1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE OF THE COMPANY/UNDERTAKING

1.1 Product Identifiers

Product name: Benzene
Company name: HCS Scientific & Chemcial Pte Ltd
Telephone no: (+65) 6777 7077
Email: reactivo@hcs-lab.com

2. HAZARDS IDENTIFICATION

2.1 GHS Classification

Flamable liquid: category 2
Skin irritation: category 2
Eye irritation: (Category 2)
Germ cell mutagenicity: (Category 1B)
Carcinogenicity: (Category 1A)
Aspiration hazard: (Category 1)

2.2 Symbol (s)

Signal Word: Danger

Hazard statements:
H225 - Highly flammable liquid and vapour.
H304 - May be fatal if swallowed and enters airways.
H340 - May cause genetic defects.
H350 - May cause cancer.

Precautionary statements: **Prevention:**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ ventilating/ lighting/ equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wash skin thoroughly after handling.

2.3 Response:

IF SWALLOWED:	immediately call a poison center or doctor/physician. ***DO NOT*** induce vomiting.
IF ON SKIN:	Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED:	Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES:	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to continue rinsing.
STORAGE:	Store in a well ventilated place and locked up
DISPOSAL:	Dispose of contents/ container to an approved waste disposal plant. Restricted to professional users.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS No.	Percent	Molecular Formula
Benzene	71-43-2	>99%	C_6H_6

4. FIRST-AID MEASURES

4.1 General advice: When symptoms persist or in all cases of doubt seek medical advice

4.2 Inhalation: Remove victim to fresh air. If cough or other respiratory symptoms develop, get medical attention. If not breathing, give artifcial respiration. If breathing is difficult, give oxygen. Call a physician.

4.3 Skin contact: Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Wash contaminated clothing before re-use. If skin irritation persists, call a physician.

4.4 Eye contact: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lift upper and lower eyelids. Get medical attention if irritation persists.

4.5 Ingestion: Rinse mouth out with plenty of water. Do not induce vomiting. If vomiting occurs spontaneously, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus. Never give anything by mouth to an unconscious or convulsing person. Get medical attention immediately.

5. FIREFIGHTING MEASURES

5.1 General information

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. Extremely flammable liquid and vapor. Vapor may cause flash fire. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.

5.2 Suitable extinguishing media

Use water spray, dry chemical, carbon dioxide, or appropriate foam.

5.3 Flash point

-11 °C (12.20 °F)

5.4 Auto ignition temperature

498 °C (928.40 °F)

5.5 Explosion limits

Lower: 1.3 vol %

Upper: 7.1 vol %

5.6 NFPA Rating (estimated)

Health: 2
Falmmability: 3
Instability: 0

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use proper personal protective equipment as indicated in Section 8.

6.2 Spills/Leaks

Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Provide ventilation. Approach spill from upwind. Use water spray to cool and disperse vapors, protect personnel, and dilute spills to form nonflammable mixtures.

7. HANDLING AND STORAGE

7.1 Handling

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor.

7.2 Condition for safe storage, including any incompatibilities

Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

8.1 Engineering controls

Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. See 29CFR 1910.1028 for the regulatory requirements for the control of employee exposure to benzene.

8.2 Exposure Limits Chemical Name ACGIH NIOSH OSHA:

Final PELs Benzene 0.5 ppm TWA; 2.5 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute 0.1 ppm TWA 500 ppm IDLH 1 ppm TWA; 10 ppm TWA (applies to industry segments exempt from the benzene stan dard at 29 CFR 1910.1028); 25 ppm Ceiling (applies to industry segments exempt from the 1 ppm TWA and 5 ppm STEL of th e benzene standard); 0.5 ppm Action Level; 1 ppm TWA; 5 ppm STEL (Cancer hazard, Flammable - see 29 C FR 1910.1028)

8.3 OSHA Vacated PELs:

Benzene: 10 ppm TWA (unless specified in 1910.1028)

Eyes:

Wear chemical splash goggles.

Skins:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective gloves to prevent skin exposure.

Respirators:

A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Colour:	Clear Colourless
Odour:	Sweetish odor - aromatic odor
pH:	Not applicable
Vapour pressure:	75mm Hg @ 20°C
Vapour density:	2.8 (air=1)
Evaporation rate:	Not available
Viscocity:	0.647 mPa @ 20°C
Boiling point:	80.1°C
Freezing/melting point:	5.5°C
Decomposition temperature:	Not available
Solubility:	0.108 g/100ml @ 25°C
Specific gravity/density:	0.8765 @ 20°C
Molecular formula:	C6H6
Molecular weight:	78.11

10. STABILITY AND REACTIVITY

10.1 Chemical Stability

Stable under normal temperatures and pressures.

10.2 Conditions to avoid

Ignition sources, excess heat, confined spaces

10.3 Incompatibilities with Other Materials

Strong oxidizing agents.

10.4 Hazardous Decomposition Products

Carbon monoxide, carbon dioxide.

10.5 Hazardous Polymerization

Has not been reported.

11. TOXICOLOGICAL INFORMATION

CAS No.: 71-43-2
RTECS: CY1400000

Oral, rat: LD50 = 1800 Benzene is considered very toxic; probable human oral lethal dose would be 50-500 mg/kg. Human inhalation of approximately 20,000 ppm (2% in air) was fatal in 5-10 minutes. While percutaneous absorption of liquid benzene through intact human skin can be limited (e.g., 0.05% of the applied dose), the absorbed dose via direct dermal contact combined with that received from body surface exposure to benzene in workplace air is such that a substantial fraction (20-40%) of the total exposure is due to skin absorption.

11.1 Carcinogenicity

ACGIH:	A1 - Confirmed human carcinogen
NTP:	Known carcinogen
IARC:	Group 1 carcinogen

11.2 Epidemiology

IARC has concluded that epidemiological studies have established the relationship between benzene exposure and the development of acute myelogenous leukemia, and that there is sufficient evidence that benzene is carcinogenic to humans.

11.3 Teratogenicity

Inhalation, rat: TCLO = 50 ppm/24H (female 7-14 day(s) after conception) Effects on Embryo or Fetus - extra-embryonic structures (e.g., placenta, umbilical cord) and Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).; Inhalation,mouse: TCLo = 5 ppm (female 6-15 day(s) after conception) Effects on Embryo or Fetus - cytological changes (including somatic cell genetic material) and Specific Developmental Abnormalities - blood and lymphatic systems (including spleen and marrow).

11.4 Reproductive Effects

Inhalation, rat: TCLO = 670 mg/m3/24H (female 15 day(s) pre-mating and female 1-22 day(s) after conception) female fertility index (e.g. # females pregnant per # sperm positive females; # females pregnant per # females mated).; Oral, mouse: TDLo = 12 gm/kg (female 6-15 day(s) after conception) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).

11.5 Mutagenicity

DNA Inhibition: Human, Leukocyte = 2200 umol/L.; DNA Inhibition: Human, HeLa cell = 2200 umol/L.; Mutation Test Systems - not otherwise specified: Human, Lymphocyte = 5 umol/L.; Cytogenetic Analysis: Inhalation, Human = 125 ppm/1Y.; Cytogenetic Analysis: Human, Leukocyte = 1 mmol/L/72H.; Cytogenetic Analysis: Human, Lymphocyte = 1 mg/L.

11.6 Cytogenetic Analysis

Human, Lymphocyte = 1 mg/L.

11.7 Neurotoxicity

See actual entry in RTECS for complete information.

12. ECOLOGICAL INFORMATION

12.1 Toxicity to fish:

Fish: Mosquito
Fish: TLm = 395 mg/L; 24 Hr;
Unspecified Fish: Goldfish - LC50 =46 mg/L; 24 Hr; Modified ASTM D 1345
Fish: Fathead Minnow - LC50 = 15.1 mg/L; 96 Hr; Flow-through at 25°C (pH 7.9-8.0)
Fish: Rainbow trout - LC50 = 5.3 mg/L; 96 Hr; Flow-through at 25°C (pH 7.9-8.0)
Fish: Bluegill/Sunfish - LD50 = 20 mg/L; 24-48 Hr;
Unspecified If benzene is released to soil, it will be subject to rapid volatilization near the surface and that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater. If benzene is released to water, it will be subject to rapid volatilization. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation.

12.2 Environmental

If benzene is released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase benzene will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Benzene is fairly soluble in water and is removed from the atmosphere in rain.

12.3 Physical:

Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods:

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.
RCRA U-Series: Waste number U019 (Ignitable waste, Toxic waste).

14. TRANSPORT INFORMATION

14.1

UN/ID No:	UN1114
Shipping Name:	BENZENE
Class:	3
Packing group:	II
Flash point:	-11°C

TSCA
CAS# 71-43-2 is listed on the TSCA inventory.

Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.

Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs
CAS# 71-43-2: 10 lb final RQ (receives an adjustable RQ of 10 lbs based on potential carcinoge

SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.

SARA Codes
CAS # 71-43-2: immediate, delayed, fire.

Section 313
This material contains Benzene (CAS# 71-43-2, > 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean air act
CAS# 71-43-2 is listed as a hazardous air pollutant (HAP).

Clean water act
CAS# 71-43-2 is listed as a Hazardous Substance under the CWA.
CAS# 71-43-2 is listed as a Priority Pollutant under the Clean Water Act.
CAS# 71-43-2 is listed as a Toxic Pollutant under the Clean Water Act.
S 53 Avoid exposure - obtain special instructions before use.

15. REGULATORY INFORMATION

15.1 Related regulations

This substance is controlled as a Hazardous Substance under the Environmental Protection and Management Act, EPM (HS) Regulations of the Pollution Control Department of National Environment Agency.

16. OTHER INFORMATION

16.1 Reason for Revision: General Update
Date of Revision: 27/01/2020

16.2 Disclaimer:

The information contained in this Safety Data Sheet is intended to assist in the use of the above product without risk to safety or health and is based on current knowledge and experience. This information relates only to the specific material designed and may not be valid for such material used in combination with any other materials or in any process. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use.

16.3 Further information:

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.