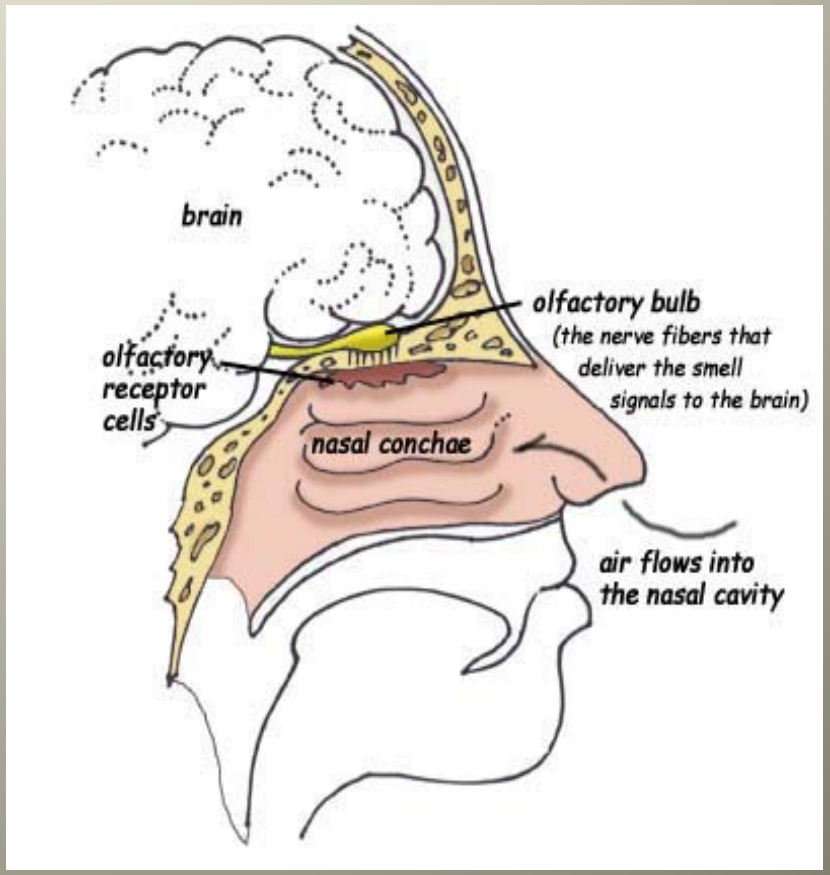
THE SENSE OF SMELL



Objectives

Terminal Objective:

Why the sense of smell is **not** a good way to determine chemical exposure.

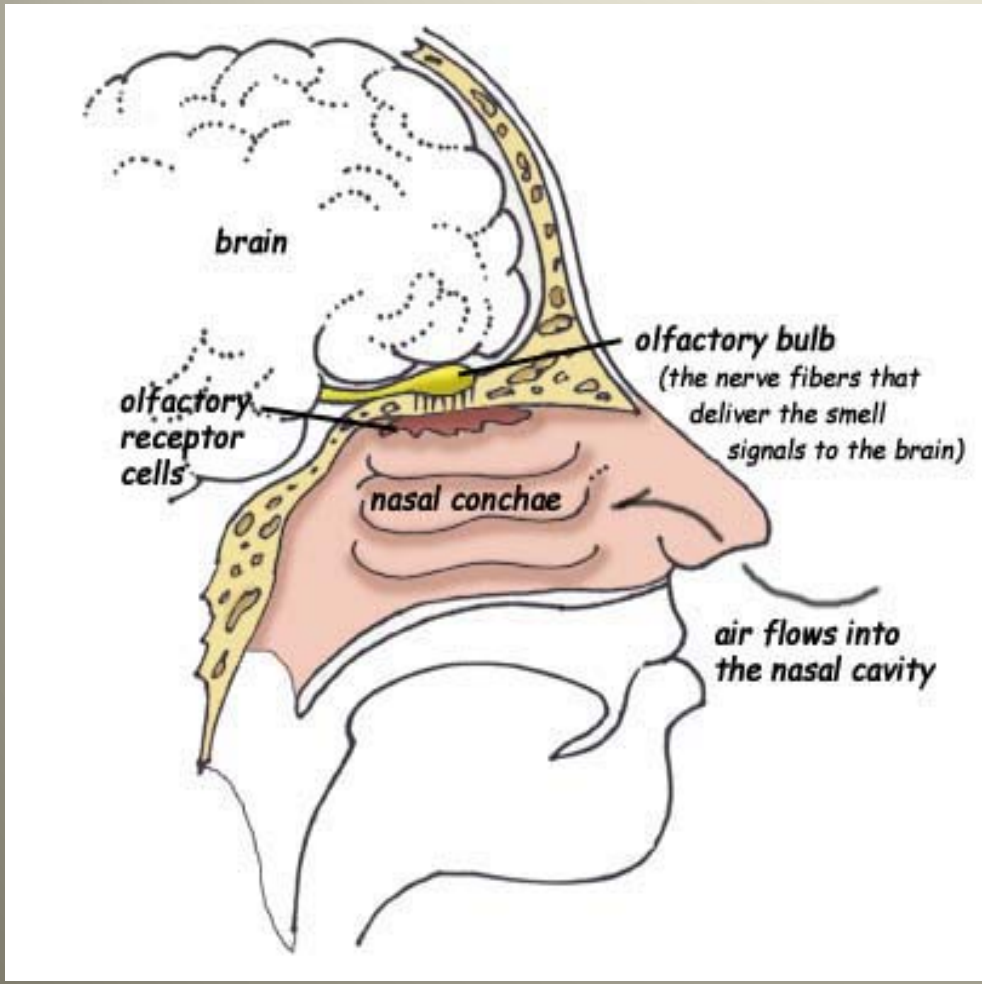
Enabling Objectives:

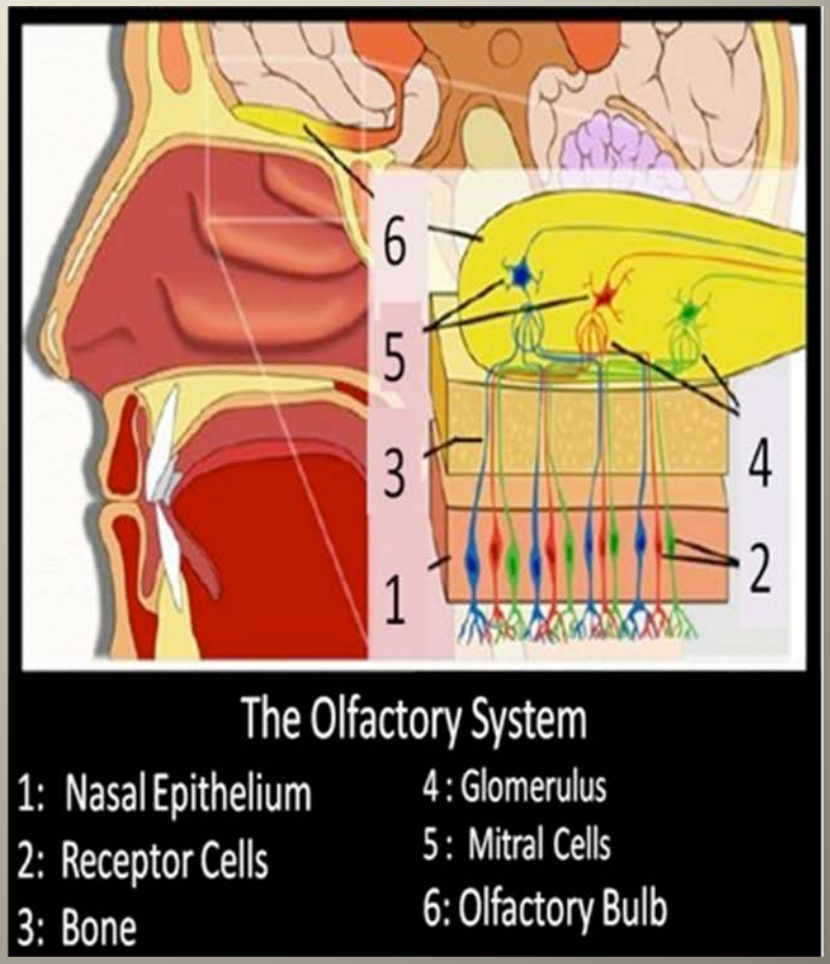
- Recognize the basic anatomy of the nose and how it works
- Recognize the meaning of olfactory fatigue and its effect
- Recognize the difference between odor threshold and PEL and TLV

Sense of Smell

Bears are thought to have the best sense of smell of any animal on earth. For example, the average dog's sense of smell is 100 times better than a human’s. A blood hound's is 300 times better. A bear's sense of smell is 7 times better than a blood hound's or 2,100 times better than a human’s.

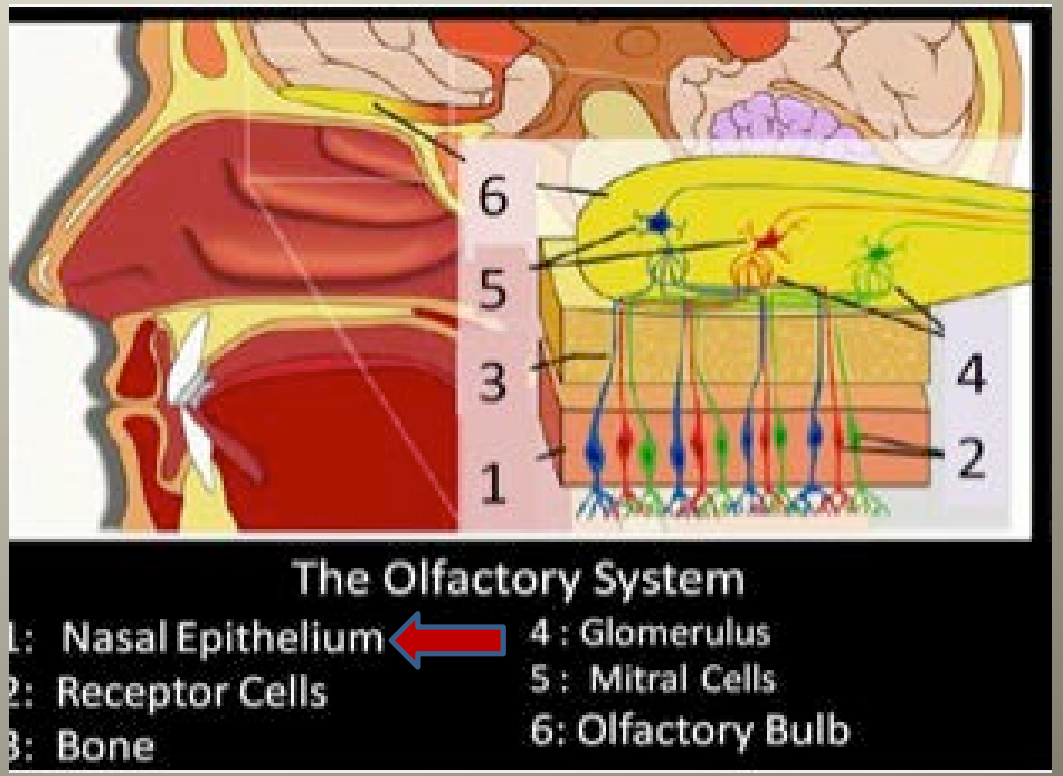
The Olfactory System





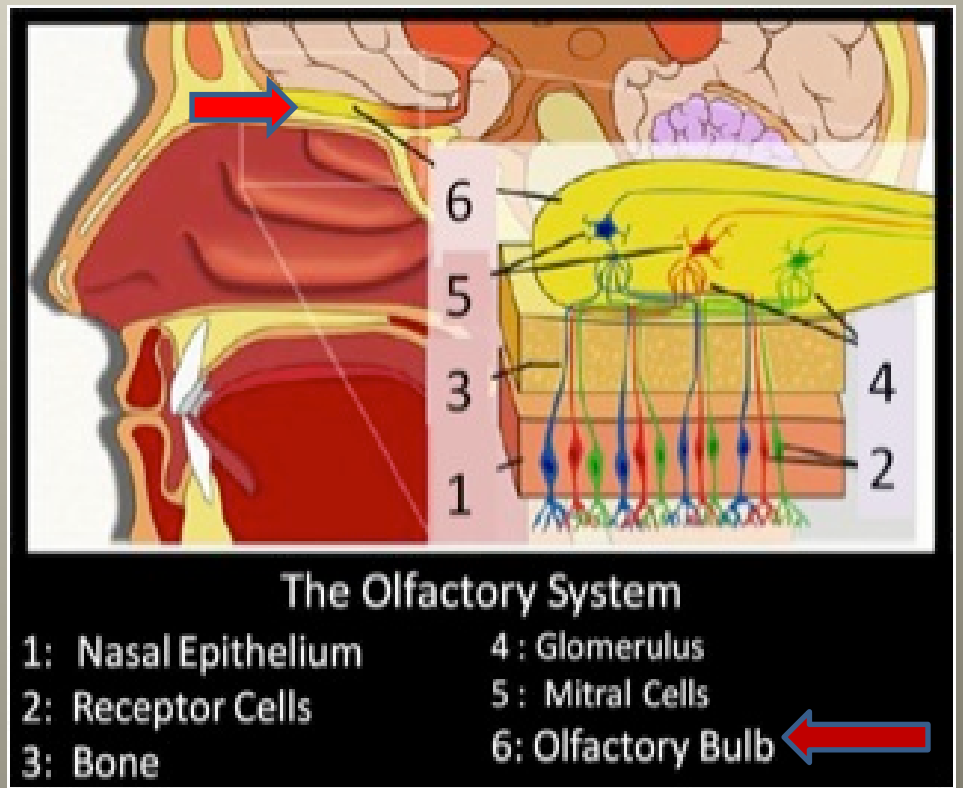
Nasal Epithelium

- The **Nasal Epithelium** is a specialized epithelial tissue inside the nasal cavity that is involved in smell.



Olfactory Bulb

- In most vertebrates, the **olfactory bulb** is the most forward part of the brain. In humans, however, the olfactory bulb is on the bottom side of the brain.



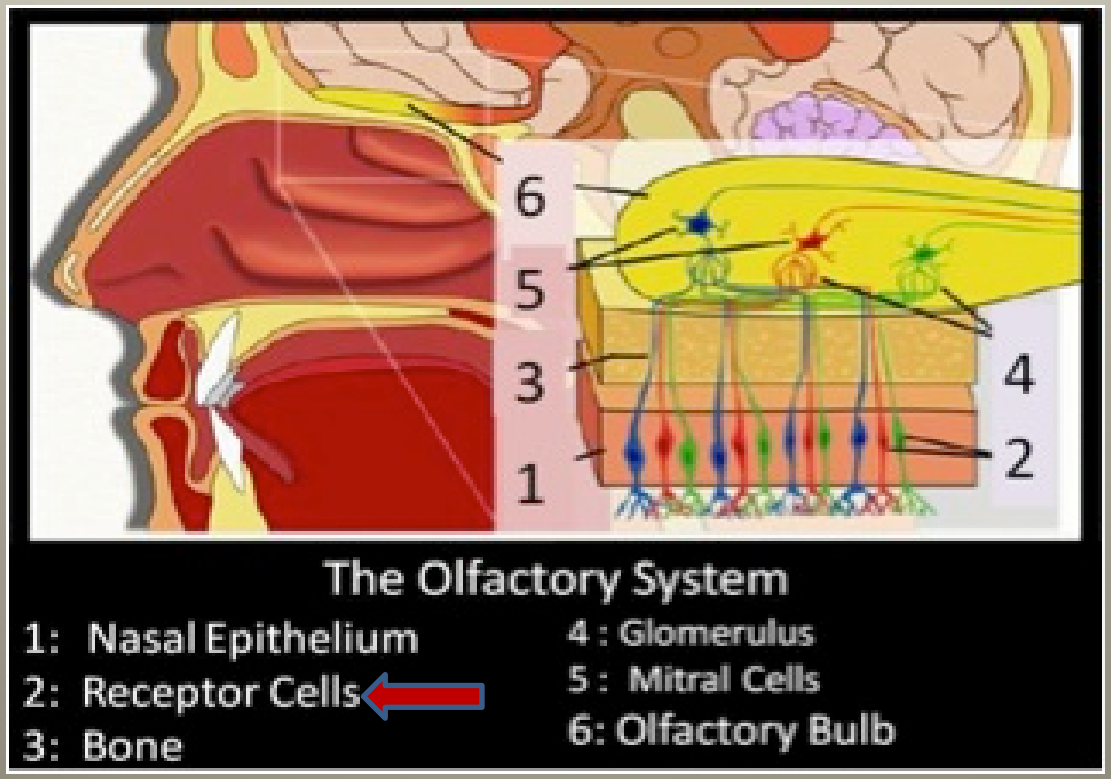
The Olfactory Bulb—cont.

The olfactory bulb transmits smell information from the nose to the brain, and is thus necessary for a proper sense of smell. With this in mind, its potential functions can be placed into four general categories:

- **Enhancing discrimination between odors**
- **Enhancing sensitivity of odor detection**
- **Filtering out many background odors to enhance the transmission of a few select odors**
- **Permitting higher brain areas involved in arousal and attention to modify the detection or the discrimination of odors**

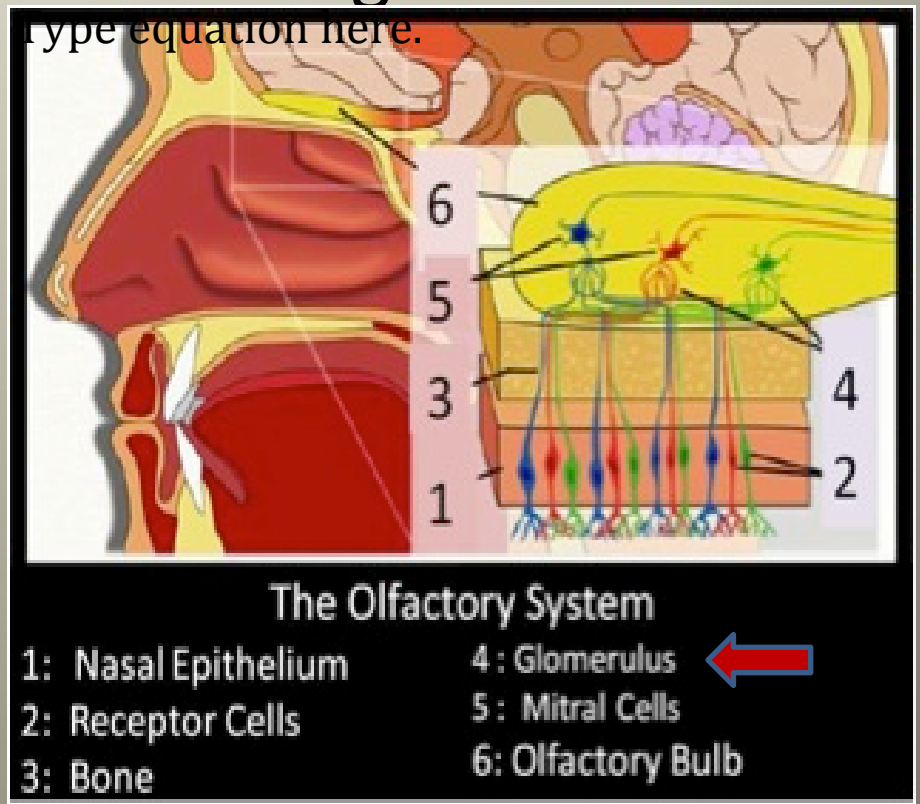
Olfactory Receptor Cells

There are **tens of millions** of olfactory receptor cells, but only about **2000 glomeruli**.
Glomeruli receive input from between **5000 and 10,000** olfactory receptor cells but output onto only **10 to 25** mitral cells.



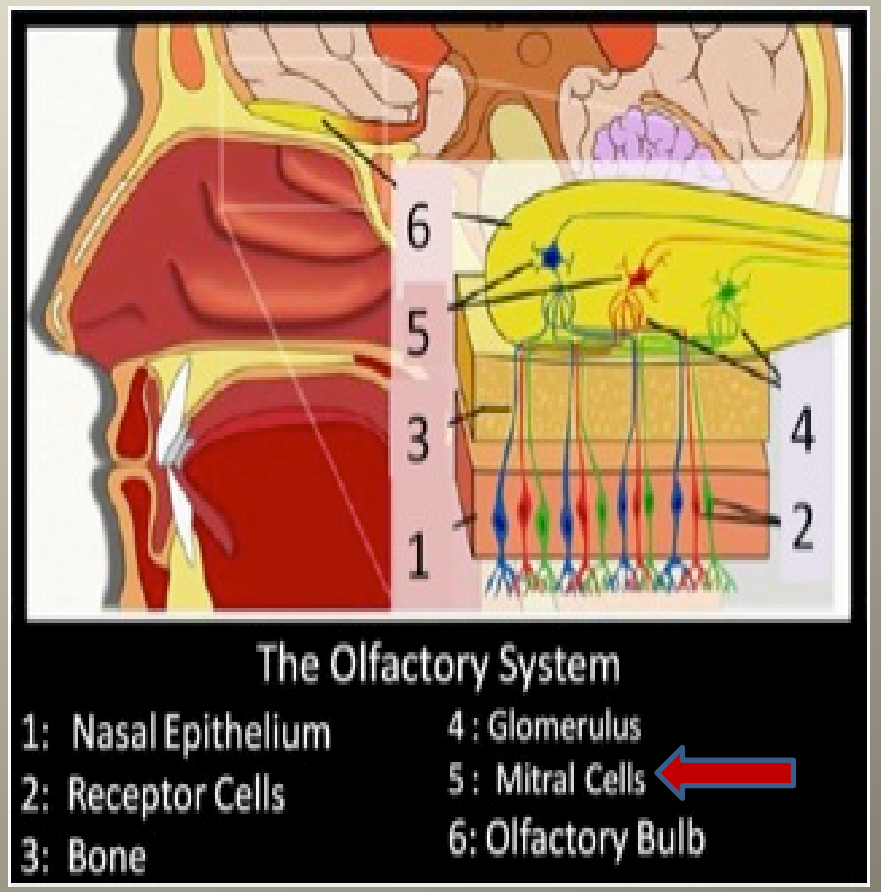
Glomerulus

- The **glomerulus** (plural **glomeruli**) in olfaction is a structure in the olfactory bulb. Each odor activates a different pattern of glomeruli.



Mitral Cells

- **Mitral cells** are neurons that are part of the olfactory system.



Mitral Cells

- The processes of smelling and tasting begin when molecules detach from substances and float into your nose or into your mouth. In both cases, the molecules must dissolve in watery mucous in order to bind to and stimulate cells. These cells transmit messages to brain areas where we perceive odors and taste, and where we remember people, places, or events associated with these olfactory (*smells*) and gustatory (*tastes*) sensations.

Detriments to Smell

The following items can hurt or eliminate a person's ability to smell or detect odors:

- **Medical Conditions**—Head trauma, stroke, subdural hematoma, tumors, hemorrhage, infections, seizures and nerve damage, Parkinson's and Alzheimer's diseases
- **Physical Changes**—Stuffy nose, colds, allergies, mouth breathing, dentures
- **Aging and Genetics**—Bone deformities, cleft palate, loss of receptors
- **Toxic Damage**—Acids, solvents, insecticides, chemicals

Olfactory Fatigue

- Olfactory fatigue can commonly be defined as adaptation to constant stimulation of our sensory system for smell.
- The stimulus causes a receptor cell to produce an electrical signal. After that signal is produced, the cell membrane soon stops allowing the ions to flow, thus preventing further signals and causing us not to “smell” any longer.
- ***The temporary normal inability to distinguish a particular odor after a prolonged exposure to that airborne compound.***

Odor Threshold

- **Odor Threshold—The minimum concentration of a substance at which a majority[50%] of test subjects can detect and identify the substance's characteristic odor.**

Sense of Smell

- EXERCISE # 1

Exercises

- EXERCISE #2
- New Jersey Fact Sheets / Right To Know[RTK]
- http://web.doh.state.nj.us/rtkhsfs/indexfs.aspx?lan=english

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **AMMONIA**

Synonyms: Anhydrous Ammonia
CAS No: 7664-41-7
Molecular Formula: NH_3
RTK Substance No: 0084
Description: Colorless gas with a strong, sharp, irritating odor

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **1 - Fire** **0 - Reactivity** **DOT#:** UN 1005 **ERG Guide #:** 125 **Hazard Class:** 2.3 (Toxic Gases)	Non-flammable gas which can ignite and burn with explosive force. Stop the flow of gas or let burn. POISONOUS GASES ARE PRODUCED IN FIRE, including *Nitrogen Oxides*. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool, and to absorb and disperse vapors.	**Ammonia** reacts violently with HALOGENS (such as FLUORINE, CHLORINE and BROMINE); ACIDS (such as HYDROGEN CHLORIDE, HYDROGEN FLUORIDE and HYDROGEN BROMIDE); NITROSYL CHLORIDE; CHROMYL CHLORIDE; TRIOXYGEN DICHLORIDE; NITROGEN DIOXIDE; NITROGEN TRICHLORIDE; BROMINE PENTAFLUORIDE; CHLORINE TRIFLUORIDE; CALCIUM HYPOCHLORITE; and forms explosive compounds that are pressure and temperature sensitive with MERCURY; GOLD OXIDES; and SILVER SALTS and OXIDES. **Ammonia** is incompatible with CHLOROFORMATES; CYANIDES; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES and NITRATES); DIMETHYL SULFATE; and MANY METALS and their ALLOYS (such as ZINC, COPPER and BRASS). **Ammonia** dissolves in WATER to release heat. Keep away from HEAT, MOISTURE and DIRECT SUNLIGHT.

SPILL/LEAKS

Isolation Distance:

Small spills – 30 meters (100 feet)

Large spills – 60 meters (200 feet)

Stop flow of gas.

Use water spray to absorb and disperse vapors.

Hazardous to the environment.

DO NOT wash into sewer.

PHYSICAL PROPERTIES

Odor Threshold:	Less than 5 ppm
Flash Point:	Non-flammable
LEL:	15%
UEL:	28%
Vapor Density:	0.6 (air = 1)
Vapor Pressure:	658 mm of Hg at 70°F (21°C)
Water Solubility:	Soluble
Boiling Point:	-28°F (-33.4°C)
Ionization Potential:	10.18 eV
Autoignition:	1,204°F (651°C)

EXPOSURE LIMITS

OSHA:	50 ppm (8-hr TWA)
NIOSH:	25 ppm (10-hr TWA), 35 ppm STEL
ACGIH:	25 ppm (8-hr TWA), 35 ppm STEL
IDLH LEVEL:	300 ppm
ERPG-1:	10 ppm
ERPG-2:	200 ppm
ERPG-3	1,000 ppm

PROTECTIVE EQUIPMENT

Gloves:	Nitrile, Neoprene, Butyl, Butyl/Neoprene, Viton/ Neoprene
Coveralls:	Dupont Tychem® CPE and Kappler Zytron® 500
Boots:	Butyl/Neoprene
Respirator:	> 25 ppm - APR with full-facepiece and cartridges for **Ammonia** >250 ppm - Supplied Air >300 ppm - SCBA

HEALTH EFFECTS

Eyes:	Irritation and burns
Skin:	Irritation and burns. Contact with liquid causes frostbite.
Acute:	Nose, throat and lung irritation with coughing and shortness of breath
Chronic:	An asthma-like allergy with shortness of breath, wheezing, coughing and/or chest tightness

FIRST AID AND DECONTAMINATION

Remove the person from exposure.
Flush eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention immediately.
Immerse affected part in warm water if in contact with liquid.
Begin artificial respiration if breathing has stopped and CPR if necessary.
Transfer to a medical facility.

SENSE OF SMELL

- QUESTIONS?
- DISCUSSIONS?

Can we always trust our nose?