AMMONIA SOLUTION ABOUT 30%

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
AMMONIA SOLUTION ABOUT 30%

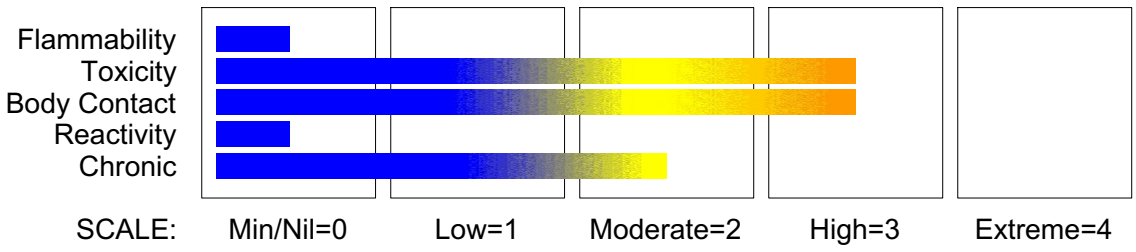
OTHER NAMES
NH3, NH4-OH, H5-N-O, H5-N-O, "ammonia solution", "ammonia solutions", "ammonia-aqueous solution", "ammonium hydrate", "aqua ammonia", "ammonia water", "ammonia forte"

PROPER SHIPPING NAME
AMMONIA SOLUTION

PRODUCT USE
The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing.Before starting consider control of exposure by mechanical ventilation.
Operators should be trained in procedures for safe use of this material.
Reagent, pH adjustment. Detergent, removing stains, bleaching, calico printing, extracting plant colours and alkaloids; manufacture of ammonium salts and aniline salts. Refrigerant gas; manufacture of fertilizers and nitric acid. Metal treatment and extraction of metals from ores. Processing crude oil, Manufacture of ammonium salts, dyes, pharmaceuticals, explosives, rayon and polymers.

SUPPLIER
Company: S D FINE- CHEM LIMITED
Address:
315- 317, T.V. INDUSTRIAL ESTATE,
248, WORLI,
MUMBAI- 400030.INDIA.
technical@sdfine.com
Telephone: 91- 22- 24959898
Telephone: 91- 22- 24959899
Fax: 91- 22- 24937232

HAZARD RATINGS



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Section 2 - HAZARDS IDENTIFICATION

GHS Classification
Acute Aquatic Hazard Category 1
Acute Toxicity (Inhalation) Category 2
Acute Toxicity (Oral) Category 4
Metal Corrosion Category 1
Skin Corrosion/Irritation Category 1C

EMERGENCY OVERVIEW

HAZARD
DANGER
Determined by using GHS criteria:
H330 H302 H290 H314 H400
Fatal if inhaled
Harmful if swallowed
May be corrosive to metals
Causes severe skin burns and eye damage
Very toxic to aquatic life

PRECAUTIONARY STATEMENTS

Prevention
Keep only in original container.
Do not breathe dust/fume/gas/mist/vapours/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Avoid release to the environment.
Wear protective gloves/protective clothing/eye protection/face protection.
Wear respiratory protection.

Response
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove 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 do. Continue rinsing.
Immediately call a POISON CENTER or doctor/physician.
Specific treatment is urgent (see MSDS).
Rinse mouth.
Wash contaminated clothing before reuse.
Absorb spillage to prevent material damage.
Collect spillage.

continued...

Storage
Store in a well-ventilated place. Keep container tightly closed.
Store locked up.
Store in corrosive resistant container or with a resistant inner liner.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
ammonia	1336-21-6	10-35
water	7732-18-5	65-90

Section 4 - FIRST AID MEASURES

SWALLOWED
• For advice, contact a Poisons Information Centre or a doctor at once.
• Urgent hospital treatment is likely to be needed.
• If swallowed do NOT induce vomiting.
• If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
• Observe the patient carefully.
• Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
• Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
• Transport to hospital or doctor without delay.

EYE
If this product comes in contact with the eyes:
• Immediately hold eyelids apart and flush the eye continuously with running water.
• Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
• Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
• Transport to hospital or doctor without delay.
• Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN
If skin or hair contact occurs:
• Immediately flush body and clothes with large amounts of water, using safety shower if available.
• Quickly remove all contaminated clothing, including footwear.
• Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre.
• Transport to hospital, or doctor.

INHALED
• If fumes or combustion products are inhaled remove from contaminated area.
• Lay patient down. Keep warm and rested.
• Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
• Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
• Transport to hospital, or doctor, without delay.

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NOTES TO PHYSICIAN

Treat symptomatically.
For acute or short-term repeated exposures to highly alkaline materials:
• Respiratory stress is uncommon but present occasionally because of soft tissue edema.
• Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
• Oxygen is given as indicated.
• The presence of shock suggests perforation and mandates an intravenous line and fluid administration.
• Damage due to alkaline corrosives occurs by liquefaction necrosis whereby the saponification of fats and solubilisation of proteins allow deep penetration into the tissue.
Alkalis continue to cause damage after exposure.

INGESTION:
• Milk and water are the preferred diluents
No more than 2 glasses of water should be given to an adult.
• Neutralising agents should never be given since exothermic heat reaction may compound injury.
* Catharsis and emesis are absolutely contra-indicated.
* Activated charcoal does not absorb alkali.
* Gastric lavage should not be used.

Supportive care involves the following:
• Withhold oral feedings initially.
• If endoscopy confirms transmucosal injury start steroids only within the first 48 hours.
• Carefully evaluate the amount of tissue necrosis before assessing the need for surgical intervention.
• Patients should be instructed to seek medical attention whenever they develop difficulty in swallowing (dysphagia).

SKIN AND EYE:
• Injury should be irrigated for 20-30 minutes.Eye injuries require saline. [Ellenhorn & Barceloux: Medical Toxicology].
for irritant gas exposures:
• the presence of the agent when it is inhaled is evanescent (of short duration) and therefore, cannot be washed away or otherwise removed
• arterial blood gases are of primary importance to aid in determination of the extent of damage. Never discharge a patient significantly exposed to an irritant gas without obtaining an arterial blood sample.
• supportive measures include suctioning (intubation may be required), volume cycle ventilator support (positive and expiratory pressure (PEEP), steroids and antibiotics, after a culture is taken
• If the eyes are involved, an ophthalmologic consultation is recommended
Occupational Medicine: Third Edition ; Zenz, Dickerson, Horvath 1994 Pub: Mosby.
For acute or short term repeated exposures to ammonia and its solutions:
• Mild to moderate inhalation exposures produce headache, cough, bronchospasm, nausea, vomiting, pharyngeal and retrosternal pain and conjunctivitis. Severe inhalation produces laryngospasm, signs of upper airway obstruction (stridor, hoarseness, difficulty in speaking) and, in excessively, high doses, pulmonary oedema.
• Warm humidified air may soothe bronchial irritation.
• Test all patients with conjunctival irritation for corneal abrasion (fluorescein stain, slit lamp exam)
• Dyspneic patients should receive a chest X-ray and arterial blood gases to detect pulmonary oedema.

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Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
The product contains a substantial proportion of water, therefore there are no restrictions on the type of extinguishing media which may be used. Choice of extinguishing media should take into account surrounding areas.Though the material is non-combustible, evaporation of water from the mixture, caused by the heat of nearby fire, may produce floating layers of combustible substances.
In such an event consider:
• foam.
• dry chemical powder.
• carbon dioxide.

FIRE FIGHTING
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Use fire fighting procedures suitable for surrounding area.
- Do not approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

FIRE/EXPLOSION HAZARD
WARNING: In use may form flammable/ explosive vapour-air mixtures.
Combustion products include: nitrogen oxides (NOx), other pyrolysis products typical of burning organic material.
Contains low boiling substance: Closed containers may rupture due to pressure buildup under fire conditions.
May emit corrosive fumes.

FIRE INCOMPATIBILITY
None known.

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS
- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with sand, earth, inert material or vermiculite.
- Wipe up.
- Place in a suitable labelled container for waste disposal.

MAJOR SPILLS
Chemical Class: bases

For release onto land: recommended sorbents listed in order of priority.

SORBENT TYPE	RANK	APPLICATION	COLLECTION	LIMITATIONS

continued...

LAND SPILL - SMALL

cross- linked polymer - particulate	1	shovel	shovel	R, W, SS
cross- linked polymer - pillow	1	throw	pitchfork	R, DGC, RT
sorbent clay - particulate	2	shovel	shovel	R, I, P
foamed glass - pillow	2	throw	pitchfork	R, P, DGC, RT
expanded minerals - particulate	3	shovel	shovel	R, I, W, P, DGC
foamed glass - particulate	4	shovel	shovel	R, W, P, DGC,

LAND SPILL - MEDIUM

cross- linked polymer - particulate	1	blower	skiploader	R, W, SS
sorbent clay - particulate	2	blower	skiploader	R, I, P
expanded mineral - particulate	3	blower	skiploader	R, I, W, P, DGC
cross- linked polymer - pillow	3	throw	skiploader	R, DGC, RT
foamed glass - particulate	4	blower	skiploader	R, W, P, DGC
foamed glass - pillow	4	throw	skiploader	R, P, DGC., RT

Legend
DGC: Not effective where ground cover is dense
R; Not reusable
I: Not incinerable
P: Effectiveness reduced when rainy
RT:Not effective where terrain is rugged
SS: Not for use within environmentally sensitive sites
W: Effectiveness reduced when windy

Reference: Sorbents for Liquid Hazardous Substance Cleanup and Control;
R.W Melvold et al: Pollution Technology Review No. 150: Noyes Data Corporation 1988.

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Neutralise/decontaminate residue.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

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EMERGENCY RESPONSE PLANNING GUIDELINES (ERPG)

The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour WITHOUT experiencing or developing

life-threatening health effects is:
ammonia 750ppm

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:
ammonia 150ppm

other than mild, transient adverse effects without perceiving a clearly defined odour is:
ammonia 25ppm

American Industrial Hygiene Association (AIHA)

Ingredients considered according to the following cutoffs

Very Toxic (T+)	>= 0.1%	Toxic (T)	>= 3.0%
R50	>= 0.25%	Corrosive (C)	>= 5.0%
R51	>= 2.5%		
else	>= 10%		

where percentage is percentage of ingredient found in the mixture

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

Contains low boiling substance:
Storage in sealed containers may result in pressure buildup causing violent rupture of containers not rated appropriately.
• Check for bulging containers.
• Vent periodically
• Always release caps or seals slowly to ensure slow dissipation of vapours.
• DO NOT allow clothing wet with material to stay in contact with skin.
• Avoid all personal contact, including inhalation.
• Wear protective clothing when risk of exposure occurs.
• Use in a well-ventilated area.
• Avoid contact with moisture.
• Avoid contact with incompatible materials.
• When handling, DO NOT eat, drink or smoke.
• Keep containers securely sealed when not in use.
• Avoid physical damage to containers.
• Always wash hands with soap and water after handling.
• Work clothes should be laundered separately. Launder contaminated clothing before re-use.
• Use good occupational work practice.
• Observe manufacturer's storing and handling recommendations.
• Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

SUITABLE CONTAINER

• Lined metal can, lined metal pail/ can.
• Plastic pail.
• Polyliner drum.
• Packing as recommended by manufacturer.
• Check all containers are clearly labelled and free from leaks.

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For low viscosity materials
• Drums and jerricans must be of the non-removable head type.
• Where a can is to be used as an inner package, the can must have a screwed enclosure.
For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.):
• Removable head packaging;
• Cans with friction closures and
• low pressure tubes and cartridges
may be used.
-Where combination packages are used, and the inner packages are of glass, porcelain or stoneware, there must be sufficient inert cushioning material in contact with inner and outer packages unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.

STORAGE INCOMPATIBILITY
• Ammonia forms explosive mixtures with oxygen, chlorine, bromine, fluorine, iodine, mercury, platinum and silver.
• Fire and/or explosion may follow contact with acetaldehyde, acrolein, aldehydes, alkylene oxides, amides, antimony, boron, boron halides, bromine chloride, chloric acid, chlorine monoxide, o-chloronitrobenzene, 1-chloro-2,4-nitrobenzene, chlorosilane, chloromelamine, chromium trioxide, chromyl chloride, epichlorohydrin, hexachloromelamine, hypochlorites (do NOT mix ammonia with liquid household bleach), isocyanates, nitrogen tetraoxide, nitrogen trichloride, nitryl chloride, organic anhydrides, phosphorous trioxide, potassium ferricyanide, potassium mercuric cyanide, silver chloride, stibine, tellurium halides, tellurium hydropentachloride, tetramethylammonium amide, trimethylammonium amide, trioxygen difluoride, vinyl acetate.
• Shock-, temperature-, and pressure sensitive compounds are formed with antimony, chlorine, germanium compounds, halogens, heavy metals, hydrocarbons, mercury oxide, silver compounds (azides, chlorides, nitrates, oxides).
• Vapours or solutions of ammonia are corrosive to copper, copper alloys, galvanised metal and aluminium. Mixtures of ammonia and air lying within the explosive limits can occur above aqueous solutions of varying strengths.
• Avoid contact with sodium hydroxide, iron and cadmium.
• Several incidents involving sudden "boiling" (occasionally violent) of a concentrated solution (d, 0.880, 35 wt %.) have occurred when screw-capped winchesters are opened. These are attributable to supersaturation of the solution with gas caused by increases in temperature subsequent to preparation and bottling. The effect is particularly marked with winchesters filled in winter and opened in summer.
• Ammonia polymerises violently with ethylene oxide.
• Ammonia attacks some coatings, plastics and rubber.
• Attacks copper, bronze, brass, aluminium, steel and their alloys.
• Avoid strong acids.
• Avoid contact with copper, aluminium and their alloys.

STORAGE REQUIREMENTS
• Store in original containers.
• Keep containers securely sealed.
• Store in a cool, dry, well-ventilated area.
• Store away from incompatible materials and foodstuff containers.
• Protect containers against physical damage and check regularly for leaks.
• Observe manufacturer's storing and handling recommendations.
• DO NOT store near acids, or oxidising agents.
No smoking, naked lights, heat or ignition sources.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

continued...

X	X	+	X	X	+

+: May be stored together
O: May be stored together with specific preventions
X: Must not be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records
• ammonia: CAS:1336- 21- 6 CAS:7664- 41- 7
• water: CAS:7732- 18- 5

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
ammonia		300

MATERIAL DATA

#32nh3

PERSONAL PROTECTION




EYE

• Chemical goggles.
• Full face shield may be required for supplementary but never for primary protection of eyes
• Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

HANDS/FEET

• Wear chemical protective gloves, eg. PVC.
• Wear safety footwear or safety gumboots, eg. Rubber.
• When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.
Suitability and durability of glove type is dependent on usage. Factors such as:
• frequency and duration of contact,
• chemical resistance of glove material,
• glove thickness and

continued...

• dexterity,
are important in the selection of gloves.

OTHER
• Overalls.
• PVC Apron.
• PVC protective suit may be required if exposure severe.
• Eyewash unit.
• Ensure there is ready access to a safety shower.

GLOVE SELECTION INDEX
Glove selection is based on a modified presentation of the:
" Forsberg Clothing Performance Index" .
The effect(s) of the following substance(s) are taken into account in the computer- generated selection: ammonia

Protective Material:

BUTYL	A
HYPALON	A
NEOPRENE	A
NEOPRENE/NATURAL	A
NITRILE	B
NATURAL+NEOPRENE	B
NATURAL RUBBER	C
PVC	C
NITRILE+PVC	C

A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion

NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -

* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

RESPIRATOR
Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Breathing Zone Level ppm (volume)	Maximum Protection Factor	Half- face Respirator	Full- Face Respirator
1000	10	K- AUS	-
1000	50	-	K- AUS
5000	50	Airline *	-
5000	100	-	K- 2
10000	100	-	K- 3
	100+		Airline**

* - Continuous Flow ** - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of

continued...

personal protective equipment required. For further information consult your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS
Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.
An approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapours, degreasing etc., evaporating from tank (in still air).	0.25- 0.5 m/s (50- 100 f/min.)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5- 1 m/s (100- 200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1- 2.5 m/s (200- 500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5- 10 m/s (500- 2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood- local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.
CARE: Explosive vapour air mixtures may be present on opening vessels which have contained liquid ammonia. Fatalities have occurred.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE
Colourless alkaline liquid with strong pungent odour; mixes with water. Immiscible with most organic solvents. Ammonia gas is evolved on heating.

continued...

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Flammability	Colour	Physical State	Odour	Miscibility with water
Highly flammable	Clear	Liquid	AmmoniaLike	Miscible

PHYSICAL PROPERTIES
Liquid.
Mixes with water.
Corrosive.
Alkaline.
Toxic or noxious vapours/gas.

Molecular Weight: 35.06
Melting Range (°C): Not available.
Solubility in water (g/L): Miscible
pH (1% solution): 11.7
Volatile Component (%vol): 35- 44
Relative Vapour Density (air=1): 0.6 approx.
Lower Explosive Limit (%): 16 ammonia gas
Autoignition Temp (°C): 630
State: Liquid

Boiling Range (°C): Not available.
Specific Gravity (water=1): 0.9 (nominal)
pH (as supplied): Not available
Vapour Pressure (kPa): 66.7 @ 27 C
Evaporation Rate: Not available
Flash Point (°C): Not applicable
Upper Explosive Limit (%): 25 ammonia gas
Decomposition Temp (°C): Not available.
Viscosity: Not Available

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY
- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED
The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.
The material is not thought to produce adverse health effects following ingestion (as classified by EC Directives using animal models). Nevertheless, adverse systemic effects have been produced following exposure of animals by at least one other route and good hygiene practice requires that exposure be kept to a minimum.
Human metabolism allows detoxification of ammonia, however toxic effects appear if this mechanism is overwhelmed by other than small doses. Large doses of ammonium salts may produce diarrhoea and may be sufficiently absorbed to produce diuresis and systemic ammonia poisoning. Such poisonings have been described after parenteral administration of the salts and produce flaccidity of facial muscles, tremor, generalised discomfort, anxiety and impairment of motor performance, recognition and of critical flicker fusion. Such a clinical picture resembles that found in terminal liver failure - elevated levels of ammonia are found regularly in advanced liver disease.
Ingestion of alkaline corrosives may produce immediate pain, and circumoral burns. Mucous membrane corrosive damage is characterised by a white appearance and soapy feel; this may then become brown, oedematous and ulcerated. Profuse salivation with an inability to

continued...

swallow or speak may also result. Even where there is limited or no evidence of chemical burns, both the oesophagus and stomach may experience a burning pain; vomiting and diarrhoea may follow. The vomitus may be thick and may be slimy (mucous) and may eventually contain blood and shreds of mucosa. Epiglottal oedema may result in respiratory distress and asphyxia. Marked hypotension is symptomatic of shock; a weak and rapid pulse, shallow respiration and clammy skin may also be evident. Circulatory collapse may occur and, if uncorrected, may produce renal failure. Severe exposures may result in oesophageal or gastric perforation accompanied by mediastinitis, substernal pain, peritonitis, abdominal rigidity and fever. Although oesophageal, gastric or pyloric stricture may be evident initially, these may occur after weeks or even months and years. Death may be quick and results from asphyxia, circulatory collapse or aspiration of even minute amounts. Death may also be delayed as a result of perforation, pneumonia or theeffects of stricture formation.

EYE

The material can produce chemical burns to the eye following direct contact. Vapours or mists may be extremely irritating.
When applied to the eye(s) of animals, the material produces severe ocular lesions which are present twenty-four hours or more after instillation.
The vapour when concentrated has pronounced eye irritation effects and this gives some warning of high vapour concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area.
Direct contact with alkaline corrosives may produce pain and burns. Oedema, destruction of the epithelium, corneal opacification and iritis may occur. In less severe cases these symptoms tend to resolve. In severe injuries the full extent of the damage may not be immediately apparent with late complications comprising a persistent oedema, vascularisation and corneal scarring, permanent opacity, staphyloma, cataract, symblepharon and loss of sight.

SKIN

The material can produce chemical burns following direct contact with the skin.
Skin contact is not thought to produce harmful health effects (as classified under EC Directives using animal models). Systemic harm, however, has been identified following exposure of animals by at least one other route and the material may still produce health damage following entry through wounds, lesions or abrasions. Good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.
Mild irritation is produced on moist skin when vapour concentrations of ammonia exceed 10000 ppm. High vapour concentrations (>30000 ppm) or direct contact with solutions produces severe pain, a stinging sensation, burns and vesiculation and possible brown stains. Extensive burning may be fatal. Vapour exposure may, rarely, produce urticaria.
Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.
Skin contact with alkaline corrosives may produce severe pain and burns; brownish stains may develop. The corroded area may be soft, gelatinous and necrotic; tissue destruction may be deep.

INHALED

Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system in a substantial number of individuals following inhalation.
The highly irritant properties of ammonia vapour result as the gas dissolves in mucous fluids and forms irritant, even corrosive solutions.
Inhalation of the ammonia fumes causes coughing, vomiting, reddening of lips, mouth, nose, throat and conjunctiva while higher concentrations can cause temporary blindness, restlessness, tightness in the chest, pulmonary oedema (lung damage), weak pulse and cyanosis.
Inhalation of high concentrations of vapour may cause breathing difficulty, tightness in chest, pulmonary oedema and lung damage. Brief exposure to high concentrations > 5000 ppm

continued...

may cause death due to asphyxiation (suffocation) or fluid in the lungs.
Prolonged or regular minor exposure to the vapour may cause persistent irritation of the eyes, nose and upper respiratory tract. Massive ammonia exposures may produce chronic airway hyperactivity and asthma with associated pulmonary function changes. The average nasal retention of ammonia by human subjects was found to be 83%.
Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects; these may be fatal.
If exposure to highly concentrated vapour atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and unless resuscitated - death.
The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing.Before starting consider control of exposure by mechanical ventilation.

CHRONIC HEALTH EFFECTS
Repeated or prolonged exposure to corrosives may result in the erosion of teeth, inflammatory and ulcerative changes in the mouth and necrosis (rarely) of the jaw. Bronchial irritation, with cough, and frequent attacks of bronchial pneumonia may ensue. Gastrointestinal disturbances may also occur. Chronic exposures may result in dermatitis and/or conjunctivitis.
Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.
Prolonged or repeated minor exposure to ammonia gas/vapour may cause long-term irritation to the eyes, nose and upper respiratory tract. Repeated exposure or prolonged contact may produce dermatitis, and conjunctivitis.
Other effects may include ulcerative changes to the mouth and bronchial and gastrointestinal disturbances. Adaptation to usually irritating concentrations may result in tolerance. In animals, repeated exposures to sub-lethal levels produces adverse effects on the respiratory tract, liver, kidneys and spleen. Exposure at 675 ppm for several weeks produced eye irritation in dogs and rabbits; corneal opacity, covering between a quarter to one half of the total surface area, was evident in rabbits.

TOXICITY AND IRRITATION
unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY
Oral (rat) LD50: 350 mg/kg
Oral (human) LDLo: 43 mg/kg
Inhalation (human) LCLo: 5000 ppm/5m
Inhalation (human) TCLo: 20 ppm
Inhalation (rat) LC50: 2000 ppm/4h
Unreported (man) LDLo: 132 mg/kg
Oral (Human) LD: 43 mg/kg
Inhalation (Human) LC: 5000 ppm/4h
Inhalation (Human) TCLo: 408 ppm/4h
Subcutaneous (Mouse) LD: 160 mg/kg
Intravenous (Mouse) LD50: 91 mg/kg
Oral (Cat) LD: 750 mg/kg
Subcutaneous (Rabbit) LD: 200 mg/kg
Intravenous (Rabbit) LD: 10 mg/kg

IRRITATION
Eye (rabbit): 0.25 mg SEVERE
Eye (rabbit): 1 mg/30s SEVERE

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an

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Section 11 - TOXICOLOGICAL INFORMATION

irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

Section 12 - ECOLOGICAL INFORMATION

Very toxic to aquatic organisms.

Section 13 - DISPOSAL CONSIDERATIONS

• Containers may still present a chemical hazard/ danger when empty.
• Return to supplier for reuse/ recycling if possible.
Otherwise:
• If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
• Where possible retain label warnings and MSDS and observe all notices pertaining to the product.
Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
A Hierarchy of Controls seems to be common - the user should investigate:
• Reduction,
• Reuse
• Recycling
• Disposal (if all else fails)
This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.
• DO NOT allow wash water from cleaning or process equipment to enter drains.
• It may be necessary to collect all wash water for treatment before disposal.
• In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
• Where in doubt contact the responsible authority.
• Recycle wherever possible.
• Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.
• Treat and neutralise at an approved treatment plant.
• Treatment should involve: Neutralisation with suitable dilute acid followed by: Burial in a licenced land-fill or Incineration in a licenced apparatus (after admixture with suitable combustible material).
• Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

WASTE DISPOSAL PROCEDURES
• Wear protective clothing, nitrile rubber gloves, eye protection, all- purpose or special canister respirator for ammonia to dispose of small quantities. Pour the substance into a large container of water and neutralise the solution with 5% hydrochloric acid. Discard the contents into the drain [Armour 1996].

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Section 13 - DISPOSAL CONSIDERATIONS

SPILLAGE DISPOSAL
• Wear protective clothing, a self- contained breathing apparatus, eye protection and nitrile rubber gloves to control personal contact. Cover and contain the spilled ammonia liquid with 1:1:1 mixture by weight of sodium carbonate or calcium carbonate, calcium bentonite and sand. In a well ventilated area, scoop the mixture into a plastic container and add to a container of cold water. Neutralise the mixture with 5% hydrochloric acid. Allow to stand overnight and then discard the liquid into the drain. Collect any solids and dispose of them with the normal refuse. Wash the area of the spill with large quantities of water [Armour 1996].

Section 14 - TRANSPORTATION INFORMATION

Labels Required: CORROSIVE
HAZCHEM: 2R

UNDG:

Dangerous Goods Class:	8	Subrisk:	None
UN Number:	2672	Packing Group:	III

Shipping Name:AMMONIA SOLUTION relative density between 0.880 and 0.957 at 15 °C in water, with more than 10% but not more than 35% ammonia

Air Transport IATA:

ICAO/IATA Class:	8	ICAO/IATA Subrisk:	None
UN/ID Number:	2672	Packing Group:	III
Special provisions:	A64		

Shipping Name: AMMONIA SOLUTION RELATIVE DENSITY (SPECIFIC GRAVITY) BETWEEN 0.880 AND 0.957 AT 15C IN WATER, WITH MORE THAN 10% BUT NOT MORE THAN 35% AMMONIA

Maritime Transport IMDG:

IMDG Class:	8	IMDG Subrisk:	None
UN Number:	2672	Packing Group:	III
EMS Number:	F- A, S- B	Special provisions:	None
Limited Quantities:	5 L		

Shipping Name: AMMONIA SOLUTION relative density between 0.880 and 0.957 at 15°C in water, with more than 10% but not more than 35% ammonia by mass

Section 15 - REGULATORY INFORMATION

REGULATIONS

ammonia (CAS: 1336-21-6) is found on the following regulatory lists;
CODEX General Standard for Food Additives (GSFA) - Additives Permitted for Use in Food in General, Unless

continued...

Section 15 - REGULATORY INFORMATION

Otherwise Specified, in Accordance with GMP
GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships
IMO IBC Code Chapter 17: Summary of minimum requirements
IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk
International Air Transport Association (IATA) Dangerous Goods Regulations
International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List
International Council of Chemical Associations (ICCA) - High Production Volume List
OECD Representative List of High Production Volume (HPV) Chemicals
WHO Guidelines for Drinking-water Quality - Chemicals for which guideline values have not been established

Section 16 - OTHER INFORMATION

MSDS SECTION CHANGES

The following table displays the version number of and date on which each section was last changed.

Section Name	Version	Date	Section Name	Version	Date	Section Name	Version	Date
Advice to Doctor	5	12- Aug- 2006	Storage (storage requirement)	5	12- Aug- 2006	Acute Health (skin)	5	12- Aug- 2006
First Aid (skin)	5	12- Aug- 2006	Storage (suitable container)	5	12- Aug- 2006	Acute Health (swallowed)	5	12- Aug- 2006
First Aid (swallowed)	5	12- Aug- 2006	Engineering Control	5	12- Aug- 2006	Chronic Health	5	12- Aug- 2006
Fire Fighter (fire fighting)	5	12- Aug- 2006	Personal Protection (hands/feet)	5	12- Aug- 2006	Toxicity and Irritation (Other)	5	12- Aug- 2006
Fire Fighter (fire/explosion hazard)	5	12- Aug- 2006	Appearance	5	12- Aug- 2006	Toxicity and Irritation (Toxicity Figure)	5	12- Aug- 2006
Spills (major)	5	12- Aug- 2006	Physical Properties	5	12- Aug- 2006	Environmental	5	12- Aug- 2006
Handling Procedure	5	12- Aug- 2006	Acute Health (eye)	5	12- Aug- 2006	Disposal	5	12- Aug- 2006
Storage (storage incompatibility)	5	12- Aug- 2006	Acute Health (inhaled)	5	12- Aug- 2006			

The above information is believed to be accurate and represent the best information currently available to us, but does not represent any warranty expressed or implied of the properties of the product. User should make their own investigation to determine the suitability of the information for their particular purpose.

Issue Date: 2-Mar-2018