the percentage of Sudan IV in the test specimen taken by the formula:

$$(100A)/(85C)$$

in which A is the absorbance at 520 nm and C is the concentration of the test specimen in g per L. Not less than 90% is found.

Loss on drying ⟨731⟩—Dry it at 105° for 2 hours: it loses not more than 10% of its weight.

Sulfamerazine *(4-Amino-N-(4-methyl-2-pyrimidinyl)-benzenesulfonamide),* $C_{11}H_{12}N_4O_2S$—**264.30** [127-79-7]—Use a suitable grade with a content of NLT 99.0%.

Sulfamic Acid, HSO_3NH_2—**97.09** [5329-14-6]—Use ACS reagent grade.

Sulfanilamide, $C_6H_8N_2O_2S$—**172.21** [63-74-1]—Use USP Sulfanilamide Melting Point RS.

Sulfanilic Acid, p-$NH_2C_6H_4SO_3H \cdot H_2O$—**191.21** [121-57-3]—Use ACS reagent grade.

Sulfatase Enzyme Preparation—Use a suitable grade.

[NOTE—A suitable grade is available commercially under catalog number S-9626 from Sigma-Aldrich, Web site: www.sigma-aldrich.com.]

Sulfathiazole Sodium *(4-Amino-N-2-thiazolylbenzenesulfonamide Sodium Salt),* $C_9H_8N_3NaO_2S_2$—**277.29** [144-74-1]—Use a suitable grade.

Sulfonic Acid Cation-exchange Resin—See *Cation-exchange Resin, Sulfonic Acid*.

Sulfosalicylic Acid, $C_6H_3(COOH)(OH)(SO_3H)$-1,2,5 · $2H_2O$—**254.22** [97-05-2]—Use ACS reagent grade.

Sulfur—Use *Precipitated Sulfur* (USP monograph).

Sulfur Dioxide Detector Tube—A fuse-sealed glass tube so designed that gas may be passed through it and containing suitable absorbing filters and support media for an iodine-starch indicator.

Measuring range: 1 to 25 ppm.

[NOTE—Available from Draeger Safety, Inc., www.draeger.com, or from Gastec Corp., www.gastec.co.jp, distributed in the USA by www.nextteq.com.]

Sulfuric Acid, H_2SO_4—**98.08** [7664-93-9]—Use ACS reagent grade.

Sulfuric Acid, Diluted (10 percent)—Cautiously add 57 mL of sulfuric acid to about 100 mL of water, cool to room temperature, and dilute with water to 1000 mL.

Sulfuric Acid, Fluorometric—Use ACS reagent grade Sulfuric Acid that conforms to the following additional test:

Fluorescence—Using a suitable fluorometer having a sharp cut-off 360-nm excitation filter and a sharp cut-off 415-nm excitation filter, determine the fluorescence of the sulfuric acid in a cuvette previously rinsed with water followed by several portions of the acid under examination: the fluorescence does not exceed that of quinine sulfate solution (1 in 1,600,000,000), similarly measured.

Sulfuric Acid, Fuming, H_2SO_4 plus free SO_3 [8014-95-7]—having a nominal content of 15%, 20%, or 30% of free SO_3—Use ACS reagent grade (containing between 15.0% and 18.0%, between 20.0% and 23.0%, or between 30.0% and 33.0% of free SO_3).

Sulfuric Acid, Nitrogen Free, H_2SO_4—**98.08** [7664-93-9]—Use a suitable grade.

[NOTE—A suitable grade is available as Sulfuric Acid, Ultrex II, catalog number 6902-05 from www.mallbaker.com.]

Sulfurous Acid, H_2SO_3—**82.08** [7782-99-2]—A water solution of sulfur dioxide. Use ACS reagent grade.

Sunflower Oil [8001-21-6]—Use a suitable grade.

Supports for Gas Chromatography—See supports for gas chromatography in the *Chromatographic Reagents* section under *Chromatography* ⟨621⟩.

Tannic Acid *(Tannin)* [1401-55-4]—Use ACS reagent grade.

Tartaric Acid, $H_2C_4H_4O_6$—**150.09**—Use ACS reagent grade.

Tertiary Butyl Alcohol—See *Butyl Alcohol, Tertiary*.

Testosterone Benzoate, $C_{26}H_{32}O_2$—**376.53**—Use a suitable grade.

2′,4′,5′,7′-Tetrabromofluorescein *(Eosin Y, Eosin Yellowish, Eosin Bromo ES, Solvent Red 43, Acid Red 87),* $C_{20}H_8Br_4O_5$—**167.8** [630-20-6]—Dark red to brown powder. Solubility 0.1% in water (clear orange solution). Use a suitable grade.

Tetrabromophenolphthalein Ethyl Ester, $C_{22}H_{14}Br_4O_4$—**661.96**—Use ACS reagent grade.

Tetrabutylammonium Bromide, $(C_4H_9)_4NBr$—**322.37** [1643-19-2]—Use ACS reagent grade.

Tetrabutylammonium Hydrogen Sulfate, $C_{16}H_{37}NO_4S$—**339.54** [32503-27-8]—White, crystalline powder. Soluble in alcohol yielding a slightly hazy, colorless solution.

Assay—Dissolve about 170 mg, accurately weighed, in 40 mL of water. Titrate with 0.1 N sodium hydroxide VS, determining the endpoint potentiometrically. Perform a blank determination and make any necessary correction. Each mL of 0.1 N sodium hydroxide is equivalent to 33.95 mg of $C_{16}H_{37}NO_4S$. Not less than 97.0% is found.

Melting range ⟨741⟩: between 169° and 173°.

Tetrabutylammonium Hydrogen Sulfate Ion Pairing Reagent *(Tetrabutylammonium bisulfate),* $C_{16}H_{37}NSO_4$—**339.53** [32503-27-8]—Use a suitable grade.

[NOTE—A suitable grade is available as catalog number WAT084189 from the Waters Corporation (www.waters.com).]

0.4 M Aqueous Tetrabutylammonium Hydroxide, $C_{16}H_{37}NO$—**259.47** [2052-49-5]—Use a suitable grade.

[NOTE—A suitable grade is availabe as catalog number 420120025 from www.fishersci.com.]

Tetrabutylammonium Hydroxide, 1.0 M in Methanol [2052-49-5]—Use a suitable grade.

Tetrabutylammonium Hydroxide 30-Hydrate, $C_{16}H_{37}NO \cdot 30H_2O$—**799.93** [2052-49-5]—Use a suitable grade with a content of not less than 98.0%.

Tetrabutylammonium Iodide, $(C_4H_9)_4NI$—**369.37** [311-28-4]—White, shiny, crystalline flakes. Soluble in alcohol and in ether; slightly soluble in water.

Assay—Dissolve 370 mg, accurately weighed, in 60 mL of acetone with vigorous stirring. Stir the solution by mechanical means, add 10 mL of 16% sulfuric acid, and titrate with 0.1 N silver nitrate VS, determining the endpoint potentiometrically, using a glass–silver electrode system, and adding the titrant in 0.1-mL increments as the endpoint is approached. Perform a blank determination, and make any necessary corrections. Each mL of 0.1 N silver nitrate is equivalent to 36.94 mg of $(C_4H_9)_4NI$: not less than 99.0% is found.

Tetrabutylammonium Phosphate, $(C_4H_9)_4NH_2PO_4$—**339.46** [5574-97-0]—White to off-white powder. Soluble in water.

Assay—Dissolve about 1.5 g, accurately weighed, in 100 mL of water. Without delay, titrate with 0.5 N sodium hydroxide VS, determining the endpoint potentiometrically. Perform a blank determination, and make any necessary correction. Each mL of 0.5 N sodium hydroxide is equivalent to 169.7 mg of $(C_4H_9)_4NH_2PO_4$. Not less than 97.0% is found.

2,3,7,8-Tetrachlorodibenzo-*p*-dioxin, ^{13}C-labeled, $^{13}C_{12}H_4\ Cl_4O_2$—**333.84**—Clear, colorless liquid.

Assay—Inject an appropriate volume into a gas chromatograph (see *Chromatography* ⟨621⟩) equipped with an electron-capture detector, helium being used as the carrier gas. The following conditions have been found suitable: a 0.25-mm × 30-m capillary column coated with a 1-µm layer of phase G2; the injection port temperature is maintained at 300°; the detector temperature is maintained at 300°; and the column temperature is maintained at 70° and programmed to rise 15° per minute to 300°. The area of the $^{13}C_{12}H_4Cl_4O_2$ peak is not less than 99.0% of the total peak area.

[NOTE—A suitable grade is available from Cambridge Isotopes Laboratories (www.isotope.com).]

2,3,7,8-Tetrachlorodibenzofuran, ^{13}C-labeled, $^{13}C_{12}H_4Cl_4O$—**317.84**—Clear, colorless liquid.

Assay—Inject an appropriate volume into a gas chromatograph (see *Chromatography* ⟨621⟩) equipped with an electron-capture detector, helium being used as the carrier gas. The following conditions have been found suitable: a 0.32-mm × 60-m capillary column coated with a 1-µm layer of phase G27; the injection port temperature is maintained at 300°; the detector temperature is maintained at 350°; and the column temperature is maintained at 70° and programmed to rise 15° per minute to 275°. The area of the $^{13}C_{12}H_4Cl_4O$ peak is not less than 99.0% of the total peak area.

[NOTE—A suitable grade is available from Cambridge Isotopes Laboratories (www.isotope.com).]

1,1,2,2-Tetrachloroethane, $C_2H_2Cl_4$—**167.8** [630-20-6]—Colorless clear liquid. Specific gravity: 1.553. Refractive index at 20° is 1.481. Use a suitable grade.

Tetracosane, $C_{24}H_{50}$—**338.66** [646-31-1]—White powder.

Melting range ⟨741⟩: between 51° and 53°.

Tetradecane, $C_{14}H_{30}$—**198.39** [629-59-4]—Clear, colorless liquid.

Assay—When examined by gas-liquid chromatography, it shows a purity of not less than 98%. The following conditions have been found suitable for assaying the reagent: a 3-mm × 2.4-m stainless steel column packed with phase G16 on support S1; the carrier gas is helium, flowing at a rate of 27.5 mL per minute; the column temperature is maintained at 250°, the injection port is maintained at 200°, and the detector is maintained at 280°. A flame-ionization detector is employed.

Melting range, Class II ⟨741⟩: between 4° and 8°, within a 2° range.

Refractive index ⟨831⟩: between 1.4280 and 1.4300 at 20°.

Tetraethylammonium Perchlorate, $(C_2H_5)_4NClO_4$—**229.70**—White crystals. Soluble in water. Use a suitable grade.

Tetraethylene Glycol, $C_8H_{18}O_5$—**194.23** [112-60-7]—Nearly colorless liquid. Refractive index: about 1.46.

Assay—When examined by gas–liquid chromatography, using suitable gas chromatographic apparatus and conditions, it shows a purity of not less than 90%.

Boiling range (Reagent test): between 177° and 187°, at a pressure of 9 mm of Hg.

Tetraethylenepentamine, $C_8H_{23}N_5$—**189.31** [112-57-2]—Colorless liquid.

Assay—Inject an appropriate volume into a gas chromatograph (see *Chromatography* ⟨621⟩) equipped with a flame-ionization detector, helium being used as the carrier gas. The following conditions have been found suitable: a 0.25-mm × 30-m capillary column coated with a 1-µm layer of phase G2; the injection port temperature is maintained at 250°; the detector temperature is maintained at 300°; and the column temperature is maintained at 150° and programmed to rise 10° per minute to 280°. The area of the $C_8H_{23}N_5$ peak is not less than 30% of the total peak area.

Refractive index ⟨831⟩: between 1.503 and 1.507 at 20°.

Tetraheptylammonium Bromide, $(C_7H_{15})_4NBr$—**490.70** [4368-51-8]—White, flaky powder.

Melting range ⟨741⟩: between 89° and 91°.

Tetrahexylammonium Hydrogen Sulfate, $C_{24}H_{53}NO_4S$—**451.75** [32503-34-7]—Use a suitable grade with a content of not less than 98.0%.

Delta-8-tetrahydrocannabinol *(Δ-8-Tetrahydrocannabinol),* $C_{21}H_{30}O_2$—**314.47** [5957-75-5]—Use a suitable grade which may be a solid material or a solution in methanol. [NOTE—A suitable grade of a methanolic solution (1 mg/mL) is available from www.cerilliant.com, catalog number T-032.]

Tetrahydrofuran, C_4H_8O—**72.11** [109-99-9]—Use ACS reagent grade.

Tetrahydrofuran, Peroxide-Free, C_4H_8O—**72.11**—Use ACS reagent grade.

Peroxide—Transfer 8 mL of potassium iodide and starch TS to a 12-mL ground glass-stoppered cylinder about 15 mm in diameter. Fill completely with the substance under test, mix, and allow to stand protected from light for 5 minutes. No color develops.

Tetrahydrofuran, Stabilizer-Free—Use a suitable grade.

Tetrahydro-2-furancarboxylic Acid *(±Tetrahydro-2-furoic Acid),* $C_5H_8O_3$—**116.12** [16874-33-2]—Use a suitable grade with a content of not less than 97%. [NOTE—A suitable grade is available from www.sigma-aldrich.com, catalog number 341517.]

***N*-(2-Tetrahydrofuroyl)piperazine** *(1-[(Tetrahydro-2-furanyl)carbonyl]piperazine),* $C_9H_{16}N_2O_2$—**184.23**—Use a suitable grade.

[NOTE—A suitable grade can be obtained from EMS-DOTTIKON, www.ems-dottikon.ch.]

1,2,3,4-Tetrahydronaphthalene, $C_{10}H_{12}$—**132.21** [119-64-2]—Colorless liquid.

Refractive index ⟨831⟩: 1.5401 at 20°.

Tetramethylammonium Bromide, $(CH_3)_4NBr$—**154.05** [64-20-0]—Use ACS reagent grade.

Tetramethylammonium Chloride, $(CH_3)_4NCl$—**109.60** [75-57-0]—Colorless crystals. Soluble in water and in alcohol; insoluble in chloroform.

Assay—Transfer about 200 mg, accurately weighed, to a beaker, add 50 mL of water and 10 mL of diluted nitric acid, swirl to dissolve the test specimen, add 50.0 mL of 0.1 N silver nitrate VS, and mix. Add 2 mL of ferric ammonium sulfate TS and 5 mL of nitrobenzene, shake, and titrate the excess silver nitrate with 0.1 N ammonium thiocyanate VS: each mL of 0.1 N silver nitrate is equivalent to 10.96 mg of $(CH_3)_4NCl$. Not less than 98% is found.

Tetramethylammonium Hydroxide, $(CH_3)_4NOH$—**91.15** [75-59-2]—Available as an approximately 10% or approximately 25% aqueous solution, or as the crystalline pentahydrate. Is clear and colorless. Tetramethylammonium hydroxide is a stronger base than ammonia and rapidly absorbs carbon dioxide from the air. Store in tight containers.

Assay—Accurately weigh a glass-stoppered flask containing about 15 mL of water. Add a quantity of a solution of tetramethylammonium hydroxide, equivalent to about 200 mg of $(CH_3)_4NOH$, and again weigh. Add methyl red TS, and titrate the solution with 0.1 N hydrochloric acid VS: each mL of 0.1 N hydrochloric acid is equivalent to 9.115 mg of $(CH_3)_4NOH$.

Residue on evaporation—Evaporate 5 mL of solution on a steam bath, and dry at 105° for 1 hour: the weight of the residue is equivalent to not more than 0.02% of the weight of the test specimen.

Ammonia and other amines—Accurately weigh a quantity of solution, corresponding to about 300 mg of $(CH_3)_4NOH$, in a low-form weighing bottle tared with 5 mL of water. Add a slight excess of 1 N hydrochloric acid (about 4 mL), evaporate on a steam bath to dryness, and dry at 105° for 2 hours: the weight of the tetramethylammonium chloride so obtained, multiplied by 0.8317, represents the quantity, in mg, of $(CH_3)_4NOH$ in the portion of test specimen taken and corresponds to within 0.2% above or below that found in the *Assay*.

Tetramethylammonium Hydroxide, Pentahydrate, $(CH_3)_4NOH \cdot 5H_2O$—**181.23** [10424-65-4]—White to off-white crystals. Is hygroscopic. Strong base. Keep well-closed. Soluble in water and in methanol.

Assay—Accurately weigh about 800 mg, dissolve in 100 mL of water, and titrate with 0.1 N hydrochloric acid VS, determining the endpoint potentiometrically. Perform a blank determination, and make any necessary correction. Each mL of 0.1 N hydrochloric acid is equivalent to 18.22 mg of $(CH_3)_4NOH \cdot 5H_2O$: not less than 98% is found.

Tetramethylammonium Hydroxide Solution in Methanol [75-59-2]—A solution in methanol of tetramethylammonium hydroxide [$(CH_3)_4NOH$—91.15]. Is generally available in concentrations of 10% and 25%. The following specifications apply specifically to the 25% concentration; for other concentrations, appropriate adjustments in the procedures may be necessary.

Assay—Accurately weigh about 1 g of the solution, and dilute with water to about 50 mL. Add phenolphthalein TS, and titrate with 0.1 N hydrochloric acid VS to the disappearance of the pink color: each mL of 0.1 N hydrochloric acid VS is equivalent to 91.15 mg of $(CH_3)_4NOH$. Between 23% and 25% is found.

Clarity—A portion of it in a test tube is clear, or only slightly turbid, when viewed transversely.

Tetramethylammonium Nitrate, $(CH_3)_4NNO_3$—**136.15** [1941-24-8]—White crystals. Freely soluble in water.

Tetramethylbenzidine, *(4-(4-Amino-3,5-dimethylphenyl)-2,6-dimethylaniline; 3,3′,5,5′ Tetramethylbenzidine; 3,3′5,5′-Tetramethyl-[1,1′-biphenyl] 4,4′-diamine)* $C_{16}H_{20}N_2$—**240.34** [54827-17-7]—Use a suitable grade.

4,4′-Tetramethyldiaminodiphenylmethane *[(4,4′-Methylenebis(N,N-dimethylaniline)],* $[(CH_3)_2NC_6H_4]_2CH_2$—**254.38** [101-61-1]—Off-white crystals.

Melting range ⟨741⟩: between 87° and 90°.

Tetramethylsilane, $(CH_3)_4Si$—**88.23** [75-76-3]—Use ACS reagent grade.

Tetrapropylammonium Chloride, $C_{12}H_{28}ClN$—**221.82** [5810-42-4]—Use a suitable grade with a content of not less than 98.0%.

Tetrasodium Ethylenediaminetetraacetate *((Ethylenedinitrilo)tetraacetic Acid Tetrasodium Salt),* $C_{10}H_{12}N_2Na_4O_8$—**380.17**—Fine, white, crystalline powder. Soluble in water.

Loss on drying ⟨731⟩—Dry it at 105° for 4 hours: it loses not more than 8% of its weight.

Thallous Chloride, TlCl—**239.84**—Fine, white, crystalline powder. Soluble in about 260 parts of cold water and in about 70 parts of boiling water; insoluble in alcohol. *Poisonous; use with adequate ventilation.*

Assay—Dissolve about 500 mg, accurately weighed, in a mixture of 80 mL of water and 0.5 mL of sulfuric acid. When dissolution is complete, add 20 mL of hydrochloric acid. Heat to 60° and maintain this temperature while titrating with 0.1 N ceric sulfate VS, determining the endpoint potentiometrically, using silver-silver chloride and platinum electrodes. Each mL of 0.1 N ceric sulfate is equivalent to 11.99 mg of TlCl. Not less than 99% is found.

Theobromine, $C_7H_8N_4O_2$—**180.17** [83-67-0]—White, crystalline solid. Very slightly soluble in water and in alcohol; almost insoluble in benzene, in ether, and in chloroform.

Assay—Dissolve about 34 mg, accurately weighed, in 50 mL of glacial acetic acid. Titrate with 0.1 N perchloric acid VS, determining the endpoint potentiometrically. Perform a blank determination, and make any necessary correction. Each mL of 0.1 N perchloric acid is equivalent to 18.02 mg of $C_7H_8N_4O_2$. Not less than 95% is found.

Thiazole Yellow *(CI Direct Yellow 9; Clayton Yellow; Titan Yellow),* $C_{28}H_{19}N_5Na_2O_6S_4$—**695.74** [1829-00-1]—Yellowish-brown powder. Soluble in water and in alcohol to yield in each instance a yellow solution; soluble in dilute alkali to yield a brownish-red solution. Protect from light.

Solubility—A 200-mg portion mixed with 50 mL of water shows not more than a faint haze.

Residue on ignition—Accurately weigh about 1.5 g, previously dried at 105° for 2 hours, and ignite until thoroughly charred. Cool, add 2 mL of nitric acid and 2 mL of sulfuric acid, ignite gently to expel excess acids, then at 600° to 800° to constant weight: the residue of sodium sulfate (Na_2SO_4) is between 19.8% and 21.5% of the weight of the test specimen (theory is 20.4%).

Sensitiveness to magnesium—Add 0.2 mL of a solution (1 in 10,000) and 2 mL of 1 N sodium hydroxide to a mixture of 9.5 mL of water and 0.5 mL of a solution prepared by dissolving 1.014 g of clear crystals of magnesium sulfate in water, diluting with water to 100 mL, then diluting 10 mL of the resulting solution with water to 1 L: a distinct pink color is produced within 10 minutes.

Thioacetamide, C_2H_5NS—**75.13** [62-55-5]— Use ACS reagent grade.

2-Thiobarbituric Acid, $C_4H_4N_2O_2S$—**144.15** [504-17-6]—White leaflets. Slightly soluble in water.

Melting temperature ⟨741⟩: 236°, with decomposition.

2,2′-Thiodiethanol, $(HOCH_2CH_2)_2S$—**122.19** [111-48-8]—Pale yellow to colorless liquid.

Assay—Not less than 98% of $C_4H_{10}O_2S$ is found, a suitable gas chromatograph equipped with a flame-ionization detector being used. The following conditions have been found suitable: a 4.0-mm × 1.83-m glass column is packed with 10% phase G25 on support S1A; the column, injection port, and detector temperatures are maintained at 200°, 250°, and 310°, respectively.

Refractive index ⟨831⟩: between 1.4250 and 1.4270, at 20°.

Thioglycolic Acid, $HSCH_2COOH$—**92.12** [68-11-1]—A colorless or nearly colorless liquid. Miscible with water. Soluble in alcohol.

Sensitiveness—Mix 1 mL with 2 mL of stronger ammonia water, and dilute with water to 20 mL. Add 1 mL of this solution to a mixture of 20 mL of water and 0.1 mL of dilute ferric chloride TS (1 in 100), then add 5 mL of ammonia TS: a distinct pink color is produced.

Thionine Acetate, $C_{12}H_9N_3S \cdot C_2H_4O_2$—**287.34** [78338-22-4]—Use a suitable grade.

Thiourea, $(NH_2)_2CS$—**76.12** [62-56-6]—Use ACS reagent grade.

Thorium Nitrate, $Th(NO_3)_4 \cdot 4H_2O$—**552.12** [13823-29-5]—Use ACS reagent grade.

Thrombin Human *(Factor II_a)*— **~33,600** [9002-04-4]—A preparation of a serine protease (enzyme) that converts human fibrinogen into fibrin. It is obtained from human plasma and may be prepared by precipitation with suitable salts and organic solvents under controlled conditions of pH, ionic strength, and temperature. A yellowish-white powder, freely soluble in a 9 g per L solution of sodium chloride, which forms a cloudy, pale yellow solution. Store in a sealed, sterile container under nitrogen, protected from light, at a temperature below 0°. One unit corresponds to the amount of enzyme that hydrolyzes 1 µmol of Tos-Gly-Pro-Arg-4-nitroaniline acetate per minute at a pH of 8.4 and a temperature of 37°.

Thromboplastin [9035-58-9]—Buff-colored powder, or opalescent or turbid suspension. It exhibits thrombokinase activity derived from the acetone-extracted brain and/or lung tissue of freshly killed rabbits. It may contain sodium chloride and calcium chloride in suitable proportions, and it may contain a suitable antimicrobial agent. It is used in suspension form for the determination of the prothrombin time and activity of blood. Its thrombokinase activity is such that it gives a clotting time of 11 to 16 seconds with normal human plasma and the proper concentration of calcium ions. Store in tight containers, preferably at a temperature below 5°.

Loss on drying ⟨731⟩—[NOTE—This test is applicable only to the dry form.] Dry it in vacuum at 60° for 6 hours: it loses not more than 5.0% of its weight.

Thymidine, $C_{10}H_{14}N_2O_5$—**242.2** [50-89-5]—White powder. Use a suitable grade.

Thymol, $C_6H_3[CH_3][OH][CH(CH_3)_2]1,3,4$—**150.22** [89-83-8]—Colorless, often large, crystals, or a white, crystalline powder. Is affected by light. Has greater density than water, but when liquefied by fusion is less dense than water. Its alcohol solutions are neutral to litmus. One g dissolves in about 1000 mL of water, in 1 mL of alcohol, in 1 mL of chloroform, in 1.5 mL of ether, and in about 2 mL of olive oil. Soluble in glacial acetic acid and in fixed or volatile oils. Store in tight, light-resistant containers.

Melting range ⟨741⟩: between 48° and 51°, but when melted it remains liquid at a considerably lower temperature.

Nonvolatile matter—Volatilize 2 g on a steam bath, and dry at 105° to constant weight: the residue weighs not more than 1 mg (0.05%).

Thyroglobulin, [9010-34-8]—A protein having a molecular weight of 670 kDa. Available as a slightly beige, freeze-dried powder made from bovine or porcine thyroid gland. Use a suitable grade.

Tin, Sn—At. Wt. **118.71** [7440-31-5]—Use ACS reagent grade.

Titanium Tetrachloride, $TiCl_4$—**189.68** [7550-45-0]—Clear, colorless liquid. Fumes in air. [**CAUTION—***It reacts violently with water.*]

Assay—Accurately weigh 0.75 g into 100 mL of 2 N sulfuric acid contained in a Smith weighing buret. Pour the solution through a zinc–mercury reduction column into 50 mL of 0.1 N ferric ammonium sulfate VS. Elute with 100 mL of 2 N sulfuric acid and 100 mL of water. Add 10 mL of phosphoric acid, and titrate with 0.1 N potassium permanganate VS. Perform a blank determination, and make any necessary correction. Each mL of 0.1 N potassium permanganate is equivalent to 18.97 mg of $TiCl_4$. Not less than 99.5% is found.

Boiling range (Reagent test): between 135° and 140°.

Titanium Trichloride *(Titanous Chloride),* $TiCl_3$—**154.23** [7705-07-9]—Black, hygroscopic powder, unstable in air. Soluble in water, the solution depositing titanic acid on exposure to air. Is available usually as 15% to 20%, dark violet-blue, aqueous solutions. Store the solution in tightly closed, glass-stoppered bottles, protected from light.

o*-Tolidine** *(4,4′-Diamino-3,3′-dimethylbiphenyl),* $(NH_2)(CH_3)C_6H_3 \cdot C_6H_3(CH_3)(NH_2)4,3,3',4'$—**212.29** [119-93-7]—White to reddish crystals or crystalline powder. Slightly soluble in water; soluble in alcohol, in ether, and in dilute acids. Preserve in well-closed containers, protected from light. [**CAUTION—Avoid contact with o-tolidine and mixtures containing o-tolidine, and conduct all tests in a well-ventilated fume hood.*]

Melting range ⟨741⟩: between 129° and 131°.

Tolualdehyde *(o-Tolualdehyde),* C_8H_8O—**120.15** [529-20-4]—Use a suitable grade.

***p*-Tolualdehyde**, C_8H_8O—**120.15** [104-87-0]—Colorless to yellow, clear liquid.

Assay—When examined by gas-liquid chromatography, it shows a purity of not less than 98%. The following conditions have been found suitable for assaying the article: A 3-mm × 1.8-m stainless steel column packed with a 5% phase G4 on support S1. Nitrogen, having a flow rate of about 12 mL per minute, is the carrier gas, the detector and column temperature are about 125°, and the injection port temperature is about 205°. A flame-ionization detector is employed and the specimen is a 5% solution in carbon disulfide.

Refractive index ⟨831⟩: between 1.544 and 1.546, at 20°.

Toluene *(Toluol),* $C_6H_5CH_3$—**92.14** [108-88-3]—Use ACS reagent grade.

***p*-Toluenesulfonic Acid**, $CH_3C_6H_4SO_3H \cdot H_2O$—**190.22** [6192-52-5]—Use ACS reagent grade.

***p*-Toluenesulfonyl-L-arginine Methyl Ester Hydrochloride** *(N_α-p-Tosyl-L-arginine methyl ester hydrochloride; TAME),* $C_{14}H_{22}N_4O_4S \cdot HCl$—**378.88** [1784-03-8]—Determine its suitability as directed in the test for *Trypsin* under *Chymotrypsin* (USP monograph).

***p*-Toluic Acid**, $CH_3C_6H_4COOH$—**136.15** [99-94-5]—White, crystalline powder. Sparingly soluble in hot water; very soluble in alcohol, in methanol, and in ether.

Assay—Transfer about 650 mg, accurately weighed, to a suitable container, dissolve in 125 mL of alcohol, add 25 mL of water, and mix. Titrate with 0.5 N sodium hydroxide VS, determining the endpoint potentiometrically. Perform a blank determination, and make any necessary correction. Each mL of 0.5 N sodium hydroxide is equivalent to 68.07 mg of $C_8H_8O_2$: not less than 98% is found.

Melting range ⟨741⟩: over a range of 2° that includes 181°.

***o*-Toluidine** *(2-Aminotoluene; 2-Methylaniline),* $C_6H_4(CH_3)(NH_2)1,2$—**107.15** [95-53-4]—Light yellow liquid becoming reddish brown on exposure to air and light. Soluble in alcohol, in ether, and in dilute acids; slightly soluble in water. Preserve in well-closed containers, protected from light.

Specific gravity ⟨841⟩: 1.008 at 20°.

Boiling range (Reagent test): between 200° and 202°.

***p*-Toluidine**, C_7H_9N—**107.15** [106-49-0]—White to beige crystals or flakes.

Freely soluble in alcohol, in acetone, in methanol, and in dilute acids; slightly soluble in water.

Assay—Dissolve 400 mg, accurately weighed, in 100 mL of glacial acetic acid, and titrate with 0.1 N perchloric acid VS, determining the endpoint potentiometrically. Perform a blank determination, and make any necessary correction. Each mL of 0.1 N perchloric acid is equivalent to 10.72 mg of $CH_3C_6H_4NH_2$. Not less than 98%, calculated on the dried basis, is found.

Loss on drying—Weigh accurately about 1 g, and dry at 30° to constant weight: it loses not more than 2% of its weight.

Toluidine Blue, $(C_{15}H_{16}ClN_3S)_2 \cdot ZnCl_2$—**747.95** [6586-04-5]—Use a suitable grade.

Toluidine Blue O, $C_{15}H_{16}N_3SCl$—**305.8** [92-31-9]—Use a suitable grade.

***n*-Triacontane**, $C_{30}H_{62}$—**422.81** [638-68-6]—Use a suitable grade.

2,4,6-Triamino-5-nitrosopyrimidine, $C_4H_6N_6O$—**154.13**—Pink powder.

Assay—Dissolve about 34 mg, accurately weighed, in 50 mL of glacial acetic acid. Titrate with 0.1 N perchloric acid VS, determining the endpoint potentiometrically. Perform a blank determination, and make any necessary corrections. Each mL of 0.1 N perchloric acid is equivalent to 15.41 mg of $C_4H_6N_6O$. Not less than 97% is found.

Tributyl Phosphate *(Tri-n-butyl Phosphate),* $(C_4H_9)_3PO_4$—**266.31** [126-73-8]—Clear, almost colorless liquid. Slightly soluble in water. Miscible with common organic solvents. Specific gravity: about 0.976.

Refractive index ⟨831⟩: between 1.4205 and 1.4225.

Tributylethylammonium Hydroxide, $C_{14}H_{33}NO$—**231.42**—Use a suitable grade.

Tributyrin *(Glyceryl Tributyrate),* $C_{15}H_{26}O_6$—**302.36** [60-01-5]—Colorless, oily liquid. Insoluble in water; very soluble in alcohol and in ether.

Assay—Inject an appropriate specimen into a suitable gas chromatograph (see *Chromatography* ⟨621⟩) equipped with a flame-ionization detector, nitrogen being used as the carrier gas. The following conditions have been found suitable: a 3-mm × 1.8-m stainless steel column containing phase G4 on support S1A; the injection port temperature is maintained at 270°; and the detector temperature is maintained at 300°. The area of the tributyrin peak is not less than 98% of the total peak area.

Refractive index ⟨831⟩: between 1.4345 and 1.4365 at 20°.

Acid content—Transfer 1.0 g, accurately weighed, to a beaker, add 75 mL of methanol, and dissolve by stirring. When dissolution is complete, add 25 mL of water, and titrate with 0.05 N potassium hydroxide VS, using phenolphthalein TS as the indicator. Perform a blank determination, and make any necessary correction. Each mL of 0.05 N potassium hydroxide is equivalent to 88.1 mg of butyric acid: not more than 0.5% is found.

Trichloroacetic Acid, CCl_3COOH—**163.39** [76-03-9]—Use ACS reagent grade.

Trichloroethane—See *Methyl Chloroform*.

Trichlorofluoromethane, CCl_3F—**137.37** [75-69-4]—Colorless liquid.

Assay—Inject an appropriate specimen into a gas chromatograph (see *Chromatography* ⟨621⟩) equipped with a thermal conductivity detector, helium being used as the carrier gas. The following conditions have been found suitable: a 2.0-mm × 1.8-m glass column packed with 10% G1 phase on support S1A; the injection port temperature is maintained at 50°; the detector temperature is maintained at 300°; and the column temperature is maintained at 0° and programmed to rise 3° per minute to 50°. The area of the CCl_3F peak is not less than 99% of the total peak area.

Refractive index ⟨831⟩: between 1.380 and 1.384 at 20°.

Trichlorotrifluoroethane—Use a suitable grade.

[NOTE—A suitable preparation, listed as "Freon-TF aerosol," is available from E. I. du Pont de Nemours and Co., Wilmington, DE 19898.]

***n*-Tricosane,** $C_{23}H_{48}$—**324.63** [638-67-5]—Colorless or white, more or less translucent mass, showing a crystalline structure. Has a slightly greasy feel. Insoluble in water and in alcohol; soluble in chloroform, in ether, in volatile oils, and in most warm fixed oils; slightly soluble in dehydrated alcohol. Boils at about 380°.

Melting range ⟨741⟩: between 47° and 49°.

Suitability—Determine its suitability for use in the test for *Related compounds* under *Propoxyphene Hydrochloride* (*USP* monograph) as follows. Dissolve a suitable quantity in chloroform to yield a solution containing 20 µg per mL. Following the directions given in the test for *Related compounds* under *Propoxyphene Hydrochloride,* inject a suitable volume of the solution into the chromatograph, and record the chromatogram. Concomitantly record the chromatogram from the *Standard preparation* prepared as directed in the test for *Related compounds:* only one main peak is obtained from the *n*-tricosane solution, and no minor peaks are observed at, or near, the peak positions obtained for propoxyphene, acetoxy, or carbinol in the chromatogram from the *Standard preparation*.

Triethanolamine—Use *Trolamine* (NF monograph).

Triethylamine, $(C_2H_5)_3N$—**101.19** [121-44-8]—Colorless liquid. Slightly soluble in water. Miscible with alcohol, with ether, and with cold water. Store in well-closed containers. Use a suitable grade with a content of not less than 99.5%.

Triethylamine Hydrochloride, $C_6H_{15}N \cdot HCl$—**137.65** [554-68-7]—White to off-white powder.

Assay—Transfer about 35 mg, accurately weighed, to a suitable beaker, add 50 mL of glacial acetic acid, and dissolve by stirring. Add 5 mL of mercuric acetate TS, with stirring. When solution is complete, titrate with 0.1 N perchloric acid VS, determining the endpoint potentiometrically. Perform a blank titration, and make any necessary correction. Each mL of 0.1 N perchloric acid is equivalent to 13.77 mg of $C_6H_{15}N \cdot HCl$. Not less than 97.5% of $C_6H_{15}N \cdot HCl$ is found.

Melting point ⟨741⟩: between 256° and 259°, with decomposition.

Triethylamine Phosphate *(Triethylammonium Phosphate),* $C_6H_{15}N \cdot H_3O_4P$—**199.19**—Use a suitable grade.

[NOTE—A suitable grade is available from www. tciamerica.com, catalog number T1300.]

Triethylene Glycol, $C_6H_{14}O_4$—**150.17** [112-27-6]—Colorless to pale yellow liquid. Is hygroscopic. Miscible with water, with alcohol, and with toluene.

Assay—Inject an appropriate test specimen into a suitable gas chromatograph equipped with a flame-ionization detector (see *Chromatography* ⟨621⟩), helium being used as the carrier gas. The following conditions have been found suitable: a 3-mm × 1.85-m stainless steel column packed with support S2; the injection port, column, and detector temperatures are maintained at 250°, 230°, and 310°, respectively. The area of the $C_6H_{14}O_4$ peak is not less than 97% of the total peak area.

Refractive index ⟨831⟩: between 1.4550 and 1.4570, at 20°.

Triethylenediamine *(1,4-Diazobicyclo[2.2.2]octane),* $C_6H_{12}N_2$—**112.17** [280-57-9]—Use a suitable grade with a content of not less than 98%.

Trifluoroacetic Acid, $C_2HF_3O_2$—**114.02** [76-05-1]—Colorless liquid. Miscible with ether, with acetone, with ethanol, with benzene, with carbon tetrachloride, and with hexane.

Assay—Dissolve about 300 mg, accurately weighed, in 25 mL of water and 25 mL of alcohol. Titrate with 0.1 N sodium hydroxide VS, determining the endpoint potentiometrically. Perform a blank determination, and make any necessary corrections. Each mL of 0.1 N sodium hydroxide is equivalent to 11.40 mg of $C_2HF_3O_2$. Not less than 99% is found.

Trifluoroacetic Anhydride, $(F_3CCO)_2O$—**210.03** [407-25-0]—Colorless liquid. Boils between 40° and 42°. Extremely volatile. Avoid exposure to air or water.

Assay—Transfer about 0.8 g, accurately weighed, to a glass-stoppered flask containing 50 mL of methanol. Add 500 mg of phenolphthalein, and titrate with 0.1 N sodium methoxide VS to a pink endpoint. Calculate A by the formula:

$$V/W$$

in which V is the volume, in mL, of 0.1 N sodium methoxide and W is the weight, in mg, of test specimen. To a second glass-stoppered flask containing 50 mL of a mixture of dimethylformamide and water (1:1) transfer 0.4 g, accurately weighed, of the specimen under test, add 500 mg of phenolphthalein, and titrate with 0.1 N sodium hydroxide VS to a pink endpoint. Calculate B by the formula:

$$V^1/W^1$$

in which V^1 is the volume, in mL, of 0.1 N sodium hydroxide and W^1 is the weight, in mg, of test specimen. Calculate the percentage of $(F_3CCO)_2O$ by the formula:

$$2100.3(B - A)$$

Not less than 97% is found. If 2A is greater than B, calculate the percentage of F_3CCOOH by the formula:

$$1140.3(2A - B)$$

α,α,α-Trifluoro-*p*-cresol (*4-hydroxybenzotrifluoride, 4-trifluoromethylphenol*), $C_7H_5F_3O$—**162.11** [402-45-9]

Melting range ⟨741⟩: between 48° and 52°.

2,2,2-Trifluoroethanol, CF_3CH_2OH—**100.04** [75-89-8]—Colorless liquid.

Assay—Inject an appropriate specimen into a gas chromatograph (see *Chromatography* ⟨621⟩) equipped with a flame-ionization detector, helium being used as the carrier gas. The following conditions have been found suitable: a 0.25-mm × 30-m capillary column coated with a 1-µm layer of phase G2; the injection port temperature is maintained at 100°; the detector temperature is maintained at 150°; and the column temperature is maintained at 0° and programmed to rise 10° per minute to 150°. The area of the CF_3CH_2OH peak is not less than 99% of the total peak area.

Boiling range: between 77° and 80°.

2,2,2-Trifluoroethyldifluoromethyl Ether *(Difluoromethyl-2,2,2-trifluoroethyl ether),* $C_3H_3F_5O$—**150.05**—Clear liquid. Use a suitable grade.

Boiling range: between 28° and 30°.

[NOTE—A suitable grade is available from PCR Incorporated, P.O. Box 1466, Gainesville, FL 32602. Tel: 904-376-8246. The catalogue number is 17151-2.]

(*m*-Trifluoromethylphenyl) Trimethylammonium Hydroxide in Methanol—Use a suitable grade.

[NOTE—A suitable grade is available as "Meth-Prep II" from Alltech, www.alltechweb.com.]

5-(Trifluoromethyl)uracil, $C_5H_3F_3N_2O_2$—**180.08** [54-20-6]—White to off-white powder.

Assay—When tested by thin-layer chromatography, with the use of plates coated with chromatographic silica gel mixture, a developing system consisting of chloroform, methanol, and acetic acid (17:2:1), and examined visually and under long-wavelength UV light, a single spot is exhibited.

Trifluorovinyl Chloride Polymer *(Fluorolube; 1-Chloro-1,2,2-trifluoro-ethene Homopolymer),* $(C_2ClF_3)_x$—Use a suitable grade.

[NOTE—A suitable grade is available as catalog number Z123552 from www.sigma-aldrich.com.]

Trimethylacethydrazide Ammonium Chloride *(Betaine Hydrazide Chloride; Girard Reagent T),* $[(CH_3)_3N^+CH_2CONHNH_2]Cl^-$—**167.64** [123-46-6]—Colorless or white crystals. Freely soluble in water. One g dissolves in about 25 mL of alcohol. Insoluble in chloroform and in ether. Hygroscopic.

Melting range ⟨741⟩: between 185° and 192°, determined after recrystallization from hot alcohol, if necessary.

Residue on ignition (Reagent test)—Ignite 1 g with 0.5 mL of sulfuric acid: the residue weighs not more than 10 mg (1%).

Trimethylchlorosilane—See *Chlorotrimethylsilane*.

2,2,4-Trimethylpentane *(Isooctane),* C_8H_{18}—**114.23** [540-84-1]—Use ACS reagent grade.

***2,4,6*-Trimethylpyridine** *(5-Collidine),* $C_8H_{11}N$—**121.18** [108-75-8]—Clear, colorless liquid. Soluble in cold water and less soluble in hot water; soluble in alcohol, in chloroform, and in methanol. Miscible with ether.

Assay—Inject an appropriate test specimen into a suitable gas chromatograph (see *Chromatography* ⟨621⟩), helium being used as a carrier gas. The following conditions have been found suitable: a 3-mm × 1.85-m stainless steel column containing phase G16 on support S1A; the injection port, column, and detector temperatures are maintained at 180°, 165°, and 270°, respectively; and a flame-ionization detector is used. The area of the $C_8H_{11}N$ peak is not less than 98% of the total peak area.

Refractive index ⟨831⟩: between 1.4970 and 1.4990, at 20°.

***N*-(Trimethylsilyl)-imidazole,** $C_6H_{12}N_2Si$—**140.26** [18156-74-6]—A clear, colorless, to light yellow liquid.

Refractive index ⟨831⟩: between 1.4744 and 1.4764 at 20°.

Trimethyltin Bromide, C_3H_9BrSn—**243.72** [1066-44-0]—Use a suitable grade.

2,4,6-Trinitrobenzenesulfonic Acid, $C_6H_2(NO_2)_3SO_3H \cdot 3H_2O$—**347.21** [2508-19-2]—Pale yellow to tan crystals. Use a suitable grade. Also available as a 5% (w/v) or a 1 M aqueous solution.

Trinitrophenol—See *Picric Acid*.

Trioctylphosphine Oxide, $C_{24}H_{51}PO$—**386.63** [78-50-2]—White, crystalline powder. Insoluble in water; soluble in organic solvents.

Melting range ⟨741⟩: between 54° and 56°.

1,3,5-Triphenylbenzene, $(C_6H_5)_3C_6H_3$—**306.41** [612-71-5]—White to off-white powder.

Melting range ⟨741⟩: between 172° and 175°.

Triphenylmethane, $C_{19}H_{16}$—**244.34** [519-73-3]—Light brown powder.

Assay—Inject an appropriate volume into a gas chromatograph (see *Chromatography* ⟨621⟩) equipped with a flame-ionization detector, helium being used as the carrier gas. The following conditions have been found suitable: a 0.25-mm × 30-m capillary column coated with a 1-µm layer of phase G2; the injection port temperature is maintained at 300°; the detector temperature is maintained at 300°; and the column temperature is maintained at 200° and programmed to rise 10° per minute to 300°. The area of the $C_{19}H_{16}$ peak is not less than 99% of the total peak area.

Melting range ⟨741⟩: between 92° and 94°.

Triphenylmethanol, $C_{19}H_{16}O$—**260.34** [76-84-6]—White to off-white powder.

Assay—Inject an appropriate volume into a gas chromatograph (see *Chromatography* ⟨621⟩) equipped with a flame-ionization detector, helium being used as the carrier gas. The following conditions have been found suitable: a 0.25-mm × 30-m capillary column coated with a 1-µm layer of phase G2; the injection port temperature is maintained at 280°; the detector temperature is maintained at 300°; and the column temperature is maintained at 180°. The area of the $C_{19}H_{16}O$ peak is not less than 96.5% of the total peak area.

Triphenyltetrazolium Chloride, $C_{19}H_{15}ClN_4$—**334.80** [298-96-4]—White to yellowish, crystalline powder. Soluble in about 10 parts of water and of alcohol; slightly soluble in acetone; insoluble in ether. Usually contains solvent of crystallization, and when dried at 105° it melts at about 240°, with decomposition.

Solubility—Separate 100-mg portions dissolve completely in 10 mL of water and in 10 mL of alcohol, respectively, to yield solutions that are clear, or practically so.

Loss on drying ⟨731⟩—Dry it at 105° to constant weight: it loses not more than 5.0% of its weight.

Residue on ignition (Reagent test): negligible, from 100 mg.

Sensitiveness—Dissolve 10 mg in 10 mL of dehydrated alcohol (*A*). Then dissolve 10 mg of dextrose in 20 mL of dehydrated alcohol (*B*). To 0.2 mL of *B* add 1 mL of dehydrated alcohol and 0.5 mL of dilute tetramethylammonium hydroxide TS (1 volume diluted with 9 volumes of dehydrated alcohol), then add 0.2 mL of *A:* a pronounced red color develops within about 10 minutes.

Tris(2-aminoethyl)amine, $C_6H_{18}N_4$—**146.23** [4097-89-6]—Yellow liquid. Soluble in methanol.

Assay—Dissolve about 80 mg in 30 mL of methanol. Add 40 mL of water, and titrate with 1 N hydrochloric acid, determining the endpoint potentiometrically. Perform a blank determination, and make any necessary correction. Each mL of 1 N hydrochloric acid is equivalent to 48.75 mg of $C_6H_{18}N_4$. Not less than 98.0% is found.

Refractive index ⟨831⟩: between 1.4956 and 1.4986 at 20°.

Tris(hydroxymethyl)aminomethane [77-86-1]—Use ACS reagent grade—See also *Tromethamine*.

Tris(hydroxymethyl)aminomethane Acetate, $C_4H_{11}O_3 \cdot NCH_3$—**181.19** [6850-28-8]—White powder with lumps. Use a suitable grade.

Tris(hydroxymethyl)aminomethane Hydrochloride, $C_4H_{11}NO_3 \cdot HCl$—**157.60** [1185-53-1]—Colorless crystals. Use a suitable grade.

***N*-Tris(hydroxymethyl)methylglycine,** $C_6H_{13}NO_5$—**179.2** [5704-04-1]—White, crystalline powder. Use a suitable grade.

***Tritirachium Album* Proteinase K**—Use a suitable grade.

[NOTE—A suitable grade can be obtained from Qiagen, Inc., www.qiagen.com.]

Tromethamine *[Tris(hydroxymethyl)aminomethane; THAM; 2-Amino-2-(hydroxymethyl)-1,3-propanediol],* $C_4H_{11}NO_3$—**121.14**—Use ACS reagent grade Tris(hydroxymethyl)aminomethane.

Tropaeolin OO *(Acid Orange 5),* $C_{18}H_{14}N_3NaO_3S$—**375.38** [554-73-4]—Orange-yellow scales, or yellow powder. Soluble in water.

pH range: from 1.4 (red) to 2.6 (yellow).

Tropic Acid, $C_9H_{10}O_3$—**166.18** [529-64-6]—Use a suitable grade.

Tropine, $C_8H_{15}NO$—**141.2** [120-29-6]—Use a suitable grade.

Trypan Blue *(Direct Blue 14),* $C_{34}H_{24}N_6Na_4O_{14}S_4$—**960.8** [72-57-1]—Use a suitable grade.

Tryptone—Use *Pancreatic Digest of Casein.*

L-Tryptophane, $C_{11}H_{12}N_2O_2$—**204.23** [73-22-3]—White or not more than slightly yellow leaflets or powder. One g dissolves in about 100 mL of water; soluble in dilute acids and in solutions of the alkali hydroxides; slightly soluble in alcohol.

Assay—Accurately weigh about 300 mg, dissolve in a mixture of 3 mL of formic acid and 50 mL of glacial acetic acid, add 2 drops of crystal violet TS, and titrate with 0.1 N perchloric acid VS to a green endpoint. Each mL of 0.1 N perchloric acid is equivalent to 20.42 mg of $C_{11}H_{12}N_2O_2$. Between 98.0% and 102.0%, calculated on the dried basis, is found.

Specific rotation ⟨781⟩: between −30.0° and −33.0°, determined in a solution containing 1.0 g of test specimen, previously dried at 105° for 3 hours, in 100 mL.

Loss on drying ⟨731⟩—Dry it at 105° for 3 hours: it loses not more than 0.3% of its weight.

Residue on ignition (Reagent test): not more than 0.1%.

Tyrosine—Dissolve 100 mg in 3 mL of diluted sulfuric acid, add 10 mL of mercuric sulfate TS, and heat on a steam bath for 10 minutes. Filter, wash with 5 mL of mercuric sulfate TS, and add to the combined filtrate 0.5 mL of sodium nitrite solution (1 in 20): no red color is produced within 15 minutes.

Tuberculin, Purified Protein Derivative *(Tuberculin PPD)*—Derived from the human strain of *Mycobacterium tuberculosis,* and available either as a solution or as a lyophilized powder. For lyophilized powder, reconstitute according to the manufacturer's instructions using the diluent provided by the manufacturer. Solutions may contain a stabilizer and a preservative. One Tuberculin Unit (TU) is equivalent to 0.02 µg of Tuberculin PPD.

Tubocurarine Chloride *(7′,12′-Dihydroxy-6,6′-dimethoxy-2,2′,2′-trimethyltubocuraranium Chloride),* $C_{37}H_{42}Cl_2N_2O_6$—**681.65** [6989-98-6]—Use a suitable grade with an assay result between 98.0% and 102.0%.

[NOTE—A suitable grade is available from Acros Organics, catalog number 24349 at www.acros.com.]

Tungstic Acid, H_2WO_4—**249.85** [7783-03-1]—Use a suitable grade with a content of not less than 99%.

L-Tyrosine Disodium, $C_9H_9NO_3Na_2$—**225.2** [69849-45-6]—Off-white to tan powder. Use a suitable grade.

Uracil, $C_4H_4N_2O_2$—**112.09** [66-22-8]—White to cream-colored, crystalline powder. Melts above 300°. One g dissolves in about 500 mL of water; less soluble in alcohol; soluble in ammonia TS and in sodium hydroxide TS. Its solutions yield no precipitate with the usual alkaloidal precipitants.

Residue on ignition (Reagent test): negligible, from 100 mg.

Loss on drying ⟨731⟩—Dry it at 105° for 2 hours: it loses not more than 2% of its weight.

Uranyl Acetate *(Uranium Acetate),* $UO_2(C_2H_3O_2)_2 \cdot 2H_2O$—**424.15** [541-09-3]—Use ACS reagent grade.

Urea, NH_2CONH_2—**60.06** [57-13-6]—Use ACS reagent grade.

Urethane *(Ethyl carbamate),* $C_3H_7NO_2$—**89.09** [51-79-6]—White powder with chunks. Freely soluble in water.

Melting range ⟨741⟩: between 48° and 50°.

Uridine, $C_9H_{12}N_2O_6$—**244.20** [58-96-8]—White powder.

Assay—

MOBILE PHASE—Prepare a mixture of methanol and 0.2 M ammonium acetate (90:10), and adjust with phosphoric acid to a pH of 7.0.

TEST SOLUTION: 0.5 mg per mL.

PROCEDURE—Inject about 20 µL of the *Test solution* into a liquid chromatograph (see *Chromatography* ⟨621⟩), equipped with a 280-nm detector and a 4.6-mm × 15-cm column that contains packing L1. The flow rate is about 2.0 mL per minute. The area of the $C_9H_{12}N_2O_6$ peak is not less than 99% of the total peak area.

Melting range ⟨741⟩: between 166° and 171°.

Valeric Acid, $C_5H_{10}O_2$—**102.13** [109-52-4]—Clear, colorless liquid.

Assay—Accurately weigh about 500 mg, transfer to a suitable container, add 30 mL of water, and mix. Add 40 mL of water, and mix. Add phenolphthalein TS, and titrate with 0.1 N sodium hydroxide VS. Each mL of 0.1 N sodium hydroxide is equivalent to 10.21 mg of $C_5H_{10}O_2$: not less than 99.0% of $C_5H_{10}O_2$ is found.

Valerophenone, $C_{11}H_{14}O$—**162.23** [1009-14-9]—Colorless liquid.

Assay—Inject an appropriate specimen into a suitable gas chromatograph (see *Chromatography* ⟨621⟩) equipped with a flame-ionization detector, helium being used as the carrier gas. The following conditions have been found suitable: a capillary column coated with a 1-µm layer of phase G2; the injection port temperature is maintained at 250°; the detector temperature is maintained at 300°; and the column temperature is maintained at 150° and programmed to rise 10° per minute to 300°. The area of the $C_{11}H_{14}O$ peak is not less than 98% of the total peak area.

Refractive index ⟨831⟩: 1.5149 at 20°.

Boiling range: between 105° and 107°, at a pressure of 5 mm of mercury.

Vanadium Pentoxide, V_2O_5—**181.88** [1314-62-1]—Fine, yellow to orange-yellow powder. Slightly soluble in water; soluble in concentrated acids and in alkalies; insoluble in alcohol.

Assay—Transfer about 400 mg, accurately weighed, to a 500-mL conical flask, and add 150 mL of water and 30 mL of dilute sulfuric acid (1 in 2). Boil the solution on a hot plate for 5 minutes, add 50 mL of water, and continue boiling until a yellow solution is obtained. Transfer the hot plate and the flask to a well-ventilated hood, and bubble sulfur dioxide gas through the solution for 10 minutes, or until the solution is a clear, brilliant blue color. Rinse the gas delivery tube into the flask with a few mL of water, then bubble carbon dioxide gas through the solution for 30 minutes while continuing to boil the solution gently. Cool the solution to about 80°, and titrate with 0.1 N potassium permanganate VS to a yellow-orange endpoint. Perform a complete blank determination, and make any necessary correction. Each mL of 0.1 N potassium permanganate is equivalent to 9.095 mg of V_2O_5. Not less than 99.5% is found.

Vanadyl Sulfate, $VOSO_4 \cdot xH_2O$ (anhydrous)—**163.00** [27774-13-6]—Blue, hygroscopic crystals. Slowly and usually incompletely soluble in water.

Assay—Accurately weigh about 400 mg of the dried test specimen obtained in the test for *Water,* and transfer with 15 to 20 mL of water into a beaker. Add 3 mL of sulfuric acid, cover the beaker with a watch glass, and heat on a steam bath until all dissolves. Cool, dilute with 125 mL of water, and titrate with 0.1 N potassium permanganate VS to the production of a pinkish color that persists for 1 minute: each mL of 0.1 N potassium permanganate is equivalent to 16.30 mg of $VOSO_4$. Not less than 97% is found.

Water—Dry about 1 g, accurately weighed, at 220° to constant weight: it loses not more than 50.0% of its weight.

Pentavalent vanadium—Heat 1 g, accurately weighed, with 50 mL of water and 5 mL of hydrochloric acid in a flask until dissolved. Cool, add 2 g of potassium iodide, insert the stopper, and allow to stand for 30 minutes. Add 50 mL of water, and titrate the liberated iodine with 0.1 N sodium thiosulfate VS, adding 3 mL of starch TS as the indicator. Correct for the volume of thiosulfate consumed by a blank. Each mL of 0.1 N thiosulfate is equivalent to 5.095 mg of vanadium (V). Not more than 0.5% is found, calculated on the dried basis.