Material Safety Data Sheet

Benzene



Section 1. Chemical product and company identification

Product name	: Benzene
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Synonym	: benzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol
Material uses	: Other non-specified industry: ETHYLBENZENE (FOR STYRENE MONOMER); DODECYLBENZENE (FOR DETERGENTS); CYLOHEXANE (FOR NYLON); PHENOL; NITROBENZENE (FOR ANILINE); MALEIC ANHYDRIDE; CHLOROBENZENE; DIPHENYL; BENZENE HEXACHLORIDE; BENZENE-SULFONIC ACID; SOLVENT.
MSDS #	: 001062
Date of Preparation/Revision	: 4/22/2010.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	Liquid. [COLORLESS TO PALE YELLOW WATERY LIQUID WITH A GASOLINE-LIKE ODOR]
Emergency overview	DANGER!
	EXTREMELY FLAMMABLE LIQUID AND VAPOR. FLAMMABLE. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF INHALED OR SWALLOWED. CAUSES RESPIRATORY TRACT AND EYE IRRITATION. MAY CAUSE SKIN IRRITATION. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CAN CAUSE CANCER.
	Extremely flammable liquid. Harmful by inhalation and if swallowed. Irritating to eyes and respiratory system. Moderately irritating to the skin. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. May cause target organ damage, based on animal data. Can cause cancer. Risk of cancer depends on duration and level of exposure. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling
Target organs	May cause damage to the following organs: blood, upper respiratory tract, skin, eyes, bone marrow, central nervous system (CNS).
Potential acute health effect	
Eyes	Irritating to eyes.
Skin	Moderately irritating to the skin.
Inhalation	Toxic by inhalation. Irritating to respiratory system.
Ingestion	Toxic if swallowed.
Potential chronic health effects	 CARCINOGENIC EFFECTS: Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union MUTAGENIC EFFECTS: Classified 2 by European Union. TERATOGENIC EFFECTS: Not available.
Medical conditions aggravated by over- exposure	Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

United States

benzene	71-43-2	100	Exposure limits ACGIH TLV (United States, 1/2009). Absorbed through skin. STEL: 8 mg/m ³ 15 minute(s). STEL: 2.5 ppm 15 minute(s). TWA: 1.6 mg/m ³ 8 hour(s). TWA: 0.5 ppm 8 hour(s). NIOSH REL (United States, 6/2009). STEL: 1 ppm 15 minute(s). TWA: 0.1 ppm 10 hour(s). OSHA PEL (United States, 11/2006). STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s). OSHA PEL 1989 (United States, 3/1989). STEL: 5 ppm 15 minute(s).

Section 4. First aid measures

Eye contact	 Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
Skin contact	 In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
Inhalation	 Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
Ingestion	: Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Section 5. Fire-fighting measures

: Flammable.
: 591.65°C (1097°F)
: Closed cup: -11.15°C (11.9°F).
: Lower: 1.3% Upper: 7.1%
 Decomposition products may include the following materials: carbon dioxide carbon monoxide
: Use dry chemical, CO ₂ , water spray (fog) or foam.
: Do not use water jet.
: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Extremely flammable liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

Special protective equipment for fire-fighters

: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions	:	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).
Environmental precautions	:	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.
Methods for cleaning up	:	Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

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Storage

: Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Recommended monitoring procedures	:	If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.
Engineering measures	:	Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Benzene	
Hygiene measures	: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
Personal protection	
Eyes	 Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
Skin	: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Hands	: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Personal protection in case of a large spill	: Full chemical-resistant suit and self-contained breathing apparatus should be worn only by trained and authorized persons.
Product name United States	Exposure limits
benzene	ACGIH TLV (United States, 1/2009). Absorbed through skin. STEL: 8 mg/m ³ 15 minute(s). STEL: 2.5 ppm 15 minute(s). TWA: 1.6 mg/m ³ 8 hour(s). TWA: 0.5 ppm 8 hour(s). NIOSH REL (United States, 6/2009). STEL: 1 ppm 15 minute(s). TWA: 0.1 ppm 10 hour(s). OSHA PEL (United States, 11/2006). STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s). OSHA PEL 1989 (United States, 3/1989). STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s). OSHA PEL 22 (United States, 11/2006). AMP: 50 ppm 10 minute(s). CEIL: 25 ppm TWA: 10 ppm 8 hour(s).

Section 9. Physical and chemical properties

Physical state	: Liquid. [COLORLESS TO PALE YELLOW WATERY LIQUID WITH A GASOLINE-LIKE ODOR]
Odor	: ODOR; CHARACTERISTIC ODOR
Molecular weight	: 78.12 g/mole
Molecular formula	: C6-H6
Boiling/condensation point	: 80°C (176°F)
Melting/freezing point	: 5.6°C (42.1°F)
Critical temperature	: 289°C (552.2°F)
Specific gravity	: 0.879 (Water = 1)
Vapor density	: 2.77 (Air = 1)
Evaporation rate	: 3.5 compared with butyl acetate
VOC	: 0 % (w/w)

Section 10. Stability and reactivity

Stability and reactivity	: The product is stable.
Incompatibility with various substances	: Highly reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data					
Product/ingredient name		Result	Species	Dose	Exposure
benzene		LD50 Dermal LD50 Intraperitoneal LD50 Oral LD50 Oral LD50 Oral LD50 Oral LDL0 Subcutaneous TDL0 Oral TDL0 Dermal TDL0 Dermal LDL0 Dermal LC50 Inhalation Gas. LC50 Inhalation	Rabbit Rat Rat Rat Rat Rat Rat	>9400 uL/kg 1100 ug/kg 6400 mg/kg 1800 mg/kg 1 mL/kg 930 mg/kg 5 mg/kg 1280 mg/kg 0.08 mL/kg 320 mg/kg 0.92 mL/kg 10000 ppm	- - - - - - - - - - 7 hours 7 hours
IDLH Chronic effects on humans	: CARC 1 (Prove (Prove MUTA May ca	Gas. 500 ppm CARCINOGENIC EFFECTS : Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union. MUTAGENIC EFFECTS : Classified 2 by European Union. May cause damage to the following organs: blood, upper respiratory tract, skin, eyes, bone marrow, central nervous system (CNS).			
Other toxic effects on humans		: Hazardous by the following route of exposure: of skin contact (irritant), of eye contact (irritant).			
Specific effects					
Carcinogenic effects	: Can ca	ause cancer. Risk of car	ncer depends	on duration and leve	el of exposure.
Mutagenic effects	: No kno	No known significant effects or critical hazards.			
Reproduction toxicity	: No kno	own significant effects or	critical hazar	ds.	

Section 12. Ecological information

quatic ecotoxicity				_
Product/ingredient name	Test	Result	Species	Exposure
benzene	-	Acute EC50 98800 ug/L Fresh water	Crustaceans - Brine shrimp - Artemia sp Nauplii	48 hours
	-	Acute EC50 58400 to 82300 ug/L Fresh water	Crustaceans - Brine shrimp - Artemia sp Nauplii	48 hours
	-	Acute EC50 22000 to 29500 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate - <=24 hours	48 hours
	-	Acute EC50 11730 to 15600 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate	48 hours

	-	Acute EC50 10000 ug/L Fresh water	 - <=24 hours Daphnia - Water flea - Daphnia magna - Juvenile (Fledgling, Hatchling, Weanling) 	48 hours
-	-	Acute EC50 9230 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate - <=24 hours	48 hours
	-	Acute LC50 76900 to 114100 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate - <=24 hours	48 hours
-	-	Acute LC50 59600 to 80700 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate - <=24 hours	48 hours
	-	Acute LC50 35 to 43.8 ppm Marine water	Crustaceans - Daggerblade grass shrimp - Palaemonetes pugio - Adult	48 hours
	-	Acute LC50 35000 ug/L Marine water	Crustaceans - Daggerblade grass shrimp - Palaemonetes pugio	48 hours
	-	Acute LC50 33000 ug/L Marine water	Crustaceans - Daggerblade grass shrimp - Palaemonetes pugio	48 hours
	-	Acute LC50 120000 ug/L Fresh water	Crustaceans - Aquatic sowbug - Asellus aquaticus	48 hours
-	-	Acute LC50 21000 ug/L Marine water	Crustaceans - Brine shrimp - Artemia salina - Nauplii	48 hours
	-	Acute LC50 99200 to 122600 ug/L Fresh water	Daphnia - Water	48 hours
	-	Acute LC50 9.2 to 11.7 mg/L Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss - 2.4 g	96 hours
	-	Acute LC50 97800 to 124000 ug/L Fresh water	Crustaceans - Brine shrimp - Artemia sp Nauplii	48 hours
-	-	Acute LC50 96200 to 134100 ug/L Fresh water	Daphnia - Water	48 hours
	-	Acute LC50 5900 ug/L Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss	96 hours
	-	Acute LC50 5300 ug/L Fresh water	Fish - Rainbow trout,donaldson	96 hours

		trout - Oncorhynchus mykiss - Juvenile (Fledgling, Hatchling, Weanling) - 106 mm - 13.9 g	
-	Acute LC50 139000 to 187000 ug/L Fresh water	Crustaceans - Brine shrimp - Artemia sp Nauplii	48 hours
-	Acute LC50 >347000 ug/L Marine water	Crustaceans - Dungeness or edible crab - Cancer magister - Zoea	48 hours
-	Acute LC50 10.76 to 12.04 ul/L Fresh water	Fish - Sockeye salmon - Oncorhynchus nerka - Smolt - 2 years - 75 mm	96 hours
-	Acute LC50 9.8 ul/L Fresh water	Fish - Coho salmon,silver salmon - Oncorhynchus kisutch - FRY	96 hours
-	Acute LC50 10.9 ul/L Marine water	Fish - Striped bass - Morone saxatilis - Juvenile (Fledgling, Hatchling, Weanling) - 52 mm - 1.5 g	96 hours
-	Acute LC50 8.47 to 9.09 ul/L Marine water	Fish - Pink salmon - Oncorhynchus gorbuscha - FRY	96 hours
-	Acute LC50 5.8 ul/L Marine water	Fish - Striped bass - Morone saxatilis - Juvenile (Fledgling, Hatchling, Weanling) - 6 g	96 hours
-	Acute LC50 5.55 to 8.21 ul/L Marine water	Fish - Sockeye salmon - Oncorhynchus nerka - Smolt - 2 years - 75 mm	96 hours
-	Acute LC50 5.28 ul/L Fresh water	Fish - Pink salmon - Oncorhynchus gorbuscha - FRY	96 hours
-	Chronic NOEC <13000 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - <=24 hours	48 hours

Products of degradation

: Products of degradation: carbon oxides (CO, CO₂) and water.

Section 13. Disposal considerations

Waste disposal

: The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1114	BENZENE	3			Reportable quantity10 lbs.(4.54 kg)Limited quantityYes.Packaging instructionPassenger aircraft Quantity limitation: 5 LCargo aircraft Quantity limitation: 60 LSpecial provisions IB2, T4, TP1
TDG Classification	UN1114	BENZENE	3	11		Explosive Limit and Limited Quantity Index 1 Passenger Carrying Road or Rail Index 5
Mexico Classification	UN1114	BENZENE	3	11	A A A A A A A A A A A A A A A A A A A	Reportable quantity 10 lbs. (4.54 kg) Limited quantity Yes.

Benzene						
						Packaging instruction Passenger aircraft Quantity limitation: 5 L Cargo aircraft Quantity limitation: 60 L Special provisions IB2, T4, TP1

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 15. Regulatory information

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United States						
HCS Classification	: Flammable liquid Toxic material Irritating material Carcinogen Target organ effects					
U.S. Federal regulations	: United States inventory (TSCA 8b): This material is listed or exempted.					
	SARA 302/304/311/312 extremely hazardous substances: No products were SARA 302/304 emergency planning and notification: No products were fou SARA 302/304/311/312 hazardous chemicals: benzene SARA 311/312 MSDS distribution - chemical inventory - hazard identificat benzene: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) he					
	Clean Water Act (CWA) 307: benzene					
	Clean Water Act (CWA) 311: benzene					
	Clean Air Act (CAA) 112 accidental release prevention: No products were found.					
	Clean Air Act (CAA) 112 regulated fla	mmable substances: No p	products were found.			
	Clean Air Act (CAA) 112 regulated to	kic substances: No produc	ts were found.			
<u>SARA 313</u>						
	Product name	<u>CAS number</u>	Concentration			
Form R - Reporting requirements	: benzene	71-43-2	100			
Supplier notification	: benzene	71-43-2	100			
SARA 313 notifications mu	ist not be detached from the MSDS and any c	conving and redistribution of	the MSDS shall			

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations	: Connecticut Carcinogen Reporting: This material is not listed.
	Connecticut Hazardous Material Survey: This material is not listed.
	Florida substances: This material is not listed.
	Illinois Chemical Safety Act: This material is not listed.
	Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
	Louisiana Reporting: This material is not listed.
	Louisiana Spill: This material is not listed.
	Massachusetts Spill: This material is not listed.
	Massachusetts Substances: This material is listed.
	Michigan Critical Material: This material is not listed.

Benzene					
L	Minnesota Hazardous Substances: This material is not listed. New Jersey Hazardous Substances: This material is listed. New Jersey Spill: This material is not listed. New Jersey Toxic Catastrophe Prevention Act: This material is not listed. New York Acutely Hazardous Substances: This material is listed. New York Toxic Chemical Release Reporting: This material is not listed. Pennsylvania RTK Hazardous Substances: This material is listed. Rhode Island Hazardous Substances: This material is not listed.				
		oduct contains a cher ects or other reprodu	mical known to the State uctive harm.	of California to cause	
Ingredient name	<u>Cancer</u>	<u>Reproductive</u>	<u>No significant risk</u> level	<u>Maximum</u> <u>acceptable dosage</u> level	
benzene	Yes.	Yes.		24 μg/day (ingestion) 49 μg/day (inhalation)	
<u>Canada</u>					
WHMIS (Canada)	: Class B-2: Flammable liquid Class D-2A: Material causing other toxic effects (Very toxic). Class D-2B: Material causing other toxic effects (Toxic).				
	CEPA Toxic substances: This material is listed. Canadian ARET: This material is not listed. Canadian NPRI: This material is listed. Alberta Designated Substances: This material is not listed. Ontario Designated Substances: This material is not listed. Quebec Designated Substances: This material is not listed.				

Section 16. Other information

Label requirements	: EXTREMELY FLAMMABLE LIQUID AND VAPOR. FLAMMABLE. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF INHALED OR SWALLOWED. CAUSES RESPIRATORY TRACT AND EYE IRRITATION. MAY CAUSE SKIN IRRITATION. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CAN CAUSE CANCER.			
Hazardous Material Information System (U.S.A.)	Health	* 2		
	Flammability	3		
	Physical hazards	0		
National Fire Protection Association (U.S.A.)	Health 1 0	Flammability Instability Special		

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.