

# Material Safety Data for: Cyclohexanone

## 1. PRODUCT IDENTIFICATION

<b>Name</b>	<b>cyclohexanone</b>
<b>Synonyms</b>	<b>cyclohexyl ketone</b>
<b>CAS#</b>	<b>108-94-1</b>
<b>Europe EC#</b>	<b>203-631-1</b>
<b>Product Uses</b>	<b>manufacture of caprolactam and adipic acid; solvent</b>

## 2. INGREDIENTS

	%	TWAEV / TLV mg/m <sup>3</sup>	LD <sub>50</sub> ORAL	(mg/kg) SKIN	LC <sub>50</sub> ppm INHALATION
Cyclohexanone	100%	20 / 80	1340	950	600*

\*all other values considerably higher – see Part 3 (b) “chronic”

## 3. (a) HAZARDS SUMMARY

**Hazards, Quick Guide:** combustible liquid, heavy vapour may travel, distant ignition and flashback are possible, irritating to skin and eyes, toxic by skin absorption; central nervous depressant

**Canada – WHMIS**  
Key:

**B 3, D 1B**  
**B 2** – Flash Point <38°C, **B 3** – Flash Point >38°C & <93°C  
**D 1** – Immediately Toxic, **D 2** – Chronic Toxicity  
**C** – Oxidising Substance, **E** – Corrosive

**U.S.A. – HMIS**  
Key:

**Health – 1, Fire – 2, Reactivity – 0**  
**0**=minimal, **1**=slight, **2**=moderate, **3**=serious, **4**=severe

## 3. (b) HAZARDS – TOXICITY

### Effects, Acute Exposure

Skin Contact	moderately to severely irritating
Skin Absorption	yes; toxic effects may occur by this route
Eye Contact	severely irritating; may cause permanent damage; vapour irritating above 75ppm
Inhalation	irritating above 50ppm; headache, dizziness, drowsiness, intoxication, eventual collapse
Ingestion	stomach ache; headache, dizziness, drowsiness, intoxication

### Effects, Chronic Exposure

General	prolonged exposure may cause dermatitis & skin cracking
Sensitising	not a sensitiser in humans or animals ( <i>single case of workplace skin sensitisation reported</i> )
Carcinogen/Tumorigen	not considered a tumorigen or a carcinogen in humans (IARC); animal carcinogen (ACGIH)
Reproductive Effect	no known effect in humans; infertility and teratogenicity in rodents, but only in presence of maternal toxicity
Mutagen	no known effect on humans or animals
Synergistic With	ethanol & dichlorobenzene
LD <sub>50</sub> (oral)	1340, 1540 & 1800mg/kg (rat), 1400mg/kg (mouse), 1600mg/kg (rabbit)
LD <sub>50</sub> (skin)	950mg/kg (rabbit)
LC <sub>50</sub> (inhalation)	2640, 4750 & 8000ppm (rat), 600ppm (mouse), 6250ppm (unspecified animal)

**Please ensure that this MSDS is given to, and explained to people using this product.**

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**4. FIRST AID**

- SKIN: Wash with plenty of water. Remove contaminated clothing and do not reuse until thoroughly laundered.
- EYES: Wash eyes with plenty of water, holding eyelids open. Seek medical assistance promptly if there is irritation.
- INHALATION: Remove from contaminated area promptly. **CAUTION: Rescuer must not endanger himself!** If breathing stops, administer artificial respiration and seek medical aid promptly.
- INGESTION: Give plenty of water to dilute product. Do not induce vomiting (NOTE below). Keep victim quiet. If vomiting occurs, lower victim's head below hips to prevent inhalation of vomited material. Seek medical help promptly.

*Inadvertent inhalation of vomited material may seriously damage the lungs. The danger of this is greater than the risk of poisoning through absorption of this relatively low-toxicity substance. The stomach should only be emptied under medical supervision, and after the installation of an airway to protect the lungs.*

**5. PHYSICAL PROPERTIES**

Odour & Appearance	clear, colourless to pale yellow liquid with pronounced, pleasant, peppermint odour
Odour Threshold	~3.5ppm – varies widely
Vapour Pressure	4mmHg / 0.53kPa (20°C / 68°F)
Evaporation Rate ( <i>Butyl Acetate = 1</i> )	0.3
Vapour Density (air = 1)	3.4
Boiling Range	156°C / 313°F
Freezing Point	-26°C / -15°F
Specific Gravity	0.948 (20/20°C)
Water Solubility	23 grams per litre (20°C / 68°F)
Also soluble in	most organic solvents
Viscosity	2.2centipoise (25°C / 77°F)
pH	none – ( <i>does not liberate hydrogen ions when dissolved</i> )
Conversion Factor	1ppm = 4mg/m <sup>3</sup>
Molecular Weight	98grams per mole

**6. FLAMMABILITY & FIRE FIGHTING**

Flash Point	47°C / 116°F (closed cup) ( <i>also reported as 44°C / 111°F, no method specified</i> )
Autoignition Temperature	420°C / 788°F
Flammable Limits	1.1% – 9.4%
Combustion Products	carbon monoxide, nitrogen oxides, smoke, part oxidised hydrocarbon fragments
Fire Fighting Precautions	alcohol or polymer foam, dry chemical, water fog or spray, product floats on water; Fire fighters must wear SCBA
Static Charge Accumulation	readily accumulates a static charge on agitation or pumping

**7. STABILITY / REACTIVITY**

Dangerously Reactive With	strong oxidising agents; combination of cyclohexanone with nitric acid and hydrogen peroxide creates explosive, oily peroxides
Also Reactive With	attacks most paints and plastics
Stability	stable; will not polymerize
Decomposes in Presence of	not known
Decomposition Products	none apart from Hazardous Combustion Products
Sensitive to Mechanical Impact	no

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## 8. PROTECTIVE EQUIPMENT / EXPOSURE CONTROL

ACGIH TLV	20ppm / 80mg/m <sup>3</sup>
OSHA PEL	50ppm / 200mg/m <sup>3</sup>
STEL (ACGIH)	50ppm / 200mg/m <sup>3</sup>
Ventilation	mechanical ventilation may be required to maintain airborne titre below regulated limits
Hands	butyl or "Viton" gloves recommended – <i>other types also protect; consult supplier to confirm suitability</i>
Eyes	safety glasses with side shields – <i>always protect the eyes</i>
Clothing	wear impermeable (above) apron, boots, & long sleeves if there is any danger of splashing

## 9. HANDLING & STORAGE

Store in a cool, dry environment, away from sources of ignition, heat and oxidising agents.

This product can retain a static charge on agitation or transfer from one container to another. Despite the high flash point it is prudent to ground or electrically bond the source container, the receiving container, and pump before transferring contents. Avoid splashing by ensuring that the product nozzle is below the surface in the receiving container.

This product may react with oxygen in the air to form explosive or flammable peroxides. Ensure that containers are full and tightly sealed when not in use. Empty containers may contain a flammable / explosive vapour.

Avoid breathing product vapour. Use with adequate ventilation. If dealing with a spill, and ventilation is impossible or impractical, wear a respirator with organic vapour cartridge.

Never cut, drill, weld or grind on or near this container. Avoid all contact with skin and wash work clothes frequently. An eye bath and safety shower must be available near the workplace.

## 10. SPILL PROCEDURES

Leak Precaution	dyke to control spillage and prevent environmental contamination
Handling Spill	ventilate contaminated area; recover free liquid with suitable pumps; absorb residue on an inert sorbent, sweep & pick up using plastic or aluminium shovel, & store in closed containers for recycling or disposal

## 11. DISPOSAL

Waste Disposal	<b>do not flush to sewer</b> , recycle if possible, may be incinerated in approved facility
Containers	<b>Drums</b> should be reused. Recondition and pressure test by a licensed reconditioner prior to re-use. <b>Pails</b> must be vented and thoroughly dried prior to crushing and recycling. <b>IBCs</b> (intermediate bulk containers): polyethylene bottle must be pressure tested & recertified at 30 months. Replace at 60 months (5yrs). Steel containers must be inspected, pressure tested & recertified every 5 years. <i>Never cut, drill, weld or grind on or near this container, even if empty</i>

## 12. ENVIRONMENTAL INFORMATION

Bioaccumulation	this product is water soluble and is not a bioaccumulator
Biodegradation	this product degrades readily and rapidly in the presence of oxygen; 30-60% biodegradation in 5 days
Abiotic Degradation	this product reacts with atmospheric hydroxyl radicals; its estimated half-life in air is 4.3 days
Mobility in soil, water	this product is water soluble and will move readily in soil and water
<b>Aquatic Toxicity</b>	
LC <sub>50</sub> (Fish, 96hr)	530, 625 & 730mg/litre (Pimephelas promelas)
EC <sub>50</sub> (Crustacea, 24hr)	820mg/litre (Daphnia magna)
EC <sub>50</sub> (Bacteria)	6.9mg/litre ("mixed bacterial culture"), 18.5mg/litre (Photobacterium phosphoreum), 700mg/litre ("mixed bacterial culture")

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### 13. TRANSPORT REGULATIONS

<b>Canada TDG</b>	<b>PIN</b>	<b>UN-1915</b>
<b>AND</b>	<b>Shipping Name</b>	<b>cyclohexanone</b>
<b>U.S.A. 49 CFR</b>	<b>Class</b>	<b>3</b>
	<b>Packing Group</b>	<b>III</b>
<b>Marine Pollutant</b>		<b>not a marine pollutant</b>

### 14. EMERGENCY INFORMATION

<b>Canada</b>	<b>Call CANUTEC (collect)</b>	<b>(613) 996-6666</b>
<b>U.S.A.</b>	<b>Call CHEMTREC</b>	<b>(800) 424-9300</b>

### 15. REGULATIONS

<b>Canada DSL</b>	<b>on inventory</b>
<b>U.S.A. TSCA</b>	<b>on inventory</b>
<b>Europe EINECS</b>	<b>on inventory</b>

<b>Europe Risk Phrases</b>	<b>R 10, 20 – flammable, harmful by inhalation</b>
<b>Europe Safety Phrases</b>	<b>S 25 – avoid contact with the eyes</b>

Immediately Dangerous to Life or Health (IDLH)

- 700 ppm [REF-16, p.84]

#### Allowable Tolerances

- CYCLOHEXANONE is exempted from the requirement of a tolerance when used as a SOLVENT or COSOLVENT in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only. [REF-92]
- CYCLOHEXANONE is exempted from the requirement of a tolerance when used as a SOLVENT or COSOLVENT accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to animals. [REF-93]

#### OSHA Standards

- Permissible Exposure Limit: Table Z-1 8-hr Time Weighted Avg: 50 ppm (200 mg/cu m). [REF-94]
- Vacated 1989 OSHA PEL TWA 25 ppm (100 mg/cu m), skin designation, is still enforced in some states. [REF-16, p.362]

#### NIOSH Recommendations

- Recommended Exposure Limit: 10 Hr Time-Weighted Avg: 25 ppm (100 mg/cu m). Skin. [REF-16, p.84]

#### Threshold Limit Values

- 8 hr Time Weighted Avg (TWA): 20 ppm; 15 min Short Term Exposure Limit (STEL): 50 ppm. Skin. [REF-43, p.22]
- A3; Confirmed animal carcinogen with unknown relevance to humans. [REF-43, p.22]

#### Atmospheric Standards

- This action promulgates standards of performance for equipment leaks of Volatile Organic Compounds (VOC) in the Synthetic Organic Chemical Manufacturing Industry (SOCMI). These standards implement Section 111 of the Clean Air Act and are based on the Administrator's determination that emissions from the Synthetic Organic Chemical Manufacturing Industry cause, or contribute significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare. The intended effect of these standards is to require all newly constructed, modified, and reconstructed Synthetic Organic Chemical Manufacturing Industry process units to use the best demonstrated

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- system of continuous emission reduction for equipment leaks of Volatile Organic Compounds, considering costs, non air quality health and environmental impact and energy requirements. Cyclohexanone is produced, as an intermediate or final product, by process units covered under this subpart. These standards of performance become effective upon promulgation but apply to affected facilities for which construction or modification commenced after January 5, 1981. [REF-95]

### 2 State Drinking Water Guidelines

- (FL) FLORIDA 35,000 ug/l [REF-96]

### 2 CERCLA Reportable Quantities

- Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 5000 lb or 2700 kg. The toll free number of the NRC is (800) 424-8802; In the Washington D.C. metropolitan area (202) 426-2675. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV. D.3.b). [REF-97]

### 2 TSCA Requirements

- Section 8(a) of TSCA requires manufacturers of this chemical substance to report preliminary assessment information concerned with production, use, and exposure to EPA as cited in the preamble in 51 FR 41329. [REF-98]
- 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. Cyclohexanone is included on this list. [REF-99]

### 2 RCRA Requirements

- U057; As stipulated in 40 CFR 261.33, when CYCLOHEXANONE, as a commercial chemical product or manufacturing chemical intermediate or an off-specification commercial chemical product or a manufacturing chemical intermediate, becomes a waste, it must be managed according to Federal and/or State hazardous waste regulations. Also defined as a hazardous waste is any residue, contaminated soil, water, or other debris resulting from the cleanup of a spill, into water or on dry land, of this waste. Generators of small quantities of this waste may qualify for partial exclusion from hazardous waste regulations (40 CFR 261.5). [REF-100]
- When cyclohexanone is a spent solvent, it is classified as a hazardous waste from a nonspecific source (F003), as stated in 40 CFR 261.31, and must be managed according to State and/or Federal hazardous waste regulations. [REF-101]

### 2 FIFRA Requirements

- As the federal pesticide law FIFRA directs, EPA is conducting a comprehensive review of older pesticides to consider their health and environmental effects and make decisions about their future use. Under this pesticide reregistration program, EPA examines health and safety data for pesticide active ingredients initially registered before November 1, 1984, and determines whether they are eligible for reregistration. In addition, all pesticides must meet the new safety standard of the Food Quality Protection Act of 1996. Pesticides for which EPA had not issued Registration Standards prior to the effective date of FIFRA, as amended in 1988, were divided into three lists based upon their potential for human exposure and other factors, with List B containing pesticides of greater concern and List D pesticides of less concern. Cyclohexanone is found on List C. Case No: 3053; Pesticide type: insecticide; Case Status: No products containing the pesticide are actively registered ... The case /is characterized/ as "cancelled." Under FIFRA, pesticide producers may voluntarily cancel their registered products. EPA also may cancel pesticide registrations if registrants fail to pay required fees or make/meet certain reregistration commitments, or if EPA reaches findings of unreasonable adverse effects.; Active ingredient (AI): Cyclohexanone; AI Status: The active ingredient is no longer contained in any registered pesticide products ... "cancelled." [REF-8, p.248]
- Cyclohexanone is exempted from the requirement of a tolerance when used as a solvent or cosolvent in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only. [REF-92]
- Cyclohexanone is exempted from the requirement of a tolerance when used as a solvent or cosolvent accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to animals.

## 16. PREPARATION INFORMATION

Prepared for Megaloid Laboratories by Peter Bursztyn, (705) 734-1577

With data from RTECS, Haz. Substance Data Base, Cheminfo (CCOHS), IUCLID Datasheets (European Chem. Substance Info. System), & others, as available

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