Phenol

Incident management

Key Points

Fire

- Combustible
- Incompatible with acids, aliphatic amines, amides, calcium hypochlorite, caustics and strong oxidisers
- Contact with sodium nitrite or organic liquids is explosive
- Emits acrid smoke of irritating and flammable vapours when heated to decomposition
- In the event of a fire involving phenol, use fine water spray and liquid-tight protective clothing with breathing apparatus

Health

- Toxic by any route of exposure
- Toxic, harmful and corrosive
- Ingestion may cause local irritation of the mucous membranes and of the gastrointestinal tract
- Inhalation can cause wheezing, cough and dyspnoea
- Dermal contact may cause irritation, dermatitis and burns which may not be immediately perceived due to local anaesthetic effects
- Eye contact causes irritation, conjunctival and corneal oedema
- Systemic effects include nausea, vomiting, hypotension, tachycardia, cardiac arrhythmias, pallor, sweating, shock, drowsiness, respiratory depression, cyanosis, convulsions, coma, bronchospasm and rapid onset pulmonary oedema and death

Environment

- Avoid release into the environment
- Inform Environment Agency of substantial release incidents

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Hazard Identification

Standard (UK) Dangerous Goods Emergency Action Codes[a]

UN		**1671**	Phenol, solid	
EAC		**2X**	Use fine water spray. Wear liquid-tight chemical protective clothing in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses.	
APP		**-**		
Hazards	**Class**	**6.1**	Toxic substance	
	Sub risks	**-**		
HIN		**60**	Toxic or slightly toxic substance	

UN		**2312**	Phenol, molten	
EAC		**•3X**	Use alcohol resistant foam but, if not available, normal foam. Wear liquid-tight chemical protective clothing in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses.	
APP		**-**		
Hazards	**Class**	**6.1**	Toxic substance	
	Sub risks	**-**		
HIN		**60**	Toxic or slightly toxic substance	

UN – United Nations number; EAC – Emergency Action Code; APP – Additional Personal Protection; HIN - Hazard Identification Number

[a] Dangerous Goods Emergency Action Code List, HM Fire Service Inspectorate, Publications Section, The Stationery Office, 2009.

Standard (UK) Dangerous Goods Emergency Action Codes[(a)]

UN		**2821**	Phenol, solution	
EAC		**2X**	Use fine water spray. Wear liquid-tight chemical protective clothing in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses.	
APP		**-**		
Hazards	**Class**	**6.1**	Toxic substance	
	Sub risks	**-**		
HIN		**60**	Toxic or slightly toxic substance	

UN – United Nations number; EAC – Emergency Action Code; APP – Additional Personal Protection; HIN - Hazard Identification Number

* Liquid-tight chemical protective clothing (BS 8428) in combination with self-contained open circuit positive pressure compressed air breathing apparatus (BS EN 137).

[a] Dangerous Goods Emergency Action Code List, HM Fire Service Inspectorate, Publications Section, The Stationery Office, 2009.

Chemical Hazard Information and Packaging for Supply Classification[a]

Phenol

Classification	**Muta. Cat. 3**	Category 3 mutagen	
	T	Toxic	
	Xn	Harmful	
	C	Corrosive	
Risk phrases	**R23/24/25**	Toxic by inhalation, in contact with skin and if swallowed	
	R34	Causes burns	
	R48/20/21/22	Harmful: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed	
	R68	Possible risk of irreversible effects	
Safety phrases	**S1/2**	Keep locked up and out of the reach of children	
	S24/25	Avoid contact with skin and eyes	
	S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice	
	S28	After contact with skin, wash immediately with plenty of water	
	S36/37/39	Wear suitable protective clothing, gloves and eye/face protection	
	S45	In case of accident or if you feel unwell seek medical advice immediately	

[a] Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.2.
http://esis.jrc.ec.europa.eu/index.php?PGM=cla (accessed 11/2011)

Specific concentration limits[(a)]

Concentration	Classification
C ≥ 10 %	T; R23/24/25
3 % ≤ C < 10 %	Xn; R20/21/22
C ≥ 3 %	C; R34
1 % ≤ C < 3 %	Xi; R36/38

[a] Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.2.
http://esis.jrc.ec.europa.eu/index.php?PGM=cla (accessed 11/2011)

Globally Harmonised System of Classification and Labelling of Chemicals (GHS)[a]

Hazard Class and Category	Muta. 2	Germ cell mutagenicity, category 2	
	Acute Tox. 3	Acute toxicity (oral, dermal, inhalation), category 3	
	STOT RE 2	Specific target organ toxicity following repeated exposure, category 3	
	Skin Corr. 1B	Skin corrosion, category 1B	
Hazard Statement	**H341**	Suspected of causing genetic defects	
	H331	Toxic if inhaled	
	H311	Toxic in contact with skin	
	H301	Toxic if swallowed	
	H373	May cause damage to organs through prolonged or repeated exposure	
	H314	Causes severe skin burns and eye damage	
Signal Words	DANGER		

Implemented in the EU on 20 January 2009.

[a] Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.1.
http://esis.jrc.ec.europa.eu/index.php?PGM=cla (accessed 11/2011)

Specific concentration limits

Concentration	Hazard Class and Category	Hazard Statement	
C ≥ 3 %	Skin Corr. 1A	**H314**	Causes severe skin burns and eye damage
1 % ≤ C < 3 %	Skin Irrit. 2	**H315**	Causes skin irritation
1 % ≤ C < 3 %	Eye Irrit. 2	**H319**	Causes serious eye irritation

Physicochemical Properties

CAS number	108-95-2
Molecular weight	94
Empirical formula	C_6H_6O
Common synonyms	Carbolic acid; Phenyl hydroxide; Hydroxybenzene
State at room temperature	Solid
Volatility	Vapour pressure = 1 mm Hg at 25 °C
Specific gravity	1.1 at 25 °C (water = 1)
Flammability	Combustible
Lower explosive limit	1.3 %
Upper explosive limit	8.6 %
Water solubility	Soluble in water; highly soluble in alcohol, ether, chloroform, glycerol, carbon disulfide, aqueous alkali hydroxides and acetic acid
Reactivity	Incompatible with acids, aliphatic amines, amides, calcium hypochlorite, caustics and strong oxidisers. Lead, rubber, plastics and aluminium can be corroded by phenol. Contact of phenol with sodium nitrite or organic liquids is explosive
Reaction or degradation products	Emits acrid smoke of irritating and flammable vapours when heated to decomposition
Odour	Distinctive sweet odour
Structure	

References[a,b,c]

[a] Phenol (HAZARDTEXT® Hazard Management). In: Klasco RK (Ed): TOMES® System. Thomson Micromedex, Greenwood Village, Colorado (accessed 02/2010).
[b] The Merck Index (14th Edition). Entry 7241: Phenol, 2006.
[c] The Dictionary of Substances and their Effects. Ed. S Gangolli. Second Edition, Volume 6, 1999.

Threshold Toxicity Values

EXPOSURE VIA INGESTION	
mg	**SIGNS AND SYMPTOMS**
1-32 g	Ingestion may cause death

EXPOSURE VIA SKIN	
mg	**SIGNS AND SYMPTOMS**
40 %	Premature ventricular complexes
78 %	Coma

Reference[a]

[a] Phenol (MEDITEXT® Medical Management). In: Klasco RK (Ed): TOMES® System. Thomson Micromedex, Greenwood Village, Colorado (accessed 02/2010).

Published Emergency Response Guidelines

Emergency Response Planning Guideline (ERPG) Values[a]

	Listed value (ppm)	Calculated value (mg m^{-3})
ERPG-1*	10^	39
ERPG-2**	50	193
ERPG-3***	200	770

* Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odour.
** Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.
*** Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing life-threatening health effects.
^ Odour should be detectable near ERPG-1.

Acute Exposure Guideline Levels (AEGLs)[b]

	ppm				
	10 min	**30 min**	**60 min**	**4 hr**	**8 hr**
AEGL-1†	19	19	15	9.5	6.3
AEGL-2††	29	29	23	15	12
AEGL-3†††	-	-	-	-	-

† The level of the chemical in air at or above which the general population could experience notable discomfort.
†† The level of the chemical in air at or above which there may be irreversible or other serious long-lasting effects or impaired ability to escape.
††† The level of the chemical in air at or above which the general population could experience life-threatening health effects or death.

[a] American Industrial Hygiene Association (AIHA). 2010 Emergency Response Planning Guideline Values and Workplace Environmental Exposure Level Guides Handbook, Fairfax, VA (accessed 01/2011)
[b] U.S. Environmental Protection Agency. Acute Exposure Guideline Levels, http://www.epa.gov/oppt/aegl/pubs/chemlist.htm (accessed 01/2011).

Exposure Standards, Guidelines or Regulations

Occupational standards

WEL[a]	LTEL (8 hour reference period): 2 ppm (7.8mg m^{-3})
	STEL (15 min reference period): No guideline value specified

Public health guidelines

DRINKING WATER QUALITY GUIDELINE	No guideline value specified
AIR QUALITY GUIDELINE	No guideline value specified
SOIL GUIDELINE VALUE AND HEALTH CRITERIA VALUES [b,c]	**Residential** 420 mg kg^{-1} dry weight soil
	Allotment 280 mg kg^{-1} dry weight soil
	Commercial 3200 mg kg^{-1} dry weight soil
	Tolerable Daily Intake $_{oral}$ 700 μg kg^{-1} bw day^{-1}
	Mean Daily Intake $_{oral}$ 350 μg day^{-1}
	Tolerable Daily Intake $_{inhalation}$ 10 μg kg^{-1} bw day^{-1}
	Mean Daily Intake $_{inhalation}$ 40 μg day^{-1}

WEL – Workplace exposure limit; LTEL - Long-term exposure limit; STEL – Short-term exposure limit

[a] List of approved workplace exposure limits (as consolidated with amendments October 2007). http://www.hse.gov.uk/coshh/table1.pdf (An update to EH40/2005: Workplace Exposure Limits 2005. The Stationery Office, London) (accessed 01/2011)..

[b] Environment Agency (EA). Soil Guideline Values for phenol in soil. Science Report SC050021/phenol SGV.2009. EA. Bristol, UK (accessed 01/2011).

[c] Environment Agency (EA), Contaminants in soil: updated collation of toxicological data and intake values for humans. Phenol. Science Report SC050021/TOX 9. 2009, EA: Bristol, UK (accessed 01/2011).

Health Effects

Major routes of exposure[a]

- Toxic by ingestion, skin and eye exposure.
- Inhalation is not the normal route of exposure.

Immediate signs or symptoms of acute exposure[b,c]

- Exposure by any route can cause irritation, burns and systemic effects.
- Ingestion causes irritation of the mucous membranes and of the GI tract, coma, unrecordable blood pressure, convulsions, arrhythmias and respiratory arrest. Significant ingestion is said to cause white/brown skin and mucosal burns which may be painless as phenol destroys the nerve endings. Laryngeal oedema can occur and oesophageal stricture may be a late complication.
- Skin contact with even dilute solutions (1%) can cause irritation, dermatitis and burns to the skin after prolonged contact. Often presents as relatively painless white or brown necrotic lesions; the brown discolouration may remain after healing.
- Eye contact causes irritation, conjunctival and corneal oedema and blindness.
- Systemic effects include nausea, vomiting, hypotension, tachycardia, cardiac arrhythmias, pallor, sweating and shock. CNS stimulation is followed by drowsiness, respiratory depression, cyanosis, convulsions, coma, bronchospasm and rapid onset pulmonary oedema and death.

TOXBASE - http://www.toxbase.org (accessed 01/2011)
[a] TOXBASE: Phenol, 12/2003.
[b] TOXBASE: Phenols and cresols – features and management, 10/2007.
/7/[c] TOXBASE: Chemicals splashed or sprayed into the eyes, 07/2007.

Decontamination and First Aid

Important Notes

- Ambulance staff, paramedics and emergency department staff treating chemically-contaminated casualties should be equipped with Department of Health approved, gas-tight (Respirex) decontamination suits based on EN466:1995, EN12941:1998 and prEN943-1:2001, where appropriate.
- Decontamination should be performed using local protocols in designated areas such as a decontamination cubicle with adequate ventilation.

Dermal exposure[a,b]

- Remove patient from exposure.
- The patient should remove all clothing and personal effects.
- Double-bag soiled clothing and place in a sealed container clearly labelled as a chemical hazard.
- Brush away any adherent solid particles from the patient.
- Wash hair and all contaminated skin with copious amounts of water (preferably warm) and soap for at least 10-15 minutes. Decontaminate open wounds first and avoid contamination of unexposed skin. The use of solvents (such as glycerol, polyethylene glycol and isopropanol) has been suggested.
- Pay special attention to skin folds, axillae, ears, fingernails, genital areas and feet.

Ocular exposure[c]

- Remove patient from exposure.
- Remove contact lenses if necessary and immediately irrigate the affected eye thoroughly with water or 0.9% saline for at least 10-15 minutes.
- Patients with corneal damage or those whose symptoms do not resolve rapidly should be referred for urgent ophthalmological assessment.

Inhalation

- Not applicable

Ingestion[b]

- Ensure a clear airway and adequate ventilation.
- Give oxygen to symptomatic patients.
- Apply other measures as indicated by the patient's clinical condition.

Systemic effects[b]

- Observe for at least 2 hours after exposure.
- Monitor pulse, blood pressure and cardiac rhythm. Perform a 12 lead ECG.
- Give oxygen if clinically indicated.
- Apply other measures as indicated by the patient's clinical condition.

TOXBASE - http://www.toxbase.org (accessed 01/2011)
[a] TOXBASE: Phenol, 12/2003.
[b] TOXBASE: Phenols and cresols – features and management, 10/2007.
[c] TOXBASE: Chemicals splashed or sprayed into the eyes, 072007.

This document will be reviewed not later than 3 years or sooner if substantive evidence becomes available.