



# MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

## 1. PRODUCT IDENTIFICATION

**CHEMICAL NAME; CLASS:** NON-FLAMMABLE GAS MIXTURE

Containing One or More of the Following Components in a Nitrogen  
Balance Gas: Benzene, 0.0005-0.005%; Oxygen, 0-23.5%

**SYNONYMS:** Not Applicable  
**CHEMICAL FAMILY NAME:** Not Applicable  
**FORMULA:** Not Applicable  
**Document Number:** 50059

**Note:** The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

<b>PRODUCT USE:</b>	Calibration of Monitoring and Research Equipment
<b>SUPPLIER/MANUFACTURER'S NAME:</b>	CALGAZ
<b>ADDRESS:</b>	821 Chesapeake Drive Cambridge, MD 21613
<b>EMERGENCY PHONE:</b>	CHEMTREC: 1-800-424-9300
<b>BUSINESS PHONE:</b>	1-410-228-6400
General MSDS Information:	1-713/868-0440
Fax on Demand:	1-800/231-1366

## 2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA		IDLH ppm	OTHER ppm
			TLV ppm	STEL ppm	PEL ppm	STEL ppm		
Benzene	71-43-2	0.0005 - 0.005%	10 A1, Confirmed Human Carcinogen	NE	1	5	500	NIOSH REL: 0.1 ppm TWA; 1 ppm STEL OSHA Action Level: 0.5 ppm EPA-A; IARC-1; MAK-A1; NIOSH-X; NTP-1; OSHA-X
Oxygen	7782-44-7	0 - 23.5%	There are no specific exposure limits for Oxygen.					
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.  
NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

## 3. HAZARD IDENTIFICATION

**EMERGENCY OVERVIEW:** This is a colorless, odorless gas mixture. A component of this gas mixture, Benzene, is a known human carcinogen and a possible human mutagen. Inhalation of vapors of Benzene can cause central nervous system effects and serious, permanent damage to the blood system (even at relatively low concentrations). Additionally, releases of this product may produce oxygen-deficient atmospheres (especially in small confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated.

**SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE:** The most significant route of overexposure for this product is by inhalation.

**INHALATION:** Due to the small size of an individual cylinder of this product, no unusual health effects from overexposure to the product are anticipated under routine circumstances of use. A possible health effect associated with inhalation of this gas mixture is the potential for exposures to Benzene. Long-term exposures to Benzene at relatively low vapor concentrations can cause blood system disorders. There are reports that exposure to low levels (10 ppm) over an extended period (24 weeks) of Benzene vapors can damage the bone marrow and blood systems. This damage can result in the development of serious health disorders (including anemia and leukemia). Adverse health effects on the immune system have also been reported. Refer to "Other health Effects" in this section for further information. The specific effects associated with various levels of Benzene vapors are as follows:

HAZARDOUS MATERIAL INFORMATION SYSTEM	
HEALTH (BLUE)	2
FLAMMABILITY (RED)	0
REACTIVITY (YELLOW)	0
PROTECTIVE EQUIPMENT	B
EYES      RESPIRATORY      HANDS      BODY	
See Section 8	
For routine industrial applications	

### 3. HAZARD IDENTIFICATION (Continued)

**EFFECTS OF OVER-EXPOSURES TO BENZENE:**

CONCENTRATION	OBSERVED EFFECT
Brief (10 minute) up to 25 ppm:	No symptoms.
50-150 ppm:	Exhilaration, headache, tiredness, nose and throat irritation.
Long term:	Can cause chronic blood abnormalities (chronic exposures of 30-200 ppm). Low chronic exposures (<1.4 ppm) have not produced any blood effects.

Additionally, releases of this product may produce oxygen-deficient atmospheres (especially in small confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated.

**OTHER POTENTIAL HEALTH EFFECTS:** The chief target organ affected by serious exposure to Benzene, a component of this product, is the blood and bone marrow system. Chronic Benzene exposure eventually leads to pancytopenia (abnormal decrease of all three formed elements of the blood; hemoglobin, disease-fighting leukocytes and blood-clotting thrombocytes), followed by thrombocytopenia (problems with the blood-clotting properties of the blood) and anemia. These syndromes can lead to sudden, overwhelming infections. After over-exposure to Benzene, bleeding from the nose, gums, or mucous membranes and development of small bruises can occur. Benzene is a known human carcinogen and can produce forms of leukemia.

**HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms.** Overexposure to this gas mixture may cause the following health effects:

**ACUTE:** Due to the small size of the individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. Inhalation of this product's vapors can cause headaches, nausea, dizziness, and drowsiness. Severe inhalation overexposures may be fatal, due to asphyxiation.

**CHRONIC:** Chronic exposure to Benzene (a component of this product) causes serious damage to the health by all routes of exposure. Chronic oral and inhalation exposure causes severe effects on the blood system (e.g., damage to the bone marrow). Effects can occur with an exposure level as low as 10 ppm for 24 weeks. Benzene also causes harmful changes to the immune system, decreasing the production of mature B- and T- white blood cells. Benzene is a confirmed human carcinogen, which can produce Hodgkin's Disease, leukemia and lymphomas by inhalation. Benzene is a potential reproductive toxin. Refer to Section 11 (Toxicological Information) of this MSDS for further information.

**TARGET ORGANS:** Respiratory system, blood system, central nervous system, reproductive system.

### 4. FIRST-AID MEASURES

**RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn.**

No unusual health effects are anticipated after exposure to this product, due to the small cylinder size. If any adverse symptom develops after overexposure to this product, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary.

Victim(s) who experience any adverse effect after overexposure to this product must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

### 5. FIRE-FIGHTING MEASURES

**FLASH POINT:** Not applicable.

**AUTOIGNITION TEMPERATURE:** Not applicable.

**FLAMMABLE LIMITS (in air by volume, %):**

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

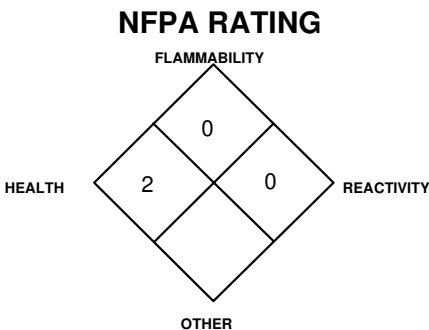
**FIRE EXTINGUISHING MATERIALS:** Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire. Fire-fighters should be aware of the presence of Benzene in this gas mixture, which can cause significant health effects.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Not Sensitive.

**SPECIAL FIRE-FIGHTING PROCEDURES:** Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.



### 6. ACCIDENTAL RELEASE MEASURES

**LEAK RESPONSE:** Due to the small size and content of the cylinder, an accidental release of this product presents significantly less risk of an oxygen-deficient environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area and protect people.

For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors. Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen, and Benzene. Benzene levels must be below exposure level listed in Section 2 (Composition and Information on Ingredients) before non-emergency personnel are allowed to re-enter area.

If leaking incidentally from the cylinder or its valve, contact your supplier.

## 7. HANDLING and USE

**WORK PRACTICES AND HYGIENE PRACTICES:** Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this product could occur without any significant warning symptoms, due to oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify the cylinders containing this mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately. Avoid breathing vapors or mists generated by this product.

**WORK PRACTICES AND HYGIENE PRACTICES (continued):** Note: Refer to the OSHA Benzene Standard (29 CFR 1910.1028) for specific requirements associated with the use of this product. The Action Level for Benzene is 0.5 ppm as an 8-hour, time-weighted average. In workplaces where employees are exposed above the Action Level, the OSHA requirements for monitoring, establishment of regulated areas, methods of compliance, respiratory protection, emergency response protocol, medical surveillance, training and record keeping must be followed.

**STORAGE AND HANDLING PRACTICES:** Entrances to regulated areas (as defined by the OSHA Benzene Standard) must be posted with signs which reads as follows:

**DANGER**  
**BENZENE**  
**CANCER HAZARD**  
**AUTHORIZED PERSONNEL ONLY**

All employees who handle this material should be trained to handle it safely. Avoid breathing vapors or mists generated by this product. Use in a well-ventilated location. Cylinders of this product must be properly labeled. Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C, 70°F). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage.

Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

**SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING!** Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

**PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:** Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

## 8. EXPOSURE CONTROLS - PERSONAL PROTECTION

**VENTILATION AND ENGINEERING CONTROLS:** No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this product in well-ventilated areas. If this product is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Benzene and oxygen.

**RESPIRATORY PROTECTION:** No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if Benzene levels exceed limits given in Section 2 (Composition Information on Ingredients) and oxygen levels are below 19.5% or unknown during emergency response to a release of this product. If respiratory protection is required for emergency response to this product, follow the requirements of the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, or the appropriate requirements of Canada and its Provinces. For additional information, the NIOSH recommended protection guidelines for Benzene are provided as follows.

**NIOSH/OSHA RECOMMENDATIONS FOR BENZENE CONCENTRATIONS IN AIR:**

**AT CONCENTRATIONS ABOVE THE NIOSH REL, OR WHERE THERE IS NO REL, AT ANY DETECTABLE CONCENTRATION:** Positive pressure, full-facepiece Self Contained Breathing Apparatus or positive pressure, full-facepiece supplied-air respirator Supplied-air respirator with an auxiliary positive pressure Self Contained Breathing Apparatus

**ESCAPE:** Air-purifying Full-facepiece respirator or escape-type Self Contained Breathing Apparatus.

**Note:** Follow the specific respiratory selection guidelines of the OSHA Benzene Standard in regulated areas (as defined by 29 CFR 1910.1028).

**EYE PROTECTION:** Safety glasses.

**HAND PROTECTION:** No special protection is needed under normal circumstances of use.

**BODY PROTECTION:** No special protection is needed under normal circumstances of use.

## 9. PHYSICAL and CHEMICAL PROPERTIES

Unless otherwise specified, the following information is for Nitrogen, the main component of this gas mixture.

**GAS DENSITY @ 0°C (32°F) and 1 atm:** .072 lb./ ft<sup>3</sup> (1.153 kg/m<sup>3</sup>)

**BOILING POINT:** -320.4°F (-195.8°C)

**FREEZING/MELTING POINT @ 10 psig** -210°C (-345.8°F)

**SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F):** 0.906

**SOLUBILITY IN WATER vol/vol @ 0°C (32°F) and 1 atm:** 0.023

**EVAPORATION RATE (nBuAc = 1):** Not applicable.

**ODOR THRESHOLD:** Not applicable. Odorless.

**VAPOR PRESSURE @ 70°F (21.1°C) psig:** Not applicable.

**COEFFICIENT WATER/OIL DISTRIBUTION:** Not applicable.

**pH:** Not applicable.

**MOLECULAR WEIGHT:** 28.01

**EXPANSION RATIO:** Not applicable.

**SPECIFIC VOLUME (ft<sup>3</sup>/lb):** 13.8

The following information is for this gas mixture.

**APPEARANCE AND COLOR:** This product is a colorless, odorless gas mixture.

**HOW TO DETECT THIS SUBSTANCE (warning properties):** There are no unusual warning properties associated with a release of this gas mixture.

## 10. STABILITY and REACTIVITY

**STABILITY:** Normally stable in gaseous state.

**DECOMPOSITION PRODUCTS:** The thermal decomposition products of Benzene (a component of this product) include toxic fumes of carbon monoxide, carbon dioxide, irritating aldehydes and ketones. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

**MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE:** Titanium will burn in Nitrogen (the main component of this product). Lithium reacts slowly with Nitrogen at ambient temperatures. Benzene is incompatible with strong oxidizing materials and strong acids, and may attack rubber and plastics.

**HAZARDOUS POLYMERIZATION:** Will not occur.

**CONDITIONS TO AVOID:** Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

## 11. TOXICOLOGICAL INFORMATION

**TOXICITY DATA:** The following toxicology data are available for the components of this product:

### **BENZENE:**

Skin-Rabbit, adult 15 mg/24 hours open  
Mild irritation effects  
Skin-Rabbit, adult 20 mg/24 hours  
Moderate irritation effects  
Eye effects-Rabbit, adult 88 mg  
Moderate irritation effects  
Eye effects-Rabbit, adult 2 mg/24H  
Severe irritation effects  
oms-Human: lymphocyte 5 µmol/L  
Microsomal Mutagenicity Assay-  
Mouse: embryo 2500 mg/L  
Oral-Mouse TDLo: 6500 mg/kg (female  
8-12 days post): Reproductive  
effects Teratogenesis,  
Carcinogenesis, and Mutagenesis  
Inhalation-Mouse TCLo: 5 ppm (female  
6-15 days post): Teratogenic effects  
Inhalation-Man TCLo: 200 mg/m<sup>3</sup>/78  
weeks -intermittent: Carcinogenic  
effects, Blood effects  
Inhalation-Human TCLo: 10 ppm/8  
hours /10 years-intermittent:  
Carcinogenic effects, Blood effects  
Oral-Rat TDLo: 52 g/kg/52 weeks -  
intermittent: Carcinogenic effects

### **BENZENE (continued):**

Inhalation-Rat TCLo: 1200 ppm/6  
hours/10 weeks - intermittent:  
Equivocal tumorigenic agent  
Oral-Mouse TDLo :18,250 mg/kg/2  
years - continuos: Carcinogenic  
effects  
Inhalation-Human TC :8 ppb/4 weeks-  
intermittent: Carcinogenic effects,  
Blood effects  
Inhalation-Dog, adult LCLo: 146,000  
mg/L  
Inhalation-Cat, adult LCLo: 170,000  
mg/m<sup>3</sup>  
Inhalation-Human TC: 10 mg/m 3/11  
years- intermittent: Carcinogenic  
effects, Blood effects  
Inhalation-Mouse TCLo: 300 ppm/6  
hours/16 weeks-intermittent:  
Equivocal tumorigenic agent  
Skin-Mouse TDLo: 1200 g/kg/49 weeks  
- intermittent: Neoplastic effects  
Intraperitoneal-Mouse TDLo: 1200  
mg/kg/8 weeks - intermittent:  
Neoplastic effects  
Subcutaneous-Mouse TDLo 600  
mg/kg/17 weeks - intermittent:  
Equivocal tumorigenic agent

### **BENZENE (continued):**

Parenteral-Mouse TDLo: 670 mg/kg/19  
weeks - intermittent: Equivocal  
tumorigenic agent  
Inhalation-Human TC: 150 ppm/15  
minutes /8 years - intermittent:  
Carcinogenic effects, Blood effects  
Oral-Rat TD: 52 g/kg/1 years -  
intermittent: Carcinogenic effects  
Oral-Rat TD: 10 g/kg/52 weeks -  
intermittent: Carcinogenic effects  
**BENZENE (continued):**  
Inhalation-Man TC :600 mg/m<sup>3</sup>/4 years -  
intermittent: Carcinogenic effects,  
Blood effects  
Inhalation-Man TC: 150 ppm/11 years -  
intermittent: Carcinogenic effects,  
Blood effects  
Inhalation-Mouse TC :1200 ppm/6  
hours/10 weeks - intermittent:  
Equivocal tumorigenic agent  
Oral-Mouse TD: 2400 mg/kg/8 weeks -  
intermittent: Neoplastic effects

**NITROGEN:** There are no specific  
toxicology data for Nitrogen. Nitrogen  
is a simple asphyxiant.

**SUSPECTED CANCER AGENT:** The components of this product are listed as follows (and are therefore considered to be, or suspected to be, cancer-causing agents):

**BENZENE:** ACGIH-A1 (Confirmed Human Carcinogen); EPA-A (Human Carcinogen); IARC-1 (Carcinogenic to Humans); MAK-A1 (Capable of Inducing Malignant Tumors/Experience with Humans); NIOSH-X (Carcinogen); NTP-1 (Known to be a Carcinogen); OSHA-X (Carcinogen); Cal-OSHA (Carcinogen).

The other components of this gas mixture are not found on the following lists: U.S. FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

**IRRITANCY OF PRODUCT:** This gas mixture is not expected to be irritating to humans.

**SENSITIZATION OF PRODUCT:** The components of this gas mixture are not sensitizers after prolonged or repeated exposures.

**REPRODUCTIVE TOXICITY INFORMATION:** Listed below is information concerning the effects of this gas mixture on the human reproductive system.

**Mutagenicity:** This gas mixture is not expected to cause mutagenic effects in humans. Human mutation data are available for the following component of this product: Benzene. These data were obtained from individuals who were exposed at levels which produced changes in the blood system.

**Embryotoxicity:** This gas mixture is not expected to cause embryotoxic effects in humans.

**Teratogenicity:** This gas mixture is not expected to cause teratogenic effects in humans due to the small cylinder size and small total amount of all components. Teratogenic data are available from clinical studies involving test animals exposed to relatively high doses of Benzene (a component of this product). Fetotoxic effects (i.e., reduced birth weight and/or minor skeletal variations) were observed at exposures above 50 ppm.

**Reproductive Toxicity:** This gas mixture is not expected to cause adverse reproductive effects in humans. Data on reproductive effects are available from clinical studies involving test animals exposed to relatively high doses to the following component of this product: Benzene. These data were obtained at doses which caused toxic effects on other organs.

*A **mutagen** is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An **embryotoxin** is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A **teratogen** is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A **reproductive toxin** is any substance which interferes in any way with the reproductive process.*

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** Pre-existing respiratory conditions and other disorders involving the "Target Organs" (See Section 3, Hazard Identification) may be aggravated by overexposure to this product.

**RECOMMENDATIONS TO PHYSICIANS:** Treat symptoms and eliminate overexposure. Refer to the OSHA Benzene Standard (29 CFR 1910.1028; paragraph (i) and Appendix C) for specific information on Medical Surveillance requirements (i.e. for the general physical exam, medical history, specific tests and re-examination protocol).

**ACGIH BIOLOGICAL EXPOSURE INDICES (BEIs):** ACGIH Biological Exposure Indices (BEIs) are currently applicable for Benzene (a component of this gas mixture).

11. TOXICOLOGICAL INFORMATION (Continued)

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
BENZENE <ul style="list-style-type: none"><li>• Total phenol in urine</li><li>• Benzene in exhaled air:<ul style="list-style-type: none"><li>mixed-exhaled</li><li>end-exhaled</li></ul></li></ul>	<ul style="list-style-type: none"><li>• End of shift</li><li>• Prior to next shift</li></ul>	<ul style="list-style-type: none"><li>• 50 mg/g creatinine</li><li>• 0.08 ppm</li><li>• 0.12 ppm</li></ul>

12. ECOLOGICAL INFORMATION

**ENVIRONMENTAL STABILITY:** The components of this material will be degraded over time into other organic compounds. The following environmental data are available for the components of this product.

**Benzene:** K<sub>OW</sub> = 2.13. Water Solubility = 1791 mg/L. BCF (*Anguilla japonica*, eels) = 3.5. BCF (*Clupea harengus Pallasi*, pacific herring) = 4.4. BCF (goldfish) = 4.3. BCF, benzene = 24 (estimated). If benzene is released into the soil, it will be volatilized near the surface or it will leach to the groundwater. No degradation of benzene (BOD) was reported in coarse-filtered Superior harbor water incubated at 21°C for 12 days. In the marine eco-system, biodegradation occurs from 2 days to 2 weeks in the summer and spring, respectively. The half-life of Benzene in estuarine water was 6 days, as measured by <sup>14</sup>CO<sub>2</sub> produced. Biodegradation half-lives of 28 and 16 days were reported in die-away tests for degradation of up to 3.2 UL/L benzene using groundwater and Lester River water, respectively, under aerobic conditions. In a base-rich para-brownish soil, 20 ppm benzene was 24% degraded in one week, 44% in 5 weeks and 47% in 10 weeks. It is not expected to adsorb to sediment nor bioconcentrate in aquatic organisms.

**EFFECT OF MATERIAL ON PLANTS or ANIMALS:** This product may be harmful or fatal to contaminated plant and animal-life (especially if large quantities of this product are released). Refer to Section 11 (Toxicology Information) for specific information on this products effects on animal life. The following information is available for the components of this product:

**BENZENE:**  
Benzene is lethal to plants at high concentrations (GT 15600 ppm in air) and short (30 minutes) exposure times. In all species studied recovery was complete upon removal from exposure to sub-lethal concentrations.  
Plant growth and rooting is stimulated by aqueous solutions of low benzene concentrations (0.01-0.10 saturated). Aqueous solutions containing high concentrations (0.10-0.15% Benzene) inhibit growth and interfere with metabolism and cell division.

**EFFECT OF CHEMICAL ON AQUATIC LIFE:** This gas mixture may be harmful or fatal to contaminated aquatic plant and animal life. The following aquatic toxicity data are available for the components of this product.

<b>BENZENE:</b> LC <sub>100</sub> ( <i>Tetrahymena pyriformis</i> , ciliate) = 12.8 mmol/L/ 24 hours LC <sub>50</sub> ( <i>Palaemonetes pugio</i> , grass shrimp) = 27 ppm/ 96 hours LC <sub>50</sub> ( <i>Cancer magister</i> , crab larvae, stage 1) = 108 ppm/ 96 hours LC <sub>50</sub> ( <i>Crangon franciscorum</i> , shrimp) = 20 ppm/ 96 hours LC <sub>50</sub> ( <i>Poecilia reticulata</i> , guppy) = 63 mg/L/ 14 days LC <sub>50</sub> ( <i>Morone saxatilis</i> , bass) = 5.8B10.9 ppm/ 96 hours LC <sub>50</sub> ( <i>Salmo trutta</i> , brown trout yearling) = 12 mg/L/ 1 hour LC <sub>50</sub> ( <i>Ambystoma mexicana</i> , mexican axototl salamander, 3-4 weeks after hatching) = 370 mg/L/ 48 hours LC <sub>50</sub> (clawed toad, 3-4 weeks after hatching) = 190 mg/L/ 48 hours LD <sub>50</sub> ( <i>Carassium auratus</i> , goldfish) = 46 mg/L/ 24 hours	<b>BENZENE (continued):</b> LC <sub>100</sub> ( <i>Lepomis macrochirus</i> , bluegill sunfish) = 60 mg/L/ 2 hours LC <sub>100</sub> ( <i>Lepomis macrochirus</i> , bluegill sunfish) = 34 mg/L/ 24 hours LC <sub>50</sub> ( <i>Lepomis macrochirus</i> , bluegill sunfish) = 20 mg/L/ 24B48 hours TLm ( <i>Artemia salina</i> , brine shrimp) = 66B21 mg/L/ 24 hours LC <sub>50</sub> ( <i>Pimephales promelas</i> , fathead minnow) = 33.5B35.5 mg/L/ 24B96 hours (soft water) LC <sub>50</sub> ( <i>Pimephales promelas</i> , fathead minnow) = 24.4B32 mg/L/ 24B96 hours (hard water) TLm (bluegill) = 22.5 mg/L/ 24 hours (soft water) LC <sub>50</sub> ( <i>Carassium auratus</i> , goldfish) = 34.4 mg/L / 24B96 hours (soft water) TLm ( <i>Lebistes reticulata</i> , guppy) = 36.6 mg/L/ 24 hours, 96 hours (soft water)	<b>BENZENE (continued):</b> LC <sub>50</sub> ( <i>Gambusia affinis</i> , mosquito fish) = 395 mg/L/ 24B96 hours LC ( <i>Daphnia magna</i> ) highest no adverse level = 98 mg/L Effect level (blue crab) = 1 mg/L EC <sub>50</sub> (freshwater green algae, <i>Ankistrodesmus falccatus</i> ) = 310 mg (3.97 mmol/L) Photosynthetic carbon fixation ( <i>selenastrum capricornutum</i> ) = 100, 95, 84, 5; for 24 hour exposure to 0, 10, 100 Or 1000 mg Benzene/L Growth inhibition ( <i>Chlorella vulgaris</i> ) = significant for 25-1744 ppm Benzene Light saturated photosynthesis relative rates ( <i>Nitzschia palea</i> , freshwater diatom) = 100, 61, 38, 13; exposure for 2 hours to 0, 175, 350, 520 mg Benzene/L Growth inhibition ( <i>Skeletonema costatum</i> ) = at 20 mg/L
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13. DISPOSAL CONSIDERATIONS

**PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL:** Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations, or the applicable standards of Canada and its Provinces. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

**THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.**

**PROPER SHIPPING NAME:** Compressed gases, n.o.s. (Oxygen, Nitrogen)  
**HAZARD CLASS NUMBER and DESCRIPTION:** 2.2 (Non-Flammable Gas)  
**UN IDENTIFICATION NUMBER:** UN 1956  
**PACKING GROUP:** Not applicable.  
**DOT LABEL(S) REQUIRED:** Non-Flammable Gas  
**NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996):** 126

**MARINE POLLUTANT:** The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

**SPECIAL SHIPPING INFORMATION:** Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

**Note:** DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

**TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:** THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

**ADDITIONAL U.S. REGULATIONS:**  
**U.S. SARA REPORTING REQUIREMENTS:** Benzene is subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL	SARA 302	SARA 304	SARA 313
Benzene	NO	YES	YES

**U.S. SARA THRESHOLD PLANNING QUANTITY:** Not applicable.  
**U.S. CERCLA REPORTABLE QUANTITY (RQ) :** Benzene = 10 lb.  
**U.S. TSCA INVENTORY STATUS:** The components of this product are on the U.S. TSCA Inventory.  
**OTHER U.S. FEDERAL REGULATIONS:**

- Benzene is subject to the requirements of CFR 29 1910.1000. Benzene is listed on Table Z.2.
- Benzene is subject to the requirements of CFR 29 1910.1028, the OSHA Benzene Standard. The Action Level for Benzene is 0.5 ppm as an 8-hour, time-weighted average under this regulation.
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- The EPA is promulgating water regulations for certain volatile synthetic organic chemicals. Specifically, this notice promulgates a maximum contaminant level for Benzene at 0.005 mg/L.
- Nitrogen and Oxygen are not listed as Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Benzene is listed under this regulation in Table 3 as a Regulated Substance (Flammable Substances), in quantities of 10,000 lb. (4,553 kg) or greater, and so this mixture will not be affected by the regulation.

**U.S. STATE REGULATORY INFORMATION:** The components of this gas mixture are covered under the following specific State regulations:

<b>Alaska - Designated Toxic and Hazardous Substances:</b> Benzene.	<b>Michigan - Critical Materials Register:</b> No.	<b>Pennsylvania - Hazardous Substance List:</b> Oxygen, Benzene, Nitrogen.
<b>California - Permissible Exposure Limits for Chemical Contaminants:</b> Nitrogen, Benzene.	<b>Minnesota - List of Hazardous Substances:</b> Benzene.	<b>Rhode Island - Hazardous Substance List:</b> Oxygen, Nitrogen, Benzene.
<b>Florida - Substance List:</b> Oxygen, Benzene.	<b>Missouri - Employer Information/Toxic Substance List:</b> Benzene.	<b>Texas - Hazardous Substance List:</b> Benzene.
<b>Illinois - Toxic Substance List:</b> Benzene.	<b>New Jersey - Right to Know Hazardous Substance List:</b> Oxygen, Nitrogen, Benzene.	<b>West Virginia - Hazardous Substance List:</b> Benzene.
<b>Kansas - Section 302/313 List:</b> Benzene.	<b>North Dakota - List of Hazardous Chemicals, Reportable Quantities:</b> Benzene.	<b>Wisconsin - Toxic and Hazardous Substances:</b> Benzene.
<b>Massachusetts - Substance List:</b> Oxygen, Benzene.		

**CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):** Benzene (a component of this product) is on the California Proposition 65 lists as a chemical known to the State of California to cause birth defects or other reproductive harm. **WARNING:** This product contains a chemical that is known to the State of California to cause cancer and other birth defects or other reproductive harm.

**ADDITIONAL CANADIAN REGULATIONS:**  
**CANADIAN DSL/NDSL INVENTORY STATUS:** The components of this product are on the Canadian DSL Inventory.  
**OTHER CANADIAN REGULATIONS:** Not applicable.  
**CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS:** The components of this product are not on the CEPA Priorities Substances Lists.  
**CANADIAN WHMIS CLASSIFICATION:** This gas mixture is categorized as a Controlled Product, Hazard Classes A and D2A, as per the Controlled Product Regulations.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. CALGAZ will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

**MIXTURES:** When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1	"Safe Handling of Compressed Gases in Containers"
AV-1	"Safe Handling and Storage of Compressed Gases"
	"Handbook of Compressed Gases"

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This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this product. To the best of CALGAZ knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this product is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.