

CAPROLACTAM

CLS

CAUTIONARY RESPONSE INFORMATION

Common Synonyms Aminocaproic lactam epsilon-Caprolactam Hexahydro-2h-azepine-2-one 2-Ketohexamethylenimine 2-Oxohexamethylenimine	Liquid or solid in solution Colorless Mild odor
Sinks and mixes with water.	
<p>Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</p>	
Fire	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
Exposure	Call for medical aid. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS Dilute and disperse Stop discharge Do not burn	2. CHEMICAL DESIGNATIONS 2.1 CG Compatibility Group: 22; Caprolactam solution 2.2 Formula: HNCH ₂ (CH ₂) ₅ CO 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 105-60-2 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51577
3. HEALTH HAZARDS	
<p>3.1 Personal Protective Equipment: Gas mask or self-contained breathing apparatus; rubber gloves and boots; goggles or face shield.</p> <p>3.2 Symptoms Following Exposure: Inhalation causes coughing or mild irritation. Contact with hot liquid will burn eyes and skin.</p> <p>3.3 Treatment of Exposure: INHALATION: remove patient to fresh air. EYES: wash with copious quantities of water for at least 15 min.; call physician. SKIN: wash with water; call physician in case of thermal burn.</p> <p>3.4 TLV-TWA: 1 mg/m³</p> <p>3.5 TLV-STEL: 3 mg/m³</p> <p>3.6 TLV-Ceiling: Not listed.</p> <p>3.7 Toxicity by Ingestion: Grade 2; oral rat LD₅₀ = 2,140 mg/kg</p> <p>3.8 Toxicity by Inhalation: Currently not available.</p> <p>3.9 Chronic Toxicity: Currently not available</p> <p>3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.</p> <p>3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.</p> <p>3.12 Odor Threshold: 0.3 mg/m³</p> <p>3.13 IDLH Value: Not listed.</p> <p>3.14 OSHA PEL-TWA: Not listed.</p> <p>3.15 OSHA PEL-STEL: Not listed.</p> <p>3.16 OSHA PEL-Ceiling: Not listed.</p> <p>3.17 EPA AEGL: Not listed</p>	

4. FIRE HAZARDS

- 4.1 **Flash Point:** 257°F O.C. 230°F C.C.
- 4.2 **Flammable Limits in Air:** 1.84% (LEL)
- 4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 2.4 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 44.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
Bioaccumulation: 0
Damage to living resources: 1
Human Oral hazard: 1
Human Contact hazard: 0
Reduction of amenities: 0

7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** 75°C
- 7.3 **Inert Atmosphere:** Nitrogen cushion
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 113
- 9.3 **Boiling Point at 1 atm:** 515°F = 268°C = 541°K
- 9.4 **Freezing Point:** 154°F = 68°C = 341°K
- 9.5 **Critical Temperature:** 944.4°F = 506.9°C = 780.1°K
- 9.6 **Critical Pressure:** 660 psia = 45 atm = 4.6 MN/m²
- 9.7 **Specific Gravity:** 1.02 at 77°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 77°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 77°C
- 9.10 **Vapor (Gas) Specific Gravity:** 3.9
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** 209 Btu/lb = 116 cal/g = 4.85 X 10⁵ J/kg
- 9.13 **Heat of Combustion:** -13,700 Btu/lb = -7,640 cal/g = -320 X 10⁵ J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** -324 Btu/lb = -180 cal/g = -7.5 X 10⁵ J/kg
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.45 psia

NOTES

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
159	64.070	160	0.508	159	1.169	160	10.940
160	64.040	162	0.509	160	1.169	162	10.590
161	64.000	164	0.510	161	1.169	164	10.250
162	63.970	166	0.511	162	1.169	166	9.927
163	63.930	168	0.513	163	1.169	168	9.613
164	63.900	170	0.514	164	1.169	170	9.312
165	63.860	172	0.515	165	1.169	172	9.021
166	63.830	174	0.516	166	1.169	174	8.742
167	63.800	176	0.517	167	1.169	176	8.472
168	63.760	178	0.518	168	1.169	178	8.213
169	63.730	180	0.519	169	1.169	180	7.963
170	63.690	182	0.520	170	1.169	182	7.723
171	63.660	184	0.521	171	1.169	184	7.491
172	63.620	186	0.523	172	1.169	186	7.267
173	63.590	188	0.524	173	1.169	188	7.051
174	63.550	190	0.525	174	1.169	190	6.843
175	63.520	192	0.526	175	1.169	192	6.642
176	63.480	194	0.527	176	1.169	194	6.449

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	525.000	215	0.062	215	0.00097	180	0.393
		220	0.070	220	0.00108	185	0.393
		225	0.078	225	0.00121	190	0.393
		230	0.088	230	0.00134	195	0.393
		235	0.098	235	0.00149	200	0.393
		240	0.110	240	0.00165	205	0.393
		245	0.122	245	0.00183	210	0.393
		250	0.136	250	0.00202	215	0.393
		255	0.151	255	0.00223	220	0.393
		260	0.168	260	0.00245	225	0.393
		265	0.186	265	0.00270	230	0.393
		270	0.206	270	0.00297	235	0.393
		275	0.227	275	0.00326	240	0.393
		280	0.251	280	0.00357	245	0.393
		285	0.276	285	0.00391		
		290	0.304	290	0.00427		
		295	0.334	295	0.00467		
		300	0.367	300	0.00509		
		305	0.403	305	0.00554		
		310	0.441	310	0.00603		
		315	0.482	315	0.00655		
		320	0.527	320	0.00712		
		325	0.575	325	0.00772		
		330	0.627	330	0.00836		
		335	0.683	335	0.00905		
		340	0.743	340	0.00978		