

1. PRODUCT NAME: Benzene
2. CHEMICAL NAME:
3. SYNONYMS:
4. CAS NUMBER: 71-42-2
5. COMPOSITION: Benzene (71-43-2), 99.85%
Other Hydrocarbons (Not available), 0.1-1%

IN CASE OF
TRANSPORT EMERGENCY
CONTACT CHEMTREC
USA: 1-800-424-9300
INTERNATIONAL: 1-703-527-3887

6. PROPERTIES: PHYSICAL STATE AND APPEARANCE: liquid.
COLOR: Colorless
ODOR: Sweet, solvent-like
ODOR THRESHOLD: Detectable at 2-5 ppm, but not reliable as warning.
PH: Not applicable
VAPOR DENSITY: 2.8
VAPOR PRESSURE: 75 mmHg @ 20 c (68 F)
DISPERSION PROPERTIES: Is not dispersed in cold or hot water.
MELTING POINT: 5.5 c (42 F)
BOILING POINT: 80 c (176 F)
SOLUBILITY (H2O): Slightly soluble (0.1 – 0.3 %), rapidly volatilizes
SPECIFIC GRAVITY (Water = 1): 0.88
LONICITY (in water): Not applicable
EVAPORATION RATE (n-Butyl Acetate=1): Not available
OCTANOL/H2O COEFF: KOW = 2.13
PERCENT VOLATILE: 100%
CHEMICAL STABILITY: This is a stable material.
CHEMICAL STABILITY: CONDITIONS TO AVOID: Keep away from heat, sparks, or open flames.
INCOMPATIBILITY: Reactive with oxidizing agents, acids and halogens. May attack and degrade some types of plastics, rubbers and coatings. Vapors may form explosive mixture with air.
HAZARDOUS POLYMERIZATION: Not likely to occur.
CORROSIVITY: Not considered to be corrosive.
HAZARDOUS DECOMPOSITION PRODUCTS: Upon decomposition, this product emits carbon monoxide, carbon dioxide and /or low molecular weight hydrocarbons.

7. HAZARDS: This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication). This material is a controlled product under Canadian WHMIS regulations.
This material is regulated under DOT and TGD as a flammable liquid for transportation.
HAZARD RATINGS:
Health Hazard: HMIS – 2* Fire Hazard: HMIS – 3 Physical Hazard: HMIS – 0
Personal Protection: chemical goggles, gloves, respirator, apron
Hazard Scale: 0 = Minimal 1 = Slight 2 = moderate 3 = Serious 4 = Severe * = Chronic hazard
Health Hazard: NFPA - 2 Fire Hazard: NFPA – 3 Physical Hazard: NFPA – 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe
EMERGENCY OVERVIEW: DANGER: TOXIC! FLAMMABLE! CANCER HAZARD! Product is a clear liquid at room temperature with a sweet, solvent-like odor. Flammable liquid and vapor can accumulate static charge – distant ignition and flashback are possible. Product will float on water and may travel to distant locations and/or spread fire; product vapor is heavier than air and may also spread long distances. This product is considered harmful by inhalation, ingestion, and dermal exposure routes. This product is irritating to the eyes and skin. Excessive inhalation may result in heartbeat irregularities and adverse



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central nervous system effects including headache, sleepiness, dizziness, nausea, loss of coordination, tumors, and in extreme conditions, coma and death. Systemic absorption effects may include long-term damage to the blood-forming system, kidney and liver damage, and/or cancer (leukemia). Ingestion may also cause adverse central nervous system effects, blood disorders, kidney and/or liver damage.

POTENTIAL HEALTH EFFECTS: EYES: Contact with liquid and high concentrations of this product's vapors are irritating to the eyes.

POTENTIAL HEALTH EFFECTS: SKIN: Product may be rapidly absorbed through the skin. Prolonged and/or repeated skin contact may cause mild to severe irritation/dermatitis and chemical blistering. Prolonged contact may also cause skin sensitization and secondary skin infections.

POTENTIAL HEALTH EFFECTS: INGESTION: This product may be harmful if swallowed. Ingestion of this product may result in adverse central nervous system effects including headache, sleepiness, dizziness, nausea, loss of coordination, and in extreme conditions coma and/or death. Ingestion may also cause kidney and liver damage and blood disorders. Small amounts of this product, if aspirated into the lungs, may cause mild to severe pulmonary injury.

POTENTIAL HEALTH EFFECTS: INHALATION: This product may be harmful if inhaled. Excessive inhalation may result in heartbeat irregularities and adverse central nervous system effects including headache, sleepiness, dizziness, nausea, loss of coordination, and in extreme conditions, coma and death. Additional adverse inhalation effects may also include long-term damage to blood-forming system, kidney and liver damage, and/or cancer (leukemia). Small amounts of this product, if aspirated into the lungs, may cause mild to severe pulmonary injury.

8. FIRE FIGHTING FLAMMABILITY CLASS: Flammable

INFORMATION: FLASH POINT: -11.1 C (12 F)

UPPER FLAMMABILITY LIMIT: 7.8% (volume/volume)

FLASH POINT METHOD: Closed cup

LOWER FLAMMABILITY LIMIT: 1.2% (volume/volume)

AUTO IGNITION: 498 C (928 F)

GENERAL FIRE HAZARDS: Fire and container explosion hazards are serious when this product is exposed to heat or flame. Vapors are heavier than air and may travel along the ground to some distant source of ignition and flash back. Consider need for immediate emergency isolation and evacuation for at least 300 meters (1000 feet). If tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions.

EXPLOSION HAZARDS: Vapors may form explosive mixture with air. Keep containers away from source of heat or fire. Containers may explode when involved in a fire. Evacuate personnel to a distance of at least one-half mile (0.8 to 1.6 km) if a fire or rail car, tank car, or major vessel rupture is possible.

HAZARDOUS COMBUSTION PRODUCTS: Upon decomposition, this product emits carbon monoxide, carbon dioxide, and/or low molecular weight hydrocarbons.

EXTINGUISHING MEDIA: Dry chemical, foam, carbon dioxide and water fog. Use of an inert foam extinguishing material may also assist in short term flammable vapor suppression. Use water to cool fire-exposed containers and to protect personnel. Water may be an ineffective extinguishing medium. Monitor water run-off for flammability, and prevent from entering waterways, drains and sewers, or other confined or underground spaces.

FIRE FIGHTING EQUIPMENT/INSTRUCTIONS: Position upwind. Keep unnecessary personnel away. Set up to fight fire at a safe distance. Fire fighters should wear full-face, self-contained breathing apparatus and impervious protective clothing. Fire fighters should avoid inhaling any combustion products. Immediately withdraw in case of fire and tank venting or heat discoloration of a tank. Control runoff water to prevent entry into sewers, drains, underground or confined spaces and waterways.

9. PERSONAL PROTECTION MEASURES: **GENERAL MATERIAL INFORMATION:** Follow all applicable exposure limits. Ensure that eyewash stations and safety showers are proximal to the workstation location. Use non-sparking, grounded ventilation systems separate from other exhaust systems.

ENGINEERING CONTROLS: Provide local and general exhaust ventilation to effectively remove and



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prevent buildup of any vapors or mists generated from the handling of this product. Ensure that eyewash stations and safety showers are proximal to the workstation location. Equipment selection. Equipment selection reviews and preventative maintenance programs (including leak detection and repairs) are recommended practices to minimize potential workplace exposures.

PERSONAL PROTECTIVE EQUIPMENT: EYES/FACE: Wear safety glasses wear chemical goggles if splashing is possible, or to prevent eye irritation from vapors.

PERSONAL PROTECTIVE EQUIPMENT: SKIN/HANDS/FEET: Wear chemically resistant gloves and footwear with good traction to avoid slipping. If splashing or contact with liquid material is possible, consider the need for use of an impervious overcoat. Remove contaminates clothing and before reuse. Fire resistant or natural fiber clothing is recommended. Synthetic clothing can generate static electricity and is not recommended where flammable vapors release may occur.

PERSONAL PROTECTIVE EQUIPMENT: RESPIRATORY: NIOSH approved organic vapor cartridge respirators or SCBA should be used in poorly ventilated areas. Air supplied breathing apparatus must be used when airborne concentrations may exceed the limits of the air purifying respirator used.

PERSONAL PROTECTIVE EQUIPMENT: GENERAL: Personal protective equipment (PPE) must not be considered a long-term solution to exposure control. PPE must be accompanied by employer programs to properly select, maintain, clean, fit and use equipment. Consult a competent industrial hygiene resource, the PPE manufacturer's recommendation, and/or applicable regulations to determine hazard potential and ensure adequate protection.

10. **FIRST AID PROCEDURES:** **FIRST AID: EYES:** Immediately flush eyes with lukewarm water for at least 15 minutes, while holding eyelids open. Remove contact lenses, if worn. Seek medical attention at once.
- FIRST AID: SKIN:** Remove contaminated clothing and immediately wash skin with large amounts of warm water and oil emulsifying soap or shampoo. Seek immediate medical attention if extensive skin exposure has occurred and/or if irritation persists.
- FIRST AID: INHALATION:** Move affected individual to a well-ventilated area as soon as possible. Loosen any restrictive clothing such as a collar, tie, belt or waistband on the individual to facilitate breathing. Seek immediate medical attention if the individual is not breathing. **WARNING:** Contact through mouth-to-mouth resuscitation may pose a secondary risk to the rescuer. Avoid mouth-to-mouth contact by using a mouth shield or guard to perform artificial respiration. Immediately transport affected individual to an emergency facility.
- FIRST AID: INGESTION:** If ingestion occurs and exposed individual is unconscious, maintain an open airway by gently lifting chin and tilting head back. **DO NOT INDUCE VOMITING.** If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Seek immediate medical attention.
- FIRST AID: NOTES TO PHYSICIAN:** An Emergency Medical Response Protocol is available for this product. These are available to first responders and medical personnel. 1-800-561-6682, 1-403-314-8767 (24 hours NOVA Chemicals Emergency Responders) Ensure thorough eye and skin decontamination. Treat unconsciousness, nausea, hypotension, seizures and cardiac arrhythmias in the conventional manner. Aspiration of this product during induced emesis can result in lung injury. If evacuation of stomach contents is considered necessary use the method least likely to cause aspiration, such as gastric lavage after protecting the airway. Observe hospitalized patients for delayed chemical pneumonia, acute tubular necrosis, encephalopathy and dysrhythmias. Monitor for urinary phenol within 72 hours of acute exposure.

11. **EXPOSURE LIMITS:** ACGIH, AIHA, OSHA, NOISH, Alberta, and Ontario exposure limit lists have been checked for those components with CAS registry numbers. Other exposure limits may apply. Check with authorities.
- Benzene (71-43-2):** ACGIH: 0.5 ppm TWA, 2.5 ppm STEL
Skin – potential for cutaneous absorption
AIHA: 150 ppm ERP-2
OSHA: 1 ppm PEL; 5 ppm STEL; 0.5 ppm Action Level (Cancer Hazard, Flammable – see 29 CFR 1910.1028)
NIOSH: 0.1 ppm TWA; 1 ppm STEL



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500 ppm IDLH
Alberta: 1 ppm TWA; 3.2 mg/m³ TWA, 5 ppm STEL; 16
Mg/m³ STEL
Ontario: 1 ppm TWAEV; 5 ppm STEV

12. TOXICOLOGICAL INFORMATION: A: ACUTE TOXICITY – Benzene primarily poses an inhalation exposure hazard. It is absorbed rapidly and extensively following inhalation or ingestion and preferentially distributes into bone marrow and tissues (esp. fat, brain, kidney, liver). Potential adverse health effects include CNS depression, pneumonitis (following aspiration), respiratory failure, coma, and death. Benzene is a skin irritant that is rapidly absorbed through the skin; absorption is more rapid through abraded skin. Aspiration of small amounts of benzene will cause immediate damage to the lungs and death may result.

B: ACUTE TOXICITY – LD50/LC50

BENZENE (71-43-2)

Inhalation LC50 Rat: 10000 mg/kg/7H;

Oral LD50 Rat: 930 mg/kg; Oral LD50 Mouse: 4700 mg/kg;

Dermal LD50 Rabbit: >9400 uL/kg

C: CHRONIC TOXICITY - Bone Marrow is the main target organ of benzene. Long-term overexposure to benzene has been associated with certain types of leukemia in humans. The international Agency for Research on Cancer (IARC) and OSHA identify benzene as a human carcinogen. Chronic exposure to benzene has also been reported to cause adverse blood effects including anemia. Progressive deterioration of hematopoietic function expressed as a decrease in absolute lymphocyte count is the most sensitive indicator of benzene exposure. Benzene may also cause fetotoxicity and teratogenicity. Chromosomal aberrations have been noted in animals tests.

D: CHRONIC TOXICITY – CARINOGENIC EFFECTS: ACGIH, IARC, OSHA, and NTP carcinogen lists have been checked for selected similar materials or those components with CAS registry numbers.

Benzene (71-43-2): ACGIH: A1 – Confirmed Human Carcinogen

OSHA: Present (Regulated Carcinogen); Present (Select Carcinogen)

NTP: Known Carcinogen (Select Carcinogen)

IARC: Supplement 7, 1987; Monograph 29, 1982 (Group 1
(Carcinogenic to humans))

13. ECOLOGICAL INFORMATION: A: GENERAL MATERIAL INFORMATION: Product is largely insoluble in water, and evaporates rapidly. Product has moderate absorption into soil and sediment. It is considered toxic to fish.

B: COMPONENT ANALYSIS – ECOTOXICITY – AQUATIC/TERRESTRIAL

BENZENE (71-43-2): 96 Hr LC50 fathhead minnow: 12.6 mg/L (flow-through); 96 Hr LC50 rainbow trout: 5.3 mg/L (flow-through); 96 Hr LC50 bluegill: 22 mg/L (Static); 48 Hr EC50 water flea: 356 mg/L (Static)

ENVIRONMENTAL FATE/MOBILITY: When released to soil or water, product will rapidly begin to volatilize. At 20 c and moderate wind speeds, the evaporation rate for benzene is calculated to be over 2g per m² per sec.) At 0 c and moderate wind speeds, the evaporation rate is calculated to drop to below 0.1 g per m² per sec.)

MOBILITY: Benzene migrates in soils and in ground waters. Airborne levels of benzene can be reduced by rain or water spray.

PERSISTANCE/DEGRADABILITY: Benzene in air will photo-degrade with a calculated half-life of 13.4 days – this is accelerated in pollutant atmospheres that contain nitrogen or sulfur oxides. By-products include phenol, nitrophenols, nitrobenzene, formic acid and peroxyacetyl nitrite. Benzene will biodegrade in soils and ground waters (half-life 16-28 days) under aerobic conditions. Limited degradation occurs under anaerobic conditions. Sewage treatment plants have been shown to remove 44-100%.

BIOACCUMULATION/ACCUMULATION: Benzene has a reported Kow = 2.13. In fish, metabolites may be detected in fatty tissues, liver, and brain.



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14. DISPOSAL CONSIDERATIONS: A: GENERAL MATERIAL INFORMATION: This product is known to be a hazardous waste according to US RCRA and Canadian regulations. The use, mixing or processing of this material may alter this product. Contact federal, provincial/state and local authorities in order to generate or ship a waste material associated with this product to ensure materials are handled appropriately and meet all criteria for disposal of hazardous waste. Vent to a burning flame at an approved facility. DO NOT ATTEMPT TO DISPOSE OF BY UNCONTROLLED IGNITION.
B: COMPONENT WASTE NUMBERS: Benzene (71-43-2), RCRA: waste number U019 (Ignitable waste, toxic waste) 0.5 mg/L regulatory level.
15. CARCINOGENIC PROPERTIES & NOTIFICATIONS: ACGIH: A1 – Confirmed Human Carcinogen
OSHA: Present (Regulated Carcinogen); Present (Select Carcinogen)
NTP: Known Carcinogen (Select Carcinogen)
IARC: Supplement 7, 1987; Monograph 29, 1982 (Group 1 (Carcinogenic to humans))
Benzene may pose a cancer hazard and may cause adverse birth and reproductive effects. Bone marrow abnormalities, leukemia, multiple myelomas, fetotoxicity, teratogenicity (exencephaly, angulated ribs and dilated brain ventricles) have been linked to benzene exposure.
16. TRANSPORT INFORMATION: US DOT INFORMATION:
SHIPPING NAME: Benzene
UN #: 1114
Hazard class: 3
PACKING GROUP: II
REQUIRED LABELS: Flammable Liquid
ADDITIONAL INFORMATION: NOTE: The Reportable quantity for Benzene is 10 lbs (4.54kg). For shipments, in a single container that exceed the RQ for benzene, the letters RQ must appear in the proper shipping name.
17. HANDLING & STORAGE: HANDLING PROCEDURES: Keep locked up or secured. Handle in fully grounded, properly designed equipment systems suitable for flammable liquids. Collect and flare vents. Keep away from heat, ignition sources and incompatible materials such as oxidizing agents and acids. No smoking or open flames permitted in storage, use, or handling areas. Dissipate static electricity during transfer by grounding and bonding containers and equipment. Take special precautions when cold cutting or breaking into lines, or when cleaning and disposing of empty containers. Do not breathe product gas, fumes, vapor, or spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately. Avoid contact with skin and eyes. Always wash hands thoroughly with soap and water after handling.
INCOMPATIBILITY: Reactive with oxidizing agents, acids and halogens. May attack and degrade some types of plastics, rubbers and coatings. Vapors may form explosive mixture with air.
STORAGE PROCEDURES: Storage area should be clearly identified, well-illuminated, clear of obstruction and accessible only to trained and authorized personnel. Store in grounded, properly designed vessels and away from incompatible materials. Store and use away from heat, sparks, open flame, or any other ignition source. Keep absorbents for leaks and spills readily available. Store according to applicable regulations for flammable materials for storage tanks, containers, piping, buildings, rooms, cabinets, allowable quantities and minimum storage distances. Have appropriate extinguishing capability in storage area (e.g. sprinkler system, portable fire extinguishers, flammable gas detectors). Equip storage tank vents with a flame arrestor. Inspect vents during winter conditions for vapor ice build-up. Storage tanks should be above ground and diked to hold entire contents. A refrigerated room is generally recommended for warehouse storage of materials with a flash point lower than 37.8 c (100 F).
18. ACCIDENTAL RELEASE EVACUATION PROCEDURES: Isolate area. Keep unnecessary away. Ground all approved equipment used in area. Alert stand-by emergency and fire fighting personnel.



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MEASURES: **SMALL SPILLS:** Eliminate ignition sources. Spill or leak area should be isolated immediately for 25 to 50 meters (80 to 160 feet) in all directions. Keep upwind and out of low areas. Stop discharge if safe to do so. Contain discharge by booming on water or diking on ground. Spills on water will volatilize rapidly, making containment or recovery difficult. Remove liquid material with non-sparking approved pumps, skimmers or vacuum equipment. Absorb/adsorb residual materials and clean up with non-sparking tools. Prevent entry into sewers, drains, underground or confined spaces, water intakes and waterways.

LARGE SPILLS: Consider downwind evacuation for 300 meters (1000 feet). Isolate, contain, and attempt to recover. Absorb with DRY earth, sand or other non-combustible material. Prevent entry into sewers, drains, underground or confined spaces, water intakes and waterways. An inert foam cover material may assist in short term vapor suppression.

SPECIAL PROCEDURES: Contact local police/emergency services and appropriate emergency telephone numbers provided. Ensure that statutory reporting requirements in the applicable jurisdiction are met. Wear appropriate protective equipment and clothing during clean-up. Individuals without appropriate protective equipment should be excluded from area of spill until clean-up has been completed. Wear appropriate protective equipment and clothing during clean-up.

19. REGULATORY INFORMATION: A: INTERNATIONAL REGULATIONS:

COMPONENT ANALYSIS – INTERNATIONAL INVENTORY STATUS:

COMPONENT	CAS#	US-TSCA	CANADA-DSL	EU EINECS
Benzene:	71-43-2	Yes	Yes	Yes

B: USA FEDERAL & STATE REGULATIONS: Ongoing occupational hygiene, medical surveillance programs may be required by Federal or State regulations. Check for applicable regulations.

USA OSHA HAZARD COMMUNICATIONS CLASS: HCS Class: Flammable liquid IB having a flash point lower than 22.8 c (73 F) and having a boiling point at or above 37.8 c (100 F). Highly toxic. Human Carcinogen. Irritating substance. Target organ effects.

USA RIGHT-TOKNOW – FEDERAL: This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4). Benzene (71-43-2): SARA 313: 0.1 percent de minimis concentration. CERCLA: 10lb final RQ (receives an adjustable RQ of 10 lbs based on potential carcinogenicity in August 14, 1989 final rule); 4.54 kg final RQ (receives an adjustable RQ of 10 lbs based on potential carcinogenicity in August 14, 1989 final rule)

USA RIGHT-TO-KNOW – STATE: The following components appear on one or more of the following state hazardous substances lists. Some components (including those percent only in trace quantities, and therefore not listed in this document) may be included on the Right To Know lists of other U.S states. The reader is therefore cautioned to contact his or her NOVA Chemicals representative or NOVA Chemicals' Product Integrity group for further U.S State Right To Know information. Benzene (71-43-2): NJ – Yes, PA – Yes

The following statements are provided under the California Safe Drinking Water and toxic Enforcement Act of 1986 (Proposition 65): **WARNING!** This product contains a chemical known to the state of California to cause cancer. **WARNING!** This product contains a chemical known to the state of California to cause reproductive/developmental effects.

C: CANADIAN REGULATIONS – FEDERAL AND PROVINCIAL:

WHMIS INGREDIENT DISCLOSURE LIST (IDL): The following components are identified under the Canadian hazardous Products Act Ingredient Disclosure List (IDL):

Benzene (71-43-2) Minimum Concentration: 0.1% (English Item 153, French Item 277)

WHMIS CLASSIFICATION: Workplace Hazardous Materials Information Systems (WHMIS): This product has been classified in accordance with the hazard criteria of the Canadian Controlled Product Regulations (CPR), and the MSDS contains all of the information required by the CPR.

WHMIS Class B2: Flammable liquid with a flash point lower than 37.8 c (100 F).

WHMIS Class D2A: Carcinogen (Benzene)

WHMIS Class D2B: Material causing other toxic effects.

PROVINCIAL REGULATIONS : Ongoing occupational hygiene, medical surveillance programs may be required by Provincial regulations. Check for applicable regulations.