

Cyclohexanone

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SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product identifier used on the label

: **Cyclohexanone**

Other means of identification : Not available.

Recommended use of the chemical and restrictions on use

: Manufacture of caprolactam and adipic acid; solvent
Use pattern: Professional use only
Recommended restrictions: None known.

Chemical family

: Pure substance

Name, address, and telephone number
of the supplier:

Comet Chemical Company Ltd.

3463 Thomas Street
Innisfill, ON, Canada
L9S 3W4

Supplier's Telephone # : 705-436-5580

24 Hr. Emergency Tel # : GFL Environmental - 1-888-772-2543

Name, address, and telephone number of
the manufacturer:

Refer to supplier

SECTION 2. HAZARDS IDENTIFICATION

Classification of the chemical

Clear to slightly yellow liquid. Peppermint odor.

Most important hazards: Toxic in contact with skin. Harmful if swallowed or if inhaled. Causes serious eye damage.

This material is classified as hazardous under U.S. OSHA regulations (29CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015).

Hazard classification:

Flammable Liquids - Category 3

Eye Damage - Category 1

Skin Irritation - Category 2

Acute toxicity, dermal - Category 3

Acute toxicity, oral - Category 4

Acute toxicity, inhalation - Category 4

Label elements

Hazard pictogram(s)



Signal Word

DANGER!

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SAFETY DATA SHEET*Hazard statement(s)*

Flammable liquid and vapour.
Toxic in contact with skin.
Harmful if swallowed or if inhaled.
Causes skin irritation.
Causes serious eye damage.

Precautionary statement(s)

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources - No smoking.
Keep container tightly closed.
Ground and bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take action to prevent static discharges.
Wash hands thoroughly after handling.
Avoid breathing mist or vapours.
Do not eat, drink or smoke when using this product.
Wear protective gloves/clothing and eye/face protection.

IF ON SKIN (or hair): Wash with plenty of water and soap.
Call a POISON CENTER or doctor/physician if you feel unwell.
Take off immediately all contaminated clothing and wash it before reuse.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.
Continue rinsing.
Immediately call a POISON CENTRE or doctor/physician.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
Call a POISON CENTRE or doctor/physician if you feel unwell.
IF INHALED: Remove person to fresh air and keep comfortable for breathing.
Call a poison center/doctor if you feel unwell.
In case of fire: Use water fog, dry chemical, CO₂ or 'alcohol' foam to extinguish.

Store locked up.
Store in a well-ventilated place. Keep cool.

Dispose of contents/container in accordance with local regulation.

Other hazards

Other hazards May be sensitive to static discharge. Take measures to prevent the build up of electrostatic charge.

Other hazards which do not result in classification:

Burning produces obnoxious and toxic fumes. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. May be an aspiration hazard. Aspiration into the lungs during swallowing or subsequent vomiting may cause chemical pneumonitis, which can be fatal.

Environmental Precautions: Avoid release to the environment. See Section 12 for more environmental information.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance

<u>Chemical name</u>	<u>Common name and synonyms</u>	<u>CAS #</u>	<u>Concentration (% by weight)</u>
Cyclohexanone	Cyclohexyl ketone; Sextone	108-94-1	100.00

SECTION 4. FIRST-AID MEASURES**Description of first aid measures**

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- Ingestion* : Rinse mouth. Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention if symptoms persist. If vomiting occurs spontaneously, keep victim's head lowered (forward) to reduce the risk of aspiration.
- Inhalation* : If inhaled: Remove person to fresh air and keep comfortable for breathing. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen by qualified medical personnel only. Call a POISON CENTRE or doctor/physician if you feel unwell.
- Skin contact* : Immediately flush with plenty of water, while removing contaminated clothing. Immediately call a POISON CENTER or doctor/physician. Wash contaminated clothing before reuse.
- Eye contact* : For eye contact, flush with running water for at least 15 minutes. If eye irritation persists: get medical advice/attention.

Most important symptoms and effects, both acute and delayed

- : May cause respiratory irritation. May cause coughing and breathing difficulties. Harmful if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Causes serious eye irritation. Symptoms may include redness, pain, tearing and conjunctivitis. Prolonged exposure can cause central nervous system effects. Toxic in contact with skin. Causes skin irritation. Symptoms may include redness, itching and swelling. May be an aspiration hazard. Aspiration into the lungs during swallowing or subsequent vomiting may cause chemical pneumonitis, which can be fatal.

Indication of any immediate medical attention and special treatment needed

- : Treat symptomatically.

SECTION 5. FIRE-FIGHTING MEASURES**Extinguishing media***Suitable extinguishing media*

- : Carbon dioxide (CO₂); Dry chemical; Alcohol resistant foam; Water fog

Unsuitable extinguishing media

- : Do not use a solid water stream as it may scatter and spread fire.

Special hazards arising from the substance or mixture / Conditions of flammability

- : Flammable liquid and vapour. Vapours may ignite explosively. Vapours are heavier than air and may spread along floors. Static discharge, impact, friction, and heat may ignite exposed chemical material. Empty containers may contain hazardous residues.

Flammability classification (OSHA 29 CFR 1910.106)

- : Flammable Liquids - Category 3

Hazardous combustion products

- : Carbon dioxide and carbon monoxide. Incomplete combustion may emit component hydrocarbons.

Special protective equipment and precautions for firefighters*Protective equipment for fire-fighters*

- : Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Do not enter without wearing specialized protective equipment suitable for the situation. Firefighter's normal protective clothing (Bunker Gear) will not provide adequate protection. A full-body encapsulating chemical protective suit with positive pressure self-contained breathing apparatus (NIOSH approved or equivalent) may be necessary.

Special fire-fighting procedures

- : Move containers from fire area if safe to do so. Cool closed containers exposed to fire with water spray. Do not allow run-off from fire fighting to enter drains or water courses. Dike for water control.

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SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

- : All persons dealing with the clean-up should wear the appropriate chemically protective equipment. Keep people away from and upwind of spill/leak. Restrict access to area until completion of clean-up. Refer to protective measures listed in sections 7 and 8.

- Environmental precautions** : Do not allow material to contaminate ground water system. If necessary, dike well ahead of the spill to prevent runoff into drains, sewers, or any natural waterway or drinking supply.

Methods and material for containment and cleaning up

- : Ventilate the area. Remove all sources of ignition. Prevent further leakage or spillage if safe to do so. Use only non-sparking tools and equipment in the clean-up process. Avoid breathing mist or vapours. Contain and absorb spilled liquid with non-combustible, inert absorbent material (e.g. sand), then place absorbent material into a container for later disposal (see Section 13). Contact the proper local authorities. Refer to Section 13 for disposal of contaminated material.

Special spill response procedures

- : In Canada: For 24-hour emergency assistance, call: 1-613-996-6666 (CANUTEC).
EPA/CERCLA Reportable quantity (RQ): Cyclohexanone (5000 lbs / 2270 kg)

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling

- : Wear protective gloves/clothing and eye/face protection. Use only in well-ventilated areas. Avoid breathing vapour or mist. Avoid contact with skin, eyes and clothing. Keep container tightly closed. Do not eat, drink or smoke when using this product. Wash thoroughly after handling. Keep away from flames and hot surfaces. - No smoking. Use only non-sparking tools. Take precautionary measures against static discharges. Ground all equipment during handling.

- Conditions for safe storage** : Keep container tightly closed. Store in cool/well-ventilated place. Store locked up. Keep cool. Storage area should be clearly identified, clear of obstruction and accessible only to trained and authorized personnel. Inspect periodically for damage or leaks. No smoking. Empty containers may contain hazardous residues.

- Incompatible materials** : Strong oxidizers (e.g. Chlorine, Peroxides, etc.); Nitric acid

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

<u>Exposure Limits:</u>			
<u>Chemical Name</u>	<u>ACGIH TLV</u>		<u>OSHA PEL</u>
	<u>TWA</u>	<u>STEL</u>	<u>PEL</u> <u>STEL</u>
Cyclohexanone	20 ppm	50 ppm	50 ppm ; 200 mg/m ³ N/Av

Exposure controls

Ventilation and engineering measures

- : Use only in well-ventilated areas. Apply technical measures to comply with the occupational exposure limits. Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction. Use explosion-proof equipment. In case of insufficient ventilation wear suitable respiratory equipment.

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- Respiratory protection** : If airborne concentrations are above the permissible exposure limit or are not known, use NIOSH-approved respirators. Respirators should be selected based on the form and concentration of contaminants in air, and in accordance with OSHA (29 CFR 1910.134) or CSA Z94.4-02. Advice should be sought from respiratory protection specialists.
- Skin protection** : Wear protective gloves/clothing. Where extensive exposure to product is possible, use resistant coveralls, apron and boots to prevent contact. The suitability for a specific workplace should be discussed with the producers of the protective gloves.
- Eye / face protection** : Wear eye/face protection. Wear safety glasses with side shields (or goggles).
- Other protective equipment** : Ensure that eyewash stations and safety showers are close to the workstation location. Other equipment may be required depending on workplace standards.
- General hygiene considerations** : Do not breathe mist or vapor. Avoid contact with skin, eyes and clothing. Do not eat, drink or smoke when using this product. Wash thoroughly after handling. Remove and wash contaminated clothing before re-use. Do not take contaminated clothing home. Handle in accordance with good industrial hygiene and safety practice.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

- Physical State** : Liquid
- Colour** : Clear to slightly yellow
- Odour** : Peppermint odor.
- Odour threshold** : 4 ppm
- pH** : None.
- Melting Point/Freezing point** : -26°C (-15°F)
- Initial boiling point and boiling range** : 156°C (313°F)
- Flash point** : 43.9°C (111°F)
- Flashpoint (Method)** : Cleveland closed cup
- Evaporation rate (BuAe = 1)** : faster than butyl acetate
- Flammability** : Flammable.
- Lower explosion or flammability limit (% by vol.)** : 1.3%
- Upper explosion or flammability limit (% by vol.)** : 9.4%
- Oxidizing properties** : None known.
- Explosive properties** : Not explosive
- Vapour pressure** : 4mmHg / 0.53kPa (20°C / 68°F)
- Relative vapour density** : 3.4
- Relative density / Specific gravity** : 0.948
- Solubility in water** : Soluble 23 grams per litre (20°C / 68°F)
- Other solubility(ies)** : Soluble in most organic solvents.
- Partition coefficient: n-octanol/water or Coefficient of water/oil distribution** : Not available.
- Auto-ignition temperature** : 420°C / 788°F
- Decomposition temperature** : No information available.
- Viscosity** : 2.2 cPs (25°C / 77°F)
- Particle characteristics** : Not applicable.
- Volatiles (% by weight)** : No information available.
- Volatile organic Compounds (VOC's)** : No information available.

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Absolute pressure of container

: Not applicable.

Flame projection length

: Not applicable.

Other physical/chemical comments

: Molecular formula: C₆-H₁₀-O
Molecular Weight: 98.14 g/mol

SECTION 10. STABILITY AND REACTIVITY

Reactivity : Not normally reactive.

Chemical stability : Stable under normal conditions. May turn yellow on prolonged exposure to air .

Possibility of hazardous reactions

: Hazardous polymerization does not occur.

Conditions to avoid

: Open flames, sparks, high heat, direct sunlight, and close proximity to incompatible substances. Do not use in areas without adequate ventilation.

Incompatible materials

: Incompatible materials (see Section 7). Attacks some elastomers, rubber, plastic and coatings.

Hazardous decomposition products

: None known, refer to hazardous combustion products in Section 5.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure:

Routes of entry inhalation : YES

Routes of entry skin & eye : YES

Routes of entry Ingestion : YES

Routes of exposure skin absorption

: YES

Potential Health Effects:

Signs and symptoms of short-term (acute) exposure

Sign and symptoms Inhalation

: May cause respiratory tract irritation. Coughing, difficulty breathing, and tightness in chest. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness.

Sign and symptoms ingestion

: Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Aspiration hazard. Aspiration into the lungs during swallowing or subsequent vomiting may cause chemical pneumonitis, which can be fatal.

Sign and symptoms skin

: Causes skin irritation. Symptoms may include redness, itching and swelling.

Sign and symptoms eyes

: Causes serious eye damage. Symptoms may include redness, pain, tearing and conjunctivitis. Permanent eye damage including blindness could result.

Potential Chronic Health Effects

: Frequent or prolonged contact may dry the skin, leading to discomfort and dermatitis.

Mutagenicity

: Not expected to be mutagenic in humans.

Carcinogenicity

: No components are listed as carcinogens by ACGIH, IARC, OSHA or NTP.

Reproductive effects & Teratogenicity

: Not expected to cause reproductive effects.

Sensitization to material

: Not expected to be a skin or respiratory sensitizer.

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Specific target organ effects : Not classified as a specific target organ toxicity - single exposure.
Not classified as a specific target organ toxicity - repeated exposure.

Medical conditions aggravated by overexposure

: Pre-existing skin, eye and respiratory disorders.

Synergistic materials

: No information available.

Toxicological data

: See below for toxicological data on the substance.

<u>Chemical name</u>	<u>LC₅₀(4hr)</u>	<u>LD₅₀</u>	
	<u>inh, rat</u>	<u>(Oral, rat)</u>	<u>(Rabbit, dermal)</u>
Cyclohexanone	2639 mg/L	1340 mg/kg	940 mg/kg

Other important toxicological hazards

: None reported by the manufacturer.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

: Do not allow material to contaminate ground water system.
See the following tables for the substance's ecotoxicity data.

Ecotoxicity data:

<u>Ingredients</u>	<u>CAS #</u>	<u>Toxicity to Fish</u>		
		<u>LC₅₀ / 96h</u>	<u>NOEC / 21 day</u>	<u>M Factor</u>
Cyclohexanone	108-94-1	96 Hr LC ₅₀ Pimephales promelas: 481 - 578 mg/L [flow-through]; 96 Hr LC ₅₀ Pimephales promelas: 8.9 mg/L	N/Av	none

<u>Ingredients</u>	<u>CAS #</u>	<u>Toxicity to Daphnia</u>		
		<u>EC₅₀ / 48h</u>	<u>NOEC / 21 day</u>	<u>M Factor</u>
Cyclohexanone	108-94-1	24 Hr EC ₅₀ Daphnia magna: 800 mg/L	N/Av	none

<u>Ingredients</u>	<u>CAS #</u>	<u>Toxicity to Algae</u>		
		<u>EC₅₀ / 96h or 72h</u>	<u>NOEC / 96h or 72h</u>	<u>M Factor</u>
Cyclohexanone	108-94-1	96 Hr EC ₅₀ Chlorella vulgaris: 20 mg/L	N/Av	none

Persistence and degradability

: Readily biodegradable

Bioaccumulation potential

: No information available.

<u>Components</u>	<u>Partition coefficient n-octanol/water (log K_{ow})</u>	<u>Bioconcentration factor (BCF)</u>
Cyclohexanone (CAS 108-94-1)	0.86 at 25 °C	will not bioconcentrate

Mobility in soil

: The product itself has not been tested.

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Other Adverse Environmental effects

: None known.

SECTION 13. DISPOSAL CONSIDERATIONS

- Handling for Disposal** : Handle in accordance with good industrial hygiene and safety practice. Refer to protective measures listed in sections 7 and 8.
- Methods of Disposal** : Dispose in accordance with all applicable federal, state, provincial and local regulations.
- RCRA** : If this product, as supplied, becomes a waste in the United States, it may meet the criteria of a hazardous waste as defined under RCRA, Title 40 CFR 261. It is the responsibility of the waste generator to determine the proper waste identification and disposal method. For disposal of unused or waste material, check with local, state and federal environmental agencies.

SECTION 14. TRANSPORT INFORMATION

Regulatory Information	UN Number	UN proper shipping name	Transport hazard class(es)	Packing Group	Label
IMDG	UN1915	CYCLOHEXANONE	3	III	
IMDG Additional information	May be shipped as a limited quantity, consult the IMDG regulations for details.				
TDG	UN1915	CYCLOHEXANONE	3	III	
TDG Additional information	May be shipped as a Limited Quantity when transported in containers no larger than 5.0 L, in combination packagings no larger than 30 kg gross mass.				
49CFR/DOT	UN1915	CYCLOHEXANONE	3	III	
49CFR/DOT Additional information	May be shipped as a limited quantity. See 49 CFR 173.150. RQ = (5000 lbs/2270 kg)				
ICAO/IATA	UN1915	Cyclohexanone	3	III	
ICAO/IATA Additional information	Refer to ICAO/IATA Packing Instruction				

Special precautions for user : Appropriate advice on safety must accompany the package. Keep away from heat, sparks and open flame - No smoking.

Environmental hazards : This product does not meet the criteria for an environmentally hazardous mixture, according to the IMDG Code. See ECOLOGICAL INFORMATION, Section 12.

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SECTION 15 - REGULATORY INFORMATION

US Federal Information:

Components listed below are present on the following U.S. Federal chemical lists:

<u>Ingredients</u>	CAS #	TSCA Inventory	CERCLA Reportable Quantity(RQ) (40 CFR 117.302):	SARA TITLE III: Sec. 302, Extremely Hazardous Substance, 40 CFR 355:	SARA TITLE III: Sec. 313, 40 CFR 372, Specific Toxic Chemical	de Minimis Concentration
Cyclohexanone	108-94-1	Yes	5000 lb/ 2270 kg	N/Av	No	No

SARA TITLE III: Sec. 311 and 312, SDS Requirements, 40 CFR 370 Hazard Classes: Flammable; Acute toxicity; Skin irritation; Serious eye damage.

US State Right to Know Laws:

The following chemicals are specifically listed by individual States:

<u>Ingredients</u>	CAS #	California Proposition 65		State "Right to Know" Lists					
		Listed	Type of Toxicity	CA	MA	MN	NJ	PA	RI
Cyclohexanone	108-94-1	No	N/Ap	Yes	Yes	Yes	Yes	Yes	Yes

Canadian Information:

All ingredients are present on the DSL.

International Information:

Components listed below are present on the following International Inventory list:

<u>Ingredients</u>	CAS #	European EINECS	Australia AICS	Philippines PICCS	Japan ENCS	Korea KECI/KECL	China IECSC	NewZealand IOC
Cyclohexanone	108-94-1	203-631-1	Present	Present	(3)-2376	KE-09188	Present	HSR001112

SECTION 16. OTHER INFORMATION

Legend

: ACGIH: American Conference of Governmental Industrial Hygienists
 AICS: Australian Inventory of Chemical Substances
 ATE: Acute Toxicity Estimate
 CAS: Chemical Abstract Services
 CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980
 CFR: Code of Federal Regulations
 CSA: Canadian Standards Association
 DOT: Department of Transportation
 ECHA: European Chemicals Agency
 ECOTOX: U.S. EPA Ecotoxicology Database
 EINECS: European Inventory of Existing Commercial chemical Substances
 ENCS: Existing and New Chemical Substances
 EPA: Environmental Protection Agency
 HSDB: Hazardous Substances Data Bank

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IARC: International Agency for Research on Cancer
IBC: Intermediate Bulk Container
IECSC: Inventory of Existing Chemical Substances
IMDG: International Maritime Dangerous Goods
IOC: Inventory of Chemicals
IUCLID: International Uniform Chemical Information Database
KECI: Korean Existing Chemicals Inventory
KECL: Korean Existing Chemicals List
LC: Lethal Concentration
LD: Lethal Dose
N/Ap: Not Applicable
N/Av: Not Available
NIOSH: National Institute of Occupational Safety and Health
NOEC: No observable effect concentration
NTP: National Toxicology Program
OECD: Organisation for Economic Co-operation and Development
OSHA: Occupational Safety and Health Administration
PEL: Permissible exposure limit
PICCS: Philippine Inventory of Chemicals and Chemical Substances
RCRA: Resource Conservation and Recovery Act
RTECS: Registry of Toxic Effects of Chemical Substances
SARA: Superfund Amendments and Reauthorization Act
SDS: Safety Data Sheet / Material Safety Data Sheet
STEL: Short Term Exposure Limit
TDG: Canadian Transportation of Dangerous Goods Act & Regulations
TLV: Threshold Limit Values
TSCA: Toxic Substance Control Act
TWA: Time Weighted Average
WHMIS: Workplace Hazardous Materials Identification System

References : 1. ACGIH, Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices
2. ECHA - European Chemical Agency
3. Canadian Centre for Occupational Health and Safety, CCInfoWeb databases
4. Safety Data Sheets from manufacturer.
5. US EPA Title III List of Lists
6. California Proposition 65 List
7. OECD - The Global Portal to Information on Chemical Substances - eChemPortal

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: 2

Revision Information

: (M)SDS sections updated 2. HAZARDS IDENTIFICATION 9. PHYSICAL AND CHEMICAL PROPERTIES

Other special considerations for handling

: Provide adequate information, instruction and training for operators.



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<u>Prepared for:</u> Comet Chemical Company Ltd. 3463 Thomas Street Innisfill, ON L9S 3W4 Information (M-F 8:00-5:00): 705-436-5580 www.cometchemical.com	The logo for Comet Chemical Company Ltd. features a red circle with a white horizontal line through the center. To the right of the circle, the word "COMET" is written in large, bold, black capital letters, and "COMET CHEMICAL COMPANY LTD." is written in smaller, bold, black capital letters below it.
<u>Prepared by:</u> ICC The Compliance Center Inc. Telephone: (888) 442-9628 (U.S.): (888) 977-4834 (Canada) http://www.thecompliancescenter.com	The logo for ICC The Compliance Center Inc. features a blue circle with the letters "icc" in white. To the right of the circle, the words "ComplianceCenter" are written in a blue, sans-serif font.

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