

## 1. Material Identification

**Product Name** : Cyclohexane  
**Catalog Number** : io-2065  
**CAS Number** : 110-82-7  
**Identified uses** : Laboratory chemicals, manufacture of chemical compounds  
**Company** : Ionz

>> R&D Use only

## 2. Hazards Identification

### GHS Classification:

Flammable liquid ( category 2 )  
Acute toxicity, oral (Category 3)  
Acute toxicity, dermal (Category 3)  
Acute toxicity, inhalation (Category 3)  
Specific target organ toxicity, single exposure (Category 1)

### Note

>> Pictograms displayed are for > 99.9% (4862 of 4863) of reports that indicate hazard statements. This chemical does not meet GHS hazard criteria for < 0.1% (1 of 4863) of reports.

### Pictogram(s)



### GHS Hazard Statements

- >> H225 (> 99.9%): Highly Flammable liquid and vapor [Danger Flammable liquids]
- >> H304 (> 99.9%): May be fatal if swallowed and enters airways [Danger Aspiration hazard]
- >> H315 (> 99.9%): Causes skin irritation [Warning Skin corrosion/irritation]
- >> H336 (99.8%): May cause drowsiness or dizziness [Warning Specific target organ toxicity, single exposure; Narcotic effects]
- >> H400 (> 99.9%): Very toxic to aquatic life [Warning Hazardous to the aquatic environment, acute hazard]
- >> H410 (98%): Very toxic to aquatic life with long lasting effects [Warning Hazardous to the aquatic environment, long-term hazard]

### Precautionary Statement Codes

>> P210, P233, P240, P241, P242, P243, P261, P264, P271, P273, P280, P301+P316, P302+P352, P303+P361+P353, P304+P340, P319, P321, P331, P332+P317, P362+P364, P370+P378, P391, P403+P233, P403+P235, P405, and P501

### NFPA 704 Diamond



### NFPA Health Rating

>> 1 - Materials that, under emergency conditions, can cause significant irritation.

### NFPA Fire Rating

- >> 3 - Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials produce hazardous atmospheres with air under almost all ambient temperatures or, though unaffected by ambient temperatures, are readily ignited under almost all conditions.

### NFPA Instability Rating

- >> 0 - Materials that in themselves are normally stable, even under fire conditions.

### Health Hazards:

- >> Dizziness, with nausea and vomiting. Concentrated vapor may cause unconsciousness and collapse. (USCG, 1999)

### ERG 2024, Guide 128 (Cyclohexane)

- >> CAUTION: Petroleum crude oil (UN1267) may contain TOXIC hydrogen sulphide gas.
- >> Inhalation or contact with material may irritate or burn skin and eyes.
- >> Fire may produce irritating, corrosive and/or toxic gases.
- >> Vapors may cause dizziness or asphyxiation, especially when in closed or confined areas.
- >> Runoff from fire control or dilution water may cause environmental contamination.
  
- >> Excerpt from ERG Guide 128 [Flammable Liquids (Water-Immiscible)]:
- >> HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames. 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 the ground and collect in low or confined areas (sewers, basements, tanks, etc.). Vapor explosion hazard indoors, outdoors or in sewers. Those substances designated with a (P) may polymerize explosively when heated or involved in a fire. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids will float on water. Substance may be transported hot. For hybrid vehicles, ERG Guide 147 (lithium ion or sodium ion batteries) or ERG Guide 138 (sodium batteries) should also be consulted. If molten aluminum is involved, refer to ERG Guide 169. (ERG, 2024)

### ERG 2024, Guide 128 (Cyclohexane)

- >> HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- >> 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 the ground and collect in low or confined areas (sewers, basements, tanks, etc.).
- >> Vapor explosion hazard indoors, outdoors or in sewers.
- >> Those substances designated with a (P) may polymerize explosively when heated or involved in a fire.
- >> Runoff to sewer may create fire or explosion hazard.
- >> Containers may explode when heated.
- >> Many liquids will float on water.
- >> Substance may be transported hot.
- >> For hybrid vehicles, GUIDE 147 (lithium ion or sodium ion batteries) or GUIDE 138 (sodium batteries) should also be consulted.
- >> If molten aluminum is involved, refer to GUIDE 169.
- >> Highly flammable. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.

## 3. Composition/Information On Ingredients

**Chemical name** : Cyclohexane

**CAS Number** : 110-82-7

**Molecular Formula** : C<sub>6</sub>H<sub>12</sub>

**Molecular Weight** : 84.1600 g/mol

## 4. First Aid Measures

### First Aid:

- >> EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.
- >> SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.
- >> INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.
- >> INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

### ERG 2024, Guide 128 (Cyclohexane)

- >> General First Aid:
- >> Call 911 or emergency medical service.
- >> Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and avoid contamination.
- >> Move victim to fresh air if it can be done safely.
- >> Administer oxygen if breathing is difficult.
- >> If victim is not breathing:
- >> DO NOT perform mouth-to-mouth resuscitation; the victim may have ingested or inhaled the substance.
- >> If equipped and pulse detected, wash face and mouth, then give artificial respiration using a proper respiratory medical device (bag-valve mask, pocket mask equipped with a one-way valve or other device).
- >> If no pulse detected or no respiratory medical device available, provide continuous compressions. Conduct a pulse check every two minutes or monitor for any signs of spontaneous respirations.
- >> Remove and isolate contaminated clothing and shoes.
- >> For minor skin contact, avoid spreading material on unaffected skin.
- >> In case of contact with substance, remove immediately by flushing skin or eyes with running water for at least 20 minutes.
- >> For severe burns, immediate medical attention is required.
- >> Effects of exposure (inhalation, ingestion, or skin contact) to substance may be delayed.
- >> Keep victim calm and warm.
- >> Keep victim under observation.
- >> For further assistance, contact your local Poison Control Center.
- >> Note: Basic Life Support (BLS) and Advanced Life Support (ALS) should be done by trained professionals.
- >> Specific First Aid:
- >> Wash skin with soap and water.
- >> In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- >> In Canada, an Emergency Response Assistance Plan (ERAP) may be required for this product. Please consult the shipping paper and/or the "ERAP" section.

### First Aid Measures

### Inhalation First Aid

>> Fresh air, rest. Refer for medical attention.

### Skin First Aid

>> Remove contaminated clothes. Rinse and then wash skin with water and soap.

### Eye First Aid

>> Rinse with plenty of water (remove contact lenses if easily possible).

### Ingestion First Aid

>> Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

## 5. Fire Fighting Measures

>> Excerpt from ERG Guide 128 [Flammable Liquids (Water-Immiscible)]:

>> CAUTION: The majority of these products have a very low flash point. Use of water spray when fighting fire may be inefficient. CAUTION: For mixtures containing alcohol or polar solvent, alcohol-resistant foam may be more effective.

>> SMALL FIRE: Dry chemical, CO<sub>2</sub>, water spray or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam.

>> LARGE FIRE: Water spray, fog or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam. Avoid aiming straight or solid streams directly onto the product. If it can be done safely, move undamaged containers away from the area around the fire.

>> FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. For petroleum crude oil, do not spray water directly into a breached tank car. This can lead to a dangerous boil over. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2024)

>> Use water spray, foam, powder, carbon dioxide. Water may be ineffective. In case of fire: keep drums, etc., cool by spraying with water.

## 6. Accidental Release Measures

### Isolation and Evacuation:

Isolation and evacuation measures to take when a large amount of this chemical is accidentally released in an emergency.

>> Excerpt from ERG Guide 128 [Flammable Liquids (Water-Immiscible)]:

>> IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

>> LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet).

>> FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

### Evacuation: ERG 2024, Guide 128 (Cyclohexane)

>> Immediate precautionary measure

>> Isolate spill or leak area for at least 50 meters (150 feet) in all directions.

>> Large Spill

>> Consider initial downwind evacuation for at least 300 meters (1000 feet).

>> Fire

>> If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

### Spillage Disposal:

Methods for containment and safety measures to protect workers dealing with a spillage of this chemical.

- >> Evacuate danger area! Consult an expert! Remove all ignition sources. Personal protection: self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

#### Accidental Release Measures

##### Public Safety: ERG 2024, Guide 128 (Cyclohexane)

- >> CALL 911. Then call emergency response telephone number on shipping paper. If shipping paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- >> Keep unauthorized personnel away.
- >> Stay upwind, uphill and/or upstream.
- >> Ventilate closed spaces before entering, but only if properly trained and equipped.

##### Spill or Leak: ERG 2024, Guide 128 (Cyclohexane)

- >> ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area.
- >> All equipment used when handling the product must be grounded.
- >> Do not touch or walk through spilled material.
- >> Stop leak if you can do it without risk.
- >> Prevent entry into waterways, sewers, basements or confined areas.
- >> A vapor-suppressing foam may be used to reduce vapors.
- >> Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- >> Use clean, non-sparking tools to collect absorbed material.
- >> Large Spill
- >> Dike far ahead of liquid spill for later disposal.
- >> Water spray may reduce vapor, but may not prevent ignition in closed spaces.

## 7. Handling And Storage

### Safe Storage:

- >> Fireproof. Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Store in an area without drain or sewer access.

### Storage Conditions:

- >> Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store under inert gas.

## 8. Exposure Control/ Personal Protection

### REL-TWA (Time Weighted Average)

- >> 300 ppm (1050 mg/m<sup>3</sup>)
- >> TWA 300 ppm (1050 mg/m<sup>3</sup>)
- >> 300.0 [ppm]

### PEL-TWA (8-Hour Time Weighted Average)

- >> 300 ppm (1050 mg/m<sup>3</sup>)
- >> 100.0 [ppm]
- >> 100 ppm as TWA.

### TLV-TWA (Time Weighted Average)

>> 100 ppm [1964]

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#### **EU-OEL**

>> 700 mg/m

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#### **MAK (Maximale Arbeitsplatz Konzentration)**

>> 700 mg/m

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#### **Emergency Response: ERG 2024, Guide 128 (Cyclohexane)**

- >> CAUTION: The majority of these products have a very low flash point. Use of water spray when fighting fire may be inefficient.
- >> CAUTION: For mixtures containing alcohol or polar solvent, alcohol-resistant foam may be more effective.
- >> Small Fire
- >> Dry chemical, CO<sub>2</sub>, water spray or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam.
- >> Large Fire
- >> Water spray, fog or regular foam. If regular foam is ineffective or unavailable, use alcohol-resistant foam.
- >> Avoid aiming straight or solid streams directly onto the product.
- >> If it can be done safely, move undamaged containers away from the area around the fire.
- >> Fire Involving Tanks, Rail Tank Cars or Highway Tanks
- >> Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles.
- >> Cool containers with flooding quantities of water until well after fire is out.
- >> For petroleum crude oil, do not spray water directly into a breached tank car. This can lead to a dangerous boil over.
- >> Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- >> ALWAYS stay away from tanks in direct contact with flames.
- >> For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

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#### **Inhalation Risk:**

>> A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20 °C.

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#### **Effects of Short Term Exposure:**

>> The substance is mildly irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure could cause lowering of consciousness.

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#### **Effects of Long Term Exposure:**

>> Repeated or prolonged contact with skin may cause dryness and cracking and dermatitis.

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#### **Fire Prevention**

>> NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).

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#### **Exposure Prevention**

>> PREVENT GENERATION OF MISTS!

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#### **Inhalation Prevention**

>> Use ventilation, local exhaust or breathing protection.

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#### **Skin Prevention**

>> Protective gloves.

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#### **Eye Prevention**

>> Wear safety goggles or eye protection in combination with breathing protection.

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#### **Ingestion Prevention**

>> Do not eat, drink, or smoke during work.

## Exposure Control and Personal Protection

### Protective Clothing: ERG 2024, Guide 128 (Cyclohexane)

- >> Wear positive pressure self-contained breathing apparatus (SCBA).
- >> Structural firefighters' protective clothing provides thermal protection but only limited chemical protection.

### Exposure Summary

- >> Biological Exposure Indices (BEI) [ACGIH] - 50 mg/g creatinine at end of shift, end of workweek (1,2-cyclohexanediol in urine); [ACGIH TLVs and BEIs]

### Maximum Allowable Concentration (MAK)

- >> 200.0 [ppm]

## 9. Physical And Chemical Properties

### Molecular Weight:

- >> 84.16

### Exact Mass:

- >> 84.093900383

### Physical Description:

- >> Cyclohexane appears as a clear colorless liquid with a petroleum-like odor. Used to make nylon, as a solvent, paint remover, and to make other chemicals. Flash point -4 °F. Density 6.5 lb / gal (less than water) and insoluble in water. Vapors heavier than air.
- >> COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

### Color/Form:

- >> Colorless mobile liquid

### Odor:

- >> Solvent odor; pungent when impure

### Boiling Point:

- >> 177.3 °F at 760 mmHg (NTP, 1992)
- >> 81 °C

### Melting Point:

- >> 43.7 °F (NTP, 1992)
- >> 7 °C

### Flash Point:

- >> -4 °F (NTP, 1992)
- >> -18 °C c.c.

### Solubility:

- >> less than 1 mg/mL at 63 °F (NTP, 1992)
- >> Solubility in water, g/100ml at 25 °C: 0.0058 (very poor)

### Density:

- >> 0.779 at 68 °F (USCG, 1999) - Less dense than water; will float
- >> Relative density (water = 1): 0.8

### Vapor Density:

- >> 2.9 (NTP, 1992) - Heavier than air; will sink (Relative to Air)
- >> Relative vapor density (air = 1): 2.9

### Vapor Pressure:

- >> 95 mmHg at 68 °F ; 100 mmHg at 77.9 °F (NTP, 1992)
- >> Vapor pressure, kPa at 20 °C: 10.3

### LogP:

>> log Kow = 3.44

>> 3.4

#### Stability/Shelf Life:

>> Most solvents and reagents, as received from the manufacturer, had low levels of peroxides. After opening the container, peroxides were formed rapidly in many solvents.

#### Autoignition Temperature:

>> 518 °F (USCG, 1999)

>> 260 °C

#### Decomposition:

>> When heated to decomposition it emits acrid smoke and fumes.

#### Viscosity:

>> 0.977 mPa.s at 20 °C

>> 1.26x10<sup>-6</sup> mm<sup>2</sup>/s at 26 °C

#### Heat of Combustion:

>> -3919.6 kJ/mole at 25 °C

#### Heat of Vaporization:

>> 33.059 kJ/mol at 25 °C; 29.977 kJ/mol at the boiling point

#### Surface Tension:

>> Liquid surface tension: 24.98mN/m at 20 °C

#### Ionization Potential:

>> 9.88 eV

#### Odor Threshold:

>> Odor Threshold Low: 0.52 [mmHg]

>> Odor Threshold High: 784.0 [mmHg]

>> Detection odor threshold from AIHA (mean = 780 ppm)

#### Refractive Index:

>> Index of refraction: 1.42662 at 20 °C/D

#### Relative Evaporation Rate:

The rate at which a material will vaporize (evaporate, change from liquid to vapor), compared to the rate of vaporization of a specific known material.

>> Evaporation time (Ether = 1): 2.6

## 10. Stability And Reactivity

>> Highly flammable. Insoluble in water.

>> Highly Flammable

## 11. Toxicological Information

#### Toxicity Summary:

>> IDENTIFICATION AND USE: Cyclohexane is a colorless, highly flammable liquid occurring naturally in petroleum at concentrations of 0.5–1.0%. It has a pungent petroleum-like odor and is used as an organic solvent for lacquers, resins, and synthetic rubber; paint and varnish remover; extraction of essential oils; manufacturing of solid fuel for camp stoves; in fungicidal formulations; in recrystallization of steroids; and in analytical chemistry for molecular weight determinations. It is also a chemical intermediate in the manufacturing of adipic acid, benzene, cyclohexyl chloride, nitrocyclohexane, cyclohexanol and cyclohexanone. Not registered for current pesticide use in the U.S., but approved



pesticide uses may change periodically and so federal, state and local authorities must be consulted for currently approved uses. Studies from the exposure of the general population to cyclohexane revealed that human milk from five of eight mothers contained cyclohexane (concentrations not determined) from the mothers' exposure to environmental pollutants since they resided near chemical manufacturing plants or industrial user facilities. HUMAN EXPOSURE AND TOXICITY: The available data indicate that cyclohexane can be absorbed via oral and inhalation routes but no adequate data exist via the dermal route. Potential symptoms of overexposure to cyclohexane are irritation of eyes, skin and respiratory system; drowsiness; dermatitis; narcosis and coma although cyclohexane generally has low acute toxicity. In humans exposed via inhalation for 4 hours to 86 or 860 mg/cu m cyclohexane, there were no significant treatment-related effects. Occupational exposure to 5 to 211 ppm cyclohexane for a median of 1.2 years, had no adverse effects on the peripheral nervous system. There have been no systemic poisonings reported in man. Cyclohexane is known to undergo oxidative metabolism to yield cyclohexanol (major metabolite), cyclohexanone, and possibly other oxidative products (1,2- or 1,4-dihydroxycyclohexane and its corresponding ketone analogs). ANIMAL STUDIES: High vapor concentrations have produced convulsions in rabbits. Toxic oral doses in rabbits led to severe diarrhea, circulatory collapse and death, without prominent central nervous depression or anesthesia. Autopsy revealed generalized vascular damage but no effects on blood formation. Rats and mice, were exposed to 0, 500, 2000, or 7000 ppm of cyclohexane vapor 6 hr/day, 5 days/week for 14 weeks. During exposure sessions, mice exposed to 7000 ppm exhibited clinical signs of toxicity which included hyperactivity, circling, jumping/hopping, excessive grooming, kicking of rear legs, standing on front legs, and occasional flipping behavior. In another study, male and female mice exposed to 7000 ppm had slight increases in measures of circulating erythrocyte mass (red blood cells, hemoglobin, hematocrit) and plasma protein concentration (males only). Male rats and male and female mice exposed to 7000 ppm had significantly increased relative liver weights, and 7000 ppm male mice also had significantly increased absolute liver weights at the end of the exposure period. In the third study, female rats were administered cyclohexane intraperitoneally at a dose of 0.375, 0.75, or 1.5 g/kg, 5 days a week for 2 weeks. The high dose of 1.5 g/kg of cyclohexane caused a proximal tubular dysfunction of the kidney which resulted in an increase in beta-2-microglobulin. The increase in beta-2-microglobulin was attributed to the metabolite cyclohexanol. When testing the effect of cyclohexane on reproduction and development, there were statistically significant reductions in mean body weight, overall mean body weight gain, and overall mean food efficiency for P1 and F1 females exposed to 7000 ppm. Adult rats exposed to 2000 ppm or 7000 ppm cyclohexane exhibited diminished response or no response to a sound stimulus while in the chambers during exposure. Mean pup weight was statistically significantly reduced from lactation day 7 throughout the remainder of the 25-day lactation period for both F1 and F2 7000 ppm litters. Cyclohexane was negative for mutagenicity at doses of 0.01, 0.033, 0.10, 0.33, 1.0, 3.3, and 10 mg/plate in as many as 5 Salmonella typhimurium strains (TA1535, TA1537, TA97, TA98, and TA100) with or without metabolic activation. ECOTOXICITY STUDIES: Cyclohexane inhibited growth of Chlorella for 11-13 days, but prolonged the exponential growth phase and increased the growth yield 2.5 fold compared with the control. Acute toxicities after 24 and 96 hr exposures to seven alicyclic hexanes including cyclohexane were determined for striped bass and one of their major food organisms, the bay shrimp, Crangon franciscorum. The 96 hr LC50 for striped bass and bay shrimp ranged from 3.2 to 9.3 uL/L and from 1.0 to 6.2 uL/L, respectively.

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**EPA Provisional Peer-Reviewed Toxicity Values:**

This section provides the EPA Provisional Peer-Reviewed Toxicity Values (PPRTVs) and links of related assessment documents.

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**Chemical Substance**

>> Cyclohexane

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**Reference Concentration (RfC), Subchronic**

>>  $1.8 \times 10^{-1} \text{ mg/m}^3$

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**PPRTV Assessment**

>> PDF Document

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**Weight-Of-Evidence (WOE)**

>> Inadequate information to assess carcinogenic potential

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**Last Revision**

>> 2010

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**Carcinogen Classification:**

This section provides the International Agency for Research on Cancer (IARC) Carcinogenic Classification and related monograph links. In the IARC Carcinogenic classification, chemicals are categorized into four groups: Group 1 (carcinogenic to humans), Group 2A (probably carcinogenic to humans), Group 2B (possibly carcinogenic to humans), and Group 3 (not classifiable as to its carcinogenicity to humans).

>> Cyclohexane is found in gasoline, which is possibly carcinogenic to humans (Group 2B). (L135)

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**Health Effects:**

- >> Petroleum distillates are aspiration hazards and may cause pulmonary damage, central nervous system depression, and cardiac effects such as cardiac arrhythmias. They may also affect the blood, immune system, liver, and kidney. (A600, L1297)

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**Exposure Routes:**

- >> The substance can be absorbed into the body by inhalation of its vapour and by ingestion.
- >> inhalation, ingestion, skin and/or eye contact

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**Inhalation Exposure**

- >> Cough. Nausea. Headache. Dizziness. Weakness. Drowsiness.

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**Skin Exposure**

- >> Redness. Dry skin.

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**Eye Exposure**

- >> Redness.

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**Ingestion Exposure**

- >> Abdominal pain. Nausea. Vomiting. Aspiration hazard! Further see Inhalation.
- >> irritation eyes, skin, respiratory system; drowsiness; dermatitis; narcosis, coma

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**Target Organs:**

Organs that are affected by exposure to this chemical. Information in this section reflects human data unless otherwise noted.

- >> Developmental
- >> Eyes, skin, respiratory system, central nervous system

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**Adverse Effects:**

An adverse effect is an undesired harmful effect resulting from a medical treatment or other intervention.

- >> Neurotoxin – Acute solvent syndrome
- >> Occupational hepatotoxin – Secondary hepatotoxins: the potential for toxic effect in the occupational setting is based on cases of poisoning by human ingestion or animal experimentation.

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**Toxicity Data:**

- >> LCLo (mice) = 70,000 mg/m<sup>3</sup>/2H

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**Treatment:**

Treatment when exposed to toxin

- >> Treatment is mainly symptomatic and supportive. Gastric lavage, emesis, and the administration of activated charcoal should be avoided, as vomiting increases the risk of aspiration. (A600)

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**Interactions:**

- >> Female mice inhaled 2x10<sup>-4</sup> mol/L cyclohexane for 0.5–3 days. No change was noted after 0.5 days in hexobarbital (i) sleeping time or its half-life in plasma. After 1 day there was a decrease by 50 and 60% respectively. A steady state in inactivation was noted during the main increase in dealkylase, reductase, and cytochrome.

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**Antidote and Emergency Treatment:**

- >> Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR if necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on the left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Aliphatic hydrocarbons and related compounds/

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**Human Toxicity Excerpts:**

- >> /HUMAN EXPOSURE STUDIES/ The neurobehavioral effects of inhaled cyclohexane in... humans are investigated to define relationships between internal doses and acute central nervous system effects... Measurements include standardized observational measures, spontaneous motor activity assessments, and learned visual discrimination performance. Cyclohexane concentrations in blood and brain are measured to assess internal exposure. Human volunteers are exposed for 4 hours to 86 or 860 mg/cu m in 2 test sessions. Neurobehavioral effects are measured using a computerized neurobehavioral test battery... In humans, there are no significant treatment-related effects at the levels tested.

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**Non-Human Toxicity Excerpts:**

>> /LABORATORY ANIMALS: Acute Exposure/ In this study, the severity and time course of inflammation induced by 4 organic solvents (acetone, cyclohexane, toluene and m-xylene), and the effect of neuropeptides during the inflammation were investigated in the hairless rat abdominal skin. Plasma extravasation used as a parameter of inflammation was measured by Evans blue and (125)I-bovine serum albumin (BSA). Total volume of plasma extravasation induced by 4 organic solvents in 240-min exposure was as follows: toluene > m-xylene > cyclohexane > acetone = 0. While hydrophobic solvents (toluene, m-xylene, cyclohexane) induced plasma extravasation, the hydrophilic solvent, acetone, did not induce plasma extravasation. It was suggested that the severity and time course of plasma extravasation depend on chemical characteristics of the organic solvents. In immunohistochemical study, substance P (SP)-immunoreactive nerve fibers (IRNF) and calcitonin gene-related peptide (CGRP)-IRNF were intact during 240-min exposure to acetone. In contrast, cyclohexane, toluene, and m-xylene reduced the number of SP-IRNF and CGRP-IRNF in 10 min exposure and further reduced immunoreactivity. In hairless rats treated with systemic capsaicin, the above plasma extravasation was significantly reduced, along with SP-IRNF and CGRP-IRNF; however, protein gene product 9.5 (PGP 9.5)-IRNF was nearly intact. These results indicated that certain organic solvents induce instance of inflammation that vary widely in terms of their severity and time course, and that these differences are correlated with neuropeptides.

#### Non-Human Toxicity Values:

>> LD50 Rabbit Oral >5000 mg/kg bw

#### TSCA Test Submissions:

Under the Toxic Substances Control Act (TSCA), EPA has broad authority to issue regulations designed to require manufacturers (including importers) or processors to test chemical substances and mixtures for health and environmental effects. This section provides information on test reports submitted for this chemical under TSCA.

>> The ability of cyclohexane to induce specific locus mutations at the TK locus in cultured L5178Y mouse lymphoma cells (Mouse Lymphoma Mutagenesis Assay) was evaluated in the presence and absence of Aroclor-induced rat liver S9 metabolic activation. Based on preliminary toxicity tests, nonactivated and activated cultures were treated with 313, 625, 1250, 2500 or 5000 nl/ml which produced a range of 45 - 57% total growth for nonactivated and from 0 - 22% total growth for S9-activated cultures. None of the nonactivated or activated cultures produced mutant frequencies significantly greater than the solvent controls. Additional tests were conducted in which activated cultures were treated with 3000, 4000, 5000, 6000, 7000 or 8000 nl/ml which produced a range of 38 - 86% total growth. None of these activated cultures produced mutant frequencies significantly greater than the solvent controls.

## 12. Ecological Information

### Resident Soil (mg/kg)

>> 6.50e+03

### Industrial Soil (mg/kg)

>> 2.70e+04

### Resident Air (ug/m3)

>> 6.30e+03

### Industrial Air (ug/m3)

>> 2.60e+04

### Tapwater (ug/L)

>> 1.30e+04

### MCL (ug/L)

>> 2.00e+02

### Risk-based SSL (mg/kg)

>> 1.30e+01

### Chronic Inhalation Reference Concentration (mg/m3)

>> 6.00e+00

### Volatile

>> Volatile

### Mutagen

>> Mutagen

#### Fraction of Contaminant Absorbed in Gastrointestinal Tract

>> 1

#### Soil Saturation Concentration (mg/kg)

>> 1.17e+02

#### ICSC Environmental Data:

>> The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

#### Sediment/Soil Concentrations:

Concentrations of this compound in sediment/soil.

>> SEDIMENT: Cyclohexane was not detected in 27 sediment samples from surface waters in Japan in 1979 (detection limit was 0.1-0.4 ug/kg dw)(1).

### 13. Disposal Considerations

#### Spillage Disposal

>> Evacuate danger area! Consult an expert! Remove all ignition sources. Personal protection: self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

#### Disposal Methods

- >> Generators of waste (equal to or greater than 100 kg/mo) containing this contaminant, EPA hazardous waste number U056, must conform with USEPA regulations in storage, transportation, treatment and disposal of waste.
- >> SRP: Wastewater from contaminant suppression, cleaning of protective clothing/equipment, or contaminated sites should be contained and evaluated for subject chemical or decomposition product concentrations. Concentrations shall be lower than applicable environmental discharge or disposal criteria. Alternatively, pretreatment and/or discharge to a permitted wastewater treatment facility is acceptable only after review by the governing authority and assurance that "pass through" violations will not occur. Due consideration shall be given to remediation worker exposure (inhalation, dermal and ingestion) as well as fate during treatment, transfer and disposal. If it is not practicable to manage the chemical in this fashion, it must be evaluated in accordance with EPA 40 CFR Part 261, specifically Subpart B, in order to determine the appropriate local, state and federal requirements for disposal.
- >> Cyclohexane may be disposed of: 1. By absorbing it in vermiculite, dry sand, earth or a similar material ... 2. By atomizing in a suitable combustion chamber. Combustion may be improved by mixing with a more flammable liquid.
- >> Cyclohexane is a good candidate for liquid injection incineration, at a temperature range of 650 to 1600 °C with a residence time of 0.1 - 2 seconds, rotary kiln incineration at a temperature range of 820 to 1,600 °C with residence time of seconds, and fluidized bed incineration at a temperature range of 450 to 980 °C with a residence time of seconds.
- >> Cyclohexane is a waste chemical stream constituent which may be subjected to ultimate disposal by controlled incineration.

### 14. Transport Information

#### DOT

Cyclohexane

3

UN Pack Group: II

Reportable Quantity of 1000 lb or 454 kg

#### IATA

Cyclohexane  
3,  
UN Pack Group: II

## 15. Regulatory Information

### Clean Water Act Requirements:

The Clean Water Act (CWA) of 1972 establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under CWA, the U.S. Environmental Protection Agency (EPA) developed the Toxic Pollutant List (40 CFR Part 401.15) and the Priority Pollutant List (40 CFR Part 423, Appendix A). These lists are to be used by EPA and States to develop the Effluent Guidelines regulations and ensure water quality criteria and standards.

- >> Cyclohexane is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.

### TSCA Requirements:

This section provides information on requirements concerning this chemical under the Toxic Substances Control Act (TSCA) of 1976. TSCA provides EPA with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures. Certain substances are generally excluded from TSCA, including, among others, food, drugs, cosmetics and pesticides.

- >> Pursuant to section 8(d) of TSCA, EPA promulgated a model Health and Safety Data Reporting Rule. The section 8(d) model rule requires manufacturers, importers, and processors of listed chemical substances and mixtures to submit to EPA copies and lists of unpublished health and safety studies. Cyclohexane is included on this list. Effective date: 12/19/85; Sunset date: 12/19/95.

### Regulatory Information

#### The Australian Inventory of Industrial Chemicals

- >> Chemical: Cyclohexane

#### REACH Registered Substance

- >> Status: Active Update: 24-03-2023 <https://echa.europa.eu/registration-dossier/-/registered-dossier/15483>

#### REACH Restricted Substance

- >> Restricted substance: Cyclohexane
- >> EC: 203-806-2

#### New Zealand EPA Inventory of Chemical Status

- >> Cyclohexane: HSNO Approval: HSRO01111 Approved with controls

## 16. Other Information

### Toxic Combustion Products:

Toxic products (e.g., gases and vapors) produced from the combustion of this chemical.

- >> Firefighting measures... Special hazards arising from the substance or mixture: carbon oxides.

### Other Safety Information

#### Chemical Assessment

- >> IMAP assessments - Cyclohexane: Human health tier I assessment

"The information provided is believed to be accurate but is not comprehensive and should be used as a reference. It reflects our current knowledge and is intended for safety guidance related to the product. This document does not constitute a warranty of

the product's properties. Inz is not responsible for any damages resulting from handling or contact with the product incorrectly."