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MILITARY STANDARD

ORGANIC LABORATORY REAGENTS

(INCLUDING ACS AND USP/NF)

AMSC N/A

FSC 6810

DEPARTMENT OF DEFENSE
Washington, DC 20301

Organic Laboratory Reagents

MIL-STD-1213A

1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Chemical Research, Development and Engineering Center, Attn: SMCCR-SPD-TS, Aberdeen Proving Ground, MD 21010-5423, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FOREWORD

This standard is approved for use by all Departments and Agencies of the Department of Defense in the selection of items for application. It is intended to prevent the entry of unnecessary items (sizes, types, varieties) into the Department of Defense logistics system. This document is not intended to restrict any service in selecting new items resulting from state-of-the-art changes.

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1. SCOPE

1.1 Coverage. This standard is a presentation of nomenclature, formulas, physical and chemical properties, specification requirements, military uses, safety information, storage information and disposal information for organic laboratory reagents. This standard does not include all of the items represented by the title or all those items which are commercially available. It does contain items preferred for use in the selection of organic laboratory reagents, for application by the Department of Defense, including American Chemical Society (ACS) organic chemicals and those contained in the non-monographed sections of National Formulary (NF) and The United States Pharmacopeia (USP) which shall be designated analyzed reagents as specified by Federal Specification O-C-265, Chemicals, Analytical; General Specification For, and commercial listings of organic chemicals reputed to be analyzed reagent. Organic chemicals, reagent grade, included in this standard are those commercially listed and reputed to be "reagent grade"; those contained in Military Specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For, and those for which an individual military specification or purchase description exists.

1.2 Application. Organic laboratory reagents are mainly used in analytical chemistry. Some organic reagents find use in organic synthesis. It is neither practical nor possible to indicate all laboratory applications for them. Only typical laboratory applications are indicated in this standard.

1.3 Classification. The items in this standard are classified on the basis of chemical composition as being organic laboratory reagents.

2. REFERENCED DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation form a part of this standard to the extent specified herein.

SPECIFICATIONS

FEDERAL

O-C-265	- Chemicals, Analytical; General Specification For
PPP-C-2020	- Chemicals, Liquid, Dry and Paste; Packaging Of

MILITARY

MIL-C-11334	- Chloramine-T, Reagent
MIL-C-51130	- Chemicals, Reagent Grade; General Specification For

STANDARDS

FEDERAL

FED-STD-313	- Material Safety Data Sheets, Preparation And The Submission Of

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this standard to the extent specified herein.

CODE OF FEDERAL REGULATIONS (CFR)

Title 29	- Department Of Labor, Occupational Safety And Health Administration
Title 40	- Protection of the Environment; Environmental Protection Agency
Title 49	- Department Of Transportation; Hazardous Materials Regulations
DOD 4145.19-R-1	- Storage And Materials Handling
DOD 4160.21-M	- Defense Utilization And Disposal Manual
DOD 6050.5-LR	- DOD Hazardous Materials Information System, Hazardous Item Listing
TB MED 502 (DLAM 1000.2)	- Occupational And Environmental Health Respiratory Protection Program
TB MED 506	- Occupational And Environmental Health Occupational Vision
TM 38-250	- Packaging, Materials Handling - Preparation Of Hazardous Materials For Military Air Shipment

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

Registry of Toxic Effects of Chemical Substances
Recommendation for Environmental Exposure Limits

(Copies of specifications, standards, handbooks, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following document(s) form a part of this standard to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. The issues of documents which have not been adopted shall be those in effect on the date of the cited DODISS.

AMERICAN CONFERENCE OF GOVERNMENT INDUSTRIAL HYGIENISTS (ACGIH)

TLVs® Threshold Limit Values for Chemical Substances in the Work Environment Adopted by American Conference of Government Industrial Hygienists (ACGIH) with Intended Changes.

Volume 13: Transactions of ACGIH Activities 1985 Conference.

(Application for copies should be addressed to American Conference of Governmental Industrial Hygienists, 6500 Glenway Avenue, Bldg D-7, Cincinnati, OH 45211.)

INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC)

Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man.

(Application for copies should be addressed to World Health Organization, International Agency for Research on Cancer, 49 Sheridan Street, Albany, New York.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

National Fire Codes

(Application for copies should be addressed to National Fire Protection Association, Battery March Park, Quincy, MA 02269.)

American Chemical Society Specifications - Reagent Chemicals

The United States Pharmacopeia - National Formulary (USP/NF)

(Nongovernment standards are generally available for reference from libraries. They are also distributed among nongovernment standards bodies and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence.

3. DEFINITIONS

3.1 Oxidizing agent. A substance that gains electrons as a result of an oxidation-reduction reaction. It causes an increase in the oxidation state of another substance.

3.2 Reducing agent. A substance that loses electrons during an oxidation-reduction reaction. It causes a decrease in the oxidation state of another substance.

4. GENERAL REQUIREMENTS

4.1 Packaging data and labeling. All chemicals included in this standard shall be packaged in accordance with Federal Specification PPP-C-2020 and all applicable documents referenced therein. Shipping containers shall be labeled in accordance with current Department of Transportation (DOT) Hazardous Materials Regulations applicable to each chemical. When shipping by military aircraft the requirements of TM 38-250 shall apply. In addition, each item shall be packaged and labeled as specified in the applicable contract or order. All labels shall also comply with Hazard Communication Standard, 29 CFR 1910.1200 (f).

4.2 Hazardous materials information. DOD 6050.5, DOD Hazardous Materials Information System (HMIS) acquires, reviews, stores, and disseminates Material Safety Data Sheet (MSDS) information for all hazardous materials used by DOD. The contractual acquisition of a MSDS is accomplished through use of Federal Acquisition Regulation, paragraph 52.223-3, Hazardous Material Identification and Material Safety Data. The MSDS is prepared in accordance with the instructions in FED-STD-313; and shall comply with requirements of Hazard Communication Standard, 29 CFR 1910.1200 (g).

4.3 Safety.

4.3.1 Personal protective measures. The necessary respiratory, eye and skin protection to be used when handling chemicals shall be prescribed by the responsible installation industrial hygiene, medical and safety authorities.

4.3.1.1 Respiratory protection. Respirators, approved by the National Institute for Occupational Safety and Health (NIOSH) or the Mine Safety and Health Administration (MSHA) or by particular respiratory schedules of the Bureau of Mines (BM) for the compounds being used, may be employed for intermittent exposure or for supplementing other control measures (refer to TB MED 502 or DLAM 1000.2). Ventilation shall be adequate to remove hazardous concentrations.

4.3.1.2 Skin protection. Personnel using these compounds shall be provided with and required to use impervious gloves, sleeves, aprons, and boots whenever indicated. Protective creams and ointments commonly known as "barrier creams" may be of value in certain cases. However, barrier creams shall not be used to replace protective clothing. In case of contact with the skin, wash affected areas thoroughly with water. Eye lavages and emergency showers shall be located where there is a potential for direct contact with harmful chemicals.

4.3.1.3 Face and eye protection. Personnel using these compounds shall be provided with and required to wear chemical splash-proof safety goggles. In addition, face shields shall be provided and worn over the goggles if splashing could occur. In case of contact with the eyes, immediately irrigate with copious amounts of water for at least 20-30 minutes, and obtain medical attention. (Refer to TB MED 506.)

4.3.1.4 Training. Employers shall provide employees with training and information including MSDSs on all chemical items in their work area, in accordance with 29 CFR 1910.1200 (h), to ensure that employees know potential

hazards of the chemicals with which they come in contact and the symptoms of exposure as well as how these chemicals affect the body and bodily functions. Employees shall be adequately trained to render first aid.

4.3.1.5 Exercises. Participation in exercises shall be stressed to demonstrate skills in the use of personal protective equipment and emergency response equipment.

4.3.2 Storage conditions. DOD 4145.19-R-1 describes general storage practices and requirements for hazardous materials in the DOD supply system. Specific requirements provided in the following paragraphs are supplementary in nature and shall be observed in consonance with the DOD storage regulations.

4.3.2.1 Flammable, combustible, pyrophoric and ignitable materials. A flammable material is generally any solid, liquid, vapor or gas that ignites easily and burns rapidly. Combustible materials are generally those that are difficult to ignite and burn slowly. The DOT, in Part 173, Subpart D, Section 173.115 of 49 CFR, defines a flammable liquid as one having a closed cup flash point below 100°F (37.8°C). A combustible liquid is defined, by DOT in the above reference, as one having a closed cup flash point at or above 100°F and below 200°F (93.3°C). A pyrophoric liquid is defined, by DOT in the above reference, as one that ignites spontaneously in dry or moist air at or below 130°F (54.5°C). Materials with flash points of 200°F or higher are to be considered as burnable. The Environmental Protection Agency (EPA), in Part 261, Subpart C, Section 261.21 of 40 CFR*, designates the criteria for flammable and combustible materials and oxidizers that exhibit the characteristic of ignitability (I). Liquids with closed cup flash points of less than 140°F (60°C) are defined by EPA as ignitable. The autoignition point (temperature) of a substance is generally defined as the minimum temperature required to initiate or cause self-sustained combustion in the absence of a spark or flame. Materials that ignite easily under normal industrial conditions are considered to be dangerous fire hazards. Such materials shall be stored in a manner to prevent ignition and combustion. Easily ignitable substances, such as reducing agents, shall be kept away from strong oxidizing agents. All containers shall be tightly sealed. It is important to provide adequate ventilation in storage areas, and to locate the storage areas of these items away from fire hazards. Ample fire-control equipment shall be easily accessible. Storage buildings, rooms and cabinets shall comply with provisions of the National Fire Codes. The building shall be electrically grounded and signs posted to prevent the lighting of matches or smoking in the area. Flammable storage areas shall be equipped with smoke or fire detection equipment.

4.3.2.2 Water-sensitive fire and explosive hazardous materials. These are materials that react on contact with water or steam to ignite or evolve heat or explosive gases. Such materials exhibit the characteristic of reactivity (R) as designated by the EPA in Section 261.23 of the above reference.* These materials shall be stored in well-ventilated, cool, dry areas. All containers shall be tightly sealed. These materials are a fire hazard in contact with water or moisture; therefore, it is essential that no sprinkler be used. Otherwise, the building shall conform to that required for storage of flammable

*Refers only to materials that have become waste materials.

materials. The building shall be waterproof, located on high ground, and separated from other storage areas.

4.3.2.3 Incompatible materials. Materials that are chemically incompatible shall be segregated in the storage of both serviceable and unserviceable items. The degree of segregation will depend upon DOD 4145.19-R-1 and local supplementary requirements that insure safe storage conditions. Hazardous storage compatibility codes are provided in the HMIS referred to in 4.2.

4.3.3 Chemical hazardous exposure limits. Chemical hazardous exposure limits for airborne concentrations of substances are obtained from the current TLVs® Threshold Limit Values for Chemical Substances in the Work Environment, adopted by the American Conference of Government Industrial Hygienists (ACGIH); current Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PEL), 29 CFR, Section 1910.1000; and NIOSH Recommendation for Environmental Exposure Limits. Such information is also shown in MSDSs and the HMIS referred to in 4.2. The identity of sources establishing if a chemical is a carcinogen or potential carcinogen, for hazard communication purposes, is shown in 29 CFR 1910.1200(d)(4).

4.3.4 Toxicity. Toxicity information for chemical compounds is available from various publications and from MSDSs, which are collected in DOD 6050.5 Hazardous Materials Information System.

4.3.4.1 EPA Toxic (T). Some chemical compounds have been designated by the EPA as toxic (T) in accordance with the criteria shown in Part 261, Subpart B, Section 261.11(a)(3) of 40 CFR.* Some commercial chemical products are listed as toxic under Subpart D, Section 261.33(f).

4.3.4.2 EPA Acute Hazardous Toxicity (H). Some chemical compounds have been designated by the EPA as acute hazardous (H) in toxicity in accordance with the criteria shown in Subpart B, Section 261.11(a)(2) of 40 CFR.* Some commercial chemical products are listed as acute hazardous in toxicity under Subpart D, Section 261.33(e).

4.3.4.3 EPA Extraction Procedure Toxicity (EP Toxicity) (E). Some chemical contaminants, that are not listed in Subpart D, have been designated by the EPA as exhibiting the characteristic of EP toxicity, and are listed in Section 261.24 Table 1 of 40 CFR.*

4.3.4.4 Hazardous toxic constituents. A list of chemical compounds and substances, shown to have toxic effects on humans or other life forms, is contained in Appendix VIII to 40 CFR Part 261; and the Registry of Toxic Effects of Chemical Substances.

4.4 Pollution and disposal.

4.4.1 Pollution potential. All items described in this standard shall be assumed to have a pollution potential. However, to minimize this potential, the proper use, storage and disposal methods shall be strictly followed.

*Refers only to materials that have become waste materials.

4.4.2 Disposal of excess or unserviceable material. To minimize disposal problems, it is recommended that no more than a one year's supply of each item listed in this standard be stocked. When stocks have been declared excess or unserviceable, they will be disposed of in accordance with the Defense Utilization and Disposal Manual, DOD 4160.21-M, and applicable DOD Policy Memoranda. Guidance can be obtained from your servicing Defense Reutilization and Marketing Office (DRMO) on procedures required for proper reporting and turn-in.

4.4.3 Disposal and storage of hazardous wastes. Items are classified and managed as hazardous wastes as defined by the Resource Conservation and Recovery Act (RCRA) (Public Law 94-580). Items have been identified as meeting the characteristics (i.e., ignitable, corrosive, reactive or EP toxic) or are listed (i.e., toxic or acute hazardous) according to Identification and Listing of Hazardous Waste, Part 261; 40 CFR; or have been determined to be hazardous wastes by declaration of the Defense Reutilization and Marketing Service (DRMS) in accordance with procedures set forth in DOD 4160.21-M. Disposal of such items shall be managed in accordance with the Installation Environmental Office, the DRMO, or the Safety and Health Office to insure proper reporting of disposal and treatment actions to the US EPA and State; and shall be managed in accordance with Federal, State and local laws. The three main disposal methods are turn-in to the DRMO, on-post disposal by installation personnel, or disposal by commercial contract. Hazardous wastes that cannot be used, or disposed of as stated in 4.4.3.2, shall be stored under environmentally safe conditions until suitable methods of disposal are determined. Short-term storage (less than 90 days) requires proper containment (i.e., packaging and facilities) in accordance with Section 262.34, Part 262 of the above reference. Long-term storage (greater than 90 days) requires permitting by the EPA or by the state under Public Law 94-580 (RCRA), in compliance with the requirements of 40 CFR Parts 264 and 265. Physical custody will be accomplished by the activity with conforming storage or most nearly conforming storage. When physical custody is in question, the Post Commander will make the final decision. In all cases where the wastes are to be collected, stored, transported and disposed of at a state or local permitted disposal facility, the identity and description of the waste shall be maintained and recorded in accordance with Part 262 of the above reference. Transportation of the waste shall be in accordance with Part 263 of the above reference, Standards Applicable to Transporters of Hazardous Waste.

4.4.3.1 Cleanup of liquid spills. To control the migration of spilled or leaking liquids, dike around the item with an inert, dry absorbent (e.g., clay, sawdust or vermiculite) or follow installations spill plans (Spill Prevention Control and Countermeasure Plan and Installations Spill Contigency Plan). Control entry to the spill site and segregate salvageable materials away from the spill area. Initiate waste cleanup operations immediately in accordance with local procedures. The residue shall be safely handled and transported to an approved or permitted disposal or storage facility. Packaging, labeling, transportation and record-keeping requirements for this waste material are determined by the appropriate Federal and State agencies and local procedures. It is recommended that all activities involving disposal preparation and transportation to commercial facilities be properly coordinated with the appropriate Federal and State agencies responsible for health and environmental aspects of hazardous materials. It is imperative that the proper description of waste

accompany the packaged item at all times. Final disposal of the waste item shall be accomplished by reutilization, transfer, donation or sales by DRMS in accordance with DOD 4160.21-M or by ultimate disposal as described in 4.4.3.2. Spill residue, including contaminants, to be turned in to the DRMO shall first be properly identified, containerized, and labeled. For large scale spills that grossly contaminate the environment, the Chemical Transportation Emergency Center (CHEMTREC), can be called for assistance. Applicable procedures of the local spill control plan shall be followed. Necessary respiratory, eye, and skin protection measures are to be used while performing cleanup operations.

4.4.3.2 Ultimate disposal. Ultimate disposal shall be accomplished at a permitted or approved hazardous waste treatment or disposal facility designated by the Installation Environmental Office, DRMO, or Safety and Health Offices.

4.4.4 DISCLAIMER. RECOMMENDED DISPOSAL INSTRUCTIONS ARE FORMULATED FOR USE BY ELEMENTS OF THE DEPARTMENT OF DEFENSE. THE UNITED STATES OF AMERICA IN NO MANNER WHATSOEVER EITHER EXPLICITLY OR IMPLICITLY WARRANTS, STATES, OR INTENDS SAID INSTRUCTION, TO HAVE ANY APPLICATION, USE OR VIABILITY BY OR TO ANY PERSON OR PERSONS CONTRACTING OUTSIDE THE DEPARTMENT OF DEFENSE OR ANY PERSON OR PERSONS CONTRACTING WITH ANY INSTRUMENTALITY OF THE UNITED STATES OF AMERICA AND DISCLAIMS ALL LIABILITY FOR SUCH USE. ANY PERSON USING THESE INSTRUCTIONS WHO IS NOT A MILITARY OR CIVILIAN EMPLOYEE OF THE UNITED STATES OF AMERICA SHOULD SEEK COMPETENT PROFESSIONAL ADVICE TO VERIFY AND ASSUME RESPONSIBILITY FOR THE SUITABILITY OF THESE INSTRUCTIONS TO THEIR PARTICULAR SITUATION REGARDLESS OF SIMILARITY TO A CORRESPONDING DEPARTMENT OF DEFENSE OR OTHER GOVERNMENT SITUATION.

5. DETAILED REQUIREMENTS

5.1 Name. Acetal, Reagent $CH_3CH(OC_2H_5)_2$ FW: 118.18
1,1-Diethoxyethane
Diethyacetal
Acetaldehyde diethylacetal
Ethylidene diethyl ether

5.1.1 Technical description. Acetal (pure) exists as a colorless, volatile, and flammable liquid. It has an agreeable odor. The boiling point of acetal is 103.2°C at 760 mm, and its flash point is -5°F (-20°C) Setaflash Closed Cup (SCC). It has a specific gravity of 0.8314 (20°/4°C). Its autoignition temperature is 446°F (230°C). It has an upper explosion limit (UEL) of 10.4 percent and a lower explosion limit (LEL) of 1.65 percent. It has a vapor pressure of 10 mm at 8.0°C and a vapor density of 4.08 (air=1). It is miscible with ethyl alcohol and ether, and very soluble in acetone. It has a limited solubility in water and chloroform.

5.1.2 Specification. Manufacturer's requirements. (No Government specification)

5.1.2.1 Requirements. The minimum purity of commercially available material is 98.0 percent with a boiling range of 3.0°C including 102°C.

5.1.3 Use. Acetal, reagent, is used in organic synthesis.

5.1.4 Safety. Acetal is a volatile flammable liquid. It is irritating to the eyes, skin and mucous membranes. Inhalation of vapors and mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Acetal shall be used with adequate ventilation. There is no Threshold Limit Value (TLV) or Permissible Exposure Limit (PEL) referenced for this compound. (Refer to 4.3.1.)

Acetal can react vigorously with oxidizing materials.

5.1.5 Storage. Acetal shall be stored in a cool, dry place in tightly closed containers away from sparks and open flame. (Refer to 4.3.2.)

5.1.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste Number D001.

5.2 Name. Acetamide, Reagent CH_3CONH_2 FW: 59.07
Acetic acid amide
Ethanamide

5.2.1 Technical description. Acetamide (pure) exists as colorless, burnable crystals that have a density of 1.159 g/cm^3 at 20°C. It has a melting point of 82.3°C, a boiling point of 221.2°C, and a vapor pressure of 1 mm at 65.0°C. It is soluble in water, alcohol and chloroform. It is insoluble in ether.

5.2.2 Specification. Manufacturer's requirements. (No Government specification)

5.2.2.1 Requirements. Acetamide, reagent, is commercially available with requirements as shown in Table I.

TABLE I. Acetamide, Reagent - requirements.

Melting point (°C)	79.0 - 81.0
Maximum Limits of Impurities (% by wt)	
Residue after ignition	0.01
Acetate (as CH_3COONH_4)	0.03
Chloride (Cl)	0.002
Sulfate (SO_4)	0.002
Maximum Limits of Trace Impurities (ppm)	
Heavy metals (as Pb)	5.0

5.2.3 Use. Acetamide, reagent, is used in organic synthesis.

5.2.4 Safety. Acetamide is an irritant of the eyes, skin and mucous membranes. Inhalation of dust and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Acetamide on contact with acids, acid fumes, water or steam will produce toxic vapors. It is incompatible with strong oxidants, including the halogens, active metals and some acids. There is no safe exposure limit. Acetamide is burnable. Acetamide is a human carcinogen. (Refer to 4.3.1.)

If heated with strong dehydrating agents, toxic fumes of cyanides are emitted.

5.2.5 Storage. Acetamide shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sparks and open flames. (Refer to 4.3.2.)

5.2.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.3 Name. Acetyl Chloride, Analyzed Reagent CH_3COCl FW: 78.50
Ethanoyl chloride

5.3.1 Technical description. Acetyl chloride (pure) exists as a colorless, flammable, corrosive highly reactive fuming liquid with a strong, pungent odor. It has a melting point of -112°C and a boiling point of 50.9°C. Its autoignition temperature is 734°F (390°C) and its flash point is 40°F (4°C) (SCC). Acetyl chloride has a specific gravity of 1.1051 (20°/4°C) and a vapor density of 2.70 (air=1). It is soluble in acetone, glacial acetic acid, ethyl ether, benzene, toluene, chloroform, carbon disulfide, and petroleum ether. It decomposes in water and ethyl alcohol.

5.3.2 Specification. Federal Specification O-C-265, Chemicals, Analytical; General Specification For.

5.3.2.1 Requirements. Specification requirements for acetyl chloride, analyzed reagent, are shown in Table II.

TABLE II. Acetyl Chloride, Analyzed Reagent - requirements (USP/NF).

Boiling range (min)	94% distills between 49 and 53°C.
Residue on evaporation	About 0.02%
Miscibility with benzene and with chloroform	Separate 5 mL portions give clear solutions with 20 mL of benzene and with 20 mL chloroform.
Solubility. To pass solubility test	The solution is clear
Phosphorus compounds (as P) (max)	0.02%
Heavy metals. To pass color test	No noticeable change in color is produced.

5.3.3 Use. Acetyl chloride, analyzed reagent, is used in organic synthesis as an acetylating agent. It is also used in pharmaceuticals.

5.3.4 Safety. Acetyl chloride is a corrosive material, highly toxic and extremely irritating to the eyes, skin and mucous membranes. Inhalation of mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Acetyl chloride shall be used with adequate ventilation. There is no TLV or PEL referenced for acetyl chloride. (Refer to 4.3.1.)

Acetyl chloride reacts violently with water, forming hydrochloric and acetic acid. Acetyl chloride also reacts violently with alcohols, oxidizing agents, alkali and certain hydrogen-containing materials to liberate hydrogen chloride. If heated to decomposition, a toxic mixture of hydrogen chloride and phosgene is emitted. The TLV for phosgene is 0.1 ppm, 0.4 mg/m^3. The PEL is the same.

5.3.5 Storage. Acetyl chloride shall be stored in a cool, dry, well ventilated place in tightly closed containers away from heat, sparks and open flame. (Refer to 4.3.2.)

5.3.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Corrosive, Reactive, Toxic; Waste No. U006.

5.4 Name. p-Aminodimethylaniline Sulfate, Analyzed Reagent

$(CH_3)_2NC_6H_4NH_2 \cdot H_2SO_4$ FW: 234.27

$[(CH_3)_2NC_6H_4NH_2]_2 \cdot H_2SO_4$ FW: 370.47

N,N-Dimethyl-p-phenylenediamine sulfate
p-Amino-N,N-dimethylaniline sulfate

5.4.1 Technical description. p-Aminodimethylaniline sulfate (pure) exists in the form of crystalline leaflets that are soluble in water. The former compound has a melting point of 234°-236°C with decomposition. p-Aminodimethylaniline sulfate is light sensitive.

5.4.2 Specification. Manufacturer's requirements. (No Government specification)

5.4.2.1 Requirements. p-Aminodimethylaniline sulfate, analyzed reagent, is commercially available with requirements as shown in Table III.

TABLE III. p-Aminodimethylaniline Sulfate, Analyzed Reagent - requirements.

$(CH_3)_2NC_6H_4NH_2 \cdot H_2SO_4$	
Assay, % by wt	98.0
Melting point (°C)	234 - 236
$[NH_2C_6H_4N(CH_3)_2]_2 \cdot H_2SO_4$	
Assay (by titration), % by wt	97.0

5.4.3 Use. p-Aminodimethylaniline sulfate, analyzed reagent, is used as a reagent for the detection of hydrogen sulfide and as a reagent for certain bacteria.

5.4.4 Safety. p-Aminodimethylaniline sulfate is highly toxic and irritating to the eyes, skin and mucous membranes. Inhalation of dust and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Aminodimethylaniline sulfate shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, p-amino-dimethylaniline sulfate will emit toxic fumes.

5.4.5 Storage. p-Aminodimethylaniline sulfate shall be stored in a cool, dry, well ventilated place in tightly closed containers protected from light. (Refer to 4.3.2.)

5.4.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.5 Name. iso-Amyl Acetate, Analyzed Reagent

$CH_3COOCH_2CH_2CH(CH_3)_2$ FW: 130.20

Acetic acid, 3-methylbutyl ester

5.5.1 Technical description. iso-Amyl acetate (pure) exists as a colorless, volatile, flammable liquid with a banana-like odor. It has a density of 0.867 at 20°/4°C. It has a boiling point of 142.0°C (288°F) at 760 mm Hg, and a melting point of -78.5°C. It has an UEL of 7.5 percent and a LEL of 1 percent at 212°F (100°C). iso-Amyl acetate has a flash point of 73°F (23°C) (SCC) and an autoignition temperature of 715°F (380°C). iso-Amyl acetate is slightly soluble in water, miscible in all proportions in alcohol and ether and soluble in acetone.

5.5.2 Specification. Federal specification O-C-265, Chemicals, Analytical; General Specification For.

5.5.2.1 Requirements. Specification requirements for iso-amyl acetate, analyzed reagent, are shown in Table IV.

TABLE IV. iso-Amyl Acetate, Analyzed Reagent - requirements (USP/NF).

Boiling range	Not less than 90% distills between 137-142°C.
Solubility in diluted alcohol	A 1.0 mL portion dissolves in 2.0 mL of diluted alcohol to form a clear solution.
Acidity (as CH_3COOH)	About 0.02%
Water	A 5 mL portion gives a clear solution with 5 mL of carbon disulfide.

5.5.3 Use. iso-Amyl acetate, analyzed reagent, is used as a solvent and in organic synthesis.

5.5.4 Safety. iso-Amyl acetate is flammable and highly irritating to the mucous membranes at high concentrations. It is irritating to the skin and eyes. Inhalation of mist and vapors shall be avoided. Prolonged or repeated contact with the skin shall be avoided. iso-Amyl acetate shall be used with adequate ventilation. The TLV for iso-amyl acetate is 100 ppm (525 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

When iso-amyl acetate is heated, it emits acrid fumes.

5.5.5 Storage. iso-Amyl acetate shall be stored in a cool, dry, well ventilated place in tightly closed containers away from heat and open flame. (Refer to 4.3.2.)

5.5.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste Number D001.

5.6 Name. n-Amyl Acetate, Reagent $CH_3COO(CH_2)_4CH_3$ FW: 130.20
Acetic acid, amyl ester
Pentyl acetate
Acetic acid, pentyl ester

5.6.1 Technical description. Amyl acetate (pure) exists as a colorless, volatile, flammable liquid that has a pear or banana-like odor. It has a boiling point of 149.25°C at 760 mm Hg, and a melting point of -70.8°C. It has an UEL of 7.5 percent and a LEL of 1 percent at 212°F (100°C). Amyl acetate has a flash point of 75°F (24°C) (SCC) and an autoignition temperature of 715°F (379°C). The specific gravity of the liquid is 0.8756 (20°/4°C) and its vapor density is 4.5 (air=1). Amyl acetate is soluble in most organic solvents and slightly soluble in water.

5.6.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.6.2.1 Requirement. Specification requirement for n-amyl acetate, reagent, is shown in Table V.

TABLE V. n-Amyl Acetate, Reagent - requirement.

Boiling point (95 mL of a 100 mL specimen) (°C)	147 - 149

5.6.3 Use. n-Amyl acetate, reagent, is used as a solvent and in organic synthesis. It is also used in the extraction of penicillin.

5.6.4 Safety. n-Amyl acetate is highly irritating to the mucous membranes at high concentrations. It is irritating to the skin and eyes. Inhalation of mist and vapors shall be avoided. Prolonged or repeated contact with the skin shall be avoided. n-Amyl acetate shall be used with adequate ventilation. The TLV for n-amyl acetate is 100 ppm (530 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

n-Amyl acetate will react vigorously with oxidizing materials. When n-amyl acetate is heated, it emits acrid fumes.

5.6.5 Storage. n-Amyl acetate shall be stored in a cool, dry, well ventilated place in tightly closed containers away from open flame and oxidizing materials. (Refer to 4.3.2.)

5.6.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste Number D001.

5.7 Name. iso-Amyl Alcohol, Analyzed Reagent $(CH_3)_2CHCH_2CH_2OH$ FW: 88.15
3-Methyl-1-butanol
iso-Pentyl alcohol

5.7.1 Technical description. iso-Amyl alcohol (pure) exists as a colorless, flammable liquid. It has a boiling point of 128.5°C at 750 mm Hg, a specific gravity of 0.8092 (25°/4°C), and a vapor density of 3.0 (air=1). Its flash point is 109°F (43°C) (SCC) and its autoignition temperature is 657°F (347°C). Its refractive index is 1.4053 at 20°/4°C. It has a LEL of 1.0 percent and an UEL of 9.0 percent at 212°C. It is slightly soluble in water, miscible with alcohol and ether and very soluble in acetone.

5.7.2 Specification. Federal specification O-C-265, Chemicals, Analytical; General Specification For.

5.7.2.1 Requirements. Specification requirements for iso-amyl alcohol, analyzed reagent, are shown in Table VI.

TABLE VI. iso-Amyl Alcohol, Analyzed Reagent - requirements (ACS).

Assay, min, % by wt	98.5
Water (H_2O), max, % by wt	0.5
Maximum Limits of Impurities (% by wt)	
Acidity (as CH_3COOH)	0.01
Maximum Limits of Impurities (ppm)	
Residue after evaporation	0.003
Acids and esters (as amyl acetate)	0.06
Carbonyl (as HCHO)	0.1

5.7.3 Use. iso-Amyl alcohol, analyzed reagent, is used as a reagent for the determination of fat in milk. It is also used in organic synthesis, microscopy, pharmaceutical products and medicine.

5.7.4 Safety. iso-Amyl alcohol is combustible and an irritant to the eyes, skin and mucous membranes. Inhalation of mists and vapors shall be avoided. Contact with the eyes and skin shall be avoided. iso-Amyl alcohol shall be used with adequate ventilation. The TLV for iso-amyl alcohol is 100 ppm (360 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

iso-Amyl alcohol can react with oxidizing materials.

5.7.5 Storage. iso-Amyl alcohol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sparks, open flame and oxidizing materials. (Refer to 4.3.2.)

5.7.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste Number D001.

5.8 Name. tert-Amyl Alcohol, Analyzed Reagent

$(CH_3)_2C(OH)CH_2CH_3$ FW: 88.15

2-Methyl-2-butanol
Dimethylethylcarbinol

5.8.1 Technical description. tert-Amyl alcohol (pure) exists as a colorless, neutral liquid. It has a melting point of -8.4°C, a boiling point of 102°C at 760 mm, a specific gravity of 0.8059 (25°/4°C), and a vapor density of 3.03 (air=1). It is slightly soluble in water, miscible with ethyl alcohol and ether, very soluble in acetone, and soluble in benzene and chloroform. Its flash point is 70°F (21°C) (SCC), and its autoignition temperature is 819°F (437°C). Its refractive index is 1.4052 at 20°C.

5.8.2 Specification. Manufacturer's requirements. (No Government specification)

5.8.2.1 Requirements. tert-Amyl alcohol, analyzed reagent, is commercially available with requirements as shown in Table VII.

TABLE VII. tert-Amyl Alcohol, Analyzed Reagent - requirements.

Boiling range (1-95 mL) (°C)	100 - 103
Maximum Limits of Impurities (% by wt)	
Residue after evaporation (% by wt)	0.004
Acids and esters (as amyl acetate), % by wt	0.06
Aldehydes	Passes test

5.8.3 Use. tert-Amyl alcohol, analyzed reagent, is used as a solvent and in organic synthesis.

5.8.4 Safety. tert-Amyl alcohol is an irritant to the eyes, skin and mucous membranes. Inhalation of mists and vapors shall be avoided. Contact with the skin and eyes shall be avoided. tert-Amyl alcohol shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

tert-Amyl alcohol can react vigorously with oxidizing materials.

5.8.5 Storage. tert-Amyl alcohol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sparks, open flame and oxidizing materials. Protect from light. (Refer to 4.3.2.)

5.8.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste Number D001.

5.9 Name. tert-Amyl Alcohol, Reagent $CH_3CH_2C(CH_3)_2OH$ FW: 88.15
2-Methyl-2-butanol
Dimethylethylcarbinol

5.9.1 Technical description. tert-Amyl alcohol (pure) exists as a colorless, neutral liquid. It has a melting point of -8.4°C, a boiling point of 102°C at 760 mm, a specific gravity of 0.8059 (25°/4°C), and a vapor density of 3.03 (air=1). It is slightly soluble in water, miscible with ethyl alcohol and ether, very soluble in acetone, and soluble in benzene and chloroform. Its flash point is 70°F (21°C) (SCC), and its autoignition temperature is 819°F (437°C). Its refractive index is 1.4052 at 20°C.

5.9.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.9.2.1 Requirements. Specification requirements for tert-amyl alcohol, reagent, are shown in Table VIII.

TABLE VIII. tert-Amyl Alcohol, Reagent - requirements.

Boiling point (95 mL of a 100 mL specimen) (°C)	100 - 103
Specific gravity (20°/4°C)	0.809 ± 0.003
Refractive index (20°C)	1.4052 ± 0.0004

5.9.3 Use. tert-Amyl alcohol, reagent, is used in organic synthesis.

5.9.4 Safety. tert-Amyl alcohol is flammable and an irritant to the eyes, skin and mucous membranes. Inhalation of mist and vapors shall be avoided. Contact with the skin and eyes shall be avoided. tert-Amyl alcohol shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

tert-Amyl alcohol will react vigorously with oxidizing materials.

5.9.5 Storage. tert-Amyl alcohol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sparks, open flame and oxidizing materials. (Refer to 4.3.2.)

5.9.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste Number D001.

5.10 Name. Anthranilic Acid, Reagent $NH_2C_6H_4COOH$ FW: 137.14
o-Aminobenzoic acid
2-Aminobenzoic acid

5.10.1 Technical description. Anthranilic acid (pure) exists as yellowish crystals that has a melting point of 146° to 147°C and a density of 1.412 g/cm^3 at 20°C. It has a flash point of 340°F (171°C). It is soluble in water, alcohol and ether, and only slightly soluble in benzene.

5.10.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.10.2.1 Requirement. Specification requirement for anthranilic acid, reagent, is shown in Table IX.

TABLE IX. Anthranilic Acid, Reagent - requirement.

Melting point (°C)	146 - 147

5.10.3 Use. Anthranilic acid, reagent, is used in the synthesis of drugs and pharmaceuticals.

5.10.4 Safety. Anthranilic acid may be irritating to the eyes, skin and respiratory organs. Inhalation of dust and mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Anthranilic acid shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

Anthranilic acid offers only a slight fire hazard.

5.10.5 Storage. Anthranilic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.10.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.11 Name. Benzaldehyde, Analyzed Reagent C_6H_5CHO FW: 106.13
Benzoic aldehyde
Benzenecarbonal
Benzenecarboxaldehyde

5.11.1 Technical description. Benzaldehyde (pure) exists as a colorless, combustible, strongly refractive, volatile oil. It has an odor resembling that of oil of bitter almonds and a burning aromatic taste. It has a melting point of -26°C and a boiling point of 178°C. Its flash point is 145°F (62°C) (SCC) and its autoignition temperature is 377°F (192°C). Benzaldehyde has a vapor pressure of 1 mm at 26.2°C and a vapor density of 3.65 (air=1). It is miscible with alcohol, ether, nonvolatile fatty oils and volatile oils. It is slightly soluble in water (0.33 g/100 mL), and very soluble in acetone and benzene.

5.11.2 Specification. Federal specification O-C-265, Chemicals, Analytical; General Specification For.

5.11.2.1 Requirements. Specification requirements for benzaldehyde, analyzed reagent, are shown in Table X.

TABLE X. Benzaldehyde, Analyzed Reagent - requirements (USP/NF).

Assay (C_6H_5CHO), min, % by wt	98.0
Specific gravity	1.041 - 1.046
Refractive index at 20°C	1.5440 - 1.5465
Hydrocyanic acid	To pass color or precipitate test

5.11.3 Use. Benzaldehyde, analyzed reagent, is used as an intermediate in the synthesis of pharmaceuticals and benzoic acid. It is also used as a solvent for oils and resins.

5.11.4 Safety. Benzaldehyde is a combustible liquid of moderate volatility which can generally be handled with normal safety precautions. The undiluted liquid is irritating to the eyes, skin and mucous membranes. Inhalation of mist and vapors shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Benzaldehyde shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

5.11.5 Storage. Benzaldehyde shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sparks and open flame and protected from light. (Refer to 4.3.2.)

5.11.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.12 Name. Benzenesulfonyl Chloride, Analyzed Reagent

$C_6H_5SO_2Cl$ FW: 176.62

Benzenesulfonic acid chloride
Benzenesulfone chloride

5.12.1 Technical description. Benzenesulfonyl chloride (pure) exists as a colorless, corrosive, oily liquid. It has a melting point of 14.5°C, a boiling point of 251° to 252°C (with decomposition), and a specific gravity of 1.3842 (15°/15°C). It is insoluble in water, and soluble in alcohol and ether.

5.12.2 Specification. Federal specification O-C-265, Chemicals, Analytical; General Specification For.

5.12.2.1 Requirements. Specification requirements for benzenesulfonyl chloride, analyzed reagent, are shown in Table XI.

TABLE XI. Benzenesulfonyl Chloride, Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	14 - 17
Boiling range (°C)	251 - 252

5.12.3 Use. Benzenesulfonyl chloride, analyzed reagent, is used in laboratory synthesis. It is also used as a catalyst.

5.12.4 Safety. Benzenesulfonyl chloride is a corrosive liquid. It is irritating to eyes, skin and mucous membranes. Inhalation of mist and vapors shall be avoided. Contact with eyes, skin and clothing shall be avoided. Benzenesulfonyl chloride shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, benzenesulfonyl chloride can emit toxic fumes.

5.12.5 Storage. Benzenesulfonyl chloride shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.12.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Corrosive, Reactive, Toxic, Waste No. U020.

5.13 Name. Benzoyl Chloride, Analyzed Reagent C_6H_5COCl FW: 140.57
Benzenecarbonyl chloride

5.13.1 Technical description. Benzoyl chloride (pure) exists as a colorless, combustible liquid with a pungent odor. Its vapor causes tears. Its melting point is -0.5°C (31°F), and boiling point is 197.2°C (387°F). Its refractive index is 1.5536 (n20/D). Its flash point is 162°F (72°C). It decomposes in water and is soluble in ether and carbon disulfide.

5.13.2 Specification. Federal specification O-C-265, Chemicals, Analytical; General Specification For.

5.13.2.1 Requirements. Specification requirements for benzoyl chloride, analyzed reagent, are shown in Table XII.

TABLE XII. Benzoyl Chloride, Analyzed Reagent - requirements (ACS).

Assay (C_6H_5COCl), min-max, % by wt	98.0-100.5
Freezing point (°C), min-max, % by wt	-2.0-0.0
Maximum Limits of Impurities (% by wt)	
Residue after ignition	0.005
Phosphorus compounds (as P)	0.002

TABLE XII. Benzoyl Chloride, Analyzed Reagent - requirements (ACS) -(Continued).

Heavy metals (as Pb)	0.001
Iron (Fe)	0.001

5.13.3 Use. Benzoyl chloride, analyzed reagent, is used in synthesis of pharmaceuticals and intermediate for benzoyl peroxide.

5.13.4 Safety. Benzoyl chloride is combustible, toxic and extremely irritating. Inhalation of vapors and mists is irritating to the mucous membranes and respiratory tract. Inhalation of vapor and mist shall be avoided. Benzoyl chloride can cause irritation and burns to the eyes and skin. Contact with the eyes, skin and clothing shall be avoided. Benzoyl chloride shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

Benzoyl chloride is a slight fire hazard when exposed to heat or flame. It will react with water or steam to produce heat and toxic and corrosive fumes. It can react vigorously with oxidizing materials.

5.13.5 Storage. Benzoyl chloride shall be stored in a cool, dry, well ventilated place in tightly sealed containers away from sparks and open flame. (Refer to 4.3.2.)

5.13.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Corrosive, Waste No. D002; Reactive, Waste No. D003.

5.14 Name. Benzyl Acetate, Reagent $CH_3COOCH_2C_6H_5$ FW: 150.18
Phenyl methyl acetate
Benzyl ethanoate

5.14.1 Technical description. Benzyl acetate (pure) exists as a water-white, burnable liquid. It has a melting point of -51.5°C, a boiling point of 215.5°C at 760 mm and 93° to 94°C at 10 mm. It has a specific gravity of 1.0550 (20°/4°C), and a refractive index of 1.5232 at 20°C. It is slightly soluble in water, and soluble in alcohol, ether and acetone. It has a flash point of 216°F (102°C) (SCC), and an autoignition temperature of 862°F (461°C).

5.14.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.14.2.1 Requirements. Specification requirements for benzyl acetate, reagent, are shown in Table XIII.

TABLE XIII. Benzyl Acetate, Reagent - requirements.

Boiling point (at 10 mm) (95 mL of 100 mL specimen) (°C)	92 - 94
Specific gravity (20°/4°C)	1.054 $\pm$ 0.003
Refractive index	1.5025 $\pm$ 0.0004

5.14.3 Use. Benzyl acetate, reagent, is used as a solvent and high boiler for cellulose acetate and nitrate; natural and synthetic resins.

5.14.4 Safety. Benzyl acetate is moderately toxic and irritating to the eyes, skin and mucous membranes. Inhalation of vapor or mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Benzyl acetate shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

Benzyl acetate can react with oxidizing materials.

5.14.5 Storage. Benzyl acetate shall be stored in a cool, dry, well ventilated place in tightly sealed containers away from open flame. (Refer to 4.3.2.)

5.14.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.15 Name. Benzyl Chloride, Analyzed Reagent $C_6H_5CH_2Cl$ FW: 126.59
Alfa chlorotoluene

5.15.1 Technical description. Benzyl chloride (pure) exists as a colorless, combustible, corrosive liquid that has a characteristic, pungent odor. It has a boiling point of 179.3°C at 760 mm, and a melting point of -39°C. Its specific gravity is 1.099 (25°/25°C), and its vapor density is 4.36 (air=1). Its flash point is 153°F (67°C) (SCC). It is insoluble in cold water and decomposes in hot water. It is soluble in ethyl alcohol, ether, benzene, hexane, methyl ethyl ketone, ethyl acetate and methylene dichloride.

5.15.2 Specification. Manufacturer's requirements. (No Government specification)

5.15.2.1 Requirements. Benzyl chloride, analyzed reagent, is commercially available with requirements as shown in Table XIV.

TABLE XIV. Benzyl Chloride, Analyzed Reagent - requirements.

Assay ($C_6H_5CH_2Cl$), by Gas Chromatography (GC), min, % by wt	97.0
Boiling range (1-95 mL) (°C)	177.0-181.0
Residue after ignition, max, % by wt	0.002

5.15.3 Use. Benzyl chloride, analyzed reagent, is used as an intermediate in organic synthesis and polymerization inhibitor.

5.15.4 Safety. Benzyl chloride is extremely irritating even in relatively low concentrations. The odor and the tears, which result following exposure to low concentrations, act as a good warning to dangerous concentrations of benzyl chloride. On contact with skin, benzyl chloride can cause severe irritation. Contact with eyes will produce severe immediate damage which may result in loss of sight. The TLV for benzyl chloride is 1 ppm (5 mg/m^3). The PEL is the

same. In case of contact with skin, wash the affected parts immediately with soap and water. (Refer to 4.3.1.)

If benzyl chloride is heated to the point of decomposition, toxic fumes of hydrogen chloride are emitted. Heating it in the presence of traces of iron can cause a violent decomposition or explosion. Benzyl chloride is a combustible liquid and is a moderate fire hazard. The ceiling limit for hydrogen chloride is 5 ppm (7 mg/m^3).

5.15.5 Storage. Benzyl chloride shall be stored in a cool, dry, well ventilated place in tightly closed containers away from direct rays of sun and sources of heat. To prevent decomposition or polymerization, only nickel, lead-lined, glass or porcelain equipment shall be used for the storage of benzyl chloride. Teflon and other fluorocarbon polymers can be used for packing. Wide range of temperature change induces vaporization and condensation, and may result in attack on nickel and steel containers. (Refer to 4.3.2.)

5.15.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Corrosive, Toxic.

5.16 Name. p-Bromoaniline, Reagent $BrC_6H_4NH_2$ FW: 172.03
4-Bromoaniline
1-Amino-4-bromobenzene

5.16.1 Technical description. p-Bromoaniline (pure) exists as white to yellowish rhombic crystals. It has a melting point of 66.4°C. Its liquid specific gravity is 1.4970 (100°/4°C). It is insoluble in water, and soluble in alcohol and ether.

5.16.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.16.2.1 Requirement. Specification requirement for p-bromoaniline, reagent, is shown in Table XV.

TABLE XV. p-Bromoaniline, Reagent - requirement.

Melting point (°C)	62 - 64

5.16.3 Use. p-Bromoaniline, reagent, is used in organic synthesis including the preparation of dihydroquinazolines.

5.16.4 Safety. p-Bromoaniline is toxic and irritating to the eyes and skin. Inhalation of vapors and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Bromoaniline shall be used with adequate ventilation. (Refer to 4.3.1.)

When heated to decomposition, p-bromoaniline can emit toxic fumes of aniline. The TLV for aniline and homologues-including skin is 2 ppm (10 mg/m^3) with a ceiling limit of 5 ppm (19 mg/m^3).

5.16.5 Storage. p-Bromoaniline shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.16.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.17 Name. Bromobenzene, Reagent C_6H_5Br FW: 157.02
Phenyl bromide

5.17.1 Technical description. Bromobenzene (pure) exists as a light yellow, mobile, combustible liquid that has a melting point of -30.8°C, and a boiling point of 156.2°C. Its flash point is 125°F (52°C) (SCC), and it has an autoignition temperature of 1051°F (566°C). It has a specific gravity of 1.495 (20°/4°C), and a vapor density of 5.41 (air=1). It has a vapor pressure of 10 mm at 40°C. It has a refractive index of 1.5597 at 20°C. It is miscible with most organic solvents and is insoluble in water.

5.17.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.17.2.1 Requirements. Specification requirements for bromobenzene, reagent, are shown in Table XVI.

TABLE XVI. Bromobenzene, Reagent - requirements.

Boiling point (95 mL of a 100 mL specimen) (°C)	154 - 157
Specific gravity (20°/4°C)	1.495 - 0.003
Refractive index (20°C)	1.5598 ± 0.0004

5.17.3 Use. Bromobenzene, reagent, is used as a solvent and in organic synthesis.

5.17.4 Safety. Bromobenzene is a volatile, combustible liquid of relatively high toxicity. It is irritating to the eyes, skin, and mucous membranes. Inhalation of vapors and mists shall be avoided. It can cause severe irritation, blisters, and burns on contact with the skin and eyes. Contact with the skin, eyes and clothing shall be avoided. Bromobenzene shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

Bromobenzene poses a moderate fire hazard when exposed to heat and open flame.

5.17.5 Storage. Bromobenzene shall be stored in a cool, dry, well ventilated place in tightly closed containers protected from direct sunlight and away from heat and open flame. (Refer to 4.3.2.)

5.17.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste No. D001.

5.18 Name. p-Bromobenzenesulfonyl Chloride, Reagent $BrC_6H_4SO_2Cl$ FW: 255.52
4-Bromobenzenesulfonic acid chloride
p-Bromobenzenesulfone chloride

5.18.1 Technical description. p-Bromobenzenesulfonyl chloride (pure) exists as colorless to white corrosive crystals. It has a melting point of 76°C, and a boiling point of 153°C at 15 mm Hg. It is insoluble in water, decomposes in alcohol, and is very soluble in ether.

5.18.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.18.2.1 Requirement. Specification requirement for p-bromobenzenesulfonyl chloride, reagent, is shown in Table XVII.

TABLE XVII. p-Bromobenzenesulfonyl Chloride, Reagent - requirement.

Melting point (°C)	75 - 77

5.18.3 Use. p-Bromobenzenesulfonyl chloride, reagent, is used as a reagent for the identification of amines.

5.18.4 Safety. p-Bromobenzenesulfonyl chloride is a corrosive solid. It is irritating to eyes, skin and mucous membranes. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Bromobenzenesulfonyl chloride shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, p-bromobenzenesulfonyl chloride can emit toxic fumes.

5.18.5 Storage. p-Bromobenzenesulfonyl chloride shall be stored in a cool, dry, well-ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.18.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.19 Name. p-Bromobenzoic Acid, Reagent BrC_6H_4COOH FW: 201.03
4-Bromobenzoic acid

5.19.1 Technical description. p-Bromobenzoic acid (pure) exists as colorless or slightly reddish crystals. It has a melting point of 254.5°C, and a density of 1.894 g/cm^3 at 20°C. It is slightly soluble in water, and soluble in alcohol and ether.

5.19.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.19.2.1 Requirement. Specification requirement for p-bromobenzoic acid, reagent, is shown in Table XVIII.

TABLE XVIII. p-Bromobenzoic Acid, Reagent - requirement.

Melting point (°C)	256 - 258

5.19.3 Use. p-Bromobenzoic acid, reagent, is used as a reagent for the detection of strontium and in organic synthesis.

5.19.4 Safety. p-Bromobenzoic acid is an irritant of the eyes and skin. Contact with the eyes, skin and clothing shall be avoided. p-Bromobenzoic acid shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, p-bromobenzoic acid can emit toxic fumes.

5.19.5 Storage. p-Bromobenzoic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.19.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.20 Name. Bromoethane, Analyzed Reagent CH_3CH_2Br FW: 108.97
Ethyl bromide
Monobromoethane

5.20.1 Technical description. Bromoethane (pure) exists as a colorless, burnable, volatile liquid that possesses an ether-like odor and a burning taste. It becomes yellowish upon exposure to air. It is produced from potassium bromide, ethyl alcohol and sulfuric acid. Its melting point is -119°C, and its boiling point is 38.4°C. Its LEL is 6.8 percent and its UEL is 8.0 percent. Its specific gravity is 1.451 (20°/4°C). Bromoethane has an autoignition temperature of 952°F (511°C) and a vapor pressure of 400 mm at 21°C. Its vapor density is 3.76 (air=1).

5.20.2 Specification. Manufacturer's requirements. (No Government specification)

5.20.2.1 Requirements. Bromoethane, analyzed reagent, is commercially available with requirements shown in Table XIX.

TABLE XIX. Bromoethane, Analyzed Reagent - requirements.

Boiling range (initial to dry point) (°C)	37.5 - 40.0
Reaction	Neutral
Maximum Limits of Impurities (% by wt)	
Residue after evaporation	0.002
Ethanol (C_2H_5OH) (by GC)	0.10
Chloroform ($CHCl_3$) (by GC)	0.10
Substances darkened by H_2SO_4	Passes test
Other bromides (as Br)	0.001

5.20.3 Use. Bromoethane, analyzed reagent, is used in organic synthesis as an ethylating agent.

5.20.4 Safety. Bromoethane is a burnable liquid and irritating to the eyes, skin and mucous membranes. Inhalation of vapors or mist shall be avoided. Its vapors are very irritating to the lungs when inhaled, even for short periods of time. Some liver and kidney damage have been found in individuals who had had repeated exposure to bromoethane. Contact with the eyes, skin and clothing shall be avoided. Bromoethane shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, bromoethane decomposes into substances such as hydrobromic acid. It will react vigorously with oxidizing materials. Contact with aluminum, magnesium and zinc shall be avoided. Bromoethane is a moderate fire hazard when exposed to heat and open flame.

5.20.5 Storage. Bromoethane shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of sparks, open flame and oxidizing materials. (Refer to 4.3.2.)

5.20.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.21 Name. p-Bromophenacyl Bromide, Reagent BrC_6H_4-CO-CH_2Br FW: 277.96
α,4-Dibromoacetophenone
2,4'-Dibromoacetophenone
α,p-Dibromoacetophenone

5.21.1 Technical description. p-Bromophenacyl bromide (pure) exists as white to colorless, fine, needle-like crystals. It has a melting point of 110° to 112°C. It is insoluble in water, and soluble in hot alcohol and ether.

5.21.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.21.2.1 Requirement. Specification requirement for p-bromophenacyl bromide, reagent, is shown in Table XX.

TABLE XX. p-Bromophenacyl Bromide, Reagent - requirement.

Melting point (°C)	110 - 112

5.21.3 Use. p-Bromophenacyl bromide, reagent, is used as a reagent for the identification of carboxylic acids.

5.21.4 Safety. p-Bromophenacyl bromide is irritating to the eyes, skin and mucous membranes. Inhalation of dust or vapor shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Bromophenacyl bromide shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, p-bromophenacyl bromide can emit toxic fumes. It offers only a slight fire hazard.

5.21.5 Storage. p-Bromophenacyl bromide shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.21.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.22 Name. p-Bromophenol, Reagent BrC_6H_4OH FW: 173.02
4-Bromophenol

5.22.1 Technical description. p-Bromophenol (pure) exists as crystals that have a melting point of 66.4°C, a boiling point of 238°C, and a density of 1.840 g/cm^3 at 15°C. It is slightly soluble in water, and very soluble in alcohol and ether.

5.22.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.22.2.1 Requirement. Specification requirement for p-bromophenol, reagent, is shown in Table XXI.

TABLE XXI. p-Bromophenol, Reagent - requirement.

Melting point (°C)	64 - 66

5.22.3 Use. p-Bromophenol, reagent, is used in organic synthesis.

5.22.4 Safety. p-Bromophenol is irritating to the eyes, skin and mucous membranes. Inhalation of dust or vapor shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Bromophenol shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, p-bromophenol can emit toxic fumes.

5.22.5 Storage. p-Bromophenol shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.22.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.23 Name. p-Bromophenylhydrazine Hydrochloride, Analyzed Reagent
$BrC_6H_4NHNH_2 \cdot HCl$ FW: 223.51
4-Bromophenylhydrazine hydrochloride

5.23.1 Technical description. p-Bromophenylhydrazine hydrochloride (pure) exists as colorless crystals that have a melting point of 209°C (with decomposition).

5.23.2 Specification. Manufacturer's requirements. (No Government specification)

5.23.2.1 Requirement. The minimum purity of commercially available p-bromophenylhydrazine hydrochloride, analyzed reagent, is 98.0 percent.

5.23.3 Use. p-Bromophenylhydrazine hydrochloride, analyzed reagent, is used in organic synthesis.

5.23.4 Safety. p-Bromophenylhydrazine hydrochloride is irritating to the eyes, skin and mucous membranes. Inhalation of dust or vapor shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Bromophenylhydrazine hydrochloride shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, p-bromophenylhydrazine hydrochloride can emit toxic fumes.

5.23.5 Storage. p-Bromophenylhydrazine hydrochloride shall be stored in a cool, dry, well-ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.23.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.24 Name. p-Bromophenylhydrazine Hydrochloride, Reagent
$BrC_6H_4NHNH_2 \cdot HCl$ FW: 223.51
4-Bromophenylhydrazine hydrochloride

5.24.1 Technical description. p-Bromophenylhydrazine hydrochloride (pure) exists as colorless crystals that have a melting point of 209°C (with decomposition).

5.24.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.24.2.1 Requirement. Specification requirement for p-bromophenylhydrazine hydrochloride, reagent, is shown in Table XXII.

TABLE XXII. p-Bromophenylhydrazine Hydrochloride, Reagent - requirement.

Melting point (°C)	199 - 200 (with decomposition)

5.24.3 Use. p-Bromophenylhydrazine hydrochloride, reagent, is used in organic synthesis for the preparation of indolacetic acid derivatives.

5.24.4 Safety. p-Bromophenylhydrazine hydrochloride is irritating to the eyes, skin and mucous membranes. Inhalation of dust or vapor shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Bromophenylhydrazine hydrochloride shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, p-bromophenylhydrazine hydrochloride can emit toxic fumes.

5.24.5 Storage. p-Bromophenylhydrazine hydrochloride shall be stored in a cool, dry, well-ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.24.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.25 Name. n-Butyl Acetate, Analyzed Reagent $CH_3COOC_4H_9$ FW: 116.16
Butyl ethanoate
Acetic acid butyl ester

5.25.1 Technical description. n-Butyl acetate (pure) exists as a colorless, volatile, flammable liquid that has a fruity odor. It has a boiling point of 126°C, and a melting point of -77.9°C. Its LEL is 1.7 percent and its UEL is 7.6 percent. n-Butyl acetate has a flash point of 75°F (24°C) Tag Closed Cup (TCC), and its autoignition temperature is 790°F (421°C). It has a specific gravity of 0.8825 (20°/4°C), and a vapor pressure of 15 mm at 25°C. It is miscible with alcohol and ether, soluble in acetone, and slightly soluble in water.

5.25.2 Specification. Federal specification O-C-265, Chemicals, Analytical; General Specification For.

5.25.2.1 Requirement. Specification requirement for n-butyl acetate, analyzed reagent, is shown in Table XXIII.

TABLE XXIII. n-Butyl Acetate, Analyzed Reagent - requirement (USP/NF).

Boiling range (Not less than 95% distills) (°C)	123 - 126

5.25.3 Use. n-Butyl acetate, analyzed reagent, is used in organic synthesis. It is also used in medicine as an extractant for penicillin.

5.25.4 Safety. n-Butyl acetate is irritating to the eyes, skin and respiratory tract. Inhalation of vapors shall be avoided. If exposure is prolonged, headache, drowsiness, and unconsciousness may result. Contact with the eyes, skin and clothing shall be avoided. n-Butyl acetate shall be used with adequate ventilation. The TLV for n-butyl acetate is 150 ppm (710 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

n-Butyl acetate is a moderate fire hazard when exposed to heat or flame.

5.25.5 Storage. n-Butyl acetate shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sparks and open flame. (Refer to 4.3.2.)

5.25.9 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste No. D001.

5.26 Name. n-Butyl Ether, Reagent $[CH_3(CH_2)_3]_2O$ FW: 130.23
1-Butoxybutane
di-n-Butyl ether

5.26.1 Technical description. n-Butyl ether (pure) exists as a colorless, stable, flammable liquid that has a mild, ethereal odor. It has a melting point of -95.3°C. It has a boiling point of 142°C and a flash point of 77°F (25°C) (SCC). It has a density of 0.769 g/ cm^3 at 20°C. Its refractive index is 1.3992 at 20°C. Its autoignition temperature is 382°F (194°C) and its vapor density is 4.48 (air=1). The LEL is 1.5 percent and the UEL is 7.6 percent. n-Butyl ether is almost insoluble in water, very soluble in acetone, and miscible with alcohol and ether. It has a tendency to form explosive peroxides, especially when anhydrous.

5.26.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.26.2.1 Requirements. Specification requirements for n-butyl ether, reagent, are shown in Table XXIV.

TABLE XXIV. n-Butyl Ether, Reagent - requirements.

Boiling point (95 mL of 100 mL specimen) (°C) (min-max)	138 - 141
Specific gravity (20°/4°C)	0.768 ± 0.003
Refractive index (20°C)	1.3993 ± 0.0004

5.26.3 Use. n-Butyl ether, reagent, is used as an extracting agent, solvent for hydrocarbons and fatty materials, and in organic synthesis.

5.26.4 Safety. n-Butyl ether is a flammable liquid. It is irritating to the eyes, skin and mucous membranes. It can be absorbed into the body by inhalation, ingestion or through the skin. Prolonged breathing of the vapors shall be avoided. Contact with the eyes, skin and clothing shall be avoided. n-Butyl ether shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

n-Butyl ether tends to form explosive peroxides, expecially when anhydrous. Addition of water or appropriate reducing agents will lessen peroxide formation. n-Butyl ether poses a fire hazard when exposed to heat and open flame. It will react vigorously with oxidizing materials. When n-butyl ether is heated, it emits acrid fumes.

5.26.5 Storage. n-Butyl ether shall be stored in a cool well-ventilated place in tightly closed containers away from sources of sparks, open flame and oxidizing materials. (Refer to 4.3.2.)

5.26.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste No. D001.

5.27 Name. dl-Camphor, Reagent $C_{10}H_{16}O$ FW: 152.24
dl-2-Camphanone

5.27.1 Technical description. dl-Camphor (pure) exists as white or colorless combustible crystals. It has a melting point of 178.8°C and a boiling point of 204°C. Its flash point is 148°F (64°C) (SCC), and its autoignition temperature is 871°F (466°C). It has a density of 0.99 g/cm^3. It is insoluble in water, very soluble in alcohol and ether, and soluble in acetone, benzene and chloroform.

5.27.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.27.2.1 Requirement. Specification requirement for dl-camphor, reagent, is shown in Table XXV, and requirements of the commercially available dl-camphor, reagent, are shown in Table XXVI.

TABLE XXV. dl-Camphor, Reagent - specification requirement.

Melting point range (°C)	173 - 174

TABLE XXVI. dl-Camphor, Reagent - requirements.

Assay, % by wt	97.0
Melting point range (°C)	175 - 177

5.27.3 Use. dl-Camphor, reagent, is used in medicine and as an intermediate in organic synthesis.

5.27.4 Safety. dl-Camphor is a combustible solid and moderately toxic. It is irritating to the eyes and skin. Prolonged breathing of vapors shall be avoided. Contact with the eyes, skin and clothing shall be avoided. dl-Camphor shall be used with adequate ventilation. The TLV for camphor (synthetic) is 2.0 ppm (12 mg/m^3); PEL is 2.0 mg/m^3. (Refer to 4.3.1.)

When heated, dl-camphor evolves flammable and explosive vapors.

5.27.5 Storage. dl-Camphor shall be stored in a cool well ventilated place in tightly closed containers away from sources of sparks and open flame. (Refer to 4.3.2.)

5.27.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.28 Name. Chloramine-T, Trihydrate, Analyzed Reagent
$CH_3C_6H_4SO_2NNaCl \cdot 3H_2O$ FW: 281.69
Sodium para-toluenesulfonchloramide
N-Chloro-p-toluenesulfonamide, sodium salt

5.28.1 Technical description. Chloramine-T, trihydrate, (pure) exists as a white crystalline powder with a slight odor of chlorine. Its melting point is 167° to 170°C (decomposes). It is soluble in water; insoluble in benzene, chloroform and ether; and is decomposed by alcohol.

5.28.2 Specification. Federal specification O-C-265, Chemicals, Analytical; General Specification For.

5.28.2.1 Requirements. Specification requirements for chloramine-T, trihydrate, analyzed reagent, are shown in Table XXVII.

TABLE XXVII. Chloramine-T, Trihydrate, Analyzed Reagent - requirements (USP/NF).

Assay ($CH_3C_6H_4SO_2NNaCl \cdot 3H_2O$), min-max, % by wt	98.0 - 103.0
Ortho-Compound	Melts at a temperature not lower than 134°C
Sodium chloride, max, % by wt	1.5

5.28.3 Use. Chloramine-T, trihydrate, analyzed reagent, is used in medicine and as a reagent in water testing.

5.28.4 Safety. Chloramine-T dust or vapor is irritating to the respiratory tract, eyes and skin. Inhalation of vapors shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Chloramine-T shall be used with adequate ventilation. It is incompatible with acids and acid fumes. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, chloramine-T can emit toxic fumes.

5.28.5 Storage. Chloramine-T, trihydrate, shall be stored in a cool, dry, well-ventilated place in tightly closed containers away from acids and acid fumes. (Refer to 4.3.2.)

5.28.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.29 Name. Chloramine-T, Trihydrate, Reagent
$CH_3C_6H_4SO_2NNaCl \cdot 3H_2O$ FW: 281.69
Sodium para-toluenesulfonchloramide
N-Chloro-p-toluenesulfonamide, sodium salt

5.29.1 Technical description. Chloramine-T, trihydrate, (pure) exists as a white crystalline powder with a slight odor of chlorine. Its melting point is 167° to 170°C (decomposes). It is soluble in water; insoluble in benzene, chloroform and ether; and is decomposed by alcohol.

5.29.2 Specification. Military specification MIL-C-11334, Chloramine-T, Reagent.

5.29.2.1 Requirements. Specification requirements for chloramine-T, trihydrate, reagent, are shown in Table XXVIII.

TABLE XXVIII. Chloramine-T, Trihydrate, Reagent - requirements.

Assay (active chlorine), % by wt	12.0 - 13.0
Form	Crystalline powder
Color	White
Solubility	To pass test

5.29.3 Use. Chloramine-T, trihydrate, reagent, is used as a reagent in water testing.

5.29.4 Safety. Chloramine-T dust or vapor is irritating to the respiratory tract, eyes and skin. Inhalation of vapors shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Chloramine-T shall be used with adequate ventilation. It is incompatible with acids and acid fumes. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, chloramine-T can emit toxic fumes.

5.29.5 Storage. Chloramine-T, trihydrate, shall be stored in a cool, dry, well-ventilated place in tightly closed containers away from acids and acid fumes. (Refer to 4.3.2.)

5.29.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.30 Name. Chlorobenzene, Analyzed Reagent C_6H_5Cl FW: 112.56
Phenyl chloride
Monochlorobenzene
Chlorobenzol

5.30.1 Technical description. Chlorobenzene (pure) exists as a clear, colorless, flammable liquid that has a pleasant aromatic, almond-line odor. It has a boiling point of 131.7°C. Chlorobenzene has an UEL of 7.1 percent at 150°C. It has a melting point of -45.6°C and a flash point of 75°F (24°C) (SCC). Chlorobenzene has a specific gravity of 1.1058 (20°/4°C). It has an autoignition temperature of 1180°F (638°C) and a vapor pressure of 10 mm at 22.2°C. Its vapor density is 3.88 (air=1). It is miscible with most organic solvents. Its refractive index is 1.5241 at 20°C.

5.30.2 Specification. Manufacturer's requirements. (No Government specification)

5.30.2.1 Requirements. Chlorobenzene, analyzed reagent, is commercially available with requirements as shown in Table XXIX.

TABLE XXIX. Chlorobenzene, Analyzed Reagent - requirements.

Boiling range (initial to dry point), max, (°C)	1.0
Recorded boiling point (°C)	132.0
Density (g/mL) at 25°C	1.101 - 1.104
Residue after evaporation, max, % by wt	0.01

5.30.3 Use. Chlorobenzene, analyzed reagent, is used as an intermediate in organic synthesis.

5.30.4 Safety. Chlorobenzene is a flammable liquid. It is irritating to the skin, eyes and mucous membranes of the upper respiratory tract. The effects can vary, depending of the degree of exposure, from drowsiness, incoordination, headache, nausea to unconsciousness or death. Liver, kidney and lung damage may result from chronic exposure. Inhalation of concentrated vapor shall be avoided. Contact with the eyes and skin shall be avoided. Chlorobenzene shall be used with adequate ventilation. The TLV for chlorobenzene is 75 ppm (350 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

Chlorobenzene poses a severe fire hazard. When it decomposes, it gives off toxic and corrosive fumes.

5.30.5 Storage. Chlorobenzene shall be stored in a cool, well-ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.30.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Toxic; Waste No. U037.

5.31 Name. Chlorobenzene, Reagent C_6H_5Cl FW: 112.56
Phenyl chloride
Monochlorobenzene
Chlorobenzol

5.31.1 Technical description. Chlorobenzene (pure) exists as a clear, colorless, flammable liquid that has a pleasant aromatic, almond-line odor. It has a boiling point of 131.7°C. Chlorobenzene has an UEL of 7.1 percent at 150°C. It has a melting point of -45.6°C and a flash point of 75°F (24°C) (SCC). Chlorobenzene has a specific gravity of 1.1058 (20°/4°C). It has an autoignition temperature of 1180°F (638°C) and a vapor pressure of 10 mm at 22.2°C. Its vapor density is 3.88 (air=1). It is miscible with most organic solvents. Its refractive index is 1.5241 at 20°C.

5.31.2 Specification. Military specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.31.2.1 Requirements. Specification requirements for chlorobenzene, reagent, are shown in Table XXX.

TABLE XXX. Chlorobenzene, Reagent - requirements.

Boiling point (°C) (95 mL of 100 mL specimen)	130 - 132
Specific gravity (20°/4°C)	1.106 ± 0.003
Refractive index (at 20°C)	1.5246 ± 0.0004

5.31.3 Use. Chlorobenzene, reagent, is used as an intermediate in organic synthesis and as a solvent.

5.31.4 Safety. Chlorobenzene is a flammable liquid. It is irritating to the skin, eyes and mucous membranes of the upper respiratory tract. The effects can vary, depending of the degree of exposure, from drowsiness, incoordination, headache, nausea to unconsciousness or death. Liver, kidney and lung damage may result from chronic exposure. Inhalation of concentrated vapor be avoided. Contact with the eyes and skin shall be avoided. Chlorobenzene shall be used with adequate ventilation. The TLV for chlorobenzene is 75 ppm (350 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

Chlorobenzene poses a severe fire hazard. When it decomposes, it gives off toxic and corrosive fumes.

5.31.5 Storage. Chlorobenzene shall be stored in a cool, well-ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.31.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Toxic; Waste No. U037.

5.32 Name. Cinnamic Acid, Analyzed Reagent $C_6H_5CH{:}CHCOOH$ FW: 148.17
trans- β -Phenylacrylic acid
trans-3-Phenylpropenoic acid

5.32.1 Technical description. Cinnamic acid (pure) exists as white, crystalline scales. Its melting point is 133°C, and its boiling point is 300°C at 760 mm. Its density is 1.2475 g/cm^3 at 4°C. It is slightly soluble in hot water, very soluble in alcohol, and soluble in ether, acetone, benzene, chloroform, toluene and methyl alcohol. It is insoluble in cold water.

5.32.2 Specification. Manufacturer's requirements. (No Government specification)

5.32.2.1 Requirements. Cinnamic acid, analyzed reagent, is commercially available with requirements as shown in Table XXXI.

TABLE XXXI. Cinnamic Acid, Analyzed Reagent - requirements.

Assay ($C_9H_8O_2$), min, % by wt	99.0
Melting point (°C)	132 - 134
Maximum Limits of Impurities (% by wt)	
Residue after ignition	0.05
Chlorinated compounds (as Cl)	0.005
Heavy metals (as Pb)	0.001
Maximum Limit of Impurity (ppm)	
Arsenic (As)	3.0

5.32.3 Use. Cinnamic acid, analyzed reagent, is used as an intermediate in organic synthesis and in medicine.

5.32.4 Safety. Cinnamic acid is irritating to the eyes and skin. Contact with the eyes, skin and clothing shall be avoided. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

Cinnamic acid offers only a slight fire hazard.

5.32.5 Storage. Cinnamic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.32.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.33 Name. Cinnamic Acid, Reagent $C_6H_5CH{:}CHCOOH$ FW: 148.17
trans-β-Phenylacrylic acid
trans-3-Phenylpropenoic acid

5.33.1 Technical description. Cinnamic acid (pure) exists as white, crystalline scales. Its melting point is 133°C, and its boiling point is 300°C at 760 mm. Its density is 1.2475 g/cm^3 at 4°C. It is slightly soluble in hot water, very soluble in alcohol, and soluble in ether, acetone, benzene, chloroform, toluene and methyl alcohol. It is insoluble in cold water.

5.33.2 Specification. Military Specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.33.2.1 Requirement. Specification requirement for cinnamic acid, reagent, is shown in Table XXXII.

TABLE XXXII. Cinnamic Acid, Reagent - requirement.

Melting point (°C)	132 - 134

5.33.3 Use. Cinnamic acid, reagent, is used as an intermediate in organic synthesis.

5.33.4 Safety. Cinnamic acid is irritating to the eyes and skin. Contact with the eyes, skin and clothing shall be avoided. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

Cinnamic acid offers only a slight fire hazard.

5.33.5 Storage. Cinnamic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.33.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.34 Name. Crotonaldehyde, Reagent $CH_3CH:CHCHO$ FW: 70.09
trans-2-Butenal
β-Methylacrolein
Crotonic aldehyde

5.34.1 Technical description. Crotonaldehyde (pure) exists as a colorless liquid. It has a melting point of -74°C, boiling point of 104° to 105°C, and specific gravity of 0.8495 (25°/4°C). Its flash point is 48°F (8°C) (SCC). It has a LEL of 2.95 percent and an UEL of 15.5 percent in air. It is soluble in water; very soluble in alcohol, ether, and acetone; and miscible with benzene.

5.34.2 Specification. Military Specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.34.2.1 Requirements. Specification requirements for crotonaldehyde, reagent, are shown in Table XXXIII.

TABLE XXXIII. Crotonaldehyde, Reagent - requirements.

Boiling point (°C) (95 mL of 100 mL specimen)	100 - 103
Specific gravity (20°/4°C)	0.857 ± 0.003

5.34.3 Use. Crotonaldehyde, reagent, is used in organic synthesis and as an alcohol denaturant.

5.34.4 Safety. Crotonaldehyde is flammable and toxic. It is irritating to the eyes and skin. It is a lachrymating material. Inhalation of vapors and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Crotonaldehyde shall be used with adequate ventilation. The TLV for crotonaldehyde is 2.0 ppm (6 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

Crotonaldehyde is a serious fire hazard when exposed to heat or flame; can react with oxidizing material.

5.34.5 Storage. Crotonaldehyde shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of sparks, open flame and oxidizing materials. (Refer to 4.3.2.)

5.34.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Toxic; Waste No. U053.

5.35 Name. Cyclohexanone, Reagent $C_6H_{10}O$ FW: 98.15
Ketohexamethylene
Pimelic ketone

5.35.1 Technical description. Cyclohexanone (pure) exists as a colorless liquid that has an acetone-like odor. It has a melting point of -45.0°C. Its boiling point is 155.65°C. Its flash point is 111°F (44°C) (TCC). It has a LEL of 1.1 percent and an UEL of 8.1 percent in air. Cyclohexanone has an autoignition temperature of 788°F (420°C). Its vapor pressure is 10 mm at

38.7°C and its vapor density is 3.4 (air=1). It is miscible with most organic solvents. Its refractive index is 1.4507 at 20°C. Its solubility in water is 2.5 percent by wt at 20°C.

5.35.2 Specification. Military Specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.35.2.1 Requirements. Specification requirements for cyclohexanone, reagent, are shown in Table XXXIV.

TABLE XXXIV. Cyclohexanone, reagent - requirements.

Boiling point (°C) (95 mL of 100 mL specimen)	154 - 156
Specific gravity (20°/4°C)	0.947 $\pm$ 0.003
Refractive index (20°C)	0.4500 $\pm$ 0.0004

5.35.3 Use. Cyclohexanone, reagent, is used in organic synthesis and as a general solvent.

5.35.4 Safety. Cyclohexanone is a combustible liquid. It is irritating to the eyes, skin and mucous membranes. It can cause damage to the liver and kidneys. Inhalation of vapors and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Cyclohexanone shall be used with adequate ventilation. The TLV for cyclohexanone is 25 ppm (100 mg/m^3). The PEL is 50 ppm (200 mg/m^3). (Refer to 4.3.1.)

Cyclohexanone will react vigorously with oxidizing materials. It poses a moderate fire hazard.

5.35.5 Storage. Cyclohexanone shall be stored in a cool, dry, well ventilated place in tightly closed containers away from heat, sparks, open flame and oxidizing materials. (Refer to 4.3.2.)

5.35.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Toxic; Waste No. U057.

5.36 Name. Diacetyl Monoxime, Reagent $CH_3C(:NOH)COCH_3$ FW: 101.11
2,3-Butanedione monoxime

5.36.1 Technical description. Diacetyl monoxime (pure) exists as white or off-white crystalline prisms or leaflets. It has a melting point of 77° to 78°C, and a boiling point of 185° to 186°C at 760 mm Hg. It is slightly soluble in water, and very soluble in alcohol, ether and chloroform.

5.36.2 Specification. Military Specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.36.2.1 Requirement. Specification requirement for diacetyl monoxime, reagent, is shown in Table XXXV.

TABLE XXXV. Diacetyl Monoxime, Reagent - requirement.

Melting point (°C)	74 - 75

5.36.3 Use. Diacetyl monoxime, reagent is used as a reagent for the colorimetric determination of urea and ureido-compounds. It is also used as a spectrometric reagent for Co(II), Cu(II) Ni(II), Pd(II) and Re(VII) and a reagent for the gravimetric determination of Ni(II).

5.36.4 Safety. Diacetyl monoxime is a burnable solid. It is irritating to the skin or eyes upon prolonged exposure. Contact with the eyes, skin and clothing shall be avoided. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition diacetyl monoxime can emit toxic fumes.

5.36.5 Storage. Diacetyl monoxime shall be stored in a cool, dry, place in tightly closed containers. (Refer to 4.3.2.)

5.36.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.37 Name. Dibutyl Phthalate, Reagent
C_6H_4-1,2-$[COO(CH_2)_3CH_3]_2$ FW: 278.35
Phthalic acid, dibutyl ester
1,2-Benzenedicarborylic acid, dibutyl ester
Dibutyl-1,2-benzenedicarboxylate

5.37.1 Technical description. Dibutyl phthalate (pure) exists as a colorless liquid. It has a specific gravity of 1.0459 (20°/4°C) and a vapor density of 9.58 (air=1). Its flash point is 340°C at 760 mm and 206°C at 20 mm Hg, and a refractive index of 1.4911 at 20°C. It is insoluble in water, very soluble in acetone, and miscible in alcohol, ether and benzene.

5.37.2 Specification. Military Specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.37.2.1 Requirements. Specification requirements for dibutyl phthalate, reagent, are shown in Table XXXVI.

TABLE XXXVI. Dibutyl Phthalate, Reagent - requirements.

Boiling point (20 mm Hg) (°C)	203 - 206
Specific gravity (20°/4°C)	1.045 $\pm$ 0.003
Refractive index (20°C)	1.4924 $\pm$ 0.0004

5.37.3 Use. Dibutyl phthalate, reagent is used in organic synthesis, as a plasticizer and as a solvent.

5.37.4 Safety. Dibutyl phthalate is a burnable liquid. It is irritating to the eyes, skin and mucous membranes. Inhalation of vapor or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Dibutyl phthalate shall be used with adequate ventilation. The TLV for dibutyl phthalate is 5 mg/m^3. The PEL is the same. (Refer to 4.3.1.)

When heated to decomposition, dibutyl phthalate can emit fumes of carbon dioxide and carbon monoxide. When in contact with oxidizing materials a vigorous reaction can occur.

5.37.5 Storage. Dibutyl phthalate shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame and oxidizing materials. (Refer to 4.3.2.)

5.37.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic; Waste Number U069.

5.38 Name. Dichloramine-T, Reagent p-Toluenesulfone-dichloramide $C_7H_7Cl_2NO_2S$ FW: 240.11

5.38.1 Technical description. Dichloramine-T is in the form of pale yellow prismatic crystals with a melting point of 83°C. It is insoluble in water, and is soluble in alcohol, ether, benzene, chloroform and carbon tetrachloride. It decomposes in hot alcohol. Dichloramine-T decomposes on exposure to air with loss of chlorine.

5.38.2 Specification. Military Specification MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.38.2.1 Requirement. Specification requirement for dichloramine-T, reagent, is shown in Table XXXVII.

TABLE XXXVII. Dichloramine-T, Reagent - requirement.

Melting point (°C)	80 - 82

5.38.3 Use. Dichloramine-T, reagent is used in medicine and as a reagent in water testing.

5.38.4 Safety. Dichloramine-T is a burnable, irritating solid. It is irritating to the eyes, and skin. Contact with the eyes, skin and clothing shall be avoided. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, dichloramine-T can emit toxic fumes.

5.38.5 Storage. Dichloramine-T shall be stored in a cool, dry, area in tightly closed containers away from open flame and protected from light. (Refer to 4.3.2.)

5.38.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.39 Name. 1,2-Dichloroethane, Analyzed Reagent CH_2CLCH_2CL FW: 98.96
Ethylene dichloride
Ethylene Chloride

5.39.1 Technical description. 1,2-Dichloroethane is in the form of a colorless liquid. Its melting point is -35.36°C and boiling point is 83.47 at 760 mm Hg. It has a density of 1.2351 at 20°C and its index of refraction is 1.4448 at 20°C. Its flash point is 13°C (55°F). It has a LEL of 6.2 percent and UEL of 15.9 percent in air. It is soluble in ether in all proportions. It is soluble in benzene and acetone and ordinary organic solvents. It is very soluble in alcohol and slightly soluble in water.

5.39.2 Specification. Federal Specification O-C-265, Chemicals, Analytical, General Specification For.

5.39.2.1 Requirements. Specification requirements for 1,2-dichloroethane, analyzed reagent, are shown in Table XXXVIII.

TABLE XXXVIII. 1,2-Dichloroethane, Analyzed Reagent - requirements (ACS).

Appearance	Clear
Color (APHA), max 1/	10
Odor	Resembling odor of chloroform
Density (g/mL) at 25°C, min-max	1.241 - 1.251
Boiling range	Entirely within 2.0°C range including 83.5°C ± 0.1°C
Maximum Limits of Impurities (% by wt)	
Residue after evaporation	0.002
Acidity (as HCl)	0.001
Water (H_2O)	0.03

1/ APHA Color Scale is identical to ASTM D 1209 (Platinum-Cobalt Scale).

5.39.3 Use. 1,2-Dichloroethane, analyzed reagent is used in organic synthesis.

5.39.4 Safety. 1,2-Dichloroethane is a flammable liquid. It is highly toxic by ingestion, inhalation and skin absorption. Inhalation of vapors or mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 1,2-Dichloroethane shall be used with adequate ventilation. The TLV for 1,2-dichloroethane is 10 ppm (40 mg/m^3). (Refer to 4.3.1.)

When heated to decomposition, 1,2-dichloroethane emits toxic fumes. It is a moderate explosion hazard in the form of vapor when exposed to flame. It is a dangerous fire hazard when exposed to heat or flame.

5.39.5 Storage. 1,2-Dichloroethane shall be stored in cool, dry well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.39.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable; Toxic, Waste No. U077.

5.40 Name. Diethanolamine, Analyzed Reagent $(HOCH_2CH_2)_2NH$ FW: 105.14
Bis(hydroxyethyl) amine
Di(2-hydroxyethyl) amine
2,2'-Dihydroxydiethyl amine
2,2'-Iminodiethanol

5.40.1 Technical description. Diethanolamine is in the form of prismatic crystals with a melting point of 28°C, above which it is a colorless, viscous liquid. It has a specific gravity of 1.09664 (20°/4°C). It has a boiling point of 269° to 271°C at 760 mm Hg with decomposition. It has a flash point of 336°F (169°C) (TCC), and an autoignition temperature of 1224°F (662°C). Its vapor pressure is 5 mm at 138°C and <0.01 mm Hg at 20°C. Its vapor density is 3.65 (air=1). It is completely miscible with water, ethanol, isopropanol, methanol and acetone. It is very slightly soluble in ether (0.7 g per 100 g) and benzene (0.2 g per 100 g).

5.40.2 Specification. Manufacturer's requirements. (No Government specification).

5.40.2.1 Requirements. Diethanolamine, analyzed reagent, is commercially available with requirements as shown in Table XXXIX.

TABLE XXXIX. Diethanolamine, Analyzed Reagent - requirements.

Assay [$(HOCH_2CH_2)_2NH$], min, % by wt	98.5
Density (g/ml) at 30°C	1.088 - 1.093
Maximum Limits of Impurities (% by wt)	
Residue after ignition	0.005
Heavy metals (as Pb)	0.002
Iron (Fe)	0.0010
Maximum Limits of Impurities (ppm)	
Chloride (Cl)	5.0

5.40.3 Use. Diethanolamine, analyzed reagent is used in organic synthesis. It is also used as an emulsifier and dispersing agent in pharmaceuticals.

5.40.4 Safety. Diethanolamine is a burnable solid. It is irritating to eyes, skin and respiratory tract. Inhalation of vapor shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Diethanolamine shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

5.40.5 Storage. Diethanolamine shall be stored in cool, dry well ventilated place in tightly closed containers away from acids, oxiding materials and open flame. (Refer to 4.3.2.)

5.40.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.41 Name. Diethyl Phthalate, Reagent $C_6H_4(COOC_2H_5)_2$ FW: 222.24
Ethyl phthalate

5.41.1 Technical description. Diethyl phthalate is a colorless liquid that has a melting point of -40.5°C, and a boiling point of 298°C at 760 mm Hg and 172°C at 12 mm Hg. Its flash point is 320°F (160°C) (SCC). Its specific gravity is 1.1175 (20°/4°C), and its refractive index is 1.5000 at 20°C. It is miscible with alcohol and ether, and soluble in acetone and benzene. It is insoluble in water.

5.41.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade, General Specification For.

5.41.2.1 Requirements. Specification requirements for diethyl phthalate, reagent, are shown in Table XL.

TABLE XL. Diethyl Phthalate, Reagent - requirements.

Boiling point (14 mm Hg) (°C) (95 mL of a 100 mL specimen)	171 - 174
Specific gravity (20°/4°C)	1.117 ± 0.003
Refractive index (20°C)	1.5018 ± 0.0004

5.41.3 Use. Diethyl phthalate, reagent is used as a solvent and alcohol denaturant.

5.41.4 Safety. Diethyl phthalate is a burnable liquid. It is moderately toxic by ingestion and inhalation. It is irritating to the eyes, skin and mucous membranes. Inhalation of vapors and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Diethyl phthalate shall be used with adequate ventilation. It is narcotic in high concentrations. The TLV for diethyl phthalate is 5 mg/m^3. There is no PEL for this compound. (Refer to 4.3.1.)

When heated to decomposition, diethyl phthalate emits irritating and toxic fumes.

5.41.5 Storage. Diethyl phthalate shall be stored in cool, dry well ventilated place in tightly closed containers away from acids, oxiding materials and open flame. (Refer to 4.3.2.)

5.41.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic, Waste No. U088.

5.42 Name. Diethylamine, Analyzed Reagent $(C_2H_5)_2NH$ FW: 73.14

5.42.1 Technical description. Diethylamine is a colorless liquid with a specific gravity of 0.7056 (20° /4°C). It has melting point of -48°C and a boiling point of 56.3°C at 760 mm Hg. It has a flash point of -20°F (-29°C) (SCC) and an autoignition temperature of 594°F (312°C). It has a vapor pressure of 400 mm at 38.0°C and a vapor density of 2.53 (air = 1). Its LEL is 1.8 percent and its UEL is 10.1 percent. It is very soluble in water, miscible with alcohol, and soluble in ether.

5.42.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.42.2.1 Requirements. Specification requirements for diethylamine, analyzed reagent, are shown in Table XLI.

TABLE XLI. Diethylamine, Analyzed Reagent - requirements (USP/NF).

Assay, min, % by wt	99.0
Specific gravity (at 25°/25°C)	0.700 - 0.705
Boiling range (°C) (between 1 mL and 95 mL of a 100 mL specimen)	55 - 58
Maximum Limits of Impurities (% by wt)	
Residue after evaporation	0.01
Water - insoluble substances	No cloudiness or turbidity when mixed with equal parts of water as specified.

5.42.3 Use. Diethylamine, analyzed reagent, is used in pharmaceuticals and as a selective solvent.

5.42.4 Safety. Diethylamine is a flammable liquid. It is irritating to the eyes, skin and mucous membranes. Inhalation of vapors and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Diethylamine shall be used with adequate ventilation. The TLV for diethylamine is 10 ppm (30 mg/m^3). The PEL is 25 ppm (75 mg/m^3). (Refer to 4.3.1.)

When heated to decomposition, diethylamine emits toxic fumes.

5.42.5 Storage. Diethylamine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from heat, sparks, open flame, acids, acid anhydrides, halides and oxidizing materials. (Refer to 4.3.2.)

5.42.6 Disposal. For appropriate procedures, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable; Waste Number D001.

5.43 Name. 1,2-Dimethoxyethane, Analyzed Reagent
$CH_3OCH_2CH_2OCH_3$ FW: 90.12

5.43.1 Technical description. 1,2-Dimethoxyethane is in the form of a colorless liquid with a melting point of -58°C and a boiling point of 83° to 84°C. Its specific gravity is 0.86285 (20°/4°C). It has a refractive index

of 1.3796 (20°C). It has a flash point of 34°F (1°C) (SCC). It is soluble in water, alcohol, ether, acetone, benzene and chloroform.

5.43.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.43.2.1 Requirements. Specification requirements for 1,2-dimethoxyethane, analyzed reagent, are shown in Table XLII.

TABLE XLII. 1,2-Dimethoxyethane, Analyzed Reagent - requirements (USP/NF).

Boiling range (°C) (not less than 95% distills)	83 - 86
Refractive index (20°C, Na-D-line)	1.379 - 1.381
Acidity (as CH_3COOH) (max %)	0.015
Water (max %)	0.20

5.43.3 Use. 1,2 Dimethoxyethane, analyzed reagent, is used as a solvent to facilitate the formation of alkali metal-hydrocarbon adducts.

5.43.4 Safety. 1,2-Dimethoxyethane is a flammable liquid. It is irritating to the eyes, skin and respiratory tract. Inhalation of vapors or mists shall be avoided. Vapors may cause dizziness or suffocation. 1,2-Dimethoxyethane is irritating to eyes and skin. Contact with the eyes, skin and clothing shall be avoided. 1,2-Dimethoxyethane shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

1,2-Dimethoxyethane vapors can form explosive mixtures in air. It can form peroxides on standing. It is a dangerous fire hazard and can react vigorously with oxidizing materials.

5.43.5 Storage. 1,2-Dimethoxyethane shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks, and open flame, and oxidizing materials. (Refer to 4.3.2.)

5.43.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable; Waste Number D001.

5.44 Name. 5,5-Dimethyl-1,3-Cyclohexanedione, Reagent
$(CH_3)_2C_6H_6(O)_2$ FW: 140.19

1,1-Dimethy-3,5-dibetocyclohexane
1,1-Dimethyl-3,5-cyclohexanedione
Dimedone
Methone

5.44.1 Technical description. 5,5-Dimethyl-1,3-cyclohexanedione is in the form of yellowish needles or prisms, and has a melting point of 150°F with decomposition. It is slightly soluble in hot water and ether. It is soluble in acetone, methanol, ethanol, benzene, and in a 50 percent ethanol - water mixture. It is very soluble in chloroform. It is light sensitive.

5.44.2 Specification. Military Specification, MIL-C-51130, Chemical Reagent Grade; General Specification For.

5.44.2.1 Requirements. Specification requirements for 5,5-dimethyl-1,3-cyclohexanedione, reagent, are shown in Table XLIII.

TABLE XLIII. 5,5-Dimethyl-1,3-Cyclohexanedione, Reagent - requirements.

Melting point	147 - 149

5.44.3 Use. 5,5-Dimethyl-1,3-cyclohexanedione, reagent, is used in the detection of ethyl alcohol and identification of aldehydes.

5.44.4 Safety. 5,5-Dimethyl-1,3-cyclohexanedione is a burnable solid. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust, vapors and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 5,5-Dimethyl-1,3- cyclohexanedione shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, 5,5-Dimethyl-1,3-cyclohexanedione can emit toxic fumes.

5.44.5 Storage. 5,5-Dimethy-1,3-cyclohexanedione shall be stored in a cool, dry, well ventilated place in tightly closed containers away from light and sources of heat,and open flame. (Refer to 4.3.2.)

5.44.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.45 Name. p-Dimethylaminobenzaldehyde, Analyzed Reagent
$(CH_3)NC_6H_4CHO$ FW: 149.19

4-Dimethylaminobenzaldehyde
4-Dimethylaminobenzenecarbinol
Ehrlich's

5.45.1 Technical description. p-Dimethylaminobenzaldehyde (pure) exists as a form of small, granular, white to lemon colored crystals or leaflets that may turn pink upon exposure to light. It has a melting point of 74°C and a boiling point of 176° to 177°C at 17 mm Hg. It is slightly soluble in alcohol, ether, chloroform, acetic acid and many other organic solvents.

5.45.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.45.2.1 Requirements. Specification requirements for p-dimethylaminobenzaldehyde, analyzed reagent, are shown in Table XLIV.

TABLE XLIV. p-Dimethylaminobenzaldehyde, Analyzed Reagent - requirements (ACS).

Melting point (°C), min-max	73 - 75
Solubility in alcohol (1 g in 25 mL alcohol)	To pass test. The solution shall be clear and colorless
Solubility in hydrochloric acid 1 g in 20 mL of dilute hydrochloric acid (1+10)	To pass test. Complete; the solution shall be clear
Color of hydrochloric acid solution	To pass test. No darker than color reference solution
Residue after ignition, % by wt, max	0.1

5.45.3 Use. p-Dimethylaminobenzaldehyde, analyzed reagent, is used as an analytical reagent for the determination of amino acids and peptides, amines, indoles, hydrazines and hydrogen peroxides. It is also used as a spray reagent for tryptophan.

5.45.4 Safety. p-Dimethylaminobenzaldehyde is a burnable solid. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust, or vapors and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. In cases of chronic exposure to the skin, it may cause severe irritation. p-Dimethylaminobenzaldehyde shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, p-Dimethylaminobenzaldehyde can emit toxic fumes.

5.45.5 Storage. p-Dimethylaminobenzaldehyde shall be stored in a cool, dry, well ventilated place in tightly closed containers away from open flame. (Refer to 4.3.2.)

5.45.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Not listed in 40 CFR.

5.46 Name. N,N-Dimethylaniline, Analyzed Reagent $C_6H_5N(CH_3)_2$ FW: 121.18
Dimethylphenylamine

5.46.1 Technical description. N,N-Dimethylaniline is an oily liquid with a specific gravity of 0.9557 (20° /4°C), a melting point of 2.45°C and a boiling point of 194.15°C at 760 mm Hg. Its flash point is 145°F (62°C) (SCC). It is slightly soluble in water; soluble in alcohol, ether, acetone and benzene; and very soluble in chloroform.

5.46.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.46.2.1 Requirements. Specification requirements for N,N-dimethylaniline, analyzed reagent, are shown in Table XLV.

TABLE XLV. N,N-Dimethylaniline, Analyzed Reagent - requirements (USP/NF).

Boiling range (°C) (max difference) (between 1 to 95 mL of 100 mL specimen)	2.5
Hydrocarbons (5 mL in mixture of 10 mL hydrochloric acid and 15 mL of water)	Clear solution to 10°C
Aniline or monomethylaniline (5 mL sample)	To pass color test. Not more than 300 mL of sodium hydroxide is consumed.

5.46.3 Use. N,N-Dimethylaniline, analyzed reagent, is used as a reagent for the detection of ferrecyanides, nitrates and nitrites.

5.46.4 Safety. N,N-Dimethylaniline is a combustible and highly toxic liquid. It is toxic by inhalation of vapors and by absorption of liquid through skin. Inhalation of vapors shall be avoided. Contact with the eyes, and clothing shall be avoided. N,N-Dimethylaniline shall be used with adequate ventilation. The TLV for N,N-Dimethylaniline - including skin is 5 ppm (25 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

N,N-Dimethylaniline will emit toxic fumes if vaporized or heated to decomposition.

5.46.5 Storage. N,N-Dimethylaniline shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.46.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.47 Name. m-Dinitrobenzene, Analyzed Reagent $C_6H_4(NO_2)_2$ FW: 168.11
m-Dinitrobenzol
1,3-Dinitrobenzene

5.47.1 Technical description. m-Dinitrobenzene is in the form of colorless to yellowish crystalline rhombic needles or plates with a melting point of 90.02°C, a boiling point of 302.8°C at 770 mm and 291°C at 754 mm Hg, and a specific gravity of 1.575 (18°/4°C). It is slightly soluble in hot water; soluble in ether; and very soluble in acetone, hot alcohol, benzene and chloroform.

5.47.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.47.2.1 Requirements. Specification requirements for m-dinitrobenzene, analyzed reagent, are shown in Table XLVI.

TABLE XLVI. m-Dinitrobenzene, Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	Between 89 and 90
Residue on ignition, % by wt, max	0.5

5.47.3 Use. m-Dinitrobenzene, analyzed reagent, is used in organic synthesis and for the identification of ketones.

5.47.4 Safety. m-Dinitrobenzene is a burnable solid. It is highly toxic and may be fatal if absorbed through skin or by inhalation of dust or vapors. Inhalation of dust or vapors shall be avoided. It is irritating to the eyes, skin and mucous membranes. Contact with the eyes, skin and clothing shall be avoided. Remove contaminated clothing immediately and wash before reuse. m-Dinitrobenzene shall be used with adequate ventilation. The TLV for m-Dinitrobenzene (all isomers) - including skin is 0.15 ppm (1.0 mg/m^3). The PEL is 1 mg/m^3. (Refer to 4.3.1.)

When heated to decomposition, m-dinitrobenzene can emit toxic vapors. It is also an explosive hazard.

5.47.5 Storage. m-Dinitrobenzene shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.47.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic

5.48 Name. 3,4-Dinitrobenzoic Acid, Analyzed Reagent
$(NO_2)_2C_6H_3COOH$ FW: 212.12

5.48.1 Technical description. 3,4-Dinitrobenzoic acid is in the form of white needles with a melting point of 165°C. It is slightly soluble in water and very soluble in alcohol and ether.

5.48.2 Specification. Manufacturer's requirements. (No Government specification)

5.48.2.1 Requirements. 3,4-Dinitrobenzoic acid, analyzed reagent, is commercially available with requirements as shown in Table XLVII.

TABLE XLVII. 3,4-Dinitrobenzoic Acid, Analyzed Reagent - requirements.

Assay (NO2)2C6H3COOH), % by wt	99.0
Melting point (°C)	165 - 167

5.48.3 Use. 3,4-Dinitrobenzoic acid, analyzed reagent, is used as a reagent for the detections of sugars.

5.48.4 Safety. 3,4-Dinitrobenzoic acid is a burnable solid. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 3,4-dinitrobenzoic shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, 3,4-dinitrobenzoic acid emits toxic fumes.

5.48.5 Storage. 3,4-Dinitrobenzoic shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.48.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.49 Name. 3,5-Dinitrobenzoic Acid, Analyzed Reagent $(NO_2)_2C_6H_3COOH$ FW: 212.12

5.49.1 Technical description. 3,5-Dinitrobenzoic acid is in the form of crystalline monoclinic prisms with a melting point of 205°C. It is slightly soluble in water and ether, soluble in alcohol, and acetic acid and insoluble in benzene.

5.49.2 Specification. Manufacturer's requirements. (No Government specification)

5.49.2.1 Requirements. 3,5-Dinitrobenzoic acid, analyzed reagent, is commercially available with requirements as shown in Table XLVIII.

TABLE XLVIII. 3,5-Dinitrobenzoic Acid, Analyzed Reagent - requirements.

Assay $(NO_2)_2C_6H_3COOH$), % by wt	99.0
Melting point (°C)	205 - 207

5.49.3 Use. 3,5-Dinitrobenzoic acid, analyzed reagent, is used as a reagent for the separation of α and β-aspartyl-L-phenylalanine and in the chromatographic determination of essential oil constituents.

5.49.4 Safety. 3,5-Dinitrobenzoic acid is a burnable solid. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 3,5-dinitrobenzoic shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, 3,5-dinitrobenzoic acid emits toxic fumes.

5.49.5 Storage. 3,5-Dinitrobenzoic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.49.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.50 Name. 3,5-Dinitrobenzoic Acid, Reagent $(NO_2)_2C_6H_3COOH$ FW: 212.12

5.50.1 Technical description. 3,5-Dinitrobenzoic acid, reagent, is in the form of crystalline monoclinic prisms with a melting point of 205°C. It is

slightly soluble in water and ether, soluble in alcohol, and acetic acid and insoluble in benzene.

5.50.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade, General Specification For.

5.50.2.1 Requirement. Specification requirement for 3,5-dinitrobenzoic acid, reagent, is shown in Table XLIX.

TABLE XLIX. 3,5-Dinitrobenzoic Acid, Reagent - requirement.

Melting point (°C)	203 - 205

5.50.3 Use. 3,5-Dinitrobenzoic acid, reagent, is used as a reagent for the separation of α and β -aspartyl-L-phenylalanine and in the chromatographic determination of essential oil constituents.

5.50.4 Safety. 3,5-Dinitrobenzoic acid is a burnable solid. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 3,5-dinitrobenzoic shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, 3,5-dinitrobenzoic acid emits toxic fumes.

5.50.5 Storage. 3,5-Dinitrobenzoic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.50.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.51 Name. 3,5-Dinitrobenzoyl Chloride, Analyzed Reagent

$(NO_2)_2C_6H_3COCL$ FW: 230.57

5.51.1 Technical description. 3,5-Dinitrobenzoyl chloride is in the form of yellow crystalline needles with a melting point of 74°C and a boiling point of 196°C at 12 mm Hg. It is decomposed by water and alcohol, and is soluble in ether.

5.51.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical, General Specification For.

5.51.2.1 Requirements. Specification requirements for 3,5-dinitrobenzoyl chloride, analyzed reagent, are shown in Table L.

TABLE L. 3,5-Dinitrobenzoyl Chloride, Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	67 - 69
Solubility in sodium hydroxide (Solution of 500 mg in 25 mL of 1N NaOH)	Clear or not more than faintly turbid
Residue on ignition, max, % by wt	0.1

5.51.3 Use. 3,5-Dinitrobenzoyl chloride, analyzed reagent, is used as a reagent in the identification of amino acids and in the characterization of the alcohol part of acetals and ketals without prior hydrolysis and separation of the alcohol.

5.51.4 Safety. 3,5-Dinitrobenzoyl chloride is a highly toxic, burnable solid. It is toxic by inhalation and is irritating to eyes, skin and mucous membranes. Inhalation of dust or vapor shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 3,5-Dinitrobenzoyl chloride shall be used with adequate ventilation. (Refer to 4.3.1.)

When heated to decomposition or vaporized, 3,5-dinitrobenzoyl chloride emits toxic fumes. It is decomposed by water; emitting hydrogen chloride. The TLV for hydrogen chloride is 5.0 ppm (7.0 mg/m^3) - ceiling limit. The PEL is the same.

5.51.5 Storage. 3,5-Dinitrobenzoyl chloride shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.51.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.52 Name. 2,4-Dinitrochlorobenzene, Analyzed Reagent
$(NO_2)_2C_6H_3CL$ FW: 202.56

1-Chloro-2,4-dinitrobenzene
4-Chloro-1,3-dinitrobenzene

5.52.1 Technical description. 2,4-Dinitrochlorobenzene is in the form of yellow rhombic crystals or needles. The α-form is stable and has a melting point of 53°C. Its specific gravity as a liquid is 1.4982 at 75°/4°C and 1.697 at 22°C as a solid. Its boiling point is 315°C at 762 mm Hg. It is insoluble in water, slightly soluble in alcohol and soluble in ether, benzene and carbon disulfide.

5.52.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.52.2.1 Requirements. Specification requirements for 2,4-dinitrochlorobenzene, analyzed reagent, are shown in Table LI.

TABLE LI. 2,4-Dinitrochlorobenzene, Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	51 - 53
Residue on ignition, max, % by wt	0.2

2,4-Dinitrochlorobenzene, analyzed reagent, is available commercially with the following theoretical values as shown in Table LII.

TABLE LII. 2,4-Dinitrochlorobenzene - theoretical values (% by weight).

Carbon (C)	35.6
Chlorine (CL)	17.5
Hydrogen (H)	1.5
Nitrogen (N)	13.8
Oxygen (O)	31.6

5.52.3 Use. 2,4-Dinitrochlorobenzene, analyzed reagent, is used as a reagent for the detection and determination of nicotinic acid, nicotinamide and other pyridine compounds. It is also used as a reference standard for the determination of C, H, CL, N and O.

5.52.4 Safety. 2,4-Dinitrochlorobenzene is a burnable solid. It is toxic by inhalation and absorption through skin. It is a primary irritant as well as a sensitizer of skin. It is also irritating to eyes and mucous membranes. Inhalation of dust or mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 2,4-Dinitrochlorobenzene shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition 2,4-Dinitrochlorobenzene emits toxic fumes. It is a moderate explosion hazard when exposed to sparks and open flame or in a fire.

5.52.5 Storage. 2,4-Dinitrochlorobenzene shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.52.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.53 Name. 2,4-Dinitrophenylhydrazine, Analyzed Reagent
$(NO2_2)2C_6H_3NHNH_2$ FW: 198.14

5.53.1 Technical description. 2,4-Dinitrophenylhydrazine is a bluish-red crystalline powder with a melting point of 194°C that decomposes at 198°C. It is insoluble in water; slightly soluble in ether benzene and chloroform; and soluble in hot alcohol and hot ethyl acetate. It is also soluble in dilute inorganic acids.

5.53.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.53.2.1 Requirements. Specification requirements for 2,4-dinitrophenylhydrazine, analyzed reagent, are shown in Table LIII.

TABLE LIII. 2,4-Dinitrophenylhydrazine Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	197 - 200
Solubility in sulfuric acid (500 mg dissolved in mixture of 25 mL sulfuric acid and 25 mL water)	Clear solution or not more than slightly turbid
Residue on ignition, max, % by wt	Negligible

5.53.3 Use. 2,4-Dinitrophenylhydrazine, analyzed reagent, is used as a reagent for the determination of aldehydes and ketones.

5.53.4 Safety. 2,4-Dinitrophenylhydrazine is a flammable solid that is explosive when dry. It shall be kept moist to prevent explosive decomposition of the dry powder. It is irritating to the eyes skin and mucous membranes. It is also a skin sensitizer. Prolonged or repeated contact shall be avoided. Inhalation of vapors and mist shall be avoided. Inhalation can cause blood cell destruction and anemia. Contact with the eyes, skin and clothing shall be avoided. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

5.53.5 Storage. 2,4-Dinitrophenylhydrazine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. 2,4-Dinitrophenylhydrazine shall be kept moist (10 to 20 percent moisture content) as delivered, in order to maintain stability of the compound. Containers shall be stored so as to prevent accidental breakage of containers and leakage of contents because when dry the compound can be explosive. (Refer to 4.3.2.)

5.53.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Reactive; Waste Number D003.

5.54 Name. sym-Di-o-Tolylthiourea, Reagent $SC(NHC_6H_4CH_3)_2$ FW: 256.37
1,3-Di(2-tolyl)-2-thiourea
2,2-Dimethylthiocarbanilide

5.54.1 Technical description. sym-Di-o-tolylthiourea is in the form of colorless needles. It has a melting point of 165-166°C and a boiling point of 216-218°C at 760 mm Hg. It is slightly soluble in hot alcohol and soluble in benzene, chloroform and acetic acid. It is insoluble water and ether.

5.54.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade, General Specification For.

5.54.2.1 Requirement. Specification requirement for sym-di-o-tolylthiourea, reagent, is shown in Table LIV.

TABLE LIV. sym-Di-o-Tolylthiourea, Reagent - requirement.

Melting point (°C)	148 - 152

5.54.3 Use. sym-Di-o-tolylthiourea, reagent, is used as a laboratory reagent.

5.54.4 Safety. sym-Di-o-tolylthiourea is a burnable solid. It is a slight allergen and contact with the eyes and skin shall be avoided. sym-Di-o-tolylthiourea shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, sym-di-o-tolylthiourea will emit toxic fumes.

5.54.5 Storage. sym-Di-o-tolylthiourea shall be stored in a cool, dry place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.54.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.55 Name. sym-Diphenylthiourea, Reagent $C_6H_5NHCSNHC_6H_5$ FW: 228.32
N,N-Diphenylthiourea
1,3-Diphenyl-2-thiourea
Thiocarbonilide

5.55.1 Technical description. sym-Diphenylthiourea is in the form of crystalline leaflets with a melting point of 154°C and a density of 1.32 g/cm^3. It is slightly soluble in water, and very soluble in alcohol, ether and chloroform.

5.55.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade, General Specification For.

5.55.2.1 Requirement. Specification requirement for sym-diphenylthiourea, reagent, is shown in Table LV.

TABLE LV. sym-Diphenylthiourea, Reagent - requirement.

Melting point (°C)	153 - 154

5.55.3 Use. sym-Diphenylthiourea, reagent, is used in the synthesis of synthetic organic pharmaceuticals.

5.55.4 Safety. sym-Diphenylthiourea is a burnable solid. It is a slight irritant. Contact with the eyes and skin and clothing shall be avoided. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition or contained in a fire, sym-diphenylthiourea can emit toxic fumes.

5.55.5 Storage. sym-Diphenylthiourea shall be stored in a cool, dry place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.55.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.56 Name. Dithiooxamide, Analyzed Reagent $NH_2CSC_5NH_2$ FW: 120.20
Rubeanic acid

5.56.1 Technical description. Dithiooxamide is in the form of orange-brown crystals or crystalline powder, which decomposes at 170°C. It is slightly soluble in water and alcohol, and soluble in acetone. It is also soluble in concentrated sulfuric acid.

5.56.2 Specification. Manufacturer's requirements. (No Government specification)

5.56.2.1 Requirements. Dithiooxamide, analyzed reagent, is commercially available with requirements as shown in Table LVI.

TABLE LVI. Dithiooxamide, Analyzed Reagent - requirements.

Maximum Limits of Impurities (% by wt)	
Loss on drying	0.5
Residue after ignition	1.0
Sensitivity	Passes test

5.56.3 Use. Dithiooxamide, analyzed reagent, is used as a reagent for copper, cobalt and nickel.

5.56.4 Safety. Dithiooxamide is a burnable solid. It is irritating to the eyes, skin and mucous membranes and respiratory tract. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Dithiooxamide shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, dithiooxamide, can emit toxic fumes.

5.56.5 Storage. Dithiooxamide shall be stored in a cool, dry place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.56.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.57 Name. Ethyl Alcohol, Analyzed Reagent CH_3CH_2OH FW: 46.07
Ethanol
Alcohol

5.57.1 Technical description. Ethyl alcohol (pure) exists as a colorless, limpid, volatile liquid with a refractive index of 1.3611 at 20°C and a specific gravity of 0.7893 at 20/4°C. Its freezing point is -114°C (-173°F) and boiling point is 79°C (174°F). It has an autoignition temperature of 423°C (793°F) and a LEL in air of 3.3 percent and an UEL in air of 19 percent. Its surface tension is 22.8 dynes/cm at 20°C and viscosity is 0.0141 poise at 20°C. It has a specific heat of 0.618 cal/g at 23°C. It is miscible with water, ether, methyl alcohol, chloroform and acetone.

5.57.2 Specification. Federal, O-C-265, Chemicals, Analytical; General Specification For. Ethyl alcohol, analyzed reagent, is also covered by Interim Federal Specification, O-E-00760 (TR-IR), Ethyl Alcohol (Ethanol); Denatured Alcohol; Proprietary Solvents And Special Industrial Solvents as Type I - Analytical Reagent (ACS grade), Grade B - 95 percent by volume.

5.57.2.1 Requirements. ACS requirements for ethyl alcohol, analyzed reagent are shown in Table LVII. Interim Federal Specification O-E-00760 (TR-IR) requirements for ethyl alcohol, analyzed reagent, are shown in Table LVIII.

TABLE LVII. Ethyl alcohol, Analyzed Reagent - requirements (ACS)

Assay, min, % by volume	95.0
Color (APHA), max 1/	10.0
Solubility in water	To pass test
Maximum Limits of Impurities (% by wt)	
Residue after evaporation	0.001
Acetone to pass test. Limit about	0.001
Isopropyl alcohol to pass test. Limit about	0.003
Acidity (as CH_3COOH)	0.003
Fusel oil	To pass test
Methanol (CH_3OH) to pass test. Limit about	0.100
Substances darkened by sulfuric	To pass test
Substances reducing permanganate	To pass test
Maximum Limits of Impurities (ppm)	
Alkalinity (as NH_3)	3.0

1/ APHA Color Scale is identical to ASTM D 1209 (Platinum-Cobalt Scale).

Note: Ethyl alcohol, analyzed reagent, is also covered by the following specification as Type I - Analytical Reagent (ACS grade), Grade B - 95 percent by volume.

TABLE LVIII. Ethyl Alcohol, Analyzed Reagent - O-E-00760 (TR-IR) requirements.

Specific gravity at 15.56°C/15.56°C, max (in air)	0.815
Acidity as acetic acid, max %	0.003
Nonvolatile residue (g/100 mL) max	0.001
Solubility in water	Pass
Methyl alcohol (limit about 0.1 %)	Pass
Fusel oil	Pass
Substances reducing permanganate (aldehydes and organic impurities) minimum minutes	5
Acetone, other ketones, isopropyl alcohol, and tertiary butyl alcohol	Pass

5.57.3 Use. Ethyl alcohol, analyzed reagent, is used in laboratory synthesis or organic compounds, in the preparation of denatured alcohol and in medicine.

5.57.4 Safety. Ethyl alcohol is a flammable liquid. Exposure to high concentrations of ethyl alcohol vapor or fumes may result in irritation of the eyes and mucous membranes of the upper respiratory tract. Inhalation of high concentrations shall be avoided. Contact with the eyes shall be avoided. Ethyl alcohol shall be used with adequate ventilation. The TLV for ethyl alcohol is 1900 mg/m^3. The PEL is the same. (Refer to 4.3.1.)

Ethyl alcohol is a dangerous fire hazard when exposed to heat or flame.

5.57.5 Storage. Ethyl alcohol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.57.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable; Waste Number D001

5.58 Name. Ethyl Alcohol, Absolute, Analyzed Reagent

CH_3CH_2OH FW: 46.07

Ethanol absolute
Alcohol absolute

5.58.1 Technical description. Ethyl alcohol (pure) exists as a colorless, limpid, volatile liquid with a refractive index of 1.3611 at 20°C and a specific gravity of 0.7893 at 20/4°C. Its freezing point is -114°C (-173°F) and boiling point is 79°C (174°F). It has an autoignition temperature of 423°C (793°F) and a LEL in air of 3.3 percent and an UEL in air of 19 percent. Its surface tension is 22.8 dynes/cm at 20°C and its viscosity is 0.0141 poise at 20°C. It has a specific heat of 0.618 cal/g at 23°C. It is miscible with water, ether, methyl alcohol, ether, chloroform and acetone.

5.58.2 Specification. Federal, O-C-265, Chemicals, Analytical; General Specification For. Ethyl alcohol, absolute, analyzed reagent, is also covered by Interim Federal Specification, O-E-00760 (TR-IR), Ethyl Alcohol (Ethanol); Denatured Alcohol; Proprietary Solvents and Special Industrial Solvents.

5.58.2.1 Requirements. ACS requirements for ethyl alcohol, absolute, analyzed reagent, are shown in Table LIX. Interim Federal Specification O-E-00760 (TR-IR) requirements for ethyl alcohol, absolute, analyzed reagent, are shown in Table LX.

TABLE LIX. Ethyl Alcohol, Absolute, Analyzed Reagent - requirements (ACS).

Assay (CH_3CH_2OH), min, % by vol	99.5
Assay (CH_3CH_2OH), min, % by wt, about	99.2
Color (APHA)(max) 1/	10.0
Solubility in water	To pass test

TABLE LIX. Ethyl Alcohol, Absolute, Analyzed Reagent - requirements (ACS) (Continued).

Maximum Limits of Impurities (% by wt)	
Water (H_2O)	0.2
Residue after evaporation	0.001
Acetone to pass test. Limit about	0.001
Isopropyl alcohol to pass test. Limit about	0.003
Titratable acid. Not more than	0.0005 meq/g
Titratable base. Not more than	0.0002 meq/g
Fusel oil	To pass test
Methanol (CH_3OH) to pass test. Limit about	0.1
Substances darkened by sulfuric acid	To pass test
Substances reducing permanganate	To pass test

1/ APHA Color Scale is identical to ASTM D 1209 (Platinum-Cobalt Scale).

Note: Ethyl alcohol, absolute is also covered by the following specification as Type I - Analytical Reagent (ACS grade), Grade A - Absolute (99.5 percent by volume).

TABLE LX. Ethyl Alcohol, Absolute, Analyzed Reagent - O-E-00760 (TR-IR) requirements.

Specific gravity at 15.56°/15.56°C, max (in air)	0.7962
Acidity as acetic acid, max %	0.003
Nonvolatile residue (g/100mL max)	0.001
Solubility in water	Pass
Methyl alcohol (limit about 0.1%)	Pass
Fusel oil	Pass
Substances reducing permanganate (aldehydes and organic impurities), minimum minutes	5
Acetone, other ketones, isopropyl alcohol, and tertiary butyl alcohol	Pass

5.58.3 Use. Ethyl alcohol, absolute, analyzed reagent, is used in laboratory synthesis of organic compounds, as a laboratory solvent and in pharmaceuticals.

5.58.4 Safety. Ethyl alcohol is a flammable liquid. Exposure to high concentrations of ethyl alcohol vapor or fumes may result in irritation of the eyes and mucous membranes of the upper respiratory tract. Inhalation of high concentrations of ethyl alcohol vapor or fumes shall be avoided. Contact with the eyes shall be avoided. Ethyl alcohol shall be used with adequate ventilation. The TLV for ethyl alcohol is 1900 mg/m^3. The PEL is the same. (Refer to 4.3.1.)

Ethyl alcohol is a dangerous fire hazard when exposed to heat or flame

5.58.5 Storage. Ethyl alcohol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.58.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste Number D001.

5.59 Name. Ethylene Chlorohydrin, Analyzed Reagent

CH_2CLCH_2OH FW: 80.52

2-Chloroethyl alcohol
Glycol chlorohydrin
2-Chloroethanol

5.59.1 Technical description. Ethylene chlorohydrin is a colorless liquid with a melting point of -67.5°C and a boiling point of 128°C at 760 mm Hg. Ethylene chlorohydrin has a specific gravity of 1.20027 (20°/4°C) and a refractive index of 1.44189 at 20°C. Its flash point is 140°F (60°C) (SCC), and its autoignition temperature is 797°F (425°C). It has a LEL of 4.9 percent and an UEL of 15.9 percent It is miscible with water and alcohol, and slightly soluble in ether.

5.59.2 Specification. Manufacturer's requirements. (No Government specification)

5.59.2.1 Requirements. Ethylene chlorohydrin, analyzed reagent, is commercially available with requirements as shown in Table LXI.

TABLE LXI. Ethylene Chlorohydrin, Analyzed Reagent - requirements.

Assay, by Gas Liquid Chromatography (GLC), min, % by wt	98.0
Boiling range	2°C range including 126°C.

5.59.3 Use. Ethylene chlorohydrin, analyzed reagent, is used for the introduction of the hydroxyethyl group in organic synthesis.

5.59.4 Safety. Ethylene chlorohydrin is a combustible liquid. Its toxic by inhalation, ingestion and skin absorption. It is irritating to the eyes, skin, respiratory tract and mucous membranes. Inhalation of vapors or mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Ethylene chlorohydrin shall be used with adequate ventilation. The TLV for ethylene chlorohydrin is 1.0 ppm (3.0 mg/m^3) - ceiling limit. The PEL is 5.0 ppm (16.0 mg/m^3). (Refer to 4.3.1.)

When heated to decomposition, ethylene chlorohydrin, will emit toxic fumes. It is a moderate fire hazard.

5.59.5 Storage. Ethylene chlorohydrin shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.59.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.60 Name. Ethylene Chlorohydrin, Reagent CH_2CLCH_2OH FW: 80.52
2-Chloroethyl alcohol
Glycol chlorohydrin
2-Chloroethanol

5.60.1 Technical description. Ethylene chlorohydrin is a colorless liquid with a melting point of -67.5°C and a boiling point of 128°C at 760 mm Hg. Ethylene chlorohydrin has a specific gravity of 1.20027 (20°/4°C) and a refractive index of 1.44189 at 20°C. Its flash point is 140°F (60°C) (SCC), and its autoignition temperature is 797°F (425°C). It has a LEL of 4.9 percent and an UEL of 15.9 percent It is miscible with water and alcohol, and slightly soluble in ether.

5.60.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.60.2.1 Requirements. Specification requirements for ethylene chlorohydrin, reagent, are shown in Table LXII.

TABLE LXII. Ethylene Chlorohydrin, Reagent - requirements.

Boiling point (°C) (95 mL of a 100 mL specimen)	127 - 129
Specific gravity (20°/4°C)	1.213±0.003
Refractive index (20°C)	1.4420±0.004

5.60.3 Use. Ethylene chlorohydrin, reagent, is used for the introduction of the hydroxyethyl group in organic synthesis.

5.60.4 Safety. Ethylene chlorohydrin is a combustible liquid. It is toxic by inhalation, ingestion and skin absorption. It is irritating to the eyes, skin, respiratory tract and mucous membranes. Inhalation of vapors or mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Ethylene chlorohydrin shall be used with adequate ventilation. The TLV for ethylene chlorohydrin is 1.0 ppm (3.0 mg/m^3) - ceiling limit. The PEL is 5.0 ppm (16.0 mg/m^3). (Refer to 4.3.1.)

When heated to decomposition, ethylene chlorohydrin, will emit toxic fumes. It is a moderate fire hazard.

5.60.5 Storage. Ethylene chlorohydrin shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.60.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.61 Name. Ethylene Glycol, Analyzed Reagent CH_2OHCH_2OH FW: 62.07
1,2-Ethanediol
Dihydroxyethane
Glycol alcohol

5.61.1 Technical description. Ethylene glycol is a colorless and odorless liquid that has a boiling point of 198°C and a melting point of -11.5°C. Its flash point 230°F (110°C) (SCC), and its autoignition temperature is 752°F (400°C). Its LEL in air is 3.2 percent and its UEL is 15.3 percent (estimated). It is miscible with water, alcohol and acetone, and is soluble in ether and chloroform. It is slightly soluble in benzene.

5.61.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.61.2.1 Requirements. Specification requirements for ethylene glycol, analyzed reagent, are shown in Table LXIII.

TABLE LXIII. Ethylene Glycol, Analyzed Reagent - requirements (USP/NF).

Boiling range (between 1 to 95 mL of a 100 mL specimen)	194° to 200°C
Residue on ignition, max, % by wt	0.005
Acidity (as CH_3COOH), max, % by wt	0.01
Water (max by wt)	0.20

5.61.3 Use. Ethylene glycol, analyzed reagent, is used as a solvent for ribosome and in the denaturation DNA.

5.61.4 Safety. Ethylene glycol burnable liquid. It is toxic by inhalation. Inhalation of vapor or mist shall be avoided. It is irritating to the eyes and skin. Contact with the eyes, skin and clothing shall be avoided. The TLV for ethylene glycol (vapor) is 50 ppm (125 mg/m^3) - ceiling limit. (Refer to 4.3.1.)

If heated to decomposition ethylene glycol, can emit toxic vapor and fumes. Ethylene glycol is a slight fire hazard.

5.61.5 Storage. Ethylene glycol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.61.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.62 Name. Fructose, Analyzed Reagent $OCH_2(CHOH_3)COHCH_2OH$ FW: 180.16
D(-)Fructose
Levulose
Fruit sugar

5.62.1 Technical description. Fructose is in the form of white crystals. It has a melting point of 103° to 105° with decomposition. Its specific rotation is -89 to -91°. Its density is 1.60 g/cm^3 (20°/4°C). It is very soluble in water and hot acetone and soluble in alcohol and methyl alcohol.

5.62.2 Specification. Manufacturer's requirements. (No Government specification)

5.62.2.1 Requirements. Fructose, analyzed reagent, is commercially available with requirements as shown in Table LXIV.

TABLE LXIV. Fructose, Analyzed Reagent - requirements.

Specific rotation $[\alpha]^{20}D$(dried basis C=10 in H_2O)	-93 to -91°
Homogeneity by GLC assay (trimethylsilylation)	Val. on label
Maximum Limits of Impurities (% by wt)	
Ash (sulfated)	0.1
Loss on drying (in vacuo, 60°C)	0.1
Heavy metals (as Cu)	0.005
Iron (Fe)	0.003
Maximum Limit of Impurities (ppm)	
Arsenic (As)	3.0

5.62.3 Use. Fructose, analyzed reagent, is used as a biochemical reagent and in medicine.

5.62.4 Safety. Fructose is a combustible, nontoxic solid. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, fructose may emit irritating fumes.

5.62.5 Storage. Fructose shall be stored in a cool, dry place in tightly closed closed containers. (Refer to 4.3.2.)

5.62.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.63 Name. Fructose, Reagent $OCH_2(CHOH_3)COHCH_2OH$ FW: 180.16
D(-)Fructose
Levulose
Fruit sugar

5.63.1 Technical description. Fructose is in the form of white crystals and has a melting point of 103° to 105° with decomposition. Its specific rotation is -89 to -91°. Its density is 1.60 g/cm^3 (20°/4°C). It is very soluble in water and hot acetone and soluble in alcohol and methyl alcohol.

5.63.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.63.2.1 Requirement. Specification requirement for fructose, reagent, is shown in Table LXV.

TABLE LXV. Fructose, Reagent - requirement.

Melting point (°C)	103 - 105

5.63.3 Use. Fructose, reagent, is used as a biochemical reagent and as a preservative.

5.63.4 Safety. Fructose is a combustible, nontoxic solid. (Refer to 4.3.1)

If heated to decomposition, fructose may emit irritating fumes.

5.63.5 Storage. Fructose shall be stored in a cool, dry place in tightly closed closed containers. (Refer to 4.3.2)

5.63.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.64 Name. Hexamethylenetetramine, Analyzed Reagent

$(CH_2)_6N_4$ FW: 140.19

Hexamine
Hexamethyleneamine
Methenamine

5.64.1 Technical description. Hexamethylenetetramine is in the form of rhombic crystals and has a melting point of 285° to 295°C with sublimation. Its density is 1.331 g/cm^3 at -5°C. It is very soluble in water; soluble in alcohol, acetone and chloroform; and slightly soluble in ether and benzene.

5.64.2 Specification. Manufacturer's requirements. (No Government specification)

5.64.2.1 Requirements. Hexamethylenetetramine, analyzed reagent, is commercially available with requirements as shown in Table LXVI.

TABLE LXVI. Hexamethylenetetramine, Analyzed Reagent - requirements.

Assay, as $[(CH_2)_6N_4]$, min, % by wt	99.0
Maximum Limits of Impurities (% by wt)	
Residue after ignition	0.05
Insoluble matter	0.005
Heavy metals (as Pb)	0.001

5.64.3 Use. Hexamethylenetetramine, analyzed reagent, is used in the preparation of primary amines.

5.64.4 Safety. Hexamethylenetetramine is a burnable solid. It is a moderate irritant of the respiratory tract, eyes and skin. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Hexamethlenetetramine shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, hexamethylenetetramine, can emit toxic fumes. Hexamethylenetetramine, is a moderate fire risk.

5.64.5 Storage. Hexamethylenetetramine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.64.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.65 Name. p-Hydroxyazobenzene, Reagent $C_6H_5N:NC_6H_4OH$ FW: 198.23
4-Hydroxyazobenzene
p-Benzeneazophenol
p-Phenylazophenol

5.65.1 Technical description. p-Hydroxyazobenzene is in the form of orange prisms or yellow leaflet crystals. It has a boiling range of 220° to 230°C at 20 mm pressure, and a melting point of 155° to 157°C. It is insoluble in water, very soluble in alcohol and ether, and soluble in benzene.

5.65.2 Specification. Military specification, MIL-C-51130, Chemicals, Reagent Grade, General Specification For.

5.65.2.1 Requirement. Specification requirement for p-hydroxyazobenzene, reagent, is shown in Table LXVII.

TABLE LXVII. p-Hydroxyazobenzene, Reagent - requirement.

Melting point (°C)	155 - 156

5.65.3 Use. p-Hydroxyazobenzene is used as a laboratory reagent.

5.65.4 Safety. p-Hydroxyazobenzene is a burnable solid. It is irritating to the respiratory tract, eyes and skin. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Hydroxyazobenzene shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, p-Hydroxyazobenzene can emit toxic fumes. p-Hydroxyazobenzene is a moderate fire risk.

5.65.5 Storage. p-Hydroxyazobenzene shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.65.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.66 Name. i-Inositol, Analyzed Reagent $HOCH(CHOH)_4CHOH$ FW: 180.16
DL-Inositol
Mesoinosite
Hexahydroxycyclohexane

5.66.1 Technical description. i-Inositol is the DL or meso, optically inactive form. The prevalent natural optically inactive form is cis-1,2,3,5-trans-4,6-cyclohexanehexol. i-Inositol is in the form of white crystalline monoclinic prisms with reported melting points of 253° and 225°C. Its density

is 1.752 g/cm^3 at 15°C. It is very soluble in water, slightly soluble in alcohol, and insoluble in ether and benzene.

5.66.2 Specification. Federal specification, O-C-265, Chemicals, Analytical; General Specification For.

5.66.2.1 Requirements. Specification requirements for i-inositol, analyzed reagent, are shown in Table LXVIII.

TABLE LXVIII. i-Inositol, Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	223 - 226
Loss on drying, % by wt, max (At 105°C for 4 hours)	0.5
Residue on ignition, % by wt, max	0.1

5.66.3 Use. i-Inositol, analyzed reagent, is used in medicine, nutrition and as a chemical intermediate.

5.66.4 Safety. i-Inositol is a burnable solid. It has a low toxicity. Inhalation of dust may cause irritation of the respiratory tract. Otherwise the compound is considered harmless. i-Inositol shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, i-inositol can emit irritating fumes.

5.66.5 Storage. i-Inositol shall be stored in a cool, dry place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.66.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.67 Name. Isopropyl Ether, Analyzed Reagent

$(CH_3)_2CHOCH(CH_3)_2$ FW: 102.18

2-Isopropoxypropane
Diisopropyl ether

5.67.1 Technical description. Isopropyl ether is a colorless liquid with a melting point of <-60°C, a boiling point of 68°C at 760 mm Hg, and a specific gravity of 0.7241 (20°/4°C). It has a flash point of 9°F (-12°C) (SCC), and an autoignition temperature of 830°F (443°C). It is slightly soluble in water, soluble in acetone, and miscible with alcohol and ether.

5.67.2 Specification. Federal specification, O-C-265, Chemicals, Analytical; General Specification For.

5.67.2.1 Requirements. Specification requirements for isopropyl ether, analyzed reagent, are shown in Table LXIX.

TABLE LXIX. Isopropyl Ether, Analyzed Reagent - requirements (USP/NF).

Specific gravity (25°/25°C)	0.716 - 0.720
Boiling range (°C)	65 - 70
Peroxides (% by wt) (max as H_2O_2)	0.001
Residue on evaporation, % by wt, max (Not to be determined if peroxides are present)	0.01
Acidity (% by wt) (max as CH_3COOH)	0.005

5.67.3 Use. Isopropyl ether, analyzed reagent, is used as a solvent, a medium for crystallizations and for oil extractions.

5.67.4 Safety. Isopropyl ether is a flammable liquid. Isopropyl ether vapors are irritating to the respiratory tract and mucous membranes. Overexposure can cause loss of consciousness. Isopropyl ether liquid is irritating to the skin. Inhalation of vapors shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Isopropyl ether shall be used with adequate ventilation. The TLV for isopropyl ether is 250 ppm (1,050 mg/m^3). The PEL is 500 ppm (2,100 mg/m^3). (Refer to 4.3.1.)

If heated to decomposition, isopropyl ether can emit toxic fumes. If isopropyl ether contains peroxides do not allow to evaporate to near dryness. It can become a dangerous explosion hazard. Addition of reducing agent lessen peroxide formation. Isopropyl ether is a dangerous fire hazard.

5.67.5 Storage. Isopropyl ether shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.67.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable; Waste Number D001.

5.68 Name. Lactic Acid, Analyzed Reagent $CH_3CHOHCO_2H$ FW: 90.08
DL-hydroxypropanoic acid
DL-2-hydroxypropanoic acid

5.68.1 Technical description. DL-Lactic acid is in the form of a yellowish, odorless hygroscopic syrupy liquid. Its melting point is 18°C and its boiling point is 122 at 15°C. Its specific gravity is 1.2060 at 25°/4°C (H_2O=1). It is very soluble in water and alcohol and slightly soluble in ether.

Note: Lactic acid may be optically active, but the commercial form is racemic.

5.68.2 Specification. Federal specification, O-C-265, Chemicals, Analytical; General Specification For.

5.68.2.1 Requirements. Specification requirements for lactic acid, analyzed reagent, are shown in Table LXX.

TABLE LXX. Lactic Acid, Analyzed Reagent - requirements (ACS).

Assay ($C_3H_6O_3$), min-max, %	85.0 - 90.0
Maximum Limits of Impurities (% by wt)	
Residue after ignition	0.02
Chlorine (Cl)	0.001
Sulfate (SO_4)	0.002
Maximum Limits of Impurities (ppm)	
Heavy metals (as Pb)	5.0
Iron (Fe)	5.0
Substances darkened by sulfuric acid	To pass color test

Note: (a) Lactic acid (ACS) is Lactic Acid, 85 percent;
(b) The reagent generally available is a mixture of lactic acid, $CH_3CHOHCOOH$, and lactic acid lactate, $C_6H_{10}O_5$.

5.68.3 Use. Lactic acid, analyzed reagent, is used in the synthesis of lactates for use in medicine. It is also used as a solvent and catalyst.

5.68.4 Safety. Lactic acid is moderately toxic by ingestion and is irritating to the eyes, skin and mucous membranes. Inhalation of vapors or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Lactic acid shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated, lactic acid emits acrid fumes.

5.68.5 Storage. Lactic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.68.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.69 Name. Maleic Acid, Analyzed Reagent HOOCCH:CHCOOH FW: 116.07
Cis-1,2-Ethylenedicarboxylic acid
Cis-Butenedioic acid

5.69.1 Technical description. Maleic acid is in the form of white crystals with a density of 1.59 g/cm^3 at 20°C and a melting point of 139°-140°C. It is very soluble in water, alcohol and acetone; soluble in ether and insoluble in benzene.

5.69.2 Specification. Federal Specification,O-C-265, Chemicals, Analytical; General Specification For.

5.69.2.1 Requirements. Specification requirements for maleic acid, analyzed reagent, are shown in Table LXXI.

TABLE LXXI. Maleic Acid, Analyzed Reagent - requirements (USP/NF).

Assay ($C_4H_4O_4$), min, % by wt	99.0
Loss on drying, max, % by wt (When dried over phosphorus pentoxide at not more than 5 mm mercury for 2 hours)	1.5

5.69.3 Use. Maleic acid, analyzed reagent, is used in organic synthesis for the preparation of malic, succinic, aspartic, tartaric, propionic, lactic, malonic, acrylic and hydracrylic acids.

5.69.4 Safety. Maleic acid is a burnable solid. It is moderately toxic and strong irritant to tissue. It is irritating to the respiratory tract, mucous membranes, eyes and skin. Inhalation of dust and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Maleic acid shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, maleic acid can emit irritating fumes.

5.69.5 Storage. Maleic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers away from open flame. (Refer to 4.3.2.)

5.69.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.70 Name. Malonic Acid, Analyzed Reagent $CH_2(COOH)_2$ FW: 104.06
Methanedicarbonic acid
Methanedicarboxylic acid
Propanedioic acid

5.70.1 Technical description. Malonic acid is in the form of small crystals with a melting point of 135.6°C with slight sublimation. It decomposes at 140°C. Its density is 1.619 g/cm^3 at 16°C. It is very soluble in water, slightly soluble in alcohol and ether and insoluble in benzene.

5.70.2 Specification. Manufacturer's requirements. (No Government specification)

5.70.2.1 Requirements. Malonic acid, analyzed reagent, is commercially available with requirements as shown in Table LXXII.

TABLE LXXII. Malonic Acid, Analyzed Reagent - requirements.

Assay [$CH_2(COOH)_2$], min, % by wt	99.0
Melting point (°C)	134 - 136

5.70.3 Use. Malonic acid, analyzed reagent, is used in the synthesis of barbiturates and pharmaceuticals.

5.70.4 Safety. Malonic acid is a burnable solid. It is highly toxic and a strong irritant of the eyes, skin and mucous membranes. Inhalation of dust and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Malonic acid shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, malonic acid can emit toxic and irritating fumes.

5.70.5 Storage. Malonic acid shall be stored in a cool, dry place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.70.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.71 Name. Methyl Ethyl Ketone, Analyzed Reagent

$CH_3COCH_2CH_3$ FW: 72.12

2-Butanone
Ethyl methyl ketone
MEK
Methyl acetone

5.71.1 Technical description. Methyl ethyl ketone is in the form of a mobile, colorless, volatile liquid that has an acetone - like odor with a melting point of -86.35°C and a boiling point of 79.56°C. It has a LEL of 1.8 percent and an UEL of 10 percent in air. Its flash point is 24°F (-4°C) (TCC). Its specific gravity is 0.8054 (20°/4°C). It has a vapor pressure of 71.2 mm at 20°C and an autoignition temperature of 515°C (960°F). Its vapor density is 2.5 (air=1). It is soluble in water and miscible with ethanol, ether, acetone and benzene.

5.71.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.71.2.1 Requirements. Specification requirements for methyl ethyl ketone, analyzed reagent, are shown in Table LXXIII.

TABLE LXXIII. Methyl Ethyl Ketone, Analyzed Reagent - requirements (USP/NF).

Boiling range (C°) (Between 1 mL and 95 mL of 100 mL sample)	79.0 - 81.0
Residue on evaporation, max, % by wt	0.0025
Specific gravity (25°/25°C)	0.801 - 0.805
Acidity (as CH_3COOH), max, % by wt	0.003
Solubility in water (5 mL added to 40 mL carbon dioxide-free water)	Clear for 20 min.

5.71.3 Use. Methyl ethyl ketone, analyzed reagent, is used in organic synthesis and as a catalyst carrier.

5.71.4 Safety. Methyl ethyl ketone is a flammable liquid. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapor or mist shall be avoided. Exposure to high concentrations can produce narcosis and unconsciousness. Paralysis can follow inhalation of concentrated vapor. Contact with the eyes, skin and clothing shall be avoided. Repeated exposure can produce a dry, scaly and fissured dermatitis. Methyl ethyl ketone shall be used with adequate ventilation. The TLV for methyl ethyl ketone is 200 ppm (590 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

Methyl ethyl ketone poses a severe fire hazard when exposed to heat, sparks and open flame. It can also react with oxidizing materials.

5.71.5 Storage. Methyl ethyl ketone shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame and separated from oxidizing material. (Refer to 4.3.2.)

5.71.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Toxic; Waste Number U159.

5.72 Name. Methylcyclohexane, Analyzed Reagent

$CH_3CH(CH_2)_4CH_2$ FW: 98.19

Hexahydrotoluene
Cyclohexylmethane
Toluene hexahydride

5.72.1 Technical description. Methylcyclohexane is in the form of a colorless liquid with a density of 0.769 g/cm^3 (20°/4°C). Its melting point is -126.6°C and boiling point is 100.9°C. Its LEL is 1.2 percent in air. It has a flash point of 25°F (-4°C) (SCC) and an autoignition temperature of 285°C. Methylcyclohexane has a vapor pressure of 40 mm at 22°C. Its vapor density is 3.39 (air=1). It is soluble in acetone, benzene, ether, and carbon tetrachloride. It is insoluble in water.

5.72.2 Specification. Manufacturer's requirements. (No Government specification)

5.72.2.1 Requirements. Methylcyclohexane, analyzed reagent, is commercially available with requirements as shown in Table LXXIV.

TABLE LXXIV. Methylcyclohexane, Analyzed Reagent - requirements.

Assay [$CH_3CH(CH_2)_4CH_2$] (by GC), % by wt	>98.0
Boiling range (°C)	98.0 - 101.0
Density (g/mL) at 20°/4°C	0.768
Refractive index	1.423

5.72.3 Use. Methylcyclohexane, analyzed reagent, is used in organic synthesis.

5.72.4 Safety. Methylcyclohexane is a flammable liquid. Its acute toxicity is low. It acts as a central nervous system depressant. Methylcyclohexane is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapor and mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Methylcyclohexane shall be used with adequate ventilation. The TLV for methylcyclohexane is 400 ppm (1600 mg/m^3). The PEL is 500 ppm (2000 mg/m^3). (Refer to 4.3.1.)

When heated to decomposition, methylcyclohexane may emit toxic and irritating fumes.

5.72.5 Storage. Methylcyclohexane shall be stored in cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.72.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable; Waste Number D001.

5.73 Name. Monochloroacetic Acid, Analyzed Reagent

$ClCH_2COOH$ FW: 94.50

Chloroacetic acid
Chloroethanoic acid

5.73.1 Technical description. Monochloroacetic acid is in the form of white monoclinic prisms. Monochloroacetic acid exists in three physical modifications differing in their melting points: e.g., the α modification melts at 63°C, the β at 56.2°C and the γ at 52.5°C. All three modifications have a boiling point of 187.85°C and a density of 1.4043 (40°/4°C). Monochloroacetic acid is very soluble in water, soluble in alcohol, ether, benzene, chloroform and carbon disulfide.

The product of commerce is α-monochloroacetic acid.

5.73.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.73.2.1 Requirements. Specification requirements for morpholine, analyzed reagent, are shown in Table LXXV.

TABLE LXXV. Monochloroacetic Acid, Analyzed Reagent - requirements (USP/NF).

Assay ($CLCH_2COOH$), min, % by wt	99.0
Melting range	61.0 - 64.0
Maximum Limits of Impurities (% by wt)	
Insoluble matter	0.01
Residue on ignition	0.02
Chloride (CL)	0.001
Sulfate (SO_4)	0.02
Heavy metals (as Pb)	0.001
Iron (Fe)	0.003

5.73.3 Use. Monochloroacetic acid, analyzed reagent, is used in organic synthesis.

5.73.4 Safety. Monochloroacetic acid is a strong irritant of the eyes, skin, respiratory tract, mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Monochloroacetic acid shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, monochloroacetic acid can emit toxic fumes of chlorides.

5.73.5 Storage. Monochloroacetic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.73.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Corrosive, Waste Number D002.

5.74 Name. Monochloroacetic Acid, Reagent $CLCH_2COOH$ FW: 94.50
Chloroacetic acid
Chloroethanoic acid

5.74.1 Technical description. Monochloroacetic acid is in the form of white monoclinic prisms. Monochloracetic acid exists in three physical modifications differing in their melting points: e.g., the α modification melts at 63°C, the β at 56.2°C and the γ at 52.5°C. All three modifications have a boiling point of 187.85°C and a density of 1.4043(40°/4°C). Monochloroacetic acid is very soluble in water, soluble in alcohol, ether, benzene, chloroform and carbon disulfide. The product of commerce is α -monochloroacetic acid.

5.74.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.74.2.1 Requirement. Specification requirement for monochloroacetic acid, reagent, is shown in Table LXXVI.

TABLE LXXVI. Monochloroacetic Acid, Reagent - requirement.

Melting point (°C)	62 - 64

5.74.3 Use. Monochloroacetic acid, reagent, is used in organic synthesis.

5.74.4 Safety. Monochloroacetic acid is a strong irritant of the eyes, skin, respiratory tract and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Monochloroacetic acid shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, monochloroacetic acid can emit toxic fumes of chlorides.

5.74.5 Storage. Monochloroacetic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.74.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Corrosive, Waste Number D002.

5.75 Name. Monoethanolamine, Analyzed Reagent $HOCH_2CH_2NH_2$ FW: 61.07
Ethanolamine
2-Aminoethanol
2-Hydroxyethylamine
β -Hydroxyethylamine
β -Aminoethyl alcohol
β -Ethanolamine

5.75.1 Technical description. Monoethanolamine is a colorless, viscous hygroscopic liquid with an ammonia-like odor. It has a boiling point of 170.5°C and a melting point of 10.3°C. Its flash point is 185°F (85°C) (TCC). Its specific gravity is 1.018 (20°/4°C). Monoethanolamine has a vapor pressure of 6 mm at 60°C and a vapor density of 2.11 (air=1). It is miscible with water, and methyl and ethyl alcohol.

5.75.2 Specification. Manufacturer's requirements. (No Government specification)

5.75.2.1 Requirements. Monoethanolamine, analyzed reagent, is commercially available with requirements as shown in Table LXXVII.

TABLE LXXVII. Monoethanolamine, Analyzed Reagent - requirements.

Assay ($HOCH_2CH_2NH_2$), by acid-base titrn, min, %	99.0
Density (g/mL) at 25°C	1.011 - 1.015
Maximum Limits of Impurities (% by wt)	
Residue after ignition	0.005
Heavy metal (as Pb)	0.002
Iron (Fe)	0.001

5.75.3 Use. Monoethanolamine, analyzed reagent, is used in the synthesis of surface active agents and is used with other substance to form an accelerator in the synthesis of antibiotics.

5.75.4 Safety. Monoethanolamine is a combustible liquid. It is irritating to the eyes, skin, respiratory tract and mucous membranes. Inhalation of vapor or mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Monoethanolamine shall be used with adequate ventilation. Wash thoroughly after handling. The TLV for monoethanolamine is 3 ppm (8 mg/m^3). (Refer to 4.3.1.)

Monoethanolamine is a moderate fire hazard when exposed to heat or open flame.

5.75.5 Storage. Monoethanolamine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.75.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3).

EPA Hazardous Waste Classification - Corrosive, Waste Number D002.

5.76 Name. Morpholine, Analyzed Reagent $NH(CH_2)_2OCH_2CH_2$ FW: 87.12
Diethylenimide oxide
Tetrahydro-1-4-isoxazine

5.76.1 Technical description. Morpholine is in the form of a mobile hygroscopic liquid with a density of 1.0005 (20°/4°C). Its melting point is 4.75°C and boiling point is 128.3°C at 760 mm Hg. Its flash point is 100°F (38°C). It is soluble in water in all proportions, it is soluble in alcohol, ether, acetone and benzene.

5.76.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.76.2.1 Requirements. Specification requirements for morpholine, analyzed reagent, are shown in Table LXXVIII.

TABLE LXXVIII. Morpholine, Analyzed Reagent - requirements (ACS).

Assay (C_4HgNO), min, % by wt	99.0
Color (APHA), max 1/	10
Density (g/mL) at 25°C, min-max	0.944-0.997
Boiling range (°C)	126.0-130.0

1/ APHA Color Scale is identical to ASTM D 1209 (Platinum-Cobalt Scale).

5.76.3 Use. Morpholine, analyzed reagent, is used in laboratory organic synthesis.

5.76.4 Safety. Morpholine is a flammable liquid. It is moderately toxic by ingestion, inhalation and absorption through skin. It is irritating to skin, eyes and mucous membranes. Inhalation of vapors and mists shall be avoided. Morpholine shall be used with adequate ventilation. Wash thoroughly after handling. The TLV for morpholine - including skin is 20 ppm (70 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

When heated to decomposition, morpholine can emit toxic and irritating fumes. It is a moderate fire hazard.

5.76.5 Storage. Morpholine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.76.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste No. D001.

5.77 Name. Naphthalene, Analyzed Reagent $C_{10}H_8$ FW: 128.19
Naphthene
Naphthalin

5.77.1 Technical description. Naphthalene comes in the form of white crystalline, volatile flakes with a strong coal-tar odor. It has a specific gravity of 1.045 (20°/4°C), a melting point of 80.6°C and a boiling point of 217.96°C. Its flash point is 174°F (79°C) (SCC). Naphthalene has a LEL of 0.9 percent and

an UEL of 5.9 percent. Its autoignition temperature is 567°C and its vapor pressure is 1 mm at 52.6°C. It has a vapor density of 4.42 (air=1). It is soluble in benzene, toluene, chloroform and carbon tetrachloride. It is very soluble in fixed and volatile oils, ether, and hydronaphthalene. It is insoluble in water.

5.77.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.77.2.1 Requirements. Specification requirements for naphthalene, analyzed reagent, are shown in Table LXXIX.

TABLE LXXIX. Naphthalene, Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	80 - 81
Boiling range (°C) (Between 1 mL and 95 mL of 100 mL sample)	217 - 219

5.77.3 Use. Naphthalene, analyzed reagent, is used in the synthesis of phthalic and anthranilic acids. It is also used in scintillation counters.

5.77.4 Safety. Naphthalene is a combustible solid. It is moderately toxic. Poisoning may occur by ingestion of large doses, inhalation or skin absorption. It is irritating to the skin, eyes and mucous membranes. Inhalation of dust or fumes shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Naphthalene shall be used with adequate ventilation. The TLV for naphthalene is 10 ppm (50 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

Naphthalene is a moderate fire hazard when exposed to heat or flame. When heated to decomposition it may emit irritating fumes.

5.77.5 Storage. Naphthalene shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.77.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification-Toxic, Waste Number U165.

5.78 Name. α-Naphthol, Analyzed Reagent $C_{10}H_7OH$ FW: 144.19
1-Naphthol
α-Hydroxynaphthalene

5.78.1 Technical description. α-Naphthol has a g/mol. It exists as colorless or yellowish to slightly pinkish crystals with a melting point of 96°C and a boiling point of 288°C at 760 mm Hg. Its density is 1.0989 g/cm^3 (99°/4°C) and its vapor pressure is 1 mm at 94°C. It is slightly soluble in hot water, very soluble in alcohol, chloroform and ether and soluble in acetone and benzene.

5.78.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.78.2.1 Requirements. Specification requirements for α-naphthol, analyzed reagent, are shown in Table LXXX.

TABLE LXXX. α-Naphthol, Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	95 - 97
Solubility (Solutions in alcohol and benzene)	To be clear and colorless or nearly colorless
Acidity (1 g in 50 mL water shaken for 15 minutes and filtered)	Filtrate neutral to litmus
Residue on ignition, % by wt, max	0.05

5.78.3 Use. α-Naphthol, analyzed reagent, is used as a reagent in medicine of the assay of phenformin hydrochloride. It is also used in organic synthesis.

5.78.4 Safety. α-Naphthol is a combustible solid. It is toxic by ingestion and skin absorption. It is irritating to the eyes, skin, respiratory tract and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. α-Naphthol shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, α-naphthol can emit toxic fumes.

5.78.5 Storage. α-Naphthol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame and protected from light. (Refer to 4.3.2.)

5.78.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.79 Name. β-Naphthol, Analyzed Reagent $C_{10}H_7OH$ FW: 144.19
β-Hydroxynaphthalene
2-Hydroxynaphthalene
Isonaphthol

5.79.1 Technical description. β-Naphthol exists as white monoclinic leaflets with a melting point of 123-124°C. Its boiling point is 295°C at 760 mm Hg and its density is 1.28 g/cm^3. Its flash point is 307°F (153°C) (SCC). It has a vapor pressure of 10 mm at 145.5°C and a vapor density of 4.97 (air=1). It is slightly soluble in water, very soluble in alcohol and ether and soluble in benzene and chloroform. It discolors on exposure to light.

5.79.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.79.2.1 Requirements. Specification requirements for β-naphthol, analyzed reagent, are shown in Table LXXXI.

TABLE LXXXI. β-Naphthol, Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	121 - 123
Solubility in alcohol (1 g in 10 mL alcohol)	Complete and colorless or nearly colorless.
Acidity (1 g in 50 mL water shaken for 15 minutes and filtered)	Filtrate neutral to litmus
1-Naphthol	To pass color test
Insoluble in ammonia (500 mg in 30 mL of 9.5% to 10.5% NH_3 test solution)	To pass color test
Residue on ignition, max, % by wt	0.05

5.79.3 Use. β-Naphthol, analyzed reagent, is used in the synthesis of medicinal organics and intermediates.

5.79.4 Safety. β-Naphthol is a burnable solid. It is toxic by ingestion and skin absorption. It is irritating to the eyes, skin, respiratory tract and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. β-Naphthol shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, β-naphthol can emit toxic fumes.

5.79.5 Storage. β-Naphthol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame and protected from light. (Refer to 4.3.2.)

5.79.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.80 Name. β-Naphthoquinoline, Reagent $C_{10}H_6CH{:}CHCH{:}N$ FW: 179.22
5,6-Benzoquinoline
Naphthopyridine
2-Naphthoquinoline

5.80.1 Technical description. β-Naphthoquinoline exists as crystalline leaflets with a melting point of 94°C and a boiling point of 350°C at 721 mm Hg. It is very soluble in alcohol, ether and benzene, soluble in acetone and only slightly soluble in hot water.

5.80.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.80.2.1 Requirement. Specification requirement for β-naphthoquinoline, reagent, is shown in Table LXXXII.

TABLE LXXXII. β -Naphthoquinoline, Reagent - requirement.

Melting point (°C)	90 - 91

5.80.3 Use. β -Naphthoquinoline, reagent, is used as a reagent for the determination of cadmium and germanium.

5.80.4 Safety. β -Naphthoquinoline is a burnable solid. It is irritating to the eyes and skin. Contact with the eyes, skin and clothing shall be avoided. β -Naphthoquinoline shall be used with adequate ventilation. (Refer 4.3.1)

When heated to decomposition, β -naphthoquinoline may emit toxic fumes.

5.80.5 Storage. β -Naphthoquinoline shall be stored in a cool, dry place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.80.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.81 Name. 1,4-Naphthoquinone, Reagent $C_6H_4COCH:CHCO$ FW: 158.16
1,4-Dihydro-1,4-diketonaphthalene
α -Naphthoquinone

5.81.1 Technical description. 1,4-Naphthoquinone exists in the form of yellow, crystalline, triclinic needles. Its melting point is 128.5°C with sublimation beginning below 100°C. Its density is 1.422 g/cm^3. It is very soluble in hot alcohol, soluble in ether, benzene, chloroform and carbon disulfide, and slightly soluble in water.

5.81.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.81.2.1 Requirement. Specification requirement for 1,4-naphthoquinone, reagent, is shown in Table LXXXIII.

TABLE LXXXIII. 1,4-Naphthoquinone, Reagent - requirement.

Melting point (°C)	121 - 124

5.81.3 Use. 1,4-Naphthoquinone, reagent, is used as a catalyst in polymerization. It is also used in the synthesis of pharmaceuticals.

5.81.4 Safety. 1,4-Naphthoquinone is a burnable solid. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 1,4-Nahthoquinone shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, 1,4-naphthoquinone can emit toxic fumes.

5.81.5 Storage. 1,4-Naphthoquinone shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2)

5.81.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic; Waste Number U166

5.82 Name. 1-Naphthylamine, Reagent $C_{10}H_7NH_2$ FW: 143.19
α -Naphthylamine
1-Aminonaphthalene

5.82.1 Technical description. 1-Naphthylamine exists in the form white crystalline needles with a melting point of 50°C and a boiling point of 300.8°C at 760 mm Hg. Its density is 1.229 g/cm^3 at 25°C. Its flash point is 315°F (157°C). It is very soluble in alcohol and ether, and slightly soluble in water.

5.82.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.82.2.1 Requirement. Specification requirement for 1-naphthylamine, reagent, is shown in Table LXXXIV.

TABLE LXXXIV. 1-Naphthylamine, Reagent - requirement.

Melting point (°C)	49 - 50

5.82.3 Use. 1-Naphthylamine, reagent, is used as an intermediate in organic synthesis.

5.82.4 Safety. 1-Naphthylamine is a burnable solid. It is highly toxic by ingestion, inhalation and skin absorption, especially if containing the beta isomer. It is irritating to respiratory tract, eyes, skin and mucous membranes. Inhalation of dust or vapor shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 1-Naphthylamine shall be used with adequate ventilation. 1-Naphthylamine is a confirmed carcinogen. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, 1-naphthylamine can emit toxic fumes.

5.82.5 Storage. 1-Naphthylamine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2)

5.82.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic; Waste Number U167.

5.83 Name. 2-Naphthylamine, Reagent $C_{10}H_7NH_2$ FW: 143.19
β -Naphthylamine
2-Aminonaphthalene

5.83.1 Technical description. 2-Naphthylamine exists in the form of white to reddish crystals with a melting point of 113°C and a boiling point of 306.10°C at 760 mm Hg. Its density is 1.0614 at 98°C. It is soluble in hot water, alcohol and ether.

5.83.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.83.2.1 Requirement. Specification requirement for 2-naphthylamine, reagent, is shown in Table LXXXV.

TABLE LXXXV. 2-Naphthylamine, Reagent - requirement.

Melting point (°C)	110 - 112

5.83.3 Use. 2-Naphthylamine, reagent, is used as a reagent for nitrites.

5.83.4 Safety. 2-Naphthylamine is a burnable solid. It is highly toxic by ingestion, inhalation and skin absorption. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust or vapors shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 2-Naphthylamine shall be used with adequate ventilation. Wash thoroughly after handling. 2-Naphthylamine is a confirmed carcinogen. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, 2-naphthylamine can emit toxic fumes.

5.83.5 Storage. 2-Naphthylamine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. Refer to 4.3.2.)

5.83.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic, Waste No. U168.

5.84 Name. 1-Naphthylisocyanate, Reagent $C_{10}H_7NCO$ FW: 169.19
α -Naphthylisocyanate
α -Naphthylcarbylamine

5.84.1 Technical description. 1-Naphthylisocyanate exists in the form of a colorless liquid with a specific gravity of 1.1774 (20°/4°C), a melting point of 4°C and a boiling point of 269°C to 270°C. It is soluble in alcohol, ether, benzene and chloroform.

5.84.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.84.2.1 Requirements. Specification requirements for 1-naphthylisocyanate, reagent, are shown in Table LXXXVI.

TABLE LXXXVI. 1-Naphthylisocyanate, Reagent - requirements.

Boiling point (12 mm Hg) (°C) (95 mL of a 100 mL specimen)	140 - 142
Specific gravity (20°/4°C)	1.181 ± 0.003
Refractive index (20°C)	1.6238 ± 0.0004

5.84.3 Use. 1-Naphthylisocyanate, reagent, is used as a reagent for characterization of amino acids.

5.84.4 Safety. 1-Naphthylisocyanate is a poisonous burnable liquid. It is toxic by ingestion, inhalation and skin absorption. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapors or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 1-Naphthylisocyanate shall be used with adequate ventilation. Wash thoroughly after handling. (Refer to 4.3.1).

If heated to decomposition, 1-naphthylisocyanate can emit toxic fumes.

5.84.5 Storage. 1-Naphthylisocyanate shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame and protected from light. (Refer to 4.3.2.)

5.84.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic.

5.85 Name. Ninhydrin, Monohydrate, Analyzed Reagent

$C_6H_4COCOCO \cdot H_2O$ FW: 178.15

Triketohydrindene monohydrate
1,2,3-Indantrione monohydrate

5.85.1 Technical description. Ninhydrin, monohydrate, is in the form of white crystalline prisms. It turns red when heated above 100°C and melts with decomposition at 241°-243°C. It is soluble in water and alcohol, slightly soluble in ether and chloroform. It is light sensitive.

5.85.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.85.2.1 Requirements. Specification requirements for ninhydrin, monohydrate, analyzed reagent, are shown in Table LXXXVII.

TABLE LXXXVII. Ninhydrin Monohydrate, Analyzed - requirements (ACS).

Appearance	White to brownish-white crystals
Identification and melting point	To pass test
Loss on drying at 105°C, min-max, % by wt	9.0 - 11.0
Solubility	To pass test
Sensitivity to amino acids	To pass test

5.85.3 Use. Ninhydrin, monohydrate, analyzed reagent, is used as a reagent for the detection of free amino and carboxyl groups in proteins and peptides.

5.85.4 Safety. Ninhydrin is a burnable solid. It is toxic by inhalation. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Ninhydrin shall be used with adequate ventilation. Wash thoroughly after handling. (Refer to 4.3.1).

If heated to decomposition, ninhydrin can emit toxic fumes.

5.85.5 Storage. Ninhydrin shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame and protected from light. (Refer to 4.3.2.)

5.85.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.86 Name. p-Nitroaniline, Analyzed Reagent $C_6H_6N_2O_2$ FW: 138.13
1-Amino-4-nitrobenzene

5.86.1 Technical description. p-Nitroaniline exists as pale yellow monoclinic needles with a melting point of 148.5 - 149.5°C and a boiling point of 331.73°C. It has a specific gravity of 1.424 g/cm^3 (20°/4°C). Its flash point is 390°F (199°C) (SCC). It is soluble in alcohol, ether and acetone, very soluble in hot acetone, slightly soluble in benzene, insoluble in water and slightly soluble in hot water.

5.86.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.86.2.1 Requirements. Specification requirements for p-nitroaniline, analyzed reagent, are shown in Table LXXXVIII.

TABLE LXXXVIII. p-Nitroaniline, Analyzed Reagent - requirements (ACS).

Melting range (°C)	146 - 148
Residue on ignition, % by wt, max	0.2
Solubility (1 g in 30 mL alcohol, and 1 g in 40 mL ether)	Clear or practically clear solutions

5.86.3 Use. p-Nitroaniline, analyzed reagent, is used in organic synthesis as an intermediate.

5.86.4 Safety. p-Nitroaniline is a burnable solid. It is toxic by inhalation, ingestion and skin absorption. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust, vapors or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Nitroaniline shall be used with adequate ventilation. Wash thoroughly after handling. The TLV for p-nitroaniline - including skin is 3 mg/m^3. The PEL is 1 ppm (6 mg/m^3). (Refer to 4.3.1)

If heated to decomposition, p-nitroaniline can emit toxic fumes. It is a slight fire hazard.

5.86.5 Storage. p-Nitroaniline shall be stored in a cool, dry, well ventilated place in tightly closed containers away from open flame. (Refer to 4.3.2.)

5.86.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic; Acute Hazardous; Waste Number P077.

5.87 Name. 5-Nitrobarbituric Acid, Reagent $C_4H_3N_3O_5$ FW: 173.09
5-Nitro-2,4,6-trihydroxypyrimidine
Dilituric acid

5.87.1 Technical description. 5-Nitrobarbituric acid exists in the form of prismatic crystals or leaflets. It melting point is 176°C with decomposition. It is soluble in hot water and alcohol. It is insoluble in ether.

5.87.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.87.2.1 Requirement. Specification requirement for 5-nitrobarbituric acid, reagent, is shown in Table LXXXIX.

TABLE LXXXIX. 5-Nitrobarbituric Acid, Reagent - requirement.

Melting point (°C)	181 - 183 (decomposes)

5.87.3 Use. 5-Nitrobarbituric acid, reagent, is used as a microreagent for potassium.

5.86.4 Safety. 5-Nitrobarbituric acid, is a burnable solid. It is toxic by inhalation and ingestion. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 5-Nitrobarbituric acid shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, 5-nitrobarbituric acid can emit toxic fumes. 5-nitrobarbituric acid is a moderate fire hazard.

5.87.5 Storage. 5-Nitrobarbituric acid shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.87.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.88 Name. Nitrobenzene, Analyzed Reagent $C_6H_5NO_2$ FW: 123.11
Nitrobenzol
Oil of mirbane

5.88.1 Technical description. Nitrobenzene exists as a colorless to pale yellow oily liquid. Its melting point is 5.7°C and a boiling point of 210.8°C at 760 mm Hg. Its density is 1.2037 g/cm^3 (20°/4°C). It has a vapor density of 4.24 (air=1) and a flash point 190°F (88°C) (SCC). It is slightly soluble in water and very soluble in alcohol, ether, benzene and acetone.

5.88.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.88.2.1 Requirements. Specification requirements for nitrobenzene, analyzed reagent, are shown in Table XC.

TABLE XC. Nitrobenzene, Analyzed Reagent - requirements (ACS).

Density at 25°C (g/cm^3), min-max	1.196 - 1.199
Freezing point (°C), min-max	5.0 - 6.0
Maximum Limits of Impurities (% by wt)	
Residue after evaporation	0.005
Acidity (as HNO_3)	0.003
Maximum Limits of Impurities (ppm)	
Chloride (Cl)	5.0

5.88.3 Use. Nitrobenzene, analyzed reagent, is used as a reagent in analytical chemistry.

5.88.4 Safety. Nitrobenzene is a combustible liquid and highly toxic by ingestion, inhalation and skin absorption. It is irritating to the eyes, skin and mucous membranes. Inhalation of vapors or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. Nitrobenzene shall be used with adequate ventilation. The TLV for nitrobenzene - including skin is 1.0 ppm (5.0 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

Nitrobenzene is a moderate fire hazard.

5.88.5 Storage. Nitrobenzene shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.88.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic, Waste Number U169.

5.89 Name. m-Nitrobenzhydrazide, Reagent $NO_2C_6H_4CONHNH_2$ FW: 181.15
3-Nitrobenzoic acid hydrazide

5.89.1 Technical description. m-Nitrobenzhydrazide exists in the form of crystalline needles. It is slightly soluble in water and alcohol, but very soluble in hot water and hot alcohol. It is insoluble in ether, benzene, chloroform.

5.89.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.89.2.1 Requirement. Specification requirement for m-nitrobenzhydrazide, reagent, is shown in Table XCI.

TABLE XCI. m-Nitrobenzhydrazide, Reagent - requirement.

Melting point (°C)	153 - 155

5.89.3 Use. m-Nitrobenzhydrazide, reagent, is used as a laboratory reagent.

5.89.4 Safety. m-Nitrobenzhydrazide is a burnable solid. It is toxic by inhalation and ingestion. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. m-Nitrobenzhydrazide shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, m-Nitrobenzhydrazide can emit toxic fumes. m-Nitrobenzhydrazide is a moderate fire hazard.

5.89.5 Storage. m-Nitrobenzhydrazide shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.89.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.90 Name. p-Nitrobenzoic Acid, Reagent $NO_2C_6H_4COOH$ FW: 167.12
4-Nitrobenzoic acid
1-Carboxy-4-nitrobenzene
4-Nitrodracylic acid

5.90.1 Technical description. p-Nitrobenzoic acid exists in the form of monoclinic leaflets. It has a melting point of 242°C and sublimes at higher temperatures. Its density is 1.610 g/cm^3 at 20°C. It is insoluble in cold water, slightly soluble in benzene and soluble in alcohol, ether, chloroform, hot water and hot benzene.

5.90.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.90.2.1 Requirement. Specification requirement for p-nitrobenzoic acid, reagent, is shown in Table XCII.

TABLE XCII. p-Nitrobenzoic Acid, Reagent - requirement.

Melting point (°C)	240 - 242

5.90.3 Use. p-Nitrobenzoic acid, reagent, is used as a laboratory reagent.

5.90.4 Safety. p-Nitrobenzoic acid is a burnable solid. It is toxic by inhalation and ingestion. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Nitrobenzoic acid shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, p-Nitrobenzoic acid can emit toxic fumes.

5.90.5 Storage. p-Nitrobenzoic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.90.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.91 Name. p-Nitrobenzoyl Chloride, Reagent $NO_2C_6H_4COCl$ FW: 185.57
4-Nitrobenzoic acid chloride

5.91.1 Technical description. p-Nitrobenzoyl chloride exists in the form of yellow needles with a melting point of 75°C. Its boiling point is 150° - 152°C at 15 mm Hg and 202 - 205°C at 105 mm Hg. It is soluble in ether and decomposes in water and alcohol.

5.91.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.91.2.1 Requirement. Specification requirement for p-nitrobenzoyl chloride, reagent, is shown in Table XCIII.

TABLE XCIII. p-Nitrobenzoyl Chloride, Reagent - requirement.

Melting point (°C)	73 - 75

5.91.3 Use. p-Nitrobenzoyl chloride, reagent, is used in the synthesis of pharmaceuticals such as procaine hydrochloride, procaine amide, folic acid and benzocaine.

5.91.4 Safety. p-Nitrobenzoyl chloride is a toxic and burnable solid. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Nitrobenzoyl chloride shall be used with adequate ventilation. Wash thoroughly after handling. (Refer to 4.3.1.)

If heated to decomposition, p-nitrobenzoyl can emit toxic fumes of hydrogen chloride and nitric oxides. It will also react with water or steam to produce toxic and corrosive fumes. The TLV for hydrogen chloride is 5 ppm (7 mg/m^3) - ceiling limit. The PEL is the same. For nitric oxide it is 25 ppm (30 mg/m^3). The PEL is the same.

5.91.5 Storage. p-Nitrobenzoyl chloride shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.91.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Corrosive, Waste Number D002; Reactive, Waste Number D003.

5.92 Name. p-Nitrobenzyl Chloride, Reagent $ClCH_2C_6H_4NO_2$ FW: 171.58
α-Chloro-4-nitrotoluene

5.92.1 Technical description. p-Nitrobenzyl chloride exists in the form of cyrstalline plates or needles. Its melting point of 71°C. It is very soluble in acetone, benzene and ethyl acetate; soluble in methyl and ethyl alcohols and ether. It is insoluble in water.

5.92.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.92.2.1 Requirement. Specification requirement for p-nitrobenzyl chloride, reagent, is shown in Table XCIV.

TABLE XCIV. p-Nitrobenzyl Chloride, Reagent - requirement.

Melting point (°C)	71 - 73

5.92.3 Use. p-Nitrobenzyl chloride, reagent, is used as a laboratory reagent.

5.92.4 Safety. p-Nitrobenzyl chloride is a toxic and burnable solid. It is also a lachrymator. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. p-Nitrobenzyl chloride shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, p-nitrobenzyl chloride can emit toxic fumes.

5.92.5 Storage. p-Nitrobenzyl chloride shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.92.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.93 Name. Nitromethane, Analyzed Reagent CH_3NO_2 FW: 61.04
Nitrocarbol

5.93.1 Technical description. Nitromethane exists as a colorless liquid with a melting point of -29°C and a boiling point of 100.8°C at 760 mm Hg. Its density is 1.1371 g/cm^3 (20°/4°) and its refractive index is 1.3817 at 20°C. It has a vapor density of 2.11 (air=1) and a flash point of 95°F (35°C) (SCC). Its autoignition temperature is 418°C (785°F). It has a LEL of 7.3 percent in air. It is soluble in water, alcohol, ether, acetone and alkali.

5.93.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.93.2.1 Requirements. Specification requirements for nitromethane, analyzed reagent, are shown in Table XCV.

TABLE XCV. Nitromethane, Analyzed Reagent - requirements (ACS).

Assay (GLC) (area percent), min, %	95.0
Appearance	Clear
Color (APHA) (max) 1/	10.0
Maximum Limits of Impurities (% by wt)	
Water (H_2O), max	0.05

1/ APHA Color Scale is identical to ASTM D 1209 (Platinum-Cobalt Scale).

5.93.3 Use. Nitromethane, analyzed reagent, is used as a reagent in analytical chemistry.

5.93.4 Safety. Nitromethane is a flammable liquid. It is toxic by ingestion and inhalation. It is irritating to the eyes, skin and mucous membranes. Inhalation of vapor or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. Nitromethane shall be used with adequate ventilation. The TLV for nitromethane is 100 ppm (250 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

If heated to decomposition, nitromethane can emit toxic fumes of NO_x. Nitromethane is a dangerous fire and explosion hazard.

5.93.5 Storage. Nitromethane shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.93.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste No. D001.

5.94 Name. 3-Nitrophthalic Acid, Reagent

$3\text{-}NO_2C_6H_3\text{-}1,2\text{-}(COOH)_2$ FW: 211.13

3-Nitro-1,2-benzenedicarboxylic acid

5.94.1 Technical description. 3-Nitrophthalic acid exists as pale yellow prisms. It has a melting point of 218°C. It is slightly soluble in water and ether. It is soluble in hot water and hot alcohol and insoluble in benzene, chloroform and petroleum ether.

5.94.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.94.2.1 Requirement. Specification requirement for 3-nitrophthalic acid, reagent, is shown in Table XCVI.

TABLE XCVI. 3-nitrophthalic Acid, Reagent - requirement.

Melting point (°C)	215.0 (decomposition)

5.94.3 Use. 3-Nitrophthalic acid, reagent, is used as a laboratory reagent.

5.94.4 Safety. 3-Nitrophthalic acid is a burnable solid. It is toxic by inhalation. It is irritating to the eyes and skin. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. 3-Nitrophthalic acid shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, 3-nitrophthalic acid can emit toxic fumes.

5.94.5 Storage. 3-Nitrophthalic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.94.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.95 Name. 3-Nitrophthalimide, Reagent

$3\text{-}NO_2C_6H_3\text{-}1,2(CO)_2NH$ FW: 192.13

3-Nitrophthalic acid imide

3-Nitro-1,2-benzenedicarboxylic acid imide

5.95.1 Technical description. 3-Nitrophthalimide exists in the form of yellow crystalline leaflets with a melting point range of 218° to 220°C. It is soluble in hot alcohol, but insoluble in water and ether.

5.95.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.95.2.1 Requirement. Specification requirement for 3-nitrophthalimide, reagent, is shown in Table XCVII.

TABLE XCVII. 3-nitrophthalimide, Reagent - requirement.

Melting point (°C)	218 - 220

5.95.3 Use. 3-Nitrophthalimide, reagent, is used as a laboratory reagent.

5.95.4 Safety. 3-Nitrophthalimide is a burnable solid. It is toxic by inhalation. It is irritating to the eyes and skin. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. 3-Nitrophthalimide shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, 3-nitrophthalimide can emit toxic fumes.

5.95.5 Storage. 3-Nitrophthalimide shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.95.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.96 Name. 1-Nitroso-2-Naphthol, Analyzed Reagent $C_{10}H_7OH$ FW: 173.17
α-Nitroso-β-naphthol
2-Hydroxy-1-nitrosonaphthalene
1,2-Naphthoquinone-1-oxime

5.96.1 Technical description. 1-Nitroso-2-naphthol exists in the form of crystalline yellow to yellowish-brown needles, or orange prisms and plates. It is very soluble in ether, benzene, acetic acid and hot alcohol, soluble in cold alcohol and acetone. It is insoluble in water.

5.96.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.96.2.1 Requirements. Specification requirements for 1-Nitroso-2-naphthol, reagent, are shown in Table XCVIII.

TABLE XCVIII. 1-Nitroso-2-Naphthol, Analyzed Reagent - requirements (USP/NF).

Assay (C_1OH_7OH), min, % by wt	95.0
Melting range, min-max, (°C)	109 - 111
Maximum Limits of Impurities (% by wt)	
Residue on ignition, max	0.2

5.96.3 Use. 1-Nitroso-2-naphthol is used as a reference standard for the determination of carbon, hydrogen, nitrogen and oxygen. It is also used as a reagent for the separation of cobalt from nickel.

5.96.4 Safety. 1-Nitroso-2-naphthol is a burnable solid. It is toxic by inhalation. It is irritating to the eyes and skin. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. 1-Nitroso-2-naphthol shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, 1-nitroso-2-naphthol can emit toxic fumes.

5.96.5 Storage. 1-Nitroso-2-naphthol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.96.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.97 Name. Paraformaldehyde, Analyzed Reagent (CH2O)n FW: (30.03)n
Paraform (n = 8 to 100)
Polyoxymethylene

5.97.1 Technical description. Paraformaldehyde is in the form of a white crystalline powder with a density of 1.46 g/cm3. Its melting range is 110° - 150°C and sublimation temperature is 150°C. Its vapor pressure in dry air is 1 mm at 30°C and 5 mm at 60°C. It has a flash point of 158°F (70.0°C) and an autoignition temperature of 572°F (300°C). Its LEL is 7.0 percent and UEL is 73.0 percent (in air). It is soluble in water with the evolution of formaldehdye. It is insoluble in alcohol and ether.

5.97.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.97.2.1 Requirements. Specification requirements for paraformaldehyde, analyzed reagent, are shown in Table XCIX.

TABLE XCIX. Paraformaldehyde, Analyzed Reagent - requirements (USP/NF).

Assay (as HCHO), min, % by wt	95.0
Residue on ignition, %, max	0.1
Solution in ammonia (5 g in 50 mL of NH3 solution)	Clear, colorless
Reaction (1 g in 20 mL distilled water)	Filtrate is neutral to litmus

5.97.3 Use. Paraformaldehyde, analyzed reagent, is used in organic synthesis and a source of concentrated formaldehyde.

5.97.4 Safety. Paraformaldehyde is a combustible solid. It is very irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dusts and vapors shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Paraformaldehyde shall be used with adequate ventilation. It is a suspected carcinogen. (Refer to 4.3.1.)

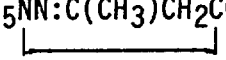
When heated, paraformaldehyde can emit flammable formaldehyde vapors. It is reactive with alkalies, inorganic acid and anhydrides, isocyanates and oxidizing compounds. The TLV for formaldehyde is 1 ppm (1.5 mg/m3).

5.97.5 Storage. Paraformaldehyde shall be stored in a cool, dry, well ventilated place in tightly closed containers made of aluminum, stainless steel or lines carbon steel. Contact with galvanized iron and copper and its alloys shall be avoided. Paraformaldehyde shall be stored away from sources of heat and open flame. (Refer to 4.3.2.)

5.97.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.98 Name. 1-Phenyl-3-Methyl-5-Pyrazolone, Reagent
3-Methyl-1-phenyl-5-pyrazolone



FW: 174.20

5.98.1 Technical description. 1-Phenyl-3-methyl-5-pyrazolone is in the form of monoclinic prismatic crystals. Its melting point is 127°C and boiling point is 287°C at 105 mm Hg. It is soluble in hot water and hot alcohol, and is slightly soluble in benzene.

5.98.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.98.2.1 Requirement. Specification requirement for 1-phenyl-3-methyl-5-pyrazolone, reagent, is shown in Table C.

TABLE C. 1-Phenyl-3-Methyl-5-Pyrazolone, Reagent - requirement.

Melting point (°C)	127 - 128

5.98.3 Use. 1-Phenyl-3-methyl-5-pyrazolone, reagent, is used as a very sensitive reagent for the detection of cyanide.

5.98.4 Safety. 1-Phenyl-3-methyl-5-pyrazolone is a burnable solid. Its toxicity is not known, but mists shall be avoided. Contact with the eyes and skin shall be avoided. Good hygienic practices employed with any industrial chemical shall be used. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, 1-phenyl-3-methyl-5-pyrazolone can emit toxic fumes.

5.98.5 Storage. 1-Phenyl-3-methyl-5-pyrazolone shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.98.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.99 Name. Phenyl- α-Naphthylamine, Reagent $C_{10}H_7NHC_6H_5$ FW: 219.29
N-Phenyl-1-naphthylamine
N-1-Naphthylaniline

5.99.1 Technical description. Phenyl- α-naphthylamine is in the form of colorless, crystalline leaflets or prisms. Its melting point is 62°C and its boiling point is 226°C at 15 mm and 335°C at 258 mm Hg. It is soluble in alcohol, ether, benzene and chloroform.

5.99.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.99.2.1 Requirement. Specification requirement for phenyl- α-naphthylamine, reagent, is shown in Table CI.

TABLE CI. Phenyl- α-Naphthylamine, Reagent - requirement.

Melting point (°C)	59.5 - 60.5

5.99.3 Use. Phenyl- α-naphthylamine, reagent, is used as fluorescent probe in studies of membrane structure of chloroplasts.

5.99.4 Safety. Phenyl- α-naphthylamine is a burnable solid. It is irritating to the respiratory tract, eyes, skin and mucous membranes. It can be readily absorbed through skin in addition to the respiratory route. Inhalation of dust and vapors shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Phenyl- α-naphthylamine shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, phenyl- α-naphthylamine can emit toxic fumes.

5.99.5 Storage. Phenyl- α-naphthylamine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.99.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.100 Name. o-Phenylenediamine, Reagent $C_6H_4(NH_2)_2$ FW: 108.15
1,2-Diaminobenzene
o-Diaminobenzene

5.100.1 Technical description. o-Phenylenediamine exists in the form of brownish-yellow crystalline leaflets or plates. It has a melting point of 102° to 103°C and a boiling point of 256° to 258°C. It is very soluble in alcohol, and soluble in ether, benzene, chloroform and hot water.

5.100.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.100.2.1 Requirement. Specification requirement for o-phenylenediamine, reagent, is shown in Table CII.

TABLE CII. o-Phenylenediamine, Reagent - requirement.

Melting point (°C)	101 - 103

5.100.3 Use. o-Phenylenediamine, reagent, is used as a reagent for the identification of nickel.

5.100.4 Safety. o-Phenylenediamine is a burnable solid. It is toxic by inhalation. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. o-Phenylenediamine shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, o-Phenylenediamine can emit toxic fumes of nitrogen compounds; it can react with oxidizing materials.

5.100.5 Storage. o-Phenylenediamine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, open flame and oxidizing materials. (Refer to 4.3.2.)

5.100.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.101 Name. p-Phenylenediamine, Reagent $C_6H_4(NH_2)_2$ FW: 108.15
1,4-Diaminobenzene
p-Diaminobenzene

5.101.1 Technical description. p-Phenylenediamine exists in the form of white to slightly red crystalline plates that darken on exposure to air. It has a melting point of 140°C and a boiling point of 267°C. It is soluble in hot water, hot alcohol, and hot benzene; and ether and chloroform.

5.101.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.101.2.1 Requirement. Specification requirement for p-phenylenediamine, reagent, is shown in Table CIII.

TABLE CIII. p-Phenylenediamine, Reagent - requirement.

Melting point (°C)	139 - 141

5.101.3 Use. p-Phenylenediamine, reagent, is used as an analytical reagent for aldehydes, ammonium salts, ozone and sulfur dioxide.

5.101.4 Safety. p-Phenylenediamine is a burnable solid. It is toxic by inhalation. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. p-Phenylenediamine shall be used with adequate ventilation. p-Phenylenediamine is a suspected carcinogen. The TLV for p-Phenylenediamine - including skin is 0.1 mg/m^3. The PEL is the same. (Refer to 4.3.1.)

If heated to decomposition, p-Phenylenediamine can emit toxic fumes of nitrogen compounds; it can react with oxidizing materials.

5.101.5 Storage. p-Phenylenediamine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, open flame and oxidizing materials and protected from light. (Refer to 4.3.2.)

5.101.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.102 Name. p-Phenylenediamine, Hydrochloride, Analyzed Reagent
$C_6H_4(NH_2)_2 \cdot 2HCl$ FW: 181.06
1,4-Diaminobenzene dihydrochloride

5.102.1 Technical description. p-Phenylenediamine hydrochloride exists as white to pale tan crystals or crystalline powder. It is very soluble in water, slightly soluble in alcohol and ether. It turns red on exposure to air.

5.102.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.102.2.1 Requirements. Specification requirements for p-phenylenediamine, hydrochloride, analyzed reagent, are shown in Table CIV.

TABLE CIV. p-Phenylenediamine, Hydrochloride, Analyzed Reagent - requirements (USP/NF).

Insoluble matter (1.0 g in 10 mL water)	Solution is clear and complete
Molar absorptivity (at 239 nm), min	9000

5.102.3 Use. p-Phenylenediamine hydrochloride, analyzed reagent, is used as a reagent for determination of blood, hydrogen sulfide and amyl alcohol.

5.102.4 Safety. p-Phenylenediamine hydrochloride is a burnable solid. It is toxic by inhalation. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. p-Phenylenediamine hydrochloride shall be used with adequate ventilation. p-Phenylenediamine hydrochloride is a suspected carcinogen. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, p-Phenylenediamine hydrochloride can emit toxic fumes of nitrogen compounds; it can react with oxidizing materials.

5.102.5 Storage. p-Phenylenediamine hydrochloride shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, open flame and oxidizing materials and protected from light. (Refer to 4.3.2.)

5.102.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.103 Name. Phenylhydrazine, Analyzed Reagent $C_6H_5NHNH_2$ FW: 108.15
Hydrozinobenzene

5.103.1 Technical description. Phenylhydrazine exists in the form of monoclinic prisms or plates. It has a melting point of 19.8°C and a boiling point of 243°C at 760 mm Hg. Its density is 1.6084 g/cm^3 at 20°C. It has a flash point of 192°F (89°C). Its vapor pressure is 1 mm at 71.8°C and vapor density is 3.7 (air=1). It is sensitive to light. It is soluble in all proportions in alcohol, ether, benzene and chloroform, very soluble in acetone, soluble in hot water and slightly soluble in ligroin.

5.103.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.103.2.1 Requirements. Specification requirements for phenylhydrazine, analyzed reagent, are shown in Table CV.

TABLE CV. Phenylhydrazine, Analyzed Reagent - requirements (USP/NF).

Congealing temperature (°C) (min)	16.0
Insoluble matter (1 mL with 20 mL diluted acetic acid)	Solution is clear or practically so.
Residue on ignition, max, % by wt (1 mL with 0.5 mL sulfuric acid)	0.1

5.103.3 Use. Phenylhydrazine, analyzed reagent, is used as a reagent for differentiation of sugars and as a reagent for aldehyes and ketones.

5.103.4 Safety. Phenylhydrazine is a flammable solid. It is toxic by inhalation and skin absorption. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. Phenylhydrazine shall be used with adequate ventilation. Phenylhydrazine is a

suspected carcinogen. The TLV for phenylhydrazine - including skin is 5 ppm (20 mg/m^3). The PEL is 5 ppm (22 mg/m^3). (Refer to 4.3.1.)

If heated to decomposition, Phenylhydrazine can emit toxic fumes of nitrogen compounds.

5.103.5 Storage. Phenylhydrazine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame and protected from light. (Refer to 4.3.2.)

5.103.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.104 Name. Phenylhydrazine Hydrochloride, Analyzed Reagent
$C_6H_5NHNH_2 \cdot HCl$ FW: 144.61
Hydrozinobenzene hydrochloride

5.104.1 Technical description. Phenylhydrazine hydrochloride exists in the form of crystaline leaflets. It has a melting point of 243°C to 246°C with decomposition. It is very soluble in water, soluble in alcohol, and insoluble in ether. It is sensitive to light.

5.104.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.104.2.1 Requirements. Specification requirements for phenylhydrazine hydrochloride, analyzed reagent, are shown in Table CVI.

TABLE CVI. Phenylhydrazine Hydrochloride, Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	242 to 246
Residue on ignition, % by wt	0.1
Solubility (Solutions of 500 mg in 10 mL water and 10 mL alcohol, separately)	Complete and clear

5.104.3 Use. Phenylhydrazine hydrochloride, analyzed reagent, is used as a reagent for differentiation of sugars and as a reagent for aldehydes and ketones. It is also used in medicine as a reagent for the determination of sugar in urine.

5.104.4 Safety. Phenylhydrazine hydrochloride is a combustible solid. It is toxic by inhalation and skin absorption. It is irritating to the eyes, skin and mucous membranes. Phenylhydrazine hydrochloride may cause sever dermatitis particularly in sensitized persons. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. Phenylhydrazine hydrochloride shall be used with adequate ventilation. Phenylhydrazine hydrochloride is a suspected carcinogen. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, Phenylhydrazine hydrochloride can emit toxic fumes of nitrogen compounds and chlorides.

5.104.5 Storage. Phenylhydrazine hydrochloride shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame and protected from light. (Refer to 4.3.2.)

5.104.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.105 Name. Phenylisocyanate, Analyzed Reagent C_6H_5NCO FW: 119.12
Phenylcarbimide
Carbanil
Isocyanobenzene

5.105.1 Technical description. Phenylisocyanate exists in the form of colorless liquid with a specific gravity of 1.0956 (19.6°/4°C). Its melting point is -30°C and its boiling point is 162°-163°C at 751 mm Hg. Its refractive index is 1.5368 (19.6°/4°C). It has a vapor pressure of 1 mm at 10.6°C and a flash point of 132°F (55°C) (SCC). It decomposes in water or alcohol. It is soluble in ether and acetone.

5.105.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.105.2.1 Requirement. Specification requirement for phenylisocyanate, analyzed reagent, is shown in Table CVII.

TABLE CVII. Phenylisocyanate, Analyzed Reagent - requirement (USP/NF).

Assay (C_6H_5NCO), min, % by wt	97.0

5.105.3 Use. Phenylisocyanate, analyzed reagent, is used for identifying alcohols and amines.

5.105.4 Safety. Phenylisocyanate is a combustible liquid. It is toxic by inhalation, ingestion and on contact with skin. It is a lachrymator. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapors and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. Phenylisocyanate shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, phenylisocyanate can emit toxic fumes. Contact with acids, acid fumes, water or steam will produce toxic and flammable vapors. Contact with alcohols, strong bases and metals which react with isocyanates shall also be avoided.

5.105.5 Storage. Phenylisocyanate shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks, open flame, acids, acid fumes, water, steam, alcohols and strong bases. (Refer to 4.3.2.)

5.105.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable - Waste No. D001.

5.106 Name. Phenylisothiocyanate, Reagent C_6H_5NCS FW: 135.19
Thiocarbanil
Phenyl mustard oil
Phenylthiocarbonimide

5.106.1 Technical description. Phenylisothiocyanate is in the form of colorless to pale yellow liquid. Its melting point is -21°C and its boiling point is 221°C at 760 mm Hg and 95°C at 12 mm Hg. Its specific gravity is 1.1303 (20°/4°C). It has a flash point of 190°F (87°C) (SCC). It is soluble in alcohol and ether, and insoluble in water.

5.106.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.106.2.1 Requirements. Specification requirements for phenylisothiocyanate, reagent, are shown in Table CVIII.

TABLE CVIII. Phenylisothiocyanate, Reagent - requirements.

Boiling point (°C)(15 mm Hg)(95 mL of a 100 mL specimen)	99 - 100
Specific gravity (20°/4°C)	1.133±0.003

5.106.3 Use. Phenylisothiocyanate reagent, is used in N-terminal residue analysis of amino acids at end of peptide chain.

5.106.4 Safety. Phenylisothiocyanate is a combustible liquid. It is toxic by inhalation, ingestion and on contact with skin. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapors and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. Phenylisothiocyanate shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, phenylisothiocyanate can emit toxic fumes. Contact with acids, acid fumes, water or steam will produce toxic and flammable vapors. Contact with alcohols, strong bases and metals which react with isocyanates shall also be avoided.

5.106.5 Storage. Phenylisothiocyanate shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks, open flame, acids, acid fumes, water, steam, alcohols and strong bases. (Refer to 4.3.2.)

5.106.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.107 Name. p-Phenylphenacyl Bromide, Reagent $C_6H_5C_6H_4COCH_2Br$ FW: 275.15

2-Bromo-4[1]-phenylacetophenone
α-Bromo-4-phenylacetophenone
α-Bromo-p-phenylacetophenone

5.107.1 Technical description. p-Phenylphenacyl bromide is in the form of long colorless needles. Its melting point is 125.5°C. It is slightly soluble in alcohol and ether.

5.107.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.107.2.1 Requirement. Specification requirement for p-phenylphenacyl bromide, reagent, is shown in Table CIX.

TABLE CIX. p-Phenylphenacyl Bromide, Reagent - requirement.

Melting point (°C)	124 - 126

5.107.3 Use. p-Phenylphenacyl bromide is used as a reagent and as an intermediate in organic synthesis.

5.107.4 Safety. p-Phenylphenacyl bromide is a burnable solid. It is a lachrymator. It is irritating to the eyes and skin. Contact with the eyes, skin and clothing shall be avoided. p-Phenylphenacyl bromide shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, p-phenylphenacyl bromide can emit toxic fumes.

5.107.5 Storage. p-Phenylphenacyl bromide shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.107.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.108 Name. 1-Phenylsemicarbazide, Reagent $C_6H_5NHNHCONH_2$ FW: 151.70
1-Carbamyl-2-phenylhydrazine

5.108.1 Technical description. 1-Phenylsemicarbazide is in the form of crystalline leaflets. Its melting point is 172°C. It is slightly soluble in cold water and ether; and soluble in alcohol, acetone, chloroform, methanal and hot water.

5.108.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.108.2.1 Requirement. Specification requirement for 1-phenylsemicarbazide, reagent, is shown in Table CX.

TABLE CX. 1-Phenylsemicarbazide, Reagent - requirement.

Melting point (°C)	174 - 176

5.108.3 Use. 1-Phenylsemicarbazide, reagent, is used as a reagent for the determination of ketones.

5.108.4 Safety. 1-Phenylsemicarbazide is a burnable solid. It is toxic by inhalation and absorption through skin. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 1-Phenylsemicarbazide shall be used with adequate ventilation. Wash thorough after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, 1-phenylsemicarbazide can emit toxic fumes.

5.108.5 Storage. 1-Phenylsemicarbazide shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.108.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.109 Name. Phloroglucinal, Dihydrate, Analyzed Reagent
$C_6H_3(OH)_3 \cdot 2H_2O$ FW: 162.14

1,3,5-Benzenetriol
1,3,5-Trihydroxybenzene

5.109.1 Technical description. Phloroglucinal dihydrate is in the form of white or yellowish crystalline leaflets or plates which become anhydrous at about 110°C. The anhydrous form has a melting point of 218° to 219°C, and sublimes partly undecomposed. It is slightly soluble in water and very soluble in alcohol, ether, benzene and pyridine. It is darkened by light.

5.109.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.109.2.1 Requirements. Specification requirements for phloroglucinol dihydrate, analyzed reagent, are shown in Table CXI.

TABLE CXI. Phloroglucinal, Dihydrate, Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	215 - 219
Residue on ignition, max, % by wt	0.1
Diresorcinol	To pass color test
Insoluble in alcohol (1 g in 20 mL)	Clear and complete solution

5.109.3 Use. Phloroglucinol dihydrate, analyzed reagent, is used as a reagent for pentoses and with vanillin for determining the presence of free hydrochloric acid.

5.109.4 Safety. Phoroglucinol dihydrate is a burnable solid. It is toxic by inhalation. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Phloroglucinol dihydrate shall be used with adequate ventilation. Wash thorough after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, phloroglucinol dihydrate can emit toxic fumes.

5.109.5 Storage. Phloroglucinol dihydrate shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame and protected from light. (Refer to 4.3.2.)

5.109.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.110 Name. Phthalic Anhydride, Analyzed Reagent $C_6H_4(CO)_2O$ FW: 148.12
Phthalandione

5.110.1 Technical description. Phthalic anhydride is in the form of white crystalline needles. It has a melting point of 131.61°C and a boiling point of 295.1°C. Its density is 1.527 g/cm^3 at 4°C. It has a flash point of 305°F (151°C) (SCC). Its LEL is 1.7 percent and UEL is 10.4 percent. It has an autoignition temperature of 1083°F. It is slightly soluble in water and ether and soluble in alcohol and hot benzene.

5.110.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.110.2.1 Requirements. Specification requirements for phloroglucinol dihydrate, analyzed reagent, are shown in Table CXII.

TABLE CXII. Phthalic Anhydride, Analyzed Reagent - requirements (ACS).

Assay ($C_8H_4O_3$), min-max, % by wt	99.7 - 110.2
Appearance	White flaky crystals
Melting point	Not more than 3°C range including 131°C
Maximum Limits of Impurities (% by wt)	
Residue after ignition	0.01
Chloride (Cl)	0.002
Sulfate (SO_4)	0.003
Maximum Limits of Impurites (ppm)	
Heavy metals (as Pb)	5.0
Iron (Fe)	

5.110.3 Use. Phthalic anhydride, analyzed reagent, is used as a reagent for the analysis of alcohols in the presence of phenols.

5.110.4 Safety. Phthalic anhydride is a burnable solid. Thermal burns are the most serious hazard of phthalic anhydride. Inhalation of the vapors may cause coughing, sneezing and irritation of the respiratory tract. Local irri-

tation can result from contact with moist skin producing reddening or small blisters if exposure is prolonged and sever. Inhalation of vapors shall be avoided. Phthalic anhydride shall be used with adequate ventilation. Wash thorough after handling. The TLV for phthalic anhydride is 1.0 ppm (6.0 mg/m^3). (Refer to 4.3.1.)

If heated to decomposition, phthalic anhydride can emit toxic fumes.

5.110.5 Storage. Phthalic anhydrides shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.110.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic; Waste No. U190.

5.111 Name. Picric Acid, Analyzed Reagent $(NO_2)_3C_6H_2OH$ FW: 229.11
2,4,6-Trinitrophenol

5.111.1 Technical description. Picric acid is in the form of yellow leaflets or prisms. Its melting point is 122°-123°C and it explodes above 300°C. Its slightly soluble in water, soluble in alcohol, ether, benzene and hot water and very soluble in hot benzene.

5.111.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.111.2.1 Requirements. Specification requirements for picric acid, analyzed reagent, are shown in Table CXIII.

TABLE CXIII. Picric Acid, Analyzed Reagent - requirements (ACS).

Water (H_2O), min-max, % by wt	10 - 15
Melting point (dried), °C, min-max	121 - 123
Maximum Limits of Impurities (% by wt)	
Insoluble and resinous matter	0.01
Insoluble in benzene	0.1
Sulfate (SO_4)	0.01

5.111.3 Use. Picric acid, analyzed reagent, is used as a reagent in microscopy (fixing agent in histology).

5.111.4 Safety. Picric acid is a flammable solid. It is a severe explosion risk when dry; it is sensitive to shocks or heat. It is especially reactive with metals or metallic salts particularly copper, lead and zinc. It is highly toxic by inhalation and in contact with skin. It is irritating to eyes, skin and mucous membranes. Inhalation of vapors shall be avoided. Contact with eyes, skin and clothing shall be avoided. Picric acid shall be used with adequate ventilation. Wash thoroughly after handling. The TLV for picric acid - including skin is 0.1 mg/m^3. The PEL is the same. (Refer to 4.3.1.)

If heated to decomposition, picric acid can emit toxic fumes.

5.111.5 Storage. Picric acid shall be stored in a cool, well ventilated place in tightly closed containers away from sources of heat and open flame. Protected against shock and contact with metals and metallic salts. (Refer to 4.3.2.)

5.111.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Reactive, Waste No. D003.

5.112 Name. Picrolonic Acid, Analyzed Reagent

$NO_2C_6H_4NN{:}C(CH_3)C(NO_2){:}COH$ FW: 264.21

3-Methyl-4-nitro-1-(p-nitrophenyl)-5-pyrazolone

5.112.1 Technical description. Picrolonic acid is in the form of yellow crystalline leaflets. Its melting point is 116°-117°C. It decomposes at 125°C. Its slightly soluble in water and soluble in alcohol.

5.112.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.112.2.1 Requirements. Specification requirements for picrolonic acid, analyzed reagent, are shown in Table CXIV.

TABLE CXIV. Picrolonic Acid, Analyzed Reagent - requirements (USP/NF).

Melting range °C	115 - 117
Residue on ignition	Negligible from 200 mg.
Sensitiveness	To pass test by formation of a precipitate when reacted with a $CaCl_2$ solution

5.112.3 Use. Picrolonic acid, analyzed reagent, is used as a reagent for alkaloid identification, for tryptophan and phenylalanine and for the detection and estimation of calcium, lead, strontium and thorium.

5.112.4 Safety. Picrolonic acid is a burnable solid. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust shall be avoided. Contact with eyes, skin and clothing shall be avoided. Picrolonic acid shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, picrolonic acid can emit toxic fumes.

5.112.5 Storage. Picrolonic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.112.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.113 Name. Piperidine, Analyzed Reagent $C_5H_{11}N$ FW: 85.15
Hexahydropyridine
Pentamethyleneimine

5.113.1 Technical description. Piperidine is in the form of clear, colorless liquid with an amine-like odor. Its melting point is -9°C and boiling point is 106°C. Its flash point is 61°F (16°C) (TCC). Its specific gravity is 0.8606 (20°/4°C). It has a vapor pressure of 40 mm at 29.2°C and a vapor density of 3.0 (air=1). Its refractive index is 1.4530 at 20°C. It is miscible with water and alcohol, and is soluble in acetone, benzene, ether and chloroform.

5.113.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.113.2.1 Requirements. Specification requirements for picrolonic acid, analyzed reagent, are shown in Table CXV.

TABLE CXV. Piperidine, Analyzed Reagent - requirements (USP/NF).

Congealing range (°C)	12 - 15
Boiling range, min-max, %, (95 mL of a 100 mL specimen)	104 - 106
Refractive index	About 1.454

5.113.3 Use. Piperidine, analyzed reagent, is used as a reagent in the Knoevenagel reaction and Michael addition reaction.

5.113.4 Safety. Piperidine is a flammable liquid. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapors shall be avoided. Contact with eyes, skin and clothing shall be avoided. Piperidine shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, piperidine can emit toxic fumes.

5.113.5 Storage. Piperidine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.113.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste No. D001.

5.114 Name. Propionic Acid, Analyzed Reagent CH_3CH_2COOH FW: 74.08
Propanoic acid
Methylacetic acid

5.114.1 Technical description. Propionic acid is in the form of a colorless, oily liquid that has a rancid odor. Its melting point is -20.8°C and boiling point is 140.99 at 760 mm Hg. Its specific gravity is 0.9930 (20°/4°C). It has a vapor pressure of 10 mm at 39.7°C and a vapor density of 2.56 (air=1). Its flash point is 125°F (51°C) (SCC). It is slightly soluble in water and alcohol, and soluble in ether.

5.114.2 Specification. Manufacturer's requirements. (No Government specification)

5.114.2.1 Requirement. Propionic acid, analyzed reagent, is commercially available with a minimum purity of 99.5 percent.

5.114.3 Use. Propionic acid, analyzed reagent, is used in organic synthesis including the synthesis of amino acids.

5.114.4 Safety. Propionic acid is a corrosive, combustible liquid. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapors or mist shall be avoided. Contact with eyes, skin and clothing shall be avoided. Propionic acid shall be used with adequate ventilation. Wash thoroughly after handling. The TLV for propionic acid is 10 ppm (30 mg/m^3). (Refer to 4.3.1.)

If heated to decomposition, propionic acid can emit acrid fumes.

5.114.5 Storage. Propionic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.114.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable; Waste Number D001

5.115 Name. Pyridine, Analyzed Reagent N:CHCH:CHCH:CH FW: 79.10

Azine

5.115.1 Technical description. Pryidine is in the form of slightly yellow or colorless liquid. Its melting point is -42°C and boiling point is 115.5°C. Its specific gravity is 0.9819 g/cm^3 (H_2O=1). Its refractive index is 1.5095 at 20°C. Its flash point is 68°F (20°C) and its autoignition temperature is 900°F. Its LEL is 1.8 percent and UEL is 12.4 percent in air. It is slightly soluble in water, alcohol, ether, aceton, benzene and chloroform.

5.115.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.115.2.1 Requirements. Specification requirements for pryidine, analyzed reagent, are shown in Table CXVI.

TABLE CXVI. Pryidine, Analyzed Reagent - requirements (ACS).

Boiling range. Entirely within 2.0°C range	Including 115.3 ± 0.1
Solubility in water (10 mL in 90 mL water)	To pass turbidity test
Residue after evaporation, max, % by wt	0.002
Water (H_2O), max, % by wt	0.1
Chloride (Cl), max, % by wt	0.001
Sulfate (SO_4), max, % by wt	0.001
Ammonia (NH_3), max, % by wt	0.002

TABLE CXVI. Pryidine, Analyzed Reagent - requirements (ACS)- Continued.

Copper (Cu)	To pass color test (limit about 5 ppm)
Reducing substances	To pass colot test

5.115.3 Use. Pyridine, analyzed reagent, is used as a reagent in liquid chromatography.

5.115.4 Safety. Pyridine is a flammable liquid. It is toxic by inhalation. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapors or mists shall be avoided. Contact with eyes, skin and clothing shall be avoided. Pryidine shall be used with adequate ventilation. Wash thoroughly after handling. The TLV for pyridine is 5 ppm (15 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

Pryidine is an explosion hazard in the form of vapor when exposed to flame or spark. If heated to decomposition it can emit toxic fumes. It will react with oxidizing materials.

5.115.5 Storage. Pryidine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame and oxidizing materials. (Refer to 4.3.2.)

5.115.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic; Waste No. U196.

5.116 Name. Pyrocatechol, Reagent $1,2\text{-}(HO)_2C_6H_4$ FW: 110.11
1,2-Dihydroxybenzene
1,2-Benzenediol
o-Dihydroxybenzene
Catechol

5.116.1 Technical description. Pyrocatechol is in the form of colorless monoclinic or prismatic crystals. Its melting point is 105°C and boiling point is 245.5°C. Its flash point is 279°F (137°C) (SCC). Its vapor pressure is 10 mm at 118.3°C and its vapor density is 3.79 (air=1). It is very soluble in acetone, soluble in water, alcohol, ether, chloroform and hot benzene. Pyrocatechol, upon exposure to light and air will turn brown.

5.116.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.116.2.1 Requirement. Specification requirement for pyrocatechol, reagent, is shown in Table CXVII.

TABLE CXVII. Pyrocatechol, Reagent - requirement.

Melting point (°C)	102-104

5.116.3 Use. Pyrocatechol, reagent, is used as a reagent for tin.

5.116.4 Safety. Pyrocatechol is a burnable solid. It is toxic by inhalation and skin absorption. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust or vapors shall be avoided. Contact with eyes, skin and clothing shall be avoided. Pyrocatechol shall be used with adequate ventilation. Wash thoroughly after handling. The TLV for pyrocatechol is 5 ppm (20 mg/m^3). (Refer to 4.3.1.)

If heated to decomposition, pyrocatechol can emit toxic fumes.

5.116.5 Storage. Pyrocatechol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.116.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.117 Name. Pyrogallol, Analyzed Reagent $C_6H_3(OH)_3$ FW: 126.11
Pyrogallic acid
1,2,3-Trihydroxybenzene

5.117.1 Technical description. Pyrogallol is in the form of white lustrous leaflets or needles. Its melting point is 133-134°C and boiling point is 309°C at 760 mm Hg. Its density is 1.453 g/cm^3 (4°/4°C). Its refractive index is 1.561 at 134°C. Pyrogallol turns gray on exposure to light and brown on exposure to air. It is very soluble in water, alcohol, ether, and insoluble in benzene.

5.117.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.117.2.1 Requirements. Specification requirements for pyrogallol, analyzed reagent, are shown in Table CXVIII.

TABLE CXVIII. Pyrogallol, Analyzed Reagent - requirements (ACS).

Melting point within 2.0°C range	Between 131.0 and 135.0
Maximum Limits of Impurities (% by wt)	
Residue after ignition	0.005
Chloride (Cl)	0.001
Sulfate (SO_4)	0.005
Iron (Fe)	0.001
Maximum Limits of Impurities (ppm)	
Heavy metals (as Pb)	5.0

5.117.3 Use. Pyrogallol, analyzed reagent, is used as a reagent in the analysis of free oxygen in the air and other gas mistures and as a protective colloid in preparation of metallic collodial solutions. It is also used as a reagent for antimony and bismuth.

5.117.4 Safety. Pyrogallol is toxic by inhalation and skin absorption. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dusts shall be avoided. Contact with eyes, skin and clothing shall be avoided. Pyrogallol shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

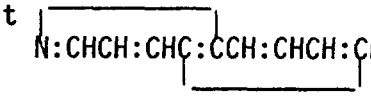
If heated to decomposition, pyrogallol can emit toxic fumes.

5.117.5 Storage. Pyrogallol shall be stored in a cool, dry, well ventilated place in tightly closed containers protected from light. (Refer to 4.3.2.)

5.117.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.118 Name. Quinoline (Synthetic), Analyzed Reagent
1-Benzazine FW: 129.16



5.118.1 Technical description. Quinoline is in the form of a colorless liquid. Its melting point is -15.6°C and boiling point is 238.05°C at 760 mm Hg. Its specific gravity is 1.0929 (20°/4°C). Its refractive index is 1.6268 at 20°C. Its density is 4.45 (air=1). Its LEL is 1.2 percent in air. Its autoignition temperature is 480°C (896°F). It darkens with age and is hygroscopic. It is soluble in hot water and slightly soluble in alcohol, ether, acetone, benzene and carbon disulfide.

5.118.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.118.2.1 Requirements. Specification requirements for quinoline (synthetic), analyzed reagent, are shown in Table CXIX.

TABLE CXIX. Quinoline (Synthetic), Analyzed Reagent - requirements (ACS).

Assay (GLC), area percent, min	99.0
Quinaldine, max, % by wt	0.05
Color (APHA), max 1/	30
Water (H_2O), max, % by wt	0.10

1/ APHA Color Scale is identical to ASTM D 1209 (Platinum-Cobalt Scale).

5.118.3 Use. Quinoline (synthethic), analyzed reagent, is used as a reagent in organic synthesis and as a preservative for anatomical specimens.

5.118.4 Safety. Quinoline is a combustible liquid. It is toxic by inhalation. It is irritating to the eyes, skin and mucous membranes. Inhalation of vapors and mists shall be avoided. Contact with eyes, skin and clothing shall be avoided. Quinoline shall be used with adequate ventilation. Wash thoroughly after handling. Quinoline is suspected carcinogen. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, quinoline can emit toxic fumes.

5.118.5 Storage. Quinoline shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks, open flames and protected from light. (Refer to 4.3.2.)

5.118.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.119 Name. 8-Quinolinol, Analyzed Reagent $HOC_6H_3N{:}CHCH{:}CH$ FW: 145.16

8-Hydroxyquinoline
Oxine

5.119.1 Technical description. 8-Quinolinol is in the form of white crystalline needles. Its melting point is 75°-76°C and boiling point is 266.6°C at 752 mm Hg. Its density is 1.034 at 209°C. Its darkens when exposed to light. It is very soluble in alcohol, hot benzene and hot chloroform, soluble in acetone, alkali and acid, and insoluble in water and ether.

5.119.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.119.2.1 Requirements. Specification requirements for 8-quinolinol, analyzed reagent, are shown in Table CXX.

TABLE CXX. 8-Quinolinol, Analyzed Reagent - requirements (ACS).

Melting point (°C), min-max	72.5 - 74.0
Suitability for magnesium determination	To pass precipitate test
Maximum Limits of Impurities (% by wt)	
Insoluble in alcohol	0.05
Residue after ignition	0.05
Sulfate (SO_4)	To pass turbidity test (Limit about 0.02)

5.119.3 Use. 8-Quinolinol, analyzed reagent, is used as a reagent for the determination of magnesium.

5.119.4 Safety. 8-Quinolinol is a burnable solid. It is moderately toxic by inhalation. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust and vapors shall be avoided. Contact with eyes, skin and clothing shall be avoided. 8-Quinolinol shall be used with adequate ventilation. Wash thoroughly after handling. 8-Quinolinol is a suspected carcinogen. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, 8-quinolinol can emit toxic fumes.

5.119.5 Storage. 8-Quinolinol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks, open flames and protected from light. (Refer to 4.3.2.)

5.119.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.120 Name. Quinone, Analyzed Reagent $OCCH{:}CHCOCH{:}CH$ FW: 108.10
p-Quinone
p-Benzoquinone
1,4-Benzoquinone
1,4-Cyclohexadienedione

5.120.1 Technical description. Quinone is in the form of yellow monoclinic crystals. Its melting point is 115.7°C. Its density is 1.318 g/cm^3. Its flash point is 560°F (293°C). It is soluble in hot water, alcohol and ether and slightly soluble in petroleum ether.

5.120.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.120.2.1 Requirement. Specification requirement for quinone, analyzed reagent, is shown in Table CXXI.

TABLE CXXI. Quinone, Analyzed Reagent - requirement (USP/NF).

Melting range (°C)	113-115

Quinone, analyzed reagent, is available commercially with a minimum purity of 98.0 percent.

5.120.3 Use. Quinone, analyzed reagent, is used as a reagent for the determination of amino acids by the formation of red charge-transfer complexes. It is also used for spectrophotometric determination of amines.

5.120.4 Safety. Quinone is a burnable solid. It is toxic by inhalation. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust and vapors shall be avoided. Contact with eyes, skin and clothing shall be avoided. Quinone shall be used with adequate ventilation. Wash thoroughly after handling. The TLV for quinone is 0.1 ppm (0.4 mg/m^3). The PEL is the same. (Refer to 4.3.1.)

If heated to decomposition, quinone can emit toxic fumes.

5.120.5 Storage. Quinone shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flames. (Refer to 4.3.2.)

5.120.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic, Waste No. U197.

5.121 Name. Resorcinol, Analyzed Reagent $1,3\text{-}(HO)_2C_6H_4$ FW: 110.11
1,3-Dihydroxybenzene
1,3-Benzenediol
m-Dihydroxybenzene

5.121.1 Technical description. Resorcinol is in the form of white crystalline needles or plates. Its melting point is 111°C and boiling point is 276.5°C. Its density is 1.271 g/cm^3. Its flash point is 261°F (127°C) (TCC), and its autoignition temperature is 608°C. Its vapor density is 3.79 (air=1). It turns pink on exposure to light. It is soluble in water, alcohol, and ether, and is slightly soluble in benzene.

5.121.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.121.2.1 Requirements. Specification requirements for resorcinol, analyzed reagent, are shown in Table CXXII.

TABLE CXXII. Resorcinol Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	109 - 111
Maximum Limits of Impurities (% by wt)	
Loss on drying	1.0
Residue on ignition	0.5
Phenol	No perceptible phenol odor
Catechol (No turbidity by addition of lead acetate teat solution	To pass turbidity test

5.121.3 Use. Resorcinol, analyzed reagent, is used as a reagent for the determination of barium nitrates and tartrates.

5.121.4 Safety. Resorcinol is a burnable solid. It is toxic by inhalation. It is irritating to the respiratory tract, eyes, skin and mucous membranes. In a suitable solvent it can readily be absorbed through skin. Inhalation of dust and vapors shall be avoided. Contact with eyes, skin and clothing shall be avoided. Resorcinol shall be used with adequate ventilation. Wash thoroughly after handling. The TLV for resorcinol is 10 ppm (45 mg/cm^3). Resorcinol is a suspected carcinogen. (Refer to 4.3.1.)

If heated to decomposition, resorcinol can emit toxic fumes.

5.121.5 Storage. Resorcinol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flames. Protect from light (Refer to 4.3.2.)

5.121.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic, Waste Number U201.

5.122 Name. Salicylaldoxime, Reagent 2-Hydroxybenzaldehyde oxime $2\text{-}HOC_6H_4CH{:}NOH$ FW: 137.40

5.122.1 Technical description. Salicylaldoxime is in the form of crystalline prisms. Its melting point is 63°C. Its flash point is 172°F (77.8°C). On heating, it decomposes to salicylaldehyde and hydroxylamine. It is very soluble in alcohol, ether and benzene; and slightly soluble in cold water.

5.122.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.122.2.1 Requirement. Specification requirement for salicylaldoxime, reagent, is shown in Table CXXIII.

TABLE CXXIII. Salicylaldoxime, Reagent - requirement.

Melting point (°C)	57 - 59

5.122.3 Use. Salicylaldoxime, reagent, is used as a reagent for the spectrophotometric determination of copper (II), iron (III), molybdenum (VI) and nickel (II).

5.122.4 Safety. Salicylaldoxime is a combustible solid. It is irritating to the skin and eyes. Contact with eyes, skin and clothing shall be avoided. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

Salicylaldoxime melts to a combustible liquid at about 140°F (60°C). If heated to decomposition it can emit toxic fumes.

5.122.5 Storage. Salicylaldoxime shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flames. (Refer to 4.3.2.)

5.122.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.123 Name. Semicarbazide Hydrochloride, Analyzed Reagent

$NH_2CONHNH_2 \cdot HCl$ FW: 111.57

Aminourea hydrochloride
Carbamylhydrazine hydrochloride

5.123.1 Technical description. Semicarbazide hydrochloride is in the form of white prismatic crystals. Its melting point range is 175°-177°C with decomposition. It is very soluble in water and slightly soluble in hot alcohol. It is insoluble in cold alcohol and ether.

5.123.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.123.2.1 Requirements. Specification requirements for semicarbazide hydrochloride, analyzed reagent, are shown in Table CXXIV.

TABLE CXXIV. Semicarbazide Hydrochloride, Analyzed Reagent - requirements (USP/NF).

Melting range (°C)	181-184
Solubility (1 g in 20 mL distilled water)	Clear Solution
Maximum Limits of Impurities (% by wt)	
Residue on ignition	0.2

5.123.3 Use. Semicarbazide hydrochloride, analyzed reagent, is used as a reagent for the determination of aldehydes and ketones; isolation of hormones and isolation of certain fractions from essential oils.

5.123.4 Safety. Semicarbazide hydrochloride is generally considered to be relatively non-toxic. Inhalation of dust and mists shall be avoided. Contact with eyes, skin and clothing shall be avoided. Semicarbazide hydrochloride shall be used with adequate ventilation. Wash thoroughly after handling. Semicarbazide is a suspected carcinogen. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, semicarbazide hydrochloride can emit toxic fumes.

5.123.5 Storage. Semicarbazide hydrochloride shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flames. (Refer to 4.3.2.)

5.123.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.124 Name. Sodium Bitartrate, Monohydrate, Analyzed Reagent

$NaHC_4H_4O_6 \cdot H_2O$ FW: 190.09

Sodium hydro tartrate, monohydrate
Sodium acid tartrate, monhydrate

5.124.1 Technical description. Sodium bitartrate, monohydrate, is in the form of white or colorless monoclinic or triclinic crystals. It loses water of hydration at 100°C and decomposes at 219°C. Its solubility in water is 9 g per 100 mL at 19°C. It is almost insoluble in alcohol. Its aqueous solution is acidic.

5.124.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.124.2.1 Requirements. Specification requirements for sodium bitartrate, monohydrate, analyzed reagent, are shown in Table CXXV.

TABLE CXXV. Sodium Bitartrate, Monohydrate, Analyzed Reagent - requirements (USP/NF).

Assay (as $NaHC_4H_4O_6 \cdot H_2O$), min-max, % by wt	99.0-100.5
Maximum Limits of Impurities (% by wt)	
Insoluble matter	0.01
Chloride (Cl)	0.02
Heavy metals (as Pb)	0.001
Sulfate (SO_4)	0.02

5.124.3 Use. Sodium bitartrate, monohydrate, analyzed reagent, is used as a reagent for the determination of potassium.

5.124.4 Safety. Sodium bitartrate, monohydrate, is a burnable solid. It has a low toxicity. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust or mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Sodium bitartrate, monohydrate, shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

Sodium bitartrate, monohydrate, is a slight fire hazard.

5.124.5 Storage. Sodium bitartrate, monohydrate, shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flames. (Refer to 4.3.2.)

5.124.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.125 Name. D-Sorbitol, Analyzed Reagent $HOCH_2(CHOH)_4CH_2OH$ FW: 182.18
D-Sorbite
D-Glucitol

5.125.1 Technical description. D-Sorbitol is in the form of white crystalline needles. Its melting point is 110°-112°C and a boiling point of 295°C. Its density is 1.489 g/cm^3 (20°/4°C). D-Sorbitol has a LEL of 0.152 oz./cu.ft. for 100 mesh material. It is very soluble in water, soluble in acetone, slightly soluble in hot alcohol and insoluble in ether.

5.125.2 Specification. Manufacturer's requirements. (No Government specification)

5.125.2.1 Requirements. D-Sorbitol, analyzed reagent, is commercially available with requirements as shown in Table CXXVI.

TABLE CXXVI. D-Sorbitol, Analyzed Reagent - requirements.

Assay ($C_6H_{14}O_6$), min, % by wt	91.0
Maximum Limits of Impurities (% by wt)	
Ash (sulfated)	0.1
Loss on drying (in vacuo, 80°C)	1.0
Reducing sugars	0.3
Total sugars	1.0
Chloride (Cl)	0.005
Sulfate (SO_4)	0.01
Heavy metals (as Pb)	0.001
Maximum Limits of Impurities (ppm)	
Arsenic (As)	3.0

5.125.3 Use. D-Sorbitol, analyzed reagent, is used as a biochemical reagent.

5.125.4 Safety. D-Sorbitol is a burnable solid. It is considered to be nontoxic, but can form nuisance dusts or mists which may effect the eyes and respiratory tract. D-Sorbitol dust can form explosive mixtures in air. D-Sorbitol shall be used with adequate ventilation. (Refer to 4.3.1.)

5.125.5 Storage. D-Sorbitol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flames. (Refer to 4.3.2.)

5.124.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.126 Name. Tannic Acid, Analyzed Reagent $C_{76}H_{52}O_{46}$ FW: 1701.24
Gallotannic
Tanin

5.126.1 Technical description. Tannic acid is in the form of pale yellow to brown amorphous crystals or flakes. Its melting point is 210°-215°C with decomposition into pyrogallol and carbon dioxide. Its flash point is 390°F (199°C) open cup (OC) and its autoignition temperature is 980°F (527°C). It is incompatable with salts of heavy metals, alkaloids, gelatin, albumin, starch and oxidizing materials. It is very soluble in alcohol and acetone, soluble in water and insoluble in ether, benzene, chloroform and carbon disulfide.

5.126.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.126.2.1 Requirements. Specification requirements for Tannic acid, analyzed reagent, are shown in Table CXXVII.

TABLE CXXVII. Tannic Acid, Analyzed Reagent - requirements (USP/NF).

Solubility (Solution of 2 g in 10 mL water)	Clear
Maximum Limits of Impurities (% by wt)	
Residue on ignition	0.1
Loss on drying	12.0
Dextrin, gum and resinous substances	To pass turbidity test
Heavy metals (as Pb)	0.002

5.126.3 Use. Tannic acid, analyzed reagent, is used as a reagent in analytical chemistry.

5.126.4 Safety. Tannic acid is a burnable solid. It is moderately toxic by inhalation. It is irritating to the eyes and skin. Inhalation of dust or mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Tannic acid shall be used with adequate ventilation. Tannic acid is a confirmed carcinogen. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, tannic acid emit toxic fumes. Tannic acid is a slight fire hazard.

5.126.5 Storage. Tannic acid shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flames. (Refer to 4.3.2.)

5.126.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.127 Name. Tetraethylammonium Bromide, Reagent $(C_2H_5)_4NBr$ FW: 210.17
TEAB
Tetranium
Ctambro

5.127.1 Technical description. Tetraethylammonium bromide is in the form of white, odorless, deliquescent crystals. It decomposes on melting at 547°F (286°C). It has a density of 1.397 (20°/4°C). Its vapor density is 5.3 (air=1). It has a negligible vapor pressure. It is freely soluble in water, alcohol, chloroform and acetone. It is slightly soluble in benzene.

5.127.2 Specification. Manufacturer's requirements. (No Government specification)

5.127.2.1 Requirements. Tetraethylammonium bromide, reagent, is commercially available with requirements as shown in Table CXXVIII.

TABLE CXXVIII. Tetraethylammonium Bromide, Reagent - requirements.

Assay [$(C_2H_5)_4NBr$], min, % by wt	98

5.127.3 Use. Tetraethylammonium bromide, reagent, is used as a chemical intermediate, catalyst and inhibitor. It is also used in medicine.

5.127.4 Safety. Tetraethylammonium bromide is a burnable solid. Contact of the eyes with crystals may cause irritation. Prolonged or repeated contact with the skin may cause irritation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition or burning of tetraethylammonium bromide may produce hydrogen bromide, carbon dioxide and/or carbon monoxide. It is incompatable with strong oxidizers.

5.127.5 Storage. Tetraethylammonium bromide shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, flame and strong oxidizers. (Refer to 4.3.2.)

5.127.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.128 Name. Tetramethylammonium Bromide, Analyzed Reagent
$(CH_3)_4NBr$ FW: 154.06

5.128.1 Technical description. Tetramethylammonium bromide has a melting point of 230°C with decomposition. It has a density of 1.56 g/cm^3. It is very soluble in water, soluble in methyl alcohol, slightly soluble in alcohol and insoluble in ether and benzene.

5.128.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.128.2.1 Requirement. Specification requirement for tetramethylammonium bromide, analyzed reagent, is shown in Table CXXIX.

TABLE CXXIX. Tetramethylammonium Bromide, Analyzed Reagent - requirement (USP/NF).

Assay [$(CH_3)_4NBr$], min, % by wt	98.0

5.128.3 Use. Tetramethylammonium bromide, analyzed reagent, is used as a chemical intermediate, catalyst and inhibitor. It is also used in medicine.

5.128.4 Safety. Tetramethylammonium bromide is a burnable solid. Contact of the eyes with crystals may cause irritation. Prolonged or repeated contact with the skin may cause irritation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition or burning of tetramethylammonium bromide may produce hydrogen bromide, carbon dioxide and/or carbon monoxide. It is incompatable with strong oxidizers.

5.128.5 Storage. Tetramethylammonium bromide shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, open flame and strong oxidizers. In case of fire use a water, foam or carbon dioxide extinguisher. (Refer to 4.3.2.)

5.128.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.129 Name. p,p'-Tetramethyldiaminobenzophenone, Reagent $[(CH_3)_2NC_6H_4]_2CO$ FW: 268.36

N,N,N',N'-Tetramethyl-4,4'-diaminobenzone
4,4'-Bis(dimethylamine)-benzophenone

5.129.1 Technical description. p,p'-Tetramethyldiaminobenzophenone is in the form of white to greenish crystalline leaflets. Its melting point is 179°C and its boiling point is above 360°C with decomposition. It is very soluble in benzene, slightly soluble in alcohol, very slightly soluble in ether and insoluble in water.

5.129.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.129.2.1 Requirement. Specification requirement for p,p'-Tetramethyldiaminobenzophenone, reagent, is shown in Table CXXX.

TABLE CXXX. p,p'-Tetramethyldiaminobenzophenone, Reagent - requirement.

Melting point (°C)	173 - 176

5.129.3 Use. p,p'-Tetramethyldiaminobenzophenone, reagent, is used in the synthesis of auramine derivatives.

5.129.4 Safety. p,p'-Tetramethyldiaminobenzophenone is a burnable solid. It is irritating to the eyes, skin and mucous membranes. Inhalation of dust or mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p,p'-Tetramethyldiaminobenzophenone shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, p,p'-tetramethyldiaminobenzophenone can emit toxic fumes.

5.129.5 Storage. p,p'-Tetramethyldiaminobenzophenone shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.129.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.130 Name. Thiosemicarbazide, Reagent $NH_2CSNHNH_2$ FW: 91.14
Semicarbazide,3-thio
Aminothiourea

5.130.1 Technical description. Thiosemicarbazide is in the form of white crystalline powder. Its melting point is 180° to 181°C with decomposition. It is soluble in water and alcohol.

5.130.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.130.2.1 Requirement. Specification requirement for thiosemicarbazide, reagent, is shown in Table CXXXI.

TABLE CXXXI. Thiosemicarbazide, Reagent - requirement.

Melting point (°C)	180 - 181

5.130.3 Use. Thiosemicarbazide, reagent, is used as a reagent for the detection of ketones, bismuth, chromium, copper and silver.

5.130.4 Safety. Thiosemicarbazide is a burnable solid. It is toxic by inhalation. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Thiosemicarbazide shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, thiosemicarbazide can emit toxic fumes.

5.130.5 Storage. Thiosemicarbazide shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.130.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Acute Hazardous Toxic; Waste Number P116.

5.131 Name. Thiourea, Analyzed Reagent H_2NCSNH_2 FW: 76.12
Thiocarbamide

5.131.1 Technical description. Thiourea is in the form of white rhombic crystals. It has a melting point of 182°C. Its density is 1.405 g/cm^3. It sublimes in vacuo at 150°-160°C. It is soluble in water and alcohol and insoluble in ether.

5.131.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.131.2.1 Requirements. Specification requirements for thiourea, analyzed reagent, are shown in Table CXXXII.

TABLE CXXXII. Thiourea, Analyzed Reagent - requirements (ACS).

Assay (H_2NCSNH_2), min, % by wt	99.0
Melting range (°C)	174 - 177
Solubility in water	Passes test
Sensitivity for bismuth	Passes test
Maximum Limits of Impurities (% by wt)	
Loss on drying at 105°C	0.5
Residue after ignition	0.05

5.131.3 Use. Thiourea, analyzed reagent, is used as a reagent for the determination of bismuth and selenite ions.

5.131.4 Safety. Thiourea is a burnable solid. It is toxic by inhalation and irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust shall be avoided. Contact with the eyes, skin, and clothing shall be avoided. Thiourea shall be used with adequate ventilation. Wash thoroughly after handling. Thiourea is a suspected carcinogen. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, thiourea can emit toxic fumes.

5.131.5 Storage. Thiourea shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.131.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic, Waste Number U219.

5.132 Name. Thymol, Analyzed Reagent $(CH_3)_2CHC_6H_3(CH_3)OH$ FW: 150.22
Isopropyl-meta-cresol
Thyme camphor
Thymic acid

5.132.1 Technical description. Thymol is in the form of crystalline plates. It has a melting point of 52°C and a boiling point of 233°C. Its density is 0.925 g/cm^3 at 80°/4°C. It has a flash point of 216°F (102°C) (SCC) and a vapor pressure of 1 mm at 64.3°C. It is very soluble in alcohol and ether and insoluble in water. It is affected by light.

5.132.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.132.2.1 Requirements. Specification requirements for thymol, analyzed reagent, are shown in Table CXXXIII.

TABLE CXXXIII. Thymol, Analyzed Reagent - requirements (USP/NF).

Melting point (°C)	48 - 51
Nonvolatile matter content, max, % by wt	0.05

5.132.3 Use. Thymol, analyzed reagent, is used as a reagent for titanium.

5.132.4 Safety. Thymol is a burnable solid. It is a moderate local irritant. Contact with the eyes, skin and clothing shall be avoided. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, thymol can emit toxic fumes.

5.132.5 Storage. Thymol shall be stored in a cool, dry, place in tightly closed containers away from sources of heat and open flame and protected from light. (Refer to 4.3.2.)

5.132.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.133 Name. o-Tolidine, Analyzed Reagent $(C_6H_3\text{-}3\text{-}CH_3\text{-}4\text{-}NH_2)_2$ FW: 212.30
3,3'-Dimethylbenzidine
4,4'-Diamino-3,3'-dimethyl biphenyl

5.133.1 Technical description. o-Tolidine is in the form of white crystalline plates. It has a melting point of 131-132°C. It is very soluble in alcohol and ether, and slightly soluble in water. It is light sensitive.

5.133.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.133.2.1 Requirement. Specification requirement for o-tolidine, analyzed reagent, is shown in Table CXXXIV.

TABLE CXXXIV. o-Tolidine, Analyzed Reagent - requirement (USP/NF).

Melting range (°C)	129 - 131

5.133.3 Use. o-Tolidine, analyzed reagent, is used as a sensitive reagent for gold (1:10 million detectable) and for free chlorine in water.

5.133.4 Safety. o-Tolidine is a burnable solid. It is harmful if inhaled or absorbed through skin. It is irritating to eyes, skin and mucous membranes. Inhalation of dust and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. o-Tolidine shall be used with adequate ventilation. Wash thoroughly after handling. o-Tolidine is a suspected carcinogen. It has a TLV of 2.0 ppm. (Refer to 4.3.1.)

If heated to decomposition, o-tolidine can emit toxic fumes.

5.133.5 Storage. o-Tolidine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame and protected from light. (Refer to 4.3.2.)

5.133.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.134 Name. o-Tolidine, Dihydrochloride, Analyzed Reagent
$(C_6H_3\text{-}3\text{-}CH_3\text{-}4\text{-}NH_2)_2HCl$ FW: 285.22
3,3'-Dimethylbenzidine hydrochloride

5.134.1 Technical description. o-Tolidine, dihydrochloride is in the form of white crystalline scales. It decomposes >340°C. Its solibility in water is 0.9 g/100 mL at 12°C.

5.134.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.134.2.1 Requirements. Specification requirements for o-tolidine, dihydrochloride, analyzed reagent, are shown in Table CXXXV.

TABLE CXXXV. o-Tolidine, Dihydrochloride, Analyzed Reagent - requirements (ACS).

Assay ($C_{14}H_{16}N_2 \cdot HCl$), min, % by wt	98.0
Solubility	Passes test
Sensitivity (to chlorine)	Passes test
Maximum Limits of Impurities (% by wt)	
Residue after ignition	0.10
Water (H_2O)(by Karl Fisher titration)	1.0

5.134.3 Use. o-Tolidine, dihydrochloride, analyzed reagent, is used as a reagent for low concentrations of chlorine in water.

5.134.4 Safety. o-Tolidine, dihydrochloride is a burnable solid. It is harmful if inhaled or absorbed through skin. It is irritating to eyes, skin and mucous membranes. Inhalation of dust and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. o-Tolidine, dihydrochloride shall be used with adequate ventilation. Wash thoroughly after handling. o-Tolidine is a suspected carcinogen. (Refer to 4.3.1.)

If heated to decomposition, o-tolidine, dihydrochloride can emit toxic fumes.

5.134.5 Storage. o-Tolidine, dihydrochloride shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame and protected from light. (Refer to 4.3.2.)

5.133.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.135 Name. Toluene, Analyzed Reagent $C_6H_5CH_3$ FW: 92.15
Toluol
Methylbenzene
Phenylmethane
Methacide

5.135.1 Technical description. Toluene is in the form of a colorless, refractive liquid with a benzene-like odor. It has a melting point of -95°C and a boiling point of 110.6°C at 760 mm Hg. Its specific gravity is 0.8669 (20°/4°C). Its refractive index is 1.4961 at 20°C. Its vapor density is 3.1 (air=1). Its flash point is 40°F (4.4°C) (SCC) and autoignition temperature is 536°C (997°F). Its LEL is 1.4 percent and UEL is 6.7 percent in air. It is soluble in all proportions in alcohol, ether and benzene, soluble in acetone and insoluble in water.

5.135.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.135.2.1 Requirements. Specification requirements for toluene, analyzed reagent, are shown in Table CXXXVI.

TABLE CXXXVI. Toluene, Analyzed Reagent - requirements - (ACS).

Color (APHA), max 1/	10.0
Boiling range	Entirely within 2.0°C range including 110.6°C±0.1°C
Maximum Limits of Impurities (% by wt)	
Residue after evaporation	0.001
Substances darkened by sulfuric acid	To pass color test
Sulfur compounds (as S)	0.003
Water (H_2O)	0.03

1/ APHA Color Scale is identical to ASTM D 1209 (Platinum-Cobalt Scale).

5.135.3 Use. Toluene, analyzed reagent, is used as a reagent in scintillation counting, standard for gas chromatography and JV-spectroscopy.

5.135.4 Safety. Toluene is a highly flammable liquid. It is moderately toxic by inhalation and skin absorption. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapors shall be avoided. Contact with the eyes, skin and clothing by the liquid shall be avoided. Toluene shall be used with adequate ventilation. Wash thoroughly after handling. The TLV for toluene is 100.0 ppm (375 mg/m^3). (Refer to 4.3.1.)

If heated, Toluene can emit toxic fumes.

5.135.5 Storage. Toluene shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.135.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable; Toxic, Waste No. U220.

5.136 Name. p-Toluenesulfonyl Chloride, Reagent $CH_3C_6H_4SO_2Cl$ FW: 190.65
4-Toluenesulfonic acid chloride

5.136.1 Technical description. p-Toluenesulfonyl chloride is in the form of triclinic prisms. It has a melting point of 71°C and a boiling point of 145°-146°C at 15 mm Hg. It is insoluble in water and soluble in alcohol and ether and very soluble in benzene.

5.136.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.136.2.1 Requirement. Specification requirement for p-toluenesulfonyl chloride, reagent, is shown in Table CXXXVII.

TABLE CXXXVII. p-Toluenesulfonyl Chloride, Reagent - requirement.

Melting point (°C)	66.0 - 68.0

5.136.3 Use. p-Toluenesulfonyl chloride, reagent, is used in organic synthesis.

5.136.4 Safety. p-Toluenesulfonyl chloride is a corrosive, burnable solid. It is toxic by inhalation and skin absorption. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Toluenesulfonyl chloride shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

If heated to decomposition, p-toluenesulfonyl chloride can emit toxic fumes.

5.136.5 Storage. p-Toluenesulfonyl chloride shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.136.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Corrosive, Waste No. D002.

5.137 Name. o-Toluidine, Analyzed Reagent $CH_3C_6H_4NH_2$ FW: 107.16
o-Aminotoluene
o-Methyloniline

5.137.1 Technical description. o-Toluidine is in the form of a light yellow liquid that becomes reddish-brown on exposure to light and air. It has a melting point of -23.7°C and a boiling point of 200.23°C at 760 mm Hg. Its specific gravity is 0.9984 (20° /4°C). Its refractive index is 1.5725 at 20°C. Its vapor density is 3.7 (air=1) and its flash point is 482°C (900°F) (SCC). It is soluble in alcohol and ether and slightly soluble in water.

5.137.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.137.2.1 Requirements. Specification requirements for o-toluidine, analyzed reagent, are shown in Table CXXXVIII.

TABLE CXXXVIII. o-Toluidine, Analyzed Reagent - requirements (USP/NF).

Specific gravity (20°/4°C)	1.088
Boiling range (°C)	200 - 202

5.137.3 Use. o-Toluidine, analyzed reagent, is used as a reagent for the determination of blood sugar.

5.137.4 Safety. o-Toluidine is a combustible liquid. It is toxic by inhalation or absorbed through skin. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapors and mists shall be avoided. Contact with the eyes, skin and clothing shall be avoided. o-Toluidine shall be used with adequate ventilation. Wash thoroughly after handling. The TLV for o-toluidine - including skin is 2.0 ppm (9.0 mg/m^3). The PEL is 5.0 ppm (22.0 mg/m^3). o-Toluidine is a suspected carcinogen. (Refer to 4.3.1.)

If heated to decomposition, o-toluidine can emit toxic fumes.

5.137.5 Storage. o-Toluidine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame and protected from light. (Refer to 4.3.2.)

5.137.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic, Waste No. U328.

5.138 Name. p-Toluidine, Reagent $CH_3C_6H_4NH_2$ FW: 107.16
p-Aminotoluene
p-Methyloniline

5.138.1 Technical description. p-Toluidine is in the form of white crystalline leaflets. It has a melting point of 43.7°C and a boiling point of 200.55°C. Its density is 0.9619 (20°/4°). It has a flash point of 192°F (88°C) (SCC), and a vapor density of 3.90 (air=1). It is very soluble in alcohol, soluble in acetone and ether and slightly soluble in water.

5.138.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.138.2.1 Requirement. Specification requirement for p-toluidine, reagent, is shown in Table CXXXIX.

TABLE CXXXIX. p-Toluidine, Reagent - requirement.

Melting point (°C)	43 - 46

5.138.3 Use. p-Toluidine, reagent, is used as a test reagent for lignin, nitrite and phloroglucinol.

5.138.4 Safety. p-Toluidine is combustible and toxic by inhalation. As a liquid it is rapidly absorbed through skin and irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapors and dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. p-Toluidine shall be used with adequate ventilation. Wash thoroughly after handling. p-Toluidine is a confirmed carcinogen. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When vaporized or heated to decomposition, p-toluidine can emit toxic fumes.

5.138.5 Storage. p-Toluidine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.138.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Toxic, Waste No. U353.

5.139 Name. 2,4,6-Tribromoaniline, Reagent $Br_3C_6H_2NH_2$ FW: 329.83
Aniline tribromide

5.139.1 Technical description. 2,4,6-Tribromoaniline is in the form of crystalline needles. It has a melting point of 122°C and a boiling point of 300°C. Its density is 2.35 (20°/4°). It is soluble in hot alcohol, chloroform and ether, slightly soluble in cold alcohol and insoluble in water.

5.139.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.139.2.1 Requirement. Specification requirement for 2,4,6-Tribromoaniline, reagent, is shown in Table CXL.

TABLE CXL. 2,4,6-Tribromoaniline, Reagent - requirement.

Melting point (°C)	119 - 121

5.139.3 Use. 2,4,6-Tribromoaniline, reagent, is used as a laboratory reagent.

5.139.4 Safety. 2,4,6-Tribromoaniline is a burnable solid. It is toxic by inhalation or absorbed through skin. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapors and dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 2,4,6 -Tribromoaniline shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, 2,4,6-Tribromoaniline can emit toxic fumes.

5.139.5 Storage. 2,4,6-Tribromoaniline shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.139.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.140 Name. 2,4,6-Tribromophenol, Reagent $Br_3C_6H_2OH$ FW: 330.82
Bromol

5.140.1 Technical description. 2,4,6-Tribromophenol is in the form of white crystalline needles with a penetrating odor. It has a melting point of 95° to 96°C and a boiling point of 282° to 290°C at 764 mm Hg. Its density is 2.55 (20°/20°). It is very soluble in alcohol; soluble in chloroform and ether and hot benzene and slightly soluble in water.

5.140.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.140.2.1 Requirement. Specification requirement for 2,4,6-Tribromophenol, reagent, is shown in Table CXLI.

TABLE CXLI. 2,4,6-Tribromophenol, Reagent - requirement.

Melting point (°C)	93.0-95.0

5.140.3 Use. 2,4,6-Tribromophenol, reagent, is used in organic synthesis.

5.140.4 Safety. 2,4,6-Tribromophenol is toxic by inhalation or absorbed through skin. It is a strong irritant of the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapors and dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 2,4,6-Tribromophenol shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, 2,4,6-Tribromophenol can emit toxic fumes.

5.140.5 Storage. 2,4,6-Tribromophenol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame. (Refer to 4.3.2.)

5.140.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.141 Name. Triethanolamine, Analyzed Reagent $(HOCH_2CH_2)_3N$ FW: 149.19
Trihydroxy triethylamine
tris(Hydroxyethyl)amine

5.141.1 Technical description. Triethanolamine, at room temperature, it is in the form of a colorless to pale yellow, viscous, hygroscopic liquid with a slight ammoniacol odor. It has a melting point of 21.2°C and a boiling point of 277°C at 150 mm Hg and 206° - 207°C at 15 mm Hg. Its specific gravity is 1.1242 (20°/4°) and a refractive index of 1.4852 at 20°C. Its flash point is >197°F (91.7°C). Its vapor pressure is <0.01 mm Hg at 20°C. It is soluble in all proportions in water and alcohol, soluble in chloroform and slightly soluble in ether, benzene and ligroin. It turns brown on exposure to light and air.

5.141.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

NOTE: The United State Pharmacopeia specifies triethanolamine as a mixture of alkanolamines consisting largely of triethanolamine $[N(C_2H_4OH)_3]$ containing some diethanolamine $[NH(C_2H_4OH_2)]$ and monoethanolamine $[NH_2(C_2H_4OH)]$.

5.141.2.1 Requirements. Specification requirements for triethanolamine, analyzed reagent, are shown in Table CXLII.

TABLE CXLII. Triethanolamine, Analyzed Reagent - requirements (USP/NF).

Assay [calculated on anhydrous basis as $N(C_2H_4OH)_3$], min-max, % by wt (By titration with 1 N hydrochloric acid)	99.0 - 107.4
Specific gravity, min-max	1.120 - 1.128
Refractive index at 20°C, min-max	1.481 - 1.486
Maximum Limits of Impurities (% by wt)	
Water (H_2O)	0.5
Residue on ignition	0.05

5.141.3 Use. Triethanolamine, analyzed reagent, is used as a reagent for the determination of antimony, copper and tin. It is also used as a pharmaceutical aid as an alkalizing agent.

5.141.4 Safety. Triethanolamine is burnable. It has a low toxicity. It is an irritant that can be absorbed by inhalation or through the skin. It causes only slight or reversible harm to the skin or mucous membranes. Inha-

lation of vapors or mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Triethanolamine shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, triethanolamine can emit toxic fumes.

5.141.5 Storage. Triethanolamine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame and protected from light. (Refer to 4.3.2.)

5.141.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.142 Name. Triethylamine, Analyzed Reagent $(C_2H_5)_3N$ FW: 101.19

5.142.1 Technical description. Triethylamine is in the form of a colorless liquid with a strong ammoniacal odor. Its density is 0.7275 g/cm^3 at 20°/4°C. Its melting point is -114.7°C and boiling point is 89.3°C at 760 mm Hg. Its refractive index is 1.4010 at 20°C. Its LEL is 1.2 percent and UEL is 8.0 percent in air. Its vapor density is 3.48 (air=1). Its flash point is <-20°F (<-7°C) (OC). It is very soluble in acetone and benzene and soluble in water, alcohol and ether.

5.142.2 Specification. Federal Specification, O-C-265, Chemicals Analytical; General Specification For.

5.142.2.1 Requirements. Specification requirements for triethanolamine, analyzed reagent, are shown in Table CXLIII.

TABLE CXLIII. Triethylamine, Analyzed Reagent - requirements (USP/NF).

Boiling range (°C)	89.0 - 90.0
Absorbance (at the wave length of maximum absorbance at about 285 nm), max	0.01

Triethylamine, analyzed reagent, is available commercially with a minimum purity of 99.0 percent.

5.142.3 Use. Triethylamine, analyzed reagent, is used in the preparation of quaternary ammonium compounds and as a catalytic solvent in chemical synthesis.

5.142.4 Safety. Triethylamine is a flammable liquid. It is highly toxic by inhalation and a strong irritant to the eyes, skin, respiratory tract and mucous membranes. Inhalation of vapors and mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Triethylamine shall be used with adequate ventilation. The TLV for triethylamine is 10 ppm (40 mg/m^3). The PEL is 25 ppm (100 mg/m^3). Wash thoroughly after handling. (Refer to 4.3.1.)

When heated to decomposition, triethylamine can emit toxic fumes.

5.142.5 Storage. Triethylamine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat and open flame and protected from light. (Refer to 4.3.2.)

5.142.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable, Waste No. D001.

5.143 Name. Triethylamine, Reagent $(C_2H_5)_3N$ FW: 101.19

5.143.1 Technical description. Triethylamine is in the form of a colorless liquid with a strong ammoniacol odor. Its density is 0.7275 g/cm^3 at 20°/4°C. Its melting point is -114.7°C and boiling point of 89.3°C at 760 mm Hg. Its refractive index is 1.4010 at 20°C. Its LEL of 1.2 percent and an UEL of 8.0 percent in air. Its vapor density is 3.48 (air=1). It has a flash point of <-20°F (<-7°C) OC. It is very soluble in acetone and benzene and soluble in water, alcohol and ether.

5.143.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.143.2.1 Requirements. Specification requirements for triethylamine, reagent are shown in Table CXLIV.

TABLE CXLIV. Triethylamine, Reagent - requirements.

Melting point (°C)	88.0-90.0
Specific gravity (20°/4°C)	0.728±0.003
Refractive index (20°C)	1.4003±0.0004

5.143.3 Use. Triethylamine, reagent, is used in the preparation of quaternary ammonium compounds.

5.143.4 Safety. Triethylamine is a flammable liquid. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of vapors or mist shall be avoided. Contact with the eyes, skin and clothing shall be avoided. Triethylamine can cause severe burns. Triethylamine shall be used with adequate ventilation. Wash thoroughly after handling. The TLV for triethylamine is 10 ppm (40 mg/m^3); the PEL is 25 ppm (100 mg/m^3). (Refer to 4.3.1.)

When heated to decomposition, triethylamine can emit toxic fumes of nitrogen oxides, carbon monoxide and/or carbon dioxide. It is reactive with strong mineral acids.

5.143.5 Storage. Triethylamine shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, spark and open flame and mineral acids. (Refer to 4.3.2.)

5.143.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - Ignitable; Waste No. D001.

5.144 Name. 2,4,6-Triiodophenol, Reagent $I_3C_6H_2OH$ FW: 471.8
sym-Triiodophenol

5.144.1 Technical description. 2,4,6-Triiodophenol is in the form of crystalline needles. It has a melting point of 158° to 159°C. It is soluble in ether and acetone, slightly soluble in alcohol and insoluble in water.

5.144.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.144.2.1 Requirement. Specification requirement for 2,4,6-triiodophenol, reagent, is shown in Table CXLV.

TABLE CXLV. 2,4,6-Triiodophenol, Reagent - requirement.

Melting point (°C)	156 - 158

5.144.3 Use. 2,4,6-Triiodophenol, reagent, is used in organic synthesis.

5.144.4 Safety. 2,4,6-Triiodophenol is toxic by inhalation. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 2,4,6-Triiodophenol shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, 2,4,6-triiodophenol can emit toxic fumes.

5.144.5 Storage. 2,4,6-Triiodophenol shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat, spark and open flame and mineral acids. (Refer to 4.3.2.)

5.144.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.145 Name. 2,4,6-Trinitrobenzoic Acid, Reagent
$(NO_2)_3C_6H_2COOH$ FW: 257.12
sym-Trinitrobenzoic acid

5.145.1 Technical description. 2,4,6-Trinitrobenzoic acid is in the form of white orthorhombic crystals. It has a melting point of 228.7°C with decomposition. It is slightly soluble in water and benzene; soluble in ether and acetone and very soluble in alcohol and methyl alcohol.

5.145.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.145.2.1 Requirement. Specification requirement for 2,4,6-trinitrobenzoic acid, reagent, is shown in Table CXLVI.

TABLE CXLVI. 2,4,6-Trinitrobenzoic Acid, Reagent - requirement.

Melting point (°C)	220 (decomposition)

5.145.3 Use. 2,4,6-Trinitrobenzoic acid, reagent, is used in organic synthesis.

5.145.4 Safety. 2,4,6-Trinitrobenzoic acid in the dry state is explosive; wet, containing at least 10 percent water it is flammable. It is irritating to the respiratory tract, eyes, skin and mucous membranes. Inhalation of dust shall be avoided. Contact with the eyes, skin and clothing shall be avoided. 2,4,6-Trinitrobenzoic acid shall be used with adequate ventilation. Wash thoroughly after handling. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition, 2,4,6-trinitrobenzoic acid can emit toxic fumes.

5.145.5 Storage. 2,4,6-Trinitrobenzoic acid shall be stored in a cool, well ventilated place in tightly closed containers away from sources of heat, sparks and open flame. (Refer to 4.3.2.)

5.145.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.146 Name. Triphenyl Phosphate, Reagent $(C_6H_5O)_3PO$ FW: 326.29

5.146.1 Technical description. Triphenyl phosphate is in the form of colorless, odorless, crystalline needles. It has a melting point of 50° to 51°C and a boiling point of 370°C at 760 mm Hg; 244°C at 10 mm Hg and a flash point of 435°F (223°C) (SCC). It has a specific gravity of 1.2055 (20°/4°C), and a vapor pressure of 1 mm at 193.5°C. It is insoluble in water; soluble in benzene, chloroform, ether and acetone. It is moderately soluble in alcohol.

5.146.2 Specification. Military Specification, MIL-C-51130, Chemicals, Reagent Grade; General Specification For.

5.146.2.1 Requirement. Specification requirement for triphenyl phosphate, reagent, is shown in Table CXLVII.

TABLE CXLVII. Triphenyl Phosphate, Reagent - requirement.

Melting point (°C)	49.0 - 50.0

5.146.3 Use. Triphenyl phosphate, reagent, is used as a reagent for atomic absorption.

5.146.4 Safety. Triphenyl phosphate has a moderate toxicity by inhalation or absorbed through the skin. It is irritating to the eyes and skin. Inhalation of dust shall be avoided. Contact with the eyes and skin shall be avoided. Triphenyl phosphate shall be used with adequate ventilation. Wash

thoroughly after handling. The TLV for triphenol phosphate is 3 mg/m^3. The PEL is the same. (Refer to 4.3.1.)

5.146.5 Storage. Triphenyl phosphate shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.146.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.147 Name. Urea, Analyzed Reagent H_2NCONH_2 FW: 60.06
Carbamide
Carbonyldiamide

5.147.1 Technical description. Urea is in the form of tetragonal prisms. It develops an odor of NH_3. Its melting point of 135°C and on further heating it decomposes to biuret, ammonia and cyanuric acid. Its density is 1.3230 (20°/4°C). It is very soluble in water, alcohol, methyl alcohol and insoluble in ether, benzene and chloroform.

5.147.2 Specification. Federal Specification, O-C-265, Chemicals, Analytical; General Specification For.

5.147.2.1 Requirements. Specification requirements for urea, analyzed reagent, are shown in Table CXLVIII.

TABLE CXLVIII. Urea, Analyzed Reagent - requirements (ACS).

Melting point (°C), min - max	132 - 135
Maximum Limits of Impurities (% by wt)	
Insoluble matter	0.01
Residue after ignition	0.01
Sulfate (SO_4)	0.001
Heavy metals (as Pb)	0.001
Iron (Fe)	0.001
Maximum Limits of Impurities (ppm)	
Chloride (Cl)	5.0

5.147.3 Use. Urea, analyzed reagent, is used as a biochemical reagent for density gradient centrifugation and a reference standard for organic nitrogen compounds.

5.147.4 Safety. Urea has a low toxicity and is noncombustible. It is not considered an industrial hazard, however inhalation of dust shall be avoided. Contact with eyes and skin shall be avoided. Urea shall be used with adequate ventilation. There is no TLV or PEL referenced for this compound. (Refer to 4.3.1.)

When heated to decomposition urea can emit NH_3 and highly toxic fumes of cyanuric acid.

5.147.5 Storage. Urea shall be stored in a cool, dry, well ventilated place in tightly closed containers. (Refer to 4.3.2.)

5.147.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not listed in 40 CFR.

5.148 Name. Uric Acid, Reagent $C_5H_4N_4O_3$ FW: 168.11
2,6,8-trioxypurine
Uric oxide
Lithic acid

5.148.1 Technical description. Uric acid is in the form of white, odorless, tasteless crystals. It has a density of 1.89 g/cm^3. It decomposes above 250°C without melting and emits highly toxic fumes of hydrogen cyanide. One gram dissolves in about 15,000 parts cold water, about 2,000 parts boiling water; it is soluble in glycerol, in solutions alkali hydroxides, their carbonates, sodium acetate and sodium phosphate. It is insoluble in alcohol and ether.

5.148.2 Specification. Manufacturer's requirements. (No Government specification)

5.148.2.1 Requirements. Uric acid, reagent, is commercially available with a minimum purity of 98.5 percent.

5.148.3 Use. Uric acid, reagent, is used in organic synthesis.

5.148.4 Safety. Uric acid is relatively non-toxic. However inhalation of dust shall be avoided. Contact with eyes, skin and clothing shall be avoided. Uric acid shall be used with adequate ventilation. (Refer to 4.3.1.)

When heated to decomposition, uric acid emits fumes of hydrocyanic acid which is highly toxic by inhalation and skin absorption. The TLV (ceiling limit) for hydrocyanic acid - including skin is 10 ppm (10 mg/m^3). The PEL is the same.

5.148.5 Storage. Uric acid shall be stored in a cool, dry, well ventilated place in tightly closed containers away from sources of heat. (Refer to 4.3.2.)

5.148.6 Disposal. For appropriate procedure, contact the Installation Environmental Office, the DRMO, or Safety and Health Offices. (Refer to 4.4.3.)

EPA Hazardous Waste Classification - not list in 40 CFR.

NOTES

6.1 Subject term (key word) listing.

Acetal, Reagent
Acetamide, Reagent
Acetyl Chloride, Analyzed Reagent
p-Aminodimethylaniline Sulfate, Analyzed Reagent
iso-Amyl Acetate, Analyzed Reagent
n-Amyl Acetate, Reagent
iso-Amyl Alcohol, Analyzed Reagent
tert-Amyl Alcohol, Analyzed Reagent
tert-Amyl Alcohol, Reagent
Anthranilic Acid, Reagent
Benzaldehyde, Analyzed Reagent
Benzenesulfonyl Chloride, Analyzed Reagent
Benzoyl Chloride, Analyzed Reagent
Benzyl Acetate, Reagent
Benzyl Chloride, Analyzed Reagent
p-Bromoaniline, Reagent
Bromobenzene, Reagent
p-Bromobenzenesulfonyl Chloride, Reagent
p-Bromobenzoic Acid, Reagent
Bromoethane, Analyzed Reagent
p-Bromophenacyl Bromide, Reagent
p-Bromophenol, Reagent
p-Bromophenylhydrazine Hydrochloride, Analyzed Reagent
p-Bromophenylhydrazine Hydrochloride, Reagent
n-Butyl Acetate, Analyzed Reagent
n-Butyl Ether, Reagent
dl-Camphor, Reagent
Chloramine-T, Trihydrate, Analyzed Reagent
Chloramine-T, Trihydrate, Reagent
Chlorobenzene, Analyzed Reagent
Chlorobenzene, Reagent
Cinnamic Acid, Analyzed Reagent
Cinnamic Acid, Reagent
Crotonaldehyde, Reagent
Cyclohexanone, Reagent
Diacetyl Monoxime, Reagent
Dibutyl Phthalate, Reagent
Dichloramine-T, Reagent
1,2-Dichloroethane, Analyzed Reagent
Diethanolamine, Analyzed Reagent
Diethyl Phthalate, Reagent
Diethylamine, Analyzed Reagent
1,2-Dimethoxyethane, Analyzed Reagent
5,5-Dimethyl-1,3-Cyclohexanedione, Reagent
p-Dimethylaminobenzaldehyde, Analyzed Reagent
N,N-Dimethylaniline, Analyzed Reagent
m-Dinitrobenzene, Analyzed Reagent
3,4-Dinitrobenzoic Acid, Analyzed Reagent
3,5-Dinitrobenzoic Acid, Analyzed Reagent

3,5-Dinitrobenzoic Acid, Reagent
3,5-Dinitrobenzoyl Chloride, Analyzed Reagent
2,4-Dinitrochlorobenzene, Analyzed Reagent
2,4-Dinitrophenylhydrazine, Analyzed Reagent
sym-Di-o-Tolylthiourea, Reagent
sym-Diphenylthiourea, Reagent
Dithiooxamide, Analyzed Reagent
Ethyl Alcohol, Absolute, Analyzed Reagent
Ethyl Alcohol, Analyzed Reagent
Ethylene Chlorohydrin, Analyzed Reagent
Ethylene Chlorohydrin, Reagent
Ethylene Glycol, Analyzed Reagent
Exposure Limits, Hazardous Chemicals
Fructose, Analyzed Reagent
Fructose, Reagent
Hazardous Wastes, Disposal and Storage Of
Hexamethylenetetramine, Analyzed Reagent
p-Hydroxyazobenzene, Reagent
Information, Hazardous Chemicals
i-Inositol, Analyzed, Reagent
Isopropyl Ether, Analyzed, Reagent
Lactic Acid, Analyzed Reagent
Maleic Acid, Analyzed Reagent
Malonic Acid, Analyzed Reagent
Methyl Ethyl Ketone, Analyzed Reagent
Methylcyclohexane, Analyzed Reagent
Monochloroacetic Acid, Analyzed Reagent
Monochloroacetic Acid, Reagent
Monoethonolamine, Analyzed Reagent
Morpholine, Analyzed Reagent
Naphthalene, Analyzed Reagent
α -Naphthol, Analyzed Reagent
β -Naphthol, Analyzed Reagent
β -Naphthoquinoline, Reagent
1,4-Naphthoquinone, Reagent
1-Naphthylamine, Reagent
2-Naphthylamine, Reagent
1-Naphthylisocyanate, Reagent
Ninhydrin, Monohydrate, Analyzed Reagent
p-Nitroaniline, Analyzed Reagent
5-Nitrobarbituric Acid, Reagent
Nitrobenzene, Analyzed Reagent
m-Nitrobenzhydrazide, Reagent
p-Nitrobenzoic Acid, Reagent
p-Nitrobenzoyl Chloride, Reagent
p-Nitrobenzyl Chloride, Reagent
Nitromethane, Analyzed Reagent
3-Nitrophthalic Acid, Reagent
3-Nitrophthalimide, Reagent
1-Nitroso-2-Naphthol, Analyzed Reagent
Paraformaldehyde, Analyzed Reagent
Phenyl-α-Naphthylamine, Reagent
1-Phenyl-3-Methyl-5-Pyrazolone, Reagent

p-Phenylenediamine, Hydrochloride, Analyzed Reagent
o-Phenylenediamine, Reagent
p-Phenylenediamine, Reagent
Phenylhydrazine, Analyzed Reagent
Phenylhydrazine Hydrochloride, Analyzed Reagent
Phenylisocyanate, Analyzed Reagent
Phenylisothiocyanate, Reagent
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1-Phenylsemicarbazide, Reagent
Phloroglucinol, Dihydrate, Analyzed Reagent
Phthalic Anhydride, Analyzed Reagent
Picric Acid, Analyzed Reagent
Picrolonic Acid, Analyzed Reagent
Piperidine, Analyzed Reagent
Propionic Acid, Analyzed Reagent
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Semicarbazide Hydrochloride, Analyzed Reagent
Sodium Bitartrate, Monohydrate, Analyzed Reagent
D-Sorbitol, Analyzed Reagent
Tannic Acid, Analyzed Reagent
Tetraethylammonium Bromide, Analyzed Reagent
Tetraethylammonium Bromide, Reagent
p,p'-Tetramethyldiaminobenzophenone, Reagent
Thiosemicarbazide, Reagent
Thiourea, Analyzed Reagent
Thymol, Analyzed Reagent
o-Tolidine, Analyzed Reagent
o-Tolidine, Dihydrochloride, Analyzed Reagent
Toluene, Analyzed Reagent
p-Toluenesulfonyl Chloride, Reagent
o-Toluidine, Analyzed Reagent
p-Toluidine, Reagent
2,4,6-Tribromoaniline, Reagent
2,4,6-Tribromophenol, Reagent
Triethanolamine, Analyzed Reagent
Triethylamine, Analyzed Reagent
Triethylamine, Reagent
2,4,6-Triiodophenol, Reagent
2,4,6-Trinitrobenzoic Acid, Reagent
Triphenyl Phosphate, Reagent
Urea, Analyzed Reagent
Uric Acid, Reagent

6.2 Abbreviations. The use of abbreviations in this military standard are in accordance with MIL-STD-12 where applicable. Metric system abbreviations and symbols are in accordance with ASTM E 380.

6.3 Changes from previous issue. Asterisks or vertical lines are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

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