Material Safety Data Sheet

1-Butanol

ACC# 15400

Section 1 - Chemical Product and Company Identification

MSDS Name: 1-Butanol
Catalog Numbers: AC107690000, AC107690010, AC107690025, AC107690200, AC167690000, AC167691000, AC167695000, AC232080000, AC232080010, AC232080025, AC423490000, AC423490010, AC423490040, AC423492000, AC423495000, AC610020040, AC610251000, S75058, S79930, S79930-1, S799302, S79932HPLC, S93100, A383-1, A383-4, A383J-4, A383SK-1, A383SK-4, A398-4, A399-1, A399-20, A399-4, A399-4LC, A399-500, A399J-4, A399J-500, A399S-4, A400-4, BP2603-100, BP505-25, BP505-500, NC9025368, NC9210506, NC9307711, NC9321763, NC9510193, NC9517749, NC9926765, S79930-2MF*, S79932SPEC, XXA399200LI, XXA399TEST
Synonyms: n-Butanol; 1-Butanol; n-Butyl alcohol; 1-Butyl alcohol; Butyl hydroxide; 1-Hydroxybutane; Methylolpropane; n-Propylcarbinol; Propylmethanol; Butyric alcohol.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
71-36-3	n-Butyl alcohol	> 99	200-751-6

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid. Flash Point: 35 deg C.
Warning! Causes severe eye irritation and possible eye injury. **Flammable liquid and vapor.** Breathing vapors may cause drowsiness and dizziness. Causes skin and respiratory tract irritation. May be harmful if swallowed. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause central nervous system depression.

Target Organs: Central nervous system, respiratory system, eyes, skin.

Potential Health Effects

Eye: Causes severe eye irritation. May cause corneal edema and inflammation. May cause lacrimation (tearing), blurred vision, and photophobia. Vapors appear to cause a special vacuolar keratopathy in humans.
Skin: Causes skin irritation. Skin absorption is slight. Repeated or prolonged exposure may cause drying and cracking of the skin. Although n-butanol can enter the circulation after topical application, the absorbed dose is insignificant compared to that from other routes.
Ingestion: May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. May be harmful if swallowed.
Inhalation: Causes respiratory tract irritation. May cause cardiovascular disturbances, hearing abnormalities, central nervous system depression, muscle weakness, and possible death due to respiratory failure. May be absorbed through the lungs.
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis. May cause damage to the auditory nerve (some hearing loss) and vestibular injury. Animal evidence suggests that fetotoxicity and teratogenicity may be observed at doses that also cause harmful effects in the mothers. The systemic toxicity of n-butanol is low, although it may potentiate the hepatic (liver) toxicity of other inhaled compounds, such as carbon tetrachloride.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid immediately.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Alcoholic beverage consumption may enhance the toxic effects of this substance. Persons with liver, kidney, or central nervous system diseases may be at increased risk from exposure to this product. Butanol is especially toxic if aspirated. Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use

water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: 35 deg C (95.00 deg F)
Autoignition Temperature: 343 deg C (649.40 deg F)
Explosion Limits, Lower:1.4 vol %
Upper: 11.2 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Provide ventilation. Use only non-sparking tools and equipment.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Do not ingest or inhale. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
n-Butyl alcohol	20 ppm TWA	1400 ppm IDLH	100 ppm TWA; 300 mg/m3 TWA

OSHA Vacated PELs: n-Butyl alcohol: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colorless
Odor: vinous or wine-like
pH: Not available.
Vapor Pressure: 6.7 mm Hg @ 25 deg C
Vapor Density: 2.6 (Air=1)
Evaporation Rate:0.46 (Butyl acetate=1)
Viscosity: 2.94 cP at 20 deg C
Boiling Point: 116 deg C
Freezing/Melting Point:-89.5 deg C
Decomposition Temperature: Not available.
Solubility: Slightly soluble.
Specific Gravity/Density:0.8100 (Water=1)
Molecular Formula:C4H10O
Molecular Weight:74.12

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Ignition sources, excess heat, confined spaces.
Incompatibilities with Other Materials: Strong oxidizing agents, strong acids, alkali metals, halogens.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:

CAS# 71-36-3: EO1400000
LD50/LC50:
CAS# 71-36-3:
Draize test, rabbit, eye: 2 mg Severe;
Draize test, rabbit, eye: 2 mg/24H Severe;
Draize test, rabbit, skin: 405 mg/24H Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, rat: LC50 = 8000 ppm/4H;
Inhalation, rat: LC50 = 24000 mg/m3/4H;
Oral, mouse: LD50 = 100 mg/kg;
Oral, rabbit: LD50 = 3484 mg/kg;
Oral, rabbit: LD50 = 3400 mg/kg;
Oral, rat: LD50 = 790 mg/kg;
Oral, rat: LD50 = 800 mg/kg;
Skin, rabbit: LD50 = 3400 mg/kg;
.

Carcinogenicity:
CAS# 71-36-3: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No data available.
Teratogenicity: See actual entry in RTECS for complete information.
Reproductive Effects: See actual entry in RTECS for complete information.
Mutagenicity: See actual entry in RTECS for complete information.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: LC50 = 1510-1730 mg/L; 96 Hr; Static bioassay at 24.7°C (pH 7.64)Water flea Daphnia: EC50 = 1980-1983 mg/L; 48 Hr; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 = 2817-3710 mg/L; 5,30 min; Microtox test Release of n-butanol to soil may result in volatilization from the soil surface and biodegradation is expected to be significant. n-Butanol should not bind strongly to soil and so is expected to leach into groundwater. Release of n-butanol to water is expected to result in biodegradation and in volatilization from the water surface. Photooxidation by hydroxyl radicals is expected to be slow.
Environmental: When released to soil, substance is expected to biodegrade, leach to ground water or volatilize. In water, substance is expected to biodegrade or volatilize. Bioconcentration potential is predicted to be low. Soil Mobility: Substance is moderately to highly mobile (log octanol/ water partition coefficient=0.88).
Physical: Substance reacts in air with hydroxyl radicals (half-life=2.3 days).
Other: None.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 71-36-3: waste number U031 (Ignitable waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	BUTANOLS	BUTANOLS
Hazard Class:	3	3
UN Number:	UN1120	UN1120
Packing Group:	III	III
Additional Info:		FLASHPOINT 29 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 71-36-3 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 71-36-3: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 71-36-3: immediate, fire.
Section 313
This material contains n-Butyl alcohol (CAS# 71-36-3, > 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 71-36-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

R 10 Flammable.
R 22 Harmful if swallowed.
R 37/38 Irritating to respiratory system and skin.
R 41 Risk of serious damage to eyes.
R 67 Vapours may cause drowsiness and dizziness.

Safety Phrases:

S 13 Keep away from food, drink and animal feeding stuffs.
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 37/39 Wear suitable gloves and eye/face protection.
S 46 If swallowed, seek medical advice immediately and show this container or label.
S 7/9 Keep container tightly closed and in a well-ventilated place.

WGK (Water Danger/Protection)

CAS# 71-36-3: 1

Canada - DSL/NDSL

CAS# 71-36-3 is listed on Canada's DSL List.

Canada - WHMIS

not available.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 71-36-3 is listed on the Canadian Ingredient Disclosure List.

Material Safety Data Sheet

1-Fluoro-4-nitrobenzene, 99%

ACC# 71704

Section 1 - Chemical Product and Company Identification

MSDS Name: 1-Fluoro-4-nitrobenzene, 99%
Catalog Numbers: AC119490000, AC119490050, AC119491000, AC119495000
Synonyms: p-Fluoronitrobenzene; 4-Fluoronitrobenzene; p-Nitrofluorbenzene; 4-Nitrofluorobenzene.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
350-46-9	1-Fluoro-4-nitrobenzene	99	206-502-8

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: yellow clear liquid. Flash Point: 83 deg C.
Caution! May cause eye, skin, and respiratory tract irritation. **Combustible liquid and vapor.** May cause methemoglobinemia.
Target Organs: Red blood cells.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin irritation. May be absorbed through the skin. Absorption into the body may cause cyanosis (bluish discoloration of skin due to deficient oxygenation of the blood). Effects may be delayed.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Causes effects similar to those of acute skin absorption. Effects may be delayed 2 to 4 hours.
Inhalation: May cause respiratory tract irritation.
Chronic: Laboratory experiments have resulted in mutagenic effects.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: For methemoglobinemia, administer oxygen alone or with Methylene Blue depending on the methemoglobin concentration in the blood.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Combustible liquid. Containers may explode when heated.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: 83 deg C (181.40 deg F)
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: Not published.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wash area with soap and water. Remove all sources of ignition. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep

away from heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1-Fluoro-4-nitrobenzene	none listed	none listed	none listed

OSHA Vacated PELs: 1-Fluoro-4-nitrobenzene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Appearance: yellow
Odor: None reported.
pH: Not available.
Vapor Pressure: 5.5 mm Hg @ 70 C
Vapor Density: >1.0 (air=1.0)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 214 - 216 deg C
Freezing/Melting Point:27 deg C
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density:1.34
Molecular Formula:C6H4FNO2
Molecular Weight:141.10

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials.
Incompatibilities with Other Materials: Strong oxidizing agents, strong bases.
Hazardous Decomposition Products: Nitrogen oxides, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, fluoride fumes.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 350-46-9: DA1400000
LD50/LC50:
CAS# 350-46-9:
Inhalation, rat: LC50 = 2600 mg/m3/4H;
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Carcinogenicity:
CAS# 350-46-9: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No data available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Mutagenicity: No data available.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	TOXIC SOLIDS, ORGANIC, N.O.S.	No information available.
Hazard Class:	6.1	
UN Number:	UN2811	
Packing Group:	III	

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 350-46-9 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 350-46-9 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

Safety Phrases:

S 24/25 Avoid contact with skin and eyes.
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face pr otection.

WGK (Water Danger/Protection)

CAS# 350-46-9: No information available.

Canada - DSL/NDSL

CAS# 350-46-9 is listed on Canada's NDSL List.

Canada - WHMIS

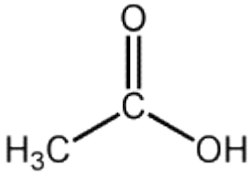
WHMIS: Not available.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

Acetic acid, glacial

- Methanecarboxylic acid
- Ethanoic acid
- Ethylic acid

Formula	CH_3COOH
Structure	
Description	Clear, colorless liquid, odor of vinegar.
Uses	Herbicide, microbiocide, fungicide, ph adjustment.

Registry Numbers and Inventories.

CAS	64-19-7
NIH PubChem CID	176
EC (EINECS/ELINCS)	200-580-7
EC Index Number	607-002-00-6
EC Class	R10, C; R35
RTECS	AF1225000
RTECS class	Mutagen; Reproductive Effector; Human Data; Primary Irritant
UN (DOT)	2789
Merck	13,56
Beilstein/Gmelin	506007
Beilstein Reference	4-02-00-00094
EPA OPP	44001
FEMA	2006
Swiss Giftliste 1	G-4595
Canada DSL/NDSL	DSL
US TSCA	Listed
Austrailia AICS	Listed
New Zealand	Listed
Japan ENCS (MITI)	Listed
Korea ECL	Listed
Philippiens PICCS	Listed

Israel	Listed

Properties.

Formula	C2H4O2
Formula mass	60.05
Melting point, °C	16.6
Boiling point, °C	118
Vapor pressure, mm_{Hg}	11 (20 C)
Vapor density (air=1)	2.07
Saturation Concentration	1.5% (15000 ppm) at 20 C (calculated)
Evaporization number	0.97 (Butyl acetate = 1)
Odor threshold	0.21 To 1.0 ppm
Critical temperature	321.6
Critical pressure	57.15
Density	1.05 g/cm3 (20 C)
Solubility in water	Miscible
Viscosity	1.06 cp (25 C)
Surface tension	28.8 g/s2 @ 10 C
Refractive index	1.3718 (20 C)
Dipole moment	1.5 D (20 C)
Dielectric constant	6.1 (20 C)
pKa/pKb	4.76 (pKa)
Partition coefficient, pK_{ow}	-0.17
Heat of fusion	11.7 kJ/mol
Heat of vaporization	52.30 kJ/mol
Heat of combustion	-873 kJ/mol

Hazards and Protection.

Storage	Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Protect from freezing. Store above 17 C.
WHMIS	D2B

Handling	Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid contact with heat, sparks and flame. Do not get on skin or in eyes. Avoid ingestion and inhalation. Discard contaminated shoes. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Protection	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Skin: Wear appropriate gloves to prevent skin exposure. Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators	If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Small spills/leaks	Use water spray to dilute spill to a non-flammable mixture. Avoid runoff into storm sewers and ditches which lead to waterways. Wash area with soap and water. Use water spray to disperse the gas/vapor. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. Cover with material such as dry soda ash or calcium carbonate and place into a closed container for disposal. A vapor suppressing foam may be used to reduce vapors.
Stability	Stable at room temperature in closed containers under normal storage and handling conditions.
Incompatibilities	Chromic acid, nitric acid, ethylene glycol, perchloric acid, phosphorous trichloride, oxidizers, sodium peroxide, strong caustics, most metals (except aluminum), carbonates, hydroxides, oxides, and phosphates.
Decomposition	Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.

Fire.

Flash Point,°C	40
Autoignition, °C	427
Upper exp. limit, %	16
Lower exp. limit, %	4
Fire fighting	Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use alcohol foam, dry chemical or carbon dioxide. Use water spray to knock-down vapors.
Fire potential	Moderately flammable. Will support combustion.
Hazards	Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapor explosion hazard indoors, outdoors or in sewers.
Combustion products	Irritating vapor generated when heated.

NFPA	**Health**	3
	Flammability	2
	Reactivity	0

Health.

Exposure limit(s)	OSHA PEL: TWA 10 ppm (25 mg/m3) NIOSH REL: TWA 10 ppm (25 mg/m3) ST 15 ppm (37 mg/m3) NIOSH IDLH: 50 ppm
Poison_Class	4
Exposure effects	Prolonged or repeated skin contact may cause dermatitis. Repeated exposure may lead to blackening and hyperkeratosis of the skin and hands, conjunctivitis, bronchitis and pharyngitis and erosion of the teeth.
Ingestion	Swallowing can cause severe injury leading to death. Symptoms include sore throat, vomiting, and diarrhea. Ingestion of as little as 1.0 ml has resulted in perforation of the esophagus.
Inhalation	Effects may be delayed. Causes chemical burns to the respiratory tract. Exposure may lead to bronchitis, pharyngitis, and dental erosion. Inhalation of concentrated vapors may cause serious damage to the lining of the nose, throat, and lungs. Breathing difficulties may occur. Neither odor nor degree of irritation are adequate to indicate vapor concentration.
Skin	Causes skin burns. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. May be harmful if absorbed through the skin. Contact with the skin may cause blackening and hyperkeratosis of the skin of the hands.
Eyes	Causes severe eye irritation. Contact with liquid or vapor causes severe burns and possible irreversible eye damage. Lachrymator.

First aid

Ingestion	Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation	Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. DO NOT use mouth-to-mouth respiration. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Skin	Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Eyes	Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed. Extensive irrigation is required (at least 30 minutes).

Transportation.

UN number	2789

Response guide	132
Hazard class	8
Packing Group	II
USCG CHRIS Code	AAC
USCG Compatatibility Group	4 Organic acids
HS Code	2915 21 00
Std. Transport #	4931401
IMO Chemical Code	17
IMO Pollution Category	D
IMO Hazard code	S

Material Safety Data Sheet

Acetic anhydride

ACC# 00130

Section 1 - Chemical Product and Company Identification

MSDS Name: Acetic anhydride
Catalog Numbers: AC149490000, AC149490250, AC222130000, AC222130010, AC222130025, AC222135000, AC400060000, AC400060010, AC400060040, AC423230000, AC423230040, AC423230200, 14949-0010, 14949-0025, 14949-0200, 42323-0010, 42323-0050, 42323-5000, A10-1, A10-100, A10-4, A10-500, A10-500LC, A10RS50, A10SS200, NC9079114
Synonyms: Acetic oxide; Acetyl oxide; Ethanoic anhydride; Acetic acid anhydride.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
108-24-7	Acetic anhydride	> 97	203-564-8

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid. Flash Point: 54 deg C.
Danger! Causes burns by all exposure routes. **Flammable liquid and vapor.** Harmful if inhaled or swallowed. Lachrymator (substance which increases the flow of tears). Moisture sensitive.
Target Organs: Eyes, skin, mucous membranes.

Potential Health Effects
Eye: Eye damage may be delayed. Contact with liquid is corrosive to the eyes and causes

severe burns. Lachrymator (substance which increases the flow of tears).
Skin: Causes skin burns.
Ingestion: Harmful if swallowed. Causes gastrointestinal tract burns. May cause perforation of the digestive tract. Ingestion of large amounts may cause CNS depression.
Inhalation: Harmful if inhaled. Causes chemical burns to the respiratory tract. May cause lung damage. Aspiration may lead to pulmonary edema.
Chronic: Effects may be delayed. Prolonged skin contact may be painless and cause redness and subsequently a white appearance of the skin accompanied by wrinkling. Skin burns may be

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid immediately.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Water reactive. Material will react with water and may release a flammable and/or toxic gas. Use water spray to keep fire-exposed containers cool. Wear appropriate protective clothing to prevent contact with skin and eyes. Wear a self-contained breathing apparatus (SCBA) to prevent contact with thermal decomposition products. Containers may explode in the heat of a fire. Flammable liquid and vapor. May ignite or explode on contact with steam or moist air.
Extinguishing Media: Use dry sand or earth to smother fire. If water is the only media available, use in flooding amounts. DO NOT USE WATER! Do NOT use straight streams of water. Contact professional fire-fighters immediately. Cool containers with flooding quantities of water until well after fire is out.
Flash Point: 54 deg C (129.20 deg F)
Autoignition Temperature: 316 deg C (600.80 deg F)
Explosion Limits, Lower:2.9%
Upper: 10.3%
NFPA Rating: (estimated) Health: 3; Flammability: 2; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. Do not expose spill to water. Spill may be carefully neutralized with lime (calcium oxide, CaO). Cover with material such as dry soda ash or calcium carbonate and place into a closed container for disposal. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Remove contaminated clothing and wash before reuse. Do not allow water to get into the container because of violent reaction. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Do not breathe dust, mist, or vapor. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep away from heat, sparks and flame. Use with adequate ventilation. Discard contaminated shoes. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Keep from contact with moist air and steam.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Do not store in direct sunlight. Keep container closed when not in use. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from water. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Acetic anhydride	5 ppm TWA	200 ppm IDLH	5 ppm TWA; 20 mg/m3 TWA

OSHA Vacated PELs: Acetic anhydride: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by

OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colorless
Odor: strong odor - pungent odor - acetic odor
pH: 3 (10g/L aq sol 20°C)
Vapor Pressure: 3.9 mm Hg @68F
Vapor Density: 3.5 (air=1)
Evaporation Rate:0.46 (n-butyl acetate=1)
Viscosity: 0.91mPa.s @ 20 deg C
Boiling Point: 140 deg C @ 760mmHg
Freezing/Melting Point: Not available.
Decomposition Temperature:-73.1 deg C
Solubility: Decomposes.
Specific Gravity/Density:1.0820g/cm3
Molecular Formula:C4H6O3
Molecular Weight:102.09

Section 10 - Stability and Reactivity

Chemical Stability: Stable. However, may decompose if exposed to moist air or water. Substance is readily hydrolyzed. Reacts with water to form corresponding acid.
Conditions to Avoid: Ignition sources, contact with water, excess heat, exposure to moist air or water.
Incompatibilities with Other Materials: Metals, strong oxidizing agents, reducing agents, bases, alcohols, amines, ammonia, nitrates, nitric acid, permanganates, phenols, sodium hydroxide, hydrogen peroxide, chromium trioxide, potassium hydroxide, perchloric acid, ethanol.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 108-24-7: AK1925000
LD50/LC50:
CAS# 108-24-7:
Inhalation, rat: LC50 = 1000 ppm/4H;
Oral, rat: LD50 = 1780 mg/kg;
Skin, rabbit: LD50 = 4 mL/kg;
.

Carcinogenicity:
CAS# 108-24-7: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: Terrestrial: Will readily infiltrate downward toward ground water. Aquatic: Will react slowly and become miscible, and will produce an irritating vapor. Mixing takes place and the spill is diluted. In rivers, the principal mixing agent is stream turbulence. Atmospheric: Since acetic anhydride is a relatively non-volatile liquid, direct venting of the vapor to the atmosphere from a hole in a ruptured vessel does not consitiute a significant hazard downwind. Only vapor released from a liquid pool spilled on a ground or water surfaces is important.
Physical: Not expected to bioconcentrate or biodegrade.
Other: For more information, see "HANDBOOK OF ENVIRONMENTAL FATE AND EXPOSURE DATA."

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	ACETIC ANHYDRIDE	ACETIC ANHYDRIDE
Hazard Class:	8	8(3)
UN Number:	UN1715	UN1715
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 108-24-7 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 108-24-7: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 108-24-7: immediate, delayed, fire, reactive.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 108-24-7 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 108-24-7 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 10 Flammable.
R 20/22 Harmful by inhalation and if swallowed.
R 34 Causes burns.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 108-24-7: 1

Canada - DSL/NDSL

CAS# 108-24-7 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B3, D1A, D2B, E.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 108-24-7 is listed on the Canadian Ingredient Disclosure List.

SIGMA-ALDRICH
MATERIAL SAFETY DATA SHEET
Date Printed: 07/28/2011
Date Updated: 12/12/2006
Version 1.3
Section 1 - Product and Company Information
Product Name ALCONOX(R) DETERGENT, BULK PACKED
Product Number 242985
Brand ALDRICH
Company Sigma-Aldrich
Address 3050 Spruce Street
SAINT LOUIS MO 63103 US
Technical Phone: 800-325-5832
Fax: 800-325-5052
Emergency Phone: 314-776-6555
Section 2 - Composition/Information on Ingredient
Substance Name CAS # SARA 313
ALCONOX DETERGENT None No
Ingredient Name CAS # Percent SARA 313
DODECYLBENZENE-SULFONIC ACID SODIUM 25155-30-0 >= 10 No
<= 30
SODIUM CARBONATE (ANHYDROUS) 497-19-8 >= 7 No
<= 13
PYROPHOSPHATE TETRASODIUM 7722-88-5 >= 10 No
<= 30
SODIUM TRIPHOSPHATE PENTABASIC 7758-29-4 >= 10 No
<= 30
Section 3 - Hazards Identification
EMERGENCY OVERVIEW
Toxic (USA) Harmful (EU).
Toxic if swallowed. Irritating to eyes, respiratory system and
skin. Risk of serious damage to eyes.
HMIS RATING
HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0
NFPA RATING
HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0
For additional information on toxicity, please refer to Section 11.
Section 4 - First Aid Measures
ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is
conscious. Call a physician.
INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give
artificial respiration. If breathing is difficult, give oxygen.
DERMAL EXPOSURE

In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT

N/A

AUTOIGNITION TEMP

N/A

FLAMMABILITY

N/A

EXTINGUISHING MEDIA

Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING

Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL

Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)

Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP

Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING

User Exposure: Do not breathe dust. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE

Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS

Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator.

Hand: Compatible chemical-resistant gloves.

Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling.
Section 9 - Physical/Chemical Properties
Appearance Physical State: Solid
Property Value At Temperature or Pressure
pH N/A
BP/BP Range N/A
MP/MP Range N/A
Freezing Point N/A
Vapor Pressure N/A
Vapor Density N/A
Saturated Vapor Conc. N/A
Bulk Density N/A
Odor Threshold N/A
Volatile% N/A
VOC Content N/A
Water Content N/A
Solvent Content N/A
Evaporation Rate N/A
Viscosity N/A
Surface Tension N/A
Partition Coefficient N/A
Decomposition Temp. N/A
Flash Point N/A
Explosion Limits N/A
Flammability N/A
Autoignition Temp N/A
Refractive Index N/A
Optical Rotation N/A
Miscellaneous Data N/A
Solubility N/A
N/A = not available
Section 10 - Stability and Reactivity
STABILITY
Stable: Stable.
Materials to Avoid: Oxidizing agents.
HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Nature of decomposition products not known.
HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur
Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: Harmful if absorbed through skin.
Eye Contact: Causes eye irritation.
Inhalation: Material is irritating to mucous membranes and upper respiratory tract. Harmful if inhaled.

Ingestion: Harmful if swallowed.
SIGNS AND SYMPTOMS OF EXPOSURE
The chemical, physical, and toxicological properties of this product have not been thoroughly investigated.
Section 12 - Ecological Information
No data available.
Section 13 - Disposal Considerations
APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.
Section 14 - Transport Information
DOT
Proper Shipping Name: Environmentally hazardous substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH
IATA
Non-Hazardous for Air Transport: Non-hazardous for air transport.
Section 15 - Regulatory Information
EU ADDITIONAL CLASSIFICATION
Symbol of Danger: Xn
Indication of Danger: Harmful.
R: 22-36/37/38-41
Risk Statements: Harmful if swallowed. Irritating to eyes, respiratory system and skin. Risk of serious damage to eyes.
S: 26-27-36/37/39
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Take off immediately all contaminated clothing. Wear suitable protective clothing, gloves, and eye/face protection.
US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic (USA) Harmful (EU).
Risk Statements: Toxic if swallowed. Irritating to eyes, respiratory system and skin. Risk of serious damage to eyes.
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Take off immediately all contaminated clothing. Wear suitable protective clothing, gloves, and eye/face protection. In case of

accident or if you feel unwell, seek medical advice immediately (show the label where possible).
UNITED STATES REGULATORY INFORMATION

SARA LISTED: No CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: No
NDSL: No
Section 16 - Other Information
DISCLAIMER
For R&D use only. Not for drug, household or other uses.
WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Ammonium hydroxide water solution, >5.7N but < 14N NH4OH (>10% but <25% as ammonia, NH3)

ACC# 01260

Section 1 - Chemical Product and Company Identification

MSDS Name: Ammonium hydroxide water solution, >5.7N but < 14N NH4OH (>10% but <25% as ammonia, NH3)
Catalog Numbers: AC390070000, AC390070010, AC390070025, A470-1, A470-250, A470-500, A512-4, A512-4EA, A512-500
Synonyms: Ammonium hydrate; Ammonia solution; Ammonia water; Aqueous ammonia; Aqua ammonia.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7732-18-5	Water	76-90	231-791-2
7664-41-7	Ammonia	10-24	231-635-3

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid.
Danger! Causes eye and skin burns. Causes digestive and respiratory tract burns. Harmful if swallowed.
Target Organs: Eyes, skin, mucous membranes.

Potential Health Effects

Eye: Contact with liquid or vapor causes severe burns and possible irreversible eye damage. Lachrymator (substance which increases the flow of tears).
Skin: Causes severe skin irritation. Causes skin burns. May cause deep, penetrating ulcers of the skin. Contact with the skin may cause staining, inflammation, and thickening of the skin.
Ingestion: Harmful if swallowed. May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. Causes throat constriction, vomiting, convulsions, and shock.
Inhalation: Effects may be delayed. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma.
Chronic: Prolonged inhalation may cause respiratory tract inflammation and lung damage. Prolonged or repeated exposure may cause corneal damage and the development of cataracts and glaucoma.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid immediately.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: After inhalation exposure, observe for 24 to 72 hours as pulmonary edema may be delayed.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Ammonium hydroxide itself is non-combustible. However concentrated ammonia solutions may give off ammonia vapours. Ammonia gas is generally not considered a serious fire or explosion hazard because ammonia/air mixtures are difficult to ignite. A relatively high concentration of ammonia gas must be present in order for ignition to occur. However, a large and intense energy source may cause ignition and/or explosion in a confined space.
Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.
Flash Point: Not available.
Autoignition Temperature: Not applicable.

Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Neutralize spill with a weak acid such as vinegar or acetic acid. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation. Approach spill from upwind.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Discard contaminated shoes. Do not breathe vapor. Use only with adequate ventilation.
Storage: Do not store in direct sunlight. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Corrosives area. Isolate from oxidizing materials and acids. Walls, floors, shelving, fittings, lighting and ventilation systems in storage area should be made from carbon steel or stainless steel which do not react with ammonium hydroxide.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Water	none listed	none listed	none listed
Ammonia	25 ppm TWA; 35 ppm STEL	25 ppm TWA; 18 mg/m3 TWA 300 ppm IDLH	50 ppm TWA; 35 mg/m3 TWA
Ammonium hydroxide	none listed	none listed	none listed

OSHA Vacated PELs: Water: No OSHA Vacated PELs are listed for this chemical.

Ammonia: No OSHA Vacated PELs are listed for this chemical. Ammonium hydroxide: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear chemical splash goggles and face shield.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colorless
Odor: strong odor - ammonia-like
pH: 13.6
Vapor Pressure: > 112.5 mm Hg @ 20 deg C
Vapor Density: 0.59 (air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 27 deg C
Freezing/Melting Point:-34.9 deg C
Decomposition Temperature: Not available.
Solubility: Soluble.
Specific Gravity/Density:0.92
Molecular Formula:NH4OH
Molecular Weight:35.04

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures. Ammonium hydroxide is actually a solution of ammonia in water. Therefore the flammable properties of ammonia apply.
Conditions to Avoid: High temperatures, confined spaces, Ammonia solutions are corrosive to copper, zinc, aluminum and their alloys..
Incompatibilities with Other Materials: Strong oxidizing agents, acids, acrolein, halogens, mercury, hypochlorite, silver nitrate, acrylic acid, dimethyl sulfate, silver oxide.
Hazardous Decomposition Products: Nitrogen oxides (NOx) and ammonia (NH3).
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7732-18-5: ZC0110000
CAS# 7664-41-7: BO0875000
CAS# 1336-21-6: BQ9625000
LD50/LC50:
CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;
.

CAS# 7664-41-7:
Inhalation, mouse: LC50 = 4230 ppm/1H;
Inhalation, mouse: LC50 = 4600 mg/m3/2H;
Inhalation, rabbit: LC50 = 7 gm/m3/1H;
Inhalation, rat: LC50 = 2000 ppm/4H;
Inhalation, rat: LC50 = 18600 mg/m3/5M;
Inhalation, rat: LC50 = 7040 mg/m3/30M;
Skin, rat: LD50 = 112000 mg/m3/15M;
Skin, rat: LD50 = 71900 mg/m3/30M;
Skin, rat: LD50 = 4840 mg/m3/60M;
.

CAS# 1336-21-6:
Draize test, rabbit, eye: 250 ug Severe;
Draize test, rabbit, eye: 44 ug Severe;
Oral, rat: LD50 = 350 mg/kg;
.

Carcinogenicity:
CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7664-41-7: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 1336-21-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 0.008 mg/L; 24 Hr.; Unspecified
Fish: Fathead Minnow: LC50 = 8.2 mg/L; 96 Hr.; Unspecified
Fish: Bluegill/Sunfish: LC50 = 0.024-0.093 mg/L; 48 Hr.; Unspecified
Water flea Daphnia: EC50 =0.66 mg/L; 48 Hr.; 22 degrees C

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	AMMONIA SOLUTIONS	AMMONIA SOLUTIONS
Hazard Class:	8	8(9.2)
UN Number:	UN2672	UN2672
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7732-18-5 is listed on the TSCA inventory.
CAS# 7664-41-7 is listed on the TSCA inventory.
CAS# 1336-21-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 7664-41-7: 100 lb final RQ; 45.4 kg final RQ CAS# 1336-21-6: 1000 lb final RQ; 454 kg final RQ
SARA Section 302 Extremely Hazardous Substances
CAS# 7664-41-7: 500 lb TPQ
SARA Codes
CAS # 1336-21-6: immediate, delayed.

Section 313

This material contains Ammonia (CAS# 7664-41-7, 10-24%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 7664-41-7 is listed as a Hazardous Substance under the CWA. CAS# 1336-21-6 is listed as a Hazardous Substance under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

CAS# 7664-41-7 is considered highly hazardous by OSHA.

STATE

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

CAS# 7664-41-7 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 1336-21-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 34 Causes burns.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 36/37/39 Wear suitable protective clothing, gloves and eye/face pr otection.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 7732-18-5: No information available.

CAS# 7664-41-7: 2

CAS# 1336-21-6: 2

Canada - DSL/NDSL

CAS# 7732-18-5 is listed on Canada's DSL List.

CAS# 7664-41-7 is listed on Canada's DSL List.

CAS# 1336-21-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D1B, E.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those

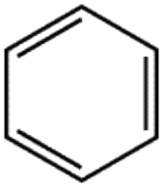
regulations.

Canadian Ingredient Disclosure List

CAS# 7664-41-7 is listed on the Canadian Ingredient Disclosure List.
CAS# 1336-21-6 is listed on the Canadian Ingredient Disclosure List.

Benzene

- Benzol
- Cyclohexatriene
- Phenyl hydride
- Benzine

Formula	C_6H_6
Structure	
Description	Clear, colorless liquid with a characteristic, aromatic hydrocarbon odor. Toxic, volatile, flammable liquid hydrocarbon byproduct of coal distillation.
Uses	Used as an industrial solvent in paints, varnishes, lacquer thinners, gasoline... It was formerly used as parasiticide.

Registry Numbers and Inventories.

CAS	71-43-2
NIH PubChem CID	241
EC (EINECS/ELINCS)	200-753-7
EC Index Number	601-020-00-8
EC Class	F; R11, Carc. Cat. 1; R45, Muta. Cat. 2; R46, T; R48/23/24/25, Xn; R65, Xi; R36/38
RTECS	CY1400000
RTECS class	Agricultural Chemical and Pesticide; Tumorigen; Drug; Mutagen; Reproductive Effector; Human Data; Primary Irritant
UN (DOT)	1114
Merck	13,1066
Beilstein/Gmelin	969212
Beilstein Reference	4-05-00-00583
RCRA	U019
EPA OPP	600019
Swiss Giftliste 1	G-1236
Canada DSL/NDSL	DSL
US TSCA	Listed
Austrailia AICS	Listed
New Zealand	Listed

Japan ENCS (MITI)	Listed
Korea ECL	Listed
Philippiens PICCS	Listed
Israel	Listed

Properties.

Formula	C6H6
Formula mass	78.11
Melting point, °C	5.5
Boiling point, °C	80.1
Vapor pressure, mm_{Hg}	75 (20 C)
Vapor density (air=1)	2.8
Saturation Concentration	9.9% (98700 ppm) at 20 C; 12.5% (approximately 125300 ppm) at 25 C (calculated)
Evaporization number	3 (diethyl ether = 1)
Odor threshold	4.9 mg/m3
Critical temperature	288.9
Critical pressure	48.6
Density	0.878 g/cm3 (20 C)
Solubility in water	1.8 g/L
Viscosity	0.604 cp @ 25C
Surface tension	28.22 g/s2 @ 25 C
Refractive index	1.50108 (20 C)
Dipole moment	2.27 D
Dielectric constant	2.3 (20 C)
Partition coefficient, pK_{ow}	2.13
Heat of fusion	9.9 kJ/mol
Heat of vaporization	33.83 kJ/mol
Heat of combustion	-3275 kJ/mol

Hazards and Protection.

Storage	Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.
WHMIS	B2 D2A D2B

Handling	Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Do not breathe dust, vapor, mist, or gas. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Do not ingest or inhale. Use only in a chemical fume hood. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Protection	Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Skin: Wear appropriate protective gloves to prevent skin exposure. Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators	A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.
Small spills/leaks	Use water spray to dilute spill to a non-flammable mixture. Avoid runoff into storm sewers and ditches which lead to waterways. Use water spray to disperse the gas/vapor. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite.
Disposal code	9
Stability	Stable under normal temperatures and pressures.
Incompatibilities	Chlorine, oxygen, ozone, permanganates, sulfuric acid, peroxides, perchlorates, nitrating agents, nitric acid, chromic acid anhydride, chromium trioxide, iodine pentafluoride, iodine heptafluoride, dioxygenyl tetrafluoroborate, dioxygen difluoride + hydrogen fluoride, sodium peroxide, uranium hexafluoride, bromine pentafluoride, chlorine trifluoride, nitryl perchlorate, aresenic pentafluoride, potassium methoxide, permanganic acid, peroxodisulfuric acid, liquid oxygen, peroxomonosulfuric acid, metal perchlorates, strong oxidizing agents.
Decomposition	Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.

Fire.

Flash Point,°C	-11
Autoignition, °C	498
Upper exp. limit, %	7.1
Lower exp. limit, %	1.3
Fire fighting	Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may spread fire. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use foam, dry chemical, or carbon dioxide. Wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
Fire potential	Very flammable. Combustion imminent.
Hazards	Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
Combustion products	Fire will produce irritating, corrosive and/or toxic gases.
NFPA **Health**	2

Flammability	3
Reactivity	0

Health.

Exposure limit(s)	TLV: 10 ppm; 32 mg/m3 (as TWA) A2 (ACGIH 1991-1992). OSHA PEL: 1910.1028 TWA 1 ppm ST 5 ppm See Appendix F NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm See Appendix A NIOSH IDLH: Potential occupational carcinogen 500 ppm.
Carcinogin	O, G-A1, I-1, N-1, CP65
Poison_Class	1*
Exposure effects	Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated exposure may cause adverse reproductive effects. May cause bone marrow abnormalities with damage to blood forming tissues. May cause anemia and other blood cell abnormalities. Chronic exposure has been associated with an increased incidence of leukemia and multiple myelomas. Immunodepressive effects have been reported. Animal studies have reported fetotoxicity (growth retardation) and teratogenicity (exencephaly, angulated ribs, dilated brain ventricles).
Ingestion	Aspiration hazard. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation	Causes respiratory tract irritation. May cause adverse central nervous system effects including headache, convulsions, and possible death. May cause drowsiness, unconsciousness, and central nervous system depression. Central nervous system effects may include confusion, ataxia, vertigo, tinnitus, weakness, disorientation, lethargy, drowsiness, and finally coma. Exposure may lead to irreversible bone marrow injury. Exposure may lead to aplastic anemia. May be absorbed through the lungs.
Skin	Causes moderate skin irritation. May be absorbed through the skin in harmful amounts. Direct contact with the liquid may cause erythema and vesiculation. Prolonged or repeated contact has been associated with the development of a dry scaly dermatitis or with secondary infections.
Eyes	Causes severe eye irritation. May cause slight transient injury.

First aid

Ingestion	Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.
Inhalation	Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. DO NOT use mouth-to-mouth respiration. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Skin	Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing

	before reuse.
Eyes	Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Transportation.

UN number	1114
Response guide	130
Hazard class	3
Packing Group	II
USCG CHRIS Code	BNZ
USCG Compatatibility Group	32 Aromatic hydrocarbons
HS Code	2902 20 00
Std. Transport #	4908112
IMO Chemical Code	17
IMO Pollution Category	C

MATERIAL SAFETY DATA SHEET

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof.

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FOR PRODUCT AND SALES INFORMATION

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PRODUCT IDENTIFICATION

PRODUCT NAME: Chloroform, Reagent ACS

SYNONYMS:

Trichloromethane; Methane Trichloride; R 20; Freon 20; Methane, Trichloro-; Methyl Trichloride; Trichloroform; R 20 (Refrigerant); Methenyl Trichloride; RCRA U044; STCC 4940310; UN 1888; CHCL3; OHS04770

CHEMICAL FAMILY: Halogen compound, Aliphatic

MOLECULAR FORMULA: CHCL3

MOLECULAR WEIGHT: 119.38

CERCLA RATINGS:(Scale 0-3): Health=3 Fire=0 Reactivity=0 Persistence=3
NFPA RATINGS:(Scale 0-4): Health=2 Fire=0 Reactivity=0

COMPONENTS

COMPONENT: CHLOROFORM
PERCENT: >99
CAS #: 67-66-3
OTHER CONTAMINANTS: May contain traces of a stabilizer.

EXPOSURE LIMITS:
CHLOROFORM: 2 ppm (9.78 mg/m3) OSHA TWA
10 PPM (49 mg/m3) ACGIH TWA
ACGIH A2-Suspected human carcinogen.
2 ppm (9.78 mg/m3) NIOSH recommended 60 minute STEL
10 ppm (49 mg/m3) DFG MAK TWA
20 ppm (98 mg/m3) DFG MAK 30 minute peak, average value, 4 times/shift

MEASUREMENT METHOD:

Charcoal tube, carbon disulfide, gas chromatography
with flame ionization detection; (NIOSH VOL. III # 1003, halogenated
hydrocarbons).

10,000 pounds SARA Section 302 threshold planning quantity.
5000 pounds SARA Section 304 reportable quantity.
10 pounds CERCLA Section 103 reportable quantity.

Subject to SARA Section 313 annual toxic chemical release reporting.
Subject to California proposition 65 cancer and/or reproductive
toxicity warning and release requirements-(October 1, 1987).

PHYSICAL DATA

DESCRIPTION: clear, colorless, heavy, volatile liquid with a sweet
pleasant ethereal taste and odor.

BOILING POINT: 143oF (62oC)
MELTING POINT: -82oF (-64oC)
VAPOR PRESSURE: 160 MMHG @ 20oC
SPECIFIC GRAVITY: 1.4832
VOLATILITY: 100%
EVAPORATION RATE: (Butyl Acetate=1) 11.6
SOLUBILITY IN WATER: 0.82% @ 20oC
ODOR THRESHOLD: 200 ppm
VAPOR DENSITY: 4.12

SOLVENT SOLUBILITY: Soluble in alcohol, ether, acetone, benzene,
ligroin, solvent naphtha, petroleum ether, carbon tetrachloride,
carbon disulfide, oils,
other organic solvents.
VISCOSITY: 56.3 CPS @ 20oC

FIRE AND EXPLOSION INFORMATION

FIRE AND EXPLOSION HAZARD:

Negligible fire hazard when exposed to heat or flame.

AUTOIGNITION TEMP: >1832oF (>1000oC)

FIREFIGHTING MEDIA: Dry chemical, water spray or regular foam. (1990) EMERGENCY RESPONSE GUIDEBOOK, DOT P5800.5)

For larger fires, use water spray, fog or regular foam. (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P5800.5).

FIREFIGHTING:

Move container from fire area if you can do it without risk. Fight fire from maximum distance. Stay away from ends of tanks. Dike fire-control water for later disposal: do not scatter the material (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P5800.5, Guide Page 55).

Extinguish using agents suitable for type of fire. Avoid breathing vapors or dusts. Keep upwind.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49-CFR 172.101: ORM-A

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49-CFR 172.101 AND SUBPART E: None

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49-CFR 173.630

EXCEPTIONS: 49-CFR 173.505

Final rule on hazardous materials regulations (HMR, 49 CFR Parts 171-180). Docket numbers HM-181, HM-181A, HM-181B, HM-181C, HM-181D and HM-204. Effective date October 1, 1991. However, compliance with the regulations is authorized on and after January 1, 1991. (55 FR 52402, 12/21/90)

Except for explosives, inhalation hazards, and infectious substances, the effective date for hazard communication requirements is extended to October 1, 1993. (56 FR 47158, 09/18/91.

U.S. DEPARTMENT OF TRANSPORTATION SHIPPING NAME-ID NUMBER, 49 CFR 172.101: Chloroform-UN 1888

U.S. DEPARTMENT OF TRANSPORTATION HAZARD CLASS OR DIVISION, 49 CFR 172.101: 6.1 - Poisonous materials

U.S DEPARTMENT OF TRANSPORTATION PACKING GROUP, 49 CFR 172.101: PG II

U.S. DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS, 49 CFR 172.101 AND SUBPART E: Poison

U.S. DEPARTMENT OF TRANSPORTATION PACKAGING AUTHORIZATIONS:
EXCEPTIONS: None

NON-BULK PACKAGING: 49 CFR 173.202
BULK PACKAGING: 49 CFR 173.243

U.S. DEPARTMENT OF TRANSPORTATION QUANTITY LIMITATIONS 49 CFR 172.101:
PASSENGER AIRCRAFT OR RAILCAR: 5 L
CARGO AIRCRAFT ONLY: 60 L

TOXICITY

CHLOROFORM:

IRRITATION DATA: 10 mg/24 hours open skin-rabbit mild; 500 mg/24 hours skin-rabbit mild; 148 mg eye-rabbit; 20 mg/24 hours eye-rabbit moderate.

TOXICITY DATA:

25,000 ppm/5 minutes inhalation-human LCLO; 10 mg/m3/1 year inhalation-human TCLO; 5000 mg/m3/7 minutes inhalation-human TCLO; 47,702 mg/m3/4 hours inhalation-rat LC50; 50 ppm/7 hours/26 weeks intermittent inhalation-rat TCLO; 28 gm/m3 inhalation-mouse LCLO; 59 gm/m3 inhalation-rabbit LCLO; 35 gm/m3/4 hours inhalation-cat LCLO; 100 gm/m3 inhalation-dog LCLO; 20,000 ppm/2 hours inhalation-guinea pig LCLO; 25 ppm/7 hours/26 weeks intermittent inhalation-guinea-pig TCLO; 25,000 ppm/5 minutes inhalation-mammal LCLO; >20 gm/kg skin-rabbit LD50; >4000 mg/kg skin-rabbit LD50 (DOW MSDS); 908 mg/kg oral-rat LD50; 36 mg/kg oral-mouse LD50; 1000 mg/kg oral-dog LDLO; 500 mg/kg oral-rabbit LDLO; 820 mg/kg oral-guinea pig LD50; 704 mg/kg subcutaneous-mouse LD50; 800 mg/kg subcutaneous-rabbit LDLO; 75 mg/kg intravenous-dog LDLO; 894 mg/kg intraperitoneal-rat LD50; 623 mg/kg intraperitoneal-mouse LD50; 1000 mg/kg intraperitoneal-dog LD50; 546 mg/kg unreported-man LDLO; Mutagenic data (RTECS); reproductive effects data (RTECS); Tumorigenic data (RTECS).

CARCINOGEN STATUS:

Anticipated human carcinogen (NTP); human inadequate evidence, animal sufficient evidence (IARC Group-2B). Chloroform produced benign and malignant tumors of the liver and kidney in mice following oral gavage. Administration to rats by gavage or in drinking-water increased the incidences of kidney and thyroid tumors and of neoplastic nodules of the liver.

LOCAL EFFECTS: Irritant-inhalation, skin, eye.

ACUTE TOXICITY LEVEL: Moderately toxic by ingestion.
Slightly toxic by inhalation and dermal absorption.

TARGET EFFECTS: Central nervous system depressant, Hepatotoxin, Nephrotoxin. Poisoning may also affect the heart.

AT INCREASED RISK FROM EXPOSURE:

Alcoholics and persons with chronic skin, eye, liver, kidney, heart or respiratory disorders.

ADDITIONAL DATA:

Use of, or exposure to, alcohol, steroids, polybrominated biphenyls, acetone, or chlordecone may enhance the toxic effects. May be excreted in breast milk. Stimulants such as Epinephrine may induce ventricular fibrillation.

HEALTH EFFECTS AND FIRST-AID

INHALATION-CHLOROFORM: Irritant/narcotic/Hepatotoxin/Nephrotoxin.

ACUTE EXPOSURE:

May cause irritation of the upper respiratory tract. Central nervous system depression may be preceded by excitation and inebriation. 1,000-2,000 ppm may cause dizziness, headache, fatigue, salivation, and nausea; 4,000 ppm may cause vomiting, serious disorientation, and a fainting feeling; 14,000-16,000 ppm may cause anesthesia and rapid loss of consciousness; more than 20,000 ppm may cause respiratory failure, cardiac arrhythmias, and death. Other symptoms may include a feeling of warmth. malaise, drowsiness, mydriasis with diminished light reflex, toxemia, loss of tendon reflexes, stupor, convulsions, coma and hypotension. Fatty changes and centrilobular necrosis of the liver and fatty degenerative changes of the kidney and heart may occur. If death does not occur immediately from respiratory arrest or ventricular fibrillation, it may occur later from liver and kidney damage.

CHRONIC EXPOSURE:

Repeated exposure to 77-237 ppm has caused lassitude, dullness, urinary frequency, and gastrointestinal disturbances. Other reported symptoms include dry mouth, thirst, malaise, anorexia, headache, depression, confusion, weakness, blurred vision, paresthesias, loss of sense of balance, memory loss, tremors, anemia, kidney damage. and fatty degeneration of the liver. 17 of 68 workers exposed to 10-200 ppm for 1-4 years exhibited hepatomegaly and increased susceptibility to Viral Hepatitis. Exposure of rats on days 6-15 of gestation caused a high rate of resorptions, retarded fetal development, decreased fetal body measurements, and a low incidence of acaudate fetuses with imperforate anus. Mice exposed on days 8-15 of gestation had offspring with a significant increase of cleft palate. One noncorroborated study reports abnormal spermatozoa in mice exposed to levels above the TLV.

FIRST AID:

Remove from exposure area to fresh air immediately. If breathing has stopped. perform artificial respiration. Keep person warm and

at rest. Treat symptomatically and supportively. Get medical attention immediately.

SKIN CONTACT: Irritant.

ACUTE EXPOSURE:

May cause irritation with inflammation, destruction of the epithelium, and prurulent blebs. Application to rabbit skin for 24 hours caused hyperemia and moderate necrosis. Some absorption occurred resulting in weight loss and degenerative kidney changes. However, doses as high as 3980 mg/kg were survived.

CHRONIC EXPOSURE: Repeated or prolonged exposure may cause dermatitis with drying, cracking, and redness.
If sufficient amounts are absorbed, systemic effects may occur.

FIRST AID:

Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

EYE CONTACT/CHLOROFORM: Irritant.

ACUTE EXPOSURE:

High vapor concentrations may cause stinging, irritation, and blepharospasm. Contact with the liquid may also cause burning pain. lacrimation, and redness. The corneal epithelium may be injured and partially lost. However, the eyes return to normal in 1-3 days. Long exposure of the cornea during general anesthesia has caused persistent injury.

CHRONIC EXPOSURE:

Repeated or prolonged contact with irritants may cause conjunctivitis.

FIRST AID:

Wash eyes immediately with large amounts of water or normal saline, occasionally lifting upper and lower lids, until no evidence of chemical remains (approximately 15-20 minutes).
Get medical attention immediately.

INGESTION: Narcotic/Hepatotoxin/Nephrotoxin/Carcinogen.

ACUTE EXPOSURE:

May cause burning of the mouth, throat, esophagus, and stomach, nausea, vomiting, diarrhea, abdominal and substernal pain, cold, clammy skin, cyanosis of the extremities and face, muscle cramps, mydriasis, hypotension, peripheral vasodilation, irregular respiration, respiratory failure, unconsciousness, and liver damage. The mean lethal dose in humans is about 1 ounce, aspiration may occur and

result in chemical pneumonitis. 250 mg/kg caused depression, profound sleep, dyspnea, anorexia, hematuria, and liver and kidney changes in rats.

CHRONIC EXPOSURE:

Repeated ingestion may cause liver and kidney damage. In feeding studies, there was an increased incidence of benign and malignant tumors of the liver and kidneys in mice and of tumors of the kidney and thyroid and neoplastic nodules in the liver in rats. Reproductive effects have been reported in animals.

FIRST AID:

Treat symptomatically and supportively. Get medical attention immediately. If vomiting occurs, keep head lower than hips to prevent aspiration.

ANTIDOTE: No specific antidote. Treat symptomatically and supportively.

REACTIVITY DATA

REACTIVITY: Stable under normal temperatures and pressures.

INCOMPATIBILITY:
CHLOROFORM:

ALUMINUM (POWDERED): Explosion on contact.
BIS(DIMETHYAMINO)DIMETHYLSTANNANE: Explosion when heated.
DINITROGEN TETRAOXIDE: Explosive mixture.
DISILANE: Vigorous incandescent reaction.
FLUORINE: Explosive reaction.
KETONES + ALKALIES: Vigorous exothermic reaction.
LITHIUM: Forms shock-sensitive mixture.
MAGNESIUM (POWDER): Explodes on contact.
METALS + WATER: May be attacked.
METHANOL + ALKALIES: Exothermic reaction.
NITROMETHANE: Forms explosive mixture.
PERCHLORIC ACID + PHOSPHOROUS PENTOXIDE: Violent explosion.
PLASTICSD, RUBGER, COATINGS: May be attacked.
POTASSIUM: Explosive reaction.
POTASSIUM TERT-BUTOXIDE(VAPOR): Ignites on contact.
SODIUM: Explosive reaction.
SODIUM METHOXIDE: Incompatible.
TRIISOPROPYLPHOSPHINE: Vigorous reaction.

DECOMPOSITION:

Thermal decomposition may release toxic or corrosive vapors, including oxides of chlorine and carbon, phosgene, chlorine gas and hydrogen chloride.

POLYMERIZATION:

Hazardous polymerization has not been reported to occur under

normal temperatures and pressures.

STORAGE AND DISPOSAL

Observe all Federal, State and Local regulations when storing or disposing of this substance.

THRESHOLD PLANNING QUANTITY (TPQ):

The superfund amendments and reauthorization act (Sara) Section 302 requires that each facility where any extremely hazardous substance is present in a quantity equal to or greater than the TPQ established for that substance notify the State Emergency Response Commission for the state in which it is located. Section 303 of Sara requires these facilities to participate in local emergency response planning (40 CFR 355.30).

Store in a cool, dry, well-ventilated location. Separate from strong alkalis (NFPA 49, Hazardous Chemicals Data, 1975).

Store away from imcompatible substances.

Keep container tightly closed. Protect from exposure to air or light.

DISPOSAL:

Disposal must be in accordance with standards applicable to generators of hazardous waste, 40CFR 262. EPA Hazardous Waste Number U044.

CHLOROFORM-REGULATORY LEVEL:

6.0 mg/l (TCLP-40 CFR 261 Appendix II) materials which contain the above substance at or above the TCLP regulatory level meet the EPA toxicity characteristic, and must be disposed of in accordance with 40 CFR Part 262. EPA Hazardous Waste Number D022.

CONDITIONS TO AVOID: May burn but does not ignite readily. Containers may explode in heat of fire.

SPILL AND LEAK PROCEDURES

SOIL SPILL:

Dig a holding area such as a pit, pond or lagoon to contain spill and dike surface flow using barrier of soil, sandbags, foamed polyurethane or foamed concrete. Absorb liquid mass with fly ash or cement powder.

Immobilize spill with universal gelling agent.

AIR SPILL: Combustion products include corrosive or toxic vapors.

WATER SPILL: Trap spilled material at bottom in deep water pockets,

excavated holding areas or within sand bag barriers.

Use suction hoses to remove trapped spill material.

Use mechanical dredges or lifts to extract immobilized masses of pollution and precipitates.

If dissolved, at a concentration of 10 ppm or greater, apply activated carbon at ten times the amount that has been spilled.

The California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) prohibits contaminating any known source of drinking water with substances known to cause cancer and/or reproductive toxicity.

OCCUPATIONAL SPILL:

Do not touch spilled material. Stop leak if you can do it without risk. Use water spray to reduce vapors for small spills. Take up with sand or other absorbent material and place into containers for later disposal. For small dry spills, with a clean shovel place material into clean, dry containers and cover. Move containers from spill area. For larger spills, dike far ahead of spill for later disposal. Keep unnecessary people away. Isolate hazard area and deny entry. Ventilate closed spaces before entering.

REPORTABLE QUANTITY (RQ):

The Superfund Amendments and Reauthorization Act (SARA) Section 304 requires that a release equal to or greater than the reportable quantity established for that substance be immediately reported to the local Emergency Planning Committee and the State Emergency Response Commission (40 CFR 355.40). If the release of this substance is reportable under Cercla Section 103. The National Response Center must be notified immediately at (800) 424-8802 or (202) 426-2675 in the Metropolitan Washington, D.C. area (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:

Provide local exhaust or process enclosure ventilation to meet published exposure limits.

RESPIRATOR:

The following respirators and maximum use concentrations are recommendations by the U.S. Department of Health and Human Services, NIOSH Pocket Guide to Chemical Hazards; NIOSH Criteria Documents or by the U.S. Department of Labor, 29 CFR 1910 Subpart Z.

The specific respirator selected must be based on contamination

levels found in the work place. Must not exceed the working limits of the respirator and be jointly approved by the National Institute For Occupational Safety and Health and the Mine Safety and Health Administration (NIOSH-MSHA).

CHLOROFORM:
AT ANY DETECTABLE CONCENTRATION:

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive pressure-mode.

Any supplied-air respirator with a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

ESCAPE:

Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front-or back-mounted organic vapor canister. Any appropriate escape-type, self-contained breathing apparatus.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

CLOTHING:

Employee must wear appropriate protective (impervious) clothing and equipment to prevent repeated or prolonged skin contact with this substance.

GLOVES: Employee must wear appropriate protective gloves to prevent contact with this substance.

EYE PROTECTION:

Employee must wear splash-proof or dust-resistant safety goggles and a faceshield to prevent contact with this substance.

EMERGENCY WASH FACILITIES:

Where there is any possibility that an employee's eyes and/or skin may be exposed to this substance, the employer should provide an eye wash fountain and quick drench shower within the immediate work area for emergency use.

Material Safety Data Sheet

Chloroform-D, 100 Atom % D

ACC# 95522

Section 1 - Chemical Product and Company Identification

MSDS Name: Chloroform-D, 100 Atom % D
Catalog Numbers: AC166270000, AC166270100, AC166270500, AC166271000
Synonyms: Formyl Trichloride-D; Methane Trichloride-D; Methane-D, Trichloro-; Methenyl Trichloride-D; Methyl Trichloride-D; Trichlormethan-D; Trichloroform-D; Trichloromethane-D.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
865-49-6	Chloroform-D	100%	212-742-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid.
Warning! Causes eye and skin irritation. May be harmful if swallowed. Causes digestive and respiratory tract irritation. Cancer suspect agent. May cause central nervous system depression. May cause cancer based on animal studies. Light sensitive. May cause cardiac disturbances. This substance has caused adverse reproductive and fetal effects in animals.
Target Organs: Blood, kidneys, heart, central nervous system, liver, gastrointestinal system, cardiovascular system, excretory system.

Potential Health Effects

Eye: May cause conjunctivitis. Causes redness and pain. Contact with liquid causes immediate burning pain, tearing, and reddening of the conjunctiva.
Skin: Causes irritation with burning pain, itching, and redness.
Ingestion: May cause central nervous system depression, kidney damage, and liver damage. Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause

cardiac disturbances. May cause hallucinations and distorted perceptions.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause liver and kidney damage. May cause cardiac sensitization and possible failure. Inhalation of large amounts may cause respiratory stimulation, followed by respiratory depression, convulsions and possible death due to respiratory paralysis. May be absorbed through the lungs. Causes irritation of the mucous membrane and upper respiratory tract.
Chronic: Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause dermatitis. May cause reproductive and fetal effects. Effects may be delayed. Laboratory experiments have resulted in mutagenic effects. Chronic exposure has been associated with an increased incidence of kidney, liver, rectal, bladder, colon, brain, and lymph node cancer. Toxicity may be increased by exposure to alcohol, steroids, and ketones. Prolonged exposure may cause liver, kidney, and heart damage.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid. Do NOT allow victim to rub eyes or keep eyes closed.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid. Wash mouth out with water.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation.
Notes to Physician: Causes cardiac sensitization to endogenous catelcholamines which may lead to cardiac arrhythmias. Do NOT use adrenergic agents such as epinephrine or pseudoepinephrine. Persons with liver, kidney, or central nervous system diseases may be at increased risk from exposure to this product. Alcoholic beverage consumption may enhance the toxic effects of this substance. Effects may be delayed.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Use extinguishing media appropriate to the surrounding fire. Substance is nonflammable. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Containers may explode when heated.
Extinguishing Media: Do NOT get water inside containers. Do NOT use straight streams of water. For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use

water spray, fog or regular foam. Cool containers with flooding quantities of water until well after fire is out.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Avoid contact with eyes, skin, and clothing. Do not breathe dust, vapor, mist, or gas. Do not ingest or inhale. Store protected from light.
Storage: Do not store in direct sunlight. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store near alkaline substances. Separate from strong mineral acids.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Chloroform-D	none listed	none listed	none listed

OSHA Vacated PELs: Chloroform-D: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard

EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: sweet, fruity odor - ethereal odor
pH: Not available.
Vapor Pressure: 160 mm Hg @ 20 deg C
Vapor Density: 4.20 (Air=1)
Evaporation Rate:11.6 (Butyl acetate=1)
Viscosity: 0.58 cps @ 20 deg C
Boiling Point: 60.5-61.5 deg C
Freezing/Melting Point:-63 deg C
Decomposition Temperature: Not available.
Solubility: Slightly soluble.
Specific Gravity/Density:1.492 (Water=1)
Molecular Formula:CDCl3
Molecular Weight:120.373

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions. Light sensitive.
Conditions to Avoid: High temperatures, incompatible materials, light, moisture.
Incompatibilities with Other Materials: Strong oxidizing agents, aluminum, fluorine, magnesium, sodium potassium, lithium, caustics (e.g. ammonia, ammonium hydroxide, calcium hydroxide, potassium hydroxide, sodium hydroxide), dinitrogen tetraoxide, sodium + methanol, potassium-tert-butoxide, chemically active metals, Attacks some forms of plastics, rubbers, and coatings., nitrogen tetroxide, acetone + alkali, disilane, perchloric acid + phosphorus pentoxide, sodium methylate, triisopropylphosphine, sodium methoxide + methanol.
Hazardous Decomposition Products: Hydrogen chloride, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, chlorine, phosgene gas.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 865-49-6 unlisted.
LD50/LC50:
Not available.
LD50 values similar to that of
Carcinogenicity:
CAS# 865-49-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Oral, rat: TDLo = 13832 mg/kg/2Y-C (Tumorigenic - Carcinogenic by RTECS criteria - Blood - leukemia).; Oral, mouse: TDLo = 127 gm/kg/92W-I (Tumorigenic - Carcinogenic by RTECS criteria - Liver - tumors).; Oral, rat: TD = 98 gm/kg/78W-I (Tumorigenic - neoplastic by RTECS criteria - Kidney, Ureter, Bladder - Kidney tumors and Endocrine - thyroid tumors).; Oral, mouse: TD = 18 gm/kg/17W-I (Tumorigenic - neoplastic by RTECS criteria - Liver - tumors).;
Teratogenicity: Oral, rat: TDL0 = 1260 mg/kg (female 6-15 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus) Specific Developmental Abnormalities - musculoskeletal system.; Inhalation, rat: TCLo = 100 ppm/7H (female 6-15 day(s) after conception) Specific Developmental Abnormalities - gastrointestinal system and homeostasis.; Inhalation, mouse: TCLo = 100 ppm/7H (female 8-15 day(s) after conception) Specific Developmental Abnormalities - craniofacial (including nose and tongue).
Reproductive Effects: Inhalation, rat: TCLo = 30 ppm/7H (female 6-15 day(s) after conception) Fertility - other measures of fertility.; Inhalation, rat: TCLo = 300 ppm/7H (female 6-15 day(s) after conception) Fertility - female fertility index (e.g. # females pregnant per # sperm positive females; # females pregnant per # females mated) and post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).
Mutagenicity: DNA Inhibition: Human, HeLa cell = 19 mmol/L.; Sister Chromatid Exchange: Human, Lymphocyte = 10 mmol/L.; Micronucleus Test: Oral, rat = 4 mmol/kg.; Unscheduled DNA Synthesis: Oral, rat = 1 gm/kg.; Sister Chromatid Exchange: Hamster, Embryo = 100 umol/L.
Neurotoxicity: No information found.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Channel catfish: LC50 = 75 ppm; 96 Hr; UnspecifiedFish: Rainbow trout: LC50 = 43.8 mg/L; 96 Hr; Static bioassayFish: Fathead Minnow: LC50 = 129.0 mg/L; 96 Hr; Static bioassay (pH = 7.6-8.3)Fish: Bluegill/Sunfish: LC50 = 100.0 mg/L; 96 Hr; Static bioassayWater flea Daphnia: EC50 = 28.9 mg/L; 48 Hr; Static bioassay The majority of the environmental releases from industrial uses are to the atmosphere; releases to water and land will be primarily lost by evaporation and will end up in the atmosphere. Release to the atmosphere may be transported long distances and will photodegrade with a half-life of a few months. Spills and other releases on land will also leach into the groundwater where it will reside for long periods of time.
Environmental: Chloroform will not be expected to bioconcentrate into the food chain but contamination of food is likely due to its use as an extractant and its presence in drinking

water.
Physical: No information available.
Other: For more information, see "HANDBOOK OF ENVIRONMENTAL FATE AND EXPOSURE DATA."

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	CHLOROFORM	CHLOROFORM
Hazard Class:	6.1	6.1
UN Number:	UN1888	UN1888
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 865-49-6 is not listed on the TSCA inventory. It is for research and development use only.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

Section 313 No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 865-49-6 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

R 22 Harmful if swallowed.
R 38 Irritating to skin.
R 40 Limited evidence of a carcinogenic effect.
R 48/20/22 Harmful : danger of serious damage to health by prolonged exposure through inhalation and if swallowed.

Safety Phrases:

S 36/37 Wear suitable protective clothing and gloves.

WGK (Water Danger/Protection)

CAS# 865-49-6: No information available.

Canada - DSL/NDSL

CAS# 865-49-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A, D1B.

Canadian Ingredient Disclosure List

Material Safety Data Sheet

Cyclohexanone

ACC# 05890

Section 1 - Chemical Product and Company Identification

MSDS Name: Cyclohexanone
Catalog Numbers: AC111190000, AC111190250, AC111190251, AC406095000, 11119-0010, 11119-0025, C550-4, NC9335342, NC9449331, NC9619559, O2109-1, O2109-4, O2109-4LC, O2109FB-115, O2109FB-19, O2109FB-200, O2109FB-50, O2109POP-19, O2109POP-200, O2109POP-50, O2109POPB-20, O2109POPB-50, O2109RB-200, O2109RB-50, O2109RS-19, O2109SS-115, O2109SS-19, O2109SS-200, O2109SS-28, O2109SS-50
Synonyms: Ketohexamethylene; Pimelic ketone.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
108-94-1	Cyclohexanone	98+	203-631-1

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: APHA: 10 max liquid. Flash Point: 46 deg C.
Warning! Possible cancer hazard. May cause cancer based on animal data. **Flammable liquid and vapor.** Harmful if inhaled. Causes eye and skin irritation. May cause respiratory tract irritation. May cause central nervous system effects.
Target Organs: Blood, kidneys, central nervous system, liver, respiratory system, eyes, skin.

Potential Health Effects

Eye: Causes eye irritation. Undiluted cyclohexanone placed in the eyes of rabbits caused marked irritation and some corneal injury.
Skin: Causes skin irritation. May be harmful if absorbed through the skin. Cyclohexanone was not a sensitizer in the guinea pig maximization test and the mouse ear swelling test. There has been one case report of sensitization to cyclohexanone itself in a patient using a PVC adhesive composed of 100% cyclohexanone; patch testing confirmed the sensitization.
Ingestion: May cause irritation of the digestive tract. May be harmful if swallowed. May cause central nervous system effects.
Inhalation: Harmful if inhaled. May cause respiratory tract irritation. May cause central nervous system effects. Cyclohexanone has caused damage to the liver and kidneys in rabbits exposed by inhalation to an airborne concentration of 190 ppm.
Chronic: Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause dermatitis. May cause liver and kidney damage. Adverse reproductive effects have been reported in animals. Laboratory experiments have resulted in mutagenic effects. Chronic exposure may cause blood effects.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do not induce vomiting. Get medical aid.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Will burn if involved in a fire. Containers may explode in the heat of a fire. Flammable liquid and vapor.
Extinguishing Media: Use water spray to cool fire-exposed containers. Use foam, dry chemical, or carbon dioxide. Water may be ineffective.
Flash Point: 46 deg C (114.80 deg F)
Autoignition Temperature: 520 deg C (968.00 deg F)
Explosion Limits, Lower:1.10 vol %
Upper: 8.10 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Remove all sources of ignition. Use a spark-proof tool. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Take precautionary measures against static discharges. Keep away from heat, sparks and flame. Do not ingest or inhale. Use only in a chemical fume hood.
Storage: Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Cyclohexanone	20 ppm TWA; 50 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	25 ppm TWA; 100 mg/m3 TWA 700 ppm IDLH	50 ppm TWA; 200 mg/m3 TWA

OSHA Vacated PELs: Cyclohexanone: 25 ppm TWA; 100 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless - APHA: 10 max
Odor: none reported
pH: Not applicable.
Vapor Pressure: 4.5 mbar @ 20 deg C
Vapor Density: 3.4 (air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 155 deg C @ 760 mmHg
Freezing/Melting Point:-47 deg C
Decomposition Temperature: Not available.
Solubility: Slightly soluble.
Specific Gravity/Density:0.947
Molecular Formula:C6H10O
Molecular Weight:98.14

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials: Reducing agents, plastics.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 108-94-1: GW1050000
LD50/LC50:
CAS# 108-94-1:
Draize test, rabbit, eye: 20 mg Severe;
Draize test, rabbit, eye: 250 ug/24H Severe;
Inhalation, mouse: LC50 = 2375 mg/m3;
Inhalation, rat: LC50 = 8000 ppm/4H;
Inhalation, rat: LC50 = 19000 mg/m3;
Oral, mouse: LD50 = 1400 mg/kg;
Oral, rat: LD50 = 1620 uL/kg;
Oral, rat: LD50 = 1800 mg/kg;
Skin, rabbit: LD50 = 1 mL/kg;

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Carcinogenicity:
CAS# 108-94-1:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** Not listed.
- **NTP:** Not listed.
- **IARC:** Not listed.

Epidemiology: ACGIH has labeled this substance as a confirmed animal carcinogen.
Teratogenicity: Teratogenic effects have occurred in experimental animals.
Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.
Mutagenicity: Mutation in microorganisms:See actual entry in RTECS for complete information.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 90.0 mg/L; 96 Hr.; 320.0 mg/L CaCO3Fish: Rainbow trout: LC50 = 44.0 mg/L; 96 Hr.; 20.0 mg/L CaCO3Fish: Fathead Minnow: LC50 = 527.0 mg/L; 96 Hr.; Flow-through, 24-26 degrees C,pH7.5Water flea Daphnia: EC50 = 820.0 mg/L; 48 Hr.; UnspecifiedAlgae: EC50 = 20.0 mg/L; 96 Hr.; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 = 18.7 mg/L; 5 minutes; Microtox Test No data available.
Environmental: This chemical is expected to rapidly volatilize based on its low melting and boiling point. Cyclohexanone is estimated to be highly mobile in soil. In view of its moderate vapor pressure and low adsorption to soil, it would be expected to volatilize from surface soil. Although data are lacking, it may also undergo direct photolysis on the soil surface. Cyclohexanone is readily biodegradable according to aerobic screening tests and therefore would be expected to biodegrade in soil.
Physical: No information found.
Other: The bioconcentration factor (BCF) for cyclohexanone can be estimated to be 2.4 based on the log Kow of 0.81 and a recommended regression equation. This BCF indicates that cyclohexanone will not bioconcentrate in aquatic organisms.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.

RCRA U-Series:
CAS# 108-94-1: waste number U057 (Ignitable waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	CYCLOHEXANONE	CYCLOHEXANONE
Hazard Class:	3	3
UN Number:	UN1915	UN1915
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 108-94-1 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 108-94-1: Effective 10/4/82, Sunset 10/4/92
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 108-94-1: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 108-94-1: immediate, delayed, fire.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 108-94-1 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

R 10 Flammable.

R 20 Harmful by inhalation.

Safety Phrases:

S 25 Avoid contact with eyes.

WGK (Water Danger/Protection)

CAS# 108-94-1: 1

Canada - DSL/NDSL

CAS# 108-94-1 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B3, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 108-94-1 is listed on the Canadian Ingredient Disclosure List.

ALDRICH CHEMICAL CO INC -- DICYCLOPENTADIENE, 11279-8 -- 6810-00N065011

========== Product Identification ==========

Product ID:DICYCLOPENTADIENE, 11279-8
MSDS Date:05/31/1995
FSC:6810
NIIN:00N065011
MSDS Number: BZKXS
=== Responsible Party ===
Company Name:ALDRICH CHEMICAL CO INC
Box:355
City:MILWAUKEE
State:WI
ZIP:53201
Country:US
Info Phone Num:414-273-3850
Emergency Phone Num:414-273-3850
CAGE:60928
=== Contractor Identification ===
Company Name:ALDRICH CHEMICAL CO INC
Address:1001 WEST ST PAUL AVE
Box:355
City:MILWAUKEE
State:WI
ZIP:53233
Country:US
Phone:414-273-3850
CAGE:60928

========== Composition/Information on Ingredients ==========

Ingred Name:4,7-METHANOINDENE, 3A,4,7,7A-TETRAHYDRO-;
(DICYCLOPENTADIENE)
CAS:77-73-6
RTECS #:PC1050000
OSHA PEL:5 PPM
ACGIH TLV:5 PPM

========== Hazards Identification ==========

LD50 LC50 Mixture:LD50(ORAL,RAT):353 MG/KG
Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:ACUTE:HARMFUL IF SWALLOWED, INHALED OR
ABSORBED THROUGH SKIN. VAPOR OR MIST IS IRRITATING TO THE EYES,
MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT. CAUSES SKIN
IRRITATION. CHRONIC:DAMAGE TO THE LIVER , KIDNEYS & LUNGS. TO THE
BEST OF MFR'SKNOWLEDGE, CHEM, PHYSICAL & TOX PROPERTIES HAVE NOT
BEEN THORO INVESTIGATED.
Explanation of Carcinogenicity:NOT RELEVANT
Effects of Overexposure:SEE HEALTH HAZARDS.
Medical Cond Aggravated by Exposure:NONE SPECIFIED BY MANUFACTURER.

========== First Aid Measures ==========

First Aid:EYES:IMMEDIATELY FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT

LEAST 15 MINUTES. SKIN:IMMEDIATELY FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAM CLTHG & SHOES. WASH CON TAM CLTHG BEFORE REUSE. INHALATION:REMOVE TO FRESH AIR. IF NOT BRTHG GIVE ARTF RESP. IF BRTHG IS DFCLT, GIVE OXYG. INGEST:WASH OUT MOUTH W/WATER PROVIDED PERSON IS CONSCIOUS. CALL A PHYSICIAN.

========== Fire Fighting Measures ==========

Flash Point:80.0F,26.7C
Lower Limits:1%
Upper Limits:10%
Extinguishing Media:WATER SPRAY, CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
Fire Fighting Procedures:WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT . FLAMMABLE LIQUID.
Unusual Fire/Explosion Hazard:EMITS TOXIC FUMES UNDER FIRE CONDITIONS. VAPOR MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK. CNTNR EXPLO MAY OCCUR UNDER FIRE CNDTNS.

========== Accidental Release Measures ==========

Spill Release Procedures:EVACUATE AREA. WEAR NIOSH/MSHA APPROVED SCBA, RUBBER BOOTS AND HEAVY RUBBER GLOVES. COVER WITH DRY-LIME OR SODA ASH, PICK UP, KEEP IN A CLOSED CONTAINER AND HOLD FOR WASTE DISP. VENT AREA & WASH SPILL SITE AFTER MATL PICKUP IS COMPLETE.
Neutralizing Agent:COVER WITH DRY-LIME OR SODA ASH.

========== Handling and Storage ==========

Handling and Storage Precautions:DO NOT BREATHE VAPOR. AVOID CONTACT WITH EYES, SKIN AND CLOTHING. AVOID PROLONGED OR REPEATED EXPOSURE. KEEP TIGHTLY CLOSED.
Other Precautions:KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME. STORE UNDER NITROGEN. STORE IN A COOL, DRY PLACE. KEEP AWAY FROM SOURCES OF IGNITION. NO SMOKING.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:WEAR APPROPRIATE NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation:USE ONLY IN A CHEMICAL FUME HOOD.
Protective Gloves:CHEMICAL-RESISTANT GLOVES.
Eye Protection:ANSI APPROVED CHEM WORKERS GOGGS .
Other Protective Equipment:ANSI APPROVED EMERGENCY EYE WASH AND DELUGE SHOWER . OTHER PROTECTIVE CLOTHING.
Work Hygienic Practices:WASH THOROUGHLY AFTER HANDLING.
Supplemental Safety and Health
NONE SPECIFIED BY MANUFACTURER.

========== Physical/Chemical Properties ==========

Boiling Pt:B.P. Text:338F,170C
Melt/Freeze Pt:M.P/F.P Text:30.2F,-1.0C
Vapor Pres:9.75@37.7C
Vapor Density:4.6
Spec Gravity:0.986
Appearance and Odor:COLORLESS LIQUID.

Stability and Reactivity Data

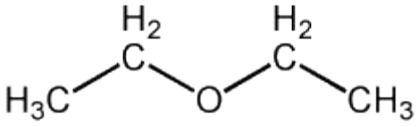
Stability Indicator/Materials to Avoid:YES
STRONG OXIDIZING AGENTS, STRONG ACIDS, STRONG BASES.
Stability Condition to Avoid:NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomposition Products:TOXIC FUMES OF:CARBON MONOXIDE, CARBON DIOXIDE.

Disposal Considerations

Waste Disposal Methods:DISPOSAL MUST BE I/A/W FEDERAL, STATE & LOCAL REGULATIONS .

Ethyl ether

- 1,1'-Oxybisethane
- Ethyl oxide
- Diethyl ether
- Ethoxyethane
- Ether

Formula	$(C_2H_5)_2O$
Structure	
Description	Clear colorless liquid, characteristic sweet pungent odor.
Uses	Solvent for waxes, fats, oils, perfumes, alkaloids, gums, nitrocellulose when mixed with alcohol, manufacture of gun powder, as primer for gasoline engines, reagent for organic syntheses, extractant of active principles (hormones, etc) from plant & animal tissues.

Registry Numbers and Inventories.

CAS	60-29-7
NIH PubChem CID	3283
EC (EINECS/ELINCS)	200-467-2
EC Index Number	603-022-00-4
EC Class	F+; R12, R19, Xn; R22, R66, R67
RTECS	KI5775000
RTECS class	Tumorigen; Drug; Mutagen; Human Data; Primary Irritant
UN (DOT)	1155
Merck	12,3852
Beilstein/Gmelin	1696894
Beilstein Reference	4-01-00-01314
RCRA	U117
Swiss Giftliste 1	G-1155
Canada DSL/NDSL	DSL
US TSCA	Listed
Austrailia AICS	Listed
New Zealand	Listed
Japan ENCS (MITI)	Listed
Korea ECL	Listed

Philippiens PICCS	Listed

Properties.

Formula	C4H10O
Formula mass	74.12
Melting point, °C	-123
Boiling point, °C	35
Vapor pressure, mm_{Hg}	440 (20 C)
Vapor density (air=1)	2.6
Saturation Concentration	58% at 20 C
Evaporization number	37.5 (butyl acetate=1)
Odor threshold	0.83 ppm
Critical temperature	192.7
Critical pressure	35.6
Density	0.7135 g/cm3 (20 C)
Solubility in water	84 g/L (20 C)
Viscosity	0.2448 cp @ 20C
Surface tension	17.06 g/s2 at 20 C
Refractive index	1.35555 (20 C)
Dipole moment	1.25 D (20 C)
Dielectric constant	4.3 (20 C)
Partition coefficient, pK_{ow}	0.89
Thermal expansion	0.00215/K
Heat of fusion	7.3 kJ/mol
Heat of vaporization	27.8 kJ/mol
Heat of combustion	-2729 kJ/mol

Hazards and Protection.

Storage	Keep away from heat, sparks, and flame. Do not store near combustible materials. Do not store in direct sunlight. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Refrigerator (approx 4 C). Do not expose to air. Store protected from moisture. Store protected from light. Store under an inert atmosphere. Keep away from oxidizing agents.
WHMIS	B2

Handling	Use only in a well ventilated area. Ground and bond containers when transferring material. Do not breathe dust, vapor, mist, or gas. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep container tightly closed. Avoid contact with heat, sparks and flame. Handle under an inert atmosphere. Store protected from air. If peroxide formation is suspected, do not open or move container. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Protection	Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Skin: Wear appropriate protective gloves to prevent skin exposure. Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators	A half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. An organic vapor respirator is predicted to have a short service life (less than 30 minutes at concentrations of ten times the TLV/PEL) when used with this material.
Small spills/leaks	Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Use a spark-proof tool. Place under an inert atmosphere. A vapor suppressing foam may be used to reduce vapors.
Disposal code	1
Stability	Stable under ordinary conditions of use and storage. Heat, light, and long standing contribute to instability. Reacts with air to form explosive peroxides.
Incompatibilities	Can react dangerously with acetyl peroxide, liquid oxygen, bromoazide, chlorine, and strong oxidizers such as nitrates.
Decomposition	Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, peroxides.

Fire.

Flash Point,°C	-45
Autoignition, °C	160
Upper exp. limit, %	36
Lower exp. limit, %	1.9
Fire fighting	Wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Extremely flammable. Material will readily ignite at room temperature. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Containers may explode in the heat of a fire. May form explosive peroxides. Will be easily ignited by heat, sparks or flame. May re-ignite after fire is extinguished. Extinguishing media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Do NOT use straight streams of water.

Fire potential		Extremely flammable liquid and vapor.
Hazards		Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. May form explosive peroxides on long standing or after exposure to air or light. May explode when brought in contact with nitric acid. Sensitivity to mechanical impact.
Combustion products		Fire may produce irritating, corrosive and/or toxic gases.
NFPA	**Health**	2
	Flammability	4
	Reactivity	1

Health.

Exposure limit(s)	TLV: 400 ppm; 1210 mg/m3 (as TWA); 500 ppm; 1520 mg/m3 (STEL) (ACGIH 1993-1994). OSHA PEL: TWA 400 ppm (1200 mg/m3) NIOSH REL: See Appendix D NIOSH IDLH: 1900 ppm LEL
Poison_Class	4
Exposure effects	Repeated exposures may be habit forming. Prolonged exposures may result in headache, drowsiness, excitation, and psychic disturbances. Teratogenic effects are possible.
Ingestion	Irritating to the mucous membranes. Ingestion of 1 or 2 ounces may be fatal. Because of volatility the stomach becomes distended, which may cause belching. Other symptoms can include vomiting, unconsciousness, and coma.
Inhalation	Irritant. General anesthesia by inhalation can occur. Continued exposure may lead to respiratory failure or death. Early symptoms include irritation of nose and throat, vomiting, and irregular respiration, followed by dizziness, drowsiness, and unconsciousness.
Skin	Irritating to the skin and mucous membranes by drying effect. Can cause dermatitis on prolonged exposure. May be absorbed through skin.
Eyes	May cause irritation, redness and pain. Prolonged exposures to high concentrations of vapor can cause eye damage.

First aid

Ingestion	Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.
Inhalation	Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. Get medical aid. DO NOT use mouth-to-mouth respiration. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Skin	Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Eyes	Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Transportation.

UN number	1155
Response guide	127
Hazard class	3
Packing Group	I
USCG CHRIS Code	EET
USCG Compatatibility Group	41 Ethers
HS Code	2909 11 00
Std. Transport #	4908156 4908157
IMO Chemical Code	17
IMO Pollution Category	III
IMO Hazard code	S

Material Safety Data Sheet

Ethylenediamine

ACC# 96094

Section 1 - Chemical Product and Company Identification

MSDS Name: Ethylenediamine
Catalog Numbers: E479-4, E479-500, S80006
Synonyms: 1,2-Diaminoethane; 1,2-Ethanediamine; Dimethylenediamine; EDA.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
107-15-3	Ethylenediamine	>98	203-468-6

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless viscous liquid. Flash Point: 34 deg C.
Danger! Causes eye and skin burns. Causes digestive and respiratory tract burns.
Flammable liquid and vapor. May cause allergic respiratory and skin reaction. Harmful if absorbed through the skin. May be harmful if swallowed or inhaled. Hygroscopic (absorbs moisture from the air).
Target Organs: Kidneys, liver, lungs, eyes, skin, mucous membranes.

Potential Health Effects
Eye: Causes eye burns. Low vapor concentrations may cause a temporary visual disturbance known as 'blue haze' or 'halo vision'. Lachrymator (substance which increases the flow of tears).
Skin: Harmful if absorbed through the skin. Causes skin burns. May cause skin

sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Undiluted EDA is corrosive to rabbit skin, causing complete tissue destruction after 6 to 12 minutes.
Ingestion: Causes gastrointestinal tract burns. May cause liver and kidney damage. May be harmful if swallowed.
Inhalation: May cause severe allergic respiratory reaction. Irritation may lead to chemical pneumonitis and pulmonary edema. May cause liver and kidney damage. Causes chemical burns to the respiratory tract. May cause asthma.
Chronic: May cause liver and kidney damage. Repeated exposure may cause allergic respiratory reaction (asthma).

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid immediately.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.
Extinguishing Media: Solid streams of water may be ineffective and spread material. Use water spray, dry chemical, "alcohol resistant" foam, or carbon dioxide.
Flash Point: 34 deg C (93.20 deg F)
Autoignition Temperature: 385 deg C (725.00 deg F)
Explosion Limits, Lower:2.6 vol %
Upper: 14.2 vol %
NFPA Rating: (estimated) Health: 3; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. Evacuate unnecessary personnel. Approach spill from upwind. Use water spray to cool and disperse vapors, protect personnel, and dilute spills to form nonflammable mixtures.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Do not breathe vapor or mist. Use only with adequate ventilation or respiratory protection.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Store protected from moisture. Store under nitrogen. Do not store in copper or copper alloy storage vessels.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Ethylenediamine	10 ppm TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	10 ppm TWA; 25 mg/m3 TWA 1000 ppm IDLH	10 ppm TWA; 25 mg/m3 TWA

OSHA Vacated PELs: Ethylenediamine: 10 ppm TWA; 25 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or

European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Viscous liquid
Appearance: clear, colorless
Odor: ammonia-like
pH: 11.9 (25% aq soln)
Vapor Pressure: 12 mm Hg @ 25 deg C
Vapor Density: 2.07 (air=1)
Evaporation Rate:0.91 (butyl acetate=1)
Viscosity: 1.54 mPas 25 deg C
Boiling Point: 118 deg C @ 760 mmHg
Freezing/Melting Point:8.5 deg C
Decomposition Temperature:> 120 deg C
Solubility: Soluble.
Specific Gravity/Density:.8980 g/ml
Molecular Formula:C2H8N2
Molecular Weight:60.1

Section 10 - Stability and Reactivity

Chemical Stability: Absorbs carbon dioxide from air to form nonvolatile carbonate.
Conditions to Avoid: Ignition sources, moisture, excess heat, confined spaces.
Incompatibilities with Other Materials: Strong oxidizing agents, strong acids, copper, copper alloys.
Hazardous Decomposition Products: Nitrogen oxides, carbon monoxide, carbon dioxide, ammonia and/or derivatives.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 107-15-3: KH8575000
LD50/LC50:
CAS# 107-15-3:
Draize test, rabbit, eye: 750 ug Severe;
Draize test, rabbit, eye: 750 ug/24H Severe;
Inhalation, mouse: LC50 = 300 mg/m3;
Oral, mouse: LD50 = 1 gm/kg;

Oral, rat: LD50 = 1200 mg/kg;
Skin, rabbit: LD50 = 730 uL/kg;

.
Skin, rabbit, LD50: 730 uL/kg = 649.7 mg/kg; Vapor concentrations of 4000 ppm for 8 hours killed 6/6 rats, while 2000 ppm produced no lethality (Doc of TLV).
Carcinogenicity:
CAS# 107-15-3: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Edema of the epithelium of the cornea, generally without pain, has been produced by amine vapors, causing colored haloes to be seen around lights, usually in the evening, after industrial exposure to the vapors of various amines.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Mutagenicity: Most mutagenicity tests have produced negative results.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: LC50 = 115.7 mg/L; 96 Hr.; Static ConditionFish: Rainbow trout: LC50 = 230.0 mg/L; 96 Hr.; Static ConditionWater flea EC50 = 0.88 mg/L; 48 Hr.; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 = 20.0 mg/L; 15 Minutes; Microtox test Chub (fresh water) 60ppm/24H (lethal)Rainbow trout LC50=230 mg/L/48H
Environmental: On soil, substance will leach and volatilize. In water, substance will form alkaline solution and will biodegrade. Bioconcentration is not predicted. In air, substance will react with hydroxyl radicals and carbon dioxide. Biological Oxygen Demand (BOD): 75% (theor.), 5 days.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG

Shipping Name:	ETHYLENEDIAMINE	ETHYLENEDIAMINE
Hazard Class:	8	8(6.1)
UN Number:	UN1604	UN1604
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 107-15-3 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 107-15-3: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
CAS# 107-15-3: 10000 lb TPQ
SARA Codes
CAS # 107-15-3: immediate, delayed, fire.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 107-15-3 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 107-15-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:
C
Risk Phrases:
R 10 Flammable.
R 21/22 Harmful in contact with skin and if swallowed.
R 34 Causes burns.
R 42/43 May cause sensitization by inhalation and skin contact.

Safety Phrases:
S 23 Do not inhale gas/fumes/vapour/spray.
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face pr otection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)
CAS# 107-15-3: 2
Canada - DSL/NDSL
CAS# 107-15-3 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of B2, D1B, E, D2A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 107-15-3 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

Material Safety Data Sheet

Formic acid

ACC# 45433

Section 1 - Chemical Product and Company Identification

MSDS Name: Formic acid
Catalog Numbers: AC147930000, AC147930010, AC147930025, AC147930250, AC147932500, AC270480000 AC270480000, AC270480010, AC270480250, AC410770000, AC410770025, AC410770050 AC410770050, AC410775000, AC423750000, AC423750050, AC423755000
Synonyms: Methanoic acid; Hydrogen carboxylic acid; Aminic acid; Formylic acid.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
64-18-6	Formic acid	85+	200-579-1
7732-18-5	Water	<15	231-791-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless clear liquid. Flash Point: 50 deg C.
Danger! Combustible liquid and vapor. Causes burns by all exposure routes. Hygroscopic (absorbs moisture from the air).
Target Organs: Respiratory system, gastrointestinal system, eyes, skin.

Potential Health Effects
Eye: Causes severe eye burns. May cause conjunctivitis. Lachrymator (substance which increases the flow of tears).
Skin: May be harmful if absorbed through the skin. Causes severe burns.
Ingestion: May be harmful if swallowed. Causes severe digestive tract burns.
Inhalation: Causes chemical burns to the respiratory tract. May be harmful if inhaled.
Chronic: Chronic absorption of formic acid may cause damage to the kidneys, which is indicated by albuminuria and hematuria. Chronic skin contact may cause sensitization dermatitis, particularly in workers previously sensitized to formaldehyde.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do not induce vomiting. Get medical aid immediately. Call a poison control center.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation

if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Will burn if involved in a fire. Combustible liquid and vapor.
Extinguishing Media: Use foam, dry chemical, or carbon dioxide.
Flash Point: 50 deg C (122.00 deg F)
Autoignition Temperature: 520 deg C (968.00 deg F)
Explosion Limits, Lower:10 vol %
Upper: 45 vol %
NFPA Rating: (estimated) Health: 3; Flammability: 2; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Remove all sources of ignition. Use a spark-proof tool. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Keep away from heat, sparks and flame. Do not ingest or inhale. Use only in a chemical fume hood.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Store in a dry area. Corrosives area. Keep refrigerated. (Store below 4°C/39°F.) Do not store in metal containers. Concentrated formic acid will slowly decompose to carbon monoxide at room temperature resulting in increased pressure if containers are sealed or unvented.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Formic acid	5 ppm TWA; 10 ppm STEL	5 ppm TWA; 9 mg/m3 TWA 30 ppm IDLH	5 ppm TWA; 9 mg/m3 TWA
Water	none listed	none listed	none listed

OSHA Vacated PELs: Formic acid: 5 ppm TWA; 9 mg/m3 TWA Water: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Appearance: colorless
Odor: pungent odor
pH: 2.1 (10 g/L aq.sol.)
Vapor Pressure: 44 mbar @ 20 deg C
Vapor Density: 1.6 (air=1)
Evaporation Rate:2.1 (Butyl Acetate=1)
Viscosity: 1.47 mPa @ 20 deg C
Boiling Point: 101 deg C @ 760 mmHg
Freezing/Melting Point:8 deg C
Decomposition Temperature: Not available.
Solubility: Miscible.
Specific Gravity/Density:1.220
Molecular Formula:CH2O2
Molecular Weight:46.02

Section 10 - Stability and Reactivity

Chemical Stability: Hygroscopic: absorbs moisture or water from the air. Keep

refrigerated. Formic acid may decompose to carbon monoxide and water or carbon dioxide and hydrogen gas. These decomposition products develop pressure. Heat sensitive
Conditions to Avoid: Incompatible materials, ignition sources, excess heat, exposure to moist air or water.
Incompatibilities with Other Materials: Metals, strong oxidizing agents, strong bases, permanganates, sulfuric acid, hydrogen peroxide, caustics (e.g. ammonia, ammonium hydroxide, calcium hydroxide, potassium hydroxide, sodium hydroxide), nitro compounds (organic, e.g. nitrobenzene, nitroglycerine, picric acid, trinitrotoluene).
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, hydrogen gas.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 64-18-6: LQ4900000
CAS# 7732-18-5: ZC0110000
LD50/LC50:
CAS# 64-18-6:
Draize test, rabbit, eye: 122 mg Severe;
Inhalation, mouse: LC50 = 6200 mg/m3/15M;
Inhalation, rat: LC50 = 15 gm/m3/15M;
Oral, mouse: LD50 = 700 mg/kg;
Oral, rat: LD50 = 1100 mg/kg;
.

CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;
.

Carcinogenicity:
CAS# 64-18-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Sister Chromatid Exchange: Human, Lymphocyte = 10 mmol/L.; Cytogenetic Analysis: Non-mammalian species Cells - not otherwise specified = 100 mmol/L.; Cytogenetic Analysis: Hammster, Ovary = 10 mmol/L.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: LC50 = 5000 mg/L; 24 Hr; UnspecifiedWater flea

Daphnia: EC50 = 34 mg/L; 48 Hr; Unspecified In natural water it has been shown to adsorb to sediment and would probably also biodegrade. Bioconcentration in aquatic organisms is not important. In the atmosphere, formic acid would be scavenged by rain and dissolve in cloud water where it reacts with dissolved hydroxyl radicals. It also reacts in the vapor phase with hydroxyl radicals (half-life 36 days).
Environmental: Formic acid is the strongest unsubstituted carboxylic acid with a pKa of 3.74(3) and will exist almost entirely as the anion at environmental pHs. If released on land, formic acid should leach into some soils where it would probably biodegrade.
Physical: Formic acid can be degraded chemically to innocuous substances in most environments.
Other: Do not empty into drains.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 64-18-6: waste number U123 (Corrosive waste, Toxic waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	FORMIC ACID	FORMIC ACID
Hazard Class:	8	8
UN Number:	UN1779	UN1779
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 64-18-6 is listed on the TSCA inventory.
CAS# 7732-18-5 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 64-18-6: 5000 lb final RQ; 2270 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 64-18-6: immediate, fire.

Section 313

This material contains Formic acid (CAS# 64-18-6, 85+%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 64-18-6 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 64-18-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 35 Causes severe burns.

Safety Phrases:

S 23 Do not inhale gas/fumes/vapour/spray.
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 64-18-6: 1
CAS# 7732-18-5: No information available.

Canada - DSL/NDSL

CAS# 64-18-6 is listed on Canada's DSL List.
CAS# 7732-18-5 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E, B3.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 64-18-6 is listed on the Canadian Ingredient Disclosure List.

Material Safety Data Sheet

Hydrochloric Acid, Reagent ACS

ACC# 95547

Section 1 - Chemical Product and Company Identification

MSDS Name: Hydrochloric Acid, Reagent ACS
Catalog Numbers: AC423790025, AC423790250, AC423795000, NC9619320
Synonyms: Muriatic acid; Chlorohydric acid; Hydrogen chloride; Spirits of salt
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7647-01-0	Hydrochloric acid	36.5	231-595-7
7732-18-5	Water	Balance	231-791-2

Hazard Symbols: C
Risk Phrases: 34 37

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless to slight yellow clear liquid. **Danger!** Corrosive. Causes eye and skin burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. May be harmful if swallowed.
Target Organs: Respiratory system, teeth, eyes, skin, circulatory system.

Potential Health Effects

Eye: May cause irreversible eye injury. Vapor or mist may cause irritation and severe burns. Contact with liquid is corrosive to the eyes and causes severe burns. May cause painful

sensitization to light.
Skin: May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Contact with liquid is corrosive and causes severe burns and ulceration.
Ingestion: May cause circulatory system failure. Causes severe digestive tract burns with abdominal pain, vomiting, and possible death. May cause corrosion and permanent tissue destruction of the esophagus and digestive tract. May be harmful if swallowed.
Inhalation: May cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath and delayed lung edema. Causes chemical burns to the respiratory tract. Exposure to the mist and vapor may erode exposed teeth. Causes corrosive action on the mucous membranes.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Repeated exposure may cause erosion of teeth. May cause fetal effects. Laboratory experiments have resulted in mutagenic effects. Prolonged exposure may cause conjunctivitis, photosensitization, and possible blindness.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes). SPEEDY ACTION IS CRITICAL!
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Give milk of magnesia.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Do NOT use sodium bicarbonate in an attempt to neutralize the acid.
Antidote: Do NOT use oils or ointments in eye.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Not flammable, but reacts with most metals to form flammable hydrogen gas. Use water spray to keep fire-exposed containers cool. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Reaction with water may generate much heat which will increase the concentration of fumes in the air. Containers may explode when heated.

Extinguishing Media: For large fires, use water spray, fog, or alcohol-resistant foam. Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Do NOT get water inside containers. Do NOT use straight streams of water. Most foams will react with the material and release corrosive/toxic gases. Cool containers with flooding quantities of water until well after fire is out. For small fires, use carbon dioxide (except for cyanides), dry chemical, dry sand, and alcohol-resistant foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Large spills may be neutralized with dilute alkaline solutions of soda ash (sodium carbonate, Na2CO3), or lime (calcium oxide, CaO). Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Provide ventilation. Do not get water inside containers. A vapor suppressing foam may be used to reduce vapors. Cover with dry earth, dry sand, or other non-combustible material followed with plastic sheet to minimize spreading and contact with water.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Contents may develop pressure upon prolonged storage. Do not breathe dust, vapor, mist, or gas. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Do not ingest or inhale. Discard contaminated shoes. Use caution when opening. Keep from contact with moist air and steam.
Storage: Do not store in direct sunlight. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Corrosives area. Do not store in metal containers. Store protected from moisture. Do not store near flammable or oxidizing substances (especially nitric acid or chlorates).

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Hydrochloric acid	2 ppm Ceiling	50 ppm IDLH	5 ppm Ceiling; 7 mg/m3 Ceiling
Water	none listed	none listed	none listed

OSHA Vacated PELs: Hydrochloric acid: No OSHA Vacated PELs are listed for this chemical. Water: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear neoprene or polyvinyl chloride gloves to prevent exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Appearance: colorless to slight yellow
Odor: strong, pungent
pH: 0.01
Vapor Pressure: 5.7 mm Hg @ 0 deg C
Vapor Density: 1.26
Evaporation Rate:> 1.00 (N-butyl acetate)
Viscosity: Not available.
Boiling Point: 81.5-110 deg C @ 760 mmHg
Freezing/Melting Point:-74 deg C
Decomposition Temperature: Not available.
Solubility: Miscible.
Specific Gravity/Density:1.0-1.2
Molecular Formula:HCl.H2O
Molecular Weight:36.46

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Mechanical shock, incompatible materials, metals, excess heat, exposure to moist air or water, bases.
Incompatibilities with Other Materials: Acetates, acetic anhydride, alcohols + hydrogen cyanide, 2-aminoethanol, ammonium hydroxide, calcium carbide, calcium phosphide, cesium acetylene carbide, cesium carbide, chlorosulfonic acid, 1,1-difluoroethylene,

ethylene diamine, ethyleneimine, fluorine, lithium silicides, magnesium boride, mercuric sulfate, oleum, perchloric acid, potassium permanganate, beta-propiolactone, propylene oxide, rubidium acetylene carbide, rubidium carbide, silver perchlorate + carbon tetrachloride, sodium, sodium hydroxide, sulfuric acid, uranium phosphide, vinyl acetate, zinc, metal oxides, aluminum, amines, carbonates, iron, steel, copper alloys, copper, alkali metals, bases, moisture.
Hazardous Decomposition Products: Hydrogen chloride, chlorine, carbon monoxide, carbon dioxide, hydrogen gas.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7647-01-0: MW4025000; MW4031000
CAS# 7732-18-5: ZC0110000
LD50/LC50:
CAS# 7647-01-0:
Inhalation, mouse: LC50 = 1108 ppm/1H;
Inhalation, mouse: LC50 = 8300 mg/m3/30M;
Inhalation, rat: LC50 = 3124 ppm/1H;
Inhalation, rat: LC50 = 45000 mg/m3/5M;
Inhalation, rat: LC50 = 8300 mg/m3/30M;
Oral, rabbit: LD50 = 900 mg/kg;<BR.

CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;<BR.

Carcinogenicity:
CAS# 7647-01-0:
ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: IARC Group 3 - not classifiable CAS# 7732-18-5: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: Experimental reproductive effects have been reported.
Teratogenicity: Embryo or Fetus: Stunted fetus, Inhalation, rat TCL0=450 mg/m3/1H Specific Developmental Abnormalities: homeostatis, Inhalation, rat TCL0=450 mg/m3/1H (female 1 days pre-mating).
Reproductive Effects: No information available.
Neurotoxicity: No information available.
Mutagenicity: Cytogenetic analysis: Hamster, lung = 30 mmol/L.; Cytogenetic analysis: Hamster, ovary = 8 mmol/L.
Other Studies: No data available.

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 3.6 mg/L; 48Hr; Lethal (unspecified) Bluegill/Sunfish:

LC50; 96 Hr; pH 3.0-3.5 No data available.
Environmental: Rapidly hydrolyzes when exposed to water. Will exhibit extensive evaporation from soil surfaces. Upon transport through the soil, hydrochloric acid will dissolve some of the soil materials (especially those with carbonate bases) and the acid will neutralize to some degree.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	HYDROCHLORIC ACID				No information available.
Hazard Class:	8				
UN Number:	UN1789				
Packing Group:	II				

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7647-01-0 is listed on the TSCA inventory.
CAS# 7732-18-5 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

CERCLA Hazardous Substances and corresponding RQs

CAS# 7647-01-0: 5000 lb final RQ; 2270 kg final RQ

SARA Section 302 Extremely Hazardous Substances

CAS# 7647-01-0: 500 lb TPQ

SARA Codes

CAS # 7647-01-0: acute.

Section 313

This material contains Hydrochloric acid (CAS# 7647-01-0, 36 5%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7647-01-0 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 7647-01-0 is listed as a Hazardous Substance under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7647-01-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 34 Causes burns.

R 37 Irritating to respiratory system.

Safety Phrases:

S 1/2 Keep locked up and out of reach of children.

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 9 Keep container in a well-ventilated place.

WGK (Water Danger/Protection)

CAS# 7647-01-0: 1

CAS# 7732-18-5: No information available.

Canada - DSL/NDSL

CAS# 7647-01-0 is listed on Canada's DSL List.
CAS# 7732-18-5 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D1A, E.

Canadian Ingredient Disclosure List

CAS# 7647-01-0 is listed on the Canadian Ingredient Disclosure List.

Exposure Limits

CAS# 7647-01-0: OEL-AUSTRALIA:TWA 5 ppm (7 mg/m3) OEL-AUSTRIA:TWA 5 ppm (7 mg/m3) OEL-BELGIUM:STEL 5 ppm (7.7 mg/m3) OEL-DENMARK:STEL 5 ppm (7 mg/m3) OEL-FINLAND:STEL 5 ppm (7 mg/m3);Skin OEL-FRANCE:STEL 5 ppm (7.5 mg/m3) OEL-GERMANY:TWA 5 ppm (7 mg/m3) OEL-HUNGARY:STEL 5 mg/m3 OEL-JAPAN:STEL 5 ppm (7.5 mg/m3) OEL-THE NETHERLANDS:TWA 5 p pm (7 mg/m3) OEL-THE PHILIPPINES:TWA 5 ppm (7 mg/m3) OEL-POLAND:TWA 5 mg/m3 OEL-RUSSIA:STEL 5 ppm (5 mg/m3) OEL-SWEDEN:STEL 5 ppm (8 mg/ m3) OEL-SWITZERLAND:TWA 5 ppm (7.5 mg/m3);STEL 10 ppm (15 mg/m3) OEL -THAILAND:TWA 5 ppm (7 mg/m3) OEL-TURKEY:TWA 5 ppm (7 mg/m3) OEL-UNI TED KINGDOM:TWA 5 ppm (7 mg/m3);STEL 5 ppm (7 mg/m3) OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPOR E, VIETNAM check ACGI TLV

Material Safety Data Sheet

IPA Methanol

ACC# 89493

Section 1 - Chemical Product and Company Identification

MSDS Name: IPA Methanol
Catalog Numbers: A462SS-200
Synonyms: Mixture
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
67-63-0	Isopropyl alcohol	99.75	200-661-7
67-56-1	Methyl Alcohol	0.18	200-659-6
91-22-5	Quinoline	0.07	202-051-6

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: Not available. Flash Point: 11.7 deg C.
Warning! Flammable liquid and vapor. May cause eye, skin, and respiratory tract irritation. May cause central nervous system depression. May form explosive peroxides. May cause kidney damage.
Target Organs: Kidneys, central nervous system.

Potential Health Effects
Eye: Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury.

Skin: Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. May cause irritation with pain and stinging, especially if the skin is abraded.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause kidney damage. May cause systemic toxicity with acidosis. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Inhalation of vapor may cause respiratory tract irritation.
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis. May cause allergic skin reaction in some

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Urine acetone test may be helpful in diagnosis.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Flammable liquid and vapor. May form explosive peroxides. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media: Use water spray to cool fire-exposed containers. Water may be ineffective. Do NOT use straight streams of water. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. For small fires, use carbon dioxide, dry chemical, dry sand, or alcohol-resistant foam. Cool containers with flooding quantities of water until well after fire is out.
Flash Point: 11.7 deg C (53.06 deg F)
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: ; Flammability: ; Instability:

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Isopropyl alcohol	200 ppm TWA; 400 ppm STEL	400 ppm TWA; 980 mg/m3 TWA 2000 ppm IDLH	400 ppm TWA; 980 mg/m3 TWA
Methyl Alcohol	200 ppm TWA; 250 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	200 ppm TWA; 260 mg/m3 TWA 6000 ppm IDLH	200 ppm TWA; 260 mg/m3 TWA
Quinoline	none listed	none listed	none listed

OSHA Vacated PELs: Isopropyl alcohol: 400 ppm TWA; 980 mg/m3 TWA Methyl Alcohol: 200 ppm TWA; 260 mg/m3 TWA Quinoline: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: Not available.
Odor: Not available.
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point: Not available.
Decomposition Temperature: Not available.
Solubility: Not available.
Specific Gravity/Density: Not available.
Molecular Formula: Not available.
Molecular Weight: Not available.

Section 10 - Stability and Reactivity

Chemical Stability: Stable. This material may be sensitive to peroxide formation.
Conditions to Avoid: This material may be sensitive to peroxide formation., incompatible materials, ignition sources.
Incompatibilities with Other Materials: Strong oxidizers, acetaldeyde, chlorine, ethylene oxide, acids and isocyanates, hydrogen + palladium, nitroform, oleum, phosgene, potassium t-butoxide, oxygen, trinitromethane, barium perchlorate, tetrafluoroborate, chromium trioxide, sodium dichromate + sulfuric acid, aluminum, and aluminum triisopropoxide. Methanol is incompatible with acetyl bromide, alkylauminum solutions, beryllium hydride, carbon tetrachloride + metals, chloroform + sodium hydroxide, cyanuric chloride, dichloromethane, diethylzinc, metals, oxidants, phosphorus (III) oxide, and potassium tert-butoxide. Quinoline is incompatible dinitrogen tetraoxide, hydrogen peroxide, linseed oil + thionyl chloride, maleic anhydride + bases. Isopropyl alcohol has also been reported to be susceptible to autoxidation and should therefore be considered peroxidizable.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, acrid smoke and

fumes.
Hazardous Polymerization: May occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 67-63-0: NT8050000
CAS# 67-56-1: PC1400000
CAS# 91-22-5: VA9275000
LD50/LC50:
CAS# 67-63-0:
Draize test, rabbit, eye: 100 mg Severe;
Draize test, rabbit, eye: 10 mg Moderate;
Draize test, rabbit, eye: 100 mg/24H Moderate;
Draize test, rabbit, skin: 500 mg Mild;
Inhalation, mouse: LC50 = 53000 mg/m3;
Inhalation, rat: LC50 = 16000 ppm/8H;
Inhalation, rat: LC50 = 72600 mg/m3;
Oral, mouse: LD50 = 3600 mg/kg;
Oral, mouse: LD50 = 3600 mg/kg;
Oral, rabbit: LD50 = 6410 mg/kg;
Oral, rat: LD50 = 5045 mg/kg;
Oral, rat: LD50 = 5000 mg/kg;
Skin, rabbit: LD50 = 12800
CAS# 67-56-1:
Draize test, rabbit, eye: 40 mg Moderate;
Draize test, rabbit, eye: 100 mg/24H Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, rabbit: LC50 = 81000 mg/m3/14H;
Inhalation, rat: LC50 = 64000 ppm/4H;
Oral, mouse: LD50 = 7300 mg/kg;
Oral, rabbit: LD50 = 14200 mg/kg;
Oral, rat: LD50 = 5600 mg/kg;
Skin, rabbit: LD50 = 15800 mg/kg;
.

CAS# 91-22-5:
Draize test, rabbit, skin: 100 mg/24H Moderate;
Oral, rat: LD50 = 331 mg/kg;
Skin, rabbit: LD50 = 540 uL/kg;
.

Carcinogenicity:
CAS# 67-63-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 67-56-1: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 91-22-5:

- **ACGIH:** Not listed.
- **California:** carcinogen, initial date 10/24/97

- **NTP:** Not listed.
- **IARC:** Not listed.

Epidemiology: Early epidemiological studies suggested an association between the strong acid manufacture of isopropyl alcohol and paranasal sinus cancer in workers. The risk of laryngeal cancer may also be increased in these workers. However, it has not been tested adequately in animals to assess its carcinogenicity.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Mutagenicity: No data available.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. Acute aquatic effects: Fathead minnow: LC50 =1000 mg/L/96 Hr. Golden orfe: LC50 = 8970 mg/L/48 Hr. goldfish: LC50 = GT5000 mg/L/24 Hr.
Environmental: This chemical has a low potential to affect aquatic organisms, secondary waste treatment microorganisms, and the germination and growth of some plants. It is readily biodegradable and is not expected to persist in an aquatic environment. It is not likely to bioconcentrate.
Physical: None
Other: None

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 67-56-1: waste number U154 (Ignitable waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	FLAMMABLE LIQUIDS, N.O.S.	No information available.
Hazard Class:	3	
UN Number:	UN1993	
Packing Group:	II	

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 67-63-0 is listed on the TSCA inventory.
CAS# 67-56-1 is listed on the TSCA inventory.
CAS# 91-22-5 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 67-63-0: Effective 12/15/86, Sunset 12/15/96

Chemical Test Rules

CAS# 67-63-0: 40 CFR 799.2325

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 67-56-1: 5000 lb final RQ; 2270 kg final RQ CAS# 91-22-5: 5000 lb final RQ; 2270 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 67-63-0: immediate, delayed, fire.
CAS # 67-56-1: immediate, fire.
CAS # 91-22-5: immediate.

Section 313

This material contains Isopropyl alcohol (CAS# 67-63-0, 99.75%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Methyl Alcohol is not at a high enough concentration to be reportable under Section 313.

Quinoline is not at a high enough concentration to be reportable under Section 313.

Clean Air Act:

CAS# 67-56-1 is listed as a hazardous air pollutant (HAP).
CAS# 91-22-5 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 91-22-5 is listed as a Hazardous Substance under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 67-63-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 67-56-1 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

CAS# 91-22-5 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65
WARNING: This product contains Quinoline, a chemical known to the state of California to cause cancer.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
F
Risk Phrases:
R 11 Highly flammable.

Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 7 Keep container tightly closed.

WGK (Water Danger/Protection)
CAS# 67-63-0: 1
CAS# 67-56-1: 1
CAS# 91-22-5: 2
Canada - DSL/NDSL
CAS# 67-63-0 is listed on Canada's DSL List.
CAS# 67-56-1 is listed on Canada's DSL List.
CAS# 91-22-5 is listed on Canada's DSL List.
Canada - WHMIS
not available.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 67-63-0 is listed on the Canadian Ingredient Disclosure List.
CAS# 67-56-1 is listed on the Canadian Ingredient Disclosure List.
CAS# 91-22-5 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

Material Safety Data Sheet

m-Phosphoric Acid, Glacial

ACC# 13216

Section 1 - Chemical Product and Company Identification

MSDS Name: m-Phosphoric Acid, Glacial
Catalog Numbers: A280-100, A280-3, A280-500, A280ME
Synonyms: Metaphosphoric Acid; Glacial Phosphoric Acid
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
50813-16-6	Sodium meta-Phosphate	57-63	256-779-4
37267-86-0	meta-Phosphoric Acid	37-43	253-433-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear colorless crystals.
Danger! Causes burns by all exposure routes. Corrosive to metal.
Target Organs: Respiratory system, gastrointestinal system, eyes, skin.

Potential Health Effects

Eye: May cause irreversible eye injury. Contact with liquid is corrosive to the eyes and causes severe burns.
Skin: Contact with liquid is corrosive and causes severe burns and ulceration.
Ingestion: Causes severe pain, nausea, vomiting, diarrhea, and shock. May cause hemorrhaging of the digestive tract. May cause corrosion and permanent tissue destruction

of the esophagus and digestive tract.
Inhalation: Irritation may lead to chemical pneumonitis and pulmonary edema. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma.
Chronic: Prolonged inhalation may cause respiratory tract inflammation and lung damage. Prolonged or repeated skin contact may cause dermatitis. Repeated contact may cause corneal damage.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Get medical aid immediately. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Combustion generates toxic fumes.
Extinguishing Media: For small fires, use water spray, dry chemical, carbon dioxide or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section.

Avoid generating dusty conditions. Provide ventilation. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Minimize dust generation and accumulation. Do not get on skin or in eyes. Do not ingest or inhale. Use only in a chemical fume hood.
Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store in metal containers.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Sodium meta-Phosphate	none listed	none listed	none listed
meta-Phosphoric Acid	none listed	none listed	none listed

OSHA Vacated PELs: Sodium meta-Phosphate: No OSHA Vacated PELs are listed for this chemical. meta-Phosphoric Acid: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Crystals
Appearance: clear colorless
Odor: none reported
pH: Acidic
Vapor Pressure: Negligible.

Vapor Density: Not available.
Evaporation Rate: Negligible.
Viscosity: Not available.
Boiling Point: Not applicable.
Freezing/Melting Point: Not available.
Decomposition Temperature: Not available.
Solubility: Soluble in water.
Specific Gravity/Density:2.4
Molecular Formula:HPO3
Molecular Weight:79.979

Section 10 - Stability and Reactivity

Chemical Stability: In water slowly forms ortho-phosphoric acid.
Conditions to Avoid: Incompatible materials, dust generation, contact with water, metals, excess heat.
Incompatibilities with Other Materials: Carbonates, metal oxides, Solutions attack some metals., cyanides, sulfides.
Hazardous Decomposition Products: Oxides of phosphorus.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 50813-16-6 unlisted.
CAS# 37267-86-0 unlisted.
LD50/LC50:
Not available.
Not available.

Carcinogenicity:
CAS# 50813-16-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 37267-86-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available. Shore crab LC50=240 mg/L/48H Chronic plant toxicity=100 ppm
Environmental: No information reported.
Physical: No information available.
Other: Do not empty into drains.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	PHOSPHORIC ACID, SOLID	PHOSPHORIC ACID, SOLID
Hazard Class:	8	8
UN Number:	UN3453	UN3453
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 50813-16-6 is not listed on the TSCA inventory. It is for research and development use only.
CAS# 37267-86-0 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 37267-86-0: immediate.

Section 313 No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 50813-16-6 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
CAS# 37267-86-0 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 34 Causes burns.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 28A After contact with skin, wash immediately with plenty of water.

WGK (Water Danger/Protection)

CAS# 50813-16-6: 1
CAS# 37267-86-0: 1

Canada - DSL/NDSL

CAS# 37267-86-0 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

Material Safety Data Sheet

N,N-Dimethylformamide

ACC# 07860

Section 1 - Chemical Product and Company Identification

MSDS Name: N,N-Dimethylformamide
Catalog Numbers: AC116220000, AC116220025, AC116220050, AC116220250, AC167790000, AC167790010, AC167790025, AC167795000, AC210580000, AC210580010, AC210580025, AC210580250, AC210585000, AC279600000, AC279600010, AC279600025, AC326870000, AC326870010, AC326870025, AC326871000, AC326872500, AC327170000, AC327175000, AC348430000, AC348430010, AC348430025, AC348431000, AC348435000, AC354830000, AC354830010, AC354830025, AC354830100, AC408310000, AC408320000, AC423640000, AC423640250, AC423645000, AC61032019, AC61032019, AC61032050, AC61032050, AC61032115, AC61032115, AC61032200, AC61032200, AC610530190, AC610530500, AC610531150, AC610532000, AC610730190, AC610730500, AC610731150, AC610732000, 11622-0010, 27960-0040, 40831-1000, 40832-5000, 42364-0010, 61032-0010, 61032-1000, 61094-1000, BP1160-4, BP1160-500, BP1160N219, BP1160POP-200, BP1160POP-50, BP1160POP20, BP1160RS-200, BP1160RS115, BP1160RS19, BP1160RS28, BP1160RS50, BP1160SS-50, D119-1, D119-20, D119-200, D119-4, D119-500, D11920LC, D119FB-200, D119FB115, D119FB19, D119FB50, D119J4, D119POP19, D119RB115, D119RB19, D119RB200, D119RB50, D119RS-200, D119RS115, D119RS28, D119RS50, D119S-4, D119SS115, D119SS200, D119SS28, D119SS50, D131-1, D131-4, D131POP-50, D131RS-19, D131RS-200, D132-1, D132RS-19, D132RS-50, NC9542368, NC9734650, PS03494, S79999SPEC
Synonyms: N,N-Dimethylmethanamide; DMF; Dimethylformamide.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
68-12-2	N,N-Dimethylformamide	99+	200-679-5

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: APHA: 20 max liquid. Flash Point: 58 deg C.
Warning! Flammable liquid and vapor. May cause harm to the unborn child. Harmful if absorbed through skin or if inhaled. Lachrymator (substance which increases the flow of tears). Causes eye and skin irritation. May cause respiratory tract irritation. May cause liver and kidney damage. May cause central nervous system effects.
Target Organs: Blood, kidneys, central nervous system, liver, spleen, respiratory system, gastrointestinal system, eyes, skin.

Potential Health Effects

Eye: Causes eye irritation. Lachrymator (substance which increases the flow of tears).
Skin: Causes skin irritation. Harmful if absorbed through the skin. Substance is rapidly absorbed through the skin.
Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause liver and kidney damage. May be harmful if swallowed.
Inhalation: Harmful if inhaled. May cause respiratory tract irritation. May cause central nervous system effects.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Repeated exposure may cause damage to the spleen. Adverse reproductive effects have been reported in animals. Laboratory experiments have resulted in mutagenic effects. Chronic exposure may cause blood effects. Possible risk of harm to the unborn child.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Immediately flush eyes with plenty of wa ter for at least 15 minutes.
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do not induce vomiting. Get medical aid immediately. Call a poison control center.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors

may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Will burn if involved in a fire. Containers may explode in the heat of a fire. Flammable liquid and vapor.
Extinguishing Media: Use water spray to cool fire-exposed containers. Use foam, dry chemical, or carbon dioxide.
Flash Point: 58 deg C (136.40 deg F)
Autoignition Temperature: 445 deg C (833.00 deg F)
Explosion Limits, Lower:2.2 vol %
Upper: 16 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Remove all sources of ignition. Use a spark-proof tool. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Take precautionary measures against static discharges. Keep away from heat, sparks and flame. Do not ingest or inhale. Use only in a chemical fume hood.
Storage: Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
N,N-Dimethylformamide	10 ppm TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	10 ppm TWA; 30 mg/m3 TWA 500 ppm IDLH	10 ppm TWA; 30 mg/m3 TWA

OSHA Vacated PELs: N,N-Dimethylformamide: 10 ppm TWA; 30 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless - APHA: 20 max
Odor: amine-like
pH: 6 - 8 @ 20% aq.sol.
Vapor Pressure: 4.9 mbar @ 20 C
Vapor Density: 2.5 (air=1)
Evaporation Rate:0.17 (butylacetate=1)
Viscosity: 0.8 mPas @ 20 C
Boiling Point: 153 deg C
Freezing/Melting Point:-61 deg C
Decomposition Temperature: Not available.
Solubility: Soluble.
Specific Gravity/Density:0.94
Molecular Formula:C3H7NO
Molecular Weight:73.09

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials: Reducing agents, acids, alkali metals, halogenated agents, nitrates, metal oxides, chloroformates.
Hazardous Decomposition Products: Carbon monoxide, oxides of nitrogen, oxides of nitrogen, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 68-12-2: LQ2100000
LD50/LC50:
CAS# 68-12-2:
Inhalation, mouse: LC50 = 9400 mg/m3/2H;
Inhalation, rat: LC50 = 3421 ppm/1H;
Inhalation, rat: LC50 = 3421 ppm/3H;
Inhalation, rat: LC50 = 1948 ppm/4H;
Oral, mouse: LD50 = 2900 mg/kg;
Oral, rabbit: LD50 = 5 gm/kg;
Oral, rat: LD50 = 2800 mg/kg;
Skin, rabbit: LD50 = 4720 mg/kg;
Skin, rat: LD50 = >3.2 gm/kg;
.

Carcinogenicity:
CAS# 68-12-2: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information foundIARC Group 3: Limited or insufficient evidence for carcinogenicity in both animals and humans.
Teratogenicity: Teratogenic effects have occurred in experimental animals.
Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.
Mutagenicity: Mutagenic effects have occurred in humans.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	N,N-DIMETHYLFORMAMIDE	N,N-DIMETHYLFORMAMIDE
Hazard Class:	3	3
UN Number:	UN2265	UN2265
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 68-12-2 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 68-12-2: Effective 4/13/89, Sunset 12/19/95
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 68-12-2: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 68-12-2: immediate, fire.
Section 313
This material contains N,N-Dimethylformamide (CAS# 68-12-2, 99+%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR
Clean Air Act:
CAS# 68-12-2 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 68-12-2 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 20/21 Harmful by inhalation and in contact with skin.
R 36 Irritating to eyes.
R 61 May cause harm to the unborn child.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.

WGK (Water Danger/Protection)

CAS# 68-12-2: 1

Canada - DSL/NDSL

CAS# 68-12-2 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B3, D2A, D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 68-12-2 is listed on the Canadian Ingredient Disclosure List.

Material Safety Data Sheet

o-Xylene

ACC# 17180

Section 1 - Chemical Product and Company Identification

MSDS Name: o-Xylene
Catalog Numbers: A4926551, A4926558, DO5081500, NC9698851, NC9932825, O5081-4, XXO508120LI
Synonyms: 1,2-Dimethylbenzene.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
95-47-6	o-Xylene	>98	202-422-2

Hazard Symbols: XN F
Risk Phrases: 11 20/21 38

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. **Flammable liquid and vapor.** May cause central nervous system depression. May cause liver and kidney damage. Aspiration hazard if swallowed. Can enter lungs and cause damage. Causes respiratory tract irritation.

Warning! Causes eye irritation. Prolonged or repeated contact may dry the skin and cause irritation. May be harmful if absorbed through skin or if inhaled. This substance has caused adverse reproductive and fetal effects in animals.

Target Organs: Blood, kidneys, central nervous system, liver, lungs, eyes, skin, mucous membranes.

Potential Health Effects

Eye: Causes severe eye irritation. Splashes of xylene in human eyes generally cause transient superficial injury.
Skin: May be harmful if absorbed through the skin. Xylene contact causes defatting of the skin with irritation, dryness, and cracking. Blistering may occur, particularly if exposure to concentrated xylene is prolonged and the exposed area of skin is occluded.
Ingestion: Aspiration hazard. May cause irritation of the digestive tract. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause effects similar to those of acute inhalation.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Prolonged exposure may result in dizziness and general weakness. Irritation may lead to chemical pneumonitis and pulmonary edema. May cause liver and kidney damage. Causes irritation of mucous membrane. Exposure may cause blood abnormalities. Odor is not an adequate warning for overexposure to xylene.
Chronic: Chronic exposure to xylene may cause defatting dermatitis, reversible eye damage, dyspnea (labored breathing), confusion, dizziness, apprehension, memory loss, headache, tremors, weakness, anorexia, nausea, ringing in the ears, irritability, thirst, mild changes in liver function, kidney impairment, anemia, and hyperplasia, but not destruction, of the bone marrow.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Flammable liquid and vapor. Vapors may form an explosive mixture with air. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.
Extinguishing Media: Use water spray to cool fire-exposed containers. Water may be

ineffective. This material is lighter than water and insoluble in water. The fire could easily be spread by the use of water in an area where the water cannot be contained. Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: 87-90 deg F
Autoignition Temperature: 867 deg F (463.89 deg C)
Explosion Limits, Lower:0.9%
Upper: 6.7%
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces. U.S. regulations require reporting spills and releases to soil, water and air in excess of reportable quantities. This material creates a fire hazard because it floats on water. If possible, try to contain floating material.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor or mist.
Storage: Keep away from sources of ignition. Keep container closed when not in use. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from strong acids.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
o-Xylene	100 ppm TWA; 150 ppm STEL	100 ppm TWA; 435 mg/m3 TWA 900 ppm	none listed

		IDLH	

OSHA Vacated PELs: o-Xylene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear chemical goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: aromatic odor
pH: Not applicable.
Vapor Pressure: 6.72 mm Hg @ 21 deg C
Vapor Density: 3.66 (air=1)
Evaporation Rate:0.7 (butyl acetate=1)
Viscosity: <32.6 SUS
Boiling Point: 291 deg F
Freezing/Melting Point:-13 deg F
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:0.87 (water=1)
Molecular Formula:C8H10
Molecular Weight:106.17

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, ignition sources.
Incompatibilities with Other Materials: Strong oxidizing agents, strong acids, acetic acid, nitric acid.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 95-47-6: ZE2450000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 95-47-6:
ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: IARC Group 3 - not classifiable (listed as Xylenes (o-, m-, p- isomers)).
Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: There is ample evidence that xylene produces embryotoxicity (reduced body weight, retarded ossification, retarded kidney development, increased extra rib) and fetotoxicity in mice and rats, but xylene is not considered teratogenic.
Neurotoxicity: No information available.
Mutagenicity: No information available.
Other Studies: Standard Draize Test: Administration into the eye (rabbit) = 5 mg/24H (Severe). Standard Draize Test: Administrat ion onto the skin (rabbit) = 500 mg (Moderate).

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 13.5 mg/L; 96 Hr; Unspecified Goldfish: LD50 = 13 mg/L; 24 Hr; Unspecified Fathead Minnow: LC50 = 46 mg/L; 1 Hr; Static bioassay Acute and long-term toxicity to fish and invertebrates: LD50 for goldfish is 13 mg/L/24 Hr.Cas#1330-20-7:LC50(96Hr.) rainbow trout = 8.05 mg/L, Static condition;LC50(96Hr.) fathead minnow = 16.1 mg/L, flow-through conditions; LC50(96Hr.) bluegill = 16.1 mg/L, flow-through;EC50 (48 Hr.) water flea = 3.82 mg/L, flow-through conditions;EC50(24 Hr.) photobacterium phosphoreum = 0.0084 mg/L, Microtox test.
Environmental: In air, xylenes degrade by reacting with photochemically produced hydroxyl radicals. In soil it will volatilize and leach into groundwater. Little bioconcentration is expected.
Physical: ATMOSPHERIC FATE: According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere, xylene, which has an experimental vapor pressure of 7.99 mm Hg at 25 deg C, will exist solely as a vapor in the ambient atmosphere. Vapor-phase xylene is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the atmospheric lifetime of xylene is about 14-26 hours. Ambient levels of xylene are detected in the atmosphere due to large emissions of this compound.
Other: None

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste

regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	XYLENES				XYLENE
Hazard Class:	3				3(9.2)
UN Number:	UN1307				UN1307
Packing Group:	II				III
Additional Info:					FLASHPOINT 32C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 95-47-6 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 95-47-6: Effective Date: 10/4/82; Sunset Date: 10/4/92
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 95-47-6: 1000 lb final RQ (Listed under Xylene, mixed); 454 kg final RQ (Listed unde
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 95-47-6: acute, chronic, flammable.
Section 313
This material contains o-Xylene (CAS# 95-47-6, 98%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 95-47-6 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.

Clean Water Act:
CAS# 95-47-6 is listed as a Hazardous Substance under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 95-47-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
XN F
Risk Phrases:
R 11 Highly flammable.
R 20/21 Harmful by inhalation and in contact with skin.
R 38 Irritating to skin.

Safety Phrases:
S 25 Avoid contact with eyes.

WGK (Water Danger/Protection)
CAS# 95-47-6: 2
Canada - DSL/NDSL
CAS# 95-47-6 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of B2, D2B.
Canadian Ingredient Disclosure List
CAS# 95-47-6 is listed on the Canadian Ingredient Disclosure List.
Exposure Limits
CAS# 95-47-6 (listed as xylenes (o-, m-, p- isomers)): OEL-ARAB Republ
ic of Egypt:TWA 0.5 ppm (0.9 mg/m3) OEL-AUSTRALIA:TWA 80 ppm (330 mg/
m3);STEL 150 ppm (655 mg/m3) OEL-BELGIUM:TWA 100 ppm (434 mg/m3);STEL
150 ppm (651 mg/m3) OEL-CZECHOSLOVAKIA:TWA 200 mg/m3;STEL 1000 mg/m3
OEL-DENMARK:TWA 50 ppm (217 mg/m3);Skin OEL-FINLAND:TWA 100 ppm (43
5 mg/m3);STEL 150 ppm;Skin OEL-FRANCE:TWA 100 ppm (435 mg/m3);STEL 15
0 ppm (650 mg/m3) OEL-GERMANY:TWA 100 ppm (440 mg/m3) OEL-HUNGARY:TW
A 100 mg/m3;STEL 300 mg/m3 OEL-JAPAN:TWA 100 ppm (430 mg/m3) OEL-THE
NETHERLANDS:TWA 100 ppm (435 mg/m3);Skin OEL-THE PHILIPPINES:TWA 0.1
mg/m3 OEL-POLAND:TWA 100 mg/m3 OEL-SWEDEN:TWA 50 ppm (200 mg/m3);ST
EL 100 ppm (450 mg/m3);Skin OEL-SWITZERLAND:TWA 100 ppm (436 mg/m3);S
TEL 200 ppm (870 mg/m3) OEL-THAILAND:TWA 100 ppm (435 mg/m3) OEL-TUR
KEY:TWA 100 ppm (435 mg/m3) OEL-UNITED KINGDOM:TWA 100 ppm (435 mg/m3
);STEL 150 ppm;Skin OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check AC
GIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Material Safety Data Sheet

Perchloric acid, 50-72%

ACC# 18230

Section 1 - Chemical Product and Company Identification

MSDS Name: Perchloric acid, 50-72%
Catalog Numbers: AC223310000, AC223310010, AC223312500, AC424030000, AC424030010, AC424032500, A228-7LB, A2286-1LB, A228S-7LB, A229-8LB, A2296-1LB, A229S-8LB, A469-1, A469-2, A469-250, A469-500, A511-212, A511-500, A511SK-212, S76875ACS-1, S76875ACS-2
Synonyms: Dioxonium perchlorate; Perchloric acid solution; Hydronium perchlorate.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7601-90-3	Perchloric acid	50-72	231-512-4
7732-18-5	Water	28-50	231-791-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid.
Danger! Strong oxidizer. Contact with other material may cause a fire. Heating may cause an explosion. Contact with other material may cause explosion. Causes eye and skin burns. Causes digestive and respiratory tract burns. Corrosive to metal.
Target Organs: Eyes, thyroid, skin, mucous membranes.

Potential Health Effects

Eye: Causes eye burns.
Skin: Causes skin burns.
Ingestion: Harmful if swallowed. Causes gastrointestinal tract burns.
Inhalation: Causes severe respiratory tract irritation with possible burns.
Chronic: Prolonged or repeated skin contact may cause dermatitis.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid immediately.
Skin: Destroy contaminated shoes. In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Strong oxidizer. Contact with other material may cause fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Some oxidizers may react explosively with hydrocarbons(fuel). Contact with metals may evolve flammable hydrogen gas. May decompose explosively when heated or involved in a fire. Fight fire from protected location or maximum possible distance.
Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire. Use flooding quantities of water as spray.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 3; Special Hazard: OX

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as sawdust. Flush spill area with water. Wet area to prevent drying out. Provide ventilation. Keep combustibles (wood, paper, oil, etc.,) away from spilled material. Keep unnecessary and unprotected personnel away. Use only non-sparking tools and equipment. Spill may be carefully neutralized with soda ash (sodium carbonate).

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use spark-proof tools and explosion proof equipment. Avoid contact with clothing and other combustible materials. Do not get on skin or in eyes. Do not ingest or inhale. Use only with adequate ventilation. Do not allow perchloric acid to come into contact with strong dehydrating agents (concentrated sulfuric acid, anhydrous phosphorous pentoxide, etc.). Keep the quantities of perchloric acid handled at the bare minimum for safety. Perchloric acid should be handled in a masonry building with concrete or tile floors. Handling acid on wooden floors is dangerous, especially after the acid has dried. The wooden floor will then become sensitive to ignition by friction. Perchloric acid mist and vapor can condense in ventilation systems to form metallic perchlorates, which can be explosive. Inform laundry personnel of contaminant's hazards.
Storage: Do not store near combustible materials. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Avoid storage on wood floors. Perchloric acid should be stored segregated from all other chemicals & inside secondary containment (such as pyrex baking dish). It must not be stored near organic acids, near bases, or near other organic or flammable material. Shelves and floor material should be non-combustible and acid-resistant. Protect from freezing.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Any procedure involving heating of perchloric acid must be conducted in a perchloric acid fume hood, with the sash down. No organic materials should be stored in the perchloric acid hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Perchloric acid	none listed	none listed	none listed
Water	none listed	none listed	none listed

OSHA Vacated PELs: Perchloric acid: No OSHA Vacated PELs are listed for this chemical.
Water: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment
Eyes: Wear chemical splash goggles and face shield.
Skin: Wear appropriate gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: strong odor
pH: Not available.
Vapor Pressure: 0.9 kPa @ 20 deg C
Vapor Density: 3.46 (air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 203 deg C @ 760 mmHg
Freezing/Melting Point:-18 deg C
Decomposition Temperature: Not available.
Solubility: Soluble.
Specific Gravity/Density:1.41-1.67
Molecular Formula:HClO4
Molecular Weight:100.46

Section 10 - Stability and Reactivity

Chemical Stability: This material is a strongly acidic, powerful oxidizing substance. The anhydrous form of this material is an explosion hazard. Perchloric acid is stable at concentrations below 73%.
Conditions to Avoid: Excess heat, Do not allow water to evaporate from product..
Incompatibilities with Other Materials: Metals, strong reducing agents, bases, acetic acid, acetic anhydride, alcohols, dimethyl sulfoxide, fluorine, sulfuric acid, diethyl ether, hypophosphites, phosphorus pentoxide, hydrochloric acid, organic materials, ketones, wood, combustible materials.
Hazardous Decomposition Products: Chlorine dioxide, which may be spontaneously explosive.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7601-90-3: SC7500000
CAS# 7732-18-5: ZC0110000
LD50/LC50:
CAS# 7601-90-3:
Oral, rat: LD50 = 1100 mg/kg;
.

CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;
.
Oral, dog: LD50 = 400 mg/kg excitement, difficult breathing, decrease in body temperature.
Carcinogenicity:
CAS# 7601-90-3: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: Administration of potassium perchlorate KClO4 experimentally to pregnant guinea pigs, rabbits, & rats has been reported to result in enlarged fetal thyroids, consistent with transplacental passage of perchlorate. Administration of up to 1% KClO4 indrinking water during early pregnancy did not interfere with blastocyst implantation or pregnancy success in rats. Detailed morphologic evaluation of offspring was not reported. In both a 2-generation reproductive tox study in rats & a developmental toxstudy in rabbits, respective KClO4 doses up to 30 & 100 mg/kg/day were not found to have adverse effects on reproduction or development.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. LC100 Cyprinus carprio 180 ppm/24H @ 25°C.
Environmental: There has been concern that perchlorate environmental contamination could result in hypothyroidism in the population.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR

Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	PERCHLORIC ACID	PERCHLORIC ACID
Hazard Class:	5.1	5.1(8)
UN Number:	UN1873	UN1873
Packing Group:	I	I

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7601-90-3 is listed on the TSCA inventory.
CAS# 7732-18-5 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 7601-90-3: immediate, fire.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

CAS# 7601-90-3 is considered highly hazardous by OSHA.

STATE

CAS# 7601-90-3 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

O C

Risk Phrases:

R 35 Causes severe burns.
R 5 Heating may cause an explosion.
R 8 Contact with combustible material may cause fire.

Safety Phrases:

S 23 Do not inhale gas/fumes/vapour/spray.
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36 Wear suitable protective clothing.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 7601-90-3: 1
CAS# 7732-18-5: No information available.

Canada - DSL/NDSL

CAS# 7601-90-3 is listed on Canada's DSL List.
CAS# 7732-18-5 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of C, E.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7601-90-3 is listed on the Canadian Ingredient Disclosure List.

Material Safety Data Sheet

Petroleum Ether

ACC# 18330

Section 1 - Chemical Product and Company Identification

MSDS Name: Petroleum Ether
Catalog Numbers: S76880, S768801, S768802, S93319, S93320, E120-4, E120-400, E120J-4, E120SK-4, E120SS-50, E139-1, E139-20, E139-200, E139-4, E139-500, E139FB-115, E139FB-19, E139FB-200, E139FB-50, E139J-1, E139J-4, E139RB-115, E139RB-200, E139RB-50, E139RS-115, E139RS-19, E139RS-200, E139RS-28, E139RS-50, E139S-4, E139SK-4, E139SS-115, E139SS-200, E139SS-28, E139SS-50, NC9585026, P480-4, P480-4LC, P480RS-115, P480RS-19, P480RS-200, P480RS-28, P480RS-50, P480SS-115, P480SS-200, P480SS-28, P480SS-50, P481RS-200, P481SS-200
Synonyms: Naphtha Solvent; Naphtha Petroleum; Ligroin.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
8032-32-4	Petroleum Ether	100	232-453-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid.
Danger! Flammable liquid and vapor. Breathing vapors may cause drowsiness and dizziness. Harmful if inhaled or swallowed. Cancer hazard. May cause eye, skin, and respiratory tract irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause central nervous system depression.
Target Organs: Kidneys, central nervous system, lungs.

Potential Health Effects

Eye: May cause eye irritation.
Skin: Exposure may cause irritation characterized by redness, dryness, and inflammation. May aggravate existing skin disorders.
Ingestion: Aspiration hazard. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. High vapor concentrations may cause drowsiness. Aspiration may cause respiratory swelling and pneumonitis. May cause numbness in the extremities.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic exposure to vapors may produce polyneuropathy. May cause kidney damage. Potential cancer hazard.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Use water spray to keep fire-exposed containers cool. Vapor may cause flash fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Containers may explode when heated.
Extinguishing Media: Water may be ineffective. This material is lighter than water and insoluble in water. The fire could easily be spread by the use of water in an area where the water cannot be contained. Cool containers with flooding quantities of water until well after fire is out. Use dry chemical, carbon dioxide, or appropriate foam.
Flash Point: < -17.8 deg C
Autoignition Temperature: 287.8 deg C (550.04 deg F)
Explosion Limits, Lower:1.1

Upper: 5.9
NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Avoid ingestion and inhalation. Prevent build up of vapors to explosive concentration. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Petroleum Ether	300 ppm TWA	350 mg/m3 TWA	none listed

OSHA Vacated PELs: Petroleum Ether: 300 ppm TWA; 1350 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colorless
Odor: mild odor - gasoline-like
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Slower than ether
Viscosity: Not available.
Boiling Point: 38 deg C
Freezing/Melting Point: Not available.
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density: Lighter than water
Molecular Formula: Hydrocarbon
Molecular Weight: Not available

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials: May explode with nitrogen tetroxide, potential violent reaction with strong oxidizers.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 8032-32-4: OI6180000
LD50/LC50:
CAS# 8032-32-4:
Inhalation, rat: LC50 = 3400 ppm/4H;
.

Carcinogenicity:
CAS# 8032-32-4:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** Not listed.
- **NTP:** Not listed.
- **IARC:** Not listed.

Epidemiology: Epidemiological studies involving petroleum refinery workers indicate persons with routine exposure to petroleum or one of its constituents may be at an increased risk to the development of benign neoplasms, digestive tract cancer, and skin cancer.
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. This chemical is expected to cause some oxygen depletion in aquatic systems. It has a low potential to affect aquatic systems. It has a low potential to affect aquatic organisms, secondary waste treatment microorganisms and the germination of some plants. It has a moderate potential to affect the germination and growth of some plants.
Environmental: No information available.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	PETROLEUM DISTILLATES, N.O.S.	PETROLEUM DISTILLATES, N.O.S.
Hazard Class:	3	3
UN Number:	UN1268	UN1268
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 8032-32-4 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 8032-32-4: immediate, delayed, fire.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 8032-32-4 can be found on the following state right to know lists: New Jersey, Pennsylvania, Minnesota.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 10 Flammable.
R 45 May cause cancer.
R 65 Harmful: may cause lung damage if swallowed.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.
S 33 Take precautionary measures against static discharges.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.
S 7 Keep container tightly closed.
S 43I In case of fire, use dry chemical, CO2, water spray or foam. (These chemicals have very low flashpoints and the use of water spr ay may be inefficient).

WGK (Water Danger/Protection)

CAS# 8032-32-4: 1

Canada - DSL/NDSL

CAS# 8032-32-4 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 8032-32-4 is listed on the Canadian Ingredient Disclosure List.

Material Safety Data Sheet

Polyphosphoric acid

ACC# 40328

Section 1 - Chemical Product and Company Identification

MSDS Name: Polyphosphoric acid
Catalog Numbers: AC196950000, AC196950010, AC196950025, AC196950250, AC364680000
Synonyms: Superphosphoric acid.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
8017-16-1	Polyphosphoric acid	84+	232-417-0

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid.
Danger! Causes burns by all exposure routes.
Target Organs: Respiratory system, gastrointestinal system, eyes, skin.

Potential Health Effects

Eye: May cause irreversible eye injury. Contact with liquid is corrosive to the eyes and causes severe burns.
Skin: Contact with liquid is corrosive and causes severe burns and ulceration.
Ingestion: Causes gastrointestinal tract burns. Causes severe pain, nausea, vomiting, diarrhea, and shock. May cause hemorrhaging of the digestive tract. May cause corrosion and permanent tissue destruction of the esophagus and digestive tract.
Inhalation: Irritation may lead to chemical pneumonitis and pulmonary edema. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma. Causes chemical burns to the respiratory tract.
Chronic: Prolonged inhalation may cause respiratory tract inflammation and lung damage.

Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact may cause conjunctivitis.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do not induce vomiting. Get medical aid immediately. Call a poison control center.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Substance is noncombustible.
Extinguishing Media: Substance is noncombustible; use agent most appropriate to extinguish surrounding fire.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Provide ventilation. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood.
Storage: Store in a cool, dry place. Store in a tightly closed container. Corrosives area. Do not store in metal containers.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Polyphosphoric acid	none listed	none listed	none listed
Phosphoric acid	1 mg/m3 TWA; 3 mg/m3 STEL	1 mg/m3 TWA 1000 mg/m3 IDLH	1 mg/m3 TWA

OSHA Vacated PELs: Polyphosphoric acid: No OSHA Vacated PELs are listed for this chemical. Phosphoric acid: 1 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: Not available.
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: 3.4 (air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 550 deg C @ 760 mmHg
Freezing/Melting Point: Not available.
Decomposition Temperature: Not available.

Solubility: May decompose.
Specific Gravity/Density:2.050
Molecular Formula: Not applicable.
Molecular Weight: Not available.

Section 10 - Stability and Reactivity

Chemical Stability: May decompose on exposure to moist air or water.
Conditions to Avoid: Incompatible materials, metals, excess heat, exposure to moist air or water.
Incompatibilities with Other Materials: Metals, strong bases, alcohols, water, chlorates, nitrates, Water reactive substances..
Hazardous Decomposition Products: Phosphine, oxides of phosphorus, hydrogen gas.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 8017-16-1 unlisted.
CAS# 7664-38-2: TB6300000
LD50/LC50:
Not available.

CAS# 7664-38-2:
Draize test, rabbit, eye: 119 mg Severe;
Draize test, rabbit, skin: 595 mg/24H Severe;
Inhalation, mouse: LC50 = 25.5 mg/m3;
Inhalation, rat: LC50 = >850 mg/m3/1H;
Inhalation, rat: LC50 = 25.5 mg/m3;
Oral, mouse: LD50 = 1.25 gm/kg;
Oral, rat: LD50 = 1530 mg/kg;
Oral, rat: LD50 = 1.25 gm/kg;
Skin, rabbit: LD50 = 2740 mg/kg;
.

Carcinogenicity:
CAS# 8017-16-1: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7664-38-2: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Mosquito Fish: LC50 = 138 mg/L; 96 Hr; Unspecified No data available.
Environmental: The acidity of phosphoric acid may be reduced readily by natural water hardness minerals, but the phosphate may persist indefinitely. During transport through the soil, phosphoric acid will dissolve some of the soil material, in particular, carbonate-based materials. The acid will be neutralized to some degree with adsorption of the proton and phosphate ions also possible. However, significant amounts of acid will remain for transport down toward the groundwater table.
Physical: No information available.
Other: Dangerous to aquatic life in high concentrations.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	PHOSPHORIC ACID SOLUTION	PHOSPHORIC ACID SOLUTION
Hazard Class:	8	8
UN Number:	UN1805	UN1805
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 8017-16-1 is listed on the TSCA inventory.

CAS# 7664-38-2 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 7664-38-2: 5000 lb final RQ; 2270 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 8017-16-1: immediate.
CAS # 7664-38-2: immediate.

Section 313 No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 7664-38-2 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 8017-16-1 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
CAS# 7664-38-2 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 34 Causes burns.

Safety Phrases:

S 25 Avoid contact with eyes.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 8017-16-1: 1

CAS# 7664-38-2: 1

Canada - DSL/NDSL

CAS# 8017-16-1 is listed on Canada's DSL List.

CAS# 7664-38-2 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7664-38-2 is listed on the Canadian Ingredient Disclosure List.

Material Safety Data Sheet

m-Phosphoric Acid, Glacial

ACC# 13216

Section 1 - Chemical Product and Company Identification

MSDS Name: m-Phosphoric Acid, Glacial
Catalog Numbers: A280-100, A280-3, A280-500, A280ME
Synonyms: Metaphosphoric Acid; Glacial Phosphoric Acid
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
50813-16-6	Sodium meta-Phosphate	57-63	256-779-4
37267-86-0	meta-Phosphoric Acid	37-43	253-433-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear colorless crystals.
Danger! Causes burns by all exposure routes. Corrosive to metal.
Target Organs: Respiratory system, gastrointestinal system, eyes, skin.

Potential Health Effects

Eye: May cause irreversible eye injury. Contact with liquid is corrosive to the eyes and causes severe burns.
Skin: Contact with liquid is corrosive and causes severe burns and ulceration.
Ingestion: Causes severe pain, nausea, vomiting, diarrhea, and shock. May cause hemorrhaging of the digestive tract. May cause corrosion and permanent tissue destruction

of the esophagus and digestive tract.
Inhalation: Irritation may lead to chemical pneumonitis and pulmonary edema. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma.
Chronic: Prolonged inhalation may cause respiratory tract inflammation and lung damage. Prolonged or repeated skin contact may cause dermatitis. Repeated contact may cause corneal damage.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Get medical aid immediately. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Combustion generates toxic fumes.
Extinguishing Media: For small fires, use water spray, dry chemical, carbon dioxide or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section.

Avoid generating dusty conditions. Provide ventilation. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Minimize dust generation and accumulation. Do not get on skin or in eyes. Do not ingest or inhale. Use only in a chemical fume hood.
Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store in metal containers.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Sodium meta-Phosphate	none listed	none listed	none listed
meta-Phosphoric Acid	none listed	none listed	none listed

OSHA Vacated PELs: Sodium meta-Phosphate: No OSHA Vacated PELs are listed for this chemical. meta-Phosphoric Acid: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Crystals
Appearance: clear colorless
Odor: none reported
pH: Acidic
Vapor Pressure: Negligible.

Vapor Density: Not available.
Evaporation Rate: Negligible.
Viscosity: Not available.
Boiling Point: Not applicable.
Freezing/Melting Point: Not available.
Decomposition Temperature: Not available.
Solubility: Soluble in water.
Specific Gravity/Density:2.4
Molecular Formula:HPO3
Molecular Weight:79.979

Section 10 - Stability and Reactivity

Chemical Stability: In water slowly forms ortho-phosphoric acid.
Conditions to Avoid: Incompatible materials, dust generation, contact with water, metals, excess heat.
Incompatibilities with Other Materials: Carbonates, metal oxides, Solutions attack some metals., cyanides, sulfides.
Hazardous Decomposition Products: Oxides of phosphorus.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 50813-16-6 unlisted.
CAS# 37267-86-0 unlisted.
LD50/LC50:
Not available.
Not available.

Carcinogenicity:
CAS# 50813-16-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 37267-86-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available. Shore crab LC50=240 mg/L/48H Chronic plant toxicity=100 ppm
Environmental: No information reported.
Physical: No information available.
Other: Do not empty into drains.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	PHOSPHORIC ACID, SOLID	PHOSPHORIC ACID, SOLID
Hazard Class:	8	8
UN Number:	UN3453	UN3453
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 50813-16-6 is not listed on the TSCA inventory. It is for research and development use only.
CAS# 37267-86-0 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 37267-86-0: immediate.

Section 313 No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 50813-16-6 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
CAS# 37267-86-0 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 34 Causes burns.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face pr otection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 28A After contact with skin, wash immediately with plenty of water .

WGK (Water Danger/Protection)

CAS# 50813-16-6: 1
CAS# 37267-86-0: 1

Canada - DSL/NDSL

CAS# 37267-86-0 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

Section 16 - Additional Information

Material Safety Data Sheet

Propionic acid, 99%

ACC# 96448

Section 1 - Chemical Product and Company Identification

MSDS Name: Propionic acid, 99%
Catalog Numbers: AC149300000, AC149300010, AC149300025, AC149300050
Synonyms: Carboxyethane; Ethanecarboxylic acid; Ethylformic acid; Methylacetic acid; Metacetonic acid; Propanoic acid; Propanoic acid grain preserver; Psuedoacetic acid.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
79-09-4	Propionic acid	99	201-176-3

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless, oily clear liquid. Flash Point: 51 deg C.
Danger! Flammable liquid and vapor. Harmful if absorbed through the skin. Causes severe eye and skin irritation and burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. May cause central nervous system depression. Corrosive to carbon steel. Possible sensitizer.
Target Organs: Central nervous system, respiratory system, eyes, skin, mucous membranes.

Potential Health Effects
Eye: May result in corneal injury. Causes severe eye irritation and burns.
Skin: Harmful if absorbed through the skin. Causes severe skin irritation and burns. Skin absorption in rabbits was found to cause focal hemorrhage of the lungs, discoloration of the liver and kidney, enlarged gall bladder, and gastrointestinal inflammation.
Ingestion: May cause severe and permanent damage to the digestive tract. Causes digestive tract burns with immediate pain, swelling of the throat, convulsions, and possible

coma. May cause central nervous system depression.
Inhalation: May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. May cause asthmatic attacks due to allergic sensitization of the respiratory tract. Causes chemical burns to the respiratory tract. Vapors may cause dizziness or suffocation.
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis. Laboratory experiments have resulted in mutagenic effects.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Will burn if involved in a fire. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Containers may explode in the heat of a fire. Flammable liquid and vapor. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media: Water may be ineffective. Do NOT use straight streams of water. Use water spray, dry chemical, carbon dioxide, or alcohol-resistant foam.
Flash Point: 51 deg C (123.80 deg F)
Autoignition Temperature: 513 deg C (955.40 deg F)
Explosion Limits, Lower: 2.9 vol %
Upper: 12.1 vol %
NFPA Rating: (estimated) Health: 3; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Use water spray to dilute spill to a non-flammable mixture. Large spills may be neutralized with dilute alkaline solutions of soda ash (sodium carbonate, Na2CO3), or lime (calcium oxide, CaO). Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Cover with sand, dry lime or soda ash and place in a closed container for disposal. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Discard contaminated shoes. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Do not breathe vapor or mist.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Keep container closed when not in use. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Do not store in steel container.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Propionic acid	10 ppm TWA	10 ppm TWA; 30 mg/m3 TWA	none listed

OSHA Vacated PELs: Propionic acid: 10 ppm TWA; 30 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Appearance: colorless, oily
Odor: rancid odor - pungent odor
pH: Acidic.
Vapor Pressure: 2 mm Hg @ 20 deg C
Vapor Density: 2.56
Evaporation Rate: Not available.
Viscosity: 1.175 cps @ 15 deg C
Boiling Point: 141 deg C
Freezing/Melting Point:-21 deg C
Decomposition Temperature: Not available.
Solubility: Soluble.
Specific Gravity/Density:0.9942 @ 20/4°C
Molecular Formula:CH3CH2COOH
Molecular Weight:74.08

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Ignition sources, excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents, strong bases, steel.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 79-09-4: UE5950000
LD50/LC50:
CAS# 79-09-4:
Draize test, rabbit, eye: 990 ug Severe;
Oral, rat: LD50 = 2600 mg/kg;
Skin, rabbit: LD50 = 500 uL/kg;<BR.

Carcinogenicity:
CAS# 79-09-4: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Medical reports of acute exposures of workers to propionic acid show mild to moderate skin burns, mild eye redness, and one case of mild cough and asthmatic response.
Teratogenicity: No information found.
Reproductive Effects: No information found.
Mutagenicity: Sister Chromatid Exchange: Human, Lymphocyte = 2500 umol/L.
Neurotoxicity: No information found.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Water flea Daphnia: TLm = 130 mg/L; 24 Hr; unspecifiedFish: Fathead Minnow: LC50 = 4740 mg/L; 96 Hr; Flow-through bioassay at 24.7 °C (pH 7.60) Volatilization of propionic acid from envioronmental waters and moist soil should be extremely slow. Evaporation form dry surfaces is expected, especially when present in high concentrations such as in spill situation. The hydroysis, photolysis and bioconcentration of propionic acid are not expected to be important fate processes.
Environmental: Estimate Koc value = 36. This value suggests that propionic acid should not partition from the water column to organic matter contained in sediments and suspended solids and should be highly mobile in soil. Leaching into ground water may occur. Estimated BCF value = 0.02. This value indicates that propionic acid should not bioconcentrate among aquatic organisms. Biodegradation is the expected to be the most important removal mechanisms of propionic acid form aerobic soil and water.
Physical: No information available.
Other: In the atmophsere this product exist primarily in the vapor phase and degrades by the reaction with photochemically produced hydroxyl radicals with a half-life of approximately 13 days.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	PROPIONIC ACID	PROPIONIC ACID
Hazard Class:	8	8
UN Number:	UN1848	UN1848
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 79-09-4 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 79-09-4: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 79-09-4: acute, flammable.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 79-09-4 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 79-09-4 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 34 Causes burns.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.
S 23 Do not inhale gas/fumes/vapour/spray.
S 33 Take precautionary measures against static discharges.
S 36 Wear suitable protective clothing.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 9 Keep container in a well-ventilated place.

WGK (Water Danger/Protection)

CAS# 79-09-4: 1

Canada - DSL/NDSL

CAS# 79-09-4 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B3, D1B, E.

Canadian Ingredient Disclosure List

CAS# 79-09-4 is listed on the Canadian Ingredient Disclosure List.

Material Safety Data Sheet

Sulfamic acid

ACC# 22200

Section 1 - Chemical Product and Company Identification

MSDS Name: Sulfamic acid
Catalog Numbers: AC222060000, AC222061000, AC222065000, AC222070000, AC222070025, AC222070050, AC222072500, AC222075000, 22207-0010, 22207-1000, A295-100, A295-500, A295-J100
Synonyms: Amidosulfonic acid; Amidosulfuric acid; Aminosulfonic acid; Sulfamidic acid.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
5329-14-6	Sulfamic acid	98+	226-218-8

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white crystalline powder.
Danger! Harmful to aquatic organisms; may cause long-term adverse effects in the aquatic environment. Causes burns by all exposure routes. Corrosive to metal.
Target Organs: Respiratory system, gastrointestinal system, eyes, skin.

Potential Health Effects

Eye: Causes eye burns.
Skin: Causes skin burns. May be harmful if absorbed through the skin.
Ingestion: Causes gastrointestinal tract burns. May be harmful if swallowed.

Inhalation: Causes chemical burns to the respiratory tract. May be harmful if inhaled.
Chronic: No information found.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do not induce vomiting. Get medical aid immediately. Call a poison control center.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Avoid generating dusty conditions. Provide ventilation. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Minimize dust generation and accumulation. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood.
Storage: Store in a cool, dry place. Store in a tightly closed container. Do not store in metal containers.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Sulfamic acid	none listed	none listed	none listed

OSHA Vacated PELs: Sulfamic acid: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Crystalline powder
Appearance: white
Odor: none reported
pH: 1.2 (1% aq. sol.)
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point:205 deg C
Decomposition Temperature:205 deg C
Solubility: Soluble.
Specific Gravity/Density: Not available.

Molecular Formula:H3NO3S
Molecular Weight:97.09

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, dust generation, excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents, strong bases, metals.
Hazardous Decomposition Products: Nitrogen oxides, oxides of sulfur.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 5329-14-6: WO5950000
LD50/LC50:
CAS# 5329-14-6:
Draize test, rabbit, eye: 20 mg Moderate;
Draize test, rabbit, eye: 250 ug/24H Severe;
Draize test, rabbit, skin: 500 mg/24H Severe;
Oral, mouse: LD50 = 1312 mg/kg;
Oral, rat: LD50 = 3160 mg/kg;
.

Carcinogenicity:
CAS# 5329-14-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: No information available.
Physical: No information available.
Other: May be toxic to aquatic organisms; May cause long-term adverse effects in the aquatic environment.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	SULFAMIC ACID	SULFAMIC ACID
Hazard Class:	8	8
UN Number:	UN2967	UN2967
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 5329-14-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 5329-14-6: immediate.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 5329-14-6 can be found on the following state right to know lists: New Jersey.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XI

Risk Phrases:

R 36/38 Irritating to eyes and skin.
R 52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28A After contact with skin, wash immediately with plenty of water .
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)

CAS# 5329-14-6: 1

Canada - DSL/NDSL

CAS# 5329-14-6 is listed on Canada's DSL List.

Canada - WHMIS

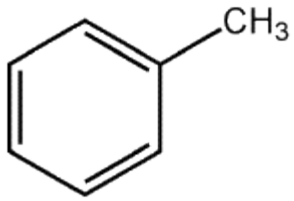
This product has a WHMIS classification of E.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 5329-14-6 is listed on the Canadian Ingredient Disclosure List.

Toluene

- Methylbenzene
- Toluol
- Phenyl methane

Formula	$C_6H_5CH_3$
Structure	
Description	Clear, colorless liquid with a benzene-like odor.
Uses	In the manufacture of benzoic acid, benzaldehyde, explosives, dyes, and many other organic compounds, as a solvent for paints, lacquers, gums, resins, in the extraction of various principles from plants, as gasoline additive.

Registry Numbers and Inventories.

CAS	108-88-3
NIH PubChem CID	1140
EC (EINECS/ELINCS)	203-625-9
EC Index Number	601-021-00-3
EC Class	F; R11, Repr. Cat. 3; R63, Xn; R48/20-65, Xi; R38, R67
RTECS	XS5250000
RTECS class	Tumorigen; Mutagen; Reproductive Effector; Human Data; Primary Irritant
UN (DOT)	1294
Merck	12,9667

Beilstein/Gmelin	635760
Beilstein Reference	4-05-00-00766
RCRA	U220
EPA OPP	80601
Swiss Giftliste 1	G-2953
Canada DSL/NDSL	DSL
US TSCA	Listed
Austrailia AICS	Listed
New Zealand	Listed
Japan ENCS (MITI)	Listed
Korea ECL	Listed
Philippiens PICCS	Listed
Israel	Listed

Properties.

Formula	C7H8
Formula mass	92.14
Melting point, °C	-95
Boiling point, °C	110.6
Vapor pressure, mm_{Hg}	22 (20 C)

Vapor density (air=1)	3.14
Saturation Concentration	2.9% (20 C)
Evaporization number	2.24 (butyl acetate=1)
Odor threshold	2.14 ppm
Critical temperature	315
Critical pressure	40.4
Density	0.867 g/cm3 (20 C)
Solubility in water	0.5 g/L (20 C)
Viscosity	0.778 cp @ 0C
Surface tension	29.71 g/s2 @ 10 C
Refractive index	1.4967 (20 C)
Dipole moment	0.36 D (20 C)
Dielectric constant	2.3 (25 C)
Partition coefficient, pK_{ow}	2.73
Heat of fusion	38.0 kJ/mol
Heat of vaporization	38.01 kj/mol
Heat of combustion	-3910.3 kJ/mol

Hazards and Protection.

Storage	Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from

	incompatible substances. Flammables-area.
WHMIS	B2 D2B
Handling	Wash thoroughly after handling. Use only in a well ventilated area. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Avoid contact with skin and eyes. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Protection	Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Skin: Wear appropriate protective gloves to prevent skin exposure. Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators	A half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator.
Small spills/leaks	Avoid runoff into storm sewers and ditches which lead to waterways. Use water spray to disperse the gas/vapor. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Use water spray to reduce vapors, do not put water directly on leak, spill area or inside container.
Disposal code	1
Stability	Stable under ordinary conditions of use and storage. Containers may burst when heated.
Incompatibilities	Acids (mineral, oxidizing, e.g. chromic acid, hypochlorous acid, nitric acid, sulfuric acid), oxidizing agents (strong, e.g. bromine, hydrogen peroxide, nitrogen dioxide, potassium nitrate), water reactive substances (e.g. acetic anyhdride, alkyl aluminum chloride, calcium carbide, ethyl dichlorosilane).
Decomposition	Carbon monoxide, carbon dioxide.

Fire.

Flash Point,°C		7
Autoignition, °C		422
Upper exp. limit, %		819.0
Lower exp. limit, %		3.3
Fire fighting		Wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use foam, dry chemical, or carbon dioxide.
Fire potential		Flammable liquid and vapor.
Hazards		Dangerous fire hazard when exposed to heat or flame. Vapors can flow along surfaces to distant ignition source and flash back.
Combustion products		Moderately dangerous; when heated, emits toxic fumes which can react vigorously with oxidizing materials.
NFPA	**Health**	2
	Flammability	3
	Reactivity	0

Health.

Exposure limit(s)	OSHA PEL: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak) NIOSH REL: TWA 100 ppm (375 mg/m3) ST 150 ppm (560 mg/m3) NIOSH IDLH: 500 ppm
Poison_Class	4
Exposure effects	Reports of chronic poisoning describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated or prolonged

	contact has a defatting action, causing drying, redness, dermatitis. Exposure to toluene may affect the developing fetus.
Ingestion	Swallowing may cause abdominal spasms and other symptoms that parallel over-exposure from inhalation. Aspiration of material into the lungs can cause chemical pneumonitis, which may be fatal.
Inhalation	Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Very high concentrations may cause unconsciousness and death.
Skin	Causes irritation. May be absorbed through skin.
Eyes	Causes severe eye irritation with redness and pain.

First aid

Ingestion	Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.
Inhalation	Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. Get medical aid. DO NOT use mouth-to-mouth respiration. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Skin	Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.
Eyes	Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Transportation.

UN number	1294

Response guide	130
Hazard class	3
Packing Group	II
USCG CHRIS Code	TOL
USCG Compatatibility Group	32 Aromatic hydrocarbons
HS Code	2902 30 00
Std. Transport #	4963316
IMO Chemical Code	17
IMO Pollution Category	C
IMO Hazard code	P

Material Safety Data Sheet

o-Xylene

ACC# 01967

Section 1 - Chemical Product and Company Identification

MSDS Name: o-Xylene
Catalog Numbers: AC140990000, AC140990100, AC140990200, AC140995000, 14099-0010, 14099-0025, DO5081500, NC9393626, NC9932825, O5081-4, O50814LC, O5081FB-200
Synonyms: 1,2-Dimethylbenzene; o-Methyltoluene.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
95-47-6	o-Xylene	98+	202-422-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: 31 deg C.
Danger! **Flammable liquid and vapor.** Causes eye, skin, and respiratory tract irritation. Harmful if absorbed through skin or if inhaled. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause central nervous system depression.
Target Organs: Blood, kidneys, central nervous system, liver, respiratory system, eyes, skin.

Potential Health Effects
Eye: Causes eye irritation. The liquid is probably a mild irritant, based on animal information for mixed xylene isomers.

Skin: Causes skin irritation. Harmful if absorbed through the skin. Substance is readily absorbed through the skin. o-Xylene liquid or vapor can be absorbed through the skin, but not as readily as when inhaled or ingested. Skin absorption has been reported to be slow and significant harmful effects are not expected by this route. Skin sensitization was not produced in any of 24 volunteers. There is one case report of a person developing an allergic skin reaction (contact urticaria) following exposure to xylene (unspecified composition) vapor. The person subsequently tested positive in a patch test. No information was provided regarding previous history of allergies. No conclusions can be drawn regarding the potential for xylene to produce allergic skin reactions, based on this single case report.
Ingestion: Aspiration hazard. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Exposure may cause anemia and other blood abnormalities. May cause lung damage.
Inhalation: Harmful if inhaled. Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. May cause respiratory tract irritation. Irritation may lead to chemical pneumonitis and pulmonary edema. Reversible liver and kidney damage has been reported in cases of severe xylene exposure. Industrial fatalities due to gross inhalation exposure have been described.
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis. May cause liver and kidney damage. Adverse reproductive effects have been reported in animals. Narcotic in high concentrations.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Possible aspiration hazard. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Will burn if involved in a fire. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Containers may explode in the heat of a fire. Flammable liquid and vapor. Vapors may be heavier than air. They can spread along the

ground and collect in low or confined areas.
Extinguishing Media: Use water spray to cool fire-exposed containers. Use foam, dry chemical, or carbon dioxide. Water may be ineffective.
Flash Point: 31 deg C (87.80 deg F)
Autoignition Temperature: 465 deg C (869.00 deg F)
Explosion Limits, Lower:1.7 vol %
Upper: 7.6 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Remove all sources of ignition. Use a spark-proof tool. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Take precautionary measures against static discharges. Keep away from heat, sparks and flame. Do not ingest or inhale. Use only in a chemical fume hood.
Storage: Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
o-Xylene	100 ppm TWA; 150 ppm STEL	100 ppm TWA; 435 mg/m3 TWA 900 ppm IDLH	100 ppm TWA; 435 mg/m3 TWA (listed under Xylenes (o-, m-, p- isomers)).

OSHA Vacated PELs: o-Xylene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: aromatic odor
pH: Not applicable.
Vapor Pressure: 7 mbar @ 20 deg C
Vapor Density: 3.7 (air=1)
Evaporation Rate:0.7 (butyl acetate=1)
Viscosity: 0.81 mPa @ 20 deg C
Boiling Point: 143 - 145 deg C @ 760 mmHg
Freezing/Melting Point:-25 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:0.878
Molecular Formula:C8H10
Molecular Weight:106.17

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents, strong acids, coatings, rubber, plastics.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 95-47-6: ZE2450000
LD50/LC50:

CAS# 95-47-6:
Inhalation, mouse: LC50 = 4595 ppm/6H;
Oral, rat: LD50 = 3567 mg/kg;
.

Carcinogenicity:
CAS# 95-47-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: IARC Group 3: Limited or insufficient evidence for carcinogenicity in both animals and humans.
Teratogenicity: Teratogenic effects have occurred in experimental animals.
Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 13.5 mg/L; 96 Hr; UnspecifiedFish: Goldfish: LD50 = 13 mg/L; 24 Hr; UnspecifiedFish: Fathead Minnow: LC50 = 46 mg/L; 1 Hr; Static bioassay Acute and long-term toxicity to fish and invertebrates: LD50 for goldfish is 13 mg/L/24 Hr.Cas#1330-20-7:LC50(96Hr.) rainbow trout = 8.05 mg/L, Static condition;LC50(96Hr.) fathead minnow = 16.1 mg/L, flow-through conditions; LC50(96Hr.) bluegill = 16.1 mg/L, flow-through;EC50 (48 Hr.) water flea = 3.82 mg/L, flow-through conditions;EC50(24 Hr.) photobacterium phosphoreum = 0.0084 mg/L, Microtox test.
Environmental: In air, xylenes degrade by reacting with photochemically produced hydroxyl radicals. In soil it will volatilize and leach into groundwater. Little bioconcentration is expected.
Physical: ATMOSPHERIC FATE: According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere, xylene, which has an experimental vapor pressure of 7.99 mm Hg at 25 deg C, will exist solely as a vapor in the ambient atmosphere. Vapor-phase xylene is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the atmospheric lifetime of xylene is about 14-26 hours. Ambient levels of xylene are detected in the atmosphere due to large emissions of this compound.
Other: Do not empty into drains.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	XYLENES	XYLENES
Hazard Class:	3	3
UN Number:	UN1307	UN1307
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 95-47-6 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 95-47-6: Effective 10/4/82, Sunset 10/4/92

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 95-47-6: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 95-47-6: immediate, delayed, fire.

Section 313

This material contains o-Xylene (CAS# 95-47-6, 98+%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 95-47-6 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 95-47-6 is listed as a Hazardous Substance under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 95-47-6 can be found on the following state right to know lists: California, New

Jersey, Pennsylvania, Minnesota, (listed as Xylenes (o-, m-, p- isomers)), Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

R 10 Flammable.
R 20/21 Harmful by inhalation and in contact with skin.
R 38 Irritating to skin.

Safety Phrases:

S 25 Avoid contact with eyes.

WGK (Water Danger/Protection)

CAS# 95-47-6: 2

Canada - DSL/NDSL

CAS# 95-47-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D2B, D2A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 95-47-6 is listed on the Canadian Ingredient Disclosure List.