1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

- Product name: Cyclohexanone
- Product Number: 398241
- Brand: Sigma-Aldrich
- Index-No.: 606-010-00-7
- CAS-No.: 108-94-1

1.2 Relevant identified uses of the substance or mixture and uses advised against

- Identified uses: Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

- Company: Sigma-Aldrich
- Address: 3050 Spruce Street
- SAINT LOUIS MO  63103
- USA
- Telephone: +1 800-325-5832
- Fax: +1 800-325-5052

1.4 Emergency telephone number

- Emergency Phone #: (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

- GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
  - Flammable liquids (Category 3), H226
  - Acute toxicity, Oral (Category 4), H302
  - Acute toxicity, Inhalation (Category 4), H332
  - Acute toxicity, Dermal (Category 4), H312
  - Skin irritation (Category 2), H315
  - Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

- Pictogram

- Signal word: Danger

- Hazard statement(s)
  - H226: Flammable liquid and vapour.
  - H302 + H312 + H332: Harmful if swallowed, in contact with skin or if inhaled
  - H315: Causes skin irritation.
  - H318: Causes serious eye damage.

- Precautionary statement(s)
  - P210: Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
  - P233: Keep container tightly closed.
  - P240: Ground/bond container and receiving equipment.
2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclohexanone</td>
<td>Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Eye Dam. 1; H226, H302 + H312 + H332, H315, H318</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.
4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES
5.1 Extinguishing media
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES
6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas. For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE
7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
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. Storage class (TRGS 510): Flammable liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSOAL PROTECTION
8.1 Control parameters
Components with workplace control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclohexanone</td>
<td>108-94-1</td>
<td>TWA</td>
<td>20 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td>Upper Respiratory Tract irritation</td>
<td>Eye irritation</td>
<td>Confirmed animal carcinogen with unknown relevance to humans</td>
</tr>
<tr>
<td>Parameters</td>
<td>Value</td>
<td>Biological specimen</td>
<td>Basis</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
<td>---------------------</td>
<td>------------------------------</td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>20.000000 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye &amp; Upper Respiratory Tract irritation</td>
<td>Confirmed animal carcinogen with unknown relevance to humans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Danger of cutaneous absorption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEL</td>
<td>50 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Respiratory Tract irritation</td>
<td>Eye irritation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confirmed animal carcinogen with unknown relevance to humans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Danger of cutaneous absorption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>50.000000 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye &amp; Upper Respiratory Tract irritation</td>
<td>Confirmed animal carcinogen with unknown relevance to humans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Danger of cutaneous absorption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEL</td>
<td>50.000000 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye &amp; Upper Respiratory Tract irritation</td>
<td>Confirmed animal carcinogen with unknown relevance to humans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Danger of cutaneous absorption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>50.000000 ppm</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye irritation</td>
<td>Confirmed animal carcinogen with unknown relevance to humans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Danger of cutaneous absorption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEL</td>
<td>50 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye irritation</td>
<td>Confirmed animal carcinogen with unknown relevance to humans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Danger of cutaneous absorption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>25.000000 ppm</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential for dermal absorption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>25 ppm</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential for dermal absorption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Biological occupational exposure limits

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Parameters</th>
<th>Value</th>
<th>Biological specimen</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclohexanone</td>
<td>108-94-1</td>
<td>1,2-</td>
<td>80.0000 mg/l</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cyclohexane diol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
<td>End of shift at end of workweek</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cyclohexanol</td>
<td>8.0000 mg/l</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
<td>End of shift (As soon as possible after exposure ceases)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 8.2 Exposure controls

#### Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

#### Personal protective equipment

**Eye/face protection**

- Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**

- Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

- Full contact
- Material: butyl-rubber
- Minimum layer thickness: 0.3 mm
- Break through time: 480 min
Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)
Splash contact
Material: Nature latex/chloroprene
Minimum layer thickness: 0.6 mm
Break through time: 35 min
Material tested: Lapren® (KCL 706 / Aldrich Z677558, Size M)
data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls.
If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

---

**9. PHYSICAL AND CHEMICAL PROPERTIES**

**9.1 Information on basic physical and chemical properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Appearance</td>
<td>Form: clear, liquid</td>
</tr>
<tr>
<td>Colour: colourless</td>
<td></td>
</tr>
<tr>
<td>b) Odour</td>
<td>No data available</td>
</tr>
<tr>
<td>c) Odour Threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>d) pH</td>
<td>No data available</td>
</tr>
<tr>
<td>e) Melting point/freezing point</td>
<td>Melting point/range: -47 °C (-53 °F) - lit.</td>
</tr>
<tr>
<td>f) Initial boiling point and boiling range</td>
<td>155 °C (311 °F) - lit.</td>
</tr>
<tr>
<td>g) Flash point</td>
<td>44 °C (111 °F) - closed cup</td>
</tr>
<tr>
<td>h) Evaporation rate</td>
<td>No data available</td>
</tr>
<tr>
<td>i) Flammability (solid, gas)</td>
<td>No data available</td>
</tr>
<tr>
<td>j) Upper/lower flammability or explosive limits</td>
<td>Upper explosion limit: 9.4 %(V)</td>
</tr>
<tr>
<td></td>
<td>Lower explosion limit: 1.1 %(V)</td>
</tr>
<tr>
<td>k) Vapour pressure</td>
<td>4.5 hPa (3.4 mmHg) at 20 °C (68 °F)</td>
</tr>
<tr>
<td></td>
<td>13.3 hPa (10.0 mmHg) at 38.7 °C (101.7 °F)</td>
</tr>
<tr>
<td>l) Vapour density</td>
<td>3.39 - (Air = 1.0)</td>
</tr>
<tr>
<td>m) Relative density</td>
<td>0.947 g/cm3 at 25 °C (77 °F)</td>
</tr>
<tr>
<td>n) Water solubility</td>
<td>86 g/l at 20 °C (68 °F)</td>
</tr>
<tr>
<td>o) Partition coefficient: n-octanol/water</td>
<td>log Pow: 0.81</td>
</tr>
<tr>
<td>p) Auto-ignition temperature</td>
<td>420 °C (788 °F) at 1,013 hPa (760 mmHg)</td>
</tr>
</tbody>
</table>
q) Decomposition temperature  No data available
r) Viscosity  No data available
s) Explosive properties  No data available
t) Oxidizing properties  No data available

9.2 Other safety information
- Surface tension  35.05 mN/m at 20 °C (68 °F)
- Relative vapour density  3.39 - (Air = 1.0)

10. STABILITY AND REACTIVITY
10.1 Reactivity  No data available
10.2 Chemical stability  Stable under recommended storage conditions.
10.3 Possibility of hazardous reactions  No data available
10.4 Conditions to avoid  Heat, flames and sparks.
10.5 Incompatible materials  Oxidizing agents, Plastics
10.6 Hazardous decomposition products  Other decomposition products - No data available
   In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION
11.1 Information on toxicological effects
   - Acute toxicity
     LD50 Oral - Rat - 1,534 mg/kg
     LC50 Inhalation - Rat - 4 h - > 6.2 mg/l
     LD50 Dermal - Rabbit - 794 - 3,160 mg/kg
     No data available
   - Skin corrosion/irritation
     Skin - Rabbit
     Result: Irritating to skin.
     (OECD Test Guideline 404)
   - Serious eye damage/eye irritation
     Eyes - Rabbit
     Result: Risk of serious damage to eyes. - 24 h
   - Respiratory or skin sensitisation
     No data available
   - Germ cell mutagenicity
     Not mutagenic in Ames Test
     Ames test
     S. typhimurium
     Result: negative
     Human fibroblast
     Result: Laboratory experiments have shown mutagenic effects.
Carcinogenicity
This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.
IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Cyclohexanone)
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Specific target organ toxicity - single exposure
No data available

Acute inhalation toxicity - Breathing difficulties

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: GW1050000
Prolonged or repeated exposure to skin causes defatting and dermatitis., Cough, Shortness of breath, Headache, Nausea, Vomiting, Incoordination., Inhalation of high concentrations may cause:, Central nervous system depression, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.
Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity
Toxicity to daphnia and other aquatic invertebrates
EC50 - Daphnia magna (Water flea) - 820 mg/l - 24 h

12.2 Persistence and degradability
Biodegradability Result: 90 - 100 % - Readily biodegradable

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.
14. TRANSPORT INFORMATION

DOT (US)
- UN number: 1915
- Class: 3
- Proper shipping name: Cyclohexanone
- Reportable Quantity (RQ): 5000 lbs
- Packing group: III
- Poison Inhalation Hazard: No

IMDG
- UN number: 1915
- Class: 3
- Proper shipping name: CYCLOHEXANONE
- Packing group: III
- EMS-No: F-E, S-D

IATA
- UN number: 1915
- Class: 3
- Proper shipping name: Cyclohexanone
- Packing group: III

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
- Cyclohexanone
  - CAS-No.: 108-94-1
  - Revision Date: 1993-04-24

Pennsylvania Right To Know Components
- Cyclohexanone
  - CAS-No.: 108-94-1
  - Revision Date: 1993-04-24

New Jersey Right To Know Components
- Cyclohexanone
  - CAS-No.: 108-94-1
  - Revision Date: 1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.
- Acute Tox.: Acute toxicity
- Eye Dam.: Serious eye damage
- Flam. Liq.: Flammable liquids
- H226: Flammable liquid and vapour.
- H302: Harmful if swallowed.
- H302 + H312 +: Harmful if swallowed, in contact with skin or if inhaled
- H332: Harmful in contact with skin.
- H315: Causes skin irritation.
- H318: Causes serious eye damage.
**HMIS Rating**
Health hazard: 2
Chronic Health Hazard: *
Flammability: 2
Physical Hazard: 0

**NFPA Rating**
Health hazard: 2
Fire Hazard: 2
Reactivity Hazard: 0

**Further information**
Copyright 2015 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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 Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.11 Revision Date: 03/04/2015 Print Date: 06/24/2015