Section 1 - Product and Company Information

Product Name                       PHENOL, LOOSE CRYSTALS, 99+%,
                                    A.C.S. REAGENT
Product Number                     242322
Brand                              SIAL
Company                            Sigma-Aldrich
Street Address                     3050 Spruce Street
City, State, Zip, Country          SAINT LOUIS MO 63103 US
Technical Phone:                   314 771 5765
Emergency Phone:                   414 273 3850 Ext. 5996
Fax:                               800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name                          CAS #           SARA 313
PHENOL                                  108-95-2           Yes

Formula         C6H6O
Synonyms        Acide carbolique (French) * Baker's P and S
                 Liquid and Ointment * Benzenol * Carbolic acid *
                 Carbolsaure (German) * Fenol (Dutch, Polish) *
                 Fenolo (Italian) * Hydroxybenzene *
                 Monohydroxybenzene * Monophenol * NCI-C50124 *
                 Oxybenzene * Phenic acid * Phenol (ACGIH:OSHA) *
                 Phenol alcohol * Phenole (German) * Phenyl
                 hydrate * Phenyl hydroxide * Phenolic acid *
                 Phenolic alcohol * RCRA waste number U188
RTECS Number:   SJ3325000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW
Toxic.
Toxic by inhalation, in contact with skin and if swallowed. Causes
burns. Harmful: danger of serious damage to health by prolonged
exposure through inhalation in contact with skin, and if
swallowed. Possible risk of irreversible effects.
Vesicant. Readily absorbed through skin. Target organ(s): Central
nervous system. Kidneys.

HMIS RATING
HEALTH: 3*
FLAMMABILITY: 2
REACTIVITY: 0

NFPA RATING
HEALTH: 3
FLAMMABILITY: 2
REACTIVITY: 0

*additional chronic hazards present.
For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

**ORAL EXPOSURE**
If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

**INHALATION EXPOSURE**
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

**DERMAL EXPOSURE**
In case of contact, immediately wash skin with soap and copious amounts of water.

**EYE EXPOSURE**
Assure adequate flushing of the eyes by separating the eyelids with fingers.

Section 5 - Fire Fighting Measures

**FLASH POINT**
174.2 °F  79 °C  Method: closed cup

**EXPLOSION LIMITS**
Lower: 1.7 %  Upper: 8.6 %

**AUTOIGNITION TEMP**
715 °C

**FLAMMABILITY**
N/A

**EXTINGUISHING MEDIA**
Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

**FIREFIGHTING**
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

**PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL**
Evacuate area.

**PROCEDURE(S) OF PERSONAL PRECAUTION(S)**
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

**METHODS FOR CLEANING UP**
Cover with dry lime or soda ash, pick up, keep in a closed container, and hold for waste disposal. Avoid raising dust.

Section 7 - Handling and Storage

**HANDLING**
User Exposure: Do not breathe vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.
STORAGE
Suitable: Keep tightly closed. Keep away from heat and open flame. Handle and store under nitrogen.

SPECIAL REQUIREMENTS
Handle and store under inert gas. Light sensitive.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Use only in a chemical fume hood.

PERSONAL PROTECTIVE EQUIPMENT
Other: Wear appropriate government approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling. Wash contaminated clothing before reuse.

EXPOSURE LIMITS, RTECS

<table>
<thead>
<tr>
<th>Country</th>
<th>Source</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>ACGIH</td>
<td>TWA</td>
<td>5 PPM</td>
</tr>
<tr>
<td></td>
<td>Remarks: Skin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>MSHA Standard-air</td>
<td>TWA</td>
<td>5 PPM (19 MG/M3) (SKIN)</td>
</tr>
<tr>
<td>USA</td>
<td>OSHA.</td>
<td>PEL</td>
<td>8H TWA 5 PPM (19 MG/M3) (SKIN)</td>
</tr>
<tr>
<td>New Zealand OEL</td>
<td>Remarks: check ACGIH TLV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>NIOSH</td>
<td>TWA</td>
<td>5 PPM (SK)</td>
</tr>
<tr>
<td></td>
<td>Ceiling co15.6 PPM/15M (SK)</td>
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</table>

EXPOSURE LIMITS

<table>
<thead>
<tr>
<th>Country</th>
<th>Source</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poland</td>
<td>NDS</td>
<td>7.8 MG/M3</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>NDSCh</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>NDSP</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Section 9 - Physical/Chemical Properties

Appearance: Physical State: Solid

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>At Temperature or Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Weight</td>
<td>94.11 AMU</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>BP/BP Range</td>
<td>182 °C</td>
<td>760 mmHg</td>
</tr>
<tr>
<td>MP/MP Range</td>
<td>40.0 - 42.0 °C</td>
<td></td>
</tr>
<tr>
<td>Freezing Point</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>0.36 mmHg</td>
<td>20 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>3.24 g/l</td>
<td></td>
</tr>
<tr>
<td>Saturated Vapor Conc.</td>
<td>N/A</td>
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</tr>
<tr>
<td>SG/Density</td>
<td>1.071 g/cm3</td>
<td></td>
</tr>
<tr>
<td>Bulk Density</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Volatile %</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>VOC Content</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Water Content</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Solvent Content</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Evaporation Rate</td>
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<td></td>
</tr>
<tr>
<td>Viscosity</td>
<td>3.437 Pas</td>
<td>50 °C</td>
</tr>
</tbody>
</table>
Section 10 - Stability and Reactivity

STABILITY
Stable. Stable.
Conditions of Instability: May discolor on exposure to light.
Materials to Avoid: Strong oxidizing agents, Strong bases, Strong acids.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes burns. Causes blisters on contact with skin.
Skin Absorption: Toxic if absorbed through skin. Readily absorbed through skin.
Eye Contact: Causes burns.
Inhalation: Toxic if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.
Ingestion: Toxic if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)

SIGNS AND SYMPTOMS OF EXPOSURE
Ingestion can cause circulatory collapse, tachypnea, paralysis, convulsions, coma, necrosis of mouth and G.I. tract, jaundice, death from respiratory failure, sometimes from cardiac arrest. Exposure can cause: Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Inhalation may result in spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin.

CONDITIONS AGGRAVATED BY EXPOSURE
May cause nervous system disturbances.

TOXICITY DATA
Oral
Rat
410.0 - 650.0 mg/kg
LD50
8 H
Inhalation
Rat
900 mg/m3
LC50
Skin
Rabbit
LD50
Oral
Infant
10 mg/kg
LDLO

Oral
Human
14000 mg/kg
LDLO

Oral
Human
140 mg/kg
LDLO

Oral
Rat
317 mg/kg
LD50
Remarks: Behavioral: Convulsions or effect on seizure threshold.

Inhalation
Rat
316 mg/m3
LC50
Skin
Rat
669 mg/kg
LD50

Intraperitoneal
Rat
127 MG/KG
LD50
Subcutaneous
Rat
460 MG/KG
LD50
Oral
Mouse
270 mg/kg
LD50

Inhalation
Mouse
177 mg/m3
LC50

Intraperitoneal
Mouse
180 MG/KG
LD50

Subcutaneous
Mouse
344 MG/KG
LD50

Intravenous
Mouse
112 MG/KG
LD50

Skin
Rabbit
630 mg/kg
LD50

Oral
Mammal
500 mg/kg
LD50

IRRITATION DATA

Skin
Rabbit
500 mg
24H
Remarks: Severe irritation effect

Skin
Rabbit
535 mg
Remarks: Open irritation test

Skin
Rabbit
100 mg
Remarks: Mild irritation effect

Eyes
Rabbit
5 mg
Remarks: Severe irritation effect

Eyes
Rabbit
5 mg
CHRONIC EXPOSURE - CARCINOGEN

Result: This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

Species: Mouse
Route of Application: Skin
Dose: 16 GM/KG
Exposure Time: 40W
Frequency: I
Result: Skin and Appendages: Other: Tumors.
Tumorigenic: Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Skin
Dose: 4000 MG/KG
Exposure Time: 24W
Frequency: I
Result: Skin and Appendages: Other: Tumors.
Tumorigenic: Neoplastic by RTECS criteria.

IARC CARCINOGEN LIST

Rating: Group 3

NTP CARCINOGEN LIST

Rating: No evidence.
Species: Mouse/rat
Route: Oral

ACGIH CARCINOGEN LIST

Rating: A4

CHRONIC EXPOSURE - TERATOGEN

Species: Rat
Dose: 1200 MG/KG
Route of Application: Oral
Exposure Time: (6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Rat
Dose: 600 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (12-14D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Mouse
Dose: 2600 MG/KG
Route of Application: Oral
Exposure Time: (6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Mouse
Dose: 4 GM/KG  
**Route of Application: Oral**  
**Exposure Time:** (6-15D PREG)  
**Result:** Specific Developmental Abnormalities: Musculoskeletal system.

**Species:** Mouse  
**Dose:** 2800 MG/KG  
**Route of Application:** Oral  
**Exposure Time:** (6-15D PREG)  
**Result:** Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Craniofacial (including nose and tongue).

**CHRONIC EXPOSURE - MUTAGEN**  
**Result:** May alter genetic material.

**Species:** Human  
**Dose:** 17 MG/L  
**Cell Type:** HeLa cell  
**Mutation test:** Other mutation test systems

**Species:** Human  
**Dose:** 1 MMOL/L  
**Cell Type:** HeLa cell  
**Mutation test:** DNA inhibition

**Species:** Human  
**Dose:** 5 UMOL/L  
**Cell Type:** lymphocyte  
**Mutation test:** Other mutation test systems

**Species:** Human  
**Dose:** 5 UMOL/L  
**Cell Type:** lymphocyte  
**Mutation test:** Sister chromatid exchange

**Species:** Rat  
**Route:** Oral  
**Dose:** 4 GM/KG  
**Mutation test:** Unscheduled DNA synthesis

**Species:** Mouse  
**Route:** Oral  
**Dose:** 265 MG/KG  
**Mutation test:** Micronucleus test

**Species:** Mouse  
**Route:** Intraperitoneal  
**Dose:** 265 MG/KG  
**Mutation test:** Micronucleus test

**Species:** Mouse  
**Dose:** 300 MG/L (+S9)  
**Cell Type:** lymphocyte  
**Mutation test:** Mutation in microorganisms

**Species:** Mouse  
**Dose:** 1500 UMOL/L  
**Cell Type:** lymphocyte  
**Mutation test:** DNA damage
Species: Mouse
Route: Oral
Dose: 20 GM/KG
Mutation test: DNA inhibition

Species: Mouse
Dose: 800 UMOL/L
Cell Type: lymphocyte
Mutation test: DNA inhibition

Species: Mouse
Dose: 2500 UMOL/L
Cell Type: Other cell types
Mutation test: Other mutation test systems

Species: Mouse
Dose: 1890 UMOL/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Species: Hamster
Dose: 4 MMOL/L
Cell Type: lung
Mutation test: Micronucleus test

Species: Hamster
Dose: 175 MG/L
Cell Type: ovary
Mutation test: Micronucleus test

Species: Hamster
Dose: 10 UMOL/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Hamster
Dose: 3 UMOL/L
Cell Type: Embryo
Mutation test: Unscheduled DNA synthesis

Species: Hamster
Dose: 1900 UMOL/L
Cell Type: lung
Mutation test: DNA inhibition

Species: Hamster
Dose: 2 GM/L
Cell Type: ovary
Mutation test: Cytogenetic analysis

Species: Hamster
Dose: 100 UMOL/L
Cell Type: Embryo
Mutation test: Cytogenetic analysis

Species: Hamster
Dose: 300 MG/L
Cell Type: ovary
Mutation test: Sister chromatid exchange

Species: Hamster
Dose: 1 MMOL/L
Cell Type: Embryo
Mutation test: Sister chromatid exchange
Species: Hamster
Dose: 3 MMOL/L
Cell Type: Embryo
Mutation test: Mutation in mammalian somatic cells.
Species: Mammal
Dose: 250 MMOL/L
Cell Type: lymphocyte
Mutation test: DNA damage
Species: Rabbit
Dose: 250 UMOL/L
Cell Type: Bone marrow
Mutation test: Other mutation test systems

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 300 MG/KG
Route of Application: Oral
Exposure Time: (6-15D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Rat
Dose: 3600 MG/KG
Route of Application: Oral
Exposure Time: (6-15D PREG)
Result: Maternal Effects: Other effects. Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Rat
Dose: 1200 MG/KG
Route of Application: Oral
Exposure Time: (6-15D PREG)
Result: Maternal Effects: Other effects.

Species: Mouse
Dose: 2300 MG/KG
Route of Application: Oral
Exposure Time: (6-15D PREG)
Result: Effects on Embryo or Fetus: Fetal death. Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 24 h
Value: 12 mg/l

Test Type: EC100 Daphnia
Species: Daphnia magna
Time: 24 h
Value: 100 mg/l
Test Type: LC50 Fish
Species: Leuciscus idus
Time: 48 h
Value: 14.0 - 25.0 mg/l

Test Type: LC50 Fish
Species: Carassius auratus (Goldfish)
Time: 96 h
Value: 36.1 - 68.8 mg/l

Test Type: EC50 Algae
Species: Chlorella vulgaris
Time: 96 h
Value: 370 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations. This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber.

Section 14 - Transport Information

DOT
Proper Shipping Name: Phenol, solid
UN#: 1671
Class: 6.1
Packing Group: Packing Group II
Hazard Label: Toxic substances.
PIH: Not PIH

IATA
Proper Shipping Name: Phenol, solid
IATA UN Number: 1671
Hazard Class: 6.1
Packing Group: II

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T-C
R: 23/24/25-34-48/20/21/22-68
Risk Statements: Toxic by inhalation, in contact with skin and if swallowed. Causes burns. Harmful: danger of serious damage to health by prolonged exposure through inhalation in contact with skin, and if swallowed. Possible risk of irreversible effects.
Safety Statements: Avoid contact with skin and eyes. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of soap-suds. Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic.
Risk Statements: Toxic by inhalation, in contact with skin and
if swallowed. Causes burns. Harmful: danger of serious damage to health by prolonged exposure through inhalation in contact with skin, and if swallowed. Possible risk of irreversible effects. Safety Statements: Avoid contact with skin and eyes. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of soap-suds. Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). US Statements: Vesicant. Readily absorbed through skin. Target organ(s): Central nervous system. Kidneys.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
DEMINIMIS: 1 %
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2005 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.