 24 hours before using, mix *A* and *B*.

Stain: The stain is carbol fuchsin.

Remarks: Place the bacterial suspension on a clean slide and spread out into a film with a piece of unsized paper. Dry and flood with the mordant solution. Allow to act for 5 to 10 minutes and rinse well. Finally, stain for 5 or 10 minutes.

Ref. Kolmer and Boerner, p. 398

GRENACHER'S ALCOHOLIC ACID CARMINE

Use: A stain for nuclei.

Preparation: Dissolve 1 g. of carmine and 1-2 ml. of hydrochloric acid in 100 ml. of 70 per cent alcohol (by volume).

GRENACHER'S ALCOHOLIC BORAX-CARMINE

Use: A stain for nuclei.

Preparation: Dissolve 2 g. of carmine and 4 g. of borax in 100 ml. of water and 100 ml. of 70 per cent alcohol (by volume).

Ref. Biol. Stains, Conn p. 179

GRENACHER'S ALUM-CARMINE

Use: A stain for nuclei and muscle tissue.

Preparation: Dissolve 1 g. of carmine and 5 g. of potassium alum in 100 ml. of water.

Ref. Lee pp. 140-142

GRIESS' PAPER (RED)

Use: Test reagent for nitrites and nitrous acid in urine. Also test for aldehydes and bilirubin.

Preparation: Soak filter paper in a solution of sulfanilic acid and naphthylamine sulfate and allow to dry.

Remarks: Paper turns a red color with nitrous acid.

GRIESS' PAPER (YELLOW)

Use: Test reagent for nitrous acid.

Preparation: Soak filter paper in a solution of sulfanilic acid and metaphenylenediamine and allow to dry.

Remarks: Paper turns a yellowish-brown in presence of nitrous acid. This is a delicate test.

GRIGORIEW'S REAGENTS

Use: Solvent for blood stains for spectroscopic studies.

Preparation:

Solution A: Dissolve 12 g. of potassium hydroxide and 40 g. of Rochelle salt in 100 ml. of water.

Solution B: Dissolve 1.5 g. of potassium hydroxide and 1 g. of Rochelle salt in 2 ml. of water.

Solution C: Dissolve 1 g. of sodium carbonate in 5 ml. of water and 95 g. of alcohol.

Ref. Deut. Med.-Ztg. 1908, 188

GRIMBERT-DUFAU'S REAGENT

Use: Reagent to differentiate between albumin and mucus in urine.

Preparation: Dissolve 100 g. of citric acid in 75 ml. of water.

Procedure for Test: Carefully superimpose urine over the citric acid solution, and observe any ring formed at the junction of the liquids. Compare this with the result obtained using nitric acid instead of the citric acid solution. This is sufficient to distinguish between mucus and albumin.

Ref. C. A. 1, 2806 (1907)

GROSSFELD'S REAGENT

Use: Test reagent for oxalic acid in beverages.

Preparation: Dissolve the following in 100 ml. of hot water:

Sodium acetate	30 g.
Citric acid	5 g.
Calcium chloride	5 g.
Methyl orange	0.01 g.

Allow the mixture to cool and filter.

Procedure for Test: Acidify 10 ml. of the liquid to be tested, and then add the reagent drop by drop until a red color appears. A white precipitate forms if oxalic acid is present.

Ref. The Merck Index, p. 747

GROTE'S REAGENT

Use: Reagent for sulfur in organic compounds.

Preparation: Dissolve 0.5 g. of sodium nitroferricyanide in 10 ml. of water, and add 0.5 g. of hydroxylamine hydrochloride and 1 g. of sodium bicarbonate. Wait until a gas is no longer evolved and then add 2 drops of bromine. Filter the dark solution and make up to 25 ml.

Procedure for Test: Dissolve a few mg. of the substance under investigation in a little water, and add an excess of sodium bicarbonate and 0.5 ml. of the reagent. If a sulfur compound is present, a purple-red color forms within 10 minutes.

Ref. J. Biol. Chem. **93**, 25 (1931)

GRÜSS REAGENT

Use: For testing oxidase action of yeast.

Preparation: Dissolve violamine (tetramethyl-*p*-phenylenediamine hydrochloride) in an agar prepared by adding the following to 50 ml. of water.

Agar	2.00 g.
Glucose	2.00 g.
Peptone	0.04 g.
Asparagine	0.01 g.
Potassium tartrate	0.02 g.
Magnesium sulfate	0.02 g.
Sodium phosphate	0.02 g.
Potassium chloride	0.01 g.
Calcium phosphate	0.02 g.

Ref. C. A. **21**, 3913 (1927)

GUAIAC-COPPER SULFATE PAPER

Use: Reagent to detect hydrogen cyanide.

Preparation: Impregnate filter paper with an alcoholic solution of guaiac resin and allow to dry. Then treat with an aqueous solution of cupric sulfate and again dry.

Remarks: The slightest trace of hydrogen cyanide turns this paper blue.

Ref. C. A. 4645 (1929); Dennis, p. 268

GUAIACONIC ACID SOLUTION

See: Doebner's reagent.

GUERIN'S REAGENT

Use: Reagent for selenium.

Preparation: Dissolve 10 g. of mercuric nitrate in 10 ml. of nitric acid and 100 ml. of water.

Remarks: This reagent yields crystalline precipitates with selenic acid and soluble selenites.

Ref. C. A. 4235 (1930)

GUGLIALMELLI'S REAGENTS

Use: Test reagents for phenols.

Preparation:

Reagent I: Add 50 g. of arsenious acid to a solution prepared by dissolving 20 g. of sodium tungstate in 150 ml. of water, and then boil in a flask equipped with a reflux condenser for 1.5 hours.

Reagent II: Add 50 g. of arsenious acid to a solution prepared by dissolving 20 g. of sodium tungstate and 4 g. of sodium molybdate in 150 ml. of water, and then reflux for 1.5 hours. Finally, dilute to 200 ml.

Remarks: Reagent I gives a blue color with alkaline solutions of phenol. Reagent II gives color reactions with most phenols.

Ref. C. A. 12, 664 (1918)

GUM GHATTI SOLUTION

Use: For the determination of urea in blood (method of Folin and Svedberg).

Preparation: Fill a liter cylinder with water, and just below the surface of the liquid suspend a wire screen. On this screen place 20 g. of soluble gum ghatti. Allow to stand for 24 hours, and remove the screen. Filter the solution. The mixture may be strained through a clean cloth.

Ref. Hawk and Bergeim, pp. 416-417; J. Biol. Chem. **88**, 77 (1930)

GÜNZBERG'S REAGENT

Use: Test reagent for free hydrochloric acid in gastric juice.

Preparation: Dissolve 2.0 g. of vanillin and 4.0 g. of phloroglucinol in 80 ml. of 95 per cent alcohol.

Procedure for Test: Evaporate a little of this solution with the liquid to be tested. A red marginal zone forms if free hydrochloric acid is present

Sensitiveness: 1 : 10,000-20,000.

Ref. Hawk and Bergeim, p. 289

GUTMANN'S REAGENT (HALOGENS)

Use: Reagent for organic halogen compounds.

Preparation: Dissolve 35 g. of arsenic trioxide in 200 g. of 40 per cent sodium hydroxide solution.

Remarks: Certain organic compounds containing loosely held halogen atoms oxidize the arsenite to arsenate, and this forms a crystalline precipitate.

Ref. C. A. **19**, 1831 (1925)

GUTMAN'S REAGENT (MERCURY)

Use: Reagent for mercury in urine.

Preparation: Dissolve 5 g. of potassium iodide in 12 ml. of 10 per cent sulfuric acid and dilute with water to 25 ml. This solution must be freshly prepared.

Procedure for Test: Treat urine with an oxidizing agent to destroy organic matter, and precipitate mercury with hydrogen sulfide in a slightly acid solution. Purify precipitate by dissolving in aqua regia and reprecipitating with hydrogen sulfide. If the precipitate is mercury, it is insoluble in hot nitric acid, but soluble in aqua regia and the above reagent.

Ref. C. A. **13**, 3323 (1919)

HAGEDORN-JENSEN'S REAGENTS

Use: For the determination of blood sugar.

Preparation:

Solution A: Mix 2 ml. of 0.1 *N* sodium hydroxide solution with 10 ml. of 0.45 per cent zinc sulfate solution just before use.

Solution B: Dissolve 1.65 g. of potassium ferricyanide and 10.6 g. of ignited sodium carbonate in 1 liter of water.

Solution C: Dissolve 5 g. of potassium iodide, 10 g. of zinc sulfate, and 50 g. of sodium chloride in water and dilute to 200 ml.

Solution D: Dilute 3 ml. of iron-free glacial acetic acid with water to 100 ml.

Solution E: Dissolve 1 g. of soluble starch in 100 ml. of saturated sodium chloride solution.

Solution F: Dissolve 0.7 g. of sodium thiosulfate in 500 ml. of water, and standardize against a solution containing 0.3566 g. of potassium iodate dissolved in 2 liters of water.

Procedure for Use: Mix 0.1 ml. of blood with 6 ml. of *Solution A*. Filter, and wash the residue 3 times with 3 ml. portions of water. Add 2 ml. of *Solution B* to the filtrate, and heat in a boiling water bath for 15 minutes. Then add 3 ml. of *Solution C*. Mix well and add 2 ml. of *Solution D* and 2 drops of *Solution E*, and titrate with *Solution F*.

Ref. Hawk and Bergeim, pp. 435-437

HAGER'S REAGENT (ALKALOIDS)

Use: Reagent for alkaloids.

Preparation: Prepare a cold, saturated solution of picric acid in water.

Remarks: Reagent yields precipitates with most alkaloids.

Ref. Pharm. Zentralhalle. 1869, 131

HAGER'S SOLUTION (GLUCOSE)

Use: Reagent for glucose.

Preparation: Dissolve 15 g. of mercuric oxide, 15 g. of sodium acetate, and 25 g. of sodium chloride in 200 ml. of water acidified with 12 ml. of glacial acetic acid. Heat if necessary.

Remarks: Mercurous chloride is precipitated when this solution is heated with glucose.

Ref. Pharm. Zentralhalle. **18**, 313 (1877)

HAINE'S REAGENT

Use: Reagent for glucose.

Preparation: Dissolve 8.314 g. of cupric sulfate and 40 ml. of glycerol in 400 ml. of water, and add 500 ml. of a 5 per cent solution of potassium hydroxide.

Remarks:: This solution is reduced by glucose.

Ref. Hawk and Bergeim, p. 748

HALDEN'S REAGENTS

Use: Test reagents for vitamin D.

Preparation:

(1) Dissolve 0.1 g. of pyrogallol in 100 g. of absolute alcohol.

(2) Dissolve 10 g. of anhydrous aluminum chloride in 110 ml. of alcohol.

Procedure for Test: Dissolve the vitamin D in benzene or chloroform and add to this solution about 10 drops of the pyrogallol reagent. Concentrate over a water bath to about 0.3 ml. and then add 3 drops of the aluminum chloride reagent. Again heat and allow to stand for a few minutes until the color develops. A deep violet color is formed with vitamin D.

Fats and oils must be separated by saponification and subsequent extraction. Sterols in moderate proportions do not interfere.

Remarks: Tzoni has made this reaction the basis for the quantitative estimation of vitamin D.

Ref. Jacobs, pp. 459-460

HALPHEN'S REAGENT (COTTONSEED OIL)

Use: Test reagent for cottonseed oil.

Preparation: Dissolve 1 g. of sulfur in 100 ml. of carbon disulfide.

Procedure for Test: Mix 3 ml. of the reagent, 3 ml. of the oil to be tested, and 3 ml. of amyl alcohol in a tube, and then heat for about 15 minutes with the tube immersed in a concentrated aqueous solution of sodium chloride A red color develops if cottonseed oil is present.

Ref. Leach, p 537; Jacobs, pp. 230-231

HALPHEN'S REAGENT (LINSEED OIL)

Use: Test reagent for linseed oil.

Preparation: Add bromine to 10 ml. of carbon tetrachloride until the total volume of the mixture is 15 ml.

Procedure for Test: Add 0.5 ml. of the oil to be tested to 30 ml. of ether and add 1 ml. of the reagent. The mixture becomes turbid at 25° C. within 2 minutes if linseed oil is present.

Ref. J. pharm. chim. 1905, *32*

HALPHEN'S REAGENT (ROSIN OIL)

Use: Test for rosin oil in mineral oil.

Preparation:

Solution A: Mix 10 ml. of phenol with 20 ml. of carbon tetrachloride.

Solution B: Mix 10 ml. of bromine with 10 ml. of carbon tetrachloride.

Ref. J. Ind. Eng. Chem. **3**, 86 (1911)

HAMANN'S ACETIC CARMINE

Use: Same as other carmine stains.

Preparation: Dissolve 1.5 g. of carmine in 10 ml. of ammonium hydroxide, and add acetic acid until the solution is faintly acid.

HAMMERSTEN'S REAGENT

Use: Test reagent for bile pigments in urine.

Preparation: Mix 95 ml. of 25 per cent hydrochloric acid with 5 ml. of 25 per cent nitric acid, and allow the solution to stand until it has acquired a yellowish color.

Procedure for Test: Mix 1 ml. of the reagent with 5 ml. of alcohol, and then add a few drops of urine. A green color is obtained if bilirubin is present.

Ref. Zeitschr. anal. Chem. **39**, 269 (1900)

HANSEN'S REAGENT

Use: Test reagent for ammonia.

Preparation:

Solution A: Dissolve 2 g. of thymol in 10 ml. of 2 *N* sodium hydroxide and 90 ml. of water.

Solution B: Mix 100 ml. of bromine water with 35 ml. of 2 *N* sodium hydroxide solution.

Procedure for Test: Add 1 ml. of *Solution A* to 1 ml. of *Solution B* and 5 ml. of a dilute alkaline or neutral solution to be tested. This solution must contain no strong reducing agents. Allow the mixture to stand for 20 minutes. If ammonia is present, a blue to green color develops and this can be extracted with ether.

Ref. J. Bact. **19**, 223 (1930)

HANUS IODINE BROMIDE REAGENT

Use: Reagent for determining the iodine number of fats and oils.

Preparation: Dissolve 13.2 g. of iodine in about 750 ml. of warm glacial acetic acid. Add the iodine in small portions until solution is complete. Next dissolve about 3 ml. of liquid bromine in 250 ml. of glacial acetic acid, and then determine the exact concentration of each solution by titrating a 25 ml. portion of each with potassium iodide solution and standard 0.1 *N* sodium thiosulfate solution. From these data, calculate the exact amount of the bromine solution that must be added to the iodine solution to double the halogen content. 8.31 g. of bromine are required for exactly 13.2 g. of iodine.

Ref. Jacobs, pp. 213-214

HARDER'S MEDIUM

Use: Culture medium.

Preparation: Dissolve the following in 1 liter of distilled water:

Ammonium sulfate	0.5 g.
Sodium nitrate	0.5 g.
Dipotassium phosphate	0.5 g.
Magnesium sulfate ($MgSO_4.7H_2O$)	0.5 g.
Calcium chloride	0.2 g.
Ferric ammonium citrate	10.0 g.

Add 2 per cent agar if desired. Sterilize in an autoclave.

If the iron precipitates, sterilize the ferric ammonium citrate separately and add to the solution when cool.

HARRIS' HEMATOXYLIN

Use: Staining solution.

Preparation: Dissolve 20 g. of ammonium or potassium alum in 200 ml. of distilled water with the aid of moderate heat. Dissolve 1 g. of hematoxylin in 10 ml. of alcohol and add to the warm alum solution. Bring rapidly to a boil and add 0.5 g. of mercuric oxide. When the solution turns dark purple, cool, and add 8 ml. of glacial acetic acid.

Ref. Kolmer and Boerner, p. 814

HAYEM'S DILUTING FLUID

Use: To dilute blood in counting corpuscles.

Preparation: Dissolve 5 g. of sodium chloride, 25 g. of sodium sulfate, and 2.5 g. of mercuric chloride in 1 liter of water.

Remarks: Solution must be crystal clear and filtered if necessary.

Ref. Kolmer and Boerner, p. 69

HEART INFUSION MEDIUM

See: Hormone broth.

HEARON-GUSTAVSON'S REAGENTS

Use: Reagents for nitro group in organic compounds.

Preparation: Prepare the following solutions:

(A) Boil 500 ml. of distilled water and cool, and in the cool solution dissolve 25 g. of ferrous ammonium sulfate, and 2 ml. of concentrated sulfuric acid.

(B) Dissolve 30 g. of potassium hydroxide in 30 ml. of water and dilute to 200 ml. with 95 per cent alcohol.

Procedure for Test: To 0.7 ml. of the ferrous ammonium sulfate solution contained in a 4 ml. test tube, add a small quantity of the finely powdered substance to be tested, and then add 0.5 ml. of the potassium hydroxide solution. Pass a stream of inert gas through the tube to remove air, and then quickly stopper the tube and shake well. A red-brown precipitate forms if nitro compounds are present.

Ref. Ind. Eng. Chem., Anal. Ed. **9**, 352 (1937)

HEATH'S REAGENT

Use: Test reagent for tungsten in ores.

Preparation: Prepare three solutions as follows:

(A) Dissolve 5 g. of cupric sulfate in 15 ml. of water.

(B) Dissolve 5 g. of stannous chloride in 10 ml. of water.

(C) Dissolve 2 g. of potassium iodide in 10 ml. of water.

Mix these solutions thoroughly and dissolve the precipitate which forms in 100 ml. of ammonium hydroxide. Use more ammonium hydroxide if necessary.

Procedure for Test: Grind 5 g. of the sample and digest with 25 ml. of concentrated nitric acid by boiling. If the ore is not completely decomposed, add hydrochloric acid. Dilute with water and filter. Add 5 ml. of glacial acetic acid to 15 ml. of the filtrate, and slowly add 8-12 ml. of the reagent by pouring down the side of the tube in which the mixture is contained. A red ring forms below the precipitate if tungsten is present.

Ref. Eng. Mining J. **106**, 27 (1918)

HECHT'S REAGENT

Use: Test reagent for mucus in feces.

Preparation: Mix the following:

Brilliant green solution, 2%	50 ml.
Neutral red solution, 1%	50 ml.

Remarks: Mucus is colored red by this reagent.

Ref. Weiner klin., Wochschr. 1908, 1554

HECZKO'S REAGENT

Use: In manganese determinations.

Preparation: Add 55 g. of phosphorus pentoxide and 12 ml. of 30 per cent hydrogen peroxide to 500 ml. of water, and add a little 85 per cent phosphoric acid to aid solution. Use an ice jacket during the preparation of this solution.

Remarks: Exercise care in the preparation of this solution.

Ref. C. A. 21, 34 (1927)

HEIDENHAIN'S AZOCARMINE (AZAN)

Use: Staining solution.

Preparation: Dissolve 2 g. of azocarmine *G* in 100 ml. of distilled water. Heat, cool, and filter.

Remarks: When used as a tissue stain, this solution is strongly acidified with glacial acetic acid.

Ref. Kolmer and Boerner, p. 818; Biol. Stains, Conn pp. 101-102

HEIDENHAIN'S HEMATOXYLIN

Use: A stain for histological specimens.

Preparation: Dissolve 1 g. of hematoxylin in 100 ml. of water.

Remarks: This solution must be freshly prepared as it deteriorates rapidly.

HEIDENHAIN'S IRON-HEMATOXYLIN

Use: Staining solution.

Preparation:

Mordant: Dissolve from 1.5 to 4.0 g. of ferric ammonium sulfate in 100 ml. of water.

Stain: Dissolve 0.5 g. of hematoxylin in 100 ml. of water.

Remarks: Use solutions separately on tissues to be treated.

Ref. Kolmer and Boerner, pp. 259-260

HEIDENHAIN'S REAGENT

Use: Test reagent for carbon dioxide.

Preparation: Dissolve a little Nile Blue A in alcohol and add drop by drop 0.1 *N* sodium hydroxide until the solution turns red.

Remarks: Carbon dioxide causes this solution to turn blue.

Ref. Zeitschr. angew. Chem., 1904, 332

HELIANTHINE PAPER

See: Methyl orange paper.

HELLY'S FLUID

Use: Fixative.

Preparation: Mix the following:

Potassium dichromate	2.5 g.
Mercuric chloride	5.0 g.
Sodium sulfate	1.0 g.
Water	100.0 ml.

Just before use, add 5 ml. of formaldehyde solution to each 100 ml. of the fluid.

Ref. Kolmer and Boerner, p. 806

HEMALUM (MAYER)

Use: A staining solution.

Preparation: Dissolve 1 g. of hematein or the ammonium salt in 50 ml. of 90-95 per cent alcohol, and then prepare a second solution by dissolving 50 g. of potassium alum in 1 liter of distilled water. Now mix the two solutions.

Remarks: This solution may be kept for a year or longer.

Mayer's Modification: Dissolve 1 g. of hematoxylin in 1 liter of distilled water and add 0.2 g. of sodium iodate and 50 g. of potassium alum. Mix well and filter. To use, dilute 1 volume of the solution with 1 volume of distilled water.

Remarks: If the solution is to be kept for any length of time a preservative should be added. Fifty g. of chloral hydrate and 1 g. of citric acid may be used for this purpose.

Ref. Kolmer and Boerner, pp. 256-259

HEMATIN SOLUTION (GAUCHER)

Use: Test reagent for unboiled milk.

Preparation: Dissolve 1 g. of hematin in 100 ml. of water.

Procedure for Test: Add 20 drops of the reagent to 20 ml. of milk. The rose-red color which first forms disappears on shaking if the milk is boiled but remains if it is unboiled.

Ref. Ann. chim. anal. chim. appli. **13**, 146 (1931)

HEMATEIN SOLUTION (LEAD)

Use: Test reagent for lead in water.

Preparation: Dissolve 0.5 g. of hematein in 1 liter of water.

Remarks: This solution gives a blue color with water containing lead.

Ref. Am. J. Sci. **22**, 236 (1907); Yoe I, p. 257

HEMATOXYLIN SOLUTION

Use: Reagent used for the colorimetric determination of aluminum in water.

Preparation: Dissolve 0.1 g. of hematoxylin in 100 ml. of hot water.

Remarks: When reagent and ammonium carbonate are added to water containing aluminum, a lavender-blue color is obtained. The solution turns yellowish-brown when acidified with acetic acid. The yellow solution is used for comparison. Iron is the only element commonly present in water that interferes.

Sensitiveness: 1 : 1,000,000.

Ref. Ind. Eng. Chem. **16**, 233 (1924); Snell I, pp. 266-267; Yoe I, pp. 121-122; A.O.A.C., p. 225

HEMATOXYLIN INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.5 g. of hematoxylin in 100 ml. of alcohol.

Remarks: pH : yellow 5.0-6.0 violet.

HEMATOXYLIN PAPER

Use: Indicator.

Preparation: Impregnate filter paper with an alcoholic solution of hematoxylin and allow to dry.

Remarks: This is a delicate indicator for ammonia and other alkalies. Store in well-stoppered amber bottles.

Colors: Base : violet.
Acid : yellow.

HEMATOXYLIN SOLUTION

See : Delafield, Ehrlich, and Harris.

HEMATOXYLIN-EOSIN

Use: Staining solution.

Preparation:

Solution I: Dissolve 1 g. of hematoxylin in 100 ml. of distilled water. Filter if any precipitate forms on standing.

Solution II: Dissolve 0.1-0.25 g. of eosin Y (85% dye content) in 100 ml. of distilled water.

Mix equal parts of *Solutions I* and *II* just before using.

Ref. Krajian, p. 53

HENLE'S REAGENT

Use: Test reagent for water in organic solvents.

Preparation: Mix 27 g. of aluminum filings and 0.2 g. of mercuric chloride with 276 g. of absolute alcohol, and heat in a flask equipped with a reflux condenser until the mixture crystallizes.

Distill off the alcohol at 210°, and heat the residue at 340° until the temperature drops to 330°. Finally, allow the material to cool and dissolve in 1 liter of anhydrous xylene. Filter, and keep filtrate in a well-stoppered bottle.

Remarks: Reagent yields a precipitate of aluminum hydroxide with water.

Ref. C. A., 14, 2601 (1920)

HENNEGUY'S ACETIC ALUM CARMINE

Use: A stain for tissues and cell nuclei.

Preparation: Boil 2 or 3 g. of carmine with 100 ml. of 15 per cent aqueous solution of potassium alum. Allow to cool and add 10 ml. of acetic acid. This solution should stand several days before using.

HENNING'S FLUID

Use: Fixative.

Preparation: Add 6 ml. of a saturated aqueous solution of picric acid and 12 ml. of a saturated solution of mercuric chloride in 60 per cent alcohol to 8 ml. of a 0.5 per cent aqueous solution of chromic acid. Then add 21 ml. of absolute alcohol. Cool and add 8 ml. of concentrated nitric acid.

This fluid should be green in color and free from sediment.

Remarks: This fluid will keep in a cool room for several days.

HEPTAMETHOXY RED INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of heptamethoxy red (2,4,6,2′,4′,2″,4″-heptamethoxytriphenylcarbinol) in 100 ml. of alcohol.

Remarks: pH : red 5.0-7.0 colorless.

HERMANN'S FLUID

Use: Fixative.

Preparation: Mix the following:

Platinic chloride, 10% aq. soln.	3 parts
Osmic acid, 1% aq. soln.	16 parts
Glacial acetic acid	2 parts
Water	19 parts

Remarks: This fluid should be freshly prepared.

Ref. Biol. Stains, Conn p. 278

HERTWIG'S OSMIC-ACETIC ACID

Use: To harden microscopic specimens.

Preparation:

Solution A: Dissolve 0.05 g. of osmium tetroxide and 0.2 g. of acetic acid in 200 ml. of water.

Solution B: Mix the following:

Mercuric chloride, saturated aq. soln.	150 ml.
Chromic acid, 1% aq. soln.	150 ml.
Glacial acetic acid	15 ml.
Formaldehyde	50 ml.
Water	135 ml.

HERZBERG'S PAPER

See: Congo red paper.

HEXAMETHYLENETETRAMINE REAGENT

See: Methenamine reagent (Ko).

HEXAMETHYLENETETRAMINE ALLYLIODIDE SOLUTION

Use: Reagent for the quantitative determination of cadmium.

Preparation: Dissolve 10 g. of hexamethylenetetramine allyliodide (allyl iodourotropine) in 100 ml. of distilled water.

Remarks: This reagent precipitates cadmium quantitatively. The precipitate contains 11.45 per cent cadmium, and may be dried at 105° C. for gravimetric determination. Zinc interferes.

Ref. C. A. **24**, 311 (1930)

HEXANITRODIPHENYLAMINE SOLUTION

See: Aurantia solution.

HEYN'S REAGENT

Use: To show segregation of carbon, sulfur, and phosphorus in steel.

Preparation: Dissolve 10 g. of cupric ammonium chloride in 100 ml. of water.

Ref. Metals Handbook, p. 729

HEYN-BAUER'S REAGENT

Use: Test reagent for sulfur, selenium, and tellurium in copper.

Preparation: Dissolve 25 g. of cadmium acetate in 200 ml. of acetic acid diluted with water to 1 liter.

Procedure for Test: Treat copper with a potassium cyanide solution, and then add alcohol and the reagent. A yellow precipitate forms if sulfur is present; an orange-red precipitate forms with selenium; and a dark gray precipitate with tellurium.

Ref. Metallurgie **3**, 73

HICK'S REAGENT

Use: Test reagent for resin.

Preparation:

Solution A: Dissolve 10 ml. of phenol in 20 ml. of carbon tetrachloride.

Solution B: Dissolve 5 ml. of bromine in 20 ml. of carbon tetrachloride.

Remarks: Characteristic color reactions are obtained when resins are dissolved in *Solution A* and then exposed to the bromine vapors from *Solution B*. (See reference).

Ref. J. Ind. Eng. Chem. **3**, 86 (1911)

HIRSCHFELD'S REAGENT

Use: Reagent for the detection of pus in body fluids.

Preparation: Mix 2 ml. of aqueous dimethyl-*p*-phenylenediamine-hydrochloride solution with 1 per cent *α*-naphthol in 70 per cent alcohol or 1 per cent potassium hydroxide solution.

Procedure for Test: Pour reagent carefully onto the diluted blood. A blue ring forms in myeloid leukemia and neutrophile leucocytosis. The same technic is used to detect pus in body fluids.

Ref. C. A. **12**, 2331 (1918)

HIRSCHSOHN'S REAGENT (COTTONSEED OIL)

Use: Reagent for cottonseed oil.

Preparation: Dissolve 1 g. of gold chloride in 150 ml. of chloroform.

Procedure for Test: Add 10 drops of the reagent to 5 ml. of the olive oil to be tested and heat for 20 minutes on a boiling water bath. A red color appears if cottonseed oil is present.

Ref. Chem.-Ztg. 1888, Rep. 341

HIRSCHSOHN'S REAGENT (MYRRH)

Use: Test reagent for myrrh.

Preparation: Dissolve 4 g. of chloral hydrate in 1 g. of trichloroacetal. Heat if necessary to effect solution.

Remarks: Herabol myrrh gives a violet color with this reagent, while bissabol myrrh does not.

Ref. Pharm. Zentralhalle **44**, 809 (1903)

HIRSCHSOHN'S REAGENT (VOLATILE OILS)

Use: Test reagent for volatile oils.

Preparation:

Solution 1: Add 2-4 drops of ferric chloride solution to 95 ml. of alcohol and mix thoroughly.

Solution 2: Dissolve 0.1 g. of fuchsin in 1 liter of water and decolorize by passing sulfur dioxide through the solution.

Remarks: These reagents give color reactions with various volatile oils.

HISS SERUM WATER

Use: To test fermentation reaction of certain bacteria.

Preparation: Dilute 1 volume of beef serum with 3 volumes of distilled water and heat in an Arnold sterilizer for 15 minutes. The medium should remain liquid. One per cent of litmus is used and also 1 per cent of sugar may be added.

Ref. Muir, p. 46

HISS'S STAIN

Use: Staining solution for capsules.

Preparation:

Solution 1: Mix 5-10 ml. of a saturated alcoholic solution of crystal violet with sufficient distilled water to make 100 ml. of solution.

Solution 2: Dissolve 20 g. of cupric sulfate in 80 ml. of distilled water.

Remarks: Prepare film with animal serum. Dry in air and fix with heat, and then stain with *Solution 1.* This is done by warming gently for a few minutes until the steam rises. Wash with *Solution 2* and blot dry.

Ref. Kolmer and Boerner, p. 400; Muir, p. 107

HÖHNEL'S REAGENT

Use: Test reagent for silk.

Preparation: Add 50 ml. of water to 50 ml. of a saturated solution of chromic acid.

Remarks: This reagent dissolves silk within 30 seconds.

Ref. Dingler's Polytech. J. **246,** 465

HOLL'S REAGENT

Use: Test reagent for pine oil in oil of turpentine.

Preparation: Dissolve 0.2 g. of ferric chloride and 0.5 g. of potassium ferricyanide in 250 ml. of water.

Remarks: Reagent produces a blue turbidity in presence of pine oil.

Ref. Apoth.-Ztg. **50,** 748 (1935)

HONEY AGAR

Use: Culture medium for the cultivation and identification of fungi.

Preparation: Dissolve the following in 1 liter of distilled water:

Honey	60.0 g.
Peptone	10.0 g.
Agar	20.0 g.

Adjust the reaction to pH 5.5 and sterilize by the fractional method.

Ref. Kolmer and Boerner, p. 367

HOOGOLIET'S TEST PAPER

Use: Test paper for chlorides.

Preparation: Saturate strips of filter paper with a solution of silver chromate in ammonia, and then rapidly draw the moist strips through dilute nitric acid to distribute the silver chromate uniformly.

Remarks: The dried paper is red, but it is decolorized when dipped into liquids containing chlorides.

Ref. Pharm. Zentralhalle. 1890, 268

HOPKINS-COLE REAGENT

Use: Reagent for tryptophane.

Preparation: Dissolve 10 g. of mercuric sulfate in 90 g. of 5 per cent sulfuric acid.

Remarks: This reagent precipitates tryptophane quantitatively.

Ref. J. Physiol. 27, 418 (1901)

HOPKINS-COLE'S REAGENT (BENEDICT'S MODIFICATION)

Use: For color reaction of the tryptophane group. A test reagent for proteins.

Preparation: Place 10 g. of powdered magnesium in a large flask, and add enough distilled water to cover the metal. Then add slowly 250 ml. of a cold, saturated solution of oxalic acid. The flask and contents must be cooled under running water during the addition of the acid. When the reaction is complete, filter off the insoluble magnesium oxalate and make the filtrate slightly acid with acetic acid. Finally dilute the filtrate to 1 liter with distilled water.

Procedure for Test: Place the substance to be tested in a test tube and add a little of the reagent (glyoxylic acid). Then pour sulfuric acid down the side of the tube so that it forms a layer at the bottom. A reddish-violet ring at the junction of the two liquids indicates tryptophane or proteins containing this group.

Ref. J. Biol. Chem. 6, 51 (1909); J. Physiol. 27, 418 (1902)

HORMONE BROTH

Use: Culture medium.

Preparation: Mix the following and place in an icebox overnight:

Beef heart, lean, fresh, and minced	500 g.
Peptone	10 g.
Sodium chloride	5 g.
Distilled water	1000 ml.
Whole egg, slightly beaten, shell included	1 only

Remove from the icebox and slowly heat the mixture to 68° C. with constant stirring. Keep at this temperature for 10 minutes. Place in a steam sterilizer for 1 hour from the boiling point, or until a clot is well formed. Loosen the clot from the sides of the container with a stirring rod and replace the vessel in the sterilizer for 1-1.5 hours, or until the coagulum settles leaving a clear supernatant liquid. Place in a refrigerator overnight, and then strain through a fine wire sieve. This removes the meat and the hardest fat. Adjust the reaction to pH 8.0-8.5 with *N* sodium hydroxide solution. Allow the solution to stand for ½-1 hour until phosphates precipitate, and then siphon off the clear broth. Store in liter containers. Sterilize in a steam sterilizer for 40 minutes at 100° C. on each of three successive days. For immediate use, adjust the reaction to pH 7.6-7.8 with *N* hydrochloric acid. Tube or flask, and sterilize in a steam sterilizer at 100° C. for 20-30 minutes on each of three successive days.

Ref. J. Infectious Diseases **23**, 169 (1918)

HOSHIDA'S REAGENT

Use: Reagent for morphine.

Preparation: Dissolve 0.3 g. of sodium molybdate and 0.5 ml. of formaldehyde in 60 ml. sulfuric acid.

Remarks: Morphine gives a violet color with this reagent. This color changes to blue-violet and finally to a green shade.

Pseudomorphine also causes a violet color, but this color changes to a blue-green.

Ref. Apoth. Ztg. 1908, 643

HOYER'S AMMONIUM CARMINATE SOLUTION

Use: A stain for nuclei and nerve cells.

Preparation: Dissolve 1 g. of carmine in 50 ml. of water to which has been added a little ammonium hydroxide and chloral hydrate.

HOYER'S CHLORAL-ACACIA

Use: A preservative for certain specimens.

Preparation: Dissolve chloral hydrate and acacia in a mixture of water and glycerol.

HUBER'S SOLUTION

Use: A reagent for free mineral acids.

Preparation: Dissolve a little potassium ferrocyanide and ammonium molybdate in water.

Remarks: A reddish-yellow to dark-brown precipitate forms when this solution is added to free mineral acids, but this color disappears on the addition of an alkali. Boric and arsenious acids do not give this test.

Ref. Zeitschr. anal. Chem. **16**, 242 (1877)

HÜBL'S SOLUTION

Use: Qualitative test for unsaturated acids in fats.

Preparation: Dissolve 5.2 g. of iodine and 6 g. of mercuric chloride in 200 ml. of 95 per cent alcohol.

Remarks: Unsaturated fats decolorize this solution.

HÜBL'S SOLUTION

Use: Reagent for determining the iodine number of fats and oils.

Preparation:

Solution A: Dissolve 25 g. of iodine in 500 ml. of 90 per cent alcohol.

Solution B: Dissolve 30 g. of mercuric chloride in 500 ml. of 90 per cent alcohol.

Mix these two solutions and allow to stand for 12 to 24 hours.

Remarks: This solution must be standardized at the time it is used.

Ref. Sutton, pp. 400-403; Zeitschr. anal. Chem. **25**, 432 (1886); **39**, 654 (1900)

HUMFREY'S REAGENT

Use: To show carbon segregation in steel.

Preparation: Mix the following:

Cupric ammonium chloride	100 g.
Hydrochloric acid, conc.	50 ml.
Water	1000 ml.

Ref. Williams and Homerberg, pp. 248-249

HUNTER'S REAGENT

Use: Test reagent for ergothioneine.

Preparation:

Solution A: Add 1.5 ml. of 5 per cent sodium nitrite solution to 1.5 ml. of a solution prepared by dissolving 9 g. of sulfanilic acid and 90 ml. of concentrated hydrochloric acid in enough water to make 1 liter. Allow to stand for 5 minutes and add 6 ml. more of the 5 per cent sodium nitrite solution. After 5 minutes dilute to 50 ml.

Solution B: Dissolve 1 g. of anhydrous sodium carbonate and 10 g. of sodium acetate in 100 ml. of water.

Procedure for Test: Mix 1 ml. of *Solution A* with 0.5 ml. of *Solution B* and allow to stand for 15 seconds. Then add 2 ml. of the solution to be tested. Keep cold for 30 seconds and add 2 ml. of 10 per cent sodium hydroxide solution and shake well. A purplish-red color appears if ergothioneine is present.

Ref. Biochem. J. **22**, 4 (1928)

HUNTOON'S STAIN

Use: Stain for capsules.

Preparation:

Solution 1: Heat 100 ml. of a 3 per cent solution of sodium caseinate ("nutrose") for 1 hour in flowing steam, and then add 5 ml. of a 2 per cent solution of phenol. Finally, decant into test tubes.

Solution 2: Mix the following:

Phenol, 2% soln.	100 ml.
Lactic acid, conc.	0.25-0.5 ml.
Acetic acid, 1% soln.	1 ml.
Basic fuchsin, sat. alcoholic soln.	1 ml.
Carbol fuchsin, old soln.	1 ml.

Procedure for Use: Mix organisms to be stained with a drop of *Solution 1*. Spread in a thin film and dry in air. Without fixing, stain with *Solution 2* for 30 seconds. Wash and dry.

Ref. Kolmer and Boerner, pp. 400-401

HYDRAZINE SULFATE SOLUTION

Use: Reagent for copper.

Preparation: Dissolve 3 g. of hydrazine sulfate in 100 ml. of water.

Remarks: Reagent precipitates copper as cuprous compounds or in the metallic state in hot alkaline solutions. Reaction is quantitative.

Ref. Ber. 1900, 631

HYDROCHLORIC ACID SOLUTIONS

Reagent: Hydrochloric acid (sp. gr. 1.19-38% HCl).

Preparation:

6.0 Normal (approximate): Dilute concentrated hydrochloric acid (12 *N*) with an equal volume of water.

1.0 Normal (approximate):

Method 1: Dilute concentrated hydrochloric acid with water to d. 1.020 using a hydrometer.

Method 2: Dilute 80 ml. of concentrated hydrochloric acid to 1 liter with water.

1.0 Molar: Same as 1.0 Normal

HYDROCHLORIC ACID SOLUTION (VOLUMETRIC REAGENT)

Reagent: Hydrochloric acid (sp. gr. 1.19-38% HCl).

Preparation:

1.0 Normal (standardized): The 1.0 *N* solution prepared in the preceding section may be standardized by precipitation as silver chloride.

An excellent method for preparing standard hydrochloric acid is described by Hulett and Bonner, *J. Am. Chem. Soc. 31, 390 (1909)*. This involves the use of constant boiling hydrochloric acid, and is carried out as follows:

Use an ordinary hydrometer and prepare 1 liter of hydrochloric acid of d. 1.10. Place this acid in a distilling flask and distill off the first 750 ml., which is discarded, and then collect the next 200 ml. The composition of the distillate is given in the following table, prepared by Hollingsworth and Foulk:

Barometric Pressure	Per Cent HCl by Weight	Wt. of HCl sol. Required for 1 Mol. Wt. of HCl
770 mm.	20.215	180.407 g.
760 mm.	20.239	180.193 g.
750 mm.	20.263	179.979 g.
740 mm.	20.286	179.766 g.
730 mm.	20.311	179.555 g.

The constant boiling acid is not hygroscopic, does not volatilize readily, and may easily be weighed in a small flask.

To prepare a solution of any required strength, note the barometric pressure at which the distillation is carried out; and, by reference to the figure given in the last column of the table, determine the weight of the constant boiling acid required to contain 1 mole of hydrogen chloride. Then by means of a capillary pipette weigh out the proper amount of the acid into a small flask to within 10 mg. or less. The weight of acid indicated in the last column of the table is the weight of the constant boiling mixture required to produce 1 liter of 1 *N* hydrochloric acid. Solutions of other strengths or volumes may be computed from these figures.

A 1 *N* solution may be prepared in this manner with an accuracy seldom attained by other methods.

Ref. J. Am. Chem. Soc. **31**, 390 (1909); **52**, 633 (1930); **45**, 1223 (1923); Kolthoff and Furman, pp. 73-75

HYDROCHLORIC ACID-CARMINE (MAYER)

Use: Staining solution.

Preparation: Add 30 drops of hydrochloric acid to 20 ml. of distilled water and dissolve in this solution 4 g. of carmine. Boil if necessary to aid solution. Cool a little and add 100 ml. of 80 per cent alcohol and filter while still warm. Add ammonia drop by drop until the carmine begins to precipitate, and then filter again.

HYDROSTRYCHNINE SOLUTION (DENIGÈS)

Use: Test reagent for bromine.

Preparation: Dissolve 1 g. of strychnine sulfate in 100 ml. of water and add 5 ml. of hydrochloric acid (sp. gr. 1.14) and 5 g. of amalgamated zinc. Heat to boiling, cool, and then decant the clear liquid.

Procedure for Test: Add 1 ml. of reagent to 5 ml. of dilute bromine solution and mix well. A purple-red color is produced with bromine. This solution shows a characteristic absorption spectrum.

Sensitiveness: 1 : 100,000.

Ref. C. A. **5**, 2792 (1911)

3-HYDROXY-7-IODOQUINOLINE-5-SULFONIC ACID REAGENT

See: Loretin reagent.

HYDROXYNAPHTHALENEQUINONESULFONIC ACID REAGENT

Use: Test reagent for germanium.

Preparation: Dissolve 0.01 g. of the reagent in 100 g. of concentrated sulfuric acid.

Procedure for Test: Evaporate a drop of the sample to be tested in a dish and add 2-3 ml. of the reagent. Examine the mixture in a blue light. A pink color is obtained if germanium is present.

Ref. C. A. **31**, 4615 (1937)

8-HYDROXYQUINOLINE SOLUTION

See: Oxine solution.

ILOSVAY'S REAGENT

Use: Test reagent for hydrogen peroxide.

Preparation: Dissolve 5 drops of dimethylaniline and 0.03 g. of potassium dichromate in 1 liter of water.

Procedure for Test: Mix 5 ml. of the solution to be tested with 5 ml. of the reagent, and then add 1 drop of 5 per cent oxalic acid solution. A yellow color develops if hydrogen peroxide is present.

Sensitiveness: 1 : 5,000,000.

Ref. Ber. **28**, 2029 (1895)

INDICATORS, MIXED

Use: Indicators.

Preparation: The formulas for a number of mixed indicators are given below:

(1) Mix 50 ml. each of 0.1 per cent alcoholic solutions of methyl yellow and methylene blue.

Remarks: (acid) blue violet—(alkaline) green : transition point at pH 3.25.

(2) Mix 50 ml. of 0.1 per cent alcoholic solution of hexamethoxytriphenyl carbinol with 50 ml. of 0.1 per cent methyl green.

Remarks: (acid) violet—(alkaline) green: transition point at pH 4.0. Color is blue-violet at pH 4.0.

(3) Mix 50 ml. of 0.1 per cent aqueous methyl orange solution with 50 ml. of 0.25 per cent of aqueous indigo carmine.

Remarks: (acid) violet—(alkaline) green: transition point at pH 4.1.

(4) Mix 50 ml. of 0.1 per cent aqueous solution of methyl orange with 50 ml. of 0.1 per cent aqueous aniline blue.

Remarks: (acid) violet—(alkaline) green: transition point at pH 4.3.

(5) Mix 75 ml. of 0.1 per cent of alcoholic bromcresol blue solution with 25 ml. of 0.2 per cent alcoholic solution of methyl red.

Remarks: (acid) wine—(alkaline) green: transition point at pH 5.1.

(6) Mix 50 ml. of 0.2 per cent alcoholic methyl red solution and 50 ml. of 0.1 per cent alcoholic methylene blue.

Remarks: The above solution must be stored in a dark bottle. (acid) red-violet—(alkaline) green: transition point at pH 5.4. The color is a dirty blue at pH 5.4.

(7) Mix 50 ml. of 0.1 per cent aqueous solution of the sodium salt of bromcresol green with 50 ml. of 0.1 per cent aqueous solution of sodium alizarin sulfonate.

Remarks: (acid) violet—(alkaline) greenish-yellow: transition point at pH 5.6.

(8) Mix 50 ml. of 0.1 per cent sodium chlorophenol red in water with 50 ml. of 0.1 per cent aqueous aniline blue solution.

Remarks: (acid) green—(alkaline) violet: transition point at pH 5.8. Pale violet at pH 5.8.

(9) Mix 50 ml. of 0.1 per cent aqueous solution of the sodium salt of bromcresol green with 50 ml. of 0.1 per cent aqueous solution of the sodium salt of chlorophenol red.

Remarks: (acid) greenish-yellow—(alkaline) blue-violet: transition point at pH 6.1.

(10) Mix 50 ml. of 0.1 per cent aqueous solution of the sodium salt of bromcresol purple with 50 ml. of 0.1 per cent aqueous solution of the sodium salt of bromthymol blue.

Remarks: (acid) yellow—(alkaline) blue-violet: transition point at pH 6.7.

(11) Mix 50 ml. 0.1 per cent of sodium bromthymol blue solution in water with 25 ml. of 0.1 per cent aqueous azolitmin solution.

Remarks: (acid) violet—(alkaline) blue: transition point at pH 6.9.

(12) Mix 50 ml. of 0.1 per cent alcoholic solution of methylene blue with 50 ml. of 0.1 per cent alcoholic solution of neutral red.

Remarks: (acid) blue violet—(alkaline) green: transition point at pH 7.0.

(13) Mix 50 ml. of 0.1 per cent alcoholic neutral red with 50 ml. of 0.1 per cent alcoholic bromthymol blue.

Remarks: (acid) rose—(alkaline) green: transition point at pH 7.2.

(14) Mix 50 ml. of 0.1 per cent cyanine in 50 per cent alcohol with 25 ml. of 0.1 per cent phenol red in 50 per cent alcohol.

Remarks: (acid) yellow—(alkaline) violet: transition point at pH 7.3.

(15) Mix 50 ml. of 0.1 per cent aqueous solution of the sodium salt of phenol red with 50 ml. of 0.1 per cent aqueous solution of the sodium salt of bromthymol blue.

Remarks: (acid) yellow—(alkaline) violet: transition point at pH 7.5.

(16) Mix 25 ml. of 0.1 per cent aqueous solution of the sodium salt of cresol red with 75 ml. of 0.1 per cent aqueous solution of the sodium salt of thymol blue.

Remarks: (acid) yellow—(alkaline) violet: transition point at pH 8.3.

(17) Mix 50 ml. of 0.1 per cent alcoholic α-naphtholphthalein with 25 ml. of 0.1 per cent alcoholic cresol red.

Remarks: (acid) pale rose—(alkaline) violet: transition point at pH 8.3.

(18) Mix 25 ml. of 0.1 per cent alcoholic α-naphtholphthalein with 75 ml. of 0.1 per cent alcoholic phenolphthalein.

Remarks: (acid) pale rose—(alkaline) violet: transition point at pH 8.9.

(19) Mix 25 ml. of 0.1 per cent alcoholic phenolphthalein with 50 ml. of 0.1 per cent alcoholic methyl green.

Remarks: (acid) green—(alkaline) violet: transition point at pH 8.9.

(20) Mix 25 ml. of 0.1 per cent solution of thymol blue in 50 per cent alcohol with 75 ml. of 0.1 per cent solution of phenolphthalein in 50 per cent alcohol.

Remarks: (acid) yellow—(alkaline) violet: transition point at pH 9.0.

(21) Mix 50 ml. of 0.1 per cent solution of α-naphtholphthalein in 50 per cent alcohol with 100 ml. of 0.1 per cent solution of phenolphthalein in 50 per cent alcohol.

Remarks: (acid) rose—(alkaline) violet: transition point at pH 9.6.

(22) Mix 50 ml. of 0.1 per cent alcoholic phenolphthalein solution with 50 ml. of 0.1 per cent thymolphthalein in alcohol.

Remarks: (acid) colorless—(alkaline) violet: transition point at pH 9.9. Color change is quite sharp.

(23) Mix 50 ml. of 0.1 per cent alcoholic solution of phenolphthalein with 100 ml. of 0.2 per cent alcoholic solution of Nile blue.

Remarks: (acid) blue—(alkaline) red: transition point at pH 10.0.

(24) Mix 50 ml. of 0.1 per cent alcoholic thymolphthalein with 25 ml. of 0.1 per cent alcoholic alizarin yellow.

Remarks: (acid) yellow—(alkaline) violet: transition point at pH 10.2. Color change is quite sharp.

(25) Mix 50 ml. of 0.1 per cent alizarin yellow solution with 100 ml. of 0.1 per cent aqueous solution of Nile blue.

Remarks: (acid) green—(alkaline) red-brown: transition point at pH 10.8.

Ref. Kolthoff and Furman, pp. 64-65

INDICATORS, UNIVERSAL

Solution 1: Dissolve 5 mg. of thymol blue, 25 mg. of methyl red, 60 mg. of bromthymol blue, and 60 mg. of phenolphthalein in 75 per cent alcohol, and dilute to 100 ml. with that solvent. Then add $N/100$ sodium hydroxide solution until a green color is obtained.

Remarks: Color changes at whole pH numbers between 4 and 10 as follows: red, orange, yellow-green, blue, indigo, and violet.

Solution 2: Dissolve 1.125 g. of *sym*-trinitrobenzene, 0.035 g. of phenolphthalein, 0.10 g. of dibromothymolsulfonphthalein, 0.03 g. of o-cresolphthalein, 0.022 g. of methyl red, 0.05 g. of pentamethoxyl red, and 0.0085 g. of methyl orange in 100 ml. of alcohol.

Remarks: Color changes occur at the following pH ranges: 14-12, 10-8.3, 9.8-8.2, 7.6-6.0, 6.3-4.2, 4.4-3.1, 3.2-1.2.

Solution 3: Mix 20 ml. each of 0.10 per cent solutions of the following: methyl red, thymolphthalein, phenolphthalein, bromthymol blue, and α-naptholphthalein.

Remarks: Color changes occur as follows:

pH	Color
4.0	red
5.0	orange-red
6.0	yellow
7.0	greenish-yellow
8.0	green
9.0	blue-green
10.0	blue-violet
11.0	red-violet

Solution 4: Dissolve 0.5 g. of thymol blue, 0.1 g. of phenolphthalein, 0.2 g. of methyl red, 0.4 g. of bromthymol blue, and 0.3 g. of dimethylaminoazo-

benzene in 500 ml. of alcohol, and then add $N/10$ sodium hydroxide solution until the mixture turns yellow.

Remarks: Color changes occur as follows:

pH	Color
1.0	cherry-red
2.0	rose
3.0	reddish-orange
4.0	orange-red
5.0	orange
6.0	yellow
7.0	yellowish-green
8.0	green
9.0	bluish-green
10.0	blue

Solution 5: Dissolve the following in 100 ml. of 50 per cent alcohol:

Neutral red	0.035 g.
Nitramine	0.010 g.
m-Nitrophenol	0.060 g.
Thymolsulfonphthalein	0.015 g.
Thymolphthalein	0.025 g.

Remarks: Color changes occur as follows:

pH	Color
7.0	red
8.0	orange
9.0	yellow
10.0	green
11.0	blue
12.0	blue-violet
13.0	violet

Solution 6: Dissolve the following in 100 ml. of dilute alcohol:

Naphtholphthalein	0.50 g.
Bromthymol blue	0.07 g.
Alizarin yellow *R*	0.15 g.
Phenolphthalein	0.50 g.
Cresolphthalein	0.40 g.

Remarks: Colors produced at different pH ranges follow the order of the spectrum from red at pH 2.0 to violet at pH 14.0.

Solution 7: Mix 0.1 per cent solutions of the following as directed:

Dimethyl yellow	15 ml.
Methyl red	5 ml.
Bromthymol blue	20 ml.
Phenolphthalein	20 ml.
Thymolphthalein	20 ml.

Remarks: The following color changes occur:

pH	Color
1.0	rose
3.0	red-orange
4.0	orange
5.0	yellow-orange
6.0	lemon-yellow
7.0	yellow-green
8.0	green
9.0	blue-green
10.0	violet

Solution 8: Dissolve the following in 100 ml. of dilute alcohol:

Tropaeolin 00	0.07 g.
Methyl orange	0.10 g.
Methyl red	0.08 g.
Bromthymol blue	0.40 g.
Phenolphthalein	0.50 g.
Alizarin yellow *R*	0.10 g.

Remarks: Use 1 drop in 10 ml. of solution. The following color changes occur:

pH	Color
2.0	orange-red
3.0	red-orange
4.0	orange
5.0	yellow-orange
6.0	orange-yellow
7.0	green-yellow
8.0	green
9.0	green-blue
9.5	blue-violet
10.0	violet
11.0	violet-red
12.0	violet-red

Solution 9: Dissolve 5 mg. of thymol blue, 25 mg. of methyl red, 60 mg. of bromthymol blue, and 60 mg. of phenolphthalein in enough 75 per cent alcohol to make 100 ml. of solution. Neutralize this solution with 0.1 *N* sodium hydroxide until a green color is obtained.

Remarks: This indicator shows color changes at whole pH numbers between 4.0 and 10.0 in the following order: red, orange, yellow-green, blue, indigo, and violet.

Ref. C. A. **33**, 3715 (1939)

INDIGO SOLUTION

Use: Reagent for the determination of tannin and coloring matter in wines.

Preparation: Dissolve 6 g. of sodium indigotine disulfonate in 500 ml. of water by heating. Cool, add 50 ml. of sulfuric acid, and dilute with water to 1 liter. Filter to obtain a clear solution.

Ref. Jacobs, p. 406

INDIGO CARMINE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.25 g. of indigo carmine (sodium indigodisulfonate) in 100 ml. of 50 per cent alcohol.

Remarks: pH: blue 11.6-14.0 yellow.

INDIGO CARMINE REAGENT

Use: Reagent used for the determination of dissolved oxygen.

Preparation: Add sufficient glucose and potassium carbonate to a 0.1 per cent solution of indigo carmine to give a 1 per cent solution of each. Place this solution in a flask and fill completely. Stopper so that no air remains in the flask, and then place in the dark for 24 hours. Discard a small amount of the solution and pour a thick layer of paraffin oil over the surface.

Remarks: This solution contains the yellow leuco-base of indigo carmine. This solution turns blue in the presence of oxygen, and the intensity of this color may be used to determine the amount of oxygen in the sample under investigation.

Ref. Snell I, pp. 137-138

INDIGO SULFONATE INDICATOR SOLUTION

Use: Oxidation-reduction indicator used in permanganate titrations.

Preparation: Mix 1 g. of indigo with 12 g. of concentrated sulfuric acid and heat on a water bath for one hour. When cool, make up to 500 ml. with concentrated sulfuric acid.

Remarks: This compound is oxidized to colorless isatin sulfonic acid by oxidizing agents, and is reduced to a colorless leuco compound by reducing agents.

Ref. Kolthoff and Furman, pp. 273-274

INDOLE REAGENT (SCHLOSS)

Use: Reagent for glyoxalic acid in urine.

Preparation: Dissolve 0.2 g. of indole in 100 ml. of water.

Procedure for Test: Shake 20 ml. of urine with animal charcoal and filter. Shake the colorless filtrate with 2 ml. of dilute sulfuric acid, and then heat at 50° C. for 10 minutes. Add the reagent and very carefully pour the mixture onto the surface of concentrated sulfuric acid. A red ring forms if glyoxalic acid is present.

INFUSION AGAR

See: Beef infusion agar.

INULIN SERUM WATER MEDIUM

Use: Culture medium.

Preparation: Dissolve 2.5 g. of peptone in 25 ml. of distilled water, using heat if necessary, and adjust the reaction to pH 7.4-7.8. Dissolve 5 g. of inulin in 25 ml. of distilled water, heating slightly if necessary. Next add 350 ml. of distilled water to 100 ml. of horse or beef serum. Finally, mix the peptone and inulin solution with the dilute serum, and add sufficient saturated alcoholic bromcresol purple solution to give the desired color. Place about 3 ml. in each serological tube, and sterilize in a steam sterilizer at 100° C. for 30 minutes on three successive days.

Ref. J. Exptl. Med. 6, 329 (1905)

INTERNATIONAL NICKEL CO. REAGENT

Use: Etching solution for nickel and nickel alloys.

Preparation: Mix the following:

Nitric acid	20-40 ml.
Acetic acid, 75%	30-40 ml.
Acetone	30-40 ml.

Ref. Williams and Homerberg, p. 324

IODEOSIN INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of iodeosin (tetraiodofluorescein) in 100 ml. of ether saturated with water.

Remarks: pH: Yellow 0.0-4.0 rose-red.

Ref. Kolthoff and Furman, pp. 58-59

IODIC ACID REAGENT (RIEGLER)

Use: Test reagent for acetoacetic acid in urine.

Preparation: Dissolve 3 g. of iodic acid in 50 ml. of water.

Procedure for Test: Acidify 50 ml. of the urine to be tested with 1 ml. of concentrated sulfuric acid and then add 50 ml. of the reagent. The appearance of a rose color is a positive test for acetoacetic acid. This color fades in about one-half hour. This color is not extracted with chloroform, which is colored violet when shaken with normal urine.

Ref. Münch. med. Wochschr. 1906, 448

IODINE-EOSIN SOLUTION

Use: Stain for the detection of cysts of amebae in feces.

Preparation: Dissolve 5 g. of potassium iodide in 100 ml. of physiological salt solution and add iodine until saturated. Mix 1 ml. of this solution with 2 ml. of a saturated solution of eosin in physiological salt solution, and 2 ml. of physiological salt solution.

Remarks: This stain is used with Donaldson's method.

Ref. Kolmer and Boerner, p. 255

IODINE MONOCHLORIDE SOLUTION

Use: A catalyst for titrations with ceric sulfate.

Preparation: Dissolve 0.1395 g. of potassium iodate and 0.0890 g. of potassium iodide in 125 ml. of water, and then add, all at once, 125 ml. of concentrated hydrochloric acid. Cool to room temperature and adjust as follows: add 5 ml. of chloroform and titrate very carefully with either dilute potassium iodate or potassium iodide, depending on which is required, until the chloroform layer shows only a faint violet color after vigorous shaking.

Ref. Kolthoff and Sandell, p. 583

IODINE SOLUTION (VOLUMETRIC REAGENT)

Reagent: Iodine, resublimed.

Preparation:

0.1 Normal (standardized): Place 12.7 g. of pure iodine in a 250 ml beaker, and add 40 g. of iodate-free potassium iodide and 25 ml. of water. Stir until solution is complete and dilute to 1 liter with distilled water. Store in a glass-stoppered bottle in a cool place.

This solution may be standardized by titration against a solution of sodium thiosulfate of known strength, using starch as an indicator, or by titrating against an accurately weighed quantity of arsenious oxide. This may be carried out as follows:

Weigh out 0.2 g. of pure dry arsenious oxide and dissolve in 10 ml. of 1 *N* sodium hydroxide solution. Next add 15 ml. of 1 *N* sulfuric acid, and then carefully add a solution prepared by dissolving 2 g. of sodium bicarbonate in 50 ml. of water. Finally add a few ml. of starch indicator and titrate with the iodine solution to the appearance of a faint permanent blue coloration.

Ref. Kolthoff and Sandell, pp. 592-596; Treadwell and Hall, pp. 554-557

IODINE, TINCTURE

Preparation: Add 70 g. of iodine and 50 g. of potassium iodide to 50 ml. of water, and then dilute to 1 liter with alcohol.

IODINE-ZINC CHLORIDE REAGENT (NOWOPOKROWSKY)

Use: Test reagent for cellulose.

Preparation: Dissolve 20 g. of zinc chloride in 8.5 ml. of water and cool. To this solution add drop by drop, until the iodine begins to precipitate, a second solution prepared by dissolving 3 g. of potassium iodide and 1.5 g. of iodine in 60 ml. of water.

Remarks: A blue color forms when cellulose is placed in this solution and allowed to stand.

Ref. C. A. **6**, 1165 (1912)

7-IODO-8-HYDROXYQUINOLINE-5-SULFONIC ACID SOLUTION

See: Ferron solution.

IODO-POTASSIUM IODIDE REAGENT

See: Goldstein's reagent.

IODO-POTASSIUM IODIDE REAGENT (ACETONE)

See: Lieben's solution.

IODO-POTASSIUM IODIDE REAGENT (BOUCHARDAT)

Use: Test reagent for alkaloids.

Preparation: Dissolve 2 g. of iodine and 4 g. of potassium iodide in 100 ml. of water.

Remarks: This reagent causes a brown precipitate with alkaloids.

Ref. Compt. rend. **9**, 475

IODO-POTASSIUM IODIDE SOLUTION (ROSENHEIM)

Use: Test reagent for choline.

Preparation: Dissolve 2 g. of iodine and 6 g. of potassium iodide in 100 ml. of water.

Remarks: Dark brown microscopic plates or prisms are formed when this solution is added to choline.

Ref. Hawk and Bergeim, p. 231; J. Physiol. **33**, 220 (1905)

IODO-POTASSIUM IODIDE REAGENT (WAGNER)

Use: Test reagent for alkaloids.

Preparation: Dissolve 2 g. of iodine and 6 g. of potassium iodide in 100 ml. of water.

Remarks: This reagent causes precipitates with many alkaloids.

Ref. C. A. **3**, 1324 (1909)

IODOQUINIC REAGENT

See: Aubry's reagent.

IRIDIUM CHLORIDE SOLUTION (IWANOW)

Use: Reagent for the detection of nitrate in the presence of nitrite.

Preparation: Dissolve 25 mg. of iridium chloride or iridium potassium chloride in 5 ml. of water and add 100 ml. of concentrated sulfuric acid. Heat the mixture until colorless.

Procedure for Test: Add a little of the dry sample to 5 ml. of the hot reagent. A blue color appears if nitrate is present. Chlorine interferes with this test.

Sensitiveness: 0.001 g. nitric acid.

Ref. C. A. **7**, 951 (1913)

IRIDIUM POTASSIUM CHLORIDE SOLUTION

See: Iridium chloride solution (Iwanow).

IRON COMPOUNDS

See: Ferric and ferrous compounds.

IRON HEMATOXYLIN

See: Heidenhain, Weigert.

ISATIN REAGENT (INDICAN)

See: Bouman's reagent.

ISATIN REAGENT (MENKE)

Use: Reagent for micro-test for silver and copper.

Preparation: Dissolve 0.5 g. of isatin in 100 ml. of 5 per cent ammonia.

Remarks: Reagent yields characteristic crystals with cuprous oxide and silver ions. No other metals give characteristic precipitates with this reagent.

Ref. C. A. **17**, 3653 (1923)

ISATIN REAGENT (THIOALCOHOLS)

Use: Reagent for thioalcohols (mercaptans).

Preparation: Dissolve 1 g. of isatin in 100 ml. of concentrated sulfuric acid.

Procedure for Use: Mix 2 ml. of the reagent with 6-8 ml. of concentrated sulfuric acid, and then add slowly and cautiously an alcoholic solution of the thioalcohol. A green color appears.

Ref. J. pharm. chim. 1889, 276

ISATIN-β-OXIME SOLUTION

Use: Test reagent for metals.

Preparation: Dissolve 1 g. of isatin-β-oxime in 100 g. of alcohol.

Remarks: Color reactions are obtained with metals as follows:

Copper (ic)	Green precipitate (from acetate sol.)
Copper (ous)	Orange precipitate
Lead	Yellow precipitate (from acetate sol.)
Nickel	Yellow-green precipitate
Cobalt	Brown precipitate (from acetate sol.)
Silver	Red to yellow precipitate (from acetate sol.)
Mercury	Orange-yellow precipitate (from acetate sol.)

Ref. C. A. **32**, 4460 (1938)

ISONITROSOACETOPHENONE SOLUTION (KRÖHNKE)

Use: Test reagent for ferrous iron in ferric salts.

Preparation: Dissolve 1.49 g. of isonitrosoacetophenone in 100 ml. of chloroform.

Procedure for Test: Dissolve the ferric salt in a little water and make the solution neutral. Then add 1 ml. of the reagent and make alkaline with 0.1 *N* ammonium hydroxide. If ferrous iron is present the chloroform layer turns blue. Nickel, cobalt, manganese, lead, and mercury give characteristic colors.

Sensitiveness: 0.03 mg. per liter.

Ref. C. A. **21**, 1605 (1927)

IWANOW'S REAGENT

Use: Test reagent for lead in water.

Preparation: Dissolve 2 g. of sodium bisulfite in 100 ml. of water. This solution must be freshly prepared and must not react acid to methyl orange.

Procedure for Test: Mix 50 ml. of the reagent with 50 ml. of the water to be tested. A white turbidity appears if lead is present. Tin, barium, and other metals give this test, so that it is useful only in determining the presence of lead in the absence of other metals.

Sensitiveness: 1 : 1,000,000.

Ref. Chem.-Ztg. 1914, 50

JACOBY'S REAGENT

Use: Reagent for pepsin and trypsin.

Preparation: Dissolve 1 g. of ricin and 1.5 g. of sodium chloride in 100 ml. of water.

Procedure for Test: Add 2-3 ml. of the reagent to 1 ml. of pepsin in 0.56 per cent hydrochloric acid. Keep the mixture at incubator temperature for a few hours. The mixture becomes perfectly clear if pepsin is present.

Sensitiveness: 0.01 mg. of pepsin.

Ref. C. A. **3**, 918 (1909)

JACQUEMART'S SOLUTION

Use: Test reagent for ethyl alcohol.

Preparation: Dissolve a few grams of mercuric nitrate in 50 ml. of water and acidify with nitric acid.

Remarks: The mercuric nitrate is reduced when heated with ethyl alcohol. When ammonium hydroxide is added, a black precipitate appears.

Ref. Zeitschr. anal. Chem. **18**, 291 (1879)

JAFFE'S REAGENT

Use: Test reagent for bismuth and antimony.

Preparation: Dissolve 8 g. of iodine in 100 ml. of triethanolamine.

Procedure for Test: Acidify the solution to be tested with hydrochloric acid and add a few drops of the reagent. A scarlet precipitate indicates the presence of bismuth, and a golden-yellow precipitate indicates antimony.

Ref. C. A. **28**, 6382 (1934)

JANNASCH'S REAGENT

Use: An oxidizing agent for decomposing organic matter.

Preparation: Mix 15-20 per cent hydrogen peroxide with 65 per cent nitric acid.

Remarks: Neither nitric acid nor 30 per cent hydrogen peroxide is used alone because of the danger of explosions.

Jannasch's reagent is used in analytical procedures where organic matter is likely to interfere with the determination of metals, as in poison cases, etc.

Ref. C. A. **6**, 1577 (1912)

JANNASCH-BIEDERMANN'S REAGENT

See: Hydrazine sulfate solution.

JAWOROWSKI'S REAGENT (ALBUMIN)

Use: Reagent for albumin in urine.

Preparation: Dissolve 2 g. of ammonium molybdate and 8 g. of citric acid in 80 ml. of water.

Procedure for Test: Acidify 4 ml. of urine with a little citric acid if necessary, and add 1 drop of the reagent. A turbidity forms if albumin is present, and it does not disappear on warming. Peptone produces a turbidity also, but the latter clears up on warming.

Ref. Zeitschr. anal. Chem. **36**, 70 (1897)

JAWOROWSKI'S REAGENT (ALKALOIDS)

Use: Test reagent for alkaloids.

Preparation: Dissolve 0.3 g. of sodium vanadate in 10 ml. of hot water. Cool, and mix with a second solution prepared by dissolving 0.2 g. of cupric sulfate in 100 ml. of water. Mix well and add acetic acid drop by drop until the precipitate which forms is dissolved. Filter to obtain a clear solution.

Procedure for Test: Dissolve a little of the alkaloid salt in a few ml. of water. The free alkaloid is dissolved with the aid of 5 per cent acetic acid. Add 1 drop of the reagent to the solution so formed. A precipitate indicates the presence of alkaloids. If after 15 minutes no precipitate has formed, divide the mixture into two parts, and to one add a few drops of the reagent and heat the other to boiling. A turbidity in either case indicates the presence of alkaloids.

JAWOROWSKI'S REAGENT (AMMONIA)

Use: Test reagent for ammonia.

Preparation: Dissolve 2 g. of mercuric chloride, 2 g. of sodium carbonate, and 8 g. of sodium chloride in 60 ml. of water.

Remarks: This reagent is used much like Nessler's reagent.

Ref. Zeitschr. anal. Chem. **35**, 589 (1896)

JENDRASSIK'S REAGENT

Use: Color test for water-soluble vitamin B.

Preparation: Mix 5 ml. of 0.1 *N* ferric chloride and 5 ml. of 0.1 *N* potassium ferricyanide. The reagent must be freshly prepared.

Procedure for Test: Acidify a concentrated water solution of vitamin B with 2 per cent acetic acid and then add the freshly prepared reagent. Allow to stand for 10 minutes and dilute with 1-5 volumes of water. A dark blue color or precipitate is a positive test.

Ref. J. Biol. Chem. **57**, 129 (1923)

JENNER'S STAIN

Use: Staining solution.

Preparation: Mix 50 ml. of a 1.2-1.25 per cent aqueous solution of water-soluble eosin with 50 ml. of a 1.0 per cent aqueous solution of methylene blue. Set aside for 24 hours. At the end of this time filter and wash the precipitate well with distilled water. Dry the precipitate in an incubator at 37° C. Store the dry powder in tightly stoppered containers.

To use, dissolve 0.5 g. of the powder in 100 ml. of acetone-free methanol.

JENNER'S STAIN

Use: A general blood stain, and a stain for neutrophile granules in leucocytes.

Preparation:

Solution A: Dissolve 0.5 g. of eosin in 100 ml. of methyl alcohol.

Solution B: Dissolve 0.5 g. of methylene blue in 100 ml. of methyl alcohol.

When ready to use, mix 100 ml. of *Solution A* and 80 ml. of *Solution B*.

Ref. Kolmer and Boerner, p. 77

JENSEN-URBAIN REAGENT

Use: Reagent for blood pigments.

Preparation:

Solution A: Dissolve 1 g. of sodium hyposulfite in 1 liter of water.

Solution B: Dissolve 1 g. of sodium nitrite in 1 liter of water.

Procedure for Test: Place a portion of the material to be tested in *Solution A*, which has been freshly prepared, and after standing for several minutes remove and wash with water. Next place the treated material in *Solution B* and allow to remain for several minutes. Remove and wash with water, and treat with hydrogen peroxide. A green color is produced if hemoglobin is present.

Ref. Food Research **1**, 275 (1936)

JODLBAUER'S REAGENT

Use: For the determination of nitrogen.

Preparation: Dissolve 50 g. of phenol in enough concentrated sulfuric acid to make 100 ml. of solution.

Ref. Zeitschr. anal. Chem. **26**, 93 (1887)

JOHANNSON'S REAGENT

Use: A reagent for colchicine.

Preparation: Dissolve 13.5 g. of mercuric chloride and 50 g. of potassium iodide in 1 liter of water.

Remarks: This reagent produces a turbidity or precipitate with a solution of colchicine that has been acidified with sulfuric acid.

Ref. Zeitschr. anal. Chem. **15**, 456 (1876)

JOLLÈS SOLUTION

Use: Reagent for albumin in urine.

Preparation: Dissolve 10 g. of mercuric chloride, 20 g. of citric acid, and 20 g. of sodium chloride in 500 ml. of water.

Remarks: Urine containing albumin becomes turbid when treated with this solution and acetic acid.

Ref. C. A. **7**, 1032 (1913)

JÖRGENSEN'S REAGENT

Use: Test reagent for quinine.

Preparation: Dissolve the following in sufficient alcohol to make 250 ml. of solution:

Iodine	1.96 g.
Hydroiodic acid, 10% soln.	10.00 g.
Dilute sulfuric acid (SO_3-10%)	10.00 g.

Remarks: This reagent is used for the herapathite reaction for quinine.

Ref. Pharm. Zentralhalle. 1907, 582

JORISSEN'S REAGENT

Use: Test reagent for glucosides and alkaloids.

Preparation: Dissolve 2 g. of fused zinc chloride in 60 ml. of concentrated hydrochloric acid and 60 ml. of water.

Remarks: This reagent gives various color reactions when evaporated to dryness on a steam bath with alkaloids and glucosides.

Ref. Zeitschr. anal. Chem. **19**, 358 (1880)

KAHLE'S FLUID

See: Dietrich's fluid.

KAISER'S GLYCERIN-GELATIN

Use: A preservative for plant specimens.

Preparation: Soak 14 g. of gelatin in 84 ml. of water until the gelatin is soft and then warm until it dissolves. Add 76 ml. of glycerol and 2 g. of phenol and filter through glass wool while still hot.

KAMLET'S REAGENT

Use: Reagent for albumin in urine.

Preparation: Dissolve 25 g. of commercial ammonium molybdate, 15 g. of sulfosalicylic acid, and 85 g. of citric acid in 1 liter of water. Add 2 ml. of chloroform to prevent formation of molds.

Sensitiveness: 0.005 per cent albumin.

Ref. Chemist Analyst **28**, 62-3 (1939)

KARL FISCHER REAGENT

See: Fischer's reagent.

KASTLE-CLARK'S REAGENT

Use: Reagent for free acids.

Preparation: Dissolve 0.153 g. of cyanogen iodide in water and dilute to 100 ml.

Procedure for Test: Add 1 ml. of 0.01 *N* potassium iodide solution and 1 ml. of 0.1 per cent starch solution to the solution to be tested and add a little of the reagent. A blue color forms if free acids are present.

Ref. Am. Chem. J. **30**, 87 (1901)

KELLER'S ETCHING SOLUTION

Use: To show microstructure of duralumin type alloys.

Preparation: Mix the following:

Hydrochloric acid, conc.	1.5 ml.
Hydrofluoric acid, conc.	1.0 ml.
Nitric acid, conc.	2.5 ml.
Water	95.0 ml.

Remarks: Immerse for 10-20 seconds and wash in a stream of warm water.

Ref. Metals Handbook, p. 1291

KENTMANN'S REAGENT

Use: Test reagent for formaldehyde.

Preparation: Dissolve 10 g. of morphine hydrochloride in 100 ml. of concentrated sulfuric acid.

Procedure for Test: Float a little of the liquid to be tested on a few ml. of the reagent. If formaldehyde is present, the aqueous layer turns reddish-violet within a few minutes.

Sensitiveness: 1 : 6,000.

Ref. Chem.-Ztg. 1896, Rep. 313

KERBOSCH'S REAGENT

Use: Test reagent for alkaloids.

Preparation: Dissolve 1.8 g. of cadmium iodide and 5 g. of cesium iodide in 100 ml. of water.

Remarks: Reagent yields precipitates with solutions of alkaloids.

Ref. Arch. Pharm. 1910, 541

KHARICHKOV'S REAGENT

Use: Test reagent for organic bases.

Preparation:

Solution A: Dissolve a little "inactive" naphthenic acid or oleic acid in 100 ml. of ether.

Solution B: Dissolve 3 g. of cupric sulfate in 100 ml. of water.

Procedure for Test: Mix 4 ml. of *Solution A* with 2 ml. of *Solution B.* When an organic base is added to this mixture, the ether layer turns green.

Ref. C. A. **6**, 2728 (1912)

KILIANI'S REAGENT

Use: Test reagent for digitalis glucosides.

Preparation: Mix 1 ml. of 5 per cent ferric sulfate solution with 100 ml. of concentrated sulfuric acid.

Remarks: Reagent yields characteristic color reactions with digitalis glucosides and their decomposition products.

Ref. C. A. **8**, 2449 (1914)

KISSER'S REAGENT

See: Picrolonic acid solution.

KLEIN'S SOLUTION

Use: High specific gravity solution used to separate minerals.

Preparation: A saturated solution of cadmium borotungstate ($2CdO \cdot B_2O_3 \cdot 9WO_3 \cdot 18H_2O$).

Remarks: The specific gravity of this solution is 3.28.

KLEIN'S SOLUTION

Use: Test reagent for nitrates.

Preparation: Dissolve 0.05-0.1 g. of tellurium in 5 ml. of fuming sulfuric acid and add 3 ml. of 95 per cent sulfuric acid.

Remarks: This red solution is decolorized by metals.

Ref. J. Ind. Eng. Chem. **2**, 389 (1910)

KLEINBERG-MAYER'S PICRO-SULFURIC ACID

Use: Fixative for animal tissues.

Preparation: Dissolve enough picric acid in 2 per cent sulfuric acid to form a saturated solution. Add a few drops of creosote.

KLIGLER LEAD ACETATE AGAR

See: Russell's Double Sugar Agar.

KNAPP'S SOLUTION

Use: Reagent for the quantitative determination of glucose.

Preparation: Add 10 g. of mercuric cyanide to 100 ml. of 13.3 per cent sodium hydroxide solution and add water to make 1 liter.

Remarks. Mercury is precipitated when this solution is heated with glucose. Sulfide is used as an indicator. One ml. of this solution is equal to 0.0025 g. of glucose.

Ref. Biochem. J. **9**, 156 (1915)

KOBULADZE'S REAGENT

Use: Reagent for the determination of albumin in urine.

Preparation: Mix 10 g. of mercuric chloride, 2 g. of sodium chloride, and 2 g. of tartaric acid with 500 ml. of water.

Remarks: To make determination, add 10-12 drops of this reagent to 5 ml. of urine. If albumin is present, a turbidity appears which develops in intensity in proportion to the amount of albumin present.

Ref. C. A. **33**, 4618 (1939)

KOCH-EHRLICH'S STAIN

Use: A stain for tuberculosis bacilli.

Preparation:

Solution A: Dissolve 1 g. of methylene blue in 200 ml. of water, and make alkaline by the addition of a few drops of 10 per cent potassium hydroxide solution.

Solution B: Prepare a concentrated aqueous solution of vesuvin.

To use, first stain object with methylene blue, and finally with the vesuvin solution.

Remarks: Nuclei and most micrococci are stained brown. Tuberculosis bacilli are colored an intense blue.

KOCH'S METHYLENE BLUE SOLUTION

Use: A stain for bacteria.

Preparation: Dissolve 0.5 ml. of a saturated alcoholic solution of methylene blue, and 0.1 ml. of 10 per cent potassium hydroxide solution in 100 ml. of water.

KOLISCH'S REAGENT

Use: Reagent for creatinine.

Preparation: Dissolve the following in 125 ml. of absolute alcohol:

Mercuric chloride	30 g.
Sodium acetate	1 g.
Acetic acid, glacial	3 drops

Ref. Chem. News **55**, 304 (1887)

KOLTHOFF'S REAGENT

See: Diphenylcarbazide solution (Metals).

KOMAROVSKII-SHAPIRO REAGENT

Use: Reagent for columbium and tantalum.

Preparation: Mix the following:

Sodium thiosulfate, 1% aq. soln.	2 ml.
Barium chloride, 25% aq. soln.	2 ml.
Acetic acid, 0.1 *N*	2 ml.
Hydrogen peroxide, 0.7%	2 ml.

This solution must be freshly prepared.

Procedure for Test: Carefully neutralize the solution to be tested, and to 4 ml. of this solution add 4 ml. of the reagent. To the remaining 4 ml. of the reagent add 4 ml. of water. Shake each mixture and allow to stand for 20 minutes. If columbium or tantalum is present in the solution being tested, a precipitate of barium sulfate is formed. In the blank solution only a turbidity of sulfur appears.

Ref. C. A. **32**, 5329 (1938)

KOPPESCHAAR'S SOLUTION

Use: As a standard bromine solution for quantitative determinations.

Preparation: Dissolve 3 g. of potassium bromate and 25 g. of potassium bromide in water and dilute to 1 liter.

Remarks: This solution liberates free bromine when treated with an acid.

Ref. Zeitschr. anal. Chem. **15**, 233 (1876)

KORENMAN REAGENT

Use: Reagent for free ammonia in pyridine.

Preparation: Mix the following solutions:

Picric acid, sat. soln.	10 ml.
Cupric sulfate, 0.1% aq. soln.	10 ml.

Procedure for Test: Place a drop of the reagent on a glass slide and invert over a vessel containing the pyridine under investigation. A precipitate forms within a few minutes if ammonia is present in the sample.

Ref. C. A. **27**, 43 (1933)

KOSER'S CITRATE MEDIUM

Use: Culture medium.

Preparation: Dissolve the following in 1 liter of distilled water:

Sodium chloride	5.00 g.
Magnesium sulfate ($MgSO_4$)	0.20 g.
Ammonium phosphate ($NH_4H_2PO_4$)	1.00 g.
Dipotassium phosphate (K_2HPO_4)	1.00 g.
Sodium citrate ($5\frac{1}{2}$ H_2O)	2.77 g.

Tube and sterilize in an autoclave at 121° C. for 30 minutes.

Ref. Kolmer and Boerner, p. 357

KOVAC'S REAGENT

Use: Reagent for detecting indole formation by bacteria.

Preparation: Dissolve 5 g. of p-dimethylaminobenzaldehyde in 75 g. of amyl alcohol and 25 g. of hydrochloric acid.

Procedure for Test: Shake culture in bouillon with a little of the reagent. Indole is extracted by the amyl alcohol and gives a cherry-red color with the reagent.

Ref. C. A. 22, 3425 (1928)

KOWALEWSKY'S REAGENT

Use: Test reagent for albuminous substances.

Preparation: Dissolve 0.5 g. of uranium acetate in 100 ml. of water.

Remarks: Reagent produces a yellow precipitate with albumin.

Ref. Zeitschr. anal. Chem. 24, 552 (1885)

KRAUT'S REAGENT

Use: Test reagent for choline.

Preparation: Dissolve 27.2 g. of potassium iodide in a little water, and add 8 g. of bismuth subnitrate dissolved in 20 g. of nitric acid (sp. gr. 1.18). Let stand until the potassium nitrate crystallizes out and then filter. Finally, add water to the filtrate until the total volume is 100 ml.

Remarks: Test solution gives a brick-red precipitate with choline.

Ref. Hawk and Bergeim, p. 231

KREIS-STUDINGER'S REAGENT

Use: Test reagent for vanillin in brandy.

Preparation: Dissolve 4.4 g. of potassium nitrite in 100 ml. of a cold saturated solution of mercuric chloride, and add 1 ml. of a 10 per cent solution of sodium carbonate. Filter to obtain a clear solution.

Procedure for Test: Mix 3 ml. of vanillin solution with 3 ml. of the reagent and heat for 15 minutes on a steam bath. A wine-red color develops if vanillin is present. This reagent deteriorates on standing.

Ref. C. A. 22, 1823 (1928)

KRONBERGER'S REAGENT

Use: Test reagent for pathological urine.

Preparation:

Solution A: Dissolve 1 g. of iodine and 2 g. of potassium iodide in 200 ml. of water.

Solution B: Dilute 1 ml. of a saturated aqueous solution of gentian violet with 200 volumes of water.

Procedure for Test: Mix 1 ml. of *Solution A* with 10 ml. of filtered urine, and add 1 ml. of *Solution B* and 10 ml. of absolute alcohol. A red color develops in pathological urine, while normal urine gives a blue-violet color.

Ref. Deut. med. Wochschr. 1917, 750, 1363

KROUPAS' PAPER

Use: Test reagent for free ammonia.

Preparation: Add sulfuric acid to a fuchsin solution until it appears yellow, and then immerse filter paper in this solution. Remove the paper and allow to dry.

Remarks: This paper turns red when exposed to free ammonia.

KUEVER'S REAGENT

Use: Test reagent for cottonseed oil.

Preparation: Reflux 2 g. of precipitated sulfur with a mixture of 100 ml. of carbon disulfide and 100 ml. of pyridine.

Remarks: Reagent gives a wine-red color with cottonseed oil when heated on a paraffin bath at 115°. One per cent cottonseed oil gives test immediately.

Ref. J. Am. Pharm. Assoc. 1921, 594

KÜHNE'S CARBOLIC METHYLENE BLUE

Use: A stain for bacteria.

Preparation: Dissolve 1.5 g. of methylene blue and 10 ml. of absolute alcohol in 100 ml. of a 5 per cent aqueous solution of phenol.

Ref. Muir, p. 102; Biol. Stains, Conn p. 83

KUHN'S REAGENT

Use: Reagent for bile pigments in urine.

Preparation:

Solution A: Mix 20 ml. of a 5 per cent cupric sulfate solution with 10 ml. of 20 per cent ammonia solution.

Solution B: Mix 20 ml. of 85 per cent phosphoric acid with 20 ml. of water.

Procedure for Test: Add 2 ml. of *Solution A* to 20 ml. of urine, and then add 2 ml. of *Solution B*. Mix well and add 6 drops of toluene. Shake and allow to stand for a few minutes. Then carefully float 4 ml. of alcohol on the surface of the liquid. A green color forms in the alcohol if bile pigments are present.

Ref. J. pharm. chim. [8] **8**, 546 (1928)

KUNZ-KRAUSE REAGENT

Use: Test reagent for dicyanogen.

Preparation: Mix 2 ml. of a cold saturated aqueous solution of picric acid with 18 ml. of alcohol and 5 ml. of 15 per cent potassium hydroxide.

Remarks: This solution turns a deep purple-red when brought into contact with dicyanogen. This color later turns brown. Hydrogen cyanide gives this test.

Ref Dennis, p. 269

LACMOID PAPER

Use: Indicator.

Preparation: Impregnate filter paper with a solution of lacmoid and allow to dry.

Remarks: Color: Base: blue.
Acid: red.

LACMOID INDICATOR SOLUTION

Use: Indicator.

Preparation. Dissolve 0.5 g. of lacmoid in 100 ml. of alcohol.

Remarks: pH: red 4.4-6.2 blue.

LACTOSE AGAR

Use: Culture medium.

Preparation:

(1) *With Litmus:* Prepare a beef extract agar of pH 7.5-7.8 and add 1 per cent lactose and enough litmus or azolitmin solution to give a bluish-purple color when cooled.

(2) *With Andrade's Indicator:* Instead of litmus in the above preparation, use 1 per cent Andrade's indicator. The reaction of this medium must be 7.2. If the pH is correct, the medium is dark red in color when hot and nearly colorless when cold.

After the addition of the lactose indicator, sterilize the medium in a steam sterilizer at 100° C. on three successive days.

LACTOSE BILE

Use: Culture medium.

Preparation: Add 1 per cent of peptone and 1 per cent of lactose to ox-bile or to a 50 per cent ox-bile-water mixture. Place in fermentation tubes and heat in an autoclave at 15 pounds pressure for 20 minutes.

Ref. Am. J. Public Health **5**, 1168 (1915)

LACTOSE BROTH

Use: Culture medium.

Preparation: Add 0.5 per cent lactose to nutrient broth, and adjust the reaction so that after sterilization the pH will be 6.9. Place in fermentation tubes and heat in an autoclave at 15 pounds pressure for 20 minutes. Cool rapidly after removal from the autoclave.

This broth may be prepared by adding directly to a tube of sterile nutrient broth from a sterile pipette enough lactose solution to make the required 0.5 per cent solution. These tubes should be incubated at 37° C. for 24 hours as a test of sterility.

Ref. A.P.H.A., pp. 200-201; J. Am. W. W. Assoc. **27**, 1732 (1935)

LAILLER'S REAGENT

Use: Reagent to determine the purity of olive oil.

Preparation: Dissolve 3 g. of chromic acid in 22 ml. of water and dilute this solution with one-half its volume of concentrated nitric acid.

Procedure for Test: Shake 2 g. of the reagent with 8 g. of the oil to be tested and allow to stand. If the oil is pure it solidifies within a few days and acquires a blue color.

Ref. J. pharm. chim. 1865, 180

LANGE'S REAGENT

Use: Test reagent for mercerized cotton.

Preparation: Dissolve the following in 24 ml. of water:

Iodine	1 g.
Potassium iodide	5 g.
Zinc chloride	30 g.

Ref. Chem.-Ztg. 1903, 592, 735

LANTHANUM ACETATE SOLUTION (MEYER-SCHULTZ)

Use: Reagent for detection and determination of small quantities of fluorine.

Preparation: Dissolve 1 g. of lanthanum acetate in 100 ml. of water.

Procedure for Test: Strongly acidify 10 ml. of the solution to be tested with acetic acid and add 2-3 g. of solid ammonium acetate. Now add an excess of the reagent and heat to boiling. Lanthanum fluoride precipitates from the boiling solution. This reagent can be used for the quantitative determination of fluorine.

Sensitiveness: 0.01 mg.

Ref. C. A. **19**, 1674 (1925)

LANTHANUM NITRATE SOLUTION

Use: Test reagent for acetates.

Preparation: Dissolve 5 g. of lanthanum nitrate in 100 ml. of water.

Procedure for Test: Add a few drops of test reagent to a solution containing acetate. Add a few drops of 0.01 *N* iodine solution and a few drops of ammonium hydroxide. Boil the mixture. A blue color forms if acetate is present.

Ref. Engelder, p. 216; C. A. 2401 (1930); 894 (1931); 2083 (1930)

LEA'S REAGENT

Use: Test reagent for cyanides.

Preparation: Dissolve 1 g. of ferrous ammonium sulfate and 1 g. of either uranium nitrate or cobalt nitrate in 250 ml. of water.

Procedure for Test: Place a few drops of the reagent in a porcelain dish, and carefully allow a few drops of the solution to be tested to flow down into contact with the reagent. A red color appears at the zone of contact if cyanide is present.

Sensitiveness: 1 : 5,000.

Ref. Zeitschr. anal. Chem. **14**, 370 (1875)

LEAD ACETATE AGAR

Use: Culture medium for study of hydrogen sulfide production.

Preparation: Liquefy 100 ml. of sterile nutrient agar by heating and cool to 50° C. Add aseptically the following:

Lead acetate, sterile, 0.5% aq. soln.	1 ml.
Lactose, sterile, 25% aq. soln. (warm)	4 ml.
Glucose, sterile, 25% aq. soln.	4 ml.

Mix well and distribute aseptically into sterile containers.

Ref. Lab. Methods U. S. Army, 585 (1935)

LEAD ACETATE PAPER

Use: Reagent for hydrogen sulfide and soluble sulfides.

Preparation: Soak filter paper in an aqueous solution of lead acetate and allow to dry.

Remarks: Paper is colored brown to black by hydrogen sulfide or soluble sulfides.

Ref. Bur. Stand., Tech. Paper No. 41 (1914)

LEAD ACETATE REAGENT (LABICHE)

Use: Reagent for cottonseed oil.

Preparation: Dissolve 50 g. of lead acetate in 100 ml. of warm water.

Procedure for Test: Mix 25 ml. of the reagent with 25 ml. of the oil and heat to 35° C. Add 5 ml. of ammonium hydroxide and shake. The resulting emulsion becomes yellowish-red if cottonseed oil is present.

Ref. Zeitschr. anal. Chem. **29**, 722 (1890)

LEAD ACETATE SOLUTIONS

Reagent: $Pb(C_2H_3O_2)_2 \cdot 3H_2O$, mol. wt. = 379.35.

Preparation:

0.5 Molar: Dissolve 189.7 g. of lead acetate in distilled water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of lead ion per ml. of solution: Dissolve 18.4 g. of lead acetate in distilled water and dilute to 1 liter.

LEAD NITRATE SOLUTIONS

Reagent: $Pb(NO_3)_2$, mol. wt. = 331.23.

Preparation:

0.5 Molar: Dissolve 165.6 g. of lead nitrate in distilled water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of lead ion per ml. of solution: Dissolve 16 g. of lead nitrate in distilled water and dilute to 1 liter.

LEAKE AND GUY'S FLUID

Use: Fluid for diluting blood.

Preparation: Mix the following:

Crystal violet	0.05 g.
Sodium oxalate	1.6 g.
Formalin	6.0 ml.
Distilled water	94.0 ml.

Warm, filter, and store in a bottle.

Remarks: This fluid keeps well.

Ref. Kolmer and Boerner, p. 99

LeCHATELIER AND DUPUY REAGENT

Use: To show phosphorus segregation in steel.

Preparation: Mix the following:

Cupric chloride	1.0 g.
Picric acid	0.5 g.
Water	10.0 ml.
Hydrochloric acid, conc.	1-2 ml.
Alcohol	100 ml.

Ref. Metals handbook, p. 729

LeCHATELIER AND LEMOINE REAGENT

Use: To show segregation in steel.

Preparation: Mix the following:

Cupric chloride	10 g.
Magnesium chloride	40 g.
Hydrochloric acid	20 ml.
Water	180 ml.
Alcohol, absolute	1000 ml.

Ref. Williams and Homerberg, p. 312

LEGAL'S SOLUTION

Use: Test reagent for acetone in urine.

Preparation: Dissolve 10 g. of sodium nitroprusside in 30 ml. of water and make slightly alkaline with potassium hydroxide.

Remarks: When added to urine containing acetone, this solution produces a red color which changes to yellow. When acidified with acetic acid the color changes to a carmine red, violet, and finally to blue after 1 to 2 days.

Ref. Hawk and Bergeim, p. 765

LEISHMAN'S STAIN (WRIGHT'S MODIFICATION)

Use: Blood stain.

Preparation: Dissolve 1 g. of methylene blue in 100 ml. of 0.5 per cent sodium bicarbonate solution, and place in a steam sterilizer for one hour. Now pour the solution into a large dish and heat on a steam bath. During the heating add slowly a 0.1 per cent yellow, aqueous solution of eosine until the mixture turns purple and a yellow scum forms. About 500 ml. of the eosine solution is required.

Collect the precipitate and dry in an incubator without washing.

When ready to use, dissolve 0.3 g. of the powder in 100 ml. of pure methyl alcohol and filter. Dilute 80 ml. of the filtrate with 20 ml. of methyl alcohol.

LEJEUNE'S REAGENT

See: p-Diaminodiphenylamine sulfate solution (Lejeune).

LELLI'S REAGENT

Use: Test reagent for indican in urine.

Preparation: Dissolve 1 g. of gold chloride in 10 ml. of concentrated hydrochloric acid.

Procedure for Test: Mix 10 ml. of urine with an equal volume of the reagent. A violet color forms if indican is present.

LeMITHOUARD'S REAGENT

Use: Reagent for picric or picramic acid in urine.

Preparation: Dissolve 4 g. of ferrous sulfate and 20 g. of tartaric acid in 200 ml. of water.

Procedure for Test: Precipitate the urine with lead acetate solution and filter, and then precipitate the lead with sulfuric acid. Again filter and extract the filtrate with chloroform. Add water and ammonia to the extract and then a few drops of the reagent. If picric or picramic acid is present, a deep red ring appears at the junction of the liquids.

Sensitiveness: 1 : 500,000.

Ref. C. A. **10**, 1990 (1916)

LeROY'S REAGENT

Use: Test reagent for free chlorine in water.

Preparation: Dissolve 1 g. of hexamethyltri-p-aminotriphenylmethane in 20 ml. of 1 : 1 hydrochloric acid and dilute to 100 ml.

Remarks: A few drops of this reagent when added to 1 liter of water produces a violet color if free chlorine is present.

Sensitiveness: 3 : 100,000,000.

Ref. C. A. **11**, 507 (1917)

LEUCHTER'S REAGENT (HYDROGEN PEROXIDE)

Use: Test reagent for minute quantities of hydrogen peroxide.

Preparation: Mix 50 g. of a 1 per cent aqueous solution of cobalt chloride with 50 g. of a solution prepared by dissolving 0.8 g. of borax and 10 g. of glycerol in 50 ml. of water.

Procedure for Test: Float about 2 ml. of the solution to be tested on 2 ml. of the reagent, and, if hydrogen peroxide is present, a brown or dark ring will form.

Sensitiveness: 1 drop 3% H_2O_2 per l.

Ref. C. A. **6**, 200-201 (1912)

LEUCHTER'S REAGENT (PINE OIL AND TURPENTINE OIL)

Use: Reagent for pine oil and turpentine oil.

Preparation: Mix the following:

Phloroglucinol	0.3 g.
Alcohol	3.0 g.
Glycerol	7.5 g.
Water	3.75 g.
Hydrochloric acid, 25% aq. soln.	15.0 g.

Remarks: Reagent gives a light yellow to light brown color with turpentine and a reddish color with pine oil.

Ref. C. A. **7**, 2316 (1913)

LEUCINE REAGENT

See: α-amino-n-caproic acid reagent (Lyle-Curtman-Marshall).

LEVINE-RICHMAN'S REAGENT

Use: Test reagent for terpenes.

Preparation: Wash antimony trichloride three times with chloroform containing 1 per cent alcohol and then dry the residue in a dessicator. Add 30 g. of this product to 100 ml. of chloroform and decant the clear solution.

Procedure for Test: Add 0.5 ml. of acetic anhydride and 2 ml. of the reagent to 3 drops of a chloroform solution of terpene. Characteristic color reactions are obtained with this test.

Ref. Biochem. J. 27, 2051 (1933)

LEY'S REAGENT

Use: To distinguish between natural and artificial honey.

Preparation: Dissolve 10 g. of silver nitrate in water and precipitate the silver completely as silver oxide by the addition of a solution of sodium hydroxide. Filter and wash with distilled water, and then dissolve the oxide in enough 10 per cent ammonia to make 115 g. of solution.

Ref. Pharm. Ztg. 1902, 603

LIBERALLI'S REAGENT

Use: Test reagent for hydroxy acids.

Preparation: Mix 32.4 ml. of 10 per cent ferric chloride solution with 58.2 ml. of 10 per cent potassium thiocyanate solution and add water to make 100 ml.

Remarks: Reagent causes a yellow color with neutral solutions of hydroxy acids. Acetic and oxalic acids give the same color.

Ref. C. A. 26, 3200 (1932)

LIGHTHARDT'S REAGENT

Use: Test reagent for caramel.

Preparation: Dissolve 1 g. of tannin in 30 ml. of water, and add 0.75 g. of sulfuric acid (sp. gr. 1.84) and enough water to make 50 g. of solution. Allow reagent to stand for 24 hours and filter.

Procedure for Test: Add 5 ml. of the solution to be tested (alcohol-free) to 5 ml. of the reagent, and warm until solution is complete. A brown precipitate forms within 12 hours if caramel is present.

Ref. J. Ind. Eng. Chem. 2, 389 (1910)

LIEBEN'S SOLUTION

Use: Test reagent for acetone.

Preparation: Dissolve 3 g. of potassium iodide and 2 g. of iodine in a little water and dilute to 50 ml.

Procedure for Test: Add a few drops of test solution to the liquid to be tested, and then a few drops of potassium hydroxide solution. The characteristic odor of iodoform may be detected if acetone is present. Alcohol gives the same test.

Ref. J. Biol. Chem. **3**, 27 (1907)

LIEBERMANN'S REAGENT

Use: Test reagent for thiophene in benzene.

Preparation: Add 100 g. of concentrated sulfuric acid to 6 ml. of water, and dissolve in this solution 8 g. of potassium nitrite. Allow to settle and use the clear solution.

Procedure for Test: Shake 1 ml. of the reagent with 10 ml. of the benzene to be tested. The mixture turns green and finally blue if thiophene is present.

Ref. Ber. **16**, 1473 (1883)

LIEBIG'S REAGENT

Use: Reagent for the determination of urea.

Preparation: Dissolve 77.2 g. of mercuric oxide in 16 g. of nitric acid (sp. gr. 1.185) and evaporate until a thick syrupy liquid is obtained. Then add enough water to make 1 liter of solution.

Remarks: A precipitate forms when reagent is added drop by drop to a solution of urea in dilute sodium hydroxide. One ml. of the above reagent is equivalent to 0.01 g. of urea.

Ref. J. Am. Med. Assoc. 1903, 321

LIESGANG'S REAGENT

Use: Reagent for gelatin.

Preparation: Add 1 ml. of a 10 per cent cupric chloride solution to 14 ml. of 40 per cent tripotassium phosphate solution.

Remarks: A violet color is produced when a 10 per cent gelatin solution is added to this mixture.

Ref. C. A. **4**, 1005 (1910)

LIGHT GREEN S F YELLOWISH

Use: Staining solution.

Preparation: Dissolve 0.5 g. of the dye in 100 ml. of water.

Remarks: The solution decomposes and fades rapidly.

Ref. Biol. Stains, Conn. pp. 109-110

LILENDAHL-PETERSEN'S REAGENT

Use: Test reagent for albumin.

Preparation: Mix the following with enough water to make 400 g.:

Phosphomolybdic acid	2 g.
Sulfuric acid	6 g.
Kaolin	6 g.

Remarks: Reagent precipitates albumin completely in 6 hours.

Ref. C. A. **13**, 3205 (1919)

LIPP'S SOLUTION

Use: Test reagent for dextrin.

Preparation: A saturated aqueous solution of monobasic lead acetate (lead subacetate).

Remarks: This solution causes a white precipitate to form when boiled with dextrin solutions.

LISON'S REAGENT

Use: Reagent for histochemical detection of peroxidases.

Preparation: Mix 1.5 g. of acid fuchsin or acid violet with 2 ml. of glacial acetic acid and 100 ml. of water and warm until solution is complete. Do not heat strongly. Now add 5 g. of zinc dust, cool, and add 2 ml. of glacial acetic acid.

Remarks: Filter before use, and to each 10 ml. of the reagent add 1 ml. of hydrogen peroxide. Immerse tissue in this solution for 10 minutes.

Ref. C. A. **26**. 5112 (1932)

LITHIUM CARMINE

See: Orth's Lithium Carmine.

LITHIUM CHLORIDE SOLUTIONS

Reagent. LiCl, mol. wt. = 42.4.

Preparation:

1.0 Molar: Dissolve 42.4 g. of lithium chloride in water and dilute to 1 liter.

1.0 Normal: Same as 1.0 Molar.

5 mg. of lithium ion per ml. of solution: Dissolve 30.3 g. of lithium chloride in water and dilute to 1 liter.

LITHIUM NITRATE SOLUTIONS

Reagent: $LiNO_3$, mol wt. = 68.95.

Preparation:

0.5 Molar: Dissolve 34.5 g. of lithium nitrate in water and dilute to 1 liter.

0.5 Normal: Same as 0.5 Molar.

5 mg. of lithium ion per ml. of solution: Dissolve 49.3 g. of lithium nitrate in water and dilute to 1 liter.

LITMUS INDICATOR SOLUTION

Use: Indicator.

Preparation: Place a number of litmus cubes in an evaporating dish and cover with 85 per cent alcohol. Digest on a water-bath for a time with frequent stirring. Decant off this solution, and repeat the extraction three times. Next extract the residue with hot water and pour the solution into a tall cylinder. Allow to stand for several days and siphon off the clear liquid. Evaporate the liquid to about one-third of its original volume and acidify with acetic acid. Evaporate to a syrupy consistency over a water-bath, and then cover the mass with a quantity of 90 per cent alcohol. Filter off the residue and dissolve in such quantity of hot distilled water that 3 drops of the solution impart a distinct color to 50 ml. of water.

Remarks: pH: red 4.5-8.3 blue.

Ref. Treadwell and Hall, pp. 471-472

LITMUS MILK

Use: Culture medium.

Preparation: Prepared in the same manner as plain milk except that litmus or azolitmin is added just before tubing. Bromcresol purple is sometimes used for the indicator. The product is known as *bromcresol purple milk.*

Ref. Biol. Stains, Conn p. 432

LITMUS PAPER

Use: Indicator.

Preparation:

Red Paper: Impregnate filter paper with a solution of red litmus and allow to dry.

Blue Paper: Impregnate filter paper with a solution of blue litmus and allow to dry.

Remarks: Color: Base: blue.
Acid: red.

LITMUS TEST SOLUTION

Use: Reagent for the preparation of culture media.

Preparation: Extract 25 g. of powdered litmus continuously for 1 hour with 100 ml. of boiling alcohol. Repeat the extraction twice with 100 ml. portions of boiling alcohol. Filter and wash with alcohol. Discard the filtrate. Digest the residue with 25 ml. of cold distilled water and filter.

Finally, extract the residue with 125 ml. of boiling distilled water. Cool, and filter. Store the filtrate in wide-mouthed bottles that are loosely plugged with purified cotton.

Ref. Stitt, p. 39

LIVER INFUSION AGAR

Use: Culture medium.

Preparation: Mix 500 g. of ground beef liver (free from fat) with 500 ml. of water and heat at 100° C. for 20 minutes. Stir well and continue to heat for 90 minutes. Filter, first through a wire sieve and then through cheese-cloth. Dissolve in the filtrate 10 g. of peptone and 5 g. of sodium chloride.

Dissolve 20 g. of agar in 500 ml. of water with the aid of heat and add to the infusion prepared above. Make up with water to 1 liter. If it is desired to inhibit Gram-positive organisms, add 0.1 g. of gentian violet.

Adjust the reaction to pH 7.0, or adjust to 0.2 per cent phenolphthalein for the gonococcus. Add 10 g. of egg albumin dissolved in a little water and mix thoroughly at a temperature of 50° C. Heat at 100° C. for 90 minutes and filter through a wire sieve and clean glass wool. Again adjust the reaction to pH 7.0 and place in suitable containers.

Heat in an autoclave at 15 pounds pressure for 30 minutes.

Remarks: Use soon after preparation.

Ref. J. Infectious Diseases **40**, 352 (1927)

LIVER INFUSION MEDIUM (CAMERON AND WILLIAMS)

Use: Culture medium for the general cultivation of anaerobes.

Preparation: Steam 500 g. of ground beef liver with 1 liter of tap water for about 2 hours. Cool and strain through cheese-cloth. Dilute filtrate to 1 liter and add 10 g. of peptone and 1 g. of dipotassium phosphate. Distribute in flasks and heat in an autoclave for 30 minutes at 15 pounds pressure.

Ref. Kolmer and Boerner, pp. 362-363; J. Bact. **2**, 435 (1917); **6**, 460 (1921)

LJUBINSKY DIPHTHERIA STAIN

Use: Staining solution.

Preparation:

Solution I: Mix the following:

Methyl violet 2B, or crystal violet (85% dye content)	0.25 g.
Acetic acid, glacial	5.0 ml.
Distilled water	95.0 ml.

Solution II: Dissolve 0.1 g. of Bismark brown Y in 100 ml. of distilled water.

Remarks: Stain from 30 seconds to 2 minutes with *Solution I*, wash, and stain with *Solution II* for 30 seconds. Finally wash and dry.

Ref. Kolmer and Boerner, p. 397

LJUNGREN'S REAGENT

Use: Test reagent for carbon monoxide.

Preparation: Dissolve about 0.1 g. of palladium chloride and a little sodium acetate in 100 ml. of water. Soak filter paper in this solution and allow to dry.

Procedure for Test: Moisten the paper with water and expose to the gas to be tested. The paper is blackened if carbon monoxide is present.

Sensitiveness: Reaction occurs within 20 minutes if 0.01 per cent by volume of carbon monoxide is present.

Ref. The Merck Index, p. 656

LOCKE'S SOLUTION

Use: Culture medium.

Preparation: Mix the following and sterilize:

Sodium chloride	9-10 g.
Potassium chloride	0.4 g.
Calcium chloride ($CaCl_2 \cdot 2H_2O$)	0.2 g.
Water	1000 ml.
Sodium bicarbonate	0.2 g.
Glucose	2.5 g.

Ref. Stitt, p. 50

LOCKE-RINGER SOLUTION

Use: Culture medium.

Preparation: Dissolve the following in sufficient freshly distilled water to make 1 liter of solution:

Sodium chloride	9.000 g.
Potassium chloride	0.420 g.
Calcium chloride ($CaCl_2 \cdot 2H_2O$)	0.240 g.
Magnesium chloride ($MgCl_2 \cdot 6H_2O$)	0.005 g.
Sodium bicarbonate	0.500 g.
Glucose	0.500 g.

Remarks: The distilled water should be stored in a hard glass flask.

Ref. Kolmer and Boerner, p. 377

LOEFFLER'S BLOOD SERUM

Use: Culture medium.

Preparation: Mix 250 ml. of glucose broth (pH 6.8-7.0) with 750 ml. of blood serum in a sterile flask, and pour the mixture into sterilized culture tubes in such quantities that long slanted surfaces of the liquid are formed when the tubes are inclined in a rack. Coagulate the slanted fluid at 80° C. to 90° C. and sterilize in a steam sterilizer by the intermittent method, or by heating in an autoclave at 10 pounds pressure for 30 minutes.

Ref. Kolmer and Boerner, p. 372

LOEFFLER'S FERROUS-TANNATE MORDANT

Use: A mordant and stain for flagella.

Preparation: Dissolve 20 g. of tannin in 80 ml. of water and add 50 ml. of a cold, saturated aqueous solution of ferrous sulfate, and 10 g. of a concentrated alcoholic solution of fuchsin.

LOEFFLER'S METHYLENE BLUE SOLUTION

Use: A stain for tubercle bacilli.

Preparation:

Solution A: Mix 30 ml. of concentrated alcoholic methylene blue solution with 100 ml. of 0.01 per cent potassium hydroxide solution.

Solution B: Mix the following:

Methylene blue	0.5 g
Potassium hydroxide, 0.1 *N* solution	2.0 ml.
Alcohol	30.0 ml.
Water	98.0 ml.

Ref. Kolmer and Boerner, p. 393

LOGWOOD SOLUTION

Use: Reagent for free mineral acids in vinegar.

Preparation: Pour 100 ml. of boiling water over 2 g. of fresh logwood chips and allow to stand for a few hours and filter.

Procedure for Test: Place a few drops of the reagent on a plate and evaporate to dryness. Place a drop of the vinegar to be tested on one of these spots and again evaporate to dryness. The drop turns red or pink if mineral acids are present.

Ref. Jacobs, p. 353

LONG'S SYNTHETIC MEDIUM

Use: Culture medium for the cultivation of bacteria.

Preparation: Mix the following:

Asparagin	5.0 g.
Ammonium citrate	5.0 g.
Potassium acid phosphate	3.0 g.
Sodium carbonate, anhyd.	3.0 g.
Sodium chloride	2.0 g.
Magnesium sulfate	1.0 g.
Ferric ammonium citrate	0.05 g.
Glycerol	50.0 ml.
Water	1 liter

Tube and sterilize at 121° C. for 15 minutes.

Ref. Kolmer and Boerner, p. 377

LOOF'S REAGENT

Use: Test reagent for arsenic.

Preparation: Dissolve 50 g. of sodium hypophosphite in 100 g. of concentrated hydrochloric acid and filter through glass wool.

Remarks: Reagent reduces arsenic compounds to brown metallic arsenic.

Ref. Apoth. Ztg. **5**, 263 (1890)

LORETIN REAGENT

Use: Reagent for the quantitative precipitation of calcium.

Preparation: Shake 8.8 g. of loretin with 200 ml. of water and add 6.5 ml. of 4 *N* sodium hydroxide solution. Dilute to 250 ml. with water and filter.

Remarks: Calcium is precipitated quantitatively from solutions containing as little as 5 mg. per liter of the calcium ion. The conditions must be properly controlled. Magnesium, sodium, and potassium do not interfere.

Ref. C. A. **33**, 5767 (1939)

LOW-BOKORNY'S REAGENT

Use: Reagent for albumin.

Preparation:

Solution A: Mix 10 ml. of ammonia (sp. gr. 0.96) with 13 ml. of 33 per cent potassium hydroxide and dilute with water to 100 ml.

Solution B: Dissolve 1 g. of silver nitrate in 100 ml. of water. To use, mix 1 ml. of *Solution A* with 1 ml. of *Solution B* and dilute with 1 liter of water.

Remarks: Used in microscopic studies. Reagent is reduced by albumin in living cells but not in dead cells.

LÖWE'S SOLUTION

Use: Test reagent for glucose.

Preparation: Dissolve 16 g. of crystalline cupric sulfate in 64 ml. of water, and slowly add 80 ml. of 35 per cent sodium hydroxide solution. Avoid heating. Then add, with shaking, 6-8 g. of pure glycerol until solution is complete.

Remarks: Reagent is reduced to cuprous oxide by glucose.

Ref. Zeitsch. anal. Chem. **9**, 20 (1870)

LOWENSTEIN'S MEDIUM

Use: Culture medium.

Preparation: Prepare a solution by adding the following to 1 liter of distilled water:

Monopotassium phosphate	1 g.
Sodium citrate ($Na_3C_6H_5O_7 \cdot 5\frac{1}{2}\ H_2O$)	1 g.
Magnesium sulfate ($MgSO_4 \cdot 7H_2O$)	1 g.
Asparagin	3 g.
Glycerol	60 ml.

Add 6 g. of potato flour to 150 ml. of the above solution contained in a flask, and immerse in boiling water for 15 minutes. Shake frequently to aid solution.

Keep at a temperature of 56° C. for one hour and then add 4 whole eggs (whites and yolks) which have been prepared as follows: wash the eggs well in water and place in a 5 per cent solution of phenol for 15 minutes. Remove and drain, and then immerse in 95 per cent alcohol. Break the eggs into flasks containing sterile beads and shake until the mass is homogeneous.

Add 5 ml. of sterile 2 per cent aqueous congo red solution to the above mixture and filter through sterile gauze. Distribute into sterile tubes or onto plates. Slowly thicken by evaporation by keeping the temperature at 80°-85° C. for 2 hours on 2 successive days. Incubate and test for sterility. Seal with sterile paraffin.

Ref. J. Exptl. Med. 53 (1933)

LOWENTHAL'S REAGENT

Use: Test reagent for glucose.

Preparation: Dissolve the following in 500 ml. of water:

Ferric chloride	5 g.
Tartaric acid	60 g.
Sodium carbonate	240 g.

Remarks: A black precipitate forms when glucose is boiled with this reagent.

Ref. J. prakt. Chem. **73**, 71 (1858)

LUDWIG'S REAGENT

Use: Reagent for uric acid.

Preparation:

Solution A: Dissolve the following in water and dilute to 100 ml.

Magnesium chloride	10 g.
Ammonium chloride	5 g.
Ammonia	15 g.

Solution B: Dissolve 26 g. of silver nitrite in water and add ammonia until a clear solution is obtained. Dilute with water to 1 liter.

Solution C: Dissolve 15 g. of potassium hydroxide and 10 g. of sodium hydroxide in water and dilute to 1 liter. Saturate 500 ml. of this solution with hydrogen sulfide and then add the other 500 ml. portion.

Remarks: This reagent gives a white precipitate of magnesium urate with dilute ammoniacal solutions of uric acid. Ions which precipitate with magnesium under such conditions interfere with this test.

Ref. The Merck Index, p. 820

LUDWIG-HAUPT'S REAGENT

Use: Test reagent for oleic and saturated acids.

Preparation: Dissolve 0.5 g. of aniline hydrochloride in 25 ml. of 96 per cent alcohol, and to this solution add a mixture prepared by adding 5 ml. of 1 per cent alcoholic solution of furfural to 1 ml. of phenol. Then add a 5 per cent ammonia solution drop by drop until the mixture becomes yellowish-red in color. Allow to stand for two hours after which the reagent is ready for use.

Remarks: Acids of the oleic acid series give a yellow color with this reagent, while acids of the saturated series give a red color.

Ref. C. A. 1, 2149 (1907)

LUFF'S REAGENT

Use: Test reagent for reducing sugars.

Preparation: Dissolve 63 g. of citric acid in water and add 35.9 g. of cupric citrate. Warm to aid solution. Cool, and add 67.2 g. of potassium hydroxide.

Remarks: Reducing sugars cause the formation of cuprous oxide.

LUGOL'S SOLUTION

Prepared in same manner as Lieben's solution.

Ref. Krajian, p. 80

LUGOL'S TEST SOLUTION

Use: Test reagent for albumin.

Preparation: Solution is prepared by diluting glacial acetic acid with water, or by dissolving a little iodine in an aqueous soluton of potassium iodide and acidifying with acetic acid.

Remarks: This solution precipitates albumin.

LUND'S REAGENTS

Use: For testing honey.

Preparation:

Solution 1: Dissolve 2 g. of phosphotungstic acid in 20 g. of 1:4 sulfuric acid and 80 ml. of water.

Solution 2: Dissolve 0.5 g. of tannic acid in 100 ml. of water.

Remarks: Solution 1 is used to precipitate nitrogeneous compounds, and *Solution 2* is used to precipitate albuminoids.

Ref. C. A. 3, 2682 (1910)

LUNGE'S SOLUTION

Use: Reagent for detection and determination of nitrous acid.

Preparation: Dissolve 0.1 g. of α-naphthylamine in 20 ml. of boiling distilled water and filter through washed absorbent cotton. To the filtrate add 150 ml. of 30 per cent acetic acid and 0.5 g. of sulfanilic acid dissolved in 150 ml. of 30 per cent acetic acid.

Remarks: Nitrous acid causes a pink color when added to test solution. For the colorimetric determination of nitrite, Yoe uses two solutions prepared as follows:

Sulfanilic acid solution: Add 1 g. of sulfanilic acid to 14.7 g. of glacial acetic acid and 15 ml. of water. Warm until solution is complete and dilute by adding 270 ml. of water. Stir while diluting.

α-Naphthylamine solution: Add 0.2 g. of α-naphthylamine to 14.7 g. of glacial acetic acid and 25 ml. of water. Warm until solution is complete and add 300 ml. of water. Stir while adding the water.

Ref. Yoe I, p. 308

LUTZ'S REAGENT

Use: Reagent for the detection of tannins in drugs.

Preparation: Dissolve 1 g. of cupric sulfate in 25 ml. of water and add ammonium hydroxide drop by drop until the precipitate which first forms just dissolves. Dilute with water to 50 ml.

Procedure for Test: Soak sections of the drug to be tested for several hours in this solution, and then examine them under the microscope. A brown color is observed if tannins are present.

Ref. Pharm. Zentralhalle 1900, 194

LYON'S BLUE

Use: Staining solution.

Preparation: Dissolve 0.3 g. of Lyon's blue in 100 g. of absolute alcohol.

Remarks. Solution is used as a counter-stain to safranin and carmine.

MACNEAL'S TETRACHROME

See: Tetrachrome (MacNeal)

MAGNESIA MIXTURE

Use: Reagent used for the determination of arsenates and phosphates.

Preparation: Dissolve 50 grams of magnesium chloride hexahydrate and 100 grams of ammonium chloride in 500 ml. of water. Add a slight excess of ammonium hydroxide and allow the solution to stand overnight. Filter if a precipitate forms. Make the filtrate slightly acid with hydrochloric acid and dilute to 1 liter.

Ref. J. Assoc. Off. Agr. Chem. 8, 188 (1924); Kolthoff and Sandell, pp. 373-374

MAGNESIUM ACETATE SOLUTIONS

Reagent: Mg $(C_2H_3O_2)_2 \cdot 4H_2O$, mol. wt. = 214.47.

Preparation:

0.5 Molar: Dissolve 107.2 g. of magnesium acetate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of magnesium ion per ml. of solution: Dissolve 88.3 g. of magnesium acetate in water and dilute to 1 liter.

MAGNESIUM CHLORIDE SOLUTIONS

Reagent: $MgCl_2\ 6H_2O$, mol. wt. = 203 33.

Preparation:

0.5 Molar: Dissolve 101.7 g. of magnesium chloride in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of magnesium ion per ml. of solution: Dissolve 83.5 g. of magnesium chloride in water and dilute to 1 liter.

MAGNESIUM NITRATE SOLUTION

Reagent: $Mg(NO_3)_2 \cdot 6H_2O$, mol. wt. = 256.43.

Preparation:

0.5 Molar: Dissolve 128.2 g. of magnesium nitrate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of magnesium ion per ml. of solution: Dissolve 105.8 g. of magnesium nitrate in water and dilute to 1 liter.

MAGNESIUM SULFATE SOLUTIONS

Reagent: $MgSO_4 \cdot 7H_2O$, mol. wt. = 246.49.

Preparation:

0.5 Molar: Dissolve 123.2 g. of magnesium sulfate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of magnesium ion per ml. of solution: Dissolve 101.4 g. of magnesium sulfate in water and dilute to 1 liter.

MAGNESIUM URANYL ACETATE SOLUTION

Use: Test reagent for sodium.

Preparation: Dissolve 10 g. of uranyl acetate in 6 ml. of glacial acetic acid and dilute to 50 ml. Dissolve 33 g. of magnesium acetate in 6 ml. of glacial acetic acid and dilute to 20 ml. Heat both solutions to boiling, and

as soon as they are clear, pour the magnesium acetate solution into that containing the uranyl acetate. Cool, and dilute to 100 ml. Allow to stand about 12 hours and filter if not clear.

Remarks: Test solution gives a yellow precipitate with sodium.

Ref. C. A. 17, 3006 (1923)

MALLORY'S STAIN

Use: Staining solution for diphtheria bacilli.

Preparation: Mix the following:

Methylene blue	1 g.
Glacial acetic acid	3 ml.
Distilled water	100 ml.

Remarks: Stain for 15-30 minutes.

MALLORY'S TRIPLE STAIN

Use: Staining solution for connective tissues.

Preparation:

Solution 1: Mix the following:

Acid fuchsin	0.2 or 0.5 g.
Distilled water	100 ml.

Solution 2: Mix the following and dissolve:

Aniline blue, water soluble (commission certified)	0.5 g.
Orange *G* (85% dye content)	2.0 g.
Phosphomolybdic acid	1.0 g.
Distilled water	100.0 ml.

Ref. Kolmer and Boerner, p. 818; Biol. Stains, Conn. p. 136

MALONATE MEDIUM (LEIFSON)

Use: Culture medium for colon bacilli.

Preparation: Dissolve the following in 1 liter of distilled water.

Ammonium sulfate	2.0 g.
Dipotassium phosphate	0.6 g.
Monopotassium phosphate	0.4 g.
Sodium malonate	3.0 g.

To each 100 ml. of the above solution, add 0.2 ml. of a 1 per cent alcoholic solution of bromthymol blue. Adjust pH to 6.9-7.1. Tube, and heat in an autoclave at 121° C. for 15 minutes.

Ref. Kolmer and Boerner, p. 357

MANCHOT-SCHERER'S REAGENT

Use: Reagent for carbon monoxide.

Preparation: Mix the following:

Silver nitrate, 0.1 *N* aq. soln.	50 ml.
Sodium hydroxide, 0.15 *N* aq. soln. (chloride-free)	50 ml.
Pyridine	50 ml.

Remarks: Carbon monoxide precipitates metallic silver from this reagent.

Ref. C. A. **21**, 1774 (1927)

MANEVAL'S AGAR FOR YEASTS

Use: For the production of ascospores by yeasts.

Preparation: Dissolve the following in distilled water and sterilize the resulting solution in an autoclave:

Beef extract	0.3	per cent
Sodium chloride	0.5	per cent
Glucose	0.25	per cent
Agar	2.0	per cent

MANGANOUS ACETATE SOLUTIONS

Reagent: $Mn(C_2H_3O_2)_2 \cdot 4H_2O$, mol. wt. = 245.04.

Preparation:

0.25 Molar: Dissolve 61.3 g. of manganous acetate in water and dilute to 1 liter.

0.5 Normal: Same as 0.25 Molar.

10 mg. of manganous ion per ml. of solution: Dissolve 44.7 g. of manganous acetate in water and dilute to 1 liter.

MANGANOUS CHLORIDE SOLUTIONS

Reagent: $MnCl_2 \cdot 4H_2O$, mol. wt. = 197.91.

Preparation:

0.5 Molar: Dissolve 99 g. of manganous chloride in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of manganous ion per ml. of solution: Dissolve 36.1 g. of manganous chloride in water and dilute to 1 liter.

MANGANOUS NITRATE SOLUTIONS

Reagent: $Mn(NO_3)_2 \cdot 6H_2O$, mol. wt. = 287.04.

Preparation:

0.5 Molar: Dissolve 143.5 g. of manganous nitrate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of manganous ion per ml. of solution: Dissolve 52.4 g. of manganous nitrate in water and dilute to 1 liter.

MANGANOUS SULFATE SOLUTIONS

Reagent: $MnSO_4 \cdot 4H_2O$, mol. wt. = 223.05, or
$MnSO_4 \cdot 7H_2O$, mol. wt. = 277.10.

Preparation:

0.5 Molar: Dissolve 111.5 g. of $MnSO_4 \cdot 4H_2O$ or 138.6 g. of $MnSO_4 \cdot 7H_2O$ in water.

1.0 Normal: Same as 0.5 Molar.

10 mg. of manganous ion per ml. of solution: Dissolve 40.7 g. of $MnSO_4 \cdot 4H_2O$ or 50.5 g. of $MnSO_4 \cdot 7H_2O$ in water and dilute to 1 liter.

MANGIN'S SOLUTIONS

Use: Test reagent for cellulose (microscopic).

Preparation:

(1) Dissolve 1 g. of iodine and 3 g. of potassium iodide in 200 ml. of water.
(2) Dissolve 0.2 g. of iodine and 1 g. of potassium iodide in 20 g. of a concentrated aqueous solution of calcium chloride.
(3) Dissolve 1.3 g. of iodine, 6.5 g. of potassium iodide, and 20 g. of zinc chloride in 10.5 ml. of water.
(4) Dissolve 0.3 g. of iodine and 0.5 g. of potassium iodide in 25 g. of phosphoric acid.

Remarks: Reagents give a blue color reaction with cellulose.

Ref. J. botan. 1892, 241

MANGINI'S SOLUTION

Use: Test reagent for alkaloids.

Preparation: Dissolve a little potassium iodide and bismuth triiodide in concentrated hydrochloric acid.

Remarks: Reagent yields a reddish-brown precipitate with alkaloids.

MANN'S PAPER

See: Citro-molybdic acid paper.

MANSON'S SOLUTION

Use: Stain for malarial parasites.

Preparation: Dissolve 5 g. of borax in 100 ml. of boiling water and add 2 g. of methylene blue. Before using, dilute the solution until it is just transparent.

Remarks: Red corpuscles are colored pale green with this solution. Leucocyte-cell-nuclei are colored blue, the malarial ring dark blue, and larger plasmodia gray-green.

Ref. Kolmer and Boerner, p. 394

MANUILOFF'S REAGENTS

Use: For determining sex.

Preparation:

(1) Dissolve 1 g. of papayotin in 100 ml. of water.
(2) Dissolve 1 g. of methyl violet in 100 g. of alcohol.
(3) Dissolve 1 g. of potassium permanganate in 100 ml. of water.
(4) This solution is 40 per cent hydrochloric acid.
(5) Dissolve 2 g. of thiosinamine in 98 ml. of water.

Ref. Biochem. Zeitschr. 176, 189, 198, 251 (1926)

MARBLE'S REAGENT

Use: Etchant to show structure of stainless steels.

Preparation: Dissolve 4 g. of cupric sulfate and 20 ml. of hydrochloric acid in 20 ml. of water.

Ref. Metals Handbook, p. 723

MARME'S SOLUTION

Use: Test reagent for alkaloids.

Preparation: Dissolve 5 g. of cadmium iodide in a hot solution prepared by dissolving 10 g. of potassium iodide in 30 ml. of water. To this mixture add an equal volume of cold, saturated potassium iodide solution.

Remarks: Reagent produces precipitates when added to acidified solutions of alkaloids.

Ref. A.O.A.C., p. 602

MARQUIS' SOLUTION

Use: Test reagent for alkaloids.

Preparation: Mix 4 ml. of 40 per cent formaldehyde with 100 ml. of concentrated sulfuric acid.

Remarks: Reagent causes characteristic color reactions with alkaloids.

Ref. Kolmer and Boerner, p. 794

MARSH'S REAGENT

Use: Test reagent for caramel.

Preparation: Mix 3 ml. of phosphoric acid with 3 ml. of water and 100 ml. of amyl alcohol.

Procedure for Test: Shake the material to be tested with the emulsion prepared above. The aqueous layer is colored brown if caramel is present.

Ref. Am. J. Pharm. 1910, 151

MARTINI'S REAGENT

Use: Reagent for micro-test for cocaine.

Preparation: Add a saturated solution of potassium iodide to 25 ml. of a 1 per cent lead nitrate solution until the precipitate which first forms just dissolves leaving a slightly yellow solution.

Remarks: Reagent forms white, microscopic crystals with cocaine hydrochloride. These crystals are characteristic of cocaine.

Ref. C. A. **26**, 6065 (1932)

MASSON'S SAFFRON SOLUTION

Use: Staining solution.

Preparation: Add 1-2 g. of saffron to 100 ml. of distilled water and boil gently for 1 hour. Filter, and add 1 ml. of a 5 per cent solution of tannic acid in water. Finally, add 1 ml. of formaldehyde solution as a preservative.

Ref. Stain Technic **8**, 101-110

MATOS' REAGENTS

Use: Reagents for artificial silks.

Preparation:

(1) Mix 10 ml. of glycerol, 5 ml. of water, and 15 ml. of concentrated sulfuric acid.
(2) Dissolve 0.3 g. of potassium iodide in 30 ml. of water and add an excess of iodine.
(3) Dissolve 1.75 g. of zinc chloride in 30 ml. of water saturated with iodine.
(4) Concentrated sulfuric acid.
(5) Add chromium trioxide to 25 ml. of water until the solution is saturated, and then add an equal volume of water.
(6) Dissolve 20 g. of potassium hydroxide in 30 ml. of water.
(7) Drop cupric oxide in ammonia and pass carbon dioxide-free air through the mixture.
(8) Add sodium hydroxide to 2 g. of nickel sulfate to precipitate completely the oxide. Filter, and then dissolve the residue in 8 ml. of ammonia and 8 ml. of water.
(9) Dissolve 3 g. of cupric sulfate in 30 ml. of water and 175 ml. of glycerol. Add potassium hydroxide solution until the mixture is clear.
(10) Dissolve 1.75 g. of diphenylamine in 25 ml. of concentrated sulfuric acid.

Ref. Am. Silk J. 1913, No. 12

MAXIMOW'S FLUID

Use: Fixative.

Preparation: Mix the following:

Potassium dichromate	2.5 g.
Mercuric chloride	5.0 g.
Sodium sulfate	1.0 g.
Water	100.0 ml.

Before use, add 10 ml. of formaldehyde solution to each 100 ml. of the fluid.

MAYER'S SOLUTION

Use: Reagent for detection and quantitative estimation of alkaloids.

Preparation: Dissolve 13.55 g. of mercuric chloride and 50 g. of potassium iodide in enough water to make 1 liter of solution.

Remarks: Reagent gives a white precipitate with most alkaloids in slightly acid solutions.

Ref. Am. J. Pharm. **35**, 20 (1863)

MAYER'S ALCOHOLIC ACID CARMINE

Use: A stain for nuclei.

Preparation: Dissolve 4 g. of carmine, 30 drops of hydrochloric acid, and 15 ml. of water in 95 ml. of 85 per cent alcohol, and then add ammonium hydroxide until a precipitate just remains on shaking. Filter.

MAYER'S CARMALUM

See: Carmalum (Mayer).

MAYER'S COCHINEAL

See: Cochineal, alcoholic (Mayer).

MAYER'S HEMACALCIUM (MAYER'S HEMATOXYLIN-ALUM-CALCIUM)

Use: A stain for nuclei.

Preparation: Dissolve 1 g. of hematein and 1 g. of aluminum chloride in 600 ml. of 70 per cent alcohol. Then add 10 ml. of acetic acid and 50 g. of calcium chloride.

A preparation obtained by the evaporation of a solution of 1 g. of hematoxylin and 1 ml. of ammonium hydroxide with 20 ml. of water may be substituted for the hematein.

MAYER'S HEMALUM

See: Hemalum (Mayer).

MAYER'S HEMATOXYLIN-ALUM-CALCIUM

See: Mayer's emacalcium.

MAYER'S MUCICARMINE

See: Mucicarmine (Mayer).

MAYER'S MUCIHEMATEIN

See: Mucihematein, alcoholic (Mayer), and
Mucihematein, aqueous (Mayer).

MAYER'S PICROCARMINE

Use: For double staining.

Preparation: Dissolve 8 g. of carmine in 100 ml. of ammonium hydroxide, and add a saturated aqueous solution of picric acid until a precipitate forms.

MAYERHOFFER'S REAGENT

Use: Reagent for berberine and hydrastine.

Preparation:

Method I: Mix the following:

Picrolonic acid, saturated soln.	60 ml.
Glycerol	30 ml
Tincture of iodine	10 ml.

Method II: Mix the following:

Picrolonic acid, saturated soln.	20 ml
Glycerol	10 ml.
Absolute alcohol	10 ml.

Remarks: These reagents precipitate alkaloids.

Ref. C. A. **9**, 122 (1915)

MEAT BROTH

See: Beef infusion broth.

MECKE'S SOLUTION

Use: Test reagent for alkaloids.

Preparation: Dissolve 0.5 g. of selenous acid in 100 ml. of concentrated sulfuric acid.

Remarks: Reagent gives color reactions with many alkaloids

MECONIC ACID INDICATOR SOLUTION

Use: Indicator for titrations of thiosulfates with ferric chloride.

Preparation: Dissolve 0.5 g. of meconic acid in 100 ml. of water.

Remarks: This acid gives a red color of ferric meconate when added to a solution of ferric chloride, but this color disappears when all of the ferric ion is reduced to ferrous ions. The ferric chloride in these determinations replaces iodine solutions in volumetric iodometric analysis.

Ref. Kolthoff and Furman, pp. 496-498

MEDES' REAGENT

Use: Reagent for detecting and estimating ascorbic acid in urine.

Preparation: Use the following reagents:

(1) Formaldehyde.
(2) A buffer prepared by mixing 30 ml. of 2 *M* acetic acid and 100 ml. of 2 *M* sodium acetate.
(3) Folin's uric acid reagent.

Procedure for Use: Add 1 ml. of formaldehyde, 6.5 ml. of the buffer solution, and 1 ml. of Folin's reagent to 5 ml. of urine. A blue color is formed if ascorbic acid is present. This color can be used for the colorimetric determination of ascorbic acid.

Ref. Biol. Chem. **106**, 311 (1934); Biochem. **J. 29**, 2251 (1935)

MEHU'S REAGENT

Use: Test reagent for albumin.

Preparation: Mix 5 ml. of phenol with 5 ml. of glacial acetic acid and 10 ml. of 90 per cent alcohol.

Procedure for Test: Add 10 ml. of the reagent and 2 ml. of nitric acid to 100 ml. of the solution to be tested. A flocculent precipitate forms if albumin is present.

Ref. Chem. Zentr. 1869, 236

MENNEL'S REAGENT

Use: Test reagent for mercerized cotton.

Preparation: Mix 160 ml. of 68 per cent sulfuric acid with 130 ml. of 37 per cent formaldehyde.

Procedure for Test: Place a sample of the material to be tested and a sample each of mercerized and unmercerized cotton in the reagent at room temperature. At the end of two minutes, remove the samples, wash with water, and neutralize with dilute sodium carbonate. Dye together in a dilute boiling solution of chlorazol sky-blue G W made alkaline with sodium carbonate. Mercerization can be detected by comparing the samples.

Ref. J. Textile Inst. **17**, 247 T (1926)

MERCURY IODOCYANIDE REAGENT

Use: Acid indicator for organic compounds.

Preparation: Dissolve 12.6 g. of mercuric cyanide in 200 ml. of water and dissolve 6.3 g. of iodine and 12.6 g. of potassium iodide in 200 ml. of water.

Remarks: This reagent gives an immediate separation of mercuric iodide in the presence of the slightest trace of acid.

Ref. C. A. **34**, 958 (1940)

MERCURY AND THALLIUM NITRATE SOLUTION

Use: High specific gravity liquid for the separation of minerals.

Preparation: A concentrated solution of the nitrates of thallium and mercury.

Remarks: Sp. gr. = 5.3.

MERCURIC ACETATE SOLUTION

Reagent: $Hg(C_2H_3O_2)_2$, mol. wt. = 318.67.

Preparation:

0.25 Molar: Dissolve 79.7 g. of mercuric acetate in water and dilute to 1 liter.

0.5 Normal: Same as 0.25 Molar.

10 mg. of mercuric ion per ml. of solution: Dissolve 15.9 g. of mercuric acetate in water and dilute to 1 liter.

MERCURIC BROMIDE PAPER (GUTZEIT)

Use: Reagent for the determination of arsenic in foods and tissues.

Preparation: Cut Whatman No. 40 (or similar grade) filter paper into strips exactly 2.5 mm. wide and about 12 cm. long, and soak for 1 hour in a freshly prepared solution consisting of 3-6 g. of mercuric bromide dissolved in 100 g. of 95 per cent alcohol. Dry and use within 48 hours.

Remarks: The Gutzeit method is based on the conversion of arsenic to arsine and the subsequent exposure of the mercuric bromide paper to this gas. The mercuric bromide is reduced, and the length of the stain which is formed determines the quantity of arsenic present in the material under investigation.

Ref. Jacobs, pp. 125-126

MERCURIC CHLORIDE SOLUTIONS

Reagent: $HgCl_2$, mol. wt. = 271.52.

Preparation:

0.25 Molar: Dissolve 67.9 g. of mercuric chloride in enough water to make 1 liter of solution.

0.5 Normal: Same as 0.25 Molar.

10 mg. of mercuric ion per ml. of solution: Dissolve 13.5 g. of mercuric chloride in enough water to make 1 liter of solution.

MERCURIC CYANIDE REAGENT

Use: Reagent for the nephelometric determination of acetone and acetoacetic acid in urine.

Preparation: Dissolve 10 g. of mercuric cyanide in water and add a solution prepared by dissolving 180 g. of sodium hydroxide in 600 ml. of water. Mix well and cool. Slowly add, with thorough mixing, a solution prepared by dissolving 2.9 g. of silver nitrate in 400 ml. of water. Allow to stand for 3-4 days and decant the clear supernatant liquid. This is the reagent.

Remarks: This reagent gives a characteristic opalescence with acetone. Ammonia, aldehydes, and sulfides must be absent.

Ref. J. Biol. Chem. **16**, 289-291 (1913-14); **18**, 263-271 (1914); J. Ind. Eng. Chem. **10**, 556-563 (1918)

MERCURIC NITRATE SOLUTIONS

Reagent: $Hg(NO_3)_2 \cdot 2H_2O$, mol. wt. = 342.64.

Preparation:

0.25 Molar: Dissolve 85.7 g. of mercuric nitrate in water and dilute to 1 liter.

0.5 Normal: Same as 0.25 Molar.

10 mg. of mercuric ion per ml. of solution: Dissolve 17.1 g. of mercuric nitrate in water and dilute to 1 liter.

MERCURIC NITRATE SOLUTION

See: Liebig's reagent.

MERCURIC SULFATE SOLUTION

Reagent: $HgSO_4$, mol. wt. = 296.67.

Preparation:

0.25 Molar: Dissolve 74.1 g. of mercuric sulfate in enough water to make 1 liter of solution.

0.5 Normal: Same as 0.25 Molar.

10 mg. of mercuric ion per ml. of solution: Dissolve 14.6 g. of mercuric sulfate in enough water to make 1 liter of solution.

MERCURIC SULFATE REAGENT (DENIGÈS)

Use: This reagent is used to detect a number of substances which are listed below:

Preparation: Dissolve 5 g. of mercuric oxide in a warm solution consisting of 20 ml. of concentrated sulfuric acid and 100 ml. of water.

(I) *Test for acetone:* Mix 5 ml. of the liquid to be tested with 5 ml. of the reagent and warm on a water bath. A cloudiness or precipitate indicates the presence of acetone.

Ref. J. Am. Med. Assoc. 1906, No. 11.

(II) *Test for carbon disulfide:* Characteristic crystals are formed when this reagent is heated with carbon disulfide.

(III) *Test for isothiocyanates:* Shake 2 ml. of the liquid to be tested with 4 ml. of the reagent and then filter. Heat the filtrate to boiling; and, if isothiocyanate is present, characteristic crystals of dithiomercuric sulfate are formed.

(IV) *Test for thiophene in benzene:* Mix 10 ml. of the reagent with 30 ml. of acetone-free methyl alcohol, and to 10 ml. of this mixture add 1 ml. of the benzene to be tested. A turbidity appears almost at once if thiophene is present. Sensitiveness: 0.001%.

Ref. Compt. rend. 120, 781 (1895)

(V) *Test for citric acid:* Mix 5 ml. of dilute citric acid solution and 1 ml. of the reagent and heat to boiling, and then add a few drops of 2 per cent potassium permanganate solution. The permanganate is decolorized and a white precipitate forms. Sensitiveness: 5 mg. of citric acid.

Ref. Analyst 23, 161 (1898)

MERCURIC THIOCYANATE REAGENT (KRUMHOLZ-SANCHEZ)

Use: Test reagent for zinc.

Preparation: Dissolve 8 g. of mercuric chloride and 9 g. of ammonium thiocyanate in 100 ml. of water and allow to stand about 4 days.

Procedure for Test: To 1 ml. of the neutral or slightly acid solution to be tested, add 1 ml. of 0.02 per cent cobalt solution in 0.5 *N* hydrochloric acid and 1 ml. of the reagent and allow to stand for 3 minutes. Then add 1-2 ml. of ether and shake well. A blue precipitate at the zone of contact of the two liquids indicates the presence of zinc.

Sensitiveness: 0.0002 mg. zinc.

Ref. C. A. 28, 6388 (1934)

MERCUROUS NITRATE SOLUTIONS

Reagent: $HgNO_3 \cdot H_2O$, mol. wt. = 280.63.

Preparation:

0.25 Molar: Dissolve 70.1 g. of mercurous nitrate in sufficient 5 per cent nitric acid to make 1 liter of solution.

0.1 Normal: Dissolve 28.1 g. of mercurous nitrate in water to which has been added 5 ml. of dilute nitric acid and make up to 1 liter with water.

10 mg. of mercurous ion per ml. of solution: Dissolve 14 g. of mercurous nitrate in water to which has been added 2 ml. of dilute nitric acid and make up to 1 liter with water.

Remarks: A little mercury should be added to a solution of mercurous nitrate that is to stand for any length of time.

MERCUROUS NITRATE ETCHING SOLUTION

Use: Reagent to show structure of stainless steel.

Preparation: Mix the following:

Mercurous nitrate	7 parts
Hydrochloric acid	100 parts
Water	100 parts

Use heat to effect complete solution, but cool before using

Ref. Williams and Homerberg, p. 317

MERICA'S SOLUTION

Use: Etching solution for nickel and its alloys.

Preparation: Mix the following:

Nitric acid (70 per cent)	50 ml.
Acetic acid (50 per cent)	50 ml.

Remarks: This is a satisfactory etching reagent for cast, cold-drawn, and annealed nickel.

Ref. Williams and Homerberg, p. 324

MERKEL'S FLUID (MODIFIED)

Use: Fixative.

Preparation: Mix the following:

Platinic chloride, 1% aq. soln.	5 mL
Chromic acid, 1% aq. soln.	10 ml.
Acetic acid, 5% aq. soln.	100 ml

Ref. Biol. Stains, Conn p. 278

MERKEL'S CHROMIC-PLATINUM CHLORIDE

Use: Solution for fixing microscopic specimens.

Preparation: Dissolve 0.5 g. of chromic oxide and 0.5 g. of platinic chloride in 400 ml. of water.

MERKEL'S INDIGOCARMINE-OXALIC ACID SOLUTION

Use: For staining ossification specimens.

Preparation:

Solution A: Prepare a saturated solution of indigocarmine in 3 per cent oxalic acid solution.

Solution B: Dissolve 1 g. of carmine and 1 g. of ammonium hydroxide in 100 ml. of water.

METACRESOL PURPLE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of metacresol purple (m-cresolsulfonphthalein) in 13.6 ml. of $N/50$ sodium hydroxide and dilute with distilled water to 250 ml.

Remarks: pH: (acid range) red 0.5-2.5 yellow.
(alkaline range) yellow 7.4-9.0 purple.

METANIL YELLOW INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.25 g. of metanil yellow (diphenylaminoazo-m-benzenesulfonic acid) in 100 ml. of alcohol.

Remarks: pH: red 1.2-2.3 yellow.

METANITROBENZOL SULFONIC ACID SOLUTION (BENEDICKS)

Use: Etch solution to show martensite and austenite in hardened steels.

Preparation: Dissolve 5 g. of m-nitrobenzenesulfonic acid in 95 g. of ethyl alcohol.

Remarks: Reagent darkens martensite more than austenite.

Ref. Williams and Homerberg, p. 315

METAPHENYLENEDIAMINE PAPER

See: Griess' paper (yellow).

METHENAMINE REAGENT (KO)

Use: Test reagent for β-naphthol in foods.

Preparation: Dissolve 1 g. of methenamine (urotropin) in 100 ml. of sulfuric acid.

Remarks: This reagent causes a green color with β-naphthol. Water interferes with this test.

Sensitiveness: 1 : 10 million.

Ref. C. A. **19**, 684 (1925)

METHYLENE AZURE SOLUTION

See: Azure I (Azure A) Solution.

METHYLENE BLUE REAGENT

Use: Reagent for the determination of Vitamin C (ascorbic acid).

Preparation: Dissolve 0.01 g. of methylene blue in 100 ml. of distilled water.

Remarks: When vitamin C is mixed with the reagent and exposed to bright sunlight, or its artificial equivalent, the color of the dye fades; and this fading can be compared colorimetrically as a method of estimation.

Ref. Snell II, pp. 626-627

METHYLENE BLUE SOLUTION

Use: Staining solution.

Preparation: Add 95 ml. of distilled water to 5 ml. of saturated alcoholic methylene blue solution.

Ref. Lab. Methods, U. S. Army, p. 561

METHYLENE BLUE ERYTHROSINE BROMCRESOL PURPLE BROTH

Use: Culture medium.

Preparation: Prepare a solution of the following composition:

Lactose	7.500 g.
Peptone	12.500 g.
Beef extract	1.250 g.
Dipotassium phosphate ($K_2HPO_4 \cdot 3H_2O$)	3.600 g.
Monopotassium phosphate (KH_2PO_4)	0.500 g.
Erythrosine	0.010 g.
Bromcresol purple	0.016 g.
Methylene blue	0.025 g.
Distilled water to make	1 liter

Ref. A.P.H.A., p. 268; J. Bact., 20, 381 (1930)

γ-METHYLDICYANODIHYDROXYHYDROPYRIDINE SOLUTION

Use: Reagent for sodium and potassium.

Preparation. Dissolve 2.5 g. of the reagent in 100 ml. of water.

Remarks: Reagent causes precipitates with solutions of sodium and potassium salts.

Ref. Rend. soc. chim. ital. 1907, 6

METHYLGLYOXAL REAGENT

Use: Test reagent in analytical chemistry for salicylate, etc.

Preparation: Mix 0.6 ml. of bromine with 20 g. of 5 per cent glycerol solution and 100 ml. of water, and then heat for 20 minutes in boiling water. Next, boil for 5 minutes and evaporate to 100 ml. When cool add 20 ml. of sulfuric acid and distill off 50 ml., which is the test reagent.

Remarks: To make test, mix 0.4 ml. of the reagent with 2 ml. of sulfuric acid and the material to be tested. Color reactions are obtained with many substances.

Ref. Bull. soc. chim. 5, 649

METHYL GREEN STAINING SOLUTION

Use: Staining solution.

Preparation: Dissolve 1 g. of methyl green in 100 ml. of distilled water.

9-METHYL-2, 3, 7-TRIHYDROXY-6-FLURONE REAGENT

Use: Test reagent for antimony.

Preparation: Dissolve 0.5 g. of the reagent in 100 g. of alcohol.

Remarks: This reagent causes a red precipitate with solutions containing antimony ions at pH 4.

Sensitiveness: 0.0002 mg. of antimony.

Ref. C. A. 32, 3296 (1938)

METHYL ORANGE PAPER

Use: Indicator.

Preparation: Impregnate filter paper with a solution of methyl orange and allow to dry.

Remarks: Acids: red.
Bases: yellow.

METHYL ORANGE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of methyl orange in 100 ml. of water.

Remarks: pH: red 3.0-4.4 yellow.

Ref. Kolthoff and Furman, p. 58

METHYL RED INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of methyl red (dimethylaminoazobenzene-o-carboxylic acid) in 18.6 ml. of *N*/50 sodium hydroxide solution and dilute with water to 250 ml.

Remarks: pH: red 4.2-6.2 yellow.

Ref. Kolthoff and Furman, p. 59

METHYL VIOLET INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.25 g. of methyl violet in 100 ml. of water.

Remarks: pH: yellow 0.1-1.5 blue
blue 1.5-3.2 violet.

Ref. Clark, p. 92

METHYL YELLOW INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of methyl yellow (p-dimethylaminoazobenzene) in 200 ml. of 90 per cent alcohol.

Remarks: pH: red 2.9-4.0 yellow.

Ref. Kolthoff and Furman, p. 57

MEYER'S REAGENT

Use: Test reagent for thorium.

Preparation: Dissolve 15 g. of potassium iodate in 100 ml. of water and 50 ml. of concentrated nitric acid.

Remarks: Reagent yields precipitates with solutions of thorium salts.

Ref. Zeitsch. anorg. Chem. 1911, 65

MICHEL'S REAGENT (BLOOD)

Use: Test reagent for blood.

Preparation:

Solution A: Dissolve 0.1 g. of leucomalachite green base in 25 ml. of 30 per cent acetic acid, and when solution is complete, add 100 ml. of water.

Solution B: Mix 10 g. of 30 per cent hydrogen peroxide with 90 g. of 3 per cent acetic acid.

Remarks: Spot moistened with *Solution A* and then with *Solution B* turns green if blood is present.

Sensitiveness: 1 : 100,000.

Ref. C. A. **5**, 2477 (1911)

MICHEL'S REAGENT

Use: Reagent for differentiating between oxyhemoglobin and CO-hemoglobin.

Preparation: Dissolve 4 g. of sodium hydroxide in 75 ml. of water and add 3 g. of sodium hydrosulfite. When solution is complete, add 40 ml. of 98 per cent alcohol and filter.

Remarks: Solution must be stored out of contact with air.

Procedure for Test: Dilute blood with water, and add a few ml. of the reagent and 2 drops of pyridine. Oxyhemoglobin is changed to hemochromogen at room temperature while CO-hemoglobin is not.

Ref. C. A. **6**, 3435 (1912)

MIDDLETON'S REAGENT

Use: Test reagent for peroxides in ether.

Preparation: Mix 30 ml. of 10 per cent sulfuric acid with 100 ml. of water, and boil for 5 minutes while carbon dioxide is passed through the mixture. Next, dissolve 5 g. of ferrous sulfate in the above solution, and add 30 ml. of 10 per cent potassium thiocyanate solution, and finally, 0.03 *N* titanium trichloride solution until the brown color disappears.

Procedure for Test: Place 5 ml. of the reagent in a 35 ml. flask and fill with the ether to be tested. A brown color returns if peroxide is present.

Ref. Pharm. J. **113**, 98 (1924)

MILK (PLAIN)

Use: Culture medium.

Preparation: Heat fresh, unpasteurized milk in a steam sterilizer for 30 minutes and then allow to stand overnight in a refrigerator. Remove the cream and transfer (preferably by means of a siphon) the milk to suitable containers. Sterilize in a steam sterilizer by the intermittent method.

Remarks: Skim milk may be used, thereby eliminating the separation procedure.

Ref. Kolmer and Boerner, p. 363

MILLER'S REAGENT

Use: Test reagent for fluorine.

Preparation: Dissolve 1.84 g. of benzidine in glacial acetic acid and dilute to 500 ml. with water. Then mix with 500 ml. of 0.02 *N* mercury succinimide solution.

Procedure for Test: Add sodium hydroxide to the solution to be tested until alkaline, and then slightly acidify with acetic acid. Heat to 50° C. and add an excess of the reagent. A precipitate indicates presence of fluorine. Oxidizing agents interfere with this test. Sulfuric and phosphoric acids must be absent.

Sensitiveness: 0.4 mg. fluorine in 10 ml.

Ref. Chemist-Analyst **26**, 35 (1937)

MILLON'S REAGENT

Use: A test reagent for proteins. Also a reagent for the hydroxyphenyl group ($-C_6H_4OH$).

Preparation: Dissolve 20 g. of mercury in 40 ml. of hot concentrated nitric acid, and add 2 volumes of water to the resulting solution.

Remarks: Reagent produces a brick-red precipitate when warmed with albumin or compounds containing the hydroxyphenyl group.

Ref. Hawk and Bergeim, p. 129

MINDES REAGENT

Use: Analytical reagent.

Preparation: Mix the following:

Ferric chloride solution (1:10)	10 ml.
Alcohol	10 ml.
Hydrogen peroxide, 12%	30 ml.

Remarks: Store this reagent in an amber colored bottle. This reagent gives color reactions with alkaloids and many other natural products.

Ref. C. A. **6**, 1203-4 (1912)

MITCHELL'S REAGENT

Use: Reagent for gallic acid.

Preparation: Dissolve 0.1 g. of ferrous sulfate and 0.5 g. of Rochelle salt in 100 ml. of water.

Remarks: Gallic acid causes a violet coloration with this solution. Pyrogallol gives a similar reaction.

Ref. Analyst 1922, 2

MIXED ACIDS IN GLYCEROL

Use: General etching reagent for alloy steels.

Preparation:

Formula I:

Nitric acid	10 ml.
Hydrochloric acid	20-30 ml.
Glycerol	20-30 ml.

Formula II:

Nitric acid	10 ml.
Hydrofluoric acid	20 ml.
Glycerol	20-40 ml.

Formula III:

Nitric acid	10 ml.
Hydrochloric acid	20 ml.
Glycerol	20 ml.
Hydrogen peroxide	10 ml.

Remarks: For details of use, see reference.

Ref. Metals Handbook, p. 723

MIXED INDICATORS

See: Indicators, mixed.

MOIR'S REAGENT

Use: Reagent for hydrogen cyanide in air.

Preparation: Dissolve 1 g. of o-tolidine, 1.5 g. of cupric acetate, and 0.5 g. of glacial acetic acid, in 100 ml. of water.

Remarks: Filter paper moistened with this reagent turns blue when in presence of hydrogen cyanide.

Sensitiveness: 1 : 2,000,000.

Ref. Dennis, pp. 276-277

MOLISCH'S REAGENT (ALBUMIN)

Use: Test reagent for albumin.

Preparation: Dissolve 20 g. of α-naphthol in 100 ml. of alcohol.

Procedure for Test: Add 2 drops of test solution to 1 ml. of sample to be tested, and then add 5 ml. of concentrated sulfuric acid. A red or violet color develops if albumin or peptone is present. Carbohydrates also respond to this test.

Ref. Monatsh. 7, 198 (1887)

MOLISCH REAGENT

Use: Test reagent for wood fibers.

Preparation: Dissolve 20 g. of thymol in 80 ml. of alcohol, and then add water slowly until the thymol just begins to precipitate. At this point add a few crystals of potassium chlorate.

Procedure for Test: Moisten the material to be tested first with the reagent and then with concentrated hydrochloric acid. Wood fibers treated in this manner turn dark blue.

Ref. Pharm. Zentralhalle 1887, 116

MOLYBDATE REAGENT (PURGOTTI)

Use: For the volumetric estimation of oxidizing agents.

Preparation: Dissolve 1.1 g. of ammonium molybdate in 30 ml. of water and 5 ml. of sulfuric acid, and add slowly 4-5 g. of powdered zinc. When the solution turns brown, filter, and dilute the filtrate with water until the total volume is 200 ml. Then add a solution prepared by dissolving 4.2 g. of ammonium molybdate in 2 ml. of sulfuric acid and 800 ml. of water, and boil until the solution turns blue.

Ref. Zeitschr. anal. Chem. 1904, 306

MOLYBDATE-STRYCHNINE REAGENT (PHOSPHORIC ACID)

See: Pouget-Chouchak's reagent.

MOLYBDIC ACID REAGENT (ALKALOIDS)

See: Fröhde's solution.

MOLYBDIC ACID REAGENT (BACOVESCO)

Use: Test reagent for alcohols and phenols.

Preparation: Dissolve 15 g. of molybdic acid in 85 g. of concentrated sulfuric acid at about 85° C.

Procedure for Test: Carefully pour 1 ml. of the liquid to be tested onto the surface of 1 ml. of the reagent. A bluish-violet ring is formed if hydroxy compounds are present.

Remarks: A better test is obtained when the phenol or alcohol is first diluted with water.

Ref. The Merck Index, p. 634

MOLYBDIC ACID REAGENT (DAVY)

Use: Test reagent for phenols.

Preparation: Dissolve 5 g. of molybdic acid in 100 g. of concentrated sulfuric acid.

Procedure for Test: Add a few drops of the reagent to a few drops of the liquid to be tested. With phenol the color of the solution becomes yellow or yellowish-brown, and this finally changes to a reddish-purple. With dilute solutions of phenol the color of the solution is first green and finally blue.

Ref. Zeitschr. anal. Chem. **18**, 292 (1879)

MOLYBDIC ACID REAGENT (THIVOLLE)

Use: Reagent for the molybdomanganimetric microdetermination of free phosphate ion in complex biological media.

Preparation: Dissolve 100 g. of crystalline ammonium molybdate in 400 ml. of warm water and add 25 g. of tartaric acid. Cool and pour into 100 ml. of concentrated nitric acid and add 50 g. of ammonium nitrate.

Ref. C. A. **33**, 191-192 (1939)

MONOMOLYBDOPHOSPHOTUNGSTIC ACID REAGENT

Use: Reagent for the determination of vitamin C.

Preparation: Dissolve 44 g. of sodium tungstate and 2.7 g. of pure phosphomolybdic acid in 100 ml. of water that has been distilled over potassium permanganate. Store for 4 days in the dark and filter. To the filtrate add 300 ml. of redistilled water, 5 ml. of 85 per cent phosphoric acid, and 40 ml. of 1 : 3 sulfuric acid. Evaporate on a water bath in vacuo at 40° C. to one-fourth volume. Decant the supernatant liquid, and wash the crystals rapidly three times with redistilled water that totals not more than 10 ml. Dry the crystals quickly between filter paper.

Dissolve 30 g. of the crystals in 50 ml. of redistilled water. If necessary, filter through paper that has been washed with 15 per cent by volume sulfuric acid. Warm the solution to 45° and add drop by drop, with constant stirring, 17.5 ml. of 50 per cent sulfuric acid. Allow to stand in the dark until crystallization takes place. Place the crystals on a filter that has been washed with 15 per cent by volume sulfuric acid, and wash with that acid, and then a small quantity of distilled water. Collect the last few drops of the filtrate and add a little 0.1 per cent pyrogallic acid solution. A yellow-brown color should be obtained, but if a violet color is formed, the material should be recrystallized.

Solutions: Two solutions are prepared from the crystalline compound.

Solution A: Dissolve 2.5 g. of the crystallized reagent in 100 ml. of 5 per cent sulfuric acid.

Solution B: Dissolve 1 g. of the crystallized reagent in 100 ml. of 5 per cent sulfuric acid.

These solutions are to be used 1 drop at a time, and so they must be stored in dropping bottles.

Remarks: This reagent gives a violet color with vitamin C. Reducing agents, and various other organic compounds produce color reactions which may interfere. The impure reagent also may give a color reaction with uric acid.

Ref. Snell II, pp. 629-632

MONTEQUI'S REAGENT

Use: Test reagent for zinc.

Preparation:

Solution A: Dissolve 0.5 g. of cupric sulfate and 4-5 drops of sulfuric acid in 100 ml. of water.

Solution B: Dissolve 8 g. of mercuric chloride and 9 g. of ammonium thiocyanate in 100 ml. of distilled water.

Procedure for Test: Place 2-3 ml. of the neutral or slightly acid solution to be tested in a tube and add 1 drop of *Solution A* and 3-4 drops of *Solution B*. Shake well and allow to stand. Violet crystals are formed if zinc is present.

Sensitiveness: 0.01 mg. zinc.

Ref. C. A. **21**, 2858 (1927)

MORIN REAGENT

Use: Reagent for aluminum.

Preparation: Dissolve 0.1 g. of morin (3,5,7,2',4'-pentahydroxyflavone) in 100 g. of alcohol.

Remarks: Reagent produces a strong green fluorescence with aluminum salts. Gallium gives the same reaction. Zinc causes a weak fluorescence.

Ref. C. A. **19**, 1108 (1925); **34**, 51 (1940)

MÖRNER'S REAGENT

Use: Test reagent for tyrosine.

Preparation: Mix 1 ml. of formalin with 45 ml. of distilled water and 55 ml. of concentrated sulfuric acid.

Remarks: Reagent causes a green color when heated with tyrosine.

Ref. Zeitschr. physiol. Chem. **37**, 86 (1902)

MORPHINE HYDROCHLORIDE REAGENT (FORMALDEHYDE)

See: Kentmann's reagent.

MORPHINE HYDROCHLORIDE REAGENT (CANE AND MILK SUGAR)

Use: Reagent for cane and milk sugars.

Preparation: Dissolve 5 g. of morphine hydrochloride in 50 ml. of concentrated sulfuric acid and add a few mg. of ferric chloride.

Remarks: Both cane and milk sugars give a blue-violet color with this reagent. Formaldehyde gives a similar test.

Ref. Pharm. J. 1905, 521

MUCICARMINE (MAYER)

Use: Staining solution.

Preparation: Add 1 g. of carmine and 0.5 g. of aluminum chloride to 2 ml. of distilled water and heat over a small flame or on a sand bath for about 2 minutes. Now add gradually sufficient 50 per cent alcohol to make 100 ml. of solution. Allow to stand for 24 hours and filter.

The aluminum chloride may be replaced with ammonium chloride.

Remarks: To use, dilute solution with 5-10 volumes of distilled water or with 50-70 per cent alcohol.

Ref. Krajian, p. 76

MUCIHEMATEIN, ALCOHOLIC (MAYER)

Use: Staining solution.

Preparation: Dissolve 0.2 g. of hematein and 0.1 g. of aluminum chloride in 100 ml. of 70 per cent alcohol and 2 drops of nitric acid.

MUCIHEMATEIN, AQUEOUS (MAYER)

Use: Staining solution.

Preparation: Rub 0.2 g. of hematein with a few drops of glycerol, and to this add 0.1 g. of aluminum chloride, 40 ml. of glycerol, and 60 ml. of distilled water. Filter if necessary.

MUIR'S REAGENT

Use: Test reagent for bismuth.

Preparation: Place 9 g. of tartaric acid and 3 g. of stannous chloride in a flask and add potassium hydroxide solution until a clear solution is obtained, and which remains clear when heated to 70° C.

Procedure for Test: Add a little tartaric acid to the liquid to be tested and then make alkaline with potassium hydroxide solution. Add a little of the reagent and heat to 70° C. If bismuth is present a dark precipitate forms. Mercury interferes.

Ref. Chem. News 1877, 35, 176

MULDER'S SOLUTION

Use: Test reagent for glucose.

Preparation: Add sodium carbonate to a solution of indigocarmine until the latter is alkaline.

Remarks: When added to liquids containing glucose and then heated, the above reagent causes a color change from green to red and finally yellow.

Ref. Zeitschr. anal. Chem. 1, 96, 377 (1862)

MÜLLER'S FLUID

Use: Fixative.

Preparation: Mix the following:

Potassium dichromate	2.5 g.
Sodium sulfate	1.0 g.
Water	100.0 ml.

Ref. Biol. Stains, Conn p. 277

MÜLLER'S REAGENT

Use: Test reagent for blood.

Preparation: Dissolve 5 g. of guaiac resin in 10 ml. of glacial acetic acid and 10 ml. of ethyl alcohol and filter. Add to the filtrate an equal volume of water and again filter. Slowly add the filtrate to 100 ml. of boiling water. Dissolve the resin which forms on cooling in 10 parts of alcohol. Then add 1 ml. of 30 per cent hydrogen peroxide to 20 ml. of the guaiac resin solution.

Remarks: This reagent is used in a manner similar to that employed in other guaiac-hydrogen peroxide tests.

Ref. Pharm. Ztg. 1911, 555

NAEGELI'S SOLUTION

See: Zinc chloroiodide solution (Naegeli's solution).

α-NAPHTHOFLAVONE INDICATOR SOLUTION

Use: Indicator in iodometry.

Preparation: Dissolve 1 g. of α-naphthoflavone in 100 g. of ethyl alcohol.

Remarks: Color reaction with this indicator is about 5 times as sensitive as that with starch.

To use, add 0.5 ml. of the indicator solution to each 100 ml. of solution to be titrated.

Ref. C. A. **24**, 1312 (1930)

α-NAPHTHOFLAVONE SOLUTION

Use: Test reagent for bromine and bromides.

Preparation: Dissolve 0.5 g. of the reagent in 100 g. of ethyl alcohol.

Remarks: The reagent gives an intense red-brown color with bromides in a neutral or acid solution. Arsenic, antimony, and tin discharge this color.

Ref. C. A. **29**, 3934 (1935); **29**, 6523 (1935)

α-NAPHTHOLBENZEIN INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 1.0 g. of α-naphtholbenzein in 100 ml. of alcohol.

Remarks: pH: yellow 8.5-9.8 green.

NAPHTHOL BLUE BLACK INDICATOR SOLUTION

Use: Indicator for bromate titrations.

Preparation: Dissolve 0.1 g. of the dye in 100 ml. of water.

Remarks: Free bromine formed at the end-point of bromate titrations decolorizes the dye. This is not a reversible indicator since the bromine destroys the dye.

Ref. J. Am. Chem. Soc. 53, 2091 (1931)

2-NAPHTHOL-6, 8-DISULFONIC ACID SOLUTION (NIXON)

Use: Test reagent for nitrate and nitrite.

Preparation: Dissolve 1 g. of the reagent in 100 ml. of water.

Procedure for Test: Mix 1 ml. of the solution to be tested with 5 ml. of the reagent and add 1 ml. of sulfuric acid. Nitrates and nitrites produce a red to yellow color.

Ref. C. A. 17, 2091 (1923)

α-NAPHTHOLPHTHALEIN INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of α-naphtholphthalein in 100 ml. of 50 per cent alcohol.

Remarks: pH: rose 7.3-8.7 green.

Ref. Kolthoff and Furman, p. 61

NAPHTHOL YELLOW S SOLUTION

Use: Test reagent for potassium.

Preparation: Dissolve 5 g. of naphthol yellow S in 100 ml. of water.

Remarks: Reagent causes a precipitate with solutions of potassium salts.

Sensitiveness: Precipitate forms within 20 minutes if solution contains as much as 0.39 mg. of potassium per ml.

Ref. Ind. Eng. Chem., Anal. Ed. 8, 209 (1936)

β-NAPHTHOQUINOLINE-POTASSIUM THIOCYANATE REAGENT

See: Sandell-Wishnick's reagent.

NAPHTHORESORCINOL REAGENT (EEGRIWE)

Use: Test reagent for glyceric acid.

Preparation: Dissolve 0.01 g. of naphthoresorcinol in 100 g. of 96 per cent sulfuric acid.

Procedure for Test: Add 2-3 ml. of the reagent to 1 drop of the solution to be tested and heat at 90° C. for about 45 minutes. A blue color appears if glyceric acid is present.

Sensitiveness: 0.05 mg. glyceric acid.

Ref. C. A. 28, 1303 (1934)

α-NAPHTHYLAMINE SOLUTION

Use: Test reagent for chromate ion.

Preparation: Add enough α-naphthylamine to 100 ml. of alcohol to form a saturated solution.

Remarks: Test reagent causes a violet color with acidified solution of a chromate. Only a decided color change is a positive test.

Ref. C. A. 23, 4644 (1929); Engelder, pp. 151-152

α-NAPHTHYLAMINE-SULFANILIC ACID REAGENT

See: Lunge's reagent.

NEISSER'S STAIN

Use: A stain for diphtheria bacilli.

Preparation:

Solution A: Dissolve 1 g. of methylene blue, 20 ml. of alcohol, and 48 ml. of glacial acetic acid in 1 liter of water.

Solution B: Dissolve 1 g. of crystal violet and 10 ml. of alcohol in 300 ml. of water.

Solution C: Dissolve 1 g. of chrysoidine in 300 ml. of water and filter.

Procedure for Use: First stain specimen with a mixture composed of 2 parts of *Solution A* and 1 part of *Solution B*. Wash with water, and then stain with *Solution C*.

Ref. Kolmer and Boerner, pp. 396-397; Muir, p. 114

NESSLER'S REAGENT (QUALITATIVE)

Use: Reagent for ammonia.

Preparation: This reagent is an alkaline solution of $HgI_2 \cdot 2KI$. There are various formulas for this solution.

Method 1: Dissolve 10 g. of mercuric iodide and 5 g. of potassium iodide in 50 ml. of water, and add a solution prepared by dissolving 20 g. of potassium hydroxide in 50 ml. of water.

Method 2: Add a saturated solution of mercuric chloride to a 10 per cent solution of potassium iodide until a slight precipitate persists. Add a little potassium iodide to dissolve the precipitate and then add 20 g. of potassium hydroxide and enough water to make 250 ml. of solution.

Remarks: This reagent causes yellow to brown precipitates with ammonia or solutions of ammonium salts.

Ref. Chem. Zentr. 1856, 529

NESSLER'S REAGENT (QUANTITATIVE)

Use: Quantitative determination of ammonia.

Preparation: There are several methods for the preparation of this reagent.

Method of Folin and Wu: Place 75 g. of potassium iodide and 55 g. of iodine in a flask and add 50 ml. of water and 70-75 g. of metallic mercury. Shake vigorously for about 15 minutes. The solution becomes hot during this process. When the red color of the iodine solution begins to fade slightly, cool in running water and continue to shake until the mixture turns a greenish color. Decant the solution and wash the flask and mercury with distilled water. Combine the solutions and washings and dilute to 1 liter. This is the stock solution of potassium mercuric iodide.

The final Nessler's soluton is prepared as follows: first, prepare 2 liters of 10 per cent sodium hydroxide solution, and standardize with an accuracy of 5 per cent. This solution should be prepared from a saturated solution of sodium hydroxide (about 55 g. per 100 ml. of water) that has been allowed to stand until the carbonate has settled. Decant and use the clear solution. Next, mix 1750 ml. of the sodium hydroxide solution with 375 ml. of the double iodide solution and 375 ml. of distilled water. Finally, check the alkalinity by titrating 20 ml. portions of *N* hydrochloric acid with the prepared solution. About 11.0 to 11.5 ml. of the reagent should give an end-point with phenolphthalein.

Method of Bock and Benedict: Place 70 g. of potassium iodide and 100 g. of mercuric iodide in a liter volumetric flask and add 400 ml. of water. Rotate the flask until solution is complete. Next, slowly, and with constant shaking, add a solution prepared by dissolving 100 g. of sodium hydroxide in 500 ml. of water. Finally, dilute to the mark with distilled water. If a precipitate forms, decant and use the clear supernatant liquid.

Method of Koch and McMeekin: Place 30 g. of potassium iodide in 20 ml. of water and add 25 g. of iodine. After solution is complete, add 30 g. of metallic mercury. Shake well and cool in running water. When the solution turns a greenish color, decant the supernatant liquid and test a few ml. with a starch solution. A slight excess of iodine should be present; and, if it is not, add a few drops of iodine solution of the same strength as that prepared above until the test for free iodine is positive. Then dilute the solution to 200 ml. and mix well. Finally, add this solution to 975 ml. of an accurately prepared 10 per cent sodium hydroxide solution. Add slowly and mix well. Allow to stand, and if a precipitate forms, decant the clear liquid.

Ref. Folin and Wu, J. Biol. Chem. **38**, 89 (1919); Hawk and Bergeim, pp. 892-893; Koch and McMeekin, J. Am. Chem. Soc. **56**, 2066 (1924); Jacobs, pp. 24-26; Yoe I, pp. 442-448; Snell I, pp. 653-655

NESSLER'S REAGENT (WINE)

Use: Reagent for wine coloring.

Preparation: Dissolve 7 g. of alum and 10 g. of sodium acetate in 100 ml. of water.

Ref. Zeitschr. anal. Chem. **23**, 318 (1884)

NEUTRAL RED INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of neutral red (aminodimethylaminotoluphenazine hydrochloride) in 70 ml. of alcohol and dilute with water to 100 ml.

Remarks: pH: red 6.8-8.0 yellow.

Ref. Kolthoff and Furman, pp. 60-61

NEUTRAL RED SOLUTION

Use: Staining solution.

Preparation: Dissolve 1 g. of neutral red (50-60% dye content) in 100 ml. of distilled water.

Ref. Biol. Stains, Conn p. 95

NICKEL ACETATE SOLUTIONS

Reagent: $Ni(C_2H_3O_2)_2 \cdot 4H_2O$, mol. wt. = 248.8.

Preparation:

0.25 Molar: Dissolve 62.2 g. of nickel acetate in water and dilute to 1 liter.

0.5 Normal: Same as 0.25 Molar.

10 mg. of nickel ion per ml. of solution: Dissolve 42.4 g. of nickel acetate in water and dilute to 1 liter.

NICKEL CHLORIDE SOLUTIONS

Reagent: $NiCl_2 \cdot 6H_2O$, mol. wt. = 237.7.

Preparation:

0.5 Molar: Dissolve 118.9 g. of nickel chloride in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of nickel ion per ml. of solution: Dissolve 40.4 g. of nickel chloride in water and dilute to 1 liter.

NICKEL-CYANIDE-AMMONIA REAGENT (HOFMANN-HÖCHTLEN)

Use: Test reagent for aniline, phenol, and benzene.

Preparation: Dissolve 5 g. of nickel sulfate in 20 ml. of water and add a solution prepared by dissolving 2.5 g. of potassium cyanide in 10 ml. of water. Next add 20 ml. of ammonia and allow to stand for 15 minutes at a temperature of 0° C. Finally, filter through glass wool, and add 60 per cent acetic acid to the filtrate until a turbidity appears.

Remarks: Characteristic precipitates are formed when this reagent is shaken with phenol, aniline, or benzene.

Ref. Ber. **36**, 1149 (1903)

NICKEL NITRATE SOLUTIONS

Reagent: $Ni(NO_3)_2 \cdot 6H_2O$, mol. wt. = 290.8.

Preparation:

0.5 Molar: Dissolve 145.4 g. of nickel nitrate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of nickel ion per ml. of solution: Dissolve 49.6 g. of nickel nitrate in water and dilute to 1 liter.

NICKEL NITRITE REAGENT

Use: Reagent used for the indirect determination of calcium.

Preparation: Dissolve 10 g. of potassium nitrite in 100 ml. of 30 per cent aqueous nickel nitrate solution. Add 10 ml. of glacial acetic acid and set aside for some time. Filter, and distill the filtrate in vacuo at 60° C. until the volume is about 50 ml. Add 50 ml. of water and repeat the distillation. Do this three times, adding 50 ml. of water each time and distilling to 50 ml. The purpose of this distillation is to remove the acetic acid. Dilute the neutral solution remaining to 100 ml. and add 45 g. of pure potassium nitrite. Allow to stand 24 hours and filter.

Remarks: Calcium is quantitatively precipitated with this reagent as a complex nitrite, and the calcium is then determined indirectly by estimating the nitrite content of the preciptate with antipyrine. The formula for the precipitate is $K_2CaNi(NO_2)_6$.

Sensitiveness: 0.1 mg. per liter.

Ref. Snell I, pp. 462-463

NICKEL OXIDE SOLUTION, AMMONIACAL

Use: A reagent for silk.

Preparation: Dissolve 10 g. of nickel sulfate in about 200 ml. of water, and add sodium hydroxide solution until precipitation is complete. Filter and wash the residue with water. Dissolve the nickel hydroxide in 50 ml. of concentrated ammonium hydroxide and 50 ml. of water.

Remarks: This reagent dissolves silk but not cotton.

Ref. J. Prakt. Chem. 73, 369 (1858); H. Harper, p. 146

NICKEL SULFATE SOLUTIONS

Reagent: $NiSO_4 \cdot 6H_2O$, mol. wt. = 262.85, or
$NiSO_4 \cdot 7H_2O$, mol. wt. = 280.86

Preparation:

0.5 Molar: Dissolve 131.4 g. of $NiSO_4 \cdot 6H_2O$ or 140.5 g. of $NiSO_4 \cdot 7H_2O$ in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of nickel ion per ml. of solution: Dissolve 44.8 g. of $NiSO_4 \cdot 6H_2O$ or 47.8 g. of $NiSO_4 \cdot 7H_2O$ in water and dilute to 1 liter.

NIKIFOROFF'S BORAX-CARMINE

Use: A stain for nuclei and whole tissue.

Preparation: Dissolve 15 g. of carmine in 500 ml. of a 5 per cent aqueous solution of borax and make alkaline with ammonium hydroxide. Evaporate to 250 ml. and add acetic acid until the cherry-red color just disappears.

NILE BLUE SULFATE SOLUTION

Use: Staining solution.

Preparation: Dissolve 0.5 g. of Nile blue A in 100 g. of alcohol.

Ref. Krajian, pp. 127-8; Biol. Stains, Conn pp. 91-92

NINHYDRIN SOLUTION (ABDERHALDEN-SCHMIDT)

Use: Test reagent for proteins and their decomposition products, and adrenalin.

Preparation: Dissolve 0.1 g. of ninhydrin in 300 ml. of water.

Procedure for Test: Add a few drops of the reagent to the solution to be tested and heat. A blue color indicates the presence of proteins or their decomposition products. These include peptones, polypeptides, and amino acids. Adrenalin gives a similar reaction.

Ref. C. A. 7, 3765 (1913)

NITAL ETCHING SOLUTION

Use: Etchant for microscopic examination of iron and steel.

Preparation: Dissolve 1.5 g. of concentrated nitric acid in 100 ml. of 95 per cent or absolute methyl or ethyl alcohol. Amyl alcohol may be used.

Remarks: Concentration may be varied to alter etching rate.

Ref. Metals Handbook, p. 722

NITRAMINE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of nitramine (2,4,6-trinitrophenylmethylnitroamine) in 60 ml. of alcohol and dilute with water to 100 ml.

Remarks: pH: yellow 11.0-13.0 orange-brown.

Ref. Kolthoff and Furman, p. 62

p-NITRANILINE SOLUTION

See: Riegler's reagent (ammonia); Berge's reagent (wood fiber).

NITRATE BROTH

Use: Culture medium for nitrate test.

Preparation: Dissolve 0.2 g. of potassium nitrate, 5 g. of sodium chloride, and 10 g. of peptone in 1 liter of distilled water, using heat if

necessary, and adjust the reaction to pH 6.5-7.5. Filter through paper and tube as desired. Heat in an autoclave at 15 pounds pressure for 20 minutes.

Ref. Kolmer and Boerner, p. 356

NITRIC ACID SOLUTIONS

Reagent: HNO_3 (sp. gr. 1.42—68-70% HNO_3).

Preparation:

6.0 Normal: Dilute 380 ml. of the concentrated acid (16 *N*) with 620 ml. of distilled water.

1.0 Normal: Dilute 65 ml. of concentrated nitric acid with water to make a total volume of 1 liter.

1.0 Molar: Same as 1.0 Normal.

NITRIC ACID SOLUTION (VOLUMETRIC REAGENT)

Reagent: Nitric acid (sp. gr. 1.42—68-70% HNO_3).

Preparation:

1.0 Normal (standardized): Dilute 65 ml. (93 g.) of nitric acid ($d = 1.42$) to 1 liter with distilled water. The concentration of this solution is slightly greater than normal and may be determined exactly by titration with standard alkali. The final adjustment may then be made by diluting the proper quantity of this solution with water to make 1 liter of solution. The acid used should be free from chlorine and the oxides of nitrogen.

Ref. Handbook of Chem. and Physics, p. 1318

NITRIC ACID IN AMYL ALCOHOL (KOURBATOFF)

Use: Etching reagent to show structure of hardened steel.

Preparation: Dissolve 4 ml. of concentrated nitric acid in 96 ml. of amyl alcohol.

Remarks: After 5 minutes, troosto-sorbite is brown, austentite is yellow, and martensite is white.

Ref. Williams and Homerberg, p. 314

NITROAMINOGUANIDINE SOLUTION

Use: Reagent for nickel.

Preparation: Dissolve 0.5 g. of nitroaminoguanidine in 50 ml. of hot water and use while hot.

Procedure for Test: Add 5 ml. of *N* ammonium hydroxide to 5 ml. of the solution to be tested, and immediately add the reagent prepared above. Boil the mixture slowly for 15 minutes. If nickel is present, a precipitate forms which is soluble in sodium hydroxide solution, and the resulting solution is blue in color.

Ref. J. Am. Chem. Soc. 50, 2469 (1928)

NITROANTHRAQUINONE REAGENT

See: Bieling's reagent.

1, 5-NITROANTHRAQUINONESULFONIC ACID REAGENT (MILROY)

Use: Reagent for determination of blood sugar.

Preparation: Dissolve 0.4 g. of 1,5-nitroanthraquinonesulfonic acid in 100 ml. of water.

Remarks: Reagent gives a red color when heated with glucose in an alkaline solution.

Ref. Biochem. J. **19**, 746 (1925)

o-NITROBENZALDEHYDE REAGENT (LEUCHTER)

Use: Reagent for pine oil and turpentine oil.

Preparation: Dissolve 1 g. of o-nitrobenzaldehyde in 30 g. of alcohol, 20 g. of water, and 10 g. of 15 per cent sodium hydroxide solution.

Remarks: Reagent gives a yellowish-brown to black color with pine oil, and a yellow color with turpentine oil.

Ref. C. A. 7, 2316 (1913)

p-NITROBENZENEAZOCHROMOTROPIC ACID REAGENT

Use: Test reagent for boron.

Preparation: Dissolve 5 mg. of the reagent in 100 g. of concentrated sulfuric acid.

Procedure for Test: Evaporate a drop of alkaline test solution to dryness in an evaporating dish, and while still hot add 2 drops of test reagent. A violet to green color forms on cooling if boron is present.

Ref. Feigel, p. 332

p-NITROBENZENEAZORESORCINOL SOLUTION

Use: Test reagent for magnesium.

Preparation: Dissolve 1 g. of sodium hydroxide in 100 ml. of water, and in this solution dissolve 0.5 g. of p-nitrobenzeneazoresorcinol. This reagent should be diluted 5 to 10 times for low concentrations of magnesium.

Procedure for Test: Make the solution to be tested slightly acid with hydrochloric acid and add 1 drop of the reagent, and then add sodium hydroxide solution until the mixture is slightly alkaline. A sky-blue precipitate forms if magnesium is present. Cobalt and nickel interfere with this test.

Ref. J. Am. Chem. Soc. **51**, 1456 (1929); C. A. 2660 (1931); C. A., 1322 (1936) Ind. Eng. Chem., Anal. Ed. **12**, 30-31 (1940)

m-NITROBENZENESULFONIC ACID SOLUTION

See: Metanitrobenzol sulfonic acid solution.

p-NITROBENZOYL CHLORIDE REAGENT

Use: Reagent for amino acids.

Preparation: Dissolve enough p-nitrobenzoyl chloride in carbon tetrachloride to form a saturated solution.

Procedure for Test: Dissolve a few mg. of the amino acid in 2 ml. of 5 per cent sodium hydroxide and add 2 ml. of the reagent. Shake for 30 seconds and add 5-10 ml. of butyl alcohol. Shake again and allow the layers to separate. A violet color forms in the butyl alcohol layer, but this color soon fades. Practically all amino acids from proteins give this color reaction.

Ref. Proc. Soc. Exptl. Biol. Med. **46**, 339-340 (1941); C. A. **35**, 2816 (1941)

p-NITRODIAZOAMINOAZOBENZENE REAGENT

Use: Test reagent for cadmium.

Preparation: Dissolve 0.02 g. of the reagent in 100 ml. of 0.02 *N* alcoholic potassium hydroxide solution.

Procedure for Test: Place 1 drop of the reagent on a filter paper resting on thick blotting paper, and add a smaller drop of the solution to be tested and make acid with acetic acid. Finally, add a large drop of 2 *N* potassium hydroxide solution. A bright pink center circle surrounded by a violet-blue ring is a positive test for cadmium. Silver, mercury, copper, nickel, iron, chromium, cobalt, magnesium, and ammonium ions interfere. Rochelle salt removes all but silver, mercury, and ammonium ions. Silver is removed with potassium iodide and mercury as sulfide.

Sensitiveness: 0.52 γ per drop.

Ref. C. A. **31**, 3412 (1937)

p-NITRODIAZOBENZENE REAGENT

See: Riegler's reagent (Bile Pigments).
Riegler's reagent (Saccharin).
Riegler's reagent (Uric acid).

NITRON SOLUTION (BUSCH)

Use: Test reagent for nitrate.

Preparation: Dissolve 10 g. of nitron in 90 g. of 5 per cent acetic acid.

Procedure for Test: Acidify 5 ml. of the solution to be tested with 1 drop of dilute sulfuric acid and add about 5 drops of the reagent. A voluminous white precipitate forms immediately if nitrate is present. If only a trace of nitrate is present, white needle-like crystals form after several hours.

Sensitiveness: 1:60,000. This may be increased to 1:80,000 by cooling the solution to 0° C.

Ref. Analyst **32**, 349 (1907); Engelder, p. 214

NITRON ACETATE SOLUTION (LOEBICH)

Use: Reagent for detection and determination of perchloric acid.

Preparation: Dissolve 10 g. of nitron and 10 g. of glacial acetic acid in 85 ml. of water.

Remarks: Reagent is used to precipitate nitron perchlorate from aqueous solutions. This method can be used for the quantitative estimation of the perchlorate ion.

Ref. C. A. **20**, 1773 (1926)

4-NITRONAPHTHALENEDIAZOBENZENE-4'-AZOBENZENE SOLUTION

See: Cadion 2 β Solution.

α-NITRO-β-NAPHTHOL REAGENT (MAYR)

Use: Reagent for cobalt and palladium.

Preparation: Dissolve 2 g. of α-nitro-β-naphthol in 100 ml. of glacial acetic acid and 100 ml. of water. Filter.

Procedure for Test: Acidify solution of cobalt ion with mineral acid, add 10-20 ml. of perhydrol and sufficient sodium hydroxide to precipitate all cobalt. Avoid an excess. Dissolve the precipitate in glacial acetic acid and dilute with hot water to 150-200 ml. Add 50 per cent excess reagent, stir, and heat to boiling. Cobalt is quantitatively precipitated. A similar procedure is used for palladium. (Note: See: C. A. 34, 44 (1940).)

Ref. C. A. **29**, 69 (1935); **27**, 5024 (1933)

p-NITROPHENOL INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.25 g. of p-nitrophenol in 100 ml. of water.

Remarks: pH: colorless 5.0-7.6 yellow.

Ref. Kolthoff and Furman, p. 60

p-NITROPHENYLAZORESORCINOL REAGENT

Use: Test reagent for beryllium.

Preparation: Dissolve 1.38 g. of p-nitroaniline in a little hydrochloric acid and cool to 0° C. To this mixture add an equally cold concentrated solution of 0.85 g. of potassium nitrite in water. Keep the temperature at 0° C. and mix the diazo compound just prepared with a cold solution of 1.42 g. of orcinol made alkaline with soda. Acidify and filter. Wash the bright red crystals first with hydrochloric acid and then with water, and then dry.

The test reagent is prepared by dissolving 0.025 g. of the red crystals in 100 ml. of *N* sodium hydroxide solution.

Procedure for Test: Moisten filter paper with a drop of the reagent, and then to this spot add a little of the solution to be tested. Next place a

drop of the test reagent in the same place. The yellow solution turns orange-red in the presence of beryllium. Zinc gives a similar test, but the spot disappears with 1 drop of 25 per cent potassium cyanide.

Sensitiveness: 0.0002 mg. in 0.04 ml.

Ref. C. A. **28**, 6387 (1934)

p-NITROPHENYLHYDRAZINE SOLUTION

Use: Reagent for aldehydes and ketones.

Preparation: Dissolve 3 g. of p-nitrophenylhydrazine in 90 g. of 40 per cent acetic acid.

Remarks: This reagent is a modified Fischer reagent, and gives insoluble, crystalline compounds with aldehydes and ketones.

Ref. J. Biol. Chem. **4**, 235 (1908)

o-NITROPHENYLPROPIOLIC ACID REAGENT (SUGAR)

See: Weitbrecht's reagent.

NITROSODIMETHYLANILINE SOLUTION

Use: Reagent for the detection and determination of perchlorates in Chili salt peter.

Preparation: Dissolve 1 g. of nitrosodimethylaniline in alcohol and dilute to 1 liter.

Remarks: This reagent gives a violet color with perchlorates. Iodides interfere and must be removed with silver oxide.

Ref. Snell I, p. 592; Yoe I, p. 163

α-NITROSO-β-NAPHTHOL SOLUTION

Use: Test reagent for cobalt.

Preparation: Mix 50 ml. of glacial acetic acid with 50 ml. of water, and dissolve in this mixture enough α-nitroso-β-naphthol to make a saturated solution.

Remarks: Test solution yields a voluminous red precipitate with solution of cobalt ions in acid solution. Nickel does not interfere.

Ref. C. A. **9**, 2363 (1915); **15**, 2598 (1921); **25**, 3263 (1931); Engelder, pp. 158-159

β-NITROSO-α-NAPHTHOL SOLUTION

Use: Reagent for determination of zirconium; also a reagent for cobalt.

Preparation: Dissolve 1 g. of β-nitroso-α-naphthol in 100 ml. of alcohol.

Remarks: (Cobalt) This reagent is about 10 times as sensitive as the isomer α-nitroso-β-naphthol in the test for cobalt. (Zirconium) When added to a dilute hydrochloric acid solution containing zirconium, this solution gives a red color. Iron, titanium, and sulfates interfere, but aluminum, cerium, and thorium do not.

Sensitiveness: 0.1 mg. Zr. per ml.
0.0059 mg. Co. per ml.

Ref. (Cobalt): C. A. **34**, 6187 (1940); C. A. **14**, 1945 (1920); (Zirconium): C. A. **18**, 3333 (1924); C. A. **29**, 2881 (1935)

NITROSOPHENOL SOLUTION (BAUDISCH-ROTHSCHILD)

Use: Test reagent for copper.

Preparation: Dissolve a little o-nitroanisol in dilute alcohol and add amyl nitrite, ammonia, and zinc dust. When the reduction is complete, acidify and add cupric acetate until precipitation is complete. Dissolve the precipitate of copper *o*-nitrosophenol in xylol and treat with lime. Then extract the solution with petroleum benzine. This extract is the test solution.

Remarks: The green reagent turns red when shaken with a solution of copper salt to which ether has been added.

Ref. Ber. **48**, 1660 (1915)

NITROSO-R-SALT REAGENT

Use: Test reagent for cobalt.

Preparation: Dissolve 0.5 g. of nitroso-R-salt in 100 ml. of water.

Procedure for Test: Add 1 g. of powdered sodium acetate to 2 ml. of the dilute solution to be tested and add 2 ml. of the reagent. Heat the mixture to boiling and slowly add 1 ml. of concentrated nitric acid and continue the boiling for 1 minute. The formation of a red color is an indication of cobalt.

Ref. J. Am. Chem. Soc. **43**, 746 (1921)

NITROSYL SULFURIC ACID SOLUTION

Use: Determination of iodides in water by the modified McClendon method.

Preparation: Mix 50 g. of starch with 50 ml. of water, and transfer the paste to a side-arm distilling flask. Heat the flask on a water bath, and allow nitric acid (sp. gr. = 1.35) to flow slowly onto the hot starch paste from a separatory funnel supported by a stopper in the neck of the flask. The flow of acid should be regulated so that a steady stream of the oxides of nitrogen is maintained. The side arm of the flask is connected with a delivery tube which dips into 30 ml. of concentrated sulfuric acid. The product is a concentrated solution of nitrosyl sulfuric acid in sulfuric acid.

Remarks: This solution keeps indefinitely in a stoppered bottle.

Ref. A.P.H.A., pp. 39-41; J. Amer. W. W. Assoc. **19**, 566 (1928)

N. N. N. MEDIUM (NICHOLS, NOVY, AND MACNEAL)

Use: Culture medium.

Preparation: Add 6 g. of sodium chloride and 14 g. of agar to 900 ml. of distilled water and boil until dissolved. Tube and heat in an autoclave at 15 pounds pressure for 30 minutes. This is a stock solution.

When needed, melt the material in the tubes and add aseptically sterile, defibrinated rabbit blood in the proportion of 2 parts of medium to 1 part of rabbit blood. Mix thoroughly and slant.

Ref. J. Infectious Diseases 1, 1 (1904); 4, 223 (1907)

NORMAL SALINE OR NORMAL SALT SOLUTION

See: Physiological salt solution.

NOVELLI'S REAGENT

Use: Test reagent for nitrite.

Preparation: Dissolve 5 g. of resorcinol in 150 ml. of water and add 5 drops of 20 per cent ferric chloride solution. Boil until the violet color first changes to yellow.

Procedure for Test: Add 1-2 drops of acetic acid and 1 drop of the reagent to 1 ml. of the solution to be tested. A green color appears if nitrite is present.

Ref. Chim. ind. 1926, 744

NUTRIENT AGAR

See: Beef Extract Agar, and
Beef Infusion Agar.

NUTRIENT BOUILLON

See: Beef Extract Broth.

NUTRIENT BROTH

See: Beef Extract Broth, and
Beef Infusion Broth.

NUTRIENT GELATIN MEDIUM

See: Gelatin Medium.

NYLANDER'S REAGENT

Use: Test reagent for glucose in urine.

Preparation: Mix 4 g. of Rochelle salt, 2 g. of bismuth subnitrate, and 10 g. of sodium hydroxide with enough water to make 100 ml. of solution. Cool and filter.

Procedure for Test: Boil 10 ml. of urine with 1 ml. of the reagent. If reducing sugar is present, a black color or precipitate is formed.

Sensitiveness: 0.01% sugar.

Ref. C. A. 8, 3310 (1914); Hawk and Bergeim, p. 54

OBERHOFFER'S REAGENT

Use: Reagent for determination of the distribution of phosphorus in iron and steel.

Preparation: Prepare a solution of the following materials:

Stannous chloride	0.5 g.
Cupric chloride	1.0 g.
Ferric chloride	30.0 g.
Hydrochloric acid, conc.	50.0 ml.
Alcohol	500.0 ml.
Water	500.0 ml.

Remarks: This solution is used as an etch.

Ref. Zeitschr. anorg. Chem. **154**, 209 (1926); Williams and Homerberg, p. 313

OBERMAYER'S REAGENT

Use: Test reagent for indican in urine.

Preparation:

Solution A: Dissolve 20 g. of lead acetate in 80 ml. of distilled water.

Solution B: Dissolve 2 g. of ferric chloride in 1 liter of concentrated hydrochloric acid (sp. gr. = 1.19).

Procedure for Test: Shake urine with chloroform, and then shake the chloroform extract with *Solutions A* and *B* in succession. A blue precipitate of indigo-blue forms if indican is present.

Ref. Hawk and Bergeim, p. 724; Kolmer and Boerner, pp. 155-156

OFFORD'S REAGENT

Use: Test reagent for chlorate.

Preparation: Impregnate filter paper with 3 *N* ammonium thiocyanate solution and dry in a current of air below 70° C.

Procedure for Test: Heat the test paper at 60° C. for 10 minutes, and apply a few drops of the solution to be tested. Do not use any paper that shows discoloration. Heat the paper in an oven at about 100° C. for 30 minutes. The paper should not come in contact with metals during the heating period. A yellow color appears if chlorates are present.

Ref. Ind. Eng. Chem., Anal. Ed. **7**, 93 (1935)

OLIVER'S REAGENT

Use: Reagent for bile salts in urine.

Preparation: Dissolve 8.33 g. of peptone and 1.12 g. of salicylic acid in 1 liter of water containing 2 drops of acetic acid.

Procedure for Use: Acidify 5 ml. of filtered urine with acetic acid and dilute with water until specific gravity is less than 1.008. Mix 2 ml. of this solution with 5 ml. of the reagent. A milky turbidity appears if bile salts are present. Thymol interferes with this test.

Ref. Kolmer and Boerner, pp. 157-158

ORANGE IV SOLUTION

Use: Test reagent for zinc.

Preparation: Dissolve 0.01 g. of orange IV (tropeolin 00) in 100 ml. of water.

Procedure for Test: Acidify 1 drop of the reagent with 1 : 24 sulfuric acid and add 5 drops of freshly prepared 2 per cent potassium ferricyanide solution. Add 1 drop of the solution to be tested. The color changes from red to green when zinc is present.

Ref. Engelder, p. 163

ORANGE G STAINING SOLUTION

Use: Staining solution.

Preparation: Dissolve 1 g. of orange G in 100 ml. of distilled water.

Ref. Biol. Stains, Conn p. 47

ORCINOL REAGENT

See: Bial's reagent.

ORTH'S FLUID

Use: Fixative.

Preparation: Mix the following:

Formaldehyde solution	4-10 ml.
Potassium dichromate	2.5 g.
Sodium sulfate	1.0 g.
Water	100.0 ml.

Remarks: This solution should be freshly prepared.

ORTH'S LITHIUM-CARMINE

Use: A stain for nuclei.

Preparation: Dissolve 1 g. of lithium carbonate and 2 g. of carmine in 100 ml. of water.

Ref. Biol. Stains, Conn p. 178

ORTH'S PICROLITHIUM-CARMINE

Use: Same as lithium carmine and similar stains.

Preparation: Add picric acid to Orth's lithium-carmine.

OSMIC ACID SOLUTION

Use: Fixative.

Preparation: Dissolve 1 g. of osmium tetroxide in 100 ml. of distilled water.

OSMIC ACID SOLUTION (GURBER)

Use: Test reagent for indican in urine.

Preparation: Dissolve 1 g. of osmic acid in 100 ml. of water.

Procedure for Test: Add 2 ml. of hydrochloric acid to 1 ml. of urine and then add 2 drops of the reagent. A violet or blue color develops if indican is present.

Ref Munch. med. Wochschr. 1905, 1578

OSMIUM TETROXIDE SOLUTION

Use: A catalyst in titrations using ceric sulfate.

Preparation: (0.01 Molar) Dissolve 0.25 g. of osmium tetroxide in 100 ml. of 0.1 *N* sulfuric acid.

Ref. Kolthoff and Sandell, pp. 582-583

OSZACI'S REAGENT

Use: Reagent to dealbuminate blood serum.

Preparation: Dissolve 1.5 g. of uranyl acetate in 100 ml. of water.

Remarks: Reagent precipitates proteins.

Ref. C. A. 7, 3137 (1913)

OXALIC ACID SOLUTION (VOLUMETRIC REAGENT)

Reagent: $H_2C_2O_4$, mol. wt. = 90.016, or
$H_2C_2O_4 \cdot 2H_2O$, mol. wt. = 126.05.

Preparation:

1.0 Normal (standardized): The amount of water of hydration of oxalic acid varies somewhat in dry climates so that it is impossible to obtain an exactly normal solution by weighing the proper amount of the dry acid and dilution to volume. The dihydrate may, however, be formed in humid climates by exposing the finely powdered acid to air for a few hours. The amount of dihydrate required for 1 liter of 1.0 *N* solution is 63.023 g.

It is always best to standardize solutions of oxalic acid (to be used as an acid) by titration with standard alkalies, using phenolphthalein as an indicator.

Remarks: Solutions of concentration less than decinormal are not stable and should be prepared as needed. The more concentrated solutions are fairly stable.

Ref. Treadwell and Hall, p. 479; Handbook of Chem. and Physics, p. 1318

OXINE REAGENT

Use: Reagent for macro- and micro-determination and separation of magnesium from metals of the alkali and alkaline earth groups.

Preparation: Dissolve 1.4 g. of oxine (8-hydroxyquinoline) in 3 ml. of glacial acetic acid. Heat slightly, if necessary, to hasten solution and dilute to 100 ml.

Remarks: This reagent gives a greenish-yellow precipitate from an ammoniacal solution of magnesium. Calcium, barium, and strontium, may be present, but aluminum, iron, manganese, zinc, copper, titanium, and phosphate must be absent.

Procedure for Qualitative Test: Place a drop of magnesium test solution on a spot plate and saturate with solid ammonium chloride. Make alkaline with ammonium hydroxide and add 1 drop of the reagent. A greenish-yellow precipitate forms with magnesium.

Ref. Snell I, pp. 474-475; Hillebrand and Lundell, pp. 114-115; Engelder, pp. 171-172; C. A. 25, 5868 (1931)

OXYGEN ABSORBENT

Use: Reagent to absorb oxygen from a mixture of gases.

Preparation: Dissolve 150 g. of ammonium chloride in 500 ml. of water, and add 500 ml. of concentrated ammonium hydroxide. Mix thoroughly.

Procedure for Use: Pass the gases through a bottle half-filled with copper turnings, and almost completely filled with the above solution.

Ref. Handbook of Chem. and Physics, p 1312

OXYGEN REAGENT (PANASYNK)

Use: Reagent for the determination of oxygen.

Preparation: Dissolve 35.4 g. of ferrous sulfate in 120 ml. of water, and add 10 g. of tartaric acid and 45 ml. of 25 per cent ammonia. Filter.

Remarks: This reagent is used in place of pyrogallol solution.

Ref. The Merck Index, p. 856

PACINI'S SOLUTION

Use: Preservative for nerves and retina.

Preparation:

Solution 1: Dissolve 2 g. of mercuric chloride, 4 g. of sodium chloride, and 26 g. of glycerol in 226 ml. of water.

Solution 2: Dissolve 1 g. of mercuric chloride, 2 ml. of acetic acid, and 43 g. of glycerol in 115 ml. of water.

PALET'S REAGENTS

Use: Test reagents for apomorphine.

Preparation:

Method 1: Dissolve 25 g. of sodium tungstate in 200 ml. of cold water and add 20 g. of arsenic trioxide. Boil in a flask equipped with a reflux condenser for 1.5 hours, and then allow to cool. Filter, and dilute the filtrate with water to 250 ml.

Method 2: Mix 10 g. of sodium tungstate, 2 g. of sodium molybdate, and 10 g. of arsenic trioxide with 75 ml. of water and reflux for 2 hours. Cool, and dilute with water to 100 ml.

Procedure for Test: Add 1-2 ml. of either of the above reagents to 1-2 drops of the alkaloid solution and shake for a few minutes. Then add 5-10 ml. of a cold, saturated solution of sodium carbonate. An indigo-blue color appears if alkaloids are present.

PALLADIUM NITRATE INDICATOR SOLUTION

Use: Indicator for the titration of silver using a standard solution of iodide.

Preparation: Dissolve 0.06 g. of palladous nitrate in 100 ml. of 16 per cent nitric acid.

Remarks: This indicator gives a red-brown precipitate of palladous iodide when an excess of the iodide solution is added.

Ref. J. Am. Chem. Soc. **40**, 583 (1918)

PAMFIL-WONNESCH'S SOLUTION

Use: Reagent for the detection of bromide and iodide.

Preparation: Dissolve 14.3 g. of silver chloride (freshly precipitated and washed) in 300 ml. of cold, saturated methenamine solution, 300 ml. of cold, saturated sodium chloride solution, and enough concentrated ammonium hydroxide to dissolve the residue. Then add water to make 1 liter of solution.

Remarks: Reagent is used to determine bromide and iodide in the presence of other ions precipitated by silver.

Ref. C. A. **19**, 22 (1925)

PAPPENHEIM'S SOLUTION

Use: Staining solution.

Preparation: Dissolve 1 g. of rosolic acid in 100 ml. of alcohol and add 1.3 g. of methylene blue (90% dye content). Shake until dissolved. Then add 20 ml. of glycerol and mix well. Filter.

Ref. Biol. Stains, Conn p. 139

PAPPENHEIM-SAATHOFF PYRONIN METHYL GREEN

Use: Staining solution.

Preparation: Dissolve 1 g. of methyl green (55-60% dye content) in 5 ml. of 95 per cent alcohol. Prepare a second solution by dissolving 0.25 g. of pyronin (commission certified) and 2 g. of phenol in a mixture consisting of 20 ml. of glycerol and 100 ml. of distilled water, and add this to the methyl green solution. Filter.

Ref. Biol. Stains, Conn p. 142

PARACARMINE (MAYER)

Use: Staining solution.

Preparation: Mix the following:

Carminic acid	1.0 g.
Aluminum chloride	0.5 g.
Calcium chloride	4.0 g.
Alcohol, 70%	100.0 ml.

Warm if necessary to hasten solution and let settle for a time. Filter.

PARKES REAGENT

Use: Test reagent for artificial dyes in fats.

Preparation: Dissolve 10 g. of butyric acid and 2 ml. of water in 90 g. of glacial acetic acid.

Procedure for Test: Add a little of the fat to 5 ml. of the reagent and acidify with dilute sulfuric acid. If an artificial dye has been used the solution is colored.

Ref. Analyst, 1918, 87

PASTEUR'S AMMONIUM PHOSPHATE SOLUTION

Use: Culture medium.

Preparation: Dissolve the following in 1 liter of water:

Potassium phosphate, monobasic	5 g.
Ammonium phosphate, monobasic	5 g.
Sucrose or glucose	80 g.

Ref. Arch. Hygiene **4**, 1 (1886)

PASTEUR'S SALT SOLUTION

Use: For fermentation experiments.

Preparation: Dissolve the following in 1 liter of distilled water:

Potassium phosphate	2.50 g.
Calcium phosphate	0.25 g.
Magnesium sulfate	0.25 g.
Ammonium tartrate	12.00 g.

Ref. Handbook of Chem. and Physics, p. 1312

PATSCHOWSKY'S REAGENT

Use: Reagent for oxalic acid in plant tissues.

Preparation: Dissolve 10 g. of ferrous ammonium sulfate in 90 ml. of water acidified with acetic acid.

Remarks: Reagent yields yellowish-green prisms with oxalic acid.

Ref. Ber. **36**, 542 (1913)

PAVY'S SOLUTION

Use: Test reagent for glucose.

Preparation:

Method 1: Mix 120 ml. of Fehling's solution, 300 ml. of ammonium hydroxide (sp. gr. 0.88), and 100 ml. of 10 per cent sodium hydroxide solution, and then add enough water to make 1 liter of solution.

Method 2: Dissolve 4.157 g. of crystalline cupric sulfate in 200 ml. of distilled water, and add to this a cold solution prepared by dissolving 21.6 g. of Rochelle salt and 18.4 g. of sodium hydroxide in 300 ml of distilled water. Then add 300 ml. of ammonium hydroxide (sp. gr. 0.88) and enough water to make 1 liter of solution.

Method 3: (According to U.S.P. IX)

Solution A: Dissolve 4.158 g. of cupric sulfate in water and dilute to 500 ml.

Solution B: Dissolve 20.4 g. of Rochelle salt, 20.4 g. of potassium hydroxide, 300 ml. of stronger ammonia, and add enough water to make 500 ml. of solution.

To use, mix equal volumes of *Solutions A* and *B*.

Remarks: Glucose reduces this solution without the precipitation of cuprous oxide.

Ref. C. A. 1, 2722 (1907); Browne, pp. 395-397; Sutton, pp. 413-415

PEPTONE WATER

See: Dunham's peptone water medium.

PELLET'S SOLUTION

Use: Test reagent for glucose.

Preparation: Dissolve 200 g. of Rochelle salt, 100 g. of anhydrous sodium carbonate, 7 g. of ammonium chloride, and 68.7 g. of cupric sulfate in water and dilute to 1 liter.

Remarks: 1 ml. of this solution = 0.005 g. of glucose.

PEPSIN STANDARD SOLUTION

Use: Experiments with pepsin. Reagent in gastric analysis.

Preparation: Mix 10 g. of pepsin preparation and 100 ml. of a 10 per cent solution of sodium chloride. Allow to stand for 1 week at room temperature. Filter, and add an equal volume of glycerol. Store in a refrigerator. This solution keeps indefinitely.

Ref. Hawk and Bergeim, p. 301

PERENYI'S CHROMO-NITRIC ACID

Use: For fixing plant and animal specimens.

Preparation: Mix 0.15 g. of chromium trioxide, 40 ml. of 10 per cent nitric acid, 30 ml. of alcohol, and 30 ml. of water.

PERSOZ'S SOLUTION

Use: Test reagent for wool and silk.

Preparation: Dissolve 100 g. of zinc chloride in 100 ml. of water and shake 20 g. of zinc oxide with this solution.

Remarks: This solution, warmed to 45° C., dissolves silk but not wool.

Ref. Comp. rend. **55**, 810 (1863)

PERTUSSIS BLOOD AGAR

See: Bordet-Gengou Medium.

PESET-BEUNDIA'S REAGENT

Use: Reagent for alkaloids.

Preparation: Dissolve 1 g. of titanic acid in 100 g. of concentrated sulfuric acid.

Remarks: Reagent causes characteristic color reactions with alkaloids.

Ref. C. A. **11**, 2018 (1917)

PETERSON'S REAGENT

Use: Test reagent for citrates and tartrates.

Preparation:

Solution A: Dissolve 0.116 g. of sodium salicylate in a little water and dilute to 1 liter.

Solution B: Dilute 1 ml. of 10 per cent ferric chloride solution with 50 ml. of water and add ammonium hydroxide drop by drop, with constant shaking, until the precipitate which forms dissolves only after vigorous shaking. Now add 1 drop of glacial acetic acid and dilute to 100 ml. This solution does not keep and must be freshly prepared each time it is used.

Procedure for Test: To each of two 50 ml. colorimetric tubes, add 1 ml. of alcohol, 1 ml. of *Solution A*, 1 ml. of *Solution B*, and 25 ml. of water. To one of these tubes add the solution to be tested and then dilute both to the mark. Shake thoroughly and allow to stand. If citrates or tartrates are present in comparatively large quantity the violet color is discharged completely, while in smaller amounts an opalescence is produced.

Sensitiveness: Tartrate: 0.3 mg.
Citrate: 0.2 mg.

Ref. Ind. Eng. Chem. **17**, 1146 (1925)

PETROFF'S MEDIUM

Use: Culture medium.

Preparation: Add 500 g. of ground beef to a mixture prepared by adding 75 ml. of glycerol of 425 ml. of distilled water, and allow to stand overnight in a refrigerator. Press through gauze or a meat press, and filter through cotton and paper. Sterilize by filtering through a bacteria-proof filter.

Immerse several eggs in 70 per cent alcohol and allow to remain 10-15 minutes. Break into sterile flask or beaker and beat well with a sterile glass rod.

Mix 1 part by volume of the beef juice with 2 parts of the beaten egg and to each 100 ml. of the mixture, add 1 ml. of a 1 per cent alcoholic solution of crystal violet. Tube aseptically, and coagulate by heating at 80°-85° C. for 45 minutes on 3 successive days.

Remarks: If the medium is to be used for the isolation of bovine tubercle bacilli, the glycerol is omitted.

Ref. J. Exptl. Med. **21**, 38 (1915)

PETRUNKEVITCH'S FLUID

Use: Fixative.

Preparation: Mix the following:

Absolute alcohol	200 ml.
Glacial acetic acid	90 ml.
Nitric acid	10 ml.
Distilled water	300 ml.

Dissolve mercuric chloride in the above solution until saturated.

Ref. Krajian, p. 195

PFIFFNER-MEYERS REAGENT

Use: Reagent for the colorimetric determination of methylguanidine.

Preparation: Dissolve 6 g. of sodium nitroprusside and 8.5 g. of sodium ferrocyanide in 100 ml. of water.

Procedure for Determination: Fifteen minutes before using, mix 1 ml. of the reagent with 1 ml. of 10 per cent sodium hydroxide solution and 2 ml. of 3 per cent hydrogen peroxide. For the actual determination, add 1 ml. of this mixture to 4 ml. of the unknown methylguanidine solution, and compare the resulting color with that of a standard solution.

Ref. C. A. **22**, 99 (1928); Snell II, pp. 405-406

PHENANTHROLINE-FERROUS ION INDICATOR SOLUTION

Use: Oxidation-reduction indicator.

Preparation: Dissolve 0.495 g. of phenanthroline monohydrate in 100 ml. of 0.025 *M* ferrous sulfate solution.

Remarks: Indicator is particularly useful in titrations with ceric sulfate. Phenanthroline-ferrous ion is intensely red, but the oxidized product is blue.

Ref. J. Am. Chem. Soc. **55**, 2649 (1933); Kolthoff and Sandell, pp. 473-474

p-PHENETIDINE HYDROCHLORIDE REAGENT

Use: Reagent for zinc.

Preparation: Dissolve 1 g. of p-phenetidine hydrochloride in 100 ml. of water.

Procedure for Test: Mix 6 drops of freshly prepared 2 per cent potassium ferricyanide solution with 2 drops of *N* sulfuric acid and 12 drops of the reagent. Now add carefully a very small drop (0.01 ml.) of the solution to be tested to 2 drops of this mixture, so that there is a zone of contact between the two drops. A blue color or precipitate at this zone indicates the presence of zinc. Silver, lead, bismuth, and tin interfere.

Sensitiveness: 0.05 γ zinc.

Ref. C. A. **31**, 67 (1937)

PHENOLDISULFONIC ACID

Use: Reagent for the determination of nitrates in water analysis.

Preparation: Dissolve 25 g. of pure white phenol in 150 ml. of pure concentrated sulfuric acid. Then add 75 ml. of fuming sulfuric acid and stir well. Heat for 2 hours at about 100° C.

Procedure for Test: Evaporate solution to be tested to dryness and add 2 ml. of phenoldisulfonic acid. Mix the residue and acid thoroughly and dilute with water and add ammonium hydroxide. A yellow color forms if nitrates are present.

Ref. J. Am. Chem. Soc., **31**, 922 (1909); **32**, 630 (1910); A.P.H.A., pp. 48-49; Yoe I, p. 313

PHENOLPHTHALEIN PAPER

Use: Indicator.

Preparation: Impregnate filter paper with a 1 per cent alcoholic solution of phenolphthalein and allow to dry.

Remarks: Colors: Alkaline: red.
Acid: colorless.

PHENOLPHTHALEIN REAGENT (BLOOD TEST)

Use: Test reagent for blood in feces.

Preparation: Dissolve 1-2 g. of phenolphthalein and 25 g. of potassium hydroxide in 100 ml. of distilled water. Add 1 g. of powdered zinc and heat gently until the color disappears. This solution does not deteriorate on standing.

Procedure for Test: Prepare a thin suspension of feces in distilled water and heat to boiling. Allow to cool, and add 2 ml. of this suspension to 1 ml. of the above reagent, and then add a few drops of hydrogen peroxide. A pink to red color appears if blood is present.

Ref. Hawk and Bergeim, p. 368; Kolmer and Boerner, p. 241

PHENOLPHTHALEIN INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 1 g. of phenolphthalein in 50 ml. of alcohol and 50 ml. of water.

Remarks: pH: colorless 8.2-10.0 pink to red.

Ref. Kolthoff and Furman, p. 61

PHENOL RED INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 1.0 g. of phenol red (phenolsulfonphthalein) in 14.2 ml. of *N*/50 sodium hydroxide solution and dilute with water to 250 ml.

Remarks: pH: yellow 6.8-8.4 red.

Ref. Kolthoff and Furman, p. 60

PHENOL RED INDICATOR SOLUTION

Use: Indicator for the preparation of culture media.

Preparation: Dissolve 1.6 g. of phenol red in 100 ml. of alcohol.

Remarks: Use 1 ml. of the indicator with each liter of the medium unless otherwise indicated.

o-PHENOLSULFONIC ACID SOLUTION (BARRAL)

Use: Test reagent for bile pigments and albumin in urine.

Preparation: Dissolve 20 g. of o-phenolsulfonic acid in 80 ml. of water.

Procedure for Test: Filter the urine to be tested and float a little of it onto the surface of the reagent. A green ring forms if bile pigments are present, and a white ring if albumin is present.

Sensitiveness: 5 mg. albumin per liter.

Ref. Pharm. Zentralhalle 1898, 28

PHENOLSULFONPHTHALEIN SOLUTION

Use: For renal function test (Rowntree and Geraghty).

Preparation: Add 0.6 g. of phenolsulfonphthalein and 0.84 ml. of 2 *N* sodium hydroxide solution to sufficient 0.75 per cent sodium chloride solution to make a total volume of 100 ml. Add 2-3 drops more of the sodium hydroxide solution to change the color to red.

Remarks: This solution is non-irritant.

Ref. J. Pharmacol. 1, 579 (1910); Arch. Internal Med., March, 1912, p. 284

PHENYLARSONIC ACID

Use: Test reagent for stannic tin.

Preparation: Dissolve 4 g. of phenylarsonic acid in 100 ml. of water.

Procedure for Test: Acidify solution to be tested with concentrated hydrochloric acid and heat to boiling, and add test reagent which has also been heated to boiling. A white precipitate indicates the presence of tin. Zirconium and thorium interfere; antimony does not.

Ref. J. Chem. Ed. 312 (1937); J. Am. Chem. Soc. **55**, 3945 (1933)

α-PHENYL-β-DIETHYLAMINOETHYL-p-NITROBENZOATE SOLUTION

Use: Test reagent for perchlorate and nitrate.

Preparation: Dissolve 3 g. of the hydrochloride in 10 ml. of water.

Remarks: Reagent causes a turbidity or white precipitate with perchlorates and nitrates. Iodide, oxalate, dichromate, and thiocyanate interfere.

Ref. J. Am. Chem. Soc. **46**, 2661 (1924)

m-PHENYLENEDIAMINE SOLUTION

Use: A reagent for oxygen.

Preparation: Dissolve 1 g. of m-phenylenediamine in 100 g. of alcohol.

Ref. Bull. soc. chim. **5**, 855

p-PHENYLENEDIAMINE SOLUTION

See: p-diaminobenzene solution.

m-PHENYLENEDIAMINE HYDROCHLORIDE REAGENT (ACETALDEHYDE)

Use: Reagent for the colorimetric determination of acetaldehyde.

Preparation: Mix 0.5 ml. of 85 per cent phosphoric acid with 10 ml. of 10 per cent aqueous solution of m-phenylenediamine, and then add 0.5 g. of activated carbon. Mix well and allow to stand for 1 or 2 days. Filter.

Remarks: This reagent gives a yellow color with acetaldehyde.

Ref. Snell II, pp. 65-66

m-PHENYLENEDIAMINE HYDROCHLORIDE REAGENT (v. BITTO)

Use: Reagent for aldehyde in alcohol.

Preparation. Dissolve 1 g. of m-phenylenediamine hydrochloride in 100 ml. of alcohol or water.

Procedure for Test: Add a few ml. of the reagent to the liquid to be tested. If aldehyde is present, an intense green fluorescence appears after a few minutes and reaches its maximum after 2 hours.

Ref. Zeitschr. anal. Chem. **36**, 371 (1897)

m-PHENYLENEDIAMINE HYDROCHLORIDE SOLUTION (OZONE)

Use: Test reagent for ozone.

Preparation: Dissolve 0.15 g. of m-phenylenediamine hydrochloride in 90 ml. of water, and then add 10 ml. of 5 per cent sodium hydroxide solution.

Procedure for Test: Add a little of the liquid to be tested to 25 ml. of the reagent. A red color indicates the presence of ozone. This test is not obtained with nitrous acid or hydrogen peroxide.

Ref. Ber. 31, 3158 (1898)

PHENYLHYDRAZINE REAGENT (ALDEHYDES AND KETONES)

Use: Test reagent for aldehydes and ketones.

Preparation: Dissolve 1 g. of phenylhydrazine hydrochloride and 1 g. of sodium acetate in 10 ml. of water.

Remarks: Reagent forms characteristic hydrazones with aldehydes and ketones.

Sensitiveness: 0.02%.

Ref. Ber. 17, 572 (1884)

PHENYLHYDRAZINE REAGENT (MOLYBDENUM)

Use: Test reagent for molybdenum.

Preparation: Dissolve 1.5 g. of freshly distilled phenylhydrazine in 100 ml. of 50 per cent acetic acid.

Procedure for Test: Add 5 ml. of the reagent to 10 ml. of the solution to be tested and boil for 2 minutes. A red color appears if molybdenum is present. This test may be made more sensitive by extracting the mixture with chloroform. Tungsten, vanadium, arsenic, chromium, antimony, tin, iron, manganese, and uranium do not interfere.

Sensitiveness: 1 mg. of molybdenum per liter.

Ref. Ber. 36, 512 (1903)

PHLOROGLUCINOL REAGENT (KREIS)

Use: Test reagent for rancidity of fats and oils.

Preparation: Dissolve 0.1 g. of phloroglucinol in 100 g. of ether.

Procedure for Test: Place 5 ml. of the fatty material in a test tube and add 5 ml. of hydrochloric acid (free from nitrosyl chloride). Close the tube with a clean rubber stopper and shake for 30 seconds. Now add 5 ml. of the reagent and shake for an additional 30 seconds, and then allow to stand for 10 minutes. A pink or red color appears in the acid layer if rancid fats are used in the test.

Ref. J. Ind. Eng. Chem. 10, 471 (1918); Jacobs, pp. 228-229

PHLOROGLUCINOL REAGENT (LIGNIN)

See: Wiesner's solution.

PHLOROGLUCINOL REAGENT (PENTOSANS)

Use: Reagent for pentosans.

Preparation: Dissolve 3 g. of phloroglucinol in 125 ml. of alcohol.

Remarks: Store in a dark bottle. This reagent precipitates pentosans.

PHLOXINE STAINING SOLUTION

Use: Staining solution.

Preparation: Dissolve 1-5 g. of phloxine in 100 g. of water or 90 per cent alcohol.

Ref. Krajian, p. 79

PHOSPHATE BROTH OR AGAR

Use: Culture medium.

Preparation: This medium is prepared like nutrient broth or nutrient agar except that the sodium chloride is replaced with 5 g. of disodium phosphate.

Remarks: This medium is frequently enriched by the addition of any of the following: ascitic fluid, blood, blood serum, or other natural albuminous fluid.

Ref. J. Med. Research **16**, 1 (1907)

PHOSPHOMOLYBDIC ACID SOLUTION (ALKALOIDS)

See: Sonnenschein's reagents.

PHOSPHOMOLYBDIC ACID REAGENT (JUNGMANN)

Use: Test reagent for arbutin.

Preparation: Dissolve 1 g. of sodium phosphomolybdate in 10 ml. of hydrochloric acid and 20 ml. of water.

Procedure for Test: Dissolve about 0.03 g. of arbutin in 1.5 ml. of water and add 6-8 drops of the reagent and 6-8 drops of ammonium hydroxide. Arbutin causes a beautiful blue color.

Ref. J. pharm. chim., 1910, I, 66

PHOSPHOMOLYBDIC ACID REAGENT (VEGETABLE OILS)

See: Welmann's solution.

PHOSPHOMOLYBDIC ACID REAGENT (VERDA)

Use: Reagent for detection of saffron adulterations.

Preparation: Dissolve 25 g. of sodium phosphomolybdate in 90 ml. of water and 20 ml. of hydrochloric acid. Allow to stand 8 days and filter.

Remarks: Saffron gives a characteristic green color with this reagent.

Ref. C. A. **8**, 779 (1914); **8**, 2217 (1914)

PHOSPHOMOLYBDIC ACID REAGENT (WAIT)

Use: Test reagent for vitamins A, C, and D.

Preparation: Dissolve 1 g. of phosphomolybdic acid in 100 g. of acetic acid.

Remarks: Reagent gives color reactions as follows:

Vitamin A: Blue
Vitamin C: Blue
Vitamin D: Green
Mixture of vitamins A and D: first green and then blue.

The reagent is stable for about one week.

Ref. C. A. **31**, 5398 (1937)

PHOSPHOMOLYBDIC ACID REAGENT

See: Tauber's reagent (Monose sugars).

PHOSPHOMOLYBDOVANADIC ACID REAGENT (PARRI)

Use: Reagent for the alcoholic hydroxyl group.

Preparation: Dissolve 3 g. of phosphomolybdic acid and 0.3 g. of ammonium vanadate in 100 ml. of sulfuric acid.

Remarks: Alcohols, sugars, and hydroxy acids cause color reactions when warmed with this reagent and allowed to stand. The most characteristic color is the azure blue color obtained with the monohydric alcohols. Methyl alcohol does not give this test.

Ref. C. A. **18**, 2667 (1924)

PHOSPHORIC ACID (ORTHO) SOLUTION

Reagent: H_3PO_4 (Sp. gr. 1.71—85-88% mol. wt. = 98.04.

Preparation:

1.0 Molar: Add 67 ml. of phosphoric acid to water and dilute to 1 liter.

1.0 Normal: Add 22 ml. of phosphoric acid to water and dilute to 1 liter.

PHOSPHOTUNGSTIC ACID SOLUTION (ALKALOIDS)

Use: Reagent for alkaloids and albumin.

Preparation:

Method 1: Dissolve 20 g. of sodium tungstate and 15 g. of sodium phosphate in 100 ml. of water that has been acidified with nitric acid.

Method 2: Prepare phosphotungstic acid by evaporating a mixture of 10 g. of sodium tungstate dissolved in 5 g. of phosphoric acid (sp. gr. = 1.13) and enough boiling water to allow complete solution. Collect 10 g. of the crystals of phosphotungstic acid which separate and dissolve them in 90 ml. of water. This solution is known as *Scheibler's reagent.*

Remarks: This solution precipitates alkaloids and also albumin.

Ref. Zeitschr. anal. Chem. **12**, 316 (1873)

PHOSPHOTUNGSTIC ACID SOLUTION (AMINO ACIDS)

Use: Reagent for amino acids.

Preparation: Dissolve 30 g. of phosphotungstic acid in 10 ml. of water.

Remarks: This reagent precipitates many amino acids from aqueous solutions.

Ref. Zeitschr. physiol. Chem. 1906, 149

PHOSPHOTUNGSTIC ACID REAGENT (BENEDICT)

Use: Reagent for the determination of uric acid.

Preparation: Add 100 g. of sodium tungstate to 150 ml. of water, and then add slowly a solution prepared by mixing 20 ml. of 85 per cent phosphoric acid and 50 ml. of water. Shake until the solution is complete. Cool, and pass hydrogen sulfide through the mixture for 10 minutes. Mix vigorously with 150 ml. of 95 per cent alcohol for 7-8 minutes and let stand until the layers separate. Draw off the lower layer through a separatory funnel and add 100 ml. of water. Discard the upper layer. Again agitate with 75 ml. of 95 per cent alcohol and let stand. Draw off the lower layer, and add water until the total weight is 250 g. Boil until all hydrogen sulfide is expelled and again dilute to 250 g. Add 15 ml. of 85 per cent phosphoric acid and heat in a flask equipped with a reflux condenser for 1 hour. Add an excess of bromine drop by drop and then boil until the excess is removed. Cool, and dilute to 500 ml. This solution should be colorless, or only faintly yellow.

Remarks: Uric acid reduces phosphotungstic to give a blue color that is suitable for colorimetric determination.

Sensitiveness: 1 : 1,000,000 uric acid.

Ref. Snell II, pp. 170-178

Additional Uses: Determination of cystine and cysteine, J. Biol. Chem. 109, 665-679 (1935); 110, 263-277 (1935); 112, 671-721 (1936); Epinephrine, Snell II, pp. 607-608; Glutathione, J. Biol. Chem. 72, 177-183 (1927); Snell II, pp. 247-248; Vitamin C, Snell II, pp. 627-629, J. Biol. Chem. 112, 671-721 (1936).

PHOSPHOTUNGSTIC ACID REAGENT (MOREIGNE)

Use: To separate urea from other nitrogeneous compounds in urine.

Preparation: Dissolve 20 g. of sodium tungstate in 100 ml. of water and 10 g. of phosphoric acid (sp. gr. 1.13). Boil for a time and keep the volume constant by the addition of water. Finally acidify with hydrochloric acid.

Ref. J. pharm. chim. 6, 8, 193, 197, 293

PHOSPHOTUNGSTIC ACID REAGENT (THIELE)

Use: Test reagent for albumin in gastric juice.

Preparation: Dissolve 0.3 g. of phosphotungstic acid and 1 g. of hydrochloric acid in 20 g. of alcohol and 180 ml. of water.

Procedure for Test: Carefully float a little of the reagent on the gastric fluid. A white ring forms at the zone of contact of the two liquids if albumin is present.

Ref. Berlin. klin. Wochschr. 1912, 544

PHOSPHOTUNGSTIC ACID-HEMATOXYLIN (MALLORY)

Use: Staining solution.

Preparation: Dissolve 0.1 g. of hematoxylin in 50 ml. of distilled water with the aid of heat. Cool, and add a solution prepared by dissolving 2 g. of phosphotungstic acid crystals in 50 ml. of water. Add 10 ml. of a freshly prepared 0.25 per cent aqueous solution of potassium permanganate or 0.2 ml. of hydrogen peroxide.

PHOSPHOTUNGSTOMOLYBDATE REAGENT (TANNIC ACID)

Use: Test reagent for tannic acid in fermented vinegar.

Preparation: Add 6 g. of sodium tungstate, 4 g. of sodium phosphate, and 0.1 g. of molybdic acid to 50 ml. of water, and heat the mixture on a water bath until solution is complete. Cool, and add nitric acid until the solution is neutral to litmus. Heat mixture to boiling, and then allow to cool to room temperature.

Procedure for Test: Acidify 10 ml. of the vinegar with 0.5 ml. of 10 per cent hydrochloric acid, and then add 1 ml. of the reagent and heat. If tannin is present a violet color appears.

Sensitiveness: 1 : 500,000

Ref. C. A. **20**, 633 (1926)

PHOSPHOTUNGSTOMOLYBDIC ACID REAGENT (MERCURY)

Use: Reagent for the detection and colorimetric determination of mercury, antimony, and bismuth.

Preparation: Place 25 g. of molybdic oxide or 34 g. of ammonium molybdate in a flask and add 140 ml. of 10 per cent sodium hydroxide solution and 150 ml. of water. Boil for 20 minutes and add 100 g. of sodium tungstate, 50 ml. of 85 per cent phosphoric acid, and 100 ml. of concentrated hydrochloric acid. Dilute to 750 ml. and close the mouth of the flask with a funnel and watch glass. Boil gently for 4 hours, adding sufficient water to keep the total volume at about 750 ml. Cool, and dilute to 1 liter.

Remarks: The solution turns blue in the presence of reducing agents such as glucose, uric acid, and phenol. Mercuric mercury separated from interfering substances acts in a similar manner, and the blue color produced by solutions of this element may be used for the colorimetric determination of mercury.

Phosphotungstic and molybdotungstic acid reagents can be substituted for the above reagent.

Sensitiveness: 2 : 1,000,000.

Ref. Snell I, pp. 183-184

PHOSPHOTUNGSTOMOLYBDIC ACID REAGENT (PHENOLS)

See: Folin-Denis reagent (Phenols).

PHOSPHOTUNGSTOMOLYBDIC ACID REAGENT (TYROSINE)

See: Folin and Denis reagent for tyrosine (special reagent).

PHOSPHOTUNGSTOMOLYBDIC ACID REAGENT (VANILLIN)

Use: Reagent for the colorimetric determination of vanillin.

Preparation: Add 100 g. of 85 per cent phosphoric acid and 700 ml. of water to 100 g. of sodium tungstate and 20 g. of phosphomolybdic acid or its equivalent of molybdic acid. Boil for 24 hours, adding water as necessary to compensate for the loss due to evaporation. Cool the mixture and filter, and then dilute the filtrate to 1 liter.

Remarks: When this reagent is added to a solution containing vanillin an intense blue color develops, and this reaction is the basis for the Folin and Denis colorimetric method for vanillin.

Ref. Ind. Eng. Chem. **4**, 670 (1912); Jacobs, pp. 344-345

PHOSPHOVANADIC ACID SOLUTION (GRÜSS)

Use: Test reagent for vanillin and wood.

Preparation: Mix 5 g. of vanadic acid with 100 ml. of water and slowly add phosphoric acid until solution is complete.

Procedure for Test: Add a few drops of the reagent to 1 ml. of vanillin solution. Needle-shaped, reddish-brown crystals are formed. Wood is colored red-brown by the reagent, while the solution in contact with the wood is colored blue.

Ref. C. A. **15**, 2260 (1921)

PHYSIOLOGICAL SALINE

See: Physiological salt solution.

PHYSIOLOGICAL SALT SOLUTION

Use: Transfusions and experimental work.

Preparation: Dissolve 0.9 g. of sodium chloride in 100 ml. of water.

Ref. Howell, p. 429

PICRAL ETCHING SOLUTION

Use: Etchant for microscopic examination of iron and steel.

Preparation: Dissolve 4 g. of picric acid in 100 ml. of 95 per cent or absolute methyl or ethyl alcohol.

Remarks: Etching time a few seconds to about 1 minute.

Ref. Metals Handbook, p. 722

PICRIC ACID REAGENT

See: Hager's reagent (Alkaloids).

PICRIC ACID SOLUTION

See: Picral etching solution.

PICRO-FORMOL SOLUTION

See: Bouin's Fluid.

PICROLONIC ACID SOLUTION

Use: Test reagent for calcium and thorium.

Preparation: Dissolve 0.528 g. of picrolonic acid in 100 ml. of water.

Remarks: Picrolonic acid forms yellow precipitates with the alkaline earth metals and with sodium, ammonium, and potassium.

Ref. C. A. 27, 3161 (1933)

PICRO-NITRIC ACID

Use: Fixative.

Preparation: Mix 5 ml. of concentrated nitric acid with 95 ml. of water and saturate with picric acid.

PICRO-SUBLIMATE-ACETIC ACID

See: Kleinenberg-Mayer's Picro-sulfuric acid.

PIERCE'S REAGENT

Use: Test reagent for sulfur and carbon disulfide in oil.

Preparation: Dissolve 1 g. of cupric sulfate in 10-15 ml. of water, and add 4 ml. of ammonium hydroxide and 3 g. of hydroxylamine hydrochloride. Finally, dilute to 50 ml.

Procedure for Test: Dilute the oil to be tested with chloroform and place 5 ml. of this solution in a test tube. Then add 2 ml. of the test reagent, shake, and allow to stand. A black, lustrous precipitate forms if sulfur is present, and if carbon disulfide occurs in the oil, an opaque, dark solution is obtained.

Ref. Ind. Eng. Chem., Anal. Ed. 1, 227 (1929)

PLATINO-OSMIC ACID

See: Hermann's Fluid.

PLATINUM-COBALT COLOR STANDARD FOR WATER ANALYSIS

Use: Determination of color in water.

Preparation: Dissolve 1.245 g. of potassium chloroplatinate (K_2PtCl_6) (contains 0.5 g. of platinum) and 1 g. of crystallized cobaltous chloride ($CoCl_2 \cdot 6H_2O$) in 100 ml. of concentrated hydrochloric acid, and dilute to 1 liter with distilled water.

Remarks: The unit of color is that produced by 1 mg. of platinum per liter. The above solution has a color of 500. Other solutions may be prepared by proper dilution.

Ref. A.P.H.A., pp. 13-14; Am. Chem. J., **14**, 300 (1892)

PLUGGE'S SOLUTION

Use: Test reagent for gum ammoniac.

Preparation: Dissolve 3 g. of sodium hydroxide and 2 g. of bromine in water and dilute to 100 ml.

Procedure for Test: Extract the material to be tested with alcohol, and shake the alkaline extract with the test solution. A transitory violet color is a positive test.

Ref. Arch. Pharm. 221, 801 (1883)

POIRRER C 4B INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.2 g. of the indicator in 100 ml. of water.

Remarks: pH: blue 11.0-13.0 red.

POLARITY PAPER

Use: To differentiate between positive and negative terminals.

Preparation: Dissolve 1 g. of phenolphthalein in 10 ml. of alcohol and 110 ml. of water. Impregnate filter paper with this solution and while still wet, pass the paper through a 15 per cent aqueous solution of crystalline sodium sulfate, and then allow to dry.

Procedure for Test: Moisten the paper with water and place the wires about one-half inch apart. The paper is colored red about the wire attached to the negative terminal.

Ref. Handbook of Chem. and Physics, p. 2440

POLLACCI'S REAGENT

Use: Test reagent for albumin in urine.

Preparation: Dissolve 1 g. of tartaric acid and 5 g. of mercuric chloride in 100 ml. of water. Filter, and add to the filtrate 5 ml. of 37 per cent formaldehyde solution.

Remarks: A ring forms when urine containing albumin is floated on this reagent.

Ref. The Merck Index, p. 867

PONDER'S DIPHTHERIA STAIN

Use: Staining solution.

Preparation: Mix the following:

Toluidine blue	0.02 g.
Glacial acetic acid	1.00 ml.
Alcohol, 95%	2.00 ml.
Distilled water	100.00 ml.

PONDER'S DIPHTHERIA STAIN (KINYOUN'S MODIFICATION)

Use: Staining solution.

Preparation: Mix the following:

Toluidine blue	0.10 g.
Azure I	0.01 g.
Methylene blue	0.01 g.
Glacial acetic acid	1.00 ml.
Alcohol, 95%	5.00 ml.
Distilled water	120.00 ml.

Remarks: The heat-fixed film is stained for 2-7 minutes.

PONS' REAGENT

Use: Reagent for albumin.

Preparation: Dissolve 0.1 g. of the sodium salt of sulfochondroitic acid in 100 ml. of water.

Remarks: This reagent precipitates albumin from dilute acetic acid solutions. The reagent is specific for albumin.

Sensitiveness: 0.000005 mg. per ml.

Ref. C. A. 5, 1121 (1911)

POTASSIUM ACETATE SOLUTIONS

Reagent: $KC_2H_3O_2$, mol. wt. = 98.14.

Preparation:

0.5 Molar: Dissolve 49.1 g. of potassium acetate in water and dilute to 1 liter.

1.0 Normal: Dissolve 98.1 g. of potassium acetate in water and dilute to 1 liter.

10 mg. of potassium ion per ml. of solution: Dissolve 25.1 g. of potassium acetate in water and dilute to 1 liter.

10 mg. of acetate ion per ml. of solution: Dissolve 16.6 g. of potassium acetate in water and dilute to 1 liter.

POTASSIUM ACID PHTHALATE SOLUTION (VOLUMETRIC REAGENT)

Reagent: $KHC_8H_4O_4$, mol. wt. = 204.22.

Preparation:

0.1 Normal (Standardized): Spread 20-21 g. of potassium acid phthalate in a thin layer on a watch glass and dry at 110°-120° C. in an electric oven for 2-3 hours. Cool in a dessicator and then weigh to the nearest milligram. Using a funnel, transfer the salt to a 1 liter volumetric flask. Then again weigh the watch glass and any adhering powder. Dissolve the salt

in the flask in a little distilled water, and then dilute to the mark with distilled water. Mix thoroughly.

The above solution is not exactly 0.1 Normal, but the normality may be calculated by means of the following equation:

$$\text{Normality} = \frac{\text{weight of salt} \times \text{purity}}{204.22}$$

POTASSIUM ANTIMONATE SOLUTION

Use: Test reagent for sodium.

Preparation: Add 22 g. of potassium antimonate to 1 liter of water and boil until the salt has almost completely dissolved. Then cool quickly and add 35 ml. of 10 per cent potassium hydroxide solution. Allow to stand for 12 hours and filter.

Remarks: Reagent causes a precipitation with alkaline solutions of sodium salts. Practically all ions interfere with this test.

Ref. Engelder, p. 177

POTASSIUM ARSENATE SOLUTIONS

Reagent: KH_2AsO_4, mol. wt. = 180.02.

Preparation:

0.5 Molar: Dissolve 90 g. of potassium arsenate in water and dilute to 1 liter.

1.0 Normal: Dissolve 60 g. of potassium arsenate in water and dilute to 1 liter.

10 mg. of arsenic per ml. of solution: Dissolve 24 g. of potassium arsenate in water and dilute to 1 liter.

10 mg. of arsenate ion per ml. of solution: Dissolve 12.9 g. of potassium arsenate in water and dilute to 1 liter.

POTASSIUM ARSENATE REAGENT (ALKALOIDS)

See: Rosenthaler-Turk's reagent.

POTASSIUM BISMUTH IODIDE REAGENT (ALKALOIDS)

See: Mangani's reagent; Dragendorff's reagent (alkaloids).

POTASSIUM BISMUTH IODIDE REAGENT (COCAINE)

See: Martini's reagent.

POTASSIUM BISMUTH IODIDE REAGENT (CHOLINE)

See: Kraut's reagent.

POTASSIUM BROMATE SOLUTION

See: Koppeschaar's solution.

POTASSIUM BROMIDE SOLUTION

Reagent: KBr, mol. wt. = 119.01.

Preparation:

0.5 Molar: Dissolve 59.5 g. of potassium bromide in water and dilute to 1 liter.

1.0 Normal: Dissolve 119 g. of potassium bromide in water and dilute to 1 liter.

10 mg. of bromide ion per ml. of solution: Dissolve 14.9 g. of potassium bromide in water and dilute to 1 liter.

POTASSIUM CADMIUM IODIDE REAGENT (ALKALOIDS)

See: Marme's reagent; Verven's reagent.

POTASSIUM CARBONATE SOLUTION

Reagent: K_2CO_3, mol. wt. = 138.2.

Preparation:

0.5 Molar: Dissolve 69.1 g. of potassium carbonate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of potassium ion per ml. of solution: Dissolve 17.7 g. of potassium carbonate in water and dilute to 1 liter.

10 mg. of carbonate ion per ml. of solution: Dissolve 23 g. of potassium carbonate in water and dilute to 1 liter.

POTASSIUM CHLORATE SOLUTIONS

Reagent: $KClO_3$, mol. wt. = 122.5.

Preparation:

0.5 Molar: Dissolve 61.3 g. of potassium chlorate in water and dilute to 1 liter.

0.5 Normal: Same as 0.5 Molar.

10 mg. of chlorate ion per ml. of solution: Dissolve 14.7 g. of potassium chlorate in water and dilute to 1 liter.

POTASSIUM CHROMATE SOLUTIONS

Reagent: K_2CrO_4, mol. wt. = 194.2.

Preparation:

0.5 Molar: Dissolve 97.1 g. of potassium chromate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of chromate ion per ml. of solution: Dissolve 16.7 g. of potassium chromate in water and dilute to 1 liter.

POTASSIUM CYANIDE SOLUTIONS

Reagent: KCN, mol. wt. = 65.11.

Preparation:

0.5 Molar: Dissolve 32.6 g. of potassium cyanide in water and dilute to 1 liter.

1.0 Normal: Dissolve 65.1 g. of potassium cyanide in water and dilute to 1 liter.

10 mg. of cyanide ion per ml. of solution: Dissolve 25 g. of potassium cyanide in water and dilute to 1 liter.

POTASSIUM DICHROMATE SOLUTIONS

Reagent: $K_2Cr_2O_7$, mol. wt. = 294.21.

Preparation:

0.1 Molar: Dissolve 29.4 g. of potassium dichromate in water and dilute to 1 liter.

0.2 Normal: Same as 0.1 Molar (not used as oxidizing agent).

10 mg. of dichromate ion per ml. of solution: Dissolve 13.8 g. of potassium dichromate in water and dilute to 1 liter.

POTASSIUM DICHROMATE SOLUTION (VOLUMETRIC REAGENT)

Reagent: $K_2Cr_2O_7$, mol. wt. = 294.21.

Preparation:

0.1 Normal (Standardized): Grind about 5 g. of pure potassium dichromate in a mortar and spread in a thin layer on a watch glass. Dry in an electric oven at 120°-140° C. for about 3-4 hours. Cool in a dessicator and weigh to the nearest mg. Use a funnel and transfer the powder to a 1 liter volumetric flask. Again weigh the watch glass and any powder which still clings to it. The quantity of potassium dichromate transferred to the flask is obtained by difference. Now add a little distilled water to the flask and shake until the dichromate is dissolved. Dilute to the mark with distilled water and shake thoroughly. The normality of this solution may be calculated from the following equation:

$$\text{Normality} = \frac{\text{weight of potassium dichromate}}{49.04}$$

In most cases it is advisable to standardize the solution to obtain greater accuracy. This is done as follows:

Weigh accurately three 0.2 g. samples of clean, bright iron wire having a purity factor of 99.8%, and transfer each to a clean 500 ml. Erlenmeyer

flask. Add to each flask 10 ml. of concentrated hydrochloric acid and cover with a small watch glass until solution is complete. Rinse off the watch glass and heat the solution to boiling. To the boiling solution, add drop by drop a solution of stannous chloride (prepared by dissolving 5 g. of stannous chloride in 10 ml. of concentrated hydrochloric acid and diluting to 100 ml.) until the solution is colorless. Do not add more than one drop of the stannous chloride solution in excess. Cool completely, and add 10 ml. of a saturated solution of mercuric chloride. Allow to stand 2 minutes and add a cold solution prepared by adding 5 ml. of 85 per cent phosphoric acid to 200 ml. of 3 *N* sulfuric acid. Now add 6-8 drops of sodium diphenylamine sulfonate solution and titrate with the dichromate solution to the first appearance of a purple or violet tinge. The titration should be carried out slowly. A blank determination should also be made. Calculate the normality from the following equation:

$$\text{Normality} = \frac{\text{weight of iron} \times \text{purity of iron}}{\text{volume of dichromate} \times 0.05584}$$

POTASSIUM DICHROMATE ETCHING SOLUTION

Use: Etching solution for copper, copper alloys of beryllium, manganese, silicon, nickel, silver, bronzes, and other copper alloys.

Preparation: Dissolve the following in 100 ml. of water:

Potassium dichromate	2 g.
Sodium chloride, sat. aq. soln.	4 ml.
Sulfuric acid (sp. gr. 1.84)	8 ml.

Remarks: This etch is followed by ferric chloride or other contrast etch.

Ref. Metals Handbook, p. 1472

POTASSIUM DITHIOOXALATE SOLUTION

Use: Reagent for the colorimetric determination of nickel.

Preparation: Dissolve 0.1 g. of potassium dithiooxalate in 100 ml. of water.

Remarks: Reagent causes a bluish-red color with solutions containing nickel. Manganese interferes if present in quantity. Iron and cobalt must be absent. Other ions give colors. Solution should be freshly prepared every few days.

Ref. Snell I, pp. 317-319; Yoe I, pp. 298-303

POTASSIUM FERRICYANIDE SOLUTIONS

Reagent: $K_3Fe(CN)_6$, mol. wt. = 329.24

Preparation:

0.5 Molar: Dissolve 164.6 g. of potassium ferricyanide in water and dilute to 1 liter.

1.0 Normal: Dissolve 109.7 g. of potassium ferricyanide in water and dilute to 1 liter.

10 mg. of ferricyanide ion per ml. of solution: Dissolve 15.6 g. of potassium ferricyanide in water and dilute to 1 liter.

POTASSIUM FERROCYANIDE SOLUTIONS

Reagent: $K_4Fe(CN)_6 \cdot 3H_2O$, mol. wt. = 422.38.

Preparation:

0.5 Molar: Dissolve 211.2 g. of potassium ferrocyanide in water and dilute to 1 liter.

1.0 Normal: Dissolve 105.6 g. of potassium ferrocyanide in water and dilute to 1 liter.

10 mg. of ferrocyanide ion per ml. of solution: Dissolve 20 g. of potassium ferrocyanide in water and dilute to 1 liter.

POTASSIUM HYDROXIDE SOLUTION

Use: For absorption of carbon dioxide.

Preparation: Dissolve 360 g. of potassium hydroxide in water and dilute to 1 liter.

Ref. Handbook of Chem. and Physics, p. 1313

POTASSIUM HYDROXIDE SOLUTIONS

Reagent: KOH (83-86% KOH) mol. wt. = 56.1.

Preparation:

1.0 Molar: Dissolve 64 g. of potassium hydroxide in water and dilute to 1 liter.

1.0 Normal: Same as 1.0 Molar.

POTASSIUM HYDROXIDE SOLUTION (VOLUMETRIC REAGENT)

Reagent: KOH (contains water and some K_2CO_3).

Preparation:

1.0 Normal (Standardized): Dissolve 64 g. of potassium hydroxide (85% KOH or better) in water and dilute to 1 liter. Standardize by titrating weighed 0.6-0.8 g. portions of potassium acid phthalate dissolved in 100 ml. of water, using phenolphthalein as an indicator.

POTASSIUM IODATE SOLUTION (VOLUMETRIC REAGENT)

Reagent: KIO_3, mol. wt. = 214.02.

Preparation:

0.1 Normal: Dry about 4-5 g. of potassium iodate in an oven at 120° C. and cool in a dessicator. Now weigh out exactly 3.567 g. of the iodate and add about 15 g. of potassium iodide, dissolved in distilled water, and then dilute to exactly 1 liter.

Remarks: This solution can be used as a standard if the iodate is pure and accurately weighed.

Ref. Volumetric Iodate Methods, Chem. Cat. Co. (1926)

POTASSIUM IODATE REAGENT

Use: Test reagent for barium, calcium, and strontium.

Preparation: Dissolve potassium iodate in 100 ml. of water to form a saturated solution.

Remarks: Barium and strontium iodates are practically insoluble in an excess of potassium iodate solution.

Ref. J. Am. Chem. Soc. **28**, 1596 (1906)

POTASSIUM IODATE REAGENT (THORIUM)

See: Meyer's reagent.

POTASSIUM IODIDE SOLUTIONS

Reagent: KI, mol. wt. = 166.02.

Preparation:

0.5 Molar: Dissolve 83 g. of potassium iodide in water and dilute to 1 liter.

1.0 Normal: Dissolve 166 g. of potassium iodide in water and dilute to 1 liter.

10 mg. of iodide ion per ml. of solution: Dissolve 13.1 g. of potassium iodide in water and dilute to 1 liter.

POTASSIUM IODIDE-STARCH PAPER

Use: A test reagent for oxidizing agents, such as chlorine, bromine, nitrous acid, and ozone.

Preparation: Rub 2 g. of soluble starch to a thin paste with a little water, and add 100 ml. of boiling water. Boil for about 5 minutes and add 1 g. of potassium iodide. Impregnate filter paper with this solution, and allow to dry in an acid-free atmosphere.

Remarks: This paper is turned blue by oxidizing agents.

Ref. Dennis, p. 189

POTASSIUM MERCURIC IODIDE REAGENT (ALKALOIDS)

See: Mayer's solution; Tanret's reagent (alkaloids); Valser's reagent.

POTASSIUM MERCURIC IODIDE REAGENT (BRÜCKE)

Use: Reagent for protein substances.

Preparation: Saturate a boiling 10 per cent solution of potassium iodide with freshly precipitated mercuric iodide. Allow the mixture to cool and then filter.

Remarks: This reagent causes the precipitation of proteins from acidified solutions.

Ref Handbook of Chem. and Physics, p. 1313

POTASSIUM MERCURIC IODIDE REAGENT (COLCHICINE)

See: Johannson's reagent.

POTASSIUM NITRATE SOLUTIONS

Reagent: KNO_3, mol. wt. = 101.1.

Preparation:

0.5 Molar: Dissolve 50.6 g. of potassium nitrate in water and dilute to 1 liter.

1.0 Normal. Dissolve 101.1 g. of potassium nitrate in water and dilute to 1 liter.

10 mg. of potassium ion per ml. of solution: Dissolve 25.8 g. of potassium nitrate in water and dilute to 1 liter.

10 mg. of nitrate ion per ml. of solution: Dissolve 16.3 g. of potassium nitrate in water and dilute to 1 liter.

POTASSIUM NITRITE SOLUTIONS

Reagent: KNO_2, mol. wt. = 85.10.

Preparation:

1.0 Molar: Dissolve 85.1 g. of potassium nitrite in water and dilute to 1 liter.

1.0 Normal: Same as 1.0 Molar.

10 mg. of nitrite ion per ml. of solution: Dissolve 18.5 g. of potassium nitrite in water and dilute to 1 liter.

POTASSIUM p-NITRODIAZOBENZENE SOLUTION (DADDI)

Use: Test reagent for bilirubin.

Preparation: Dissolve 0.1 g. of potassium p-nitrodiazobenzene in 100 ml. of water.

Procedure for Test: Mix 2 ml. of the solution to be tested with 2 ml. of the reagent and acidify with acetic acid. A pink to red color indicates the presence of bilirubin.

Ref. C. A. 27, 2972 (1933)

POTASSIUM OLEATE REAGENT (LIDOW)

Use: Reagent for the determination of hardness in water.

Preparation: Dissolve 10.08 g. of pure oleic acid in 500 ml. of 96 per cent alcohol, and add 1 ml. of 0.5 per cent phenolphthalein solution. Now dissolve 2.5 g. of potassium hydroxide in 100 ml. of water and 100 ml. of alcohol, and add this solution to the oleic acid solution until a red color appears. Finally, dilute with alcohol to 1 liter.

Ref. Chem.-Ztg. 1906, Rep. 156

POTASSIUM OXALATE SOLUTIONS

Reagent: $K_2C_2O_4 \cdot H_2O$, mol. wt. = 184.23.

Preparation:

0.5 Molar: Dissolve 92.1 g. of potassium oxalate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of oxalate ion per ml. of solution: Dissolve 20.9 g. of potassium oxalate in water and dilute to 1 liter.

POTASSIUM PALMITATE SOLUTION

Use: Reagent for the determination of the hardness of water.

Preparation: Place in a 2-liter flask 500 ml. of 95 per cent alcohol, 300 ml. of distilled water, 0.1 g. of phenolphthalein, and 25.6 g. of pure palmitic acid. Warm the mixture on a steam bath and add slowly and with constant swirling, a solution prepared by dissolving 7-8 g. of powdered potassium hydroxide in 50 ml. of hot 95 per cent alcohol. The alcoholic potassium hydroxide solution is added until the palmitic acid is dissolved and the mixture turns a pale rose color. Cool the palmitate mixture and dilute to 1 liter with 95 per cent ethyl alcohol, propyl alcohol, or neutral glycerol. The latter two liquids are to be recommended since the potassium palmitate does not separate from the solution so formed even at 0° C. Filter the mixture after several days. This solution is standardized against lime water of known strength.

Ref. Kolthoff and Furman, pp. 180-182

POTASSIUM PERMANGANATE SOLUTIONS

Reagent: $KMnO_4$, mol. wt. = 158.03.

Preparation:

0.1 Molar: Dissolve 15.8 g. of potassium permanganate in water and dilute to 1 liter.

0.1 Normal: Same as 0.1 Molar (not used as an oxidizing agent).

10 mg. of permanganate ion per ml. of solution: Dissolve 14.5 g. of potassium permanganate in water and dilute to 1 liter.

POTASSIUM PERMANGANATE SOLUTION (VOLUMETRIC REAGENT)

Reagent: $KMnO_4$, mol. wt. = 158.03.

0.1 Normal (*Standardized*): Dissolve 3.3 g. of dry potassium permanganate in 1 liter of distilled water and allow to stand 2 or 3 days in a glass-stoppered bottle. Place the bottle where it will not be disturbed. Then carefully siphon the solution through a clean glass tube into a beaker or glass-stoppered bottle. Discard the first 25 ml. to siphon over, and do not remove the last inch from the bottle, since this contains any precipitated manganese dioxide. The permanganate solution should not be permitted to come into contact with rubber tubing or stoppers, or with filter paper or other organic material. This solution is now standardized as follows:

Weigh several 0.25-0.30 g. samples of sodium oxalate (assay value of 99.95%) and transfer each portion to a 600 ml. beaker, and dissolve in 250 ml. of 5 per cent sulfuric acid. Stir until solution is complete, and then add rapidly from a burette about 95 per cent of the amount of potassium permanganate solution required to react completely with the oxalate sample. This quantity may be determined by a preliminary approximate titration. Allow the mixture to stand until the permanganate is decolorized, and then heat to 55°-60° C. At this temperature complete the titration, stirring gently with a thermometer, and allowing time for each drop to be decolorized before adding the next. The end point is reached when a faint pink color persists for 30 seconds after the addition of the last drop of permanganate solution. A blank determination should be run on 250 ml. of 5 per cent sulfuric acid at 55°-60° C. Calculate the normality of the solution from the net amount of permanganate solution used by means of the following equation:

$$\text{Normality} = \frac{\text{weight of sodium oxalate} \times \text{purity}}{\text{volume of permanganate} \times 0.0067}$$

Ref. Kolthoff and Sandell, pp. 563-565

POTASSIUM PLATINOCYANIDE REAGENT (ALKALOIDS)

See: Delff's reagent.

POTASSIUM PLUMBITE REAGENT (LASSAIGNE)

Use: Test reagent for wool and silk.

Preparation: Dissolve 10 g. of lead acetate in 100 ml. of water, and then add a solution of potassium hydroxide until the precipitate which first forms just dissolves.

Remarks: Wool fiber turns brown when treated with this reagent, while silk remains uncolored.

Ref. The Merck Index, p. 804

POTASSIUM PYROGALLATE SOLUTION

Use: For the absorption of oxygen.

Preparation:

Solution 1: (To be used when mixture of gases contains less than 28 per cent oxygen): Dissolve 5 g. of pyrogallol in 100 ml. of a solution prepared by dissolving 50 g. of potassium hydroxide in 100 ml. of water.

Solution 2: (To be used when mixture of gases contains more than 28 per cent oxygen): Dissolve 5 g. of pyrogallol in 100 ml. of a solution prepared by dissolving 120 g. of potassium hydroxide in 100 ml. of water.

Ref. Dennis, pp. 174-181; Ind. Eng. Chem. 7, 587 (1915)

POTASSIUM RUTHENATE OR POTASSIUM PERRUTHENATE SOLUTION

Use: Test reagent for alkaloids.

Preparation: Dissolve 1 g. of either potassium ruthenate or potassium perruthenate in 20 ml. of concentrated sulfuric acid.

Remarks: Reagent gives color reactions as follows:

Solanine: red
Ononin: immediate red-brown
Chelidonine: green
Imperatorine: blue changing to green.

Ref. Pharm. Post 1889, 892

POTASSIUM SODIUM TARTRATE SOLUTIONS

Reagent: $KNaC_4H_4O_6 \cdot 4H_2O$, mol. wt. = 282.19.

Preparation:

0.5 Molar: Dissolve 141.2 g. of potassium sodium tartrate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of tartrate ion per ml. of solution: Dissolve 19 g. of potassium sodium tartrate in water and dilute to 1 liter.

POTASSIUM SULFATE SOLUTIONS

Reagent: K_2SO_4, mol. wt. = 174.25.

Preparation:

0.25 Molar: Dissolve 43.6 g. of potassium sulfate in water and dilute to 1 liter.

0.25 Normal: Dissolve 21.8 g. of potassium sulfate in water and dilute to 1 liter.

10 mg. of potassium ion per ml. of solution: Dissolve 22.2 g. of potassium sulfate in water and dilute to 1 liter.

10 mg. of sulfate ion per ml. of solution: Dissolve 18.2 g. of potassium sulfate in water and dilute to 1 liter.

POTASSIUM THIOCARBONATE SOLUTION

Use: Reagent for the detection and colorimetric determination of nickel.

Preparation: Dissolve 4 g. of potassium thicarbonate in water and dilute to 100 ml.

Remarks: This reagent gives a rose-red to brown-red color when added to an ammoniacal solution of a nickel salt. This color can be used for the colorimetric determination of nickel.

Ref. Yoe I, p. 296

POTASSIUM THIOCYANATE SOLUTIONS

Reagent: KSCN, mol. wt. = 97.16.

Preparation:

0.5 Molar: Dissolve 48.6 g. of potassium thiocyanate in water and dilute to 1 liter.

1.0 Normal: Dissolve 97.2 g. of potassium thiocyanate in water and dilute to 1 liter.

10 mg. of thiocyanate ion per ml. of solution: Dissolve 16.8 g. of potassium thiocyanate in water and dilute to 1 liter.

POTASSIUM THIOCYANATE SOLUTION (COBALT REAGENT)

Use: Test reagent for cobalt.

Preparation: Add enough potassium thiocyanate to 100 ml. of water to form a saturated solution (about 200 g.).

Remarks. Reagent causes a deep blue color when added to a hydrochloric acid solution of cobaltous ions. Color is best observed when extracted with 1 : 6 amyl alcohol-ether solution. Iron interferes but may be removed with sodium fluoride.

Ref. Engelder, pp. 159-160

POTASSIUM THIOCYANATE (VOLUMETRIC REAGENT)

Reagent: KSCN, mol. wt. = 97.164.

Preparation: Recrystallize reagent quality potassium thiocyanate twice from water. Dry first in a desiccator at room temperature, and then in an oven at 120°-150° C. The last trace of water can be removed by fusing the salt for three minutes at 190°-200° C. Weigh accurately 9.712 g. of the purified salt, dissolve in a little distilled water, and then dilute to 1 liter. This solution is exactly 0.1 *N* and is quite stable.

Ref. Kolthoff and Sandell, p. 540

POTASSIUM XANTHATE REAGENT

Use: Reagent for the detection and determination of molybdenum.

Preparation: Prepare 100 ml. of a saturated solution of potassium hydroxide in absolute ethyl alcohol, and shake with carbon disulfide in excess until no further reaction occurs. A small amount of carbon disulfide should be left in the bottle containing the solution.

Procedure for Test: Add a few drops of the reagent to a neutral solution containing a small quantity of molybdenum and then make the mixture acid. A red colored complex is formed. For colorimetric determinations this colored compound is extracted with chloroform.

Ref. J. Am. Chem. Soc. **44**, 1462 (1922); Snell I, p. 383

POTATO JUICE

Use: Culture medium.

Preparation: Add 1 pound of grated white potatoes to 1 liter of water and allow to soak overnight. Heat to boiling and press through cheese-cloth. Then add 1 egg for each liter of juice, and filter through cotton into flasks. Heat in an autoclave at 15 pounds pressure for 30 minutes.

POTATO JUICE AGAR

Use: Culture medium.

Preparation: Prepare a veal agar and add 5 per cent potato juice and 5 per cent glycerol. Heat in an autoclave at 15 pounds pressure for 30 minutes.

POTATO JUICE BROTH

Use: Culture medium.

Preparation: Mix equal parts of potato juice and beef infusion broth, and add peptone and sodium chloride as in beef infusion broth. Heat in an autoclave at 15 pounds pressure for 30 minutes.

POTATO MEDIUM

Use: Culture medium for differentiation of bacteria.

Preparation: Scrub a number of large white potatoes thoroughly and pare. Wash in running water, and with the aid of a cork borer cut into cylinders. Cut each of these cylinders obliquely so as to form wedge-shaped pieces. Wash in running water overnight, or soak for several hours in a 1:1000 sodium carbonate solution. Place a small piece of cotton on the bottom of each of several test tubes, and then to each add 1 of the wedge-shaped pieces of potato. Add water to cover the butt. Heat in an autoclave at 15 pounds pressure for 30 minutes.

Ref. Kolmer and Boerner, pp. 373-374

POUGET-CHOUCHAK'S REAGENT

See: Strychnine-molybdate reagent.

PREBULA-McCOLLUM REAGENT

Use: Reagent for vitamin B_1.

Preparation: Diazotize a solution of either methyl-p-aminophenylketone or p-aminoacetanilid by the usual method with nitrous acid.

Remarks: Either of the above compounds formed by diazotization produces with vitamin B_1 a characteristic reddish-purple compound. This compound is insoluble in water, and can be extracted quantitatively with xylene.

Ref. Science **84**, 488 (1936)

PRIMOT'S REAGENT

Use: Test reagent for cryogenine and antipyrine.

Preparation:. Dissolve 1 g. of vanillin and 6 g. of hydrochloric acid in 100 ml. of alcohol.

Remarks: Reagent causes an orange-yellow residue when evaporated on a water bath with a few mg. of antipyrine. Cryogenine causes a green-yellow color.

Ref. Répert. de pharm. 1909, 306

PRIMOT'S REAGENT (NITRITE)

Use: Test reagent for nitrite in water.

Preparation: Dissolve 1 g. of o-tolidine, benzidine, or dianisidine in 100 g. of 30-40 per cent alcohol.

Procedure for Test: Add 5 drops of the reagent and 5 drops of acetic acid to 10 ml. of the water to be tested. A yellow color forms if nitrites are present. With the o-tolidine reagent, the color changes to orange-yellow, and with dianisidine to orange-red.

Sulfates and free mineral acids must first be removed before making test.

Sensitiveness: 10 mg. nitrous acid per liter.

Ref. C. A. 7, 1069 (1913)

PROČKE-UZEL'S REAGENT

Use: Test reagent for lithium.

Preparation: Dissolve 2 g. of potassium periodate in 10 ml. of a freshly prepared 2 *N* solution of potassium hydroxide. Dilute with water to 50 ml., and add 3 ml. of a 10 per cent solution of ferric chloride. Finally, dilute to 100 ml. with 2 *N* potassium hydroxide solution.

Procedure for Test: Add 1 drop of reagent to 1 drop of the neutral solution to be tested. A yellow precipitate or turbidity develops if lithium is present. Sodium may cause trouble if present in quantity.

Sensitiveness: 0.25 γ lithium.

Ref. C. A. 32, 5329 (1938)

PROESCHER'S OIL RED-PYRIDINE SOLUTION

Use: Staining solution for fats.

Preparation: Mix 3-5 g. of Oil Red O with 100 ml. of 70 per cent pyridine and allow to stand for one hour at room temperature. Stir occasionally during this interval.

Remarks: Store in a glass-stoppered bottle that is protected from light. Filter before use.

Ref. Biol. Stains, Conn p. 49

PURPURIN SOLUTION (KERSHNER-DUFF)

Use: Test reagent for aluminum.

Preparation: Dissolve 0.4 g. of purpurin and 0.01 g. of gum sandarac in 1 liter of ether.

Procedure for Test: Pour 5 ml. of 6 *N* ammonium hydroxide over the washed precipitate of group III. Add 10 ml. of *N* ammonium chloride and 1 ml. of the reagent. Shake well, and if aluminum is present a pink foam collects above the solution.

Sensitiveness: 0.001 mg. aluminum.

Ref. J. Chem. Ed. 9, 1271 (1932); C. A. 4007 (1932)

PYRAMIDONE REAGENT (IRON)

Use: Reagent for the determination of iron.

Preparation: Dissolve 10 g. of pyramidone in 90 ml. of 0.2 *N* sulfuric acid.

Remarks: This reagent gives a blue color with solutions containing small quantities of iron.

Sensitiveness: 0.05 mg. iron per 100 ml.

Ref. Snell I, pp. 309-310

PYRAMIDONE REAGENT (OXIDIZING AGENTS)

Use: Reagent for chlorine and oxidizing agents.

Preparation: Dissolve 10 g. of pyramidone in 100 ml. of alcohol and acidify slightly with acetic acid.

Remarks: A violet to violet-red color is obtained when chlorine is passed through this solution. Bromine and the oxides of nitrogen give the same reaction.

Sensitiveness: This test is slightly less sensitive than the starch-iodide reagent.

Ref. C. A. 34, 4355 (1940)

PYRIDINE REAGENT

Use: Test reagent for gold.

Preparation: Dissolve 1 volume of pyridine in 9 volumes of 40 per cent hydrobromic acid.

Remarks: This reagent causes the formation of orange to maroon colored crystals with gold (ic) ions in an acid solution.

Sensitiveness: 0.01%.

Ref. Short, Microscopic Determination of the Ore Minerals, Bull. 825 U. S. Geol. Survey, Pt. 4 Microscopical Methods (1931)

PYROGALLOL SOLUTION

See: Fearon's reagent.

PYRONIN-METHYL GREEN

See: Pappenheim-Saathoff Pyronin-Methyl Green.

QUINALDINE RED INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of quinaldine red in 100 ml. of alcohol.

Remarks: pH: colorless 1.4-3.2 red.

QUINALIZARIN REAGENT (BERYLLIUM)

Use: Reagent for beryllium.

Preparation: Dissolve 0.1 g. of quinalizarin in 100 g. of alcohol, or dissolve 0.05 g. of quinalizarin in 100 g. of 0.1 *N* ammonium hydroxide.

Procedure for Test: Add 0.1 ml. of the reagent to 10 ml. of the solution to be tested and add 6-8 drops of 4 *N* ammonium hydroxide. Boil and allow to stand for 5 minutes. A dark blue precipitate or color appears if beryllium is present.

Ref. J. Am. Chem. Soc. **50**, 393 (1928)

QUINALIZARIN REAGENT (MAGNESIUM)

Use: Reagent for magnesium.

Preparation: Dissolve 0.1 g. of quinalizarin in 1 liter of alcohol.

Procedure for Test: Add a few drops of the reagent to a neutral or slightly acid solution to be tested, and then add 2 *N* sodium hydroxide drop by drop until the solution is alkaline. A blue color or precipitate forms with magnesium.

Remarks: This reagent is not as sensitive or specific as other magnesium reagents such as oxine. The alkaline earth metals, and metals of the hydrogen sulfide groups must be removed by precipitation before this test can be used.

Ref. C. A. **29**, 7214 (1935); **30**, 4116 (1936)

QUINALIZARIN REAGENT (PIETSCH-ROMAN)

Use: Test reagent for gallium, indium, and thallium.

Preparation: Dissolve 5 g. of quinalizarin in 100 ml. of concentrated ammonium hydroxide.

Procedure for Test: Add 1 ml. of a saturated solution of ammonium chloride to 1 ml. of a neutral solution to be tested, and then add 6-8 drops of the reagent. A precipitate forms at once if indium, gallium, or thallium is present.

Sensitiveness: Indium: 0.0007 mg. per ml.
Gallium: 0.008 mg. per ml.
Thallium: 1.000 mg. per ml.

Ref. C. A. **29**, 1742 (1935)

QUININE-ARSENOMOLYBDATE REAGENT

Use: Reagent for the nephelometric determination of arsenic.

Preparation:

Solution 1: Dissolve 3.5 g. of sodium carbonate in 50 ml. of water in a 100 ml. volumetric flask. Add 9.5 g. of molybdic oxide and heat on a water bath until solution is complete. Cool, and dilute to the mark.

Solution 2: Add 5 ml. of concentrated nitric acid to 1.3207 g. of arsenious oxide and evaporate nearly to dryness on a water bath. Dissolve in water and dilute to 1 liter. Now dilute 10 ml. of this solution to 1 liter.

Dissolve 0.5 g. of neutral quinine hydrochloride in 10 ml. of distilled water and add 5 ml. of *Solution 2.* Next add 10 ml. of 1 : 3 nitric acid and then 1 ml. of *Solution 1.* Stir constantly while adding the sodium molybdate solution (*Solution 1*). Dilute this cloudy solution to 120 ml. Mix well and filter through paper that has been washed with nitric acid and then water.

Remarks: This solution gives a colloidal sol with arsenic, and since it is already saturated with quinine arsenomolybdate it is extremely sensitive. This solution keeps for several months.

Ref. Analyst, **47**, 317 (1922); Snell I, pp. 242-243

QUININE-POTASSIUM IODIDE REAGENT

See: Aubry's reagent.

QUINODINE IODIDE REAGENT

See: De Vrij's solution.

QUINOLINE BLUE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 1.0 g. of quinoline blue (cyanin) in 100 ml. of alcohol.

Remarks: pH: colorless 6.6-8.6 blue.

QUINOLINE BLUE STAIN

See: Cyanin Stain (Quinoline blue).

QUINOLINE-POTASSIUM IODIDE REAGENT

Use: Test reagent for bismuth.

Preparation: Dissolve 1 g. of quinoline in 100 ml. of alcohol, and add 20 ml. of 25 per cent potassium iodide solution.

Procedure for Test: Place a few drops of the solution to be tested on a spot plate. Acidify slightly and add a drop of sodium acetate solution, and then add 1 drop of the test reagent. An orange-red precipitate forms if bismuth is present. Mercury, silver, copper, lead, antimony, and iron form colored precipitates with the reagent, but only copper and iron interfere with the test. A drop of sodium bisulfite removes this interference.

Sensitiveness: 1 : 50,000.

Ref. C. A. **30**, 784 (1936); Belcher and Williams, p. 82

1-(2-QUINOLYL)-4-ALLYLTHIOSEMICARBAZIDE SOLUTION

Use: Test reagent for cadmium.

Preparation: Mix 10 ml. of allylisothiocyanate and 16 g. of quinolylhydrazine in ether and recrystallize.

To prepare the test solution, dissolve 0.05 g. of the crystals in 100 ml. of 50 per cent alcohol.

Procedure for Test: Boil the solution remaining after the separation of copper and cadmium from bismuth in the usual analytical procedure until all ammonia is removed. Precipitate the sulfate with barium chloride, and any copper with a saturated solution of potassium iodide. Without filtering, add a few drops of the test reagent. A bright yellow-green precipitate forms if cadmium is present. Ammonia and sulfate must be absent.

Sensitiveness: 1 : 1,000,000.

Ref. J. Am. Chem. Soc. **57**, 2541 (1935)

RABL'S FLUID

Use: Fixative.

Preparation: Mix the following:

Picric acid, saturated aq. soln.	10 ml.
Mercuric chloride, saturated aq. soln.	10 ml.
Distilled water	20 ml.

RABL'S CHROMO-FORMIC ACID

Use: A fixative for animal tissues.

Preparation: Dissolve 0.3 g. of chromium trioxide and 2 drops of formic acid in 100 ml. of water.

RAIKOW'S REAGENT

Use: Test reagent for sulfur in organic compounds.

Preparation: Dissolve 1 g. of vanillin and 1 g. of phloroglucinol in 100 ml. of ether and impregnate filter paper with this reagent.

Procedure for Test: Burn the material suspected of containing sulfur, and hold the moist test paper in the combustion gases. The paper turns red if the compound contained sulfur.

Ref. Zeitschr. anal. Chem. 1906, 726; 1910, 701

RANVIER'S PICROCARMINE

Use: For double staining.

Preparation: Dissolve 1 g. of carmine and 2 g. of picric acid in 100 ml. of water, and add 5 ml. of ammonium hydroxide.

Remarks: Nuclei are colored red; keratohyalin, red; connective tissue, rose-red; elastic fibers and keratin, yellow; and muscular fiber, brownish-red.

RATH'S FLUID

Use: Fixative.

Preparation: Mix the following:

Picric acid, saturated aq soln.	10 ml.
Mercuric chloride, hot, sat. aq. soln.	10 ml.
Glacial acetic acid	5-10 ml.

REES AND ECKER'S FLUID

Use: Fluid for diluting blood.

Preparation: Mix the following:

Brilliant cresyl blue	0.1 g.
Formalin	0.2 ml.
Sodium citrate, 3.8% aq. soln.	100.0 ml.

Filter before using.

Ref. Kolmer and Boerner, p. 99

REGAUD'S HEMATOXYLIN

Use: Nuclear stain.

Preparation: Dissolve 1 g. of hematoxylin in 80 ml. of hot, distilled water and cool. Then add 10 ml. of 95 per cent ethyl alcohol and 10 ml. of glycerol.

Remarks: Sections to be stained with this solution are first mordanted with a solution prepared by dissolving 5 g. of iron alum in 100 ml. of distilled water.

Ref. Kolmer and Boerner, p. 835

RENAUT'S HEMATOXYLIN-GLYCEROL

Use: For the rapid staining of nuclei.

Preparation: Mix 50 ml. of alcohol, 50 ml. of glycerol, and 50 ml. of water, and dissolve in this mixture 1 g. of hematoxylin and 1 g. of alum. Allow to stand exposed to air and light until the odor of alcohol disappears.

RENTELN'S SOLUTION

Use: Test reagent for alkaloids.

Preparation: Dissolve 3 g. of sodium selenate in 80 ml. of water and add 60 ml. of concentrated sulfuric acid.

Remarks: Reagent produces various color reactions with the different alkaloids.

RESORCINOL REAGENT (EICHLER)

Use: Test reagent for nitrate, nitrite, and nitrosylsulfuric acid.

Preparation: Dissolve 0.5 g. of resorcinol in 100 g. of sulfuric acid which is free of nitrosylsulfuric acid.

Procedure for Test: Add about 1 ml. of the reagent to 5 ml. of the solution to be tested and heat until fumes of sulfur trioxide are evolved. The heating is discontinued if a color appears. Cool, and very cautiously add 5 ml. of water, and then neutralize with sodium carbonate. A violet color appears if nitrate or nitrite is present.

The same color is formed if nitrosylsulfuric acid is present in the sulfuric acid. Oxidizing agents, ferric iron, and sulfides interfere.

Sensitiveness: 0.02 mg. $NaNO_3$.

Ref. C. A. **28**, 1953-1954 (1934)

RESORCINOL REAGENT (FIEHE)

Use: Test reagent for artificial honey.

Preparation: Dissolve 1 g. of resorcinol in 100 g. of concentrated hydrochloric acid.

Procedure for Test: Grind a little of the honey in a mortar with 5-10 g. of ether and then pour off the ether into a clean vessel. Evaporate the ether to dryness and add a few drops of the reagent to the residue. Invert sugar, which is present in artificial honey, causes a violet-red coloration.

Ref. Leach, p. 674

RESORCINOL REAGENT (MOHLER)

Use: Test reagent for tartaric acid.

Preparation: Dissolve 1 g. of resorcinol in 100 g. of concentrated sulfuric acid.

Procedure for Test: Heat the material to be tested with 1 ml. of this reagent to 125° C. If the material contains tartaric acid, a red color develops.

Sensitiveness: 0.01 mg. of tartaric acid.

Ref. Bull. soc. chim. **4**, 728

RESORCYLALDOXIME SOLUTION

Use: Test reagent for iron.

Preparation: Dissolve 0.2 g. of resorcylaldoxime in 100 g. of 5 per cent alcohol.

Remarks: Reagent causes a purple color with ferric ions.

Sensitiveness: 0.3 p.p.m.

Ref. C. A. **31**, 6130 (1937)

RHODAMINE B SOLUTION

Use: Test reagent for pentavalent antimony. Also reagent for tungstates.

Preparation: Dissolve 0.01 g. of rhodamine B (tetraethylrhodamine) in 100 ml. of water.

Procedure for Test: Place a few drops of the solution to be tested on a spot plate and add a few crystals of potassium nitrite and a drop of hydrochloric acid to oxidize the antimony to the antimonic ion. Wait until all action has ceased, and add 1 drop of the reagent. The color of the dye changes from a bright red to a blue-violet in the presence of pentavalent antimony. Bismuth, mercury, and tungstates give a similar color change.

Ref. C. A. **21**, 1779 (1927); Engelder, p. 137

RHODES' REAGENT

Use: Reagent for oxycellulose in artificial silk.

Preparation: Dissolve 20 g. of mercuric iodide and 16 g. of potassium iodide in 100 ml. of water and add 1 liter of 3 *N* sodium hydroxide solution. Let the mixture stand 24 hours and filter through glass wool.

Procedure for Test: Clean the samples of cloth well to remove starch and other impurities, and then boil them for 1 minute in the reagent. Remove from the solution and rinse with 1 per cent potassium iodide solution, and finally wash well with cold water. Dark stains appear on the white background of the fabric if oxycellulose is present.

Ref. J. Textile Inst. 20 T55 (1929)

RICE'S BROMINE SOLUTION

Use: For the determination of urea.

Preparation: Dissolve 12.5 g. of sodium bromide and 12.5 g. of bromine in water and dilute to 100 ml.

Remarks: Use with sodium hydroxide solution (d. 1.25) for urea determination.

RICHARDSON'S REAGENT

See: Titanium sulfate solution.

RICINOLEATE REAGENT

Use: Reagent used for the determination of calcium in urine, feces, blood, milk, etc.

Preparation: Dissolve 15 g. of potassium hydroxide in 125 ml. of 80 per cent alcohol. Warm and add 100 ml. of castor oil. Place in a flask equipped with a reflux condenser and heat on a boiling water bath until the oil dissolves completely in the alcoholic layer. The period of refluxing requires about 7 hours. This is the stock solution.

The diluted reagent is prepared as follows: Pipette 35 ml. of the stock solution into a liter flask, and add a solution prepared by dissolving 9 g. of sodium hydroxide in 500 ml. of water. Dilute to 1 liter and mix well. This reagent should be perfectly clear. It keeps about 1 week.

Remarks: This reagent forms an insoluble soap with solutions of calcium ions. Magnesium and other metals interfere.

Ref. Snell I, pp. 451-452

RIEGEL'S PAPER

See: Congo red paper.

RIEGLER'S REAGENT (ALBUMIN)

Use: Test reagent for albumin.

Preparation: Dissolve 5 g. of β-naphthalenesulfonic acid in 100 ml. of alcohol and filter.

Procedure for Test: Add 20-30 drops of the reagent to 5 ml. of urine. A precipitate forms if albumin is present. Peptones and albumoses also cause precipitates with this reagent, but these precipitates dissolve on warming. The precipitate formed with albumin does not.

Sensitiveness: 1 : 40,000.

Ref. The Merck Index, p. 880

RIEGLER'S REAGENT (AMMONIA)

Use: Test reagent for ammonia.

Preparation: Mix 1 g. of p-nitroaniline with 2 ml. of hydrochloric acid and 20 ml. of water and heat until solution is complete. Add 160 ml. of water; and, after cooling, add 20 ml. of water in which is dissolved 0.5 g. of sodium nitrite.

Procedure for Test: Mix 10 ml. of the solution with 10-15 drops of the reagent, and then add 10 per cent sodium hydroxide solution drop by drop. A red to yellow color forms if ammonia, or compounds which are capable of forming ammonia, are present. The color is discharged by sulfuric acid.

Sensitiveness: 0.0007 mg. NH_3.

Ref. Chem.-Ztg. 1897, Rep. 307

RIEGLER'S REAGENT (BILE PIGMENTS)

Use: Reagent for bile pigments in urine.

Preparation:

Solution A: Dissolve 5 g. of p-nitroaniline in 25 ml. of water and 6 ml. of concentrated sulfuric acid, and then add 100 ml. of water.

Solution B: Dissolve 3 g. of sodium nitrite in about 25 ml. of water and dilute to 250 ml.

Procedure for Test: Shake 20 ml. of urine with 5 ml. of chloroform for a few minutes, and allow to stand for one-half hour. Draw off the chloroform layer from a separatory funnel and mix it with an equal volume of absolute alcohol. Add 1 ml. of *Solution A* and 1 ml. of *Solution B* to this mixture and shake well. The chloroform layer turns red or yellowish-red if bile pigments are present.

Ref. Wiener med. Blatter 1899, 271

RIEGLER'S REAGENT (COLORING MATTER IN BLOOD)

Use: Reagent for coloring matter in blood.

Preparation: Dissolve 5 g. of sodium hydroxide in 50 ml. of water and add 2.5 g. of hydrazine sulfate. Shake until solution is complete and then add 50 ml. of alcohol. Allow to stand for 2 hours and filter.

Remarks: This reagent produces a purple-red color when added to a solution containing oxyhemoglobin, hemoglobin, and hematin. The colored solution produces an absorption band.

Ref. Zeitschr. anal. Chem. 1904, 541

RIEGLER'S REAGENT (NITRITES)

Use: Test reagent for nitrites.

Preparation: Add 1 g. of β-naphthol and 2 g. of sodium naphthionate to 200 ml. of water and shake vigorously. Filter.

Procedure for Test: Add 10 drops of the reagent to 10 ml. of the liquid to be tested, and acidify with 2 drops of concentrated hydrochloric acid. Shake, and carefully add 20 drops of ammonium hydroxide so as to form two layers. A pink to red color at the zone of contact of the two liquids indicates the presence of nitrites.

Sensitiveness: 1 : 10 million.

Ref. Chem.-Ztg. 1928, 842

RIEGLER'S REAGENT (SACCHARIN)

Use: Test reagent for saccharin.

Preparation: Dissolve 2.5 g. of p-nitroaniline in 25 ml. of water and 5 ml. of concentrated sulfuric acid, and add 25 ml. of water. Then add a solution prepared by dissolving 1.5 g. of sodium nitrite in 20 ml. of water. Mix well and dilute to 250 ml. with water and filter.

Procedure for Test: Make solution to be tested slightly alkaline and add the test reagent drop by drop with shaking. Then shake the mixture with ether. Remove the ether layer and shake with sodium hydroxide solution. A blue to green color is a positive test for saccharin.

Ref. Zeitschr. anal. Chem. 41, 121 (1902)

RIEGLER'S REAGENT (URIC ACID)

Use: Test reagent for uric acid.

Preparation: Mix 0.5 g. of p-nitroaniline, 10 ml. of water, and 15 drops of concentrated sulfuric acid, and heat carefully until solution is complete. Cool, and add 20 ml. of water. Keep solution cold and add 10 ml. of 2.5 per cent sodium nitrite solution with constant shaking. Let stand for 15 minutes, add 60 ml. of water and filter.

Procedure for Test: Add 10 drops of test reagent and 10 drops of 10 per cent sodium hydroxide solution to 10 ml. of the solution to be tested. If uric acid is present, a yellowish-red color appears, and then changes to blue or green. This reagent cannot be used for the direct detection of uric acid in urine.

Ref. Wiener med. Blatter, 1897, 427; 1902, 405

RINGER'S AGAR

Use: Culture medium.

Preparation: Add 1.5-2.0 per cent agar and 1-2 per cent peptone to Ringer's solution (culture medium).

RINGER'S ARTIFICIAL SERUM

Use: Culture medium.

Preparation: Dissolve the following in 100 ml. of water:

Sodium bicarbonate	0.01 g.
Potassium chloride	0.075 g.
Calcium chloride	0.01 g.
Sodium chloride	0.60 g.

RINGER'S BROTH

Use: Culture medium.

Preparation: Add 1-2 per cent of peptone to Ringer's solution (culture medium).

RINGER'S SOLUTION

Use: For diluting blood outside of the body.

Preparation: Dissolve the following in 1 liter of water:

Sodium chloride	9.00 g.
Calcium chloride	0.26 g.
Potassium chloride	0.30 g.

Ref. Howell, p. 429

RINGER'S SOLUTION (CULTURE MEDIUM)

Use: Culture medium.

Preparation: Dissolve the following in 1 liter of water:

Sodium chloride	10.0 g.
Calcium chloride ($CaCl_2 . 2H_2O$)	0.2 g.
Potassium chloride	0.2 g.
Sodium bicarbonate	0.1 g.
Glucose	1.0 g.

RIPAN'S REAGENT

Use: Reagent for distinguishing between phthalic and terephthalic acids.

Preparation: Dissolve 2 ml. of pyridine in 100 ml. of 4 per cent cupric sulfate solution.

Procedure for Test: Add 3-4 ml. of an approximately 2 per cent solution of phthalic or terephthalic acid to 10 ml. of the reagent. A blue precipitate forms immediately if terephthalic acid is present, but only after several hours if phthalic acid is present.

Sensitiveness: 0.002 g. of terephthalic acid.

Ref. C. A. 21, 3858 (1927)

RIPARD-PETIT FLUID

Use: Fixative.

Preparation: Mix the following:

Cupric chloride	0.39 g.
Cupric acetate	0.30 g.
Glacial acetic acid	1.00 ml.
Distilled water	75.00 ml.
Camphor water	75.00 ml.

RIPART'S SOLUTION

Use: A preservative for algae.

Preparation: Dissolve the following in 150 ml. of camphor water:

Cupric chloride	0.3 g.
Cupric acetate	0.3 g.
Acetic acid	1.0 g.

ROBERTS REAGENT

Use: Test reagent for albumin.

Preparation: Mix 50 ml. of concentrated nitric acid with 250 ml. of a saturated solution of magnesium sulfate.

Procedure for Test: Carefully pour liquid containing albumin onto the test solution so as to form separate layers. The white zone is precipitated albumin.

Ref. Hawk and Bergeim, p. 147; Kolmer and Boerner, p. 137

ROMANOWSKY'S STAIN

Use: A stain for bacteria.

Preparation:

Solution A: Add 2 g. of methylene blue (medicinal) and 10 ml. of 0.1 *N* sodium hydroxide to 200 ml. of water, and boil for 15 minutes. Cool, and add 10 ml. of 0.1 *N* sulfuric acid.

Solution B: Dissolve 1 g. of eosin in 1 liter of water.

Remarks: To use, mix 1 ml. of *Solution A* with 6 ml. of *Solution B.*

Ref. Biol. Stains, Conn p. 169

ROMANOWSKY'S STAIN (LEISHMAN'S MODIFICATION)

Use: A blood stain.

Preparation:

Solution A: Prepare 1 liter of 1 per cent solution of methylene blue, and add 0.5 g. of sodium carbonate. Heat for 12 hours at 65° C. and allow to stand for 10 days at room temperature.

Solution B: Dissolve 1 g. of eosine yellowish in 1 liter of water.

Mix equal volumes of *Solutions A* and *B* and allow to stand 12 hours with frequent stirring. Filter, and collect the residue. Wash well with water and dry. For use, prepare a 0.1 per cent solution of the residue in pure methyl alcohol.

Ref. Muir, p. 112

ROMIJN'S REAGENT

Use: Test reagent for glucose.

Preparation: Dissolve borax and iodine in water so that each 25 ml. of the resulting solution shall contain 1 g. of borax and sufficient iodine to react completely with 30-33 ml. of 0.1 *N* sodium thiosulfate solution after acidifying.

Remarks: This solution is reduced by glucose.

Ref. Zeitschr. anal. Chem. 1897, 351

ROQUES' REAGENT

See: Benzidine reagent (Roques).

ROSENHAIN AND HAUGHTON'S REAGENT

Use: To show segregation in steel.

Preparation: Mix the following:

Ferric chloride	30.0 g.
Cupric chloride	10.0 g.
Stannous chloride	0.5 g.
Hydrochloric acid	100.0 ml.
Water	1 liter

Ref. Williams and Homerberg, p. 312

ROSENHEIM-CALLOW'S REAGENT

Use: Test reagent for sterols.

Preparation: Dissolve 25 g. of mercuric acetate in 100 ml. of nitric acid (sp. gr. 1.42).

Procedure for Test: Add a chloroform solution of sterol to an equal volume of the reagent and shake immediately. Color reactions are obtained with the various sterols.

Ref. Biochem. J. 25, 74 (1931)

ROSENOW'S GLUCOSE-BRAIN AGAR

Use: Culture medium.

Preparation: Dissolve 7 g. of powdered agar in 1 liter of glucose-brain broth. Tube in 6 x ¾ in. test tubes in layers 8.5 cm. deep. Add to each tube 3 pieces of crushed calf brain and a few pieces of crushed calcium carbonate. Heat in an autoclave at 20 pounds pressure for 20 minutes.

Ref. Arch. Internal Med. 32, 831 (1923)

ROSENOW'S GLUCOSE-BRAIN BROTH

Use: Culture medium.

Preparation: Dissolve 8 g. of dehydrated bacto nutrient broth and 8 g. of sodium chloride in 1 liter of distilled water with the aid of heat. Cool, and add 2 g. of glucose and 10 ml. of Andrade's indicator. Distribute in test tubes (8 x ½-¾ in.) so that the column of broth is about 10 cm. deep. To each tube add 3 or 4 pieces of crushed marble. Heat in an autoclave at 20 pounds pressure for 20 minutes.

Remarks: If this medium is to be used for blood cultures, add 5 g. of sodium citrate to prevent coagulation of the blood.

One liter of meat infusion broth may be used instead of the dehydrated broth and water.

The indicator may be omitted. One ml. of 1.6 per cent phenol red may be substituted for the Andrade's indicator.

Ref. Arch. Internal Med. 32, 831 (1923)

ROSENTHAL-ERDELYI'S REAGENT

Use: Reagent for the detection and estimation of vitamin A.

Preparation:

Solution A: Dissolve 0.5 g. of pyrocatechol in 100 g. of absolute chloroform.

Solution B: Prepare a cold saturated solution of antimony trichloride in absolute chloroform.

Procedure for Test: Dilute a little of the oil to be tested with absolute chloroform, and to 2 ml. of this mixture add 1 ml. of *Solution A* and 2 ml. of *Solution B*. Immediately heat this mixture on a water bath at 60° C. for 2 minutes. A pink to violet color like that of dilute potassium permanganate solution is formed with vitamin A.

The quantity of vitamin A can be determined by comparing the color obtained with that of a standard solution of 0.01 per cent potassium permanganate solution. Conditions must be more carefully controlled than in the test outlined above.

Ref. Biochem. J. **28**, 41 (1934), **29**, 2112 (1935)

ROSENTHALER-TURK'S REAGENT

Use: Test reagent for opium alkaloids.

Preparation: Dissolve 1 g. of potassium arsenate in 100 g. of concentrated sulfuric acid.

Remarks: Reagent causes characteristic color reactions with the opium alkaloids.

Ref. Pharm. Zentralhalle. 1904, 692

ROSOLIC ACID INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.5 g. of rosolic acid (aurin or corallin) in 100 ml. of 50 per cent alcohol.

Remarks: pH: yellow 6.8-8.2 red.

Ref. Kolthoff and Furman, p. 61

ROSOLIC ACID PAPER

Use: Indicator.

Preparation: Dissolve 1 g. of rosolic acid in 100 ml. of 60 per cent alcohol. Impregnate filter paper with this solution and allow to dry.

Remarks: Colors: Acids: yellow.
Alkalies: red.

ROSOLIC ACID REAGENT (PETTENKOFER)

Use: Reagent for free carbon dioxide in water.

Preparation: Dissolve 0.2 g. of rosolic acid in 100 g. of 80 per cent alcohol, then add a solution of barium hydroxide until a red color just appears.

Procedure for Test: Add 0.5 ml. of the reagent to 50 ml. of the water to be tested and mix well. Free carbon dioxide causes the solution to turn yellow.

Ref. Ann. 1862, Suppl. 2, 23

ROTH'S SOLUTION

Use: Test reagent for fatty oils. (Elaidin test for olive oil).

Preparation: Saturate sulfuric acid with nitrogen trioxide.

Remarks: This test is based on the time required for oil to solidify after the addition of the test solution.

ROTHENFUSSER'S REAGENT (MILK)

Use: Test reagent for unboiled milk.

Preparation: Dissolve 1 g. of p-phenylenediamine hydrochloride in 15 ml. of water. To this add a solution prepared by dissolving 2 g. of crystalline guaiacol in 185 ml. of alcohol.

Remarks: A blue color is formed when reagent is added to unboiled milk containing a little hydrogen peroxide.

Ref. C. A. **3**, 459 (1909)

ROTHENFUSSER'S REAGENT (SUCROSE)

Use: Test reagent for sucrose.

Preparation: Mix the following:

Diphenylamine, 5% alc. soln.	20 ml.
Glacial acetic acid	60 ml.
Hydrochloric acid (1:1)	120 ml.

Sensitiveness: 0.0005%.

Ref. C. A. **3**, 2988 (1909)

ROTHERA'S REAGENT

Use: Reagent for acetone in urine.

Preparation: Dissolve 5 g. of sodium nitroprusside in 100 ml. of water.

Procedure for Use: Add about 1 g. of ammonium sulfate to 5 ml. of filtered urine, and then add 2-3 drops of the reagent. Mix thoroughly and stratify with ammonium hydroxide. A red color forms at the zone of contact if acetone is present. The reagent must be freshly prepared.

Ref. Kolmer and Boerner, pp. 153-154

RUBEANIC ACID SOLUTION

Use: Test reagent for copper.

Preparation: Dissolve 0.5 g. of rubeanic acid in 100 g. of alcohol.

Procedure for Test: To 10 ml. of the solution to be tested, add 1 ml. of 5 *N* acetic acid and a few drops of the reagent. A greenish-black precipitate or a dull green color forms if copper is present. Cobalt, iron, nickel, and cadmium do not interfere.

Sensitiveness: 0.00005 mg. of copper.

Ref. C. A. **24**, 1054 (1930); Feigel, pp. 173-175; Zeitschr. anal. Chem. **79**, 94 (1929)

RUBROPHENE INDICATOR SOLUTION

Use: Oxidation-reduction indicator in the bromatometric determination of arsenite.

Preparation: Dissolve 0.01 g. of rubrophene in 5 ml. of 2 *N* sodium hydroxide solution, and to this solution add *N* hydrochloric acid drop by drop until the violet color changes to red. Dilute this red solution to 100 ml.

Remarks: The red solution of the dyestuff is decolorized or turned yellow by bromine, but the red color returns when a reducing agent is added.

Ref. C. A. 33, 70-71 (1939)

RUDISCH-BOROSCHEK REAGENT

Use: Test reagent for uric acid in urine.

Preparation: Dissolve 0.7175 g. of silver chloride in 100 ml. of 0.05 *N* sodium sulfite solution.

Procedure for Test: Make the urine to be tested strongly alkaline with sodium carbonate and add the reagent. Uric acid is precipitated as a light, flocculent precipitate.

Ref. J. Am. Chem. Soc. 1902, 562

RUSSELL'S DOUBLE SUGAR AGAR

Use: Culture medium.

Preparation: Melt 1 liter of 2 per cent beef extract agar and add the following:

Lactose	10 g.
Glucose	1 g.
Andrade's indicator	10 ml.

Adjust the reaction to pH 7.2. Mix well and tube, but place more in each tube than is required for ordinary slants. Sterilize in a steam sterilizer at 100° C. for 20 minutes on three successive days. Slant so that the butt at the bottom is rather large.

Remarks: Phenol red may be substituted for Andrade's indicator as follows: 1 to 1.5 ml. of a 1.6 per cent alcoholic solution is used for each liter of the medium.

Ref. J. Med. Research 25, 217 (1911); 37, 225 (1917)

RUSSELL'S DOUBLE SUGAR AGAR WITH LEAD ACETATE

Use: Culture medium.

Preparation: Adjust the reaction of a sugar-free nutrient agar to pH 7.4, and to this medium add 1 per cent of Andrade's indicator. Tube in 5 ml. quantities and sterilize. Prepare a solution containing 20 per cent lactose and 20 per cent glucose and sterilize. Also prepare a 0.25 per cent basic lead acetate solution and sterilize. Cool the agar to 60° C. and to each tube add aseptically 0.25 ml. of the double sugar solution and 1 ml. of the lead acetate solution and slant.

Ref. Am. J. Public Health 7, 1042 (1917); J. Exptl. Med. 28, 319 (1918)

RUTHERFORD'S ETCHING SOLUTION

Use: Etching reagent for lead and lead alloys.

Preparation: Mix 60 ml. of glacial acetic acid with 20 ml. of 9 per cent hydrogen peroxide.

Procedure for Use:

(a) Etch for 10-30 minutes.
(b) Dry with alcohol and clean with concentrated nitric acid.
(c) Remove nitric acid by sudden immersion in a large volume of water.

Ref. Metals Handbook, p. 1558

"S" AND "O" REAGENT

See: p-nitrobenzeneazoresorcinol solution.

SABETAY'S REAGENT

Use: Reagent for determining the double bond in organic compounds.

Preparation: Dissolve 30 g. of antimony trichloride in 70 g. of chloroform.

Remarks: Reagent causes color reactions with unsaturated compounds. A white precipitate is not significant.

Ref. C. A. 27, 5714 (1933)

SABOURAUD'S AGAR MEDIUM

Use: Culture medium for fungi.

Preparation: Mix the following and heat until dissolved.

Beef extract	3.5 g.
Agar	20.0 g.
Peptone	10.0 g.
Maltose	40.0 g.
Distilled water	1000.0 ml.
Glycerol (optional)	5.0 ml.
Sodium chloride	7.5 g.

Adjust the reaction to + 5.4. Filter through paper, place in flasks or tubes, and sterilize in a steam sterilizer at 100° C. for 30 minutes on three successive days.

Ref. Kolmer and Boerner, p. 367

SACCARDI'S REAGENT

Use: Reagent for sulfur oils.

Preparation:

Solution A: Dissolve 5 g. of lead soap in 100 ml. of pure benzene.

Solution B: Dissolve 30 g. of potassium hydroxide in 100 g. of 95 per cent alcohol. Filter and keep in a glass stoppered bottle.

Procedure for Test: Add 1 ml. of *Solution A* and 1 ml. of *Solution B* to 1 ml. of the oil to be tested and heat the mixture to boiling. A black precipitate of lead sulfide is formed if sulfur oil is present.

Sensitiveness: 1 : 100.

Ref. C. A. 20, 3243 (1926)

SACHSSE'S SOLUTION

Use: Test reagent for glucose.

Preparation: Dissolve 1.8 g. of mercuric iodide, 2.5 g. of potassium iodide, and 8 g. of potassium hydroxide in water and dilute to 100 ml.

Remarks: This solution is reduced by boiling with glucose. 40 ml. of this solution is equivalent to approximately 0.15 g. of glucose.

Ref. Browne, p. 338

SAFRANIN REAGENT (TALLERMAN)

Use: Reagent for fructose sugar in urine.

Preparation: Dissolve 0.1 g. of safranin in 100 ml. of water.

Procedure for Test: Make 5 ml. of urine alkaline with 5 per cent sodium hydroxide solution and add a few ml. of the reagent. Heat on a water bath for a few minutes. If fructose is present, the solution is decolorized.

Ref. Quart. J. Med. 17, 37 (1923)

SAFRANIN O

Use: Staining solution.

Preparation: Dissolve 0.25 g. of safranin O (90% dye content) in 10 ml. of alcohol and add 100 ml. of distilled water. Mix well.

Ref. Biol. Stains, Conn pp. 97-100

SAFRANIN T SOLUTION

Use: Test reagent for nitrites and nitrates.

Preparation: Dissolve 0.03 g. of safranin T in 100 ml. of water.

Procedure for Test: Add 5 drops of the reagent to 5 ml. of the solution to be tested and acidify with dilute sulfuric acid. A blue color forms if nitrites are present.

Nitrates are detected by adding magnesium powder to the acidified solution. Nitrates are thus reduced to nitrites, which give the characteristic color reaction.

Sensitiveness: 0.02 mg. nitrite per 5 ml.

Ref. C. A. 21, 873 (1927)

SAHLI'S REAGENT

Use: For the quantitative determination of free hydrochloric acid in stomach contents.

Preparation: Mix 100 ml. of a 48 per cent solution of potassium iodide with 100 ml. of an 8 per cent solution of potassium iodate.

Remarks: Iodine is set free when this reagent is added to a solution containing free hydrochloric acid, and the amount of iodine is in proportion to the amount of free acid.

Ref. Hawk and Bergeim, pp. 296-297

SAHLI'S BORAX-METHYLENE BLUE

Use: A stain for nerve centers and ganglia cells.

Preparation: Mix 0.75 g. of methylene blue, 0.8 g. of borax, and 80 ml. of water.

SALICYLALDOXIME REAGENT

Use: Test reagent for copper.

Preparation: Dissolve 1 g. of salicylaldoxime in 5 ml. of alcohol, and pour this solution into 95 ml. of water heated to 80° C. Allow to stand for a few minutes and filter.

Procedure for Test: Place a drop of the solution to be tested on a spot plate and make slightly acid with dilute acetic acid. Then add 1 drop of the reagent. A dirty green precipitate forms if copper is present. Precipitation is quantitative. Copper, gold, and palladium also precipitate under these conditions.

Ref. Engelder, p. 123; C. A. **24**, 5665 (1930); **25**, 3590 (1931)

Additional Use: A 0.1 per cent solution of salicylaldoxime is used for the colorimetric determination of iron. Ind. Eng. Chem., Anal. Ed. 12, 448-450 (1940).

SALICYL YELLOW INDICATOR SOLUTION

See: Alizarin yellow GG Indicator Solution.

SANDELL-WISHNICK'S REAGENT

Use: Test reagent for zinc.

Preparation: Dissolve 1 g. of β-naphthoquinoline in 100 g. of 0.1 *N* sulfuric acid, and to this solution add a 5 per cent aqueous solution of potassium thiocyanate until a slight permanent turbidity appears.

Remarks: Reagent causes precipitation when added to neutral or slightly acid solutions of zinc salts.

Sensitiveness: 1 : 200,000.

Ref. C. A. **32**, 6973 (1938)

SANIN'S REAGENT

Use: Test reagent for tannic acid.

Preparation: Dissolve the following in 100 ml. of water:

Tartar emetic	20 g.
Sodium chloride	20 g.
Sodium acetate	40 g.
Sodium bitartrate	5 g.

Remarks: Reagent causes precipitation with tannic acid in aqueous solution.

Ref. The Merck Index, pp. 898-899

SAUER'S POTATO BLOOD AGAR FOR H. PERTUSSIS

Use: Culture medium.

Preparation: Mix 500 g. of peeled and sliced potatoes with 1 liter of water and 40 ml. of glycerol, and boil in a covered container until the potatoes are soft. Replace the water lost through evaporation and filter through gauze. To 500 ml. of the filtrate, add 1500 ml. of 0.6 per cent solution of sodium chloride and 60 g. of agar. Heat until the agar is dissolved. Distribute in 150 ml. quantities and heat in an autoclave at 15 pounds pressure for 20 minutes. Store in a refrigerator.

To use, liquefy by heating and cool to 45° C. To each 150 ml. of the medium add aseptically 30 ml. of sterile defibrinated blood. Distribute aseptically in Petri dishes, placing 20 ml. in each dish.

Remarks: Use only freshly prepared plates.

Ref. J. Am. Med. Assoc. **95**, 263 (1930)

SAUVEUR'S REAGENT

Use: Etch solution for metals.

Preparation: Mix the following:

Hydrochloric acid, conc.	1 part
Sulfuric acid, conc.	2 parts
Water	3 parts

Add the sulfuric acid to the water, and then add the hydrochloric acid. Keep near the boiling point.

Ref. Williams and Homerberg, p. 311

SCARLET RED STAIN

Use: Staining solution for fats.

Preparation: Mix 50 ml. of 70 per cent alcohol with 50 ml. of acetone, and add sufficient scarlet red (Sudan IV) to form a saturated solution. Filter.

Remarks: Sudan II (Oil Red O) or Sudan III can be used to replace the scarlet red.

SCHAUDINN'S FLUID

Use: Fixative.

Preparation: Mix 20 ml. of a saturated aqueous solution of mercuric chloride with 10 ml. of 95 per cent alcohol.

Ref. Kolmer and Boerner, p. 258

SCHEIBLER'S REAGENT

See: Phosphotungstic acid solution (alkaloids).

SCHIFF'S REAGENT

Use: Test reagent for aldehydes.

Preparation: Dissolve 0.2 g. of fuchsin in a few ml. of boiling water and allow to cool. Add 15 ml. of a saturated solution of sulfur dioxide in water and allow to stand several hours. After the solution becomes colorless or pale yellow, dilute to 200 ml. with water. Keep in a tightly-stoppered, dark glass bottle.

Remarks: A violet-red color appears when an aldehyde is added to this solution.

Ref. J. Am. Pharm. Assoc. 1933, 1237

SCHLAGDENHAUFFEN'S SOLUTION

Use: Test reagent for alkaloids.

Preparation: Mix 50 ml. of saturated aqueous mercuric chloride solution with 50 ml. of 3 per cent tincture of guaiac.

Remarks: Reagent gives a blue color with alkaloids.

Ref. Jahresber, 1874, 956

SCHÖNBEIN'S OZONE PAPER

See: Potassium iodide-starch paper.

SCHÖNBEIN-PAGENSTECHER'S PAPER

See: Potassium iodide-starch paper.

SCHÖNN'S REAGENT

See: Titanium sulfate solution.

SCHORN'S REAGENT (ALOE)

Use: Test reagent for aloes.

Preparation: Mix 25 ml. of 30 per cent hydrogen peroxide with 25 ml. of quinoline and shake. Place in a separatory funnel and draw off the lower layer. Dry this liquid with anhydrous sodium sulfate and filter. Finally, dilute with quinoline until the solution contains 1.0 per cent hydrogen peroxide. This point may be determined by adding potassium iodide and sulfuric acid to a measured quantity, and then titrating the mixture with sodium thiosulfate.

Procedure for Test: Add a few drops of the reagent to a small quantity of finely powdered aloes and warm to 60° C. for about 5 minutes. Each variety of aloe gives a characteristic color.

Ref. Pharm. J. **124**, 212 (1930)

SCHORN'S REAGENT

Use: Reagent for eucalyptol and cineole.

Preparation: Dissolve 15 g. of ammonium molybdate and 4.5 g. of ammonium sulfate in 85 ml. of dilute nitric acid.

Procedure for Test: A blue color develops when this reagent is heated with an equal volume of eucalyptol or cineole.

Ref. C. A. **19**, 1754 (1925)

SCHREIBER'S REAGENT

Use: Test reagent for glucose in urine.

Preparation: Dissolve the following in 88 g. of water:

Cupric sulfate	2 g.
Sodium salicylate	2 g.
Sodium carbonate (cryst.)	2 g.

Remarks: A gray to black precipitate forms when this reagent is boiled, but when boiled with an equal volume of urine containing glucose, a dirty green precipitate forms. The precipitate is yellow when boiled with an excess of urine containing glucose.

Ref. Zeitschr. anal. Chem. **36**, 395 (1897)

SCHULTZE'S SOLUTION (ALKALOIDS)

Use: Test reagent for alkaloids.

Preparation: Dissolve 20 g. of antimony pentachloride in 80 g. of a saturated solution of disodium phosphate. Phosphoric acid can be used in place of the phosphate.

Remarks: Reagent causes precipitates with alkaloid sulfates.

Ref. Ann. 109, 177 (1859)

SCHULTZE'S SOLUTION (CELLULOSE)

Use: Test reagent for cellulose.

Preparation: Dissolve 80 g. of potassium iodide and 250 g. of zinc chloride in 85 ml. of water and saturate with iodine.

Remarks: Reagent colors cellulose blue.

Ref. The Merck Index, p. 909

SCHWARZ'S REAGENT

Use: Test reagent for blood.

Preparation: Add 1.0 ml. of glacial acetic acid to 50 ml. of a 2 per cent alcoholic solution of benzidine, and then to 1.0 ml. of this solution add 1 drop of quinoline or isoquinoline.

Remarks: Reagent causes a blue color with blood. This is a very sensitive test.

Ref. C. A. **23**, 1921 (1929)

SCHWEITZER'S REAGENT

Use: A solvent for cellulose and a test reagent for wool.

Preparation: Dissolve about 5 g. of cupric sulfate in 100 ml. of water, and then add a solution of sodium hydroxide until precipitation is complete. Wash the cupric hydroxide several times by decantation with 500 ml. portions of water and filter. Wash until the precipitate is free of sulfates. Then squeeze as much water from the residue as possible, and add the cupric hydroxide to 10 ml. of concentrated ammonium hydroxide (sp. gr. 0.90) as long as it dissolves.

Remarks: Reagent dissolves cotton, silk, and linen, but not wool.

Ref. Chem. Zentr. 1863, 445

SCOTT-PLIMMER'S REAGENT

Use: Test reagent for phosphate.

Preparation: Dissolve 20 g. of ammonium chloride in 80 ml. of 10 per cent ammonium molybdate solution and 12 ml. of hydrochloric acid solution (sp. gr. 1.16) and then add 10 ml. of a saturated aqueous solution of potassium persulfate.

Remarks: Organically combined phosphoric acid can be detected with this reagent.

Sensitiveness: 0.001%.

Ref. Pharm. J. 1920, 79

SCOTT-WILSON'S REAGENT

Use: Test reagent for acetone.

Preparation: Dissolve 10 g. of mercuric cyanide in 600 ml. of water, and add a cooled solution consisting of 180 g. of sodium hydroxide dissolved in 600 ml. of water. Into this mixture pour slowly, and with constant stirring, a solution prepared by dissolving 2.9 g. of silver nitrate in 400 ml. of water.

Remarks: Vapors containing acetone cause this solution to become turbid.

Ref. J. Physiol. **42**, 444 (1911)

SEARL'S REAGENT

Use: Reagent for yeast extract in meat extract.

Preparation: Dissolve 12 g. of cupric sulfate and 15 g. of sodium tartrate in 120 ml. of water, and add a solution prepared by dissolving 15 g. of sodium hydroxide in 120 ml. of water.

Procedure for Test: Dissolve 0.6 g. of the extract in 45 ml. of water and add 25 ml. of the reagent. Boil the mixture for 2 minutes. A bluish-white precipitate forms if yeast extract is present.

Ref. Pharm. J. 1903, 516

SEELIGER'S REAGENT

Use: Test reagent for lignin in paper.

Preparation: Dissolve the following in 25 ml. of water.

Iodine	0.1 g.
Potassium iodide	0.5 g.
Calcium nitrate (cryst.)	30.0 g.

Remarks: Reagent gives color reactions with cellulose materials containing lignin.

Ref. Apoth. Ztg. 1903, 818

SEILER'S INDIGOCARMINE-BORAXCARMINE

Use: Stain for histological specimens.

Preparation:

Solution A: Dissolve 1 g. of carmine and 3 g. of borax in a mixture of 150 ml. of water and 330 ml. of alcohol.

Solution B: Mix 10 ml. of hydrochloric acid with 40 ml. of alcohol.

Solution C: Add 4 drops of a saturated aqueous solution of sodium indigosulfonate to 60 ml. of water.

To use, first stain section with *Solution A*, then wash with *Solution B*, and finally place in *Solution C*.

SELENIC ACID REAGENT (ALKALOIDS)

See: Renteln's solution.

SELENITE-F ENRICHMENT MEDIUM

Use: Culture medium for the isolation of typhoid and paratyphoid bacilli from urine and feces.

Preparation: Mix the following:

Sodium acid selenite, anhyd.	4.0 g.
Peptone	5.0 g.
Lactose	4.0 g.
Sodium phosphate (see below)	10.0 g.
Distilled water	1 liter

Determine experimentally the proportions in which mono- and disodium phosphate must be mixed to give a pH of 7.0 when mixed with the above ingredients. Warm the above mixture until solution is complete. Tube in 10 ml. quantities, and sterilize in an Arnold sterilizer for 20-30 minutes.

Ref. Kolmer and Boerner, pp. 363-364

SELENOUS ACID REAGENT (ALKALOIDS)

See: Mecke's solution.

SELIWANOFF'S REAGENT

Use: Test reagent for fructose.

Preparation: Dissolve 0.05 g. of resorcinol in 100 ml. of dilute (1 : 2) hydrochloric acid.

Procedure for Test: Add a few drops of the liquid to be tested to 5 ml. of the reagent and boil. A red color, or a red precipitate soluble in alcohol, forms if fructose is present.

Ref. Jacobs, p. 250; C. A. 3, 965 (1909)

SELLER'S STAIN

Use: Stain used in diagnosis of rabies.

Preparation:

Solution A: Dissolve 15 g. of methylene blue in 100 ml. of methyl alcohol.

Solution B: Dissolve 32 g. of basic fuchsin in 100 ml. of methyl alcohol.

Remarks: Just before use, mix 50 ml. of *Solution B* with 150 ml. of *Solution A* and 250 ml. of methyl alcohol. This mixture should be used the day it is prepared.

Ref. Kolmer and Boerner, p. 508

SEMI-SOLID AGAR MEDIUM

Use: Culture medium.

Preparation: Mix 2 g. of agar with 1 liter of nutrient broth and dissolve with the aid of heat. Adjust the reaction to pH 7.6-7.8 and filter if necessary. Tube in 5 ml. quantities, and heat in an autoclave at 15 pounds pressure for 20 minutes.

Before use melt the agar by placing in boiling water, and add aseptically a sterile carbohydrate solution.

Ref. Kolmer and Boerner, pp. 365-366

SENFT'S REAGENT

Use: Test reagent for sugar in plant tissues.

Preparation:

Solution A: Dissolve 1 g. of phenylhydrazine hydrochloride in 10 g. of glycerol.

Solution B: Dissolve 1 g. of sodium acetate in 10 g. of glycerol.

Remarks: Use 1 drop of each solution with section under examination. Characteristic osazones are formed.

Ref. Pharm. Post. 1902, 425

SERUM AGAR MEDIUM

Use: Culture medium.

Preparation: This medium is prepared like ascitic agar medium, except that sterile horse or human serum is used instead of ascitic fluid.

SERUM WATER MEDIUM (HISS)

Use: Culture medium.

Preparation: Mix 1 part of sheep, beef, or human serum with 3 parts of distilled water. Add 1 per cent of any desired sugar and heat slightly until the sugar is dissolved. Next add 1 per cent of Andrade's indicator and mix well. Pour into tubes and heat in a steam sterilizer at 100° C. for 20 minutes on each of three successive days.

Remarks: Andrade's indicator may be replaced by a 0.02 per cent aqueous solution of bromthymol blue. Five ml. of this solution is added to each 100 ml. of the medium before sterilization.

Ref. J. Exptl. Med. **6**, 324 (1901-1905)

SHUNK'S FLAGELLA STAIN

Use: Staining solution.

Preparation:

Solution A: Mix 30 ml. of a saturated aqueous solution of tannic acid with 10 ml. of a 5 per cent aqueous solution of ferric chloride. Allow to stand for at least 1 week and filter before use.

Solution B: Mix 1 ml. of aniline with 4 ml. of 95 per cent alcohol.

Solution C: Add 3 ml. of *Solution B* to 30 ml. of Loeffler's methylene blue.

Remarks: Place 8 drops of *Solution A* on a glass slide and immediately add 1 drop of *Solution B*. Drain off the excess liquid; and, without previous washing, stain for 3 minutes with *Solution C*.

SILICOMOLYBDIC ACID REAGENT

Use: Reagent used for the colorimetric determination of morphine.

Preparation: Place 14.4 g. of molybdic anhydride and 100 ml. of *N* sodium hydroxide solution in a liter beaker and warm until solution is complete. Add sufficient sodium silicate solution to introduce 0.7 g. of silica. This can be calculated from the known concentration of the sodium silicate solution. Now add 10 per cent hydrochloric acid in small portions, with constant stirring, until the solution turns green. About 200 ml. of the acid is required. Dilute with water to 900 ml., and allow to stand on a water bath for 3 hours. Remove from the heat and let stand until the solution is clear. Filter after 24 hours. Dilute the filtrate to 1 liter.

Remarks: Morphine reduces silicomolybdic acid in an alkaline solution to form a blue substance suitable for colorimetric determination. Opium and morphine syrup interfere.

Ref. Snell II, pp. 510-511

SILICOTUNGSTIC ACID REAGENT (ALKALOIDS)

Use: Reagent for the detection and determination of alkaloids.

Preparation: Dissolve 10 g. of silicotungstic acid in 90 ml. of water.

Remarks: This reagent precipitates quantitatively many alkaloids.

Ref. Snell II, p. 517

SILICOTUNGSTIC ACID REAGENT (METHENAMINE)

Use: Reagent for micro-test for methenamine.

Preparation: Dissolve 5 g. of silicotungstic acid in 100 ml. of approximately 6 *N* sulfuric acid.

Procedure for Test: Place 1 drop of solution to be tested on a clear glass slide and add 1 drop of reagent. Thin, transparent, rectangular crystals form with methenamine.

Ref. A.O.A.C., pp. 605-606

SILICOTUNGSTIC ACID REAGENT (NICOTINE)

Use: Reagent for the determination of nicotine.

Preparation: Dissolve 1 g. of silicotungstic acid in 100 ml. of water.

Procedure for Determination: Add 10 drops of the reagent and 3-4 drops of 10 per cent hydrochloric acid to equal volumes of water contained in two beakers, and then to one beaker add 3 ml. of the solution to be tested and to the other a standard nicotine solution until an equal opalescence is obtained.

Ref. C. A. **34**, 56 (1940)

SILVER NITRATE PAPER

Use: To detect chromates, arsenites, phosphorus, and arsenic.

Preparation: Impregnate filter paper with an aqueous solution of silver nitrate and dry.

Remarks: Color reactions: chromates turn paper brick red; phosphorus, black; arsenic, yellow; and uric acid, brown.

SILVER NITRATE SOLUTIONS

Reagent: $AgNO_3$, mol. wt. = 169.89.

Preparation:

0.5 Molar: Dissolve 85 g. of silver nitrate in distilled water and dilute to 1 liter.

1.0 Normal: Dissolve 169.9 g. of silver nitrate in distilled water and dilute to 1 liter.

10 mg. of silver ion per ml. of solution: Dissolve 15.7 g. of silver nitrate in distilled water and dilute to 1 liter.

SILVER NITRATE SOLUTION (VOLUMETRIC REAGENT)

Reagent: $AgNO_3$, mol. wt. = 169.89.

Preparation:

0.1 Normal (Standardized): (Contains 16.9888 g. of $AgNO_3$ per liter.) Pulverize analytical grade silver nitrate and dry in an oven at 150° C. Weigh out about 17.1 g. of the powder and dissolve in a liter of distilled water.

This solution may be standardized by running a carefully measured volume into an excess of sodium chloride, which is dissolved in water acidified with dilute nitric acid, and then weighing the precipitated silver chloride. An alternative method is to standardize against a standard solution of sodium chloride by the method of Mohr or Volhard.

Ref. Kolthoff and Sandell, p. 539

SIMMON'S CITRATE AGAR

Use: Culture medium for differentiating among colon bacilli.

Preparation: Dissolve the following in 1 liter of distilled water:

Magnesium sulfate, anhyd.	0.2 g.
Ammonium phosphate, monobasic	1.0 g.
Dipotassium phosphate	1.0 g.
Sodium citrate, dihydrate	2.0 g.
Sodium chloride	5.0 g.

To this solution add 15 g. of powdered agar. Let soak for a few minutes, and then boil for 2-3 minutes until the agar is dissolved. Titrate to pH 7.2 and add 0.2 ml. of a 1 per cent alcoholic solution of bromthymol blue for each 100 ml. of the medium. Tube and heat in an autoclave at 121° C. for 15 minutes.

Ref. Kolmer and Boerner, p. 369

SISLEY-FRAHSE'S REAGENT

Use: Reagent to detect adulterants in olive oil.

Preparation: Mix 1.4 g. of *p*-nitroaniline with 2.8 g. of concentrated hydrochloric acid and 10 ml. of water and heat until solution is complete. Add 30 ml. of water and cool to 15° C. Add 8 ml. of a 10 per cent aqueous solution of sodium nitrite and mix well. The solution must be kept cool during the mixing. Finally, dilute to 100 ml.

Procedure for Test: Mix 10 ml. of the oil with 5 ml. of a 20 per cent aqueous solution of sodium acetate and a few drops of the reagent. A deep orange or red color indicates the presence of adulterants.

Ref. Snell II, p. 662

SODA REAGENT

Use: Determination of non-carbonate hardness of water.

Preparation: Dissolve 2 g. of sodium hydroxide and 2.65 g. of anhydrous sodium carbonate in a little distilled water. Mix well and make up to 1 liter.

Ref. A.P.H.A. p. 63

SODIUM ACETATE SOLUTION

Reagent: $NaC_2H_3O_2$, mol. wt. = 82.04, or
$NaC_2H_3O_2 \cdot 3H_2O$, mol. wt. = 136.09.

Preparation:

0.5 Molar: Dissolve 41 g. of $NaC_2H_3O_2$ or 68 g. of $NaC_2H_3O_2 \cdot 3H_2O$ in water and dilute to 1 liter.

1.0 Normal: Dissolve 82 g. of the anhydrous salt or 136 g. of the hydrate in water and dilute to 1 liter.

10 mg. of the sodium ion per ml. of solution: Dissolve 35.7 g. of the anhydrous salt or 59.1 g. of the hydrate in water and dilute to 1 liter.

10 mg. of acetate ion per ml. of solution: Dissolve 13.9 g. of the anhydrous salt or 23.1 g. of the hydrate in water and dilute to 1 liter.

SODIUM ALBUMINATE AGAR

Use: Culture medium.

Preparation: Place 0.25 g. of powdered egg albumin in about 5 ml. of water containing 1 drop of phenolphthalein, and add 1 *N* sodium hydroxide solution until the albumin is dissolved and a permanent pink color remains. This is a solution of sodium albuminate.

Dissolve the following in 1 liter of distilled water:

Glucose	1.0 g.
Agar	12.5 g.
Dipotassium phosphate	0.5 g.
Magnesium sulfate ($MgSO_4 \cdot 7H_2O$)	0.2 g.
Ferric sulfate	Trace

To this solution add the sodium albuminate solution prepared above, and then adjust the reaction to pH 7.2. Distribute in small flasks or tubes and sterilize in an autoclave.

Ref. Soil Science, Vol. 14, p. 283

SODIUM ALCOHOLATE SOLUTION

Use: Quantitative determination of fat in feces.

Preparation:

0.1 Normal: Dissolve 2.3 g. of freshly cleaned sodium in 1 liter of absolute alcohol. This solution may be standardized against 0.1 *N* hydrochloric acid if the alcoholate solution contains only traces of carbonates. It may also be standardized against pure benzoic acid in chloroform.

Ref. Hawk and Bergeim, pp. 372-373

SODIUM ALIZARINSULFONATE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 1 g. of sodium alizarinsulfonate in 100 ml. of water.

Remarks: pH: yellow 3.7-5.2 violet.

Ref. Kolthoff and Furman, p. 60

SODIUM ALIZARINSULFONATE REAGENT

Use: Reagent for diagnosing urinary diseases.

Preparation: Dissolve 1 g. of sodium alizarinsulfonate in 100 ml. of water.

Remarks: Normal urine yields a brick-red precipitate with this reagent. There is a slight precipitate, if any at all, with abnormal urine.

Ref. Deut. med. Wochschr. 1922, 1035

SODIUM ALIZARINSULFONATE REAGENT

See: Alizarin S Solution.

SODIUM AMINO-β-NAPHTHOLSULFONATE REAGENT

Use: Test reagent for potassium.

Preparation: Dissolve 5 g. of the reagent in 100 ml. of water.

Remarks: The potassium salt of amino-β-naphtholsulfonic acid is sparingly soluble in water.

Ref. J. pharm. chim. 1905, 556

SODIUM ARSANILATE SOLUTION

Use: Reagent for ceric cerium.

Preparation: Dissolve 5 g. of the sodium salt of arsanilic acid in 100 ml. of water.

Procedure for Test: Add 5 ml. of *N* sulfuric acid to 45 ml. of a dilute solution to be tested and add 5 ml. of the reagent. A red or red-brown color forms if cerium (ic) is present.

Fluorides, cobalt, chromium, and zirconium interfere.

Ref. Ind. Eng. Chem., Anal. Ed. **9**, 181 (1937)

SODIUM ARSENATE SOLUTIONS

Reagent: $Na_2HAsO_4 \cdot 7H_2O$, mol. wt. = 312.02.

Preparation:

0.1 Molar: Dissolve 31.2 g. of sodium arsenate in water and dilute to 1 liter.

0.5 Normal: Dissolve 52 g. of sodium arsenate in water and dilute to 1 liter.

10 mg. of arsenic per ml. of solution: Dissolve 41.7 g. of sodium arsenate in water and dilute to 1 liter.

10 mg. of arsenate ion per ml. of solution: Dissolve 22.5 g. of sodium arsenate in water and dilute to 1 liter.

SODIUM ARSENITE REAGENT (GASPAR y ARNAL)

Use: Test reagent for lithium.

Preparation: Dissolve 5 g. of sodium arsenite in 100 ml. of methyl or ethyl alcohol.

Procedure for Test: Add 5 ml. of the reagent to 0.5 ml. of the solution to be tested and heat. A white or rose-colored precipitate forms if lithium is present.

Ref. C. A. **26**, 4269 (1932)

SODIUM ARSENITE SOLUTIONS

Reagents: $NaAsO_2$, mol. wt. = 129.96, or
Na_2HAsO_3, mol. wt. = 169.91, or
As_2O_3, mol. wt. = 197.82.

Preparation:

0.5 Molar: (a) Dissolve 65 g. of $NaAsO_2$ or 85 g. of Na_2HAsO_3 in water and dilute to 1 liter.
(b) Dissolve 50 g. of As_2O_3 in 250 ml. of 6 *N* sodium hydroxide solution and boil gently for 15 minutes. Dilute to 1 liter and allow to stand. Decant the clear solution from any residue which may form.

1.0 Normal: (a) Dissolve 43.3 g. of $NaAsO_2$ or 56.6 g. of Na_2HAsO_3 in water and dilute to 1 liter.
(b) Dissolve 33 g. of arsenic trioxide in 60 ml. of 6 *N* sodium hydroxide solution and dilute to 1 liter.

10 mg. of arsenic per ml. of solution: (a) Dissolve 17.3 g. of $NaAsO_2$ or 22.7 g. of Na_2HAsO_3 in water and dilute to 1 liter.
(b) Dissolve 13.2 g. of arsenic trioxide in 25 ml. of 6 *N* sodium hydroxide solution and dilute to 1 liter.

10 mg. of arsenite ion per ml. of solution: (a) Dissolve 9.5 g. of $NaAsO_2$ or 13.8 g. of Na_2HAsO_3 in water and dilute to 1 liter.
(b) Dissolve 8 g. of arsenic trioxide in 20 ml. of 6 *N* sodium hydroxide solution and dilute to 1 liter.

SODIUM ARSENITE SOLUTION (VOLUMETRIC REAGENT)

Reagent: As_2O_3, mol. wt. = 197.82.

Preparation:

0.1 Normal (Standardized): Dissolve 4.9465 g. of pure sublimed arsenious oxide in a concentrated solution of 4 g. of sodium hydroxide. Next add 100 ml. of a saturated

solution of sodium bicarbonate and dilute to 1 liter. Heat may be used to dissolve the arsenious oxide, but the solution must not be warmed above 60° C.

This solution is standardized by titrating against an iodine solution of known strength, using starch indicator.

Ref. Sutton, pp. 144-145

SODIUM ARSENOTUNGSTATE REAGENT (APOMORPHINE)

See: Palet's reagents.

SODIUM ARSENOTUNGSTOMOLYBDATE SOLUTION (PHENOLS)

See: Guglialmelli's reagents.

SODIUM BENZIDINEMONOSULFONATE REAGENT (FISHEL)

Use: Reagent for microscopic detection of peroxidases.

Preparation: Dissolve 2 g. of the reagent in 100 ml. of water. Add a little hydrogen peroxide before use.

Remarks: Reagent gives a blue color with peroxidases.

Ref. C. A. **5**, 2112 (1911)

SODIUM BENZOATE SOLUTIONS

Reagent: $C_7H_5O_2Na$, mol. wt. = 144.04.

Preparation:

0.5 Molar: Dissolve 72 g. of sodium benzoate in water and dilute to 1 liter.

0.5 Normal: Same as 0.5 Molar.

10 mg. of benzoate ion per ml. of solution: Dissolve 11.9 g. of sodium benzoate in water and dilute to 1 liter.

SODIUM BIS-p-CHLOROPHENYLPHOSPHATE REAGENT

Use: Reagent for precipitating iron from solutions of iron salts.

Preparation: Dissolve 34.1 g. of the reagent in water and dilute to 1 liter.

Remarks: Iron is quantitatively precipitated from 2 *N* acid solution in the presence of 2 per cent ammonium salt by the slow addition of 0.1 *N* solution of sodium bis-p-chlorophenylphosphate.

Ref. C. A. **21**, 2460-2461 (1927)

SODIUM CAFFEINE BENZOATE SOLUTION (FERRARI)

Use: Test reagent for acridine derivatives in urine.

Preparation: Dissolve 2 g. of sodium caffeine benzoate in 10 ml. of water.

Procedure for Test: Add 2 drops of the reagent to 5 ml. of urine. This produces an intense greenish fluorescence, or intensifies a fluorescence already present, if urine contains acridine derivatives.

Ref. C. A. 29, 4395 (1935)

SODIUM CARBONATE SOLUTIONS

Reagents: Na_2CO_3, mol. wt. = 105.99, or
$Na_2CO_3 \cdot H_2O$, mol. wt. = 124.01, or
$Na_2CO_3 \cdot 10H_2O$, mol. wt. = 286.15.

Preparation:

0.5 Molar: Dissolve 53 g. of Na_2CO_3, 62 g. of $Na_2CO_3 \cdot H_2O$, or 143.1 g. of $Na_2CO_3 \cdot 10H_2O$ in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of carbonate ion per ml. of solution: Dissolve 23 g. of Na_2CO_3, 28 g. of $Na_2CO_3 \cdot H_2O$, or 62 g. of $Na_2CO_3 \cdot 10H_2O$ in water and dilute to 1 liter.

SODIUM CASEINATE AGAR

Use: Culture medium.

Preparation: Dissolve the following in 100 ml. of tap water:

Sodium caseinate (nutrose)	0.2 g.
Glucose	1.0 g.
Dipotassium phosphate	0.2 g.
Magnesium sulfate ($MgSO_4$)	0.2 g.
Ferrous sulfate	Trace
Agar	2.0 g.

Adjust the reaction to pH 6.8 and sterilize in an autoclave.

SODIUM CHLORIDE SOLUTIONS

Reagent: NaCl, mol. wt. = 58.45.

Preparation:

0.5 Molar: Dissolve 29.2 g. of sodium chloride in water and dilute to 1 liter.

1.0 Normal: Dissolve 58.5 g. of sodium chloride in water and dilute to 1 liter.

10 mg. of sodium ion per ml. of solution: Dissolve 25.4 g. of sodium chloride in water and dilute to 1 liter.

10 mg. of chloride ion per ml. of solution: Dissolve 16.4 g. of sodium chloride in water and dilute to 1 liter.

SODIUM COBALTIC NITRITE SOLUTION

Use: Test reagent for potassium.

Preparation: Dissolve 25 g. of sodium nitrite in 75 ml. of water, and to this add 2.5 g. of cobaltous nitrate ($Co(NO_3)_2 \cdot 6H_2O$) and 2 ml. of

glacial acetic acid. Allow to stand for 48 hours, filter, and dilute the filtrate to 100 ml.

Remarks: This solution is unstable and should not be used after standing for long periods. Reagent gives a yellow precipitate with potassium.

Ref. Briscoe, p. 267; Handbook of Chem. and Physics, p. 1306

SODIUM CYANIDE SOLUTIONS

Reagent: NaCN, mol. wt. = 49.02.

Preparation:

0.5 Molar: Dissolve 24.5 g. of sodium cyanide in water and dilute to 1 liter.

1.0 Normal: Dissolve 49 g. of sodium cyanide in water and dilute to 1 liter.

10 mg. of cyanide ion per ml. of solution: Dissolve 18.8 g. of sodium cyanide in water and dilute to 1 liter.

SODIUM 2, 6-DICHLOROBENZENONEINDOPHENOL SOLUTION

Use: Reagent for the determination of vitamin C (ascorbic acid.)

Preparation: Weigh accurately 0.125 g. of 2,6-dichlorobenzenoneindophenol and dissolve in small portions of warm water. Filter, and when the filtrate is cool dilute to 250 ml. The solution can be kept longer if made up in a 7.2 phosphate buffer.

The strength of this solution may be estimated by titrating a 25 ml. portion with 0.01 *N* ascorbic acid prepared by dissolving 0.276 g. of ascorbic acid (Merck's cebione) in water and diluting to exactly 100 ml. The color of the dye changes from blue to red to colorless.

Two other methods are also used: the solution may be titrated with lemon juice or it may be determined iodimetrically.

Remarks: This dye is reduced to a colorless compound by some strongly reducing substance present in lemon juice. It is believed that the reducing compound is identical with ascorbic acid. The conversion of the dye to a colorless compound is made the basis of a method for titrating lemon juice for its ascorbic acid content.

Ref. Biochem. J. 27, 590 (1933); Jacobs, pp. 455-456

SODIUM 2, 6-DICHLOROPHENOLINDOPHENOL SOLUTION

See: 2,6-Dichlorobenzenoneindophenol, solution.

SODIUM DIETHYLDITHIOCARBAMATE SOLUTION

Use: Reagent for the colorimetric determination of copper in water.

Preparation: Dissolve 1 g. of sodium diethyldithiocarbamate in 1 liter of distilled water. Protect from light.

Remarks: This reagent gives a golden-brown color with solutions of copper salts. Most metals other than magnesium and calcium may interfere, though only if present in some quantity. Cyanides must be absent.

The reaction should be carried out in a slightly ammoniacal solution. Reagent is stable for several weeks.

Sensitiveness: 1 : 100,000,000.
Most sensitive range: 0.1 to 1.0 ppm.

Ref. A.P.H.A., pp. 25-26; Snell I, 164-166; Analyst, **54**, 650 (1929); **57**, 495 (1932)

SODIUM DIPHENYLAMINE SULFONATE INDICATOR SOLUTION

Use: Oxidation-reduction indicator.

Preparation: Dissolve 0.2 g. of sodium diphenylamine sulfonate in 100 ml. of water.

Remarks: See diphenylamine sulfonate solution.

Ref. Kolthoff and Sandell, pp. 578-581

SODIUM FLUORIDE SOLUTIONS

Reagent: NaF, mol. wt. = 42.0.

Preparation:

0.5 Molar: Dissolve 21 g. of sodium fluoride in water and dilute to 1 liter.

0.5 Normal: Same as 0.5 Molar.

10 mg. of fluoride ion per ml. of solution: Dissolve 22.1 g. of sodium fluoride in water and dilute to 1 liter.

SODIUM HIPPURATE BROTH

Use: Culture medium to test for the hydrolysis of sodium hippurate.

Preparation: Dissolve 10 g. of sodium hippurate in 1 liter of meat infusion broth. Tube and mark level of medium in each tube. Heat in an autoclave at 121° C. for 15 minutes.

Ref. Kolmer and Boerner, pp. 359-360

SODIUM HYDROGEN PHOSPHATE SOLUTIONS

Reagent: $Na_2HPO_4 \cdot 12H_2O$, mol. wt. = 358.22.

Preparation:

0.2 Molar: Dissolve 71.6 g. of sodium hydrogen phosphate in water and dilute to 1 liter.

0.5 Normal: Dissolve 59.7 g. of sodium hydrogen phosphate in water and dilute to 1 liter.

10 mg. of phosphate ion per ml. of solution: Dissolve 37.7 g. of sodium hydrogen phosphate in water and dilute to 1 liter.

SODIUM HYDROSULFITE REAGENT (ANILINE DYES)

See: Grandmougin-Havas Reagent.

SODIUM HYDROXIDE SOLUTIONS

Reagent: NaOH (97-98% NaOH), mol. wt. = 40.0.

Preparation:

6.0 Normal: Dissolve 250 g. of sodium hydroxide in water and dilute to 1 liter.

1.0 Normal: Dissolve 41 g. of sodium hydroxide in water and dilute to 1 liter.

1.0 Molar: Same as 1.0 Normal.

SODIUM HYDROXIDE SOLUTION (VOLUMETRIC REAGENT)

Reagent: NaOH (usually contains some Na_2CO_3).

Preparation:

1.0 Normal (standardized): Dissolve 42 g. of sodium hydroxide sticks or pellets (95% NaOH or better) in water and dilute to 1 liter. Standardize by titrating with normal hydrochloric or sulfuric acid, using methyl orange as an indicator.

0.1 Normal (standardized, carbonate free):

Method 1: Dissolve 7 g. of sodium hydroxide in 7 ml. of water, and filter the resulting solution through an asbestos mat in a Gooch crucible with the aid of suction. Do not wash the residue. Dilute two-thirds of the clear filtrate to 1 liter with freshly boiled water.

Method 2: Dissolve 6 g. of sodium hydroxide in 200 ml. of water and heat to boiling. Add slowly to the boiling solution 5 ml. of 5 per cent barium chloride solution. Allow the precipitate to settle and test for completeness of precipitation with a few drops more of the barium chloride solution. Continue the addition of barium chloride until all the carbonate is precipitated. Allow the barium carbonate to settle and decant two-thirds of the clear supernatant liquid into a clean liter flask. Finally dilute this solution to 1 liter with freshly boiled water.

Method 3: Within an empty vacuum desiccator place a small beaker containing water and a second dry beaker containing 2.3 g. of sodium metal. The sodium is cut into thin shavings, which must be clean and free of oil. Now remove the air from the desiccator by connecting to a water aspirator pump. The water vapor in the desiccator reacts with the sodium metal to form pure sodium hydroxide. Keep the desiccator connected to the vacuum pump until all of the metal is dissolved and a clear solution remains in the beaker. Dilute this solution to 1 liter with freshly boiled water.

Standardization: The above solutions are standardized by titrating accurately weighed 0.6-0.8 g. portions of potassium acid phthalate which are dissolved in 100 ml. portions of water. Phenolphthalein is used as the indicator.

Ref. Kolthoff and Sandell, pp. 521-526

SODIUM HYDROXIDE SOLUTION

Use: For the absorption of carbon dioxide.

Preparation: Dissolve 330 g. of sodium hydroxide in water and dilute to 1 liter.

Ref. Handbook of Chem. and Physics, p. 1314

SODIUM HYPOBROMITE SOLUTION

Use: Reagent for the determination of urea (Method of Van Slyke), and an analytical reagent.

Preparation: Prepare two solutions as follows:

Solution A: Dissolve 60 g. of sodium bromide in water and add 2.5 g. of bromine. Dilute to 100 ml.

Solution B: Dissolve 30 g. of sodium hydroxide in 100 ml. of water.

Remarks: Preserve in glass-stoppered bottles.

To use, mix 5 ml. of *Solution A*, and 3 ml. of *Solution B*.

Ref. Kolmer and Boerner, pp. 716-719

SODIUM HYPOPHOSPHITE REAGENT (ARSENIC)

See: Loof's reagent.

SODIUM IODIDE SOLUTION

Reagent: NaI, mol. wt. = 149.92.

Preparation:

0.5 Molar: Dissolve 75 g. of sodium iodide in water and dilute to 1 liter.

1.0 Normal: Dissolve 149.9 g. of sodium iodide in water and dilute to 1 liter.

10 mg. of iodide ion per ml. of solution: Dissolve 11.8 g. of sodium iodide in water and dilute to 1 liter.

SODIUM MOLYBDATE REAGENT (SERGER)

Use: Reagent for vegetable oils.

Preparation: Dissolve 1 g. of sodium molybdate in 100 ml. of concentrated sulfuric acid.

Procedure for Test: Dissolve 5 ml. of the oil to be tested in 10 ml. of ether and shake with 1 ml. of the reagent. Allow the mixture to stand until the layers have separated, and then note the color of the lower layer. Various oils give characteristic colors as follows:

Peanut oil: blue.
Olive oil: dark green.
Cottonseed oil: dark blue.
Sesame oil: dark bluish-green.
Coconut oil: yellow.

Ref. C. A. 5, 3098 (1911)

SODIUM β-NAPHTHOQUINONE SULFONATE REAGENT (SULLIVAN)

Use: Reagent for cysteine and cystine.

Preparation: Dissolve 0.5 g. of sodium β-naphthoquinone sulfonate in 100 ml. of water.

Procedure for Test: To 5 ml. of 0.1 *N* solution to be tested add 1 ml. of a freshly prepared 1 per cent aqueous solution of sodium cyanide. Shake well, and add 1 ml. of the test reagent. Shake for about 10 seconds, and add 5 ml. of a 15 per cent solution of anhydrous sodium sulfite in 0.5 *N* sodium hydroxide. Mix and allow to stand for 30 minutes at room temperature. A reddish color appears. Now add 1 ml. of 2 per cent sodium hyposulfite in 0.5 *N* sodium hydroxide. The red-brown color turns to a pure red if cysteine is present. Cystine gives a similar color reaction.

Ref. J. Biol. Chem. **59**, 1 (1924); U. S. Public Health Repts. Suppl. No. 78 (1929)

SODIUM β-NAPHTHOQUINONE SULFONATE SOLUTION (INDOLE)

Use: Test reagent for indole in the presence of skatole.

Preparation: Dissolve 2 g. of the reagent in 100 ml. of water.

Procedure for Test: To 10 ml. of the solution to be tested add 2 drops of the reagent and 2 ml. of 10 per cent sodium hydroxide. Let stand for 15 minutes and shake with 2 ml. of chloroform. A pink to red color in the chloroform indicates the presence of indole.

Ref. J. Biol. Chem. 1906, 267

SODIUM β-NAPHTHOQUINONE-4-SULFONATE SOLUTION (SULFANILIMIDE)

Use: Reagent for sulfanilimide in tungstic acid blood filtrates.

Preparation: Dissolve 0.05 g. of sodium-β-naphthoquinone-4-sulfonate in 100 ml. of water.

Procedure for Test: To 10 ml. of tungstic acid blood filtrate, add 1 drop of 0.1 *N* hydrochloric acid and 1 ml. of freshly prepared reagent. Allow the mixture to stand in the dark 45 to 60 minutes, and compare the color which develops with color standards.

Ref. J. Biol. Chem. **122**, 757 (1938)

SODIUM NITRATE SOLUTIONS

Reagent: $NaNO_3$, mol. wt. = 85.01.

Preparation:

1.0 Molar: Dissolve 85 g. of sodium nitrate in water and dilute to 1 liter.

1.0 Normal: Same as 1.0 Molar.

10 mg. nitrate ion per ml. of solution: Dissolve 13.7 grams of sodium nitrate in water and dilute to 1 liter.

SODIUM NITRITE SOLUTIONS

Reagent: $NaNO_2$, mol. wt. = 69.01.

Preparation:

0.5 Molar: Dissolve 34.5 g. of sodium nitrite in water and dilute to 1 liter.

1.0 Normal: Dissolve 69 g. of sodium nitrite in water and dilute to 1 liter.

10 mg. of nitrite ion per ml. of solution: Dissolve 15 g. of sodium nitrite in water and dilute to 1 liter.

SODIUM NITROPRUSSIDE INDICATOR SOLUTION

Use: Indicator for the determination of halides using the mercurimetric method.

Preparation: Dissolve 10 g. of sodium nitroprusside in 100 ml. of water. Protect from light.

Remarks: Highly dissociated mercuric compounds give precipitates with sodium nitroprusside, while the slightly dissociated mercuric halides do not. Hence, when mercuric nitrate solution is added to a solution containing chloride and a little of the indicator, a turbidity or precipitate forms when all of the chloride has reacted with the mercuric ions.

Ref. Kolthoff and Furman, pp. 261-263

SODIUM NITROPRUSSIDE REAGENT

Use: Reagent for the detection of sulfur dioxide and hydrogen sulfide.

Preparation: Wash filter paper with a solution containing 4 per cent sodium nitroprusside and 2 per cent sodium carbonate.

Sensitiveness: 1 : 1,000,000 SO_2.
1 : 5,000,000 H_2S.

Ref. C. A. **35**, 1353 (1941)

SODIUM NITROPRUSSIDE REAGENT (ACETONE)

See: Legal's solution.
Rothera's reagent.

SODIUM NITROPRUSSIDE SOLUTION

Use: Test reagent for hydrogen sulfide and wool.

Preparation: Dissolve 1 g. of sodium nitroprusside in 100 ml. of water.

Remarks: Reagent causes a violet-red color with alkaline solutions of sulfides.

The wool test is based on the formation of an alkaline sulfide when the fabric is treated with sodium hydroxide solution.

Use a freshly prepared solution of the reagent.

Sensitiveness: 0.6 g. K_2S per liter.

Ref. Engelder, p. 187

SODIUM OLEATE SOLUTION

Use: Reagent for the determination of lead spray on fruits (Method of Vorhes and Clifford).

Preparation: Transfer 45 ml. of 30 per cent sodium hydroxide solution to a 1.5 liter flask and add 400 ml. of water. With constant heating and stirring, add 90 g. of oleic acid from a separatory funnel. Heat the mixture on a steam bath until the soap which forms is entirely dissolved. Cool, dilute to 1 liter, and filter.

Ref. J. Assoc. Official Agr. Chem. **17**, 130 (1934); Jacobs, pp. 129-131

SODIUM PHOSPHOTUNGSTATE SOLUTION (RICHAUD-BIDOT)

Use: Reagent for ferrous iron in milk, gastric juice, urine, etc.

Preparation: Dissolve 25 g. of sodium phosphotungstate in 5 ml. of hydrochloric acid and 250 ml. of water.

Procedure for Test: Add 2-3 ml. of the reagent to the solution to be tested, and then make the mixture alkaline with a solution of sodium hydroxide. A blue color forms if ferrous iron is present, but this color is destroyed when the solution is acidified.

Ref. C. A. **3**, 1775 (1909)

SODIUM PICRATE SOLUTION

Use: Etch solution to show cementite and other carbides.

Preparation: Add slowly and with constant stirring a 5 per cent aqueous solution of picric acid to a 25 per cent solution of sodium hydroxide until the base is just neutralized. The final solution should always be alkaline to litmus. Add a little sodium hydroxide solution if necessary.

Ref. Metals Handbook, p. 724

SODIUM PLUMBITE SOLUTION

Use: A reagent for wool.

Preparation: Dissolve 5 g. of sodium hydroxide in 100 ml. of water and add 5 g. of lead monoxide (PbO). Boil until the oxide is completely dissolved.

Remarks: A brown to black color or precipitate forms when wool is heated with this solution.

Ref. Handbook of Chem. and Physics, p. 1314

SODIUM POLYSULFIDE SOLUTION

Reagent: $Na_2S \cdot 9H_2O$ mol. wt. = 240.19.

Preparation: Dissolve 48 g. of sodium sulfide in 50 ml. of water, and add 4 g. of sodium hydroxide and 1.8 g. of sulfur. Stir until the sulfur dissolves and dilute to 100 ml.

Ref. Jacobs, p. 132

SODIUM RHENATE REAGENT (MOKRANTZA)

Use: Test reagent for alkaloids.

Preparation: Dissolve 0.05 g. of sodium rhenate in 5 ml. of water and add enough sulfuric acid to make a total volume of 100 ml.

Remarks: Various alkaloids give characteristic color reactions.

Ref. C.A. **27**, 2531 (1933)

SODIUM RHODIZONATE SOLUTION

Use: A test reagent for barium ions, and also an indicator for the titration of sulfates by means of barium.

Preparation: Dissolve 5 g. of sodium rhodizonate in 100 ml. of distilled water.

Remarks: This solution is unstable.
Barium ions cause a brown coloration with the reagent, and this color changes to red with the addition of hydrochloric acid. Strontium gives a similar reaction but dissolves in acid.

Ref. C. A. **23**, 4644 (1929); **19**, 1108 (1925)

SODIUM SALICYLATE REAGENT

Use: Reagent for the detection and determination of uranium and iron.

Preparation: Dissolve 2 g. of sodium salicylate in 100 ml. of water. A 10 per cent solution is used for iron.

Remarks: This reagent gives a red coloration with neutral or slightly acid solutions of uranyl ions. Iron must be absent. Organic solvents also interfere. The 10 per cent solution gives an amethyst color with ferric ions.

Ref. Snell I, p. 394

SODIUM SELENATE REAGENT (ALKALOIDS)

See: Renteln's solution.

SODIUM SELENITE REAGENT (CADMIUM)

Use: Test reagent for cadmium.

Preparation: Dissolve 1 g. of sodium selenite and 0.5 g. of potassium cyanide in 100 ml. of water.

Procedure for Test: Make the solution to be tested alkaline with ammonium hydroxide, and then decolorize with potassium cyanide. Add 5 drops of the reagent and add 1 ml. of ether and shake well. A red-brown film at the contact zone indicates the presence of cadmium.

Sensitiveness: 0.005 mg.

Ref. Mikrochemie **17**, 210 (1935)

SODIUM SELENITE REAGENT (ERGOSTEROL)

Use: Reagent for differentiating between ergosterol and cholesterol.

Preparation: Mix 30 ml. of a 2 per cent aqueous solution of sodium selenite with 10 ml. of concentrated hydrochloric acid.

Procedure for Test: Mix 2 ml. of a chloroform solution of the material to be tested with 2 ml. of the reagent and heat on a water bath until the chloroform is evaporated. Add 2 ml. of chloroform to the residue. If ergosterol is present a yellow to orange color appears in the chloroform layer. Cholesterol does not give this color reaction.

Ref. Proc. Soc. Explt. Biol. Med. **33**, 546 (1936)

SODIUM SILVER COBALTIC NITRITE SOLUTION

Use: Test reagent for potassium.

Preparation: Add 2 ml. of 40 per cent silver nitrate solution to 20 ml. of 15 per cent sodium cobaltic nitrite solution and filter.

Remarks: A yellow to orange-yellow precipitate forms when this reagent is added to solutions of potassium salts.

Sensitiveness: 1 : 1,000,000.

Ref. Ind. Eng. Chem., Anal. Ed. **8**, 211 (1936); J. Biol. Chem. **87**, 81 (1930); J. Am. Chem. Soc. **34**, 652 (1912)

SODIUM SULFATE SOLUTIONS

Reagent: Na_2SO_4, mol. wt. = 142.05, or
$Na_2SO_4 \cdot 10H_2O$, mol. wt. = 322.22.

Preparation:

0.5 Molar: Dissolve 71 g. of Na_2SO_4 or 161.1 g. of $Na_2SO_4 \cdot 10H_2O$ in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of sulfate ion per ml. of solution: Dissolve 14.8 g. of Na_2SO_4 or 33.6 g. of $Na_2SO_4 \cdot 10H_2O$ in water and dilute to 1 liter.

SODIUM SULFIDE SOLUTIONS

Reagent: $Na_2S \cdot 9H_2O$, mol. wt. = 240.2.

Preparation:

0.5 Molar: *Method 1:* Dissolve 120.1 g. of sodium sulfide in water and dilute to 1 liter. *Method 2:* Saturate 500 ml. of cold 1.0 molar sodium hydroxide with hydrogen sulfide, and then add 500 ml. of 1.0 molar sodium hydroxide solution.

1.0 Normal: Same as 0.5 Molar.

10 mg. of sulfide ion per ml. of solution: Dissolve 75.1 g. of sodium sulfide in water and dilute to 1 liter.

SODIUM SULFITE AGAR (WILSON)

Use: Culture medium.

Preparation: Dissolve 1 g. of glucose and 3 g. of agar in 100 g. of beef extract peptone broth by heating in an autoclave. To this solution add the following sterile solutions just before pouring the plates:

Sodium sulfite, anhyd. 20% aq. soln.	10 per cent
Ferric chloride, 8.1% aq. soln.	1 per cent
Sodium hydroxide, 12% aq. soln.	0.5 per cent

Ref. J. of Hygiene **21**, 392; **24**, 111

SODIUM SULFITE SOLUTIONS

Reagent: $Na_2SO_3 \cdot 7H_2O$, mol. wt. = 252.17.

Preparation:

0.5 Molar: Dissolve 126.1 g. of sodium sulfite in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of sulfite ion per ml. of solution: Dissolve 32.2 g. of sodium sulfite in water and dilute to 1 liter.

SODIUM TETRABORATE SOLUTIONS

Reagent: $Na_2B_4O_7 \cdot 10H_2O$, mol. wt. = 381.44.

Preparation:

0.1 Molar: Dissolve 38.1 g. of sodium tetraborate (borax) in water and dilute to 1 liter.

0.2 Normal: Same as 0.1 Molar.

10 mg. of tetraborate ion per ml. of solution: Dissolve 24.6 g. of sodium tetraborate in water and dilute to 1 liter.

SODIUM THIOSULFATE SOLUTIONS

Reagent: $Na_2S_2O_3 \cdot 5H_2O$, mol. wt. = 248.2.

Preparation:

0.1 Molar: Dissolve 24.8 g. of sodium thiosulfate in water and dilute to 1 liter.

10 mg. of thiosulfate ion per ml. of solution: Dissolve 22.2 g. of sodium thiosulfate in water and dilute to 1 liter.

SODIUM THIOSULFATE SOLUTION (VOLUMETRIC REAGENT)

Reagent: $Na_2S_2O_3 \cdot 5H_2O$, mol. wt. = 248.2.

Preparation:

0.1 Normal (standardized): (Solution contains 24.8192 g. of $Na_2S_2O_3 \cdot 5H_2O$ per liter). Weigh out 25 g. of sodium thiosulfate

and dilute to exactly 1 liter with distilled water. Mix thoroughly and allow to stand for about two weeks. If free sulfur has precipitated, siphon off the clear supernatant liquid. This solution may be standardized by titration against potassium dichromate. This is carried out as follows:

Weigh out 0.2 g. of pure potassium dichromate and dissolve in 50 ml. of water. Add 2 g. of potassium iodide and 8 ml. of concentrated hydrochloric acid. Mix thoroughly and titrate with the thiosulfate solution. Swirl the solution constantly as the thiosulfate is added. When the color of the solution changes from brown to yellowish-green, add a few ml. of starch solution and continue the titration until the color change is quite sharp.

Ref. Sutton, pp. 136-137

SODIUM TUNGSTATE REAGENT (ASCORBIC ACID)

Use: Reagent for vitamin C (ascorbic acid).

Preparation: Dissolve 2 g. of sodium tungstate in 10 ml. of *N* sulfuric acid. This solution must be freshly prepared.

Procedure for Test: Add metaphosphoric acid to the material to be tested until 2 per cent is present, and to 4 ml. of this solution add 1 ml. of the sodium tungstate reagent. Mix and add 0.4 ml. of 2 *N* sodium hydroxide solution. A blue color develops if ascorbic acid is present. This color may be compared with a standard. This test is specific and highly sensitive.

Sensitiveness: 0.003 mg. ascorbic acid.

Ref. C. A. **29**, 4398 (1935)

SODIUM TUNGSTATE SOLUTION (BARIUM)

Use: Reagent for micro-test for barium.

Preparation: Dissolve 1 g. of sodium tungstate in 100 ml. of water.

Remarks: Characteristic crystals are formed when this reagent is added to a solution containing barium ions.

Ref. C. A. **24**, 4726-4727 (1930)

SODIUM VANADATE REAGENT (GUYOT)

Use: Test reagent for epinephrine.

Preparation: Dissolve 1.5 g. of sodium vanadate and 2 ml. of sodium hydroxide solution in 30 ml. of water.

Procedure for Test: Add 2 drops of the reagent and 2 drops of sodium hydroxide solution to a very dilute solution of epinephrine in water. A pink color appears and gradually changes to red.

Sensitiveness: 0.00001 g. epinephrine.

Ref. C. A. **20**, 965 (1926)

SOLDAINI'S SOLUTION

Use: Test reagent for glucose.

Preparation: Dissolve 41.6 g. of potassium bicarbonate in 140 ml. of water, and dissolve 1.5 g. of precipitated cupric carbonate in this solution.

Remarks: This solution is reduced by glucose and lactose.

Ref. Browne, p. 337

SOLM'S REAGENT

Use: Test reagent for pepsin.

Preparation: Dissolve 0.5 g. of ricin in 50 ml. of 5 per cent sodium chloride solution. Filter and add 0.5 ml. of 0.1 *N* hydrochloric acid.

Remarks: This milky solution is clarified by treating with pepsin at 40° C.

Ref. Zeitschr. klin. Med. 1907, Nos. 1, 2

SONNENSCHEIN'S REAGENTS

Use: Test reagents for alkaloids.

Solution A:

Method 1: Precipitate ammonium phosphomolybdate and wash well with water. Then boil with nitric acid to expel ammonia, and evaporate to dryness. Dissolve the residue in 2 *N* nitric acid.

Method 2: Dissolve ammonium molybdate in nitric acid and add phosphoric acid. Filter, and wash the residue with water. Next boil with aqua regia until the ammonium phosphomolybdate is decomposed, and then evaporate to dryness. Dissolve the residue in 10 per cent nitric acid.

Solution B: This is a solution of cerosoceric oxide in sulfuric acid.

Remarks: Solution A precipitates albumin and alkaloids in aqueous solution. *Solution B* causes color reactions with alkaloids in concentrated sulfuric acid.

Ref. Zeitschr. anal. Chem. **9**, 494 (1870); **11**, 440 (1872)

SØRENSEN'S STANDARD PHOSPHATE SOLUTIONS

See: Standard phosphate solutions (Sørensen).

SOZOIODOL REAGENT

See: Diiodophenol-p-sulfonic acid solution.

SPEHL'S REAGENT

Use: Test reagent for blood in urine or stomach contents.

Preparation: Shake a little guaiac wood with alcohol, and mix 4 ml. of this freshly-prepared tincture with 1 ml. of 20 per cent sodium carbonate

solution, 4 ml. of 3 per cent hydrogen peroxide, and 1 ml. of 95 per cent alcohol.

Procedure for Test: Acidify the material to be tested with acetic acid, and extract with 5 ml. of ether. Mix the ether extract with an equal volume of the reagent. A blue color forms if blood is present.

Ref. The Merck Index, p. 919

SPIEGLER'S REAGENT

Use: Test reagent for albumin in urine.

Preparation:

Method I: Dissolve 2 g. of tartaric acid, 4 g. of mercuric chloride, and 10 g. of cane sugar in 100 ml. of water.

Method II: Dissolve 10 g. of tartaric acid, 20 g. of mercuric chloride, 25 g. of sodium chloride, and 50 g. of glycerol in 500 ml. of water.

Procedure for Test: Carefully pour a little urine onto the surface of a few ml. of the reagent. This solution (prepared by either method) precipitates albumin. This is a very delicate test.

Sensitiveness: 1 : 225,000.

Ref. Ber. **25**, 375 (1892)

SPIEGLER-JOLLE'S SOLUTION

Use: Test reagent for albumin in urine.

Preparation: Dissolve 2 g. of mercuric chloride, 4 g. of succinic acid, and 4 g. of sodium chloride in water and dilute to 100 ml.

Remarks: This reagent produces a precipitate or turbidity with urine containing albumin.

Ref. Deut. med. Wochschr. **53**, 1906 (1927)

STAMM'S REAGENT

Use: Test reagent for cyanide.

Preparation: Dissolve 0.01 g. of fluorescein in 5 ml. of alcohol, and to this solution add 2 ml. of 33 per cent sodium hydroxide solution, 5 ml. of water, and a little powdered zinc. Heat on a water bath until the solution is colorless. Then dilute to 100 ml. with water and add 100 ml. of alcohol. Let stand overnight in the dark and filter. This stock solution will keep in the dark for several months. When ready to use, dilute 10 ml. of the solution with water to make a final volume of 200 ml.

Procedure for Test: Add 4 ml. of the reagent and 2 drops of 0.05 per cent cupric sulfate solution to the solution to be tested. An intense fluorescence develops immediately if cyanide is present. Oxidizing agents also give this reaction.

Sensitiveness: 0.0009 g. HCN per liter.

Ref. C. A. **19**, 1550 (1925)

STANDARD PHOSPHATE SOLUTIONS (SØRENSEN)

Use: Buffer solution used to adjust pH reaction of culture media.

Preparation:

(a) *M*/15 disodium phosphate (Sørensen) in ammonia-free distilled water.

(b) *M*/15 monopotassium phosphate (Sørensen) in ammonia-free distilled water.

These reagents are specially prepared for this purpose, and are ordered as Sørensen's sodium phosphate and potassium phosphate.

These two solutions are mixed as follows to give solutions of the indicated pH values:

pH	ml. M/15 Sodium Phosphate		ml. M/15 Potassium Phosphate
6.0	12.0	+	88.0
6.2	18.0	+	82.0
6.4	26.0	+	74.0
6.6	37.0	+	63.0
6.8	50.0	+	50.0
7.0	62.0	+	38.0
7.2	73.0	+	27.0
7.4	82.0	+	18.0
7.6	88.0	+	12.0
7.8	92.0	+	8.0
8.0	95.0	+	5.0
8.3	97.5	+	2.5

Remarks: These solutions are used with indicators as color standards for adjusting the pH of culture media.

Ref. Kolmer and Boerner, pp. 343-344

STANNIC CHLORIDE SOLUTIONS

Reagent: $SnCl_4$, mol. wt. = 260.53, or $SnCl_4 \cdot 3H_2O$, mol. wt. = 314.58.

Preparation:

0.2 Molar: Dissolve 52.1 g. of $SnCl_4$ or 62.9 g. of $SnCl_4 \cdot 3H_2O$ in 100 ml. of concentrated hydrochloric acid and dilute with water to 1 liter.

0.5 Normal: Dissolve 32.6 g. of $SnCl_4$ or 39.3 g. of $SnCl_4 \cdot 3H_2O$ in 100 ml. of concentrated hydrochloric acid and dilute with water to 1 liter.

10 mg. of stannic ion per ml. of solution: Dissolve 21.9 g. of $SnCl_4$ or 26.5 g. of $SnCl_4 \cdot 3H_2O$ in 100 ml. of concentrated hydrochloric acid and dilute with water to 1 liter.

STANNOUS CHLORIDE SOLUTION

Reagent: $SnCl_2 \cdot 2H_2O$, mol. wt. = 225.65.

Preparation:

0.5 Molar: Dissolve 112.8 g. of stannous chloride in 170 ml. of concentrated hydrochloric acid, using heat if necessary. Dilute with water to 1 liter and add a few pieces of tin.

1.0 Normal: Same as 0.5 Molar.

10 mg. of stannous ion per ml. of solution: Dissolve 19.1 g. of stannous chloride in enough 6 *N* hydrochloric acid to make one liter of solution. Add a few pieces of tin foil.

Remarks: Fresh solutions should be prepared at frequent intervals.

STARCH AGAR (KHOUVINNE MODIFICATION)

Use: Culture medium.

Preparation: Mix the following:

Agar	20 g.
Dipotassium phosphate	1 g.
Magnesium sulfate ($MgSO_4 \cdot 7H_2O$)	1 g.
Sodium chloride	1 g.
Ammonium sulfate	2 g.
Potato starch	10 g.
Distilled water	1000 ml.

Sterilize for 15 minutes at 100° C. in flowing steam.

STARCH REAGENT FOR IODINE (ZULKOWSKY)

Use: Reagent for iodine.

Preparation: Stir 6 g. of starch with 100 g. of glycerol and heat slowly with constant stirring until the temperature reaches 190°. Heat at this temperature until the material is soluble in water.

Remarks: The aqueous solution gives a blue color with iodine.

Ref. Ber. 13, 1395 (1880)

STARCH SOLUTION

Use: Test reagent for iodine, and an indicator in iodometric analysis.

Preparation:

Method 1: Mix enough water with 2 g. of soluble starch and 10 mg. of mercuric iodide to form a paste. Then add the paste to 1 liter of boiling water, and continue the boiling for 3 or 4 minutes. Store in a glass stoppered bottle. If soluble starch is not available, ordinary starch may be used, but the product will not be clear. In this case, allow the solution to stand, and then decant the clear supernatant liquid.

Method 2: Prepare 500 ml. of a saturated solution of sodium chloride and filter. Next, add to this solution 3 g. of starch, 20 ml. of water, and 80 ml. of glacial acetic acid. Heat slowly to the boiling point, and allow the solution to boil for 2 minutes. This solution keeps indefinitely but is not adaptable for all purposes.

Method 3: Add just enough cold water to 1 g. of starch and 5 mg. of mercuric iodide to form a paste. Next add 200 ml. of boiling water to this paste and stir at once. Under these conditions a clear solution is obtained. Cool the solution and add 4 g. of potassium iodide. A little toluene may be added as a preservative.

Ref. Kolthoff and Sandell, p. 589; Sutton, pp. 137-138

STEAD'S REAGENT

Use: To show phosphorus segregation in steel.

Preparation: Dissolve 10 g. of cupric chloride and 40 g. of magnesium chloride in the smallest possible quantity of hot water (about 25 ml.), and add 20 ml. of concentrated hydrochloric acid and enough alcohol to make 1 liter of solution.

Ref. Metals Handbook, p. 729

STEENSMA'S REAGENT

Use: Reagent for hydrochloric acid in gastric juice.

Preparation: Dissolve 2 g. of phloridzin and 1 g. of vanillin in 30 ml. of absolute alcohol.

Remarks: Used like Günzberg's reagent.

Ref. C. A. 2, 2573 (1908)

STEVENSON-RESUGGAN REAGENT

Use: Reagent for p-hydroxybenzoic acid.

Preparation:

Solution A: Dissolve 5 g. of aniline in 13 ml. of concentrated hydrochloric acid and 26 ml. of water.

Solution B: Dissolve 4.5 g. of sodium nitrite in 20 ml. of water.

To use: Cool both solutions to 5° C. and slowly add *B* to *A*, taking care that the temperature does not rise about 5° C. Use within 1 hour.

Procedure for Test: Dissolve a little of the material to be tested in a little sodium hydroxide solution and cool to 5° C. Add slowly an excess of the diazo reagent prepared by mixing *Solutions A* and *B*. Allow to stand for some time and acidify the mixture. Extract with ether and shake the ether extract with sodium carbonate solution. Finally, separate the layers and treat the ether layer with sodium hydroxide. A red color appears in the ether layer if p-hydroxybenzoic acid is present.

Ref. Am. J. Pharm. 110, 200 (1938)

STEWART'S REAGENT

Use: Test reagent for albumin.

Preparation: Dissolve the following in 1.5 liters of water:

Picric acid (wet)	10 g.
Citric acid	20 g.
Magnesium sulfate	400 g.

Remarks: Reagent precipitates albumin.

Ref. J. Am. Med. Assoc. **71**, 1050 (1918)

STOKE'S REAGENT (GUMS)

Use: Test reagent for gums.

Preparation: Dissolve mercury in twice its weight of nitric acid and dilute this solution to 25 times its volume with water.

Remarks: Reagent causes characteristic precipitates with many gums.

Ref. Jacobs, pp. 284-285

STOKES' REAGENT

Use: A reducing agent.

Preparation: Dissolve 3 g. of ferrous sulfate and 2 g. of tartaric acid in 100 ml. of water. When ready to use, place a small quantity of the solution in a test tube and add ammonium hydroxide until the precipitate which first forms is completely dissolved.

Ref. Handbook of Chem. and Physics, p. 1315

STORFER'S REAGENT

Use: Test reagent for ferricyanide.

Preparation: Add slowly 51 g. of cupric chloride to an aqueous solution containing 7.6 g. of thiourea which has previously been heated to 70° C. Crystallize from warm water. Prepare a saturated solution of the crystalline material at 70° C., and impregnate strips of filter paper with this solution. Dry the paper in vacuo.

Remarks: Paper turns red or grayish-violet when moistened with a drop of neutral solution containing ferricyanide.

Sensitiveness: 1 : 100,000.

Ref. C. A. **29**, 5379 (1935)

STRONTIUM CHLORIDE SOLUTIONS

Reagent: $SrCl_2 \cdot 2H_2O$, mol. wt. = 194.58, or
$SrCl_2 \cdot 6H_2O$, mol. wt. = 266.64.

Preparation:

0.5 Molar: Dissolve 97.3 g. of $SrCl_2 \cdot 2H_2O$ or 133.3 g. of $SrCl_2 \cdot 6H_2O$ in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of strontium ion per ml. of solution: Dissolve 22.1 g. of $SrCl_2 \cdot 2H_2O$ or 30.5 g. of $SrCl_2 \cdot 6H_2O$ in water and dilute to 1 liter.

STRONTIUM NITRATE SOLUTIONS

Reagent: $Sr(NO_3)_2$, mol. wt. = 211.65, or $Sr(NO_3)_2 \cdot 4H_2O$, mol. wt. = 283.71.

Preparation:

0.5 Molar: Dissolve 105.8 g. of $Sr(NO_3)_2$ or 141.9 g. of $Sr(NO_3)_2 \cdot 4H_2O$ in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of strontium ion per ml. of solution: Dissolve 24.1 g. of $Sr(NO_3)_2$ or 32 g. of $Sr(NO_3)_2 \cdot 4H_2O$ in water and dilute to 1 liter.

STRYCHNINE REAGENT

Use: Test reagent for chlorates and bromates.

Preparation: Dissolve 1.2 g. of strychnine in 36 ml. of nitric acid (sp. gr. 1.334).

Procedure for Test: Add 1-2 drops of the solution to be tested to 1 ml. of the reagent. With chlorates and bromates a red color develops immediately. Hypochlorites, hydrochloric acid, and chlorine interfere.

Ref. Pharm. Zentralhalle. 1901, 181

STRYCHNINE REAGENT (VANADIUM)

Use: Reagent for the colorimetric determination of vanadium.

Preparation: Dissolve 0.4 g. of strychnine in 100 g. of concentrated sulfuric acid.

Remarks: This reagent gives a violet color followed by an intense orange coloration when added to a solution containing pentavalent vanadium. Iron interferes, but tungsten, molybdenum, and titanium do not.

Sensitiveness: 0.0025 mg. ammonium vanadate per ml.

Ref. Chem. News, **100**, 221 (1909); Snell I, p. 371; Yoe I, pp. 393-395

STRYCHNINE-MOLYBDATE REAGENT

Use: Reagent for detection and determination of phosphoric acid.

Preparation:

Solution A: Dissolve 95 g. of molybdenum trioxide and 30 g. of anhydrous sodium carbonate in 600 ml. of water. Warm until solution is complete. Then add 200 ml. of nitric acid (sp. gr. 1.330) and dilute with water to 1 liter.

Solution B: Dissolve 2 g. of strychnine sulfate in 100 ml. of water.

Procedure for Test: Mix 1 ml. of *Solution A* with 10 ml. of *Solution B* and add the mixture to the solution to be tested. A blue-yellow turbidity appears if phosphoric acid is present.

Sensitiveness: 1 : 20,000,000.

Ref. C. A. **3**, 2284 (1909); Yoe I, pp. 142-143

STRYCHNINE-MOLYBDATE REAGENT (MEDINGER)

Use: Reagent for phosphate in water.

Preparation: Dissolve 40 g. of ammonium molybdate in 100 ml. of water and filter. To the clear filtrate add slowly about 80 ml. of saturated aqueous strychnine nitrate solution. Add the strychnine nitrate solution carefully toward the end until the precipitate which forms is permanent. To this mixture add an equal volume of concentrated nitric acid. Allow to stand 24 hours.

Procedure for Test: Add 10 ml. of the water to be tested to 0.5 ml. of the reagent. A turbidity or color forms if phosphate is present, and the time required for the development of this test depends on the amount of phosphate present.

Ref. C. A. **10**, 27 (1916)

STRYCHNINE SULFATE REAGENT

Use: Test reagent for cerium.

Preparation: Dissolve 0.1 g. of strychnine sulfate in 100 g. of concentrated sulfuric acid.

Procedure for Test: Make the solution to be tested alkaline with sodium hydroxide solution, and evaporate to dryness. Add 2-3 drops of the reagent to the residue and note the color. A blue color appears if cerous salts are present.

Sensitiveness: 0.01 mg. of cerium oxide.

Ref. Arch. Pharm. **229**, 558 (1891)

SUCCINIC ACID SOLUTION (VOLUMETRIC REAGENT)

Reagent: $H_2C_4H_4O_4$, mol. wt. = 118.05.

Preparation:

0.1 Normal (standardized): Place 10-11 g. of pure succinic acid in an open weighing bottle and dry in an oven at 105° C. for 10 hours. Allow to dry in a desiccator, and then weigh accurately 5.9023 g. of the acid. Transfer completely to a 400 ml. beaker and dissolve in about 200 ml. of water. Pour this solution into a liter volumetric flask, dilute to the mark, and mix thoroughly. This solution is exactly 0.1 Normal.

SUCHIER'S REAGENT

Use: Reagent for the detection of phosgene in air.

Preparation: Dissolve 5 g. of p-dimethylaminobenzaldehyde in 25 ml. of alcohol and mix with a solution prepared by dissolving 5 g. of diphenylamine in 25 ml. of alcohol, and then soak filter paper in this solution. Dry the paper in a current of carbon dioxide.

Remarks: The yellow paper turns brown in the presence of phosgene.

Sensitiveness: 4 mg. of phosgene per cu. meter of air.

Ref. C. A. **24**, 1056-1057 (1930)

SUGAR-FREE BEEF INFUSION BROTH (BOUILLON)

Use: Culture medium.

Preparation: Add 10 ml. of a 24-hour broth culture of E. coli to 1 liter of nutrient broth and incubate for 48 hours. Heat in a steam sterilizer at 100° C. for 1 hour and place in a refrigerator.

Fill two fermentation tubes, reinoculate with E. coli, and incubate for 1 day. If no gas is formed, finish the medium by adjusting the reaction, filtering, and heating in an autoclave at 15 pounds pressure for 20 minutes.

SULFATE-TUNGSTATE SOLUTION (BLOOD ANALYSIS)

Use: Deproteinization of unlaked blood in blood analysis.

Preparation: Dissolve 6 g. of sodium tungstate and 15 g. of anhydrous sodium sulfate in water and make up to 1 liter.

Ref. Hawk and Bergeim, p. 413; J. Biol. Chem. **86**, 173 (1930)

SULFOMOLYBDIC ACID SOLUTION

See: Fröhde's solution.

SULFOCHONDROITIC ACID (SODIUM SALT)

See: Pons' reagent.

SULFOSALICYLIC ACID REAGENT

Use: Test reagent for ferric iron.

Preparation: Dissolve 5 g. of sulfosalicylic acid in 100 ml. of distilled water.

Procedure for Test: Place a drop of the reagent on drop-reaction paper, and add 1 drop of the solution to be tested. A violet color appears with ferric iron. Cobalt, aluminum, chromium, nickel, manganese, zinc, and the alkaline earth metals do not interfere.

Ref. Engelder, pp. 145-146; C. A. **19**, 1234 (1925)

SULFURIC ACID SOLUTIONS

Reagent: H_2SO_4 (sp. gr. 1.84-98%) mol. wt. = 98.08.

Preparation:

6.0 Normal: Add slowly, and with constant stirring, 1 volume of concentrated sulfuric acid to 5 volumes of water.

1.0 Molar: Pour slowly, and with constant stirring, 60 ml. of concentrated sulfuric acid into about 200 ml. of water and dilute to 1 liter.

SULFURIC ACID SOLUTION (VOLUMETRIC REAGENT)

Reagent: H_2SO_4 (sp. gr. 1.84-98%) mol. wt. = 98.08.

Preparation:

1.0 Normal (standardized): Measure out 30 ml. of pure, concentrated sulfuric acid (d. = 1.84) and pour it slowly, and with constant stirring, into about 100 ml. of water. Cool, mix thoroughly, and dilute to 1 liter. This solution is only approximately normal, but it may be standardized by titration with standard sodium or potassium hydroxide solution, using phenolphthalein as an indicator.

0.1 Normal: Proceed exactly as above except that only 3 ml. of sulfuric acid is used.

Ref. Sutton, pp. 49-51

TAKAYAMA'S REAGENTS

Use: Test reagents for blood.

Preparation:

Method 1: Mix the following:

Glucose, 10% aq. soln.	10 ml.
Sodium hydroxide, 10% aq. soln.	20 ml.
Pyridine	40 ml.
Water	130 ml.

Method 2: Mix the following:

Glucose, 10% aq. soln.	3 ml.
Sodium hydroxide, 10% aq. soln.	3 ml.
Pyridine	3 ml.
Water	7 ml.

Remarks: Either solution, when added to blood, produces crystals of hemoglobin.

Ref. Münch. med. Wochschr. 1922, 116

TAKAYAMA'S SOLUTION

Use: Hemochromogen test in blood analysis.

Preparation: Mix 3 ml. of a saturated solution of glucose, 3 ml. of 10 per cent sodium hydroxide solution, 3 ml. of pyridine, and 7 ml. of water.

Remarks: This is essentially the same solution as described in *Method 2* above.

The cold solution works rapidly if 24 hours old, but fresh solutions require warming, or more time.

Solution keeps about two months.

Ref. Hawk and Bergeim, p. 396

TAKEUCHI'S REAGENT

Use: Test reagent for indican in urine.

Preparation: Dissolve the following in enough water to make 100 ml. of solution:

Potassium iodide	8.3 g.
Iodine	8.0 g.
Potassium bromide	6.0 g.

Procedure for Test: Treat 5 ml. of urine with lead acetate, and mix with several drops of acetic acid, 2-3 ml. of chloroform, and 2 drops of the reagent. Shake several times and add 5 ml. of concentrated hydrochloric acid. Shake again, and draw off the chloroform layer. Wash the chloroform extract with water to remove the acid, and treat with a few drops of sodium thiosulfate to remove the iodine. The chloroform is colored blue if indican was present in the urine.

Ref. C. A. **13**, 456 (1919)

TANANAEV'S REAGENT

Use: Test reagent for bismuth.

Preparation: Dilute 25 ml. of a saturated aqueous solution of potassium cyanide with 50 ml. of water, and to this solution add a 10 per cent manganese sulfate solution until the green precipitate which forms dissolves only with difficulty.

Procedure for Test: Add about 10 per cent hydrochloric acid to the solution to be tested, and carefully pour a little of this mixture down the side of a test tube containing about 5 ml. of the reagent. A dark ring forms if bismuth is present. This is a specific test for bismuth.

Sensitiveness: 0.001 *N* solution of bismuth gives test.
Spot test: 0.1 mg. in 0.01 ml.

Ref. C. A. **31**, 2119 (1937)

TANNIC ACID SOLUTION

Use: A reagent for albumin, alkaloids, and gelatin.

Preparation: Dissolve 10 g. of tannic acid in 10 ml. of alcohol and dilute with water to 100 ml.

Remarks: This solution precipitates albumin, gelatin, and some alkaloids.

Ref. Handbook of Chem. and Physics, p. 1315

TANRET'S REAGENT (ALBUMIN)

Use: Test reagent for albumin.

Preparation: Dissolve 1.35 g. of mercuric chloride in about 25 ml. of water, and to this add a solution prepared by dissolving 3.32 g. of potassium iodide in 25 ml. of water. To this mixture add 20 ml. of glacial acetic acid and add water to make the total volume 60 ml.

Remarks: Reagent causes white precipitates with albumin, alkaloids, and peptones. Mucin interferes.

Ref. C. A. 1, 1435 (1907); 2, 1573 (1908)

TANRET'S REAGENT (ALKALOIDS)

Use: Test reagent for alkaloids.

Preparation: Dissolve 13.546 g. of mercuric chloride and 49.8 g. of potassium iodide in water and dilute to 1 liter.

Remarks: Reagent causes precipitation in slightly acid solutions of alkaloids.

TAUBER'S REAGENTS (MONOSE SUGARS)

Use: Reagents for monose sugars.

Preparation:

Solution 1: Dissolve 24 g. of cupric acetate in 450 ml. of boiling water, and while hot add 25 ml. of 8.5 per cent lactic acid. Shake and boil until solution is complete. Cool, filter, and dilute with water to 500 ml.

Solution 2: Dissolve 150 g. of molybdenum trioxide (ammonia-free) and 75 g. of anhydrous sodium carbonate in 500 ml. of water. Heat to facilitate solution. Filter, and add 300 ml. of 85 per cent phosphoric acid. Cool and dilute to 1 liter. (This solution is known as Benedict's Molybdate Reagent.)

Ref. Jacobs, p. 255; Mikrochemie **14**, 176 (1933-1934)

TAUBER'S REAGENT (VITAMIN C)

Use: Reagent for vitamin C in plants.

Preparation: Dissolve 1 g. of ferric sulfate in 80 ml. of boiling water and 18 ml. of 85 per cent phosphoric acid, and then add a 1 per cent solution of potassium permanganate drop by drop until a faint pink color appears.

Procedure for Test: Grind in a mortar 5 g. of the material to be examined with 15 ml. of hot 8 per cent acetic acid. After a few minutes place a drop of this mixture on a double filter. Discard the upper paper and treat the spot on the lower paper with 1 drop of the reagent. A blue color indicates vitamin C.

Sensitiveness: 0.06 mg. per ml.

Ref. Mikrochemie **17**, 111 (1935)

TELLYESNICKY'S FLUID

Use: Fixative.

Preparation: Add 5 ml. of glacial acetic acid to 100 ml. of a 3 per cent aqueous solution of potassium dichromate just before use.

TETRABROMOPHENOL BLUE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of tetrabromophenol blue (tetrabromophenoltetrabromsulfonphthalein) in 5 ml. of *N*/50 sodium hydroxide solution and dilute with water to 250 ml.

Remarks: pH: yellow 3.0-4.6 blue.

TETRACHROME STAIN (MACNEAL)

Use: Staining solution.

Preparation: Mix the following:

Eosin Y (80-85% dye content)	1.0 g.
Methylene blue (90% dye content)	1.0 g.
Azure A	0.6 g.
Methylene violet (Bernthsen)	0.2 g.
Methanol, neutral, acetone-free	1000.0 ml.

Heat the mixture to 50° C. and shake vigorously. Place in an incubator at 37° C. for 24-48 hours. Filter at the end of this period.

Ref. Biol. Stains, Conn p. 173

TETRAMETHYLDIAMINODIPHENYLMETHANE SOLUTION (GOLD)

Use: Test reagent for gold.

Preparation: Dissolve 2.5 g. of the reagent and 5 g. of citric acid in 500 ml. of water.

Remarks: Reagent gives a blue to purple color with gold in neutral or slightly acid solutions. Silver, mercury, and palladium give similar reactions.

Ref. J. Am. Chem. Soc. **34**, 32 (1912); C. A. **25**, 2380 (1931)

TETRAMETHYLDIAMINODIPHENYLMETHANE SOLUTION (LEAD)

Use: Test reagent for lead.

Preparation: Dissolve 0.05 g. of the reagent in 10 ml. of glacial acetic acid and dilute to 100 ml. with water.

Remarks: Lead, when previously oxidized to lead peroxide with hydrogen peroxide in an ammoniacal solution, gives a blue color with the test reagent. The lead solution must stand for several hours before the test is made to allow the decomposition of the excess hydrogen peroxide.

Ref. Snell I, pp. 200-202; Engelder, p. 112

TETRAMETHYLDIAMINODIPHENYLMETHANE SOLUTION (MOLYBDATE AND VANADATE)

Use: Test reagent for molybdate and vanadate.

Preparation: Dissolve 1.5 g. of the reagent in 300 ml. of water containing 10 ml. of glacial acetic acid. Filter and add dilute ammonium hydroxide drop by drop until a faint opalescence appears. Then filter again to obtain a clear solution.

Remarks: Reagent yields a blue precipitate with solutions of molybdates, but only an opalescence with tungstate solutions.

Sensitiveness: Molybdenum: 0.06 g. per liter of ammonium molybdate.
Tungsten: 0.25 g. per liter of ammonium tungstate.

Ref. C. A. **23**, 3187-3188 (1929)

TETRAMETHYLPARAPHENYLENEDIAMINE PAPER

Use: Test reagent for ozone and hydrogen peroxide.

Preparation: Impregnate filter paper with a dilute alcoholic solution of tetramethylparaphenylenediamine and allow to dry.

Remarks: Ozone and hydrogen peroxide cause an intense blue color with this reagent. Pinewood and turpentine also cause this color.

Ref. Dennis, p. 190

TETTAMANZI'S REAGENT

Use: Reagent for separating arsenic and phosphoric acids.

Preparation: Dissolve 15 g. of ammonium molybdate in 50 ml. of hot water and add an equal volume of pure triethanolamine. Then mix with 20 ml. of 6 *N* nitric acid and 100 ml. of 10 per cent citric acid.

Remarks: To a solution that is neutral to phenolphthalein, add an excess of the reagent and filter. The arsenic passes through in the filtrate while the phosphate remains on the paper.

Ref. C. A. **30**, 8065 (1936)

THIERSCH'S CARMINE OXALATE

Use: For staining microscopic specimens.

Preparation: Dissolve 5 g. of carmine in 5 ml. of ammonium hydroxide and 5 ml. of water, and then mix with a solution prepared by dissolving 4 g. of oxalic acid in 80 ml. of water. Add 120 ml. of alcohol and filter.

THIOCYANOGEN SOLUTION (0.2 NORMAL)

Use: Reagent for the analysis of fats and oils.

Preparation: Suspend 50 g. of dry lead thiocyanate in 500 ml. of anhydrous acetic acid, and in another 500 ml. portion of anhydrous acetic acid dissolve 5.1 ml. of C.P. bromine. These solutions should be prepared in two glass-stoppered bottles, each of about 2 liters capacity. The bottles must be clean and dry. Now add the bromine solution to the lead thiocyanate suspension slowly and in small quantities, and between each addition shake vigorously until the solution is decolorized. When all of the bromine solution is added, allow to stand until the lead bromide and the excess lead thiocyanate has settled out. Then filter as rapidly as possible, using a Büchner funnel. The funnel and suction flask must be dry. Transfer the funnel and contents to a second suction flask and repeat the filtration. The filtrate must be perfectly clear. Store the solution in brown glass bottles fitted with glass stoppers, and keep the temperature below 21° C.

Remarks: Bottles, flasks, etc. used in the preparation of this solution should be dried at 105° C. for 1 hour before use.

Ref. Jacobs, pp. 215-218

THIODIPHENYLCARBAZIDE SOLUTION (AGOSTINI)

Use: Test reagent for magnesium.

Preparation: Use a saturated alcoholic solution of thiodiphenylcarbazide.

Procedure for Use: Add 2 drops of the reagent to 10 ml. of the solution to be tested, and then make strongly alkaline with ammonium hydroxide. If magnesium is present a carmine-red color, or a red, gelatinous precipitate appears after a few minutes.

Sensitiveness: 1 : 300,000.

Ref. C. A. **24**, 5254 (1930)

THIOGLYCOLIC ACID REAGENT

Use: Reagent for the determination of iron in milk, blood, etc.

Preparation: Dissolve 4 ml. of thioglycolic acid in 8 ml. of concentrated ammonium hydroxide and 50 ml. of water.

Remarks: This reagent gives with ferric ions at pH 8.0-10.0 a blue to purple coloration. With ferrous ions, a red color is obtained. The solution should be prepared as needed.

Sensitiveness: 1 : 10,000,000.

Ref. Snell I, p. 298

THIONIN STAINING SOLUTION

Use: Staining solution.

Preparation: Dissolve 0.5 g. of thionin (85-90% dye content) in 100 g. of 20 per cent alcohol.

Ref. Biol. Stains, Conn p. 75

THIOSINAMINE SOLUTION

See: Allylthiourea solution.

THOULET'S SOLUTION

Use: Reagent for the separation of minerals.

Preparation: This solution consists of a concentrated solution of potassium iodide and mercuric iodide in water.

Remarks: Specific gravity of this solution is 3.17 at 15° C.

THRESH'S SOLUTION

Use: Test reagent for alkaloids.

Preparation: Add 2.4 g. of bismuth citrate to a little water, and add ammonium hydroxide solution until the salt dissolves. The total volume

should be 30 ml. Mix with a solution containing 2 g. of potassium iodide dissolved in 45 ml. of hydrochloric acid.

Remarks: Reagent causes a precipitate with albumin and alkaloids in an acid solution.

THYMOL BLUE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of thymol blue (thymolsulfonphthalein) in 10.75 ml. of *N*/50 sodium hydroxide solution and dilute with water to 250 ml.

Remarks: pH: (acid range) red 1.2-2.8 yellow.
(alkaline range) yellow 8.0-9.6 blue.

Ref. Kolthoff and Furman, p. 57

THYMOL REAGENT (AMMONIA)

See: Hansen's reagent.

THYMOL SOLUTION (TITANIUM)

Use: Reagent for the detection and determination of titanium.

Preparation: Dissolve 5 g. of thymol in 5 ml. of dilute acetic acid, and mix with 95 ml. of concentrated sulfuric acid.

Remarks: Reagent gives a yellow to red color with solutions containing titanium. Tungsten may interfere.

Sensitiveness: 0.1 mg. TiO_2.

Ref. J. Am. Chem. Soc. **35**, 138-141 (1913); Yoe I, p. 381

THYMOLPHTHALEIN INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of thymolphthalein in 100 ml. of alcohol.

Remarks: pH: colorless 9.3-10.5 blue.

Ref. Kolthoff and Furman, p. 62

TITANIC ACID REAGENT (ALKALOIDS)

See: Peset-Beundia's reagent.

TITANIUM SESQUISULFATE SOLUTION

Use: Reagent for separating iridium and rhodium.

Preparation: Dissolve 12 g. of titanium sesquisulfate in 100 ml. of 2 *N* sulfuric acid.

Remarks: This reagent reduces rhodium salts to the free metal, while iridium salts are not so affected.

Titanium sesquisulfate may be prepared from the disulfate ($Ti(SO_4)_2$) by reduction with zinc amalgam.

TITANIUM SULFATE SOLUTION

Use: Test reagent for hydrogen peroxide.

Preparation: Boil titanium oxide with concentrated sulfuric acid. Cool, and dilute with water, and then add an excess of ammonium hydroxide to the filtrate. Filter, and wash the resulting residue with water. Dissolve this residue in cold, dilute sulfuric acid.

Remarks: A yellow color appears when this reagent is added to a solution containing hydrogen peroxide.

Sensitiveness: 1 : 1,800,000.

Ref. J. Chem. Soc. **63**, 1109

TITAN YELLOW REAGENT

Use: Test reagent for magnesium.

Preparation: Dissolve 0.1 g. of Titan yellow (acridine yellow 5 G) in 100 ml. of distilled water.

Procedure for Test: Add the reagent to a neutral or slightly acid solution to be tested, and then make alkaline with sodium hydroxide. The color of the reagent changes from a yellowish-brown to a bright red if magnesium is present. Aluminum, nickel, cobalt, manganese, zinc, tin, and high concentrations of ammonium ions interfere with this test. Calcium also interferes.

Remarks: A number of other dyes may be used for this test.

The above reaction may be used for the colorimetric determination of magnesium in urine, serum, blood, milk, extacts, etc.

Ref. Snell I, p. 476; Engelder, p. 172; C. A. **25**, 3267 (1931); **23**, 1838 (1929)

TITRATION MIXTURE

See: Zimmermann-Reinhardt solution.

TOISSON'S DILUTING FLUID

Use: Reagent for diluting blood for counting erythrocytes.

Preparation: Dissolve 0.05 g. of methyl violet 5B, 2 g. of sodium chloride, 16 g. of sodium sulfate, and 60 ml. of glycerol in 320 ml. of water.

Remarks: Solution must be crystal clear and filtered if necessary.

Ref. Kolmer and Boerner, p. 69

o-TOLIDINE REAGENT (BLOOD TEST)

Use: Test reagent for blood (Ruttan and Hardisty).

Preparation: Dissolve 4 g. of o-tolidine in 92 ml. of glacial acetic acid.

Remarks: In the presence of blood and hydrogen peroxide this reagent causes the appearance of a blue color.

Ref. Can. Med. Assoc. J. Nov. 1912; Biochem. Bull. **2**, 225 (1913)

o-TOLIDINE SOLUTION (CHLORINE)

Use: Reagent for the determination of free chlorine in water analysis.

Preparation: Place 1 g. of o-tolidine (M.P., 129° C.) in a 6-inch mortar and add 5 ml. of 20 per cent hydrochloric acid. The acid solution is prepared by adding 100 ml. of concentrated hydrochloric acid (sp. gr. 1.18-1.19) to 400 ml. of distilled water. Grind the o-tolidine to a thin paste and add about 200 ml. of distilled water. Transfer this solution to a 1-liter graduate and make up to 505 ml. with distilled water. Finally make up to 1 liter with the remainder of the 20 per cent hydrochloric acid solution prepared above.

Remarks: This solution should be stored in amber bottles, and should not be used after 6 months. Avoid high temperatures and direct sunlight. Reagent gives a yellow coloration with water containing chlorine.

Ref. Ind. Eng. Chem. **5**, 915, 1030 (1913); A.P.H.A., pp. 20-24

o-TOLIDINE SOLUTION (GOLD)

Use: Test reagent for gold.

Preparation: Dissolve 0.1 g. of o-tolidine in 100 g. of dilute hydrochloric acid.

Remarks: Reagent causes a yellow color with small quantities of chloroauric acid. Free chlorine, ferric iron, manganese, osmium, vanadate and tungstate interfere.

Sensitiveness: 1 : 1,000,000.

Ref. Analyst **44**, 94-95 (1919); Snell, p. 408

o-TOLIDINE SOLUTION (IODINE)

Use: Test reagent for iodine and iodides.

Preparation: Dissolve 0.6 g. of o-tolidine in 100 g. of ethyl alcohol.

Remarks: Reagent gives a blue-green color with iodine.

Ref. J. Am. Chem. Soc. **47**, 1000-1003 (1925)

TOLLEN'S REAGENT

Use: Test reagent for aldehydes.

Preparation: Mix 50 ml. of concentrated ammonium hydroxide (sp. gr. 0.9) with 50 ml. of water, and dissolve in this solution 10 g. of silver nitrate. Also prepare a 10 per cent aqueous solution of sodium hydroxide. When ready to use the reagent, mix a small portion of the ammoniacal silver nitrate solution with an equal volume of the sodium hydroxide solution.

Remarks: Make test immediately in the cold. Do not heat the solution or allow to stand as an explosive precipitate may form.

A silver mirror forms when this solution is mixed with aldehydes. Explosive silver fulminate may also form.

Ref. Ber. **15**, 1635 (1882)

o-TOLUIDINE REAGENT (BLOOD)

Use: Reagent for the detection of occult blood.

Preparation: Dissolve 4 ml. of o-toluidine in 100 ml. of glacial acetic acid. Reagent keeps for one month.

Procedure for Test: Mix 1 ml. of the liquid to be tested, 1 ml. of the reagent, and 1 ml. of 3 per cent hydrogen peroxide. A blue color forms if blood is present.

Ref. Kolmer and Boerner, p. 208

TOLUIDINE BLUE STAINING SOLUTION

Use: Staining solution.

Preparation: Dissolve 0.3-1.0 g. of toluidine blue 0 (80% dye content) in 100 ml. of distilled water.

Ref. Krajian, pp. 225-226

1, 2, 4-TOLYLENEDIAMINE REAGENT

Use: Reagent for the detection of nitrous acid.

Preparation: Dissolve 3 g. of 1,2,4-tolylenediamine in 100 ml. of 5 per cent acetic acid.

Remarks: This reagent gives an intense red or orange-red color when added to neutral solutions of nitrites. The colored compound is soluble in ethyl ether. Ferric iron and other oxidizing agents give a similar color, but this color is not soluble in ether.

Ref. C. A. 33, 3292 (1939)

TÖPFER'S REAGENT

Use: Indicator.

Preparation: Dissolve 0.5 g. of methyl yellow (dimethylaminoazobenzene) in 100 ml. of 95 per cent ethyl alcohol.

Remarks: pH: red 2.9-4.0 yellow.

Ref. J. Am. Chem. Soc. 1903, 924; Hawk and Bergeim, pp. 286-289 and 896

TRAPANI'S REAGENT

Use: Test reagent for bilirubin.

Preparation: Dissolve 2.5 g. of mercuric cyanide and 5 g. of potassium hydroxide in 100 ml. of water.

Remarks: Reagent is colored red by bilirubin, but the color is discharged by acetic acid.

Ref. The Merck Index, p. 938

TREMAIN'S REAGENT

See: p-aminodimethylaniline reagent.

1, 3, 5-TRINITROBENZENE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of 1,3,5-trinitrobenzene in 100 ml. of alcohol.

Remarks: pH: colorless 11.5-14.0 orange.

TRINITROPHENOL SOLUTION

See: Hager's reagent (alkaloids); picric acid solutions.

TROMMSDORFF'S SOLUTION

See: Zinc iodide-starch solution.

TROPAEOLINE PAPER

Use: Reagent to detect free hydrochloric acid in gastric juice.

Preparation: Impregnate filter paper with a saturated alcoholic solution of tropaeoline 00 and allow to dry.

Remarks: pH: pink 1.4-2.6 yellow.
Hydrochloric acid causes a lilac color.

TROPAEOLINE D PAPER

See: Methyl orange paper.

TROPAEOLINE O INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of tropaeoline O (resorcinolazobenzene-p-sulfonic acid) in 100 ml. of water.

Remarks: pH: yellow 11.0-13.0 orange.

Ref. Kolthoff and Furman, p. 62

TROPAEOLINE OO INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of tropaeoline OO (sodium p-diphenylamineazobenzenesulfonate) in 100 ml. of water.

Remarks: pH: red 1.3-3.0 yellow.

Ref. Kolthoff and Furman, p. 57

TROPAEOLINE OOO INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of tropaeoline OOO (sodium α-naphtholazobenzenesulfonate) in 100 ml. of water.

Remarks: pH: yellow 7.6-8.9 red.

TRYPAN BLUE

Use: Staining solution.

Preparation: Dissolve 1 or 2 g. of trypan blue in 100 g. of water.

Ref. Biol. Stains, Conn p. 64

TRYPSINIZED PEPTONE WATER (RIVAS)

Use: Culture medium and *B. Coli* studies.

Preparation: Dissolve 0.5 g. of trypsin in 20 ml. of water at 38° C., and add this to a solution prepared by dissolving 10 g. of peptone in 250 ml. of water. Digest the mixture at 38° C. for 3 hours with occasional stirring. Make neutral to litmus and dilute to 1 liter. Heat to boiling. Filter and tube, and then heat in an autoclave at 15 pounds pressure for 20 minutes.

Ref. C. A. **6**, 2444 (1912)

TSCHIRCH-EDNER'S REAGENT

Use: Test reagent for rhubarb.

Preparation: Mix 5 g. of p-nitroaniline with 25 ml. of water and 6 ml. of concentrated sulfuric acid. Add 100 ml. of water, and then a solution prepared by dissolving 3 g. of sodium nitrite in 25 ml. of water. Finally dilute to 500 ml. with water.

Remarks: Preserve this solution away from light.

Ref. C. A. **2**, 1327 (1908)

TSUCHIYA'S REAGENT

Use: Reagent for the determination of albumin in urine.

Preparation: Mix the following:

Phosphotungstic acid	1.5 g.
Hydrochloric acid, concentrated	5.0 ml.
Alcohol, 95 per cent	95.0 ml.

Remarks: This reagent is used like Esbach's reagent.

Ref. Kolmer and Boerner, p. 141

TUCKER'S ETCHING SOLUTION

Use: Reagent for the macroscopic examination of aluminum.

Preparation: Mix the following:

Hydrofluoric acid, concentrated	15 ml.
Hydrochloric acid, concentrated	45 ml.
Nitric acid, concentrated	15 ml.
Water	25 ml.

Remarks: Etch by immersion.

Ref. Metals Handbook, p. 1291

TUNGSTATE-MOLYBDATE REAGENT (BLOOD ANALYSIS)

Use: Reagent for the precipitation of blood proteins (method of Benedict and Newton).

Preparation: Place 5 g. of pure, ammonia-free molybdic acid in a flask and add 25 ml. of *N* sodium hydroxide solution. Boil gently for 5 minutes and add 75 ml. of water. Filter while hot, and to the filtrate add a solution prepared by dissolving 40 g. of sodium tungstate in 300 ml. of water. Dilute to 500 ml.

Ref. J. Biol. Chem. **88**, 357 (1929); Hawk and Bergeim, p. 413

TUNGSTIC ACID REAGENT (MOLYBDENUM)

See: Bertrand's reagent.

TURMERIC PAPER

Use: Test reagent for borates.

Preparation: Impregnate filter paper with turmeric solution and allow to dry.

Remarks: Paper turns red in the presence of boric acid, and then changes to blue-green when treated with sodium hydroxide.

Sensitiveness: 1 : 180,000.

Ref. U. S. Pharmacopeia XI, p. 449; A.O.A.C. p. 436

TURMERIC SOLUTION

Use: Test reagent for borates. Also used in the preparation of turmeric paper.

Preparation: Digest ground turmeric root with several portions of water. These are discarded. Dry the residue and allow it to stand for several days in 6 times its weight of alcohol. Filter to obtain a clear solution.

Ref. Snell, pp. 527-528; Yoe I, pp. 134-135

TZÓNI'S REAGENTS

Use: Reagents for the detection and determination of vitamin D.

Preparation:

Pyrogallol Solution: Dissolve 0.1 g. of pyrogallol in 100 g. of absolute alcohol.

Aluminum Chloride Solution: Dissolve 10 g. of anhydrous aluminum chloride in 90 g. of absolute alcohol. This solution must be freshly prepared under anhydrous conditions.

Procedure for Test: Add 0.5 ml. of the pyrogallol solution to 0.25 ml. of a solution of the vitamin in benzene or chloroform. Heat to boiling on a water bath and add 2-4 drops of the aluminum chloride solution. Con-

tinue to heat for 4 minutes. A reddish-violet color forms if vitamin D is present. This color is suitable for a colorimetric determination. Vitamin A interferes.

Sensitiveness: 0.002 mg. vitamin D.

Ref. Snell II, pp. 633-634

UFFELMANN'S REAGENT

Use: Test reagent for lactic acid in gastric juice.

Preparation:

Method 1: To a 1.0 per cent solution of phenol, slowly add a 5 per cent solution of ferric chloride until an amethyst-blue color is obtained.

Method 2: Dissolve 1 drop of ferric chloride solution and 0.4 g. of phenol in 50 ml. of water.

Procedure for Test: Add 5 ml. of strained gastric juice to 5 ml. of the reagent in a test tube. The blue reagent turns yellow if lactic acid is present.

Sensitiveness: 1 : 10,000.

Ref. Hawk and Bergeim, p. 303

UNIVERSAL STAIN (STRUMIA)

Use: Stain for blood, spirochetes, etc.

Preparation:

Solution A: Mix 1.3 g. of azure II-eosin mixture (Giemsa) with 80 ml. of glycerol and allow to stand for 2 or 3 days with occasional shaking. Then heat the mixture on a water bath at 60° C. for 2 hours with occasional shaking. Cool and add 290 ml. of methyl alcohol and 290 ml. of acetone. To this mixture add a second solution prepared as follows: mix 0.15 g. of methylene blue-eosin (May-Gruenwald) with 170 ml. of methyl alcohol and 170 ml. of acetone, and allow to stand for 2 or 3 days with occasional shaking until the dye is dissolved.

Solution B: Dissolve 1 g. of sodium carbonate in 100 ml. of water.

Ref. The Merck Index, p. 1007

UNNA'S METHYLENE BLUE SOLUTION

Use: Staining solution.

Preparation: Mix the following:

Methylene blue	1 g.
Potassium carbonate	1 g.
Distilled water	100 ml.

Remarks: Dilute 1 : 5 or 1 : 10 before use.

Ref. Biol. Stains, Conn p. 84

URANIUM ACETATE REAGENT

Use: Reagent for ascorbic acid.

Preparation: Dissolve 10 grams of uranium acetate in 90 ml. of water.

Procedure for Use: Make an approximately 1 per cent solution of ascorbic acid slightly alkaline and add 2 drops of the reagent and a few drops of concentrated sodium hydroxide solution. A brown color appears and is discharged by the sodium hydroxide, and then an amorphous precipitate of sodium uranate is formed.

Remarks: This reagent may be used to differentiate between ascorbic and isoascorbic acid, since the latter produces a deep, brownish-red color under the conditions given above, and the solution remains clear.

Ref. Zeitschr. physiol. Chem. **228**, 25 (1934)

URANIUM ACETATE SOLUTION

See: Aloy's reagent; Kowalewsky's reagent.

URANIUM SULFATE SOLUTION (VORTMANN-BINDER)

Use: For the determination of iron, manganese dioxide, etc., in volumetric analysis.

Preparation: Dissolve 50 g. of uranium sulfate in 200 ml. of water and make strongly acid with sulfuric acid. Add granulated zinc and heat on a water bath for about 40 minutes, or until reduction is complete. Cool and filter. Then dilute the filtrate with water until the resulting solution corresponds to 0.1 *N* potassium permanganate. This may be determined by titrating the solution with a potassium permanganate solution of known strength.

Ref. C. A. **20**, 1040 (1926)

URANYL ACETATE REAGENT (BLOOD SERUM)

See: Oszaci's reagent.

URANYL ACETATE REAGENT (ISOASCORBIC ACID)

Use: Reagent for the detection of isovitamin C (isoascorbic acid).

Preparation: Dissolve 10 g. of uranyl acetate in 90 ml. of water.

Procedure for Test: Add 2 drops of the reagent to 5 ml. of a faintly alkaline solution to be tested and add a few drops of concentrated sodium hydroxide solution. Ascorbic acid causes a brown color. The brown color disappears when the concentrated sodium hydroxide is added, and a clear brownish-red color appears if isoascorbic acid is present.

Ref. Snell II, p. 633

UREASE PAPER

Use: Reagent for the determination of urea (Folin and Svedberg).

Preparation: Place 30 g. of jack bean meal in a flask and add 100 ml. of dilute alcohol prepared by diluting 30 ml. of 95 per cent alcohol with

water to 100 ml. Then add 1 ml. of buffer solution prepared as follows: dissolve 15 g. of crystallized sodium acetate in 75 ml. of water contained in a 100 ml. volumetric flask, and add 1 ml. of glacial acetic acid and dilute to the mark. After adding the buffer solution, shake vigorously for 5 minutes and then gently for an additional 10 minutes. Filter or centrifuge and transfer the extract to a dish. Soak heavy filter paper in this liquid at once and dry in still air. When dry, cut the paper into strips 1 cm. x 2.5 cm. and store in a wide-mouth glass bottle.

Remarks: This paper retains its activity for a long time.

Ref. J. Biol. Chem. **88**, 77 (1930); Hawk and Bergeim, pp. 416-417

UROTROPIN REAGENT

See: Methenamine reagent (Ko).

USAMI'S REAGENT

Use: Test reagent for blood in feces.

Preparation: Place 0.2 ml. of a saturated alcoholic solution of fuchsin, or 1 ml. of saturated alcoholic methyl violet 6B solution in a flask, and add a solution prepared by mixing 16 ml. of glacial acetic acid and 64 ml. of absolute alcohol. Add 8 g. of zinc powder and shake until the solution is colorless.

Remarks: This reagent is used with hydrogen peroxide as other leuco-stain reagents.

Ref. C. A. **21**, 110 (1927)

USCHINSKY'S SOLUTION

Use: Culture medium.

Preparation: Dissolve the following in 1 liter of distilled water:

Glycerol	35.0 ml.
Sodium chloride	5.0 g.
Calcium chloride	0.1 g.
Magnesium sulfate ($MgSO_4$)	0.3 g.
Dipotassium phosphate	2.5 g.
Ammonium lactate	6.5 g.
Sodium asparaginate	3.5 g.

Sterilize in tubes or flasks.

Remarks: Add 2.0 per cent agar if desired.

UTZ REAGENT

Use: Test reagent for cottonseed oil.

Preparation: Dissolve 1 g. of sulfur in 100 g. of pentachloroethane.

Procedure for Test: Mix 5 ml. of the oil with 5 ml. of amyl alcohol and 5 ml. of reagent and heat until the mixture boils gently. A red color appears if cottonseed oil is present.

Sensitiveness: 1% cottonseed oil.

Ref. C. A. **8**, 587 (1914)

VALSER'S REAGENT

Use: Test reagent for alkaloids.

Preparation: Dissolve enough mercuric iodide in 100 ml. of a 10 per cent aqueous solution of potassium iodide to form a saturated solution.

Remarks: Test solution causes a white precipitate with alkaloids.

VANADIC ACID REAGENT

Use: Test reagent for peroxides in milk and other foods.

Preparation: Dissolve 1 g. of vanadium pentoxide in 100 ml. of 1 : 3 sulfuric acid.

Procedure for Test: Add 1 ml. of 40 per cent trichloroacetic acid to 10 ml. of the sample to be tested and allow to stand for 5 minutes. Add a few drops of the reagent to 3 ml. of the trichloroacetic acid serum. A fairly persistent reddish color forms if peroxides are present.

Ref. Jacobs, p. 111

VANADIC ACID REAGENT

See: Arnold-Mentzel's solution.

VANADIC ACID REAGENT (ALOE)

See: Wischo's reagent (aloin).

VANADIC ACID REAGENT (FRASES)

Use: Test reagent for quinine and rotenone.

Preparation: Dissolve 1 g. of vanadium pentoxide in 100 ml. of sulfuric acid.

Remarks: Reagent causes color reactions as follows:

Quinine hydrochloride:	emerald-green.
Quinine sulfate:	deep red color changing to violet.
Rotenone:	dark red streaked with violet.

Ref. The Merck Index, p. 728

VANADIC ACID (JORISSEN)

Use: Test reagent for peroxides in ether.

Preparation: Dissolve 0.4 g. of vanadic acid in 4 ml. of concentrated sulfuric acid diluted with 100 ml. of water.

Procedure for Test: Shake 10 ml. of ether with 2 ml. of the reagent. A red color develops if peroxides are present.

Sensitiveness: 0.001 per cent H_2O_2.

Ref. Apoth.-Ztg. 1903, 489

VAN ECK'S REAGENT

Use: Reagent for chromic acid.

Preparation: Dissolve 0.5 g. of α-naphthylamine and 50 g. of tartaric acid in 100 ml. of water.

Remarks: This reagent is colored blue by chromic acid.

Sensitiveness: 0.001 mg. per ml.

VAN GIESON'S STAIN

Use: A differential stain for collagen.

Preparation: Mix 5 ml. of a 1 per cent aqueous solution of acid fuchsin with 100 ml. of a saturated aqueous solution of picric acid.

Remarks: This solution should be tested on tissues known to contain collagen. If the collagen is not stained red, more acid fuchsin must be added.

Ref. Kolmer and Boerner, p. 819

VANILLIN REAGENT

Use: Determination of fusel oil in distilled liquors.

Preparation: Dissolve 17.5 g. of vanillin in sufficient 95 per cent alcohol to make 1 liter of solution.

Ref. Jacobs, p. 391

VANILLIN REAGENT

See: Ellram's reagent.

VANILLIN REAGENT (MARTINET)

Use: Reagent for distinguishing between clove oil and eugenol.

Preparation: Dissolve 1 g. of vanillin in 180 ml. of alcohol and 20 ml. of concentrated hydrochloric acid.

Procedure for Test: Shake 1 drop of the oil with 5 ml. of the reagent for 5 minutes and note the color reaction. Eugenol produces a dark yellow color, while clove oil gives a red color.

Ref. Pharm. Zentralhalle. 71, 328 (1930)

VANILLIN REAGENT (TAKAHASHI)

Use: Test reagent for aliphatic alcohols and esters.

Preparation: Dissolve 1 g. of vanillin in 200 ml. of concentrated sulfuric acid.

Remarks: Most alcohols and their esters give red colors with this reagent.

Ref. The Merck Index, p. 929

VAN LEEUWEN'S FLUID

Use: Fixative.

Preparation: Mix the following:

Picric acid, 1% soln. in absolute alcohol	24 ml.
Chloroform	4 ml.
Formaldehyde soln.	4 ml.

Add 2 ml. of glacial acetic acid just before use.

VERVEN'S REAGENT

Use: Test reagent for alkaloids.

Preparation: Dissolve 5 g. of cadmium iodide and 10 g. of potassium iodide in 100 ml. of water.

Remarks: This reagent precipitates alkaloids from solutions acidified with sulfuric acid.

Ref. Ann. Pharm. 13, 145 (1897)

VICTORIA BLUE SOLUTION

Use: Staining solution.

Preparation: Use a dilute alcoholic solution of the dye. Dilute with 2-4 parts of water.

VIEL'S REAGENT

Use: Test reagent for alkaloids.

Preparation: Dissolve 5 g. of antimony pentachloride and 40 g. of potassium iodide in 100 ml. of water and 20 ml. of hydrochloric acid.

Remarks: Reagent produces a precipitate when added to a solution containing alkaloids and a few drops of sodium sulfite.

Ref. Pharm. Monatsh. 5, 259 (1924)

VILELLA'S ETCHING SOLUTION (ALUMINUM)

Use: Etchant for aluminum.

Preparation: Mix the following:

Hydrofluoric acid, concentrated	20 ml.
Nitric acid, concentrated	10 ml.
Glycerol	30 ml.

Remarks: Etch by immersion.

Ref. Metals Handbook, p. 1291

VILELLA'S ETCHING SOLUTION (LEAD)

Use: Etching solution for lead and lead alloys.

Preparation: Mix the following:

Glacial acetic acid	20 ml.
Nitric acid, concentrated	20 ml.
Glycerol	80 ml.

Remarks: Use freshly prepared solution and etch for 10-15 seconds.

Ref. Metals Handbook, p. 1558

VILLAVECCHIA'S REAGENT

Use: Reagent for the detection of sesame oil.

Preparation: Dissolve 2 ml. of C.P. furfural in 100 ml. of 95 per cent ethyl alcohol.

Remarks: Reagent causes a pink to crimson color when mixed with sesame oil and hydrochloric acid.

Ref. A.O.A.C. p. 422; Jacobs, p. 231

VILLIERS-FAYOLLE'S REAGENT

Use: Test reagent for free chlorine.

Preparation: Mix 20 ml. of a saturated aqueous solution of o-toluidine with 100 ml. of a saturated aqueous solution of aniline and 30 ml. of acetic acid.

Remarks: Reagent turns blue in the presence of free chlorine.

Ref. Compt. rend. **118**, 1413 (1894)

VIOLETTE-FEHLING' SOLUTION

Use: Test reagent for glucose.

Preparation:

Solution A: Dissolve 34.64 g. of crystalline cupric sulfate in water and dilute to 500 ml.

Solution B: Dissolve 200 g. of Rochelle salt and 130 g. of sodium hydroxide in water and dilute to 500 ml.

Remarks: To use, mix equal volumes of *Solutions A* and *B*, and use like Fehling's solution.

Ref. Browne, pp. 393-395

VOGES-PROSKAUER REACTION MEDIUM

See: Clark-Lub medium.

VOURNASOS' REAGENT

Use: Test reagent for acetone in urine. Also used as a test reagent for lactic acid in gastric juice.

Preparation: Dissolve 1 g. of iodine and 0.5 g. of potassium iodide in 50 ml. of water. Add 5 g. of methylamine and filter.

Procedure for Test: Add sodium hydroxide to gastric juice until alkaline and heat the mixture to boiling. To the hot solution add 1-2 ml. of the reagent. Iodoform and an isonitrile are formed with acetone and lactic acid.

Ref. Bull. soc. chim. 1904, 137; Zeitschr. angew. Chem. 15, 172 (1902)

WAGGONER'S SOLUTION

Use: Reagent for decalcifying bones for preparing sections.

Preparation: Mix the following:

Formic acid, Merck's 85-90% C. P.	50 ml.
Distilled water	35 ml.

Add the above to a solution prepared by dissolving 17 g. of sodium citrate in 85 ml. of warm, distilled water.

Ref. Kolmer and Boerner, p. 828

WAGNER'S REAGENT

See: Iodo-potassium iodide reagent (Wagner).

WAGNER'S REAGENT

Use: Reagent to differentiate textile fibers.

Preparation: Dissolve the following in 100 ml. of water:

Sodium carbonate	1 g.
Disodium ammonium phosphate	4 g.
Picrocarmine	5 g.

Remarks: Soak fabric to be tested in solution for 5 minutes and wash thoroughly. The following colors are obtained depending on the composition of the fabric:

Silk (not degummed)	brown-red
Silk (degummed)	yellow
Acetate silk	yellow-green
Copper silk	wine-red
Nitro silk	rose
Viscose silk	rose
Cotton	rose

Ref. C. A. 21, 2068 (1927)

WAGNER'S SOLUTION

Use: A reagent used in the analysis of phosphate rock.

Preparation: Dissolve 25 g. of citric acid and 1 g. of salicylic acid in water and dilute to 1 liter.

Remarks: Reagent is used to prevent the precipitation of iron and aluminum. Use 50 ml. of this solution.

Ref. Handbook of Chem. and Physics, p. 1316

WASHBURN'S SOLUTION

Use: Stain for the identification of myelocytes in the diagnosis of leukemias.

Preparation:

Solution 1: Dissolve 0.3 g. of benzidine base and 0.3 g. of basic fuchsin in 100 ml. of 95 per cent alcohol, and add 1 ml. of a saturated aqueous solution of sodium nitroprusside. This solution keeps for about 8 months.

Solution 2: Add 0.3 ml. of hydrogen peroxide to 25 ml. of tap water. This solution keeps about 2 days.

Procedure for Use: Stain for 1-1.5 minutes with 10 drops of *Solution 1* and add 5 drops of *Solution 2* without pouring off *Solution 1.* Allow to stand for 3-4 minutes.

Ref. Kolmer and Boerner, pp. 91-92

WAYNE'S SOLUTION

Use: Test reagent for glucose.

Preparation: Dissolve 10 g. of crystalline cupric sulfate in 50 ml. of water, and to this add 325 ml. of a 16.3 per cent solution of potassium hydroxide. Dilute to 1 liter.

Remarks: Used like Fehling's solution.

WAYSON'S STAIN

Use: Bacteria stain.

Preparation: Dissolve 0.2 g. of fuchsin and 0.75 g. of methylene blue in 20 ml. of absolute alcohol, and add this solution to 200 ml. of a solution prepared by dissolving 10 g. of phenol in 200 ml. of distilled water.

Ref. Kolmer and Boerner, p. 394

WEIGERT'S ACID FUCHSIN

Use: A stain for bacteria.

Preparation: Dissolve 2 g. of acid fuchsin (Rubin S) in 98 g. of 15 per cent alcohol.

WEIGERT'S HEMATOXYLIN

Use: A stain for marrow-containing nerve fibers.

Preparation:

Method 1: Dissolve 0.012 g. of lithium carbonate in 90 ml. of water, and to this add a mixture of 1 g. of hematoxylin and 10 ml. of alcohol.

Method 2:

Solution A: Dissolve 0.08 g. of lithium carbonate in 100 ml. of water.

Solution B: Dissolve 1 g. of hematoxylin in 10 ml. of alcohol.

To use, mix 9 ml. of *Solution A* with 1 ml. of *Solution B.*

Ref. Krajian, pp. 133-134

WEIGERT'S IRON-HEMATOXYLIN

Use: Staining solution.

Preparation:

Solution A: Dissolve 1 g. of hematoxylin in 100 g. of alcohol.

Solution B: Mix 4 ml. of ferric chloride solution U.S.P. (48.4-53.2% $FeCl_3$ and 3-5% free HCl) and 1 ml. of hydrochloric acid with sufficient distilled water to make 100 ml. of solution. To use, mix equal parts of *Solutions A* and *B.*

Remarks: Fresh solutions should be used.

Ref. Krajian, pp. 82-83

WEINGÄRTNER'S SOLUTION

Use: Test reagent for coal tar dyes.

Preparation: Dissolve 10 g. of tannin and 10 g. of sodium acetate in 100 ml. of water.

Remarks: Reagent precipitates basic coal tar dyes but not acid dyes.

Ref. Chem.-Ztg. 11, 135 (1888)

WEITBRECHT'S REAGENT

Use: Test reagent for sugar in urine.

Preparation: Dissolve 5 g. of o-nitrophenylpropiolic acid in 8 ml. of 10 per cent sodium hydroxide solution and dilute with water to 1 liter.

Remarks: An indigo-blue color appears when 5 ml. of the reagent is heated with 1 ml. of a solution containing sugar.

Ref. The Merck Index, p. 959

WELMANN'S SOLUTION

Use: Test reagent for vegetable oils.

Preparation: Acidify a 5 per cent aqueous solution of sodium phosphomolybdate with nitric acid.

Procedure for Test: Dissolve oil in chloroform and add test reagent. Most vegetable oils cause a green color which changes to blue on the addition of ammonium hydroxide.

Ref. J. Am. Chem. Soc. 27, 263 (1905)

WICKERSHEIMER'S SOLUTION

Use: A preservative for anatomical specimens.

Preparation: Dissolve the following in 3 liters of hot water:

Arsenious oxide	10 g.
Potassium nitrate	12 g.
Sodium chloride	25 g.
Potassium carbonate	60 g.
Potassium alum	100 g.

Allow this solution to cool and filter. To each liter of the filtrate add 400 ml. of glycerol and 100 ml. of methyl alcohol.

WIESNER'S SOLUTION

Use: Test reagent for lignin.

Preparation: Dissolve 0.5 g. of phloroglucinol in 122 ml. of alcohol.

Procedure for Test: Reagent is used to detect wood fiber in paper. Moisten paper with test solution and then treat with concentrated hydrochloric acid. A red color appears if lignin is present.

Ref. Zeitschr. anal. Chem. **4**, 249 (1865); **17**, 511 (1878)

WIJ'S IODINE MONOCHLORIDE SOLUTION

Use: Reagent for the determination of the iodine number of oils.

Preparation: Dissolve 13 g. of resublimed iodine in 1 liter of glacial acetic acid. The acetic acid should pass the dichromate test for reducible matter. Set aside 25 ml. of this solution. Into the remainder of the iodine solution pass dry chlorine gas until the characteristic odor of free iodine is no longer noticeable. Dry and wash the chlorine gas by passing through concentrated sulfuric acid. Finally, add the 25 ml. of iodine solution which was reserved until all free chlorine is destroyed. A slight excess of iodine is not serious.

Remarks: Store in well-stoppered amber bottles. Solution should not be used later than 30 days after its preparation.

Ref. C. A. **2**, 1943 (1908); **9**, 388 (1915); **10**, 977 (1916)

WIJ'S SPECIAL SOLUTION

Use: Reagent for the determination of iodine number of oils.

Preparation: Add 12 g. of dichloramine T to 200 ml. of glacial acetic acid which will pass the dichromate test for reducible matter, and then slowly and with constant shaking add 16.6 g. of potassium iodide. When the potassium iodide has dissolved, dilute the solution to 1 liter with glacial acetic acid.

Remarks: Store in a dark bottle.

Ref. Analyst. **58**, 523-527 (1933)

WILSON'S SOLUTION

Use: Reagent for standardizing soap solution in water analysis.

Preparation: Dissolve 0.215 g. of crystalline calcium carbonate in dilute hydrochloric acid and add distilled water to make 1 liter of solution.

Ref. Ann. **119**, 318 (1862)

WINKLER'S REAGENT (AMMONIA)

Use: Test reagent for ammonia.

Preparation: Dissolve the following in 25 ml. of natural water:

Mercuric iodide	1.0 g.
Potassium bromide	5.0 g.
Sodium hydroxide	2.5 g.

Allow to stand overnight and remove the clear supernatant liquid.

A second solution is used to prevent the formation of a precipitate when the reagent is used with natural water. This is prepared as follows: Dissolve 100 g. of Rochelle salt in 200 ml. of water and filter. Add 1 g. of sodium hydroxide, boil for 10 minutes, and then cool. Finally, dilute to 250 ml. and add 0.2 g. of mercuric iodide. Shake and let stand.

Remarks: Reagent is used in a manner similar to Nessler's reagent. It cannot be used quantitatively.

Ref. C. A. **19**, 2314 (1925)

WINKLER'S REAGENT (CARBON MONOXIDE)

Use: Reagent for the absorption of carbon monoxide.

Preparation: Dissolve 25 g. of ammonium chloride in 75 ml. of water and add 20 g. of cuprous chloride. Then add ammonium hydroxide until the solution is clear.

Ref. Am. Chem. J. **22**, 287 (1899); Hawk and Bergeim, p. 513

WINKLER'S REAGENTS (WATER)

Use: To determine the hardness of water.

Preparation:

Solution 1: Dissolve 6 g. of potassium hydroxide and 100 g. of Rochelle salt in 250 ml. of water, and add 100 ml. of 10 per cent ammonium hydroxide solution. Finally, dilute with water to 500 ml.

Solution 2: Dissolve 15 g. of oleic acid in 600 ml. of 90-95 per cent ethyl alcohol and 400 ml. of water. Then add 4 g. of potassium hydroxide. Standardize against a barium chloride solution containing 4.363 g. of the salt per liter of solution.

Ref. Zeitschr. anal. Chem. 1901, 88

WINOGRADSKY'S STAIN

Use: Staining solution for bacteria in soil.

Preparation: Dissolve 1 g. of erythrosin B in 100 ml. of a 5 per cent aqueous solution of phenol.

Remarks: This solution is used for staining films prepared from fractions obtained by centrifuging soil infusions.

Ref. Biol. Stains, Conn p. 153

WISCHO'S REAGENT (ALOIN)

Use: Test reagent for aloin or aloe.

Preparation: Dissolve 0.4 g. of vanadium pentoxide in 4 ml. of concentrated sulfuric acid and 100 ml. of water.

Remarks: Freshly prepared aqueous or weak alcoholic solution containing aloin becomes red when treated with this reagent.

Ref. C. A. 23, 932 (1929)

WISCHO'S REAGENTS (PHENOLS)

Use: Test reagents for phenols having hydroxyl groups in the ortho position.

Preparation:

Reagent 1: Dissolve 0.2 g. of vanadium pentoxide in 3 ml. of dilute hydrochloric acid and dilute to 25 ml.

Reagent 2: Dissolve 0.2 g. of vanadium pentoxide in 3 ml. of phosphoric acid (sp. gr. 1.12) and dilute to 25 ml.

Reagent 3: Dissolve 0.4 g. of vanadium pentoxide in 4 ml. of sulfuric acid and dilute to 100 ml.

Reagent 4: Dissolve 0.2 g. of vanadium pentoxide in 50 ml. of 1 per cent oxalic acid solution.

Remarks: Reagents give color reactions with orthophenols and trihydroxyphenols.

Ref. C. A. 22, 4410 (1928)

WOLESKY'S SOLUTION

Use: Test reagent for lignin.

Preparation: Dissolve 1 g. of diphenylamine in 50 ml. of alcohol and add 5-6 ml. of concentrated hydrochloric acid.

Remarks: Reagent causes an orange-red spot when applied to paper containing lignin.

Ref. Zeitschr. anal. Chem. 36, 343 (1897)

WORCESTER'S FLUID

Use: Fixative.

Preparation: Prepare a saturated solution of mercuric chloride in a 10 per cent solution of formaldehyde.

Remarks: This solution should be freshly prepared.

WORCESTER'S FLUID WITH ACETIC ACID

Use: Fixative.

Preparation: Add 1 part of glacial acid to 9 parts of Worcester's fluid.

WRIGHT'S STAINING SOLUTION

Use: Staining solution.

Preparation: Mix the following:

Methylene blue (90% dye content)	0.9 g.
Sodium bicarbonate	0.5 g.
Distilled water	100.0 ml.

Place this solution in containers in which the depth of the liquid is not more than 6 cm. and heat in a steam sterilizer at 100° C. for 1 hour. Cool and filter.

To the filtrate add a solution prepared by dissolving 1 g. of eosin Y (85% dye content) in 500 ml. of distilled water, and place 1 drop of the mixture on a piece of white blotting paper. If an "eosin ring" is not formed, add cautiously to the mixture additional small amounts of eosin until, after thorough mixing, the ring is observed. A test should be made with 1 drop of the mixture following the addition of each portion of the dye.

Filter the mixture through a double filter paper, and then dry the precipitate at a low temperature. Powder the residue and store in dry, tightly stoppered bottles which are protected from light.

To use, dissolve 0.1 g. of the dry stain in 60 ml. of neutral and acetone-free absolute methyl alcohol. Allow to stand for at least one day and filter.

Remarks: Always filter before use.

Ref. Kolmer and Boerner, p. 77; Muir, p. 113; Biol. Stains, Conn pp. 172-173

WRIGHT AND KINNICUTT'S FLUID

Use: Fluid for diluting blood.

Preparation: Prepare the following solutions:

Brilliant cresyl blue (aq. sol. 1 : 300)	2 parts
Potassium cyanide (aq. sol. 1 : 1400)	3 parts

Remarks: The solutions are stored separately. Mix and filter just before using. The cyanide solution keeps for only about 10 days.

Ref. Kolmer and Boerner, p. 99

WURSTER'S OZONE PAPER

See: Tetramethylparaphenylenediamine paper.

XANTHYDROL REAGENT

Use: Preservative for urea crystals in tissue.

Preparation: Dissolve 5 g. of xanthydrol crystals in 100 ml. of glacial acetic acid.

Ref. Krajian, p. 22

XANTHYDROL SOLUTION (DANTEC)

Use: Reagent for antipyrine.

Preparation: Dissolve 10 g. of xanthydrol in 90 g. of acetic acid.

Procedure for Test: Add 1 ml. of the reagent to about 0.1 g. of the substance under investigation and then add 2 ml. of glacial acetic acid. Heat to boiling. A red color is produced if the sample contains antipyrine. The reaction is made more sensitive if a little stannous chloride is added to the 2 ml. of glacial acetic acid.

Ref. C. A. **30**, 3587-3588 (1936)

XYLENE CYANOLE-METHYL ORANGE INDICATOR SOLUTION

Use: Indicator for partially color blind operators.

Preparation: Dissolve 0.75 g. of xylene cyanole FF (Eastman No. T 1579) and 1.5 g. of methyl orange in 1 liter of water.

Ref. Lange's Handbook of Chem., p. 960

p-XYLENOL BLUE INDICATOR SOLUTION

Use: Indicator.

Preparation: Dissolve 0.1 g. of p-xylenol blue (1,4-dimethyl-5-hydroxybenzenesulfonphthalein) in 250 ml. of alcohol.

Remarks: pH: (Acid range) red 1.2-2.8 yellow.
(Alkaline range) yellow 8.0-9.6 blue.

YOSHIMATSU'S REAGENTS

Use: Reagents for the determination of inorganic sulfates in urine, blood and milk.

Preparation:

Solution A: Dissolve 0.0705 g. of benzidine in water and dilute to 2 liters with water.

Solution B: Grind 4 g. of benzidine with 20 ml. of water in a mortar, and then carefully wash this mixture into a 250 ml. volumetric flask. Add 5 ml. of concentrated hydrochloric acid and dilute with water to 1 liter.

Solution C: Dissolve 0.1 g. of iodine and 0.2 g. of potassium iodide in a little water and dilute to 300 ml. When ready to use, add 1 volume of 2 per cent ammonium hydroxide and 2 volumes of the solution.

Solution D: Prepare a saturated solution of benzidine sulfate in 96 per cent alcohol.

Solution E: Dissolve 1 g. of uranium acetate in 300 ml. of water.

Solution F: Dissolve 100 g. of sodium acetate and 30 ml. of glacial acetic acid in enough water to make 1 liter of solution.

Ref. C. A. **20**, 2515 (1926)

ZANFROGNINI'S REAGENT

Use: Test reagent for adrenaline.

Preparation: Dissolve 3 g. of potassium permanganate in 240 ml. of water. Cool this solution and add drop by drop 8 ml. of lactic acid.

Remarks: A red color forms when 1 drop of the reagent and 1 drop of hydrogen peroxide are added to 10 ml. of adrenaline solution.

Ref. C. A. 3, 50 (1910)

ZELLNER'S PAPER

See: Fluorescein paper.

ZENKER'S FLUID

Use: Fixative.

Preparation: Mix the following:

Potassium dichromate	2.5 g.
Mercuric chloride	5.0 g.
Sodium sulfate	1.0 g.
Water	100.0 ml.

Add 5 ml. of glacial acetic acid just before use.

Ref. Kolmer and Boerner, p. 805

ZIEHL-NEELSEN'S CARBOL FUCHSIN

See: Carbol fuchsin (Ziehl-Neelsen).

ZIMMERMANN-REINHARDT SOLUTION

Use: For the titration of iron with permanganate in the presence of hydrochloric acid.

Preparation: Dissolve 70 g. of manganese sulfate ($MnSO_4 \cdot 4H_2O$) in 500 ml. of water and add, with constant stirring, 125 ml. of concentrated sulfuric acid and 125 ml. of 85 per cent phosphoric acid. Dilute with water to 1 liter.

Remarks: Reagent is used to prevent oxidation of chloride by permanganate.

Ref. Treadwell and Hall, pp. 517-518

ZIMMET'S REAGENT

Use: Reagent for glutathione.

Preparation: Dissolve 5 g. of sodium nitroprusside and 50 g. of sodium phosphite in 100 ml. of water.

Ref. C. A. 27, 5031 (1933)

ZINC CHLORIDE SOLUTIONS

Reagent: $ZnCl_2$, mol wt. = 136.29.

Preparation:

0.5 Molar: Dissolve 68.1 g. of zinc chloride in water. Acidify with hydrochloric acid to prevent hydrolysis and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of zinc ion per ml. of solution: Dissolve 20.8 g. of zinc chloride in water acidified with hydrochloric acid and dilute to 1 liter.

ZINC CHLORIDE SOLUTION, BASIC

See: Persoz's reagent.

ZINC CHLOROIODIDE SOLUTION (NAEGELI'S SOLUTION)

Use: Microchemical test for cellulose and tannin.

Preparation: Add zinc metal to hydrochloric acid until it no longer dissolves, and then saturate the solution with iodine and potassium iodide.

Remarks: Reagent causes a blue color with cellulose, and a red or violet color with tannin.

ZINC IODIDE-STARCH PAPER

Use: Test reagent for free iodine and ozone.

Preparation: Impregnate filter paper with zinc iodide-starch solution and allow to dry.

ZINC IODIDE-STARCH SOLUTION (GENLIS)

Use: Test reagent for nitrites, free chlorine, and oxidizing agents.

Preparation: Stir 5 g. of starch with 100 ml. of water, and 20 g. of zinc chloride, and boil for several hours. Replace any water that evaporates. Dissolve 2 g. of zinc iodide in this solution and dilute to 1 liter. Filter.

Remarks: Solution should be clear or slighly opalescent. On standing it deteriorates and becomes blue.

Procedure for Test: Add 4 ml. of reagent to 50 ml. of solution to be examined and then add 2 ml. of 1 : 5 sulfuric acid. Compare with color standards for quantitative determination.

Sensitiveness: 0.00025 mg. per 50 ml.

Ref. Snell I, p. 648; Yoe I, pp. 312-313

ZINC NITRATE SOLUTIONS

Reagent: $Zn(NO_3)_2 \cdot 6H_2O$, mol. wt. = 297.49.

Preparation:

0.5 Molar: Dissolve 148.7 g. of zinc nitrate in water containing a few ml. of dilute nitric acid and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of zinc ion per ml. of solution: Dissolve 45.5 g. of zinc nitrate in water containing a few ml. of dilute nitric acid and dilute to 1 liter.

ZINC PURPURATE REAGENT (DENIGÈS)

Use: Test reagent for mercury salts.

Preparation: Add a small piece of zinc to a few ml. of alloxan reagent for ferrous iron and boil for 5 minutes. Preserve over zinc.

Procedure for Test: Treat a little of the solution containing mercuric ion with 1 ml. of the reagent and a few drops of sodium acetate solution. A peach-red precipitate of mercuric purpurate is formed. Silver salts yield a violet precipitate with this reagent.

Sensitiveness: 0.4 mg. mercury per ml.

Ref. C. A. **16**, 3043-3044 (1922)

ZINC SULFATE SOLUTIONS

Reagent: $ZnSO_4 \cdot 7H_2O$, mol. wt. = 287.55.

Preparation:

0.5 Molar: Dissolve 143.8 g. of zinc sulfate in water and dilute to 1 liter.

1.0 Normal: Same as 0.5 Molar.

10 mg. of zinc ion per ml. of solution: Dissolve 44 g. of zinc sulfate in water and dilute to 1 liter.

ZINC URANYL ACETATE SOLUTION

Use: Test reagent for sodium.

Preparation: Dissolve 30 g. of zinc acetate ($Zn(C_2H_3O_2)_2 \cdot 3H_2O$) in 3 g. of 30 per cent acetic acid and dilute to 50 ml. Next dissolve 10 g. of uranyl acetate ($UO_2(C_2H_3O_2)_2 \cdot 2H_2O$) in 6 g. of 30 per cent acetic acid, using heat if necessary, and dilute to 50 ml. Finally, mix the two solutions and add 0.05 g. of sodium chloride. Allow to stand 12 hours and filter.

Remarks: This reagent yields a precipitate with sodium ions. Calcium, magnesium, strontium, barium and iron do not interfere. Potassium does not interfere unless present in 5 times the concentration of the sodium. Phosphates and proteins must be removed before making test.

Ref. C. A. **21**, 1773 (1927), **24**; 3966 (1930); **25**, 2938 (1931)

ZIRCONIUM-ALIZARIN REAGENT

Use: Reagent for the colorimetric determination of fluorides in water.

Preparation: Dissolve 0.17 g. of sodium alizarin sulfonate in 100 ml. of water, and mix this with a second solution prepared by dissolving 0.87 g. of crystalline zirconium nitrate in 100 ml. of water. Stir constantly as

the solutions are mixed. Shake occasionally and allow to stand 24 hours. For use, dilute 20 ml. of this stock solution to 100 ml. Store both concentrated and dilute reagents in a cool, dark place.

Remarks: Fluoride ion reacts with the above reagent to produce a series of colors which can be used for the determination of fluoride. The reaction is carried out in a solution made acid with hydrochloric and sulfuric acids. Phosphates and sulfate interfere if present in sufficient quantity.

Sensitiveness: 1 : 10,000,000 fluoride ion.

Ref. Ind. Eng. Chem., Anal. Ed. 5, 7 (1933); Snell I, pp. 580-582

ZIRCONIUM-ALIZARIN REAGENT (SANCHIS)

Use: Reagents for the determination of fluorine in water.

Preparation:

Solution A: Dissolve 0.5 g. of zirconium oxychloride ($ZrOCl_2 \cdot 8H_2O$) in distilled water and dilute to 100 ml.

Solution B: Dissolve 0.1 g. of alizarin sodium monosulfonate in distilled water and dilute to 100 ml.

Zirconium-alizarin reagent: Add slowly, drop by drop, and with constant stirring, 50 ml. of *Solution B* to 50 ml. of *Solution A*. If a turbidity remains after mixing, allow to stand until clear. Finally, dilute the clear solution (mixture of *A* and *B*) with 200 ml. of distilled water. Solution keeps only a few days.

Remarks: Used like previous solution.

Ref. A.P.H.A. pp. 36-38; Ind. Eng. Chem., Anal. Ed. 6, 134-135 (1934)

ZIRCONIUM-PURPURIN REAGENT (KOLTHOFF-STANSBY)

Use: Test reagent for fluoride.

Preparation: Dissolve 0.16 g. of zirconium oxychloride in 100 ml. of concentrated hydrochloric acid and add 100 ml. of water. Now dissolve 0.009 g. of purpurin in 30 ml. of alcohol, and add this solution slowly to the zirconium oxychloride solution. Finally, add 620 ml. of concentrated hydrochloric acid and dilute with water to 1 liter.

Procedure for Test: Evaporate a little of the solution to be tested to dryness, and dissolve the residue in 2 ml. of 6 *N* hydrochloric acid. Add 2 ml. of the reagent to this solution. The color of the reagent turns from pink to yellow immediately if fluorides are present.

Sensitiveness: 0.003 mg. of fluorine.

Ref. Ind. Eng. Chem., Anal. Ed. 6, 118 (1934)

ZOUCHLOS SOLUTIONS

Use: Test reagent for albumin.

Preparation:

Solution 1: Mix the following:

Glacial acetic acid	10 ml.
Mercuric chloride, 1% aq. soln.	60 ml.

Solution 2: Mix the following:

Glacial acetic acid	20 ml.
Potassium thiocyanate, 10% aq. soln.	100 ml.

Remarks: These reagents precipitate albumin.

Ref. Zeitschr. anal. Chem. **29**, 380 (1890)

ZULKOWSKY'S REAGENT

See: Starch reagent for iodine.

ZWIKKER'S REAGENT

Use: Test reagent for perchlorates, persulfates, thiosulfates, chromates, permanganates, and other anions.

Preparation: Mix the following:

Cupric sulfate, 10% aq. soln.	4.0 ml.
Pyridine	1.0 ml.
Water	5.0 ml.

Remarks: This reagent gives characteristic crystals with the above-mentioned anions.

Ref. C. A. **34**, 5785 (1940)

INDEX

Solutions classified according to their use.

ACETALDEHYDE

m-Phenylenediamine hydrochloride reagent

ACETATE

Benedict's reagent
Lanthanum nitrate solution

ACETOACETIC ACID

Arnold's solution
Iodic acid reagent
Mercuric cyanide reagent

ACETONE

Dimethyl-p-phenylenediamine hydrochloride solution
2-Furaldehyde reagent
Iodo-potassium iodide reagent
Legal's solution
Lieben's solution
Mercuric cyanide reagent
Mercuric sulfate reagent (Denigès)
Rothera's reagent
Scott-Wilson's reagent
Sodium nirtoprusside reagent
Vournasos reagent

ACETYLENE

Denigès reagent

ACIDS, FREE

See: FREE ACIDS

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Ninhydrin solution
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ALBUMIN

Almen's solution (albumin)
Amann's reagent
Ammonium molybdate reagent (Balloni)
Blum's reagent
Boureau's reagent
Carminic acid reagent
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Formol reagent
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Gouver's solution
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Lilendahl-Petersen's reagent
Low-Bokorny's reagent
Lugol's test solution
Méhu's test reagent
Molisch's reagent
o-Phenolsulfonic acid solution
Phosphotungstic acid solution
Pollacci's reagent
Pons reagent
Riegler's reagent
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Sulfochondroitic acid (sodium salt)
Tannic acid solution

ALBUMIN (Continued)

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Fraude's solution
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ARSENIC

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See: VITAMIN C

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Isatin reagent
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Beef extract broth
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Ringer's broth
Ringer's solution
Rosenow's glucose-brain agar
Rosenow's glucose-brain broth
Russell's double sugar agar
Russell's double sugar agar with lead acetate
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Dyer-Baudisch reagent
Phosphotungstic acid reagent
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For a more complete list, see *Metals Handbook*, 1939 Edition.

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Tellyesnicky's fluid
Van Leeuwen's fluid
Worcester's fluid
Worcester's fluid with acetic acid
Zenker's fluid

FLOUR

Bellier's reagent

FLUORIDE

Benzidine reagent
Zirconium-alizarin reagent
Zirconium-purpurin reagent

FLUORINE

Lanthamum acetate solution
Miller's reagent

FORMALDEHYDE

Dimethylcyclohexanedione reagent
Dimethylhydroresorcin solution
Dimetol solution
Diphenylamine reagent
Dodsworth-Lyons reagent
Kentmann's reagent
Morphine hydrochloride reagent

FREE ACIDS

Cyanogen iodide solution
Kastle-Clark's reagent
Logwood solution

FRUCTOSE

See: LEVULOSE

FURAN

Aniline hydrochloride reagent

FURFURAL

Aniline acetate reagent

FUSEL OIL

Vanillin reagent

GALLIC ACID

Mitchell's reagent

GALLIUM

Quinalizarin reagent

GELATIN

Liesgang's reagent
Tannic acid solution

GERMANIUM

Hydroxynaphthalenequinone sulfonic acid

GLOBULIN

Folin and Ciocalteu phenol reagent

GLUCOSE

Almèn's solution (glucose)
Ammonium molybdate reagent
Arsenophosphotungstic acid reagent

GLUCOSE (Continued)—

Bang's solution
Barfoed's solution
Barreswill's solution
Benedict's solution
Bertrand's reagent
Criswell's reagent
Cupro-lactic reagent
Cuprosodic reagent
Diazobenzenesulfonic acid solution
m-Dinitrobenzene reagent
2,4-Dinitro-1-naphthol-7-sulfonic acid-formaldehyde reagent
Dinitrosalicylic acid solution
Donaldson's reagent
Dudley's reagent
Duyk's reagent
Fehling's solution
Folin-McEllroy's reagent
Frommherz's solution
Gerrard's solution
Hager's solution
Haines reagent
Knapp's solution
Löwe's solution
Lowenthal's reagent
Mulder's solution
o-Nitrophenylpropiolic acid reagent
Nylander's reagent
Pavy's solution
Pellet's solution
Romijn's reagent
Sachsse's solution
Schreiber's reagent
Soldaini's solution
Violette-Fehling's solution
Wayne's solution

GLUCOSIDES

Jorissen's reagent

GLUTATHIONE

Arsenophosphotungstic acid reagent
Phosphotungstic acid reagent
Zimmet's reagent

GLYCERIC ACID

Naphthoresorcinol reagent

GLYCINE

Alloxan reagent

GLYCOGEN

Brückner's reagent
Goldstein's reagent
Iodo-potassium iodide reagent
Roques reagent

GLYOXYLIC ACID

Fearon's reagent
Indole reagent
Pyrogallol solution

GOLD

Benzidine reagent
Cole's reagent
Pyridine reagent
Tetramethyldiaminodiphenylmethane solution
o-Tolidine solution

GUANINE

De Giacomo's reagents

GUM AMMONIAC

Plugge's solution

GUMS

Stoke's reagent

HALOGENS IN WATER

p-Aminodimethylaniline reagent
Tremain's reagent

HALOGENS, ORGANIC

Gutmann's reagent

HARDENING SOLUTION

Carnoy's hardening solution
Erlicki's hardening solution
Hertwig's osmic-acetic acid

HELLEBOREIN

Dragendorff's reagent

HISTAMINE

Diazotized sulfanilic acid reagent

HONEY

Ley's reagent
Lund's reagent

HONEY, ARTIFICIAL

Resorcinol reagent

HYDRASTINE

Mayerhoffer's reagent

HYDROCARBONS, AROMATIC
Antimony pentachloride reagent

HYDROCARBONS, UNSATURATED
Bromine in carbon tetrachloride

HYDROCHLORIC ACID
Boas solution
Congo red paper
Günzberg's reagent
Sahli's reagent
Steensma's reagent
Tropaeoline paper

HYDROCYANIC ACID
Benzidine acetate-cupric acetate solution
Guaiac-cupric sulfate paper
Moir's reagent

HYDROGEN CYANIDE
See: Hydrocyanic acid

HYDROGEN PEROXIDE
Arnold-Mentzel's solution
Bach's reagent
Doebner's reagent
Guaiconic acid reagent
Illosvay's reagent
Leuchter's solution
Richardson's reagent
Schönn's reagent
Tetramethyldiaminodiphenylmethane paper
Titanium sulfate solution
Vanadic acid reagent

HYDROGEN SULFIDE
Ganassini's reagent
Lead acetate paper
Sodium nitroprusside reagent

HYDROXY ACIDS
Liberalli's reagent

p-HYDROXYBENZOIC ACID
Stevenson-Resuggan reagent

β-HYDROXYBUTYRIC ACID
Black's reagent

HYDROXYLAMINE
Blom's reagent

HYDROXYL GROUP, ALCOHOLIC
Ammonium nitratocerate reagent
Phosphomolybdovanadic acid reagent

INDICAN
Barberio's solution
Bouman's reagent
p-Dimethylaminobenzaldehyde reagent
Ehrlich's solution
Isatin reagent
Lelli's reagent
Obermayer's reagent
Osmic acid solution
Takeuchi's reagent

INDICATOR
Ferric alum solution

INDICATOR, ACID-BASE
Alizarin solution
Alizarin yellow GG solution
Alizarin yellow R (p) solution
Alkannin paper
Anchusin paper
Aurin solution
Azolitmin paper
Azolitmin solution
Benzopurpurine 4B solution
Boettger's paper
Brazilin paper
Bromchlorophenol blue solution
Bromcresol green solution
Bromcresol purple solution
Bromphenol blue solution
Bromphenol red solution
Bromthymol blue solution
Chlorophenol red solution
Cochineal paper
Cochineal solution
Congo red paper
Congo red solution
Corallin solution
o-Cresolphthalein solution
Cresol red solution
Curcumin solution
Cyanin solution
Dibromophenoltetrabromophenolsulfonphthalein solution
2,4-Dinitrophenol solution
2,5-Dinitrophenol solution
2,6-Dinitrophenol solution

INDICATOR, ACID-BASE (Continued)

Fernambuco paper
Friedländer's reagent
Gallein solution
Helianthine paper
Hematoxylin paper
Hematoxylin solution
Heptamethoxy red solution
Herzberg's paper
Indigo carmine solution
Iodeosin solution
Lacmoid paper
Lacmoid solution
Litmus paper
Litmus solution
Metanil solution
Metacresol purple solution
Methyl orange paper
Methyl orange solution
Methyl red solution
Methyl violet solution
Methyl yellow solution
α-Naphtholbenzein solution
α-Naphtholphthalein solution
Neutral red solution
Nitramine solution
p-Nitrophenol solution
Phenolphthalein paper
Phenolphthalein solution
Phenol red solution
Poirrer C 4B solution
Quinaldine red solution
Quinaldine blue solution
Riegel's paper
Rosolic acid paper
Rosolic acid solution
Salicyl yellow solution
Sodium alizarinsulfonate solution
Tetrabromophenol blue solution
Thymol blue solution
Thymolphthalein solution
Töpfer's reagent
1,3,5-Trinitrobenzene solution
Tropaeoline D paper
Tropaeoline 0 solution
Tropaeoline 00 solution
Tropaeoline 000 solution
Xylene cyanole-methyl orange solution
p-Xylenol blue solution

(arranged in order of their pH range)

0.0- 4.0	Iodeosin
0.1- 1.5	Methyl violet
0.5- 2.5	Metacresol purple
1.2- 2.3	Metanil yellow
1.2- 2.8	Thymol blue
1.2- 2.8	p-Xylenol blue
1.3- 3.0	Tropaeolline 00
1.3- 4.0	Benzopurpurine 4B
1.4- 3.2	Quinaldine red
1.5- 3.2	Methyl violet
1.9- 3.3	Alizarin yellow R (p)
2.4- 4.0	2,6-Dinitrophenol
2.6- 4.0	2,4-Dinitrophenol
2.9- 4.0	Methyl yellow
3.0- 4.4	Methyl orange
3.0- 4.6	Tetrabromophenol blue
3.0- 4.6	Bromphenol blue
3.0- 5.2	Congo red
3.2- 4.8	Bromchlorophenol blue
3.7- 5.2	Sodium alizarinsulfonate
3.8- 5.4	Bromcresol green
3.8- 6.6	Gallein
4.0- 5.8	2,5-Dinitrophenol
4.2- 6.2	Methyl red
4.4- 6.2	Lacmoid
4.5- 8.3	Azolitmin
4.5- 8.3	Litmus
5.0- 6.0	Hematoxylin
5.0- 6.6	Chlorophenol red
5.0- 7.0	Heptamethoxy red
5.0- 7.6	p-Nitrophenol
5.2- 6.8	Bromcresol purple
5.2- 7.0	Bromphenol red
5.5- 6.8	Alizarin
5.6- 7.2	Dibromophenoltetrabromophenolsulfonphthalein
6.0- 7.6	Bromthymol blue
6.0- 8.0	Curcumin
6 6- 8.6	Quinoline blue
6.8- 8.0	Neutral red
6 8- 8.2	Rosolic acid
6.8- 8.4	Phenol red
7.2- 8.8	Cresol red
7.3- 8.7	α-Naphtholphthalein
7.4- 9.0	Metacresol purple
7.6- 8.9	Tropaeoline 000
8.0- 9.6	Thymol blue
8.0- 9.6	p-Xylenol blue
8.2-10.4	o-Cresolphthalein

INDICATOR, ACID-BASE (Continued)

8.2-10.0 Phenolphthalein
8.5- 9.8 α-Naphtholbenzein
9.3-10.5 Thymolphthalein
10.0-12.0 Alizarin yellow GG (salicyl yellow)
11.0-13.0 Poirrer C 4B
11.0-13.0 Nitramine
11.0-13.0 Tropaeoline 0
11.5-14.0 1,3,5-Trinitrobenzene
11.6-14.0 Indigo carmine

INDICATOR, ADSORPTION

Bromcresol green solution
Chlorophenol red solution
Dichlorofluorescein indicator solution
Diiodofluorescein indicator solution
Diphenylamine blue solution
Diphenylcarbazide solution
Eosin solution
Fluorescein solution

INDICATORS, MIXED

INDICATORS, OXIDATION-REDUCTION

Bordeaux indicator
Chrysoidine R solution
Diphenylamine solution
Diphenylamine sulfonate solution
Diphenylbenzidine solution
Erioglaucine solution
Eriogreen solution
Ferroin solution
Indigo sulfonate solution
Naphthol blue black solution
Phenanthroline-ferrous ion indicator
Rubrophene indicator solution
Sodium diphenylamine sulfonate

INDICATORS, UNIVERSAL

3-INDOLEACETIC ACID

Ferric chloride reagent

INDIUM

Quinalizarin reagent

INDOLE

Böhme's reagent
p-Dimethylaminobenzaldehyde reagent
Kovac's reagent
Sodium β-naphthoquinone sulfonate solution

IODIDE

Gold chloride reagent
Nitrosylsulfuric acid
Pamfil-Wonnesch's solution

IODINE

Starch reagent
o-Tolidine
Zinc iodide-starch paper
Zulkowsky's reagent

IODINE NUMBER

Borde's reagent
Hanus iodine bromide reagent
Hubl's solution
Wijs iodine monochloride solution

IRIDIUM

Titanium sesquisulfate solution

IRON

Acetylacetone reagent
Alloxan reagent
Alloxantin reagent
p-Aminophenol hydrochloride solution
Aminopyrine reagent
Ammonium phosphomolybdate reagent
Baudisch's reagent
Brazilin solution
Chromotropic acid reagent
Cooper's reagent
Cupferron reagent
2,4-Dihydroxyacetophenone solution
Diisonitrosoacetone solution
2,4-Dinitroresorcinol solution
α,α'-Dipyridyl reagent
Ferron solution
7-iodo-8-hydroxyquinoline-5-sulfonic acid solution
Isonitrosoacetophenone solution
Pyramidone reagent
Resorcylaldoxime solution
Salicylaldoxime reagent
Sodium bis-p-chlorophenylphosphate reagent

IRON (Continued)

Sodium phosphotungstate solution
Sodium salicylate reagent
Sulfosalicylic acid reagent
Thioglycolic acid reagent
Uranium sulfate solution
Zimmermann-Reinhardt solution

ISOASCORBIC ACID

Uranyl acetate reagent

ISOTHIOCYANATE

Mercuric sulfate reagent (Denigès)

KETONE

Böeseken's reagent
p-Nitrophenylhydrazine reagent
Phenylhydrazine reagent

LACTIC ACID

Carbazole solution
Uffelmann's reagent
Vournasos reagent

LAURIC ACID

Ludwig-Haupt's reagent

LEAD

Carminic acid reagent
Cochineal solution
Diphenylthiocarbazone reagent
Dithizone solution
Hematein solution
Iwanow's reagent
Sodium oleate solution
Tetramethyldiaminodiphenylmethane solution

LEVULOSANS

Benzidine reagent
Roques' reagent

LEVULOSE

Arsenotungstic reagent
Copper ketose reagent
Safranin reagent
Seliwanoff's reagent

LIGNIFIED MEMBRANES

Casparis reagent
Cobaltothiocyanate reagent

LIGNIN

Cobalt thiocyanate solution
Diphenylamine reagent
Phloroglucinol reagent
Seeliger's reagent
Wiesner's solution
Wolesky's solution

LINSEED OIL

Halphen's reagent

LITHIUM

Ammonium stearate reagent
Pročke-Uzel's reagent
Sodium arsenite reagent

LIVING TISSUE

Bieling's reagent
Nitroanthraquinone reagent

MAGNESIUM

Acridine yellow 5G reagent
Alloxan reagent
Benzoazurine G solution
Cadion 2β solution
Clayton yellow reagent
p-Diaminobenzene solution
Dubsky-Wagner's reagents
8-Hydroxyquinoline solution
p-Nitrobenzeneazoresorcinol solution
Oxine reagent
p-Phenylenediamine solution
Quinalizarin reagent
"S" and "O" reagent
Thiodiphenylcarbazide solution
Titan yellow reagent

MANGANESE

Benzidine reagent
Formaldoxime reagent
Heczko's reagent

MENTHOL

p-Dimethylaminobenzaldehyde reagent

MERCERIZED COTTON

Lange's reagent
Mennel's reagent

MERCURY

Benzopurpurin 4B reagent
Diiodophenol-p-sulfonic acid solution
Diphenylcarbazide reagent
Gallic acid solution

MERCURY (Continued)
Gutman's reagent
Phosphotungstomolybdic acid reagent
Sozoiodol reagent
Zinc purpurate reagent

METALS
Ammonium dithiocarbamate solution
Cazeneuve's reagent
Diphenylcarbazide solution
Isatin-β-oxime solution
Kolthoff's reagent

METHENAMINE
Silicotungstic acid reagent

METHYLENE BLUE
Cuprohydrocyanic reagent

METHYLGLYOXAL
Carbazole solution

METHYLGUANIDINE
Pfiffner-Meyers reagent

MILK
Alizarin solution (Morres)
Hematin solution
Rothenfusser's reagent

MILK SUGAR
Morphine hydrochloride reagent

MINERAL ACIDS
Carletti's reagent
Fuchsin reagent
Huber's solution
Logwood solution

MOLYBDATE
Tetramethyldiaminodiphenylmethane solution

MOLYBDENUM
α-Benzoinoxime reagent
Bertrand's reagent
α,α'-Dipyridyl reagent
Phenylhydrazine reagent
Potassium xanthate reagent
Tungstic acid reagent

MORPHINE
Hoshida's reagent
Silicomolybdic acid reagent

MUCIN
Citro-sodium tungstate paper

MUCUS
Hecht's reagent

MYRRH
Hirschohn's reagent

α-NAPHTHOL
Aymonier's reagent

β-NAPHTHOL
Hexamethylenetetramine reagent
Methenamine reagent
Urotropin reagent

NICKEL
Alvarez's reagent
α-Benzildioxime solution
Danheiser's solution
Dimethylglyoxime solution
Formaldoxime reagent
Nitroaminoguanidine solution
Potassium dithiooxalate solution
Potassium thiocarbonate solution

NICOTINE
Silicotungstic acid

NITRATE
Alvarez's reagent (nitrite and nitrate)
Brucine reagent
Di-(9,10-monohydroxyphenanthryl) amine solution
Diphenylamine reagent
Fornitrol solution
"G" Acid solution
Iridium chloride solution
Iridium potassium chloride solution
Klein's solution
2-Naphthol-6,8-disulfonic acid solution
Nitron solution
Phenoldisulfonic acid solution

NITRATE (Continued)
- α-Phenyl-β-diethylaminoethyl-p-nitrobenzoate solution
- Resorcinol reagent
- Safranin T solution

NITRIC ACID
- 1,5-Dihydroxyanthraquinone reagent
- Di-(1-naphthylmethyl)-amine acetate reagent

NITRITE
- Alvarez's reagent (nitrite and nitrate)
- Aniline-phenol mixture
- Antipyrine solution
- Azo-xylidic reagent
- Böttger's reagent
- Diphenylamine reagent
- Eichler's reagent
- Fuchsin reagent
- "G" Acid solution
- Genlis' reagent
- Germuth's reagent
- Griess paper
- Metaphenylenediamine paper
- 2-Naphthol-6,8-disulfonic acid solution
- Novelli's reagent
- Primot's reagent
- Resorcinol reagent
- Riegler's reagent
- Safranin T solution
- Trommsdorff's solution
- Zinc iodide-starch solution

NITRO GROUP
- Hearon-Gustavson's reagent

NITROCELLULOSE SILK
- Diphenylamine reagent

NITROGEN
- Ammonia-free water
- Jodlbauer's reagent

NITROGEN RETENTION OF BLOOD
- Barrett's reagent

NITROGENEOUS COMPOUNDS
- Phosphotungstic acid reagent

NITROSYLSULFURIC ACID
- Resorcinol reagent

NITROUS ACID
- Griess paper
- Lunge's solution
- Metaphenylenediamine paper
- α-Naphthylamine-sulfanilic acid reagent
- Potassium iodide-starch paper
- 1,2,4-Tolylenediamine reagent

NUCLEOPROTEINS
- Almén's reagent (Albumin)

OILS
- Hirschsohn's reagent

OLEIC ACID
- Ludwig-Haupt's reagent

OLIVE OIL
- Lailler's reagent
- Roth's reagent
- Sisley-Frahse's reagent

OLIVE PITS
- Dimethyl-p-phenylenediamine solution

OPIUM ALKALOIDS
- Rosenthaler-Turk's reagent

ORGANIC BASES
- Kharichkov's reagent

OXALIC ACID
- Grossfeld's reagent
- Patschowsky's reagent

OXIDASES
- Graham-Menten's reagent
- Grüss reagent

OXIDIZING AGENTS
- Aminopyrine reagent
- Caro's solution
- Genlis reagent
- Jannasch's reagent
- Molybdate reagent
- Potassium iodide—starch solution
- Pyramidone reagent
- Trommsdorff's solution
- Zinc iodide—starch solution

OXYCELLULOSE
Rhodes reagent

OXYGEN
Alkaline pyrogallol solution
Cazeneuve's reagent
Franzen's reagent
Indigo carmine reagent
Oxygen absorbent
Oxygen reagent
m-Phenylenediamine solution
Potassium pyrogallate solution

OZONE
Arnold-Mentzel's ozone reagent
Benzidine paper
Fluorescein reagent
m-Phenylenediamine hydrochloride solution
Potassium iodide-starch paper
Schönbein's ozone paper
Wurster's ozone paper
Zinc iodide-starch paper

PALLADIUM
p-Aminoacetophenone solution
α-Nitro-β-naphthol solution

PENTOSANS
Phloroglucinol reagent

PEPSIN
Jacoby's reagent
Solm's reagent

PEPTONES
Citro-sodium tungstate paper

PERCHLORATE
Nitrosodimethylaniline solution
α-Phenyl-β-diethylaminoethyl-p-nitrobenzoate solution

PERCHLORIC ACID
Nitron acetate solution

PERCHLORATES
α-Phenyl-β-diethylaminoethyl-p-nitrobenzoate solution
Zwikker's reagent

PERMANGANATES
Zwikker's reagent

PEROXIDASES
Battelli-Stern's reagent
Borinski's reagent
Fishel's reagent
Lison's reagent
Sodium benzidinemonosulfonate reagent

PEROXIDES
Middleton's reagent
Vanadic acid reagent

PERSULFATES
Zwikker's reagent

PHENOLS
Aloy-Laprade's reagent
Arsenotungstic reagent
Arsenotungstomolybdic reagent
Candussio's reagent
Davy's reagent
Diazotized sulfanilic acid reagent
2, 6-Dibromquinonechlorimide solution
Ehrlich's diazo reagent
Folin and Ciocalteu's reagent
Folin and Denis reagent
Guglialmelli's reagent
Molybdic acid reagent
Nickel-cyanide-ammonia reagent
Phosphotungstomolybdic acid reagent
Sodium arsenotungstomolybdate reagent
Wischo's reagent

PHOSGENE
Suchier's reagent

PHOSPHATES
1-Amino-2-naphthol-4-sulfonic acid reagent
Ammonium molybdate reagent
Molybdic acid reagent
Scott-Plimmer's reagent
Strychnine-molybdate reagent
Wagner's reagent

PHOSPHORIC ACID
Molybdate-strychnine reagent
Pouget-Chouchak's reagent
Strychnine-molybdate reagent
Tettamanzi's reagent

PHOSPHORUS
Ammonium molybdate solution
Silver nitrate paper

PHTHALIC ACID
Ripan's reagent

PHYTOSTEROL
Digitonin solution

PICRAMIC ACID
Le Mithouard's reagent

PICRIC ACID
Le Mithouard's reagent

PICROTOXIN
Anisaldehyde reagent

PINE OIL
Holl's reagent
Leuchter's reagent
o-Nitrobenzaldehyde reagent

PLATINUM
Benzidine reagent

POLYPEPTIDES
Folin and Ciocalteu phenol reagent

POTASSIUM
Adams-Hall-Bailey reagent
Aurantia solution
Celsi's reagent
Chloroplatinic acid solution
2, 4-Dinitro-1-naphthol-7-sulfonic acid
p-Dipicrylamine solution
Hexanitrodiphenylamine solution
γ-Methyldicyanodihydroxyhydropyridine solution
Naphthol yellow S solution
Sodium amino-β-naphtholsulfonate reagent
Sodium cobaltic nitrite solution
Sodium silver cobaltic nitrite solution

PRESERVATIVES
Barff's boroglycerin
Behren's glycerol-isinglass
Farrant's solution
Goadby's solution
Hoyer's chloral-acacia
Kaiser's glycerin-gelatin
Pacini's solution
Ripart's solution
Wickersheimer's solution
Xanthydrol reagent

PROCAINE
p-Dimethylaminobenzaldehyde reagent

PROLINE
p-Dimethylaminobenzaldehyde reagent

PROTEINS
Abrahamson's tungstic acid reagent
Biuret paper
Biuret reagent
Brücke's reagent
Folin and Ciocalteu's phenol reagent
Hopkins-Cole reagent
Millon's reagent
Ninhydrin solution
Potassium mercuric iodide reagent

PTOMAINES
Bettink-Van Dissel's reagent

PUS IN BODY FLUIDS
Hirschfeld's reagent

PYRIDINE
Congo red paper

PYRROLE
p-Dimethylaminobenzaldehyde reagent

PYRROLINE
p-Dimethylaminobenzaldehyde reagent

QUININE
Arsenomolybdic acid reagent
Christensen's reagent
De Vrij's solution
Giemsa's reagent
Jörgensen's reagent
Quinodine iodide reagent
Vanadic acid reagent

RANCID FATS AND OILS
Phloroglucinol reagent

REDUCING SUBSTANCES
Agulhon's reagent

RENAL FUNCTION TEST
Phenolsulfonphthalein solution

RESINS
Ellram's reagent
Hicks reagent
Vanillin reagent

RHODIUM
Titanium sesquisulfate solution

RHUBARB
Tschirch-Edner's reagent

ROSIN OIL
Halphen's reagent

ROTENONE
Vanadic acid reagent

RUBIDIUM
Ball's reagent

SACCHARIN
p-Nitrodiazobenzene reagent
Riegler's reagent

SAFFRON ADULTERATION
Phosphomolybdic acid reagent

SALICYLIC ACID
Ammonium molybdate reagent
Methylglyoxal reagent

SAPONINS
Fischer's blood gelatin reagent

SAUSAGE
Eber's solution

SEED OILS IN COTTONSEED OIL
Cutolo's reagent

SELENATE
Denigès reagent

SELENITE
Denigès reagent

SELENIUM
Cadmium acetate in acetic acid
as-Diphenylhydrazine solution
Guerin's reagent
Heyn-Bauer's reagent

SESAME OIL
Baudouin's solution
Breinl's reagent
Fleig's reagent
Villaveccia's reagent

SEX
Manuiloff's reagent

SILICA
Ammonium molybdate reagent

SILK
Chromic acid reagent
Cupric sulfate in glycerol-potassium hydroxide
Höhnel's reagent
Nickel oxide solution, ammoniacal
Persoz's solution
Potassium plumbite reagent
Zinc chloride solution, basic

SILVER
Benzopurpurin 4B reagent
p-Dimethylaminobenzylidinerhodanine solution
Isatin reagent

SODIUM
Adams-Hall-Bailey reagent
Ball's reagent
Blanchetière's reagent
Bougault's reagent
Caley's reagent
Fluosilicic acid
Magnesium uranyl acetate solution
γ-Methyldicyanodihydroxyhydropyridine solution
Potassium antimonate solution
Zinc uranyl acetate solution

SOLANIDINE
Brant's reagent

SOLANINE
Brant's reagent

SPERM

Bokarius reagent

STAINING SOLUTIONS

Acetic thionin (Frost)
Aceto-carmine (Schneider)
Acid fuchsin
Acid hematoxylin (Ehrlich's acid hematoxylin)
Albert's diphtheria stain
Alizarin S solution
Alkaline crystal (gentian) violet
Alkaline methylene blue
Altman's acid fuchsin
Ammonium oxalate-crystal (gentian) violet solution
Aniline blue collogen stain
Aniline blue W. S. staining solution
Aniline crystal violet
Anthony's stain
Azure I solution
Azure A solution
Azure II solution
Azure II-eosin solution
Basic fuchsin
Beale's ammonia-carmine
Benda's stain
Best's carmine stain
Biebrich's scarlet
Biondi-Heidenhain triacid mixture
Bismarck brown solution
Bizzozero's picro-carmine
Böhmer's hematoxylin
Böhmer's hematoxylin-alum
Borax-carmine
Bordeaux red solution
Carbol crystal (gentian) violet
Carbol fuchsin
Carbol methylene blue
Carbol thionin
Carmalum
Casares-Gil flagella stain
Chloral hematoxylin
Cochineal, alcoholic
Cochineal alum
Cochineal solution
Conn's stain
Cyanin stain
Czokor's alum-cochineal
Delafield's hematoxylin
Dorner's nigrosin
Ehrlich's acid hematoxylin (acid hematoxylin)
Ehrlich's hematoxylin-glycerin
Ehrlich's neutral red stain
Ehrlich's stain (bacteria)
Ehrlich's stain (tubercles)
Ehrlich's triacid stain
Ehrlich-Biondi's triacid mixture
Eosin, aqueous
Erlicki's stain
Ethyl eosin, alcoholic (Harris)
Fontana's solutions
Formalinized crystal violet solution
Friedlander's hematoxylin-alum-glycerin
Friedländer's picrocarmine
Gabbet's stain
Gibbe's stain
Giemsa's solution for Romanowsky's stain
Giemsa's stain
Golgi's osmic-silver nitrate
Goodpasture's stain
Goodpasture's acid polychrome methylene blue
Gram's solution
Gray's flagella stain
Grenacher's alcoholic acid carmine
Grenacher's alcoholic borax-carmine
Grenacher's alum-carmine
Grigoriew's reagent
Hamann's acetic carmine
Harris' hematoxylin
Heidenhain's azocarmine
Heidenhain's hematoxylin
Heidenhain's iron-hematoxylin
Hemalum solution
Hematoxylin-eosin
Hematoxylin solution
Henneguy's acetic alum carmine
Hiss's stain
Hoyer's ammonium carminate solution
Huntoon's stain
Hydrochloric acid-carmine solution
Iodine-eosin solution
Iron hematoxylin
Jenner's stain
Koch-Ehrlich's stain
Koch's methylene blue solution

STAINING (Continued)

Kühne's carbolic methylene blue
Leishman's stain
Light green S F yellowish
Lithium carmine
Ljubinsky's diphtheria stain
Loeffler's ferrous-tannate mordant
Loeffler's methylene blue solution
Lyon's blue
McNeal's tetrachrome
Mallory's stain
Mallory's triple stain
Manson's solution
Masson's saffron solution
Mayer's alcoholic acid carmine
Mayer's carmalum
Mayer's cochineal
Mayer's hemacalcium
Mayer's hematoxylin-alum-calcium
Mayer's hemalum
Mayer's mucicarmine
Mayer's mucihematein
Mayer's picrocarmine
Merkel's indigocarmine-oxalic acid solution
Methylene azure solution
Methylene blue solution
Methyl green stain solution
Mucicarmine
Mucihematein
Neisser's stain
Neutral red solution
Nikiforoff's borax-carmine
Nile blue sulfate
Orange G solution
Orth's lithium-carmine
Orth's picrolithium-carmine
Pappenheim's solution
Pappenheim-Saathoff's pyronin methyl green
Paracarmine
Phloxine staining solution
Phosphotungstic acid-hematoxylin
Ponder's diphtheria stain
Proescher's oil red-pyridine solution
Pyronin methyl green
Quinoline blue stain
Ranvier's picrocarmine
Regaud's hematoxylin
Renault's hematoxylin-glycerol
Romanowsky's stain
Romanowsky's stain—Leishman's modification
Safranin O solution
Sahli's borax-methylene blue
Scarlet red stain
Seiler's indigocarmine-borax carmine
Seller's stain
Shunk's flagella stain
Tetrachrome stain
Thiersch's carmine oxalate
Thionin staining solution
Toluidine blue staining solution
Trypan blue
Universal stain
Unna's methylene blue
Van Gieson's stain
Victoria blue solution
Washburn's solution
Wayson's stain
Weigert's acid fuchsin
Weigert's hematoxylin
Weigert's iron-hematoxylin
Winogradsky's stain
Wright's staining solution
Ziehl-Neelson's carbol fuchsin

STEROLS

Rosenheim-Callow's reagent

STRONTIUM

Potassium iodate reagent

STRYCHNINE

Aloy-Valdiguié's reagent (strychnine)

SUCROSE

Morphine hydrochloride reagent
Rothenfusser's reagent

SUGAR

Color standards for urine
o-Nitrophenylpropiolic acid reagent
Senft's reagent
Weitbrecht's reagent

SUGAR, ALDOSE

Denigès reagent

SUGAR, BLOOD

Hagedorn-Jensen's reagent
1, 5-Nitroanthraquinonesulfonic acid reagent

SUGARS, HEXOSE

Foulger's reagent

SUGARS, KETOSE

Arsenotungstic reagent (Benedict)
Benedict's arsenotungstic reagent
Denigès reagent

SUGARS, MONOSE

Benedict's molybdate reagent
Phosphomolybdic acid reagent
Phosphomolybdovanadic acid
Tauber's reagent

SUGARS, PENTOSE

Benzidine reagent
Bial's reagent
Orcinol reagent

SUGARS, REDUCING

Benedict's solution
Causse's reagent
Cramer's reagent
m-Dinitrobenzene reagent
Luff's reagent

SULFANILIMIDE

Sodium β-naphthoquinone-4-sulfonate solution

SULFATES

Benzidine hydrochloride reagent
Denigès reagent
Sodium rhodizonate solution
Yoshimatsu's reagent

SULFITE-CELLULOSE

Appelius-Schmidt reagent
Cinchonine solution

SULFUR

Benedict's sulfur reagent
Benedict-Denis sulfur reagent
Cadmium acetate in acetic acid
Dickert's reagent
Grote's reagent
Heyn-Bauer's solution
Pierce's reagent
Raikow's reagent

SULFUR OIL

Saccardi's reagent

SULFUR, NON-PROTEIN

Denis-Reed's reagent

SULFUR DIOXIDE

Fuchsin paper
Sodium nitroprusside reagent

TANNIC ACID

Arsenotungstic reagent
Phosphotungstomolybdate reagent
Sanin's reagent

TANNIN

Baemes reagent
Carpene's solution
Indigo solution
Lutz's reagent
Naegeli's solution
Zinc chloroiodide solution

TANTALUM

Komarovskii-Shapiro reagent

TARTRATES

Peterson's reagent

TARTARIC ACID

Resorcinol reagent

TELLURATE

Denigès reagent

TELLURIUM

Cadmium acetate in acetic acid
Heyn-Bauer's reagent

TEREPHTHALIC ACID

Ripan's reagent

TERPENES

Levine-Richman's reagent

TEXTILE FIBERS

Wagner's reagent

THALLIUM

Quinalizarin reagent

THIOALCOHOLS

Isatin reagent

THIOPHENE

Liebermann's reagent
Mercuric sulfate reagent (Denigès)

THIOSULFATE
- Casolori's reagent
- Zwikker's reagent

THORIUM
- Kisser's reagent
- Meyer's reagent
- Picrolonic acid solution
- Potassium iodate reagent

TIN
- Ammonium molybdate reagent
- Brucine solution
- Cacotheline solution
- Diazine green S solution
- Dinitrodiphenylaminesulfoxide reagent
- Phenylarsonic acid solution

TITANIUM
- Thymol solution

TITRATION MIXTURE
- Boric acid titration mixture
- Gilmour's reagent
- Zimmermann-Reinhardt reagent

TRYPSIN
- Jacoby's reagent

TRYPTOPHANE
- Hopkins-Cole reagent

TUNGSTATES
- Rhodamine B solution

TUNGSTEN
- Cinchonine solution
- Heath's reagent

TURPENTINE OIL
- Leuchter's reagent
- o-Nitrobenzaldehyde reagent

TYROSIN
- Folin and Denis reagent
- Mörner's reagent
- Phosphotungstomolybdic acid reagent

UNSATURATED ACIDS IN FATS
- Hübl's iodine solution

URANIUM
- Cochineal solution
- Sodium salicylate reagent

UREA
- Diazotized sulfanilic acid reagent
- Ehrlich's diazo reagent
- Folin and Ciocalteu phenol reagent
- Gum ghatti solution
- Liebig's reagent
- Mercuric nitrate solution
- Phosphotungstic acid reagent
- Rice's bromine solution
- Sodium hypobromite solution
- Urease paper

URIC ACID
- Arsenophosphotungstic acid reagent
- Arsenotungstic acid reagent
- Arthaud-Butte's reagent
- Benedict's reagent
- Citro-sodium tungstate paper
- Dimethyl-p-phenylenediamine hydrochloride solution
- Folin's mixture
- Folin-Denis reagent
- Ludwig's reagent
- p-Nitrodiazobenzene reagent
- Phosphotungstic acid reagent
- Riegler's reagent
- Rudisch-Boroschek reagent

URINE, PATHOLOGICAL
- Brunner's reagent
- p-Dimethylaminobenzaldehyde reagent
- Ehrlich's diazo reagent
- Friedenwald-Ehrlich reagent
- Kronberger's reagent
- Sodium alizarinsulfonate reagent

UROBILIN
- Florence's reagent

UROBILINOGEN
- p-Dimethylaminobenzaldehyde reagent
- Florence's reagent

VANADATE
- Tetramethyldiaminodiphenylmethane solution

VANADIUM
- Ammonium molybdate reagent
- Diphenylamine reagent
- Strychnine reagent

VANILLIN
- Kreis-Studinger's reagent
- Phosphotungstomolybdic acid reagent
- Phosphovanadic acid solution

VEGETABLE OILS
- Phosphomolybdic acid
- Sodium molybdate reagent
- Welmann's solution

VITAMIN A
- Antimony trichloride reagent
- Phosphpmolybdic acid reagent
- Rosenthal-Erdelyi's reagent

VITAMIN B
- Jendrassik's reagent

VITAMIN B_1
- Formaldehyde-Azo test reagent
- Prebula-McCollum reagent

VITAMIN C
- Diazotized sulfanilic acid reagent
- Giri's reagent
- Medes' reagent
- Methylene blue reagent
- Monomolybdophosphotungstic acid reagent
- Phosphomolybdic acid reagent
- Phosphotungstic acid
- Sodium 2, 6-dichlorobenzeneoneindophenol solution
- Sodium 2, 6-dichlorophenolindophenol solution
- Sodium tungstate reagent
- Tauber's reagent
- Uranium acetate

VITAMIN D
- Aniline reagent
- Antimony trichloride reagent
- Halden's reagent
- Phosphomolybdic acid reagent
- Tzoni's reagent

VOLATILE OIL
- Cerdeiras reagent
- Hirschsohn's reagent

WATER
- Aluminum ethylate solution
- Citro-molybdic acid paper
- Fischer's reagent
- Henle's reagent
- Karl Fischer reagent
- Mann's paper

WATER, COLOR IN
- Platinum-cobalt color standards

WATER, HALOGENS IN
- Tremain's reagent

WATER, HARDNESS OF
- Boutran-Boudet's soap solution
- Clarke's soap solution
- Potassium oleate reagent
- Potassium palmitate solution
- Wilson's solution
- Winkler's reagent

WATER, NON-CARBONATE HARDNESS OF
- Soda reagent

WATER, ORGANIC MATTER IN
- Dupasquier's solution

WINE COLORING
- Nessler's reagent (wine)

WOOD
- Phosphovanadic acid solution

WOOD FIBER
- Berge's reagent
- Molisch reagent
- p-Nitraniline solution

WOOL
- Persoz's solution
- Potassium plumbite reagent
- Schweitzer's reagent
- Sodium nirtoprusside solution
- Sodium plumbite solution

YEAST EXTRACT
- Searl's reagent

YOHIMBINE

Chloral hydrate reagent

ZINC

Alloxan reagent
Alvarez's reagent
Borneolglycuronic acid reagent
Cobalticyanide paper
Cone-Cady's reagent
Folin-Denis reagent for phenols
Mercuric thiocyanate reagent
Montequi's reagent
β-Naphthoquinoline-potassium thiocyanate solution
Orange IV solution
Phenetidine hydrochloride reagent
Sandell-Wishnick's reagent

ZIRCONIUM

β-Nitroso-α-naphthol

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A. O. A. C.	*Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists,* Fourth Ed., 1935. The Association (Washington, D. C.).
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HARPER	*Introduction to Textile Chemistry,* H. Harper. Macmillan, Limited (London), 1931.
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MUIR	*Manual of Bacteriology,* Robert Muir, Seventh Ed., 1921. The Oxford University Press.
SNELL	*Colorimetric Methods of Analysis,* Foster D. Snell and Cornelia T. Snell, Two Vols. D. Van Nostrand (New York), 1936.
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SUTTON	*Volumetric Analysis,* Francis Sutton, Eleventh Ed., 1924. Blakiston (Philadelphia).
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Am. Chem. J.	American Chemical Journal	U. S. A.
Am. J. Clin. Path.	American Journal of Clinical Pathology	U. S. A.
Am. J. Med. Sci.	American Journal of Medical Sciences	U. S. A.
Am. J. Pharm.	American Journal of Pharmacy	U. S. A.
Am. J. Public Health	American Journal of Public Health and the Nation's Health	U. S. A.
Am. J. Sci.	American Journal of Science	U. S. A.
Am. Med.	American Medicine	U. S. A.
Am. Silk J.	American Silk Journal	U. S. A.
Analyst	The Analyst	England
Ann.	Annalen der Chemie	Germany
Ann. chim. anal. chim. appli.	Annales de chimie analytique et de chimie appliquée et Revue de chimie analytique réunies	France
Ann. chim. applicata	Annali di chimica applicata	Italy
Apoth. Ztg.	Apotheker Zeitung	Germany
Arch. Hyg.	Archiv für Hygiene	Germany
Arch. Internal Med.	Archives of Internal Medicine	U. S. A.
Arch. ital. biol.	Archives italiennes de biologie	Italy
Arch. Pharm.	Archiv der Pharmazie und Berichte der deutschen pharmazeutischen Gesellschaft	Germany
Ber.	Berichte der deutschen chemischen Gesellschaft	Germany
Ber. deut. pharm. Ges.	Berichte der deutschen pharmazeutischen Gesellschaft	Germany
Biochem. J.	The Biochemical Journal	U. S. A. and England
Biochem. Zeitschr.	Biochemische Zeitschrift	Germany
Bull. soc. chim.	Bulletin de la société chimique de France	France
Bull. trav. soc. pharm. Bordeaux	Bulletin des travaux de la société de pharmacie de Bordeaux	France
Bur. Standards J. Research	Bureau of Standards Journal of Research	U. S. A.
C. A.	Chemical Abstracts	U. S. A.
Canad. Med. Assoc. J.	Canadian Medical Association Journal	Canada
Chemist-Analyst	The Chemist-Analyst	Canada and U. S. A.
Chem. News	Chemical News	England
Chem. Zntr.	Chemisches Zentralblatt	Germany
Chem.-Ztg.	Chemiker-Zeitung	Germany

REF. ABBREV.	JOURNAL	COUNTRY
Chim. ind.	Chimie et industrie	France
Compt. rend.	Comptes rendus hebdomadaires des séances de l'académie des sciences	France
Compt. rend. soc. biol.	Comptes rendus des séances de las société de biologie et de ses filiales et associées	France
Deut. med. Wochschr.	Deutsche medizinische Wochenschrift	Germany
Deut. Med.-Ztg.	Deutsche Medizinal-Zeitung	Germany
Dingler's Polytech. J.	Dingler's Polytechnisches Journal	Germany
Eng. Mining J.	Engineering and Mining Journal	U. S. A.
Food Research	Food Research	U. S. A.
Ind. Eng. Chem.	Industrial and Engineering Chemistry	U. S. A.
Ind. Eng. Chem., Anal. Ed.	Industrial and Engineering Chemistry, Analytical Edition	U. S. A.
Iowa State Coll. of Agri. and Mech. Arts Bull.	Iowa State College of Agriculture and Mechanical Arts Bulletin	U. S. A.
Jahresber	Jahresbericht uber die Fortschritte der Chemie, usw.	Germany
J. Am. Chem. Soc.	Journal of the American Chemical Society	U. S. A.
J. Am. Med. Assoc.	Journal of the American Medical Association	U. S. A.
J. Am. Pharm. Assoc.	Journal of the American Pharmaceutical Association	U. S. A.
J. Am. Water Works Assoc.	Journal of the American Water Works Association	U. S. A.
J. Agr. Res.	Journal of Agricultural Research	U. S. A.
J. Assoc. Official Agr. Chem.	Journal of the Association of Official Agricultural Chemists	U. S. A.
J. Bact.	Journal of Bacteriology	U. S. A.
J. Biol. Chem.	The Journal of Biological Chemistry	U. S. A.
J. Bot.	Journal of Botany	England
J. Chem. Ed.	Journal of Chemical Education	U. S. A.
J. Chem. Soc.	Journal of the Chemical Society	England
J. chim. méd.	Journal de chimie médicale	France
J. Exptl. Med.	The Journal of Experimental Medicine	U. S. A.
J. Hyg.	The Journal of Hygiene	England and U. S. A.
J. Infectious Diseases	The Journal of Infectious Diseases	U. S. A.
J. Lab. Clin. Med.	The Journal of Laboratory and Clinical Medicine	U. S. A.
J. méd. Bordeaux	Journal de médecine de Bordeaux	France
J. Med. Research	The Journal of Medical Research	U. S. A.
J. Pharmacol.	Journal of Pharmacology and Experimental Therapeutics	U. S. A.

REF. ABBREV.	JOURNAL	COUNTRY
J. pharm. chim.	Journal de pharmacie et de chimie	France
J. Physiol.	The Journal of Physiology	England
J. prakt. Chem.	Journal für praktische Chemie	Germany
J. Soc. Chem. Ind.	Journal of the Society of Chemical Industry	England
J. Textile Inst.	The Journal of the Textile Institute	England
Metallurgie	Metallurgie	Germany
Mikrochemie	Mikrochemie; Internationales Archiv für deren Gesamtgebiet	Austria
Mikrokosmos	Mikrokosmos	Germany
Military Surgeon	The Military Surgeon	U. S. A.
Monatsh.	Monatshefte für Chemie und verwandte Teile anderer Wissenschaften	Germany
Münch. med. Wochschr.	Münchener medizinische Wochenschrift	Germany
Petersburger med. Wochschr.	Petersburger medizinische Wochenschrift	Russia
Pharm. J.	The Pharmaceutical Journal	England
Pharm. Monatsh.	Pharmazeutische Monatshefte	Germany
Pharm. Post	Pharmazeutische Post	Germany
Pharm. Praxis	Pharmazeutische Praxis	Germany and Austria
Pharm. Zentralhalle	Pharmazeutische Zentralhalle für Deutschland	Germany
Pharm. Ztg.	Pharmazeutische Zeitung	Germany
Proc. Soc. Exptl. Biol. Med.	Proceedings of the Society for Experimental Biology and Medicine	U. S. A.
Quart. J. Med.	Quarterly Journal of Medicine	England
Rend soc. chim. ital.	Rendiconti della società chimica italiana	Italy
Rev. Intern. falsific.	Revue internationale des falsifications	France and Holland
Science	Science	U. S. A.
Soil Science	Soil Science	U. S. A.
Stain Tech.	Stain Technology	U. S. A.
U. S. Geol. Survey Repts.	United States Geological Survey Reports	U. S. A.
U. S. Public Health Repts.	United States Public Health Reports	U. S. A.
W. Wks. and Sewage	Water Works and Sewage	U. S. A.
Wiener klin. Wochschr.	Wiener klinische Wochenschrift	Austria and Germany
Wiener med. Blätter	Wiener medizinische Blätter	Austria
Zeitschr. anal. Chem.	Zeitschrift für analytische Chemie	Germany
Zeitschr. angew. Chem.	Zeitschrift für angewandte Chemie	Germany
Zeitschr. anorg. Chem.	Zeitschrift für anorganische Chemie	Germany
Zeitschr. klin. Med.	Zeitschrift für klinische Medizin	Germany
Zeitschr. physiol. Chem.	Zeitschrift für physiologische Chemie	Germany

REF. ABBREV.	JOURNAL	COUNTRY
Zeitschr. Untersuch. Nahr.-u. Genussm.	Zeitschrift für Untersuchung der Nahrungs- und Genussmittel	Germany
Zentr. Bakt. Parasitnek.	Zentralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten	Germany
Zentr. inn. Med.	Zentralblatt für innere Medizin	Germany