General Laboratory and Chemical Safety

University of Houston Clear Lake

Environmental, Health and Safety Department

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Outline

- Safety is Everyone's Responsibility
- MSDS to SDS
- SDS Sections
- GHS
- Toxicity Terms
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- NFPA Diamond
- Other Health Terms
- Common Routes of Exposure
- Labeling
- Waste
- PPE – Personal Protective Equipment
- Proper Laboratory Practice
- Glassware
- Proper Laboratory Techniques
- Fume Hoods
- Cross Contamination
- Emergency Preparedness
- Fire Safety
- Incident Reporting
- First Aid
- BBP Description & Routes of Transmission
- Governing Laws and Regulations
- Minimize or Eliminate Biohazards
- Engineering Controls & Injury Prevention
- How to Remove Gloves
- Hand Hygiene
- Biohazard Waste Containers, Handling & Disposal
- Spill Clean Up
- Sharps Injury Log

Safety is Everyone's Responsibility

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University's Responsibility

- Provide you a safe laboratory work environment
- Give you proper instruction on procedures
- Train you on safely handling potential laboratory hazards
- Ensure all safety and laboratory equipment is in good condition
- Make every attempt to keep hazardous chemical exposures low to keep you safe
- Design experiments with safe practices to eliminate as many hazards as possible

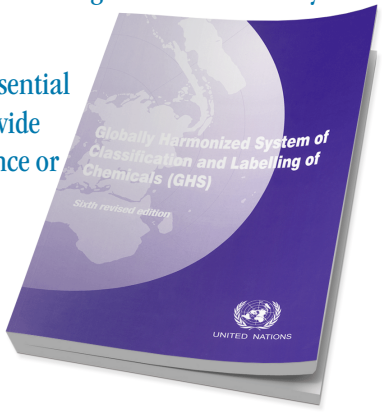
University of Houston Clear Lake

Your Responsibility

- Follow all safety guidelines, instructions and procedures
- Follow all instruction given by your instructor and teacher's aid (TA)
- Read and understand all experiment procedures, and material given in lectures
- Know how to safely operate equipment or instruments prior to use
- Understand and follow all product warning labels
- Read, understand and follow all (Material) Safety Data Sheets
- Always correctly wear proper Personal Protective Equipment when in the laboratory
- Expect that some hazards are always present in a chemistry laboratory
- Always report any unsafe conditions to your instructor

MSDS to SDS

- OSHA's adoption of the Globally Harmonized System (GHS) for Hazard Communication 2012, has brought significant changes to Material Safety Data Sheets (MSDS).
- The new Safety Data Sheets (SDS) are an essential component of GHS, and are intended to provide comprehensive information about a substance or mixture for use in workplace chemical management.
- SDS are intended to promote a consistent, user-friendly source of info about hazards, including environmental hazards, and to obtain advice on safety precautions.



SDS Sections

- **Section 1 – Product and Company Identification**
  Includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.
- **Section 2 – Hazards Identification**
  Includes all hazards regarding the chemical; required label elements.
- **Section 3 – Composition/Information On Ingredients**
  Includes information on chemical ingredients; trade secret claims.
- **Section 4 – First-Aid Measures**
  Includes important symptoms/ effects, acute, delayed; required treatment.
- **Section 5 – Firefighting Measures**
  Lists suitable extinguishing techniques, equipment; chemical hazards from fire.
- **Section 6 – Accidental Release Measures**
  Lists emergency procedures; protective equipment; proper methods of containment and cleanup.
- **Section 7 – Handling and Storage**
  Lists precautions for safe handling and storage, including incompatibilities.
- **Section 8 – Exposure Controls/Personal Protection**
  Lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).

SDS Sections, Cont.

- **Section 9 – Physical and Chemical Properties**
  Lists the chemical's characteristics.
- **Section 10 – Stability and Reactivity**
  Lists chemical stability and possibility of hazardous reactions.
- **Section 11 – Toxicological Information**
  Includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.
- **Section 12 – Ecological Information**
  This section provides information to evaluate the environmental impact of the chemical(s) if it were released to the environment.
- **Section 13 – Disposal Considerations**
  This section provides guidance on proper disposal practices, recycling or reclamation of the chemical(s) or its container, and safe handling practices.
- **Section 14 – Transport Information**
  This section provides guidance on classification information for shipping and transporting of hazardous chemical(s) by road, air, rail, or sea.
- **Section 15 – Regulatory Information**
  This section identifies the safety, health, and environmental regulations specific for the product that is not indicated anywhere else on the SDS.
- **Section 16 – Other Information**
  Includes the date of preparation or last revision.

SDS Sec. 1,2

Section 1 – Product and Company Identification
Includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

CAS Number

Manufacturers Information

Section 2 – Hazards Identification
Includes all hazards regarding the chemical; required label elements.

GHS Category Ratings
Rating order from Minimal (5) to Severe (1)

GHS Pictograms

GHS Signal Word

GHS Hazard Statements
"H" phrases followed by 3 numbers describe the nature of the hazards of a hazardous substance or mixture, including, where appropriate, the degree of hazard

GHS Precautionary Statements
"P" phrases followed by 3 numbers describe recommended measure(s) to minimize or prevent adverse effects resulting from exposure to a hazardous substance or mixture due to its use or disposal

Acetone
Safety Data Sheet
according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations
Date of issue: 8/28/2017 Revision date: 05/12/2017 Supersedes: 12/07/2016 Version: 1.2

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	Acetone
Chemical name	:	2-Propanone
CAS No	:	67-64-1
Product code	:	LC10420, LC10425
Formula	:	CH_3)$_2$CO
Synonyms	:	2-propanone / beta-ketopropane / dimethyl formaldehyde / dimethyl ketone / dimethylketal / DMK (=dimethyl ketone) / keto propane / methyl ketone / pyroacetic acid / pyroacetic ether / pyroacetic spirit

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	:	Solvent Cleaning product Chemical raw material

1.3. Details of the supplier of the safety data sheet

University of Houston-Clear Lake
Department of Environmental Health and Safety
2700 Bay Area Blvd.
Houston, TX 77058-1002
T 281-283-2105 F 281-225-7200
www.ehs@uhcl.edu - www.uhcl.edu

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Flammable liquids Category 2	H225
Serious eye damage/eye irritation Category 2A	H319
Specific target organ toxicity (single exposure) Category 3	H336

Full text of H statements : see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) : 

Signal word (GHS-US) : Danger

Hazard statements (GHS-US)
H225 - Highly flammable liquid and vapor
H319 - Causes serious eye irritation
H336 - May cause drowsiness or dizziness

Precautionary statements (GHS-US)
P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking
P233 - Keep container tightly closed
P240 - Ground/bond container and receiving equipment
P241 - Use explosion-proof electrical, lighting, ventilating equipment
P242 - Use only non-sparking tools
P243 - Take precautionary measures against static discharge
P261 - Avoid breathing mist, spray, vapors
P264 - Wash exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear eye protection, face protection, protective clothing, protective gloves
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position

SDS Sec. 3,4

GHS Precautionary Statements, Cont'd

Section 3 – Composition/Information on Ingredients
Includes information on chemical ingredients; trade secret claims.

Section 4 – First-Aid Measures
Includes important symptoms/effects, acute, delayed; required treatment.

Acetone
Safety Data Sheet
according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P337 + P313 - If eye irritation persists: Get medical advice/attention
P370 + P378 - In case of fire: Use dry chemical powder, alcohol-resistant foam, carbon dioxide (CO2) to extinguish
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P501 - Dispose of contents/container to comply with local, state and federal regulations
P235 - Keep cool

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	GHS-US classification
Acetone (Main constituent)	(CAS No) 67-64-1	100	Flam. Liq. 2, H225 Eye Irrit. 2A, H319 STOT SE 3, H336

Full text of hazard classes and H-statements : see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with labored breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

First-aid measures after inhalation : Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

First-aid measures after skin contact : Wash immediately with lots of water. Soap may be used. Do not apply (chemical) neutralizing agents. Remove clothing before washing. Take victim to a doctor if irritation persists.

First-aid measures after eye contact : Rinse immediately with plenty of water. Do not apply neutralizing agents. Take victim to an ophthalmologist if irritation persists.

First-aid measures after ingestion : Rinse mouth with water. Immediately after ingestion: give lots of water to drink. Do not give milk/oil to drink. Do not induce vomiting. Give activated charcoal. Call Poison Information Centre (1-800-222-1222) Consult a doctor/medical service if you feel unwell. Ingestion of large quantities: immediately to hospital. Doctor: gastric lavage.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : Not expected to present a significant hazard under anticipated conditions of normal use.

Symptoms/injuries after inhalation : EXPOSURE TO HIGH CONCENTRATIONS: Feeling of weakness. Irritation of the respiratory tract. Nausea. Vomiting. Headache. Central nervous system depression. Dizziness. Narcosis. Excited/restless. Drunkenness. Disturbed motor response. Respiratory difficulties. Disturbances of consciousness.

Symptoms/injuries after skin contact : ON CONTINUOUS EXPOSURE/CONTACT: Dry skin. Cracking of the skin.

Symptoms/injuries after eye contact : Irritation of the eye tissue.

Symptoms/injuries after ingestion : Dry/sore throat. Risk of aspiration pneumonia. Symptoms similar to those listed under inhalation. AFTER ABSORPTION OF LARGE QUANTITIES: Irritation of the gastric/intestinal mucosa. Change in the blood composition. Change in urine output. Renal disease. Enlargement/disease of the liver.

Symptoms/injuries upon intravenous administration : Not available.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Skin rash/inflammation. Dry/sore throat. Headache. Nausea. Feeling of weakness. Loss of weight. Possible inflammation of the respiratory tract.

EXAMPLE

SDS Sec. 5,6

Section 5 – Firefighting Measures
Lists suitable extinguishing techniques, equipment; chemical hazards from fire.

Section 6 – Accidental Release Measures
Lists emergency procedures; protective equipment; proper methods of containment and cleanup.

Acetone
Safety Data Sheet
according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

4.3. Indication of any immediate medical attention and special treatment needed
Obtain medical assistance.

SECTION 5: Firefighting measures

5.1. Extinguishing media
Suitable extinguishing media : Preferably: alcohol resistant foam. Water spray. Polyvalent foam. Alcohol-resistant foam. BC powder. Carbon dioxide.
Unsuitable extinguishing media : Solid water jet ineffective as extinguishing medium.

5.2. Special hazards arising from the substance or mixture
Fire hazard : DIRECT FIRE HAZARD. Highly flammable. Gas/vapor flammable with air within explosion limits. INDIRECT FIRE HAZARD. May be ignited by sparks. Gas/vapor spreads at floor level: ignition hazard. Reactions involving a fire hazard: see "Reactivity Hazard".
Explosion hazard : DIRECT EXPLOSION HAZARD. Gas/vapour explosive with air within explosion limits. INDIRECT EXPLOSION HAZARD. Heat may cause pressure rise in tanks/drums: explosion risk: may be ignited by sparks. Reactions with explosion hazards: see "Reactivity Hazard".
Reactivity : Upon combustion: CO and CO2 are formed. Violent to explosive reaction with many compounds. Prolonged storage: on exposure to light: release of harmful gases/vapours. Reacts violently with (strong) oxidizers: peroxidation resulting in increased fire or explosion risk.

5.3. Advice for firefighters
Firefighting instructions : Cool tanks/drums with water spray/remove them into safety. Physical explosion risk: extinguish/cool from behind cover. Do not move the load if exposed to heat. After cooling: persistant risk of physical explosion.
Protection during firefighting : Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
6.1.1. For non-emergency personnel
Protective equipment : Gloves. Protective goggles. Protective clothing. Large spills/in enclosed spaces: compressed air apparatus. See "Material-Handling" to select protective clothing.
Emergency procedures : Keep upwind. Mark the danger area. Consider evacuation. Seal off low-lying areas. Close doors and windows of adjacent premises. Stop engines and no smoking. No naked flames or sparks. Spark- and explosion-proof appliances and lighting equipment. Keep containers closed. Wash contaminated clothes.

6.1.2. For emergency responders
Protective equipment : Equip cleanup crew with proper protection.
Emergency procedures : Ventilate area.

6.2. Environmental precautions
Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up
For containment : Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Try to reduce evaporation. Measure the concentration of the explosive gas-air mixture. Dilute/disperse combustible gas/vapour with water curtain. Provide equipment/receptacles with earthing. Do not use compressed air for pumping over spills.
Methods for cleaning up : Take up liquid spill into inert absorbent material, e.g.: sand, earth, vermiculite. Scoop absorbed substance into closing containers. See "Material-handling" for suitable container materials. Spill must not return in its original container. Carefully collect the spill/leftovers. Damaged/cooled tanks must be emptied. Do not use compressed air for pumping over spills. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections
See Heading 8. Exposure controls and personal protection.

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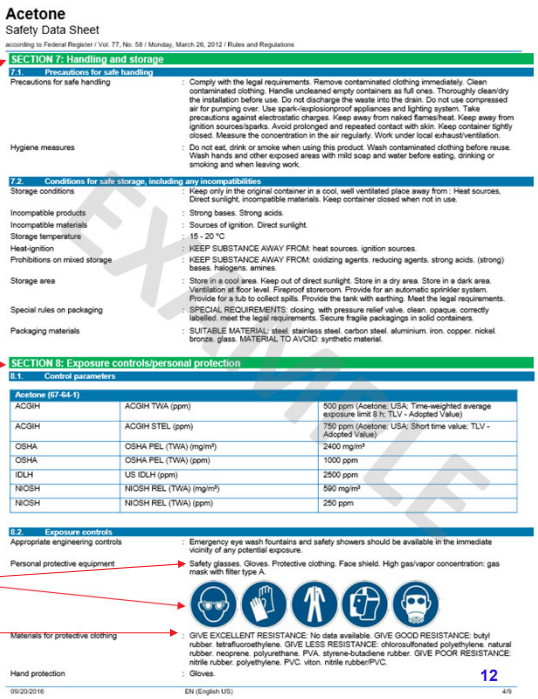
SDS Sec. 7,8

Section 7 – Handling and Storage
Lists precautions for safe handling and storage, including incompatibilities.

Section 8 – Exposure Controls/Personal Protection
Lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).

Personal Protective Equipment (PPE) and Pictograms

Materials for protective clothing
Describes the best materials for your PPE. For example, choosing the best material type of glove to use.



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SECTION 7: Handling and storage

7.1. Precautions for safe handling
Precautions for safe handling : Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Handle uncleaned empty containers as full ones. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Do not use compressed air for pumping over. Use spark-/explosionproof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks. Avoid prolonged and repeated contact with skin. Keep container tightly closed. Measure the concentration in the air regularly. Work under local exhaust/ventilation.
Hygiene measures : Do not eat, drink or smoke when using this product. Wash contaminated clothing before reuse. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

7.2. Conditions for safe storage, including any incompatibilities
Storage conditions : Keep only in the original container in a cool, well ventilated place away from : Heat sources, Direct sunlight, incompatible materials. Keep container closed when not in use.
Incompatible products : Strong bases. Strong acids.
Incompatible materials : Sources of ignition. Direct sunlight.
Storage temperature : 15 - 20 °C
Heat-ignition : KEEP SUBSTANCE AWAY FROM: heat sources, ignition sources.
Prohibitions on mixed storage : KEEP SUBSTANCE AWAY FROM: oxidizing agents. reducing agents. strong acids. (strong) bases. halogens. amines.
Storage area : Store in a cool area. Keep out of direct sunlight. Store in a dry area. Store in a dark area. Ventilation at floor level. Fireproof storeroom. Provide for an automatic sprinkler system. Provide for a tub to collect spills. Provide the tank with earthing. Meet the legal requirements.
Special rules on packaging : SPECIAL REQUIREMENTS: closing. with pressure relief valve. clean. opaque. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.
Packaging materials : SUITABLE MATERIAL: steel. stainless steel. carbon steel. aluminium. iron. copper. nickel. bronze. glass. MATERIAL TO AVOID: synthetic material.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Acetone (67-64-1)		
ACGIH	ACGIH TWA (ppm)	500 ppm (Acetone; USA; Time-weighted average exposure limit 8 h; TLV - Adopted Value)
ACGIH	ACGIH STEL (ppm)	750 ppm (Acetone; USA; Short time value; TLV - Adopted Value)
OSHA	OSHA PEL (TWA) (mg/m³)	2400 mg/m³
OSHA	OSHA PEL (TWA) (ppm)	1000 ppm
IDLH	US IDLH (ppm)	2500 ppm
NIOSH	NIOSH REL (TWA) (mg/m³)	590 mg/m³
NIOSH	NIOSH REL (TWA) (ppm)	250 ppm

8.2. Exposure controls
Appropriate engineering controls : Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Personal protective equipment : Safety glasses. Gloves. Protective clothing. Face shield. High gas/vapor concentration: gas mask with filter type A.

Materials for protective clothing : GIVE EXCELLENT RESISTANCE: No data available. GIVE GOOD RESISTANCE: butyl rubber. tetrafluoroethylene. GIVE LESS RESISTANCE: chlorosulfonated polyethylene. natural rubber. neoprene. polyurethane. PVA. styrene-butadiene rubber. GIVE POOR RESISTANCE: nitrile rubber. polyethylene. PVC. viton. nitrile rubber/PVC.
Hand protection : Gloves.

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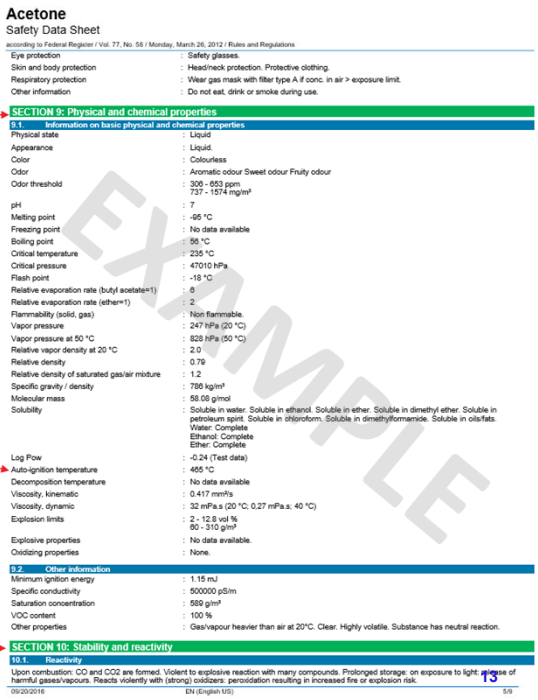
SDS Sec. 9,10

Section 9 – Physical and Chemical Properties
Lists the chemical's characteristics.

Auto-Ignition Temperature
Lowest temperature where a material will ignite without an external source of ignition. Heating to this point may result in a explosion.

Section 10 – Stability and Reactivity
Lists chemical stability and possibility of hazardous reactions.



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Eye protection	: Safety glasses.
Skin and body protection	: Head/neck protection. Protective clothing.
Respiratory protection	: Wear gas mask with filter type A if conc. in air > exposure limit.
Other information	: Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Liquid
Appearance	: Liquid.
Color	: Colourless
Odor	: Aromatic odour Sweet odour Fruity odour
Odor threshold	: 306 - 653 ppm 737 - 1574 mg/m³
pH	: 7
Melting point	: -95 °C
Freezing point	: No data available
Boiling point	: 56 °C
Critical temperature	: 235 °C
Critical pressure	: 47010 hPa
Flash point	: -18 °C
Relative evaporation rate (butyl acetate=1)	: 6
Relative evaporation rate (ether=1)	: 2
Flammability (solid, gas)	: Non flammable.
Vapor pressure	: 247 hPa (20 °C)
Vapor pressure at 50 °C	: 828 hPa (50 °C)
Relative vapor density at 20 °C	: 2.0
Relative density	: 0.79
Relative density of saturated gas/air mixture	: 1.2
Specific gravity / density	: 786 kg/m³
Molecular mass	: 58.08 g/mol
Solubility	: Soluble in water. Soluble in ethanol. Soluble in ether. Soluble in dimethyl ether. Soluble in petroleum spirit. Soluble in chloroform. Soluble in dimethylformamide. Soluble in oils/fats. Water: Complete Ethanol: Complete Ether: Complete
Log Pow	: -0.24 (Test data)
Auto-ignition temperature	: 465 °C
Decomposition temperature	: No data available
Viscosity, kinematic	: 0.417 mm²/s
Viscosity, dynamic	: 32 mPa.s (20 °C; 0.27 mPa.s; 40 °C)
Explosion limits	: 2 - 12.8 vol % 60 - 310 g/m³
Explosive properties	: No data available.
Oxidizing properties	: None.

9.2. Other information

Minimum ignition energy	: 1.15 mJ
Specific conductivity	: 500000 pS/m
Saturation concentration	: 589 g/m³
VOC content	: 100 %
Other properties	: Gas/vapour heavier than air at 20°C. Clear. Highly volatile. Substance has neutral reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

Upon combustion: CO and CO2 are formed. Violent to explosive reaction with many compounds. Prolonged storage: on exposure to light: release of harmful gases/vapours. Reacts violently with (strong) oxidizers: peroxidation resulting in increased fire or explosion risk.

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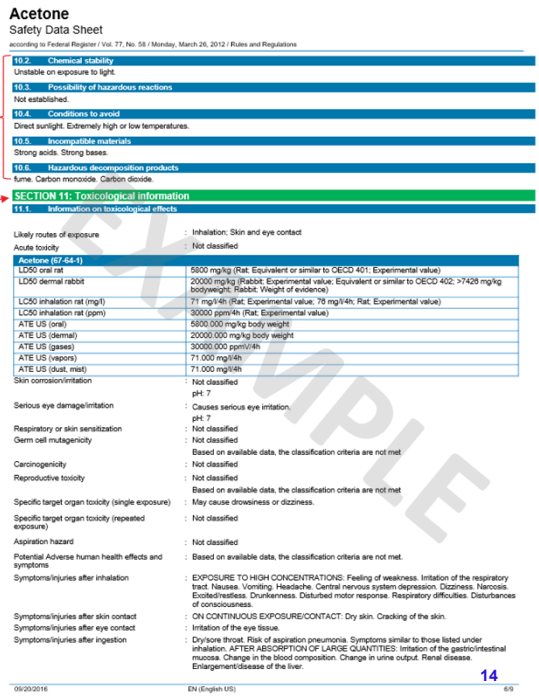
SDS Sec. 11

Section 10 – Stability and Reactivity, Cont'd

Section 11 – Toxicological Information
Includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.



Acetone
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10.2. Chemical stability
Unstable on exposure to light.

10.3. Possibility of hazardous reactions
Not established.

10.4. Conditions to avoid
Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials
Strong acids. Strong bases.

10.6. Hazardous decomposition products
fume. Carbon monoxide. Carbon dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure	: Inhalation; Skin and eye contact
Acute toxicity	: Not classified

Acetone (67-64-1)	
LD50 oral rat	5800 mg/kg (Rat; Equivalent or similar to OECD 401; Experimental value)
LD50 dermal rabbit	20000 mg/kg (Rabbit; Experimental value; Equivalent or similar to OECD 402; >7426 mg/kg bodyweight; Rabbit; Weight of evidence)
LC50 inhalation rat (mg/l)	71 mg/l/4h (Rat; Experimental value; 76 mg/l/4h; Rat; Experimental value)
LC50 inhalation rat (ppm)	30000 ppm/4h (Rat; Experimental value)
ATE US (oral)	5800.000 mg/kg body weight
ATE US (dermal)	20000.000 mg/kg body weight
ATE US (gases)	30000.000 ppmV/4h
ATE US (vapors)	71.000 mg/l/4h
ATE US (dust, mist)	71.000 mg/l/4h

Skin corrosion/irritation	: Not classified pH: 7
Serious eye damage/irritation	: Causes serious eye irritation. pH: 7
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified Based on available data, the classification criteria are not met
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified Based on available data, the classification criteria are not met
Specific target organ toxicity (single exposure)	: May cause drowsiness or dizziness.
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified
Potential Adverse human health effects and symptoms	: Based on available data, the classification criteria are not met.
Symptoms/injuries after inhalation	: EXPOSURE TO HIGH CONCENTRATIONS: Feeling of weakness. Irritation of the respiratory tract. Nausea. Vomiting. Headache. Central nervous system depression. Dizziness. Narcosis. Excited/restless. Drunkenness. Disturbed motor response. Respiratory difficulties. Disturbances of consciousness.
Symptoms/injuries after skin contact	: ON CONTINUOUS EXPOSURE/CONTACT: Dry skin. Cracking of the skin.
Symptoms/injuries after eye contact	: Irritation of the eye tissue.
Symptoms/injuries after ingestion	: Dry/sore throat. Risk of aspiration pneumonia. Symptoms similar to those listed under inhalation. AFTER ABSORPTION OF LARGE QUANTITIES: Irritation of the gastric/intestinal mucosa. Change in the blood composition. Change in urine output. Renal disease. Enlargement/disease of the liver.

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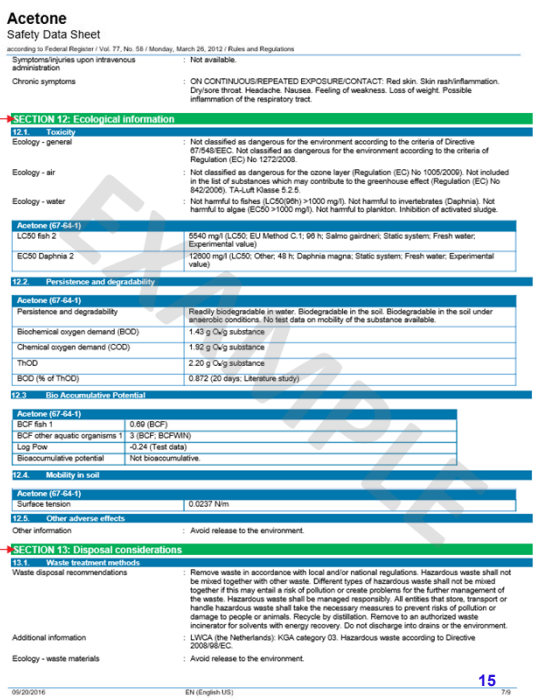
SDS Sec. 12,13

*Section 12 – Ecological Information

*Section 13 – Disposal Considerations

*Note: Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15 (29 CFR 1910.1200(g)(2)).



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Symptoms/injuries upon intravenous administration : Not available.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Skin rash/inflammation. Dry/sore throat. Headache. Nausea. Feeling of weakness. Loss of weight. Possible inflammation of the respiratory tract.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Not classified as dangerous for the environment according to the criteria of Directive 67/548/EEC. Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008.

Ecology - air : Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009). Not included in the list of substances which may contribute to the greenhouse effect (Regulation (EC) No 842/2006). TA-Luft Klasse 5.2.5.

Ecology - water : Not harmful to fishes (LC50(96h) >1000 mg/l). Not harmful to invertebrates (Daphnia). Not harmful to algae (EC50 >1000 mg/l). Not harmful to plankton. Inhibition of activated sludge.

Acetone (67-64-1)	
LC50 fish 2	5540 mg/l (LC50; EU Method C.1; 96 h; Salmo gairdneri; Static system; Fresh water; Experimental value)
EC50 Daphnia 2	12600 mg/l (LC50; Other; 48 h; Daphnia magna; Static system; Fresh water; Experimental value)

12.2. Persistence and degradability

Acetone (67-64-1)	
Persistence and degradability	Readily biodegradable in water. Biodegradable in the soil. Biodegradable in the soil under anaerobic conditions. No test data on mobility of the substance available.
Biochemical oxygen demand (BOD)	1.43 g O$_2$/g substance
Chemical oxygen demand (COD)	1.92 g O$_2$/g substance
ThOD	2.20 g O$_2$/g substance
BOD (% of ThOD)	0.872 (20 days; Literature study)

12.3 Bio Accumulative Potential

Acetone (67-64-1)	
BCF fish 1	0.69 (BCF)
BCF other aquatic organisms 1	3 (BCF; BCFWIN)
Log Pow	-0.24 (Test data)
Bioaccumulative potential	Not bioaccumulative.

12.4. Mobility in soil

Acetone (67-64-1)	
Surface tension	0.0237 N/m

12.5. Other adverse effects

Other information : Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle by distillation. Remove to an authorized waste incinerator for solvents with energy recovery. Do not discharge into drains or the environment.

Additional information : LWCA (the Netherlands): KGA category 03. Hazardous waste according to Directive 2008/98/EC.

Ecology - waste materials : Avoid release to the environment.

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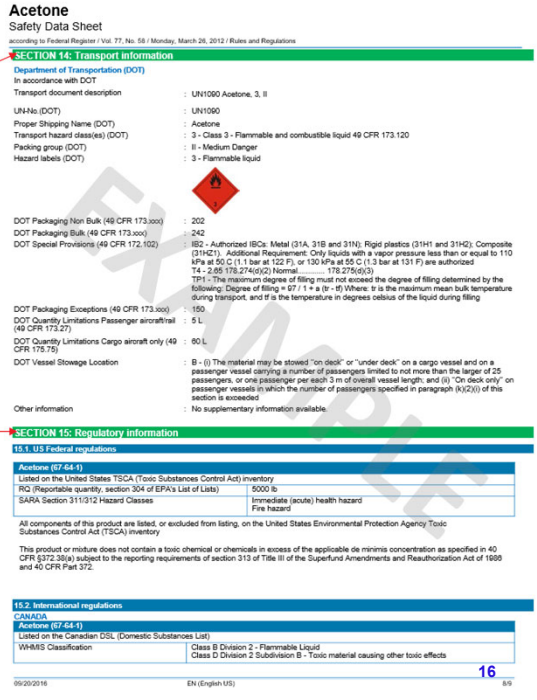
SDS Sec. 14,15

*Section 14 – Transport Information

*Section 15 – Regulatory Information

*Note: Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15 (29 CFR 1910.1200(g)(2)).



Acetone
Safety Data Sheet
according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN1090 Acetone, 3, II

UN-No.(DOT) : UN1090

Proper Shipping Name (DOT) : Acetone

Transport hazard class(es) (DOT) : 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120

Packing group (DOT) : II - Medium Danger

Hazard labels (DOT) : 3 - Flammable liquid

DOT Packaging Non Bulk (49 CFR 173.xxx) : 202

DOT Packaging Bulk (49 CFR 173.xxx) : 242

DOT Special Provisions (49 CFR 172.102) : IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized
T4 - 2.65 178.274(d)(2) Normal..... 178.275(d)(3)
TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / 1 + a (tr - tf) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling

DOT Packaging Exceptions (49 CFR 173.xxx) : 150

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 5 L

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 60 L

DOT Vessel Stowage Location : B - (i) The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) "On deck only" on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded

Other information : No supplementary information available.

SECTION 15: Regulatory information

15.1. US Federal regulations

Acetone (67-64-1)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	5000 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Fire hazard

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

Acetone (67-64-1)	
Listed on the Canadian DSL (Domestic Substances List)	
WHMIS Classification	Class B Division 2 - Flammable Liquid Class D Division 2 Subdivision B - Toxic material causing other toxic effects

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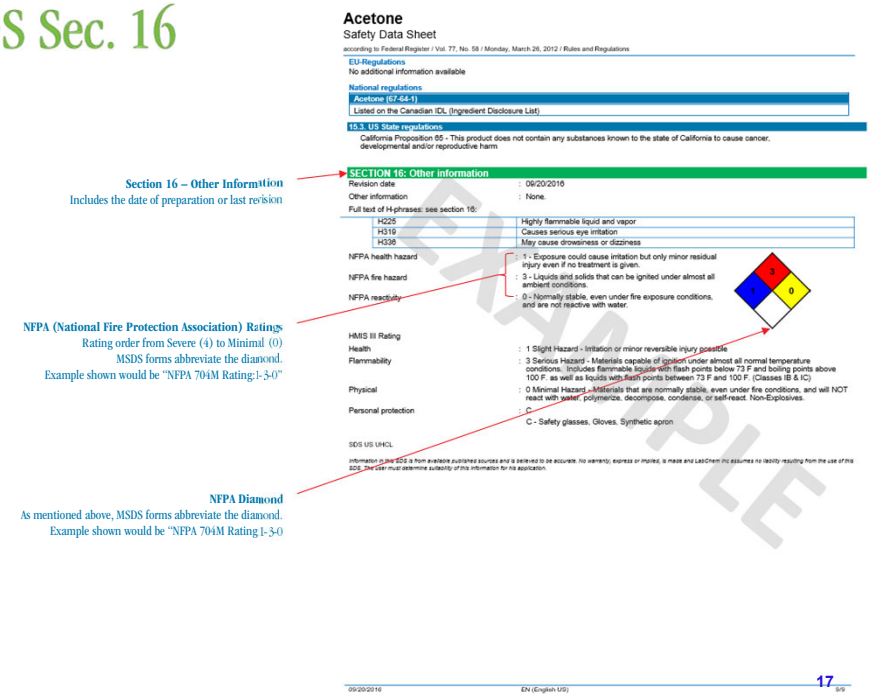
SDS Sec. 16

Section 16 – Other Information
Includes the date of preparation or last revision

NFPA (National Fire Protection Association) Ratings
Rating order from Severe (4) to Minimal (0)
MSDS forms abbreviate the diamond.
Example shown would be "NFPA 704M Rating:1-3-0"

NFPA Diamond
As mentioned above, MSDS forms abbreviate the diamond.
Example shown would be "NFPA 704M Rating 1-3-0



Acetone
Safety Data Sheet
according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

EU-Regulations
No additional information available

National regulations
Acetone (67-64-1)
Listed on the Canadian IDL (Ingredient Disclosure List)

15.3. US State regulations
California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date	: 09/20/2016
Other information	: None.

Full text of H-phrases: see section 16:

H225	Highly flammable liquid and vapor
H319	Causes serious eye irritation
H336	May cause drowsiness or dizziness

NFPA health hazard	: 1 - Exposure could cause irritation but only minor residual injury even if no treatment is given.
NFPA fire hazard	: 3 - Liquids and solids that can be ignited under almost all ambient conditions.
NFPA reactivity	: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.

HMIS III Rating

Health	: 1 Slight Hazard - Irritation or minor reversible injury possible
Flammability	: 3 Serious Hazard - Materials capable of ignition under almost all normal temperature conditions. Includes flammable liquids with flash points below 73 F and boiling points above 100 F, as well as liquids with flash points between 73 F and 100 F. (Classes IB & IC)
Physical	: 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.
Personal protection	: C C - Safety glasses, Gloves, Synthetic apron

SDS US UHCL

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

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EXAMPLE

GHS

GHS – is an acronym for the **Globally Harmonized System (GHS)** of Classification and Labeling of Chemicals developed by the United Nations for Hazard Communication purposes.

- It is not a global law or regulation, but it has been adopted by over 65 countries.
- It is a worldwide system for standardizing hazard classification criteria and the communication of chemical hazards.

GHS system includes these 6 label elements:

1. **Signal Word**
2. **GHS Symbols (Hazard Pictogram)**
3. **Manufacturing Information**
4. **First Aid**
5. **Hazard Statements**
6. **Product Name / Identifier**

GHS Label Elements

1. **Signal Word –** Indicates the hazard level. "Danger" is used for the most severe, "Warning" is less severe.
2. **GHS Hazard Pictograms (Symbols) –** Identifies hazardous products, commonly grouped by chemical/physical risk, health and environmental risk.
3. **Manufacturing Information –** Manufacturer's name, address telephone number.
4. **First Aid –** Describes general preventative, response, storage or disposal precautions.
5. **Hazard Statements –** Describes the nature of hazardous products and degree of hazard.
6. **Product Name/Identifier –** Identifies the product or chemical name.

GHS Hazard Pictograms

Chemical/Physical Risk	Health Risk	Environmental Risk
Explosive Explosives, self-reactives, organic peroxides	**Corrosive** Skin corrosion; serious eye damage	**Environmental** Aquatic toxicity
Flammable Flammable gases, liquids, & solids; self-reactives; pyrophorics; self-heating	**Severe Toxic** Acute toxicity (severe)	
Oxidizing Oxidizing gases, liquids and solids	**Acute Toxic** Irritant, dermal sensitizer, acute toxicity (harmful)	
Gas Pressure Compressed gases; liquefied gases; dissolved gases	**Health Danger** Carcinogens, respiratory sensitizers, reproductive toxicity, target organ toxicity, germ cell mutagens	
Corrosive Corrosives to metals		

Additional Pictogram Hazards Indicated

OXIDIZERS: 

Chemical may cause a fire when they come in contact with other chemicals and are extremely reactive.
Some chemicals react to exposure to air.
Other related cautionary names: PEROXIDE, PEROXIDIZABLE

Mean the same thing, Oxidizer.

CORROSIVES: 

All of these will damage (burn) metal, eyes, and skin.
(Acids) – Acidic, pH < 7.0
(Alkali) – Basic, pH >7.0
(Corrosive) – General term, can be either acidic or basic

TOXICITY: 

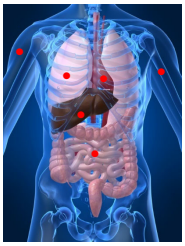
Adverse effects occur within a short time after exposure, sometimes after a single exposure.
Effects may be severe or fatal. Sometimes labeled "ACUTE", "SEVERE".

Effects occur much later (days, months, even years). It may be because of repeated exposures smaller doses. Chronic effects often hard to diagnose because of delay in response and lack of supporting evidence.
Possible carcinogen, clastogen (mutagenic). Possible reproductive, respiratory, target organ, and aspiration toxicity. Sometimes labeled, "CHRONIC", "HEALTH DANGER".

Narcotic effects, skin sensitizer, respiratory, skin and eye irritant. Possible acute toxicity. May be hazardous to Ozone layer (non-mandatory warning). Sometimes labeled, "ACUTE", "IRRITANT", "HARMFUL".

Toxicity Terms

Toxic chemicals may list specific actions such as:



- **Carcinogenic** – Possibly Causes Cancer
- **Teratogenic** – (aka Mutagenic) Possibly Causes Embryo and Fetus (Birth) Defects
- **Hepatotoxic** – Possibly Causes Liver Damage
- **Nephrotoxic** – Possibly Causes Kidney Damage
- **Neurotoxic** – Possibly Causes Nervous System Damage
- **Hematopoietic Damage** – Possibly Causes Blood Cells and/or Bone Marrow Damage
- **Clastogenic** – Possibly causes chromosomal breaks in cells, which causes mutated cells possibly leading to cancer. *Benzene and Arsenic* are examples known to cause this.
- **Systemic poison** – Can cause severe poisoning or death by remote exposure such as a small amount onto the skin. *Phenol, Hydrofluoric Acid*, and *Methyl Mercury* are examples of systemic poisons. Extreme care and special protective equipment and procedures are required for the use of these materials.

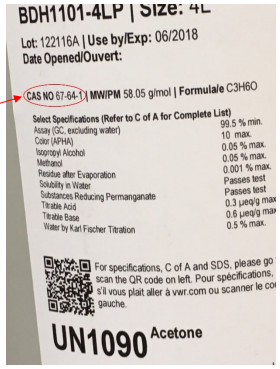
Manufacturers are required to study toxicity of new chemicals and report new adverse effects.

The (M)SDS gives information about toxicity which should help guide you to the proper PPE and handling safeguards to prevent exposure.

HOWEVER, toxicity of chemicals are not always known, so they should always be handled with caution.

CAS Number

- Chemicals sometimes have more than one name
- *Acetone* for example is also called *Aceton, Dimethyl Ketone*, and *2-Propanone*
- The Chemical Abstracts Service (CAS) assigns a unique **CAS Number**, to each compound
- You will find this universal number in the (M)SDS on the original container label (as shown)
- Emergency personnel can use this number to readily access safety information for the correct compound



NFPA to GHS

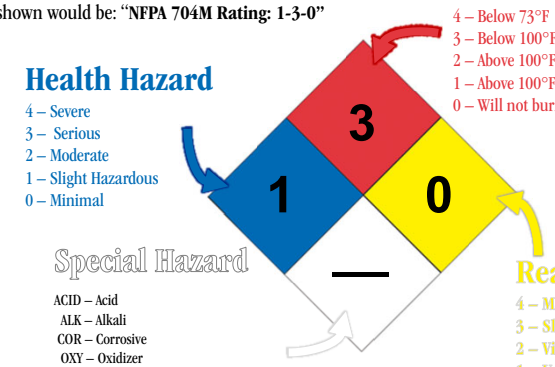
Prior to the introduction of GHS and its hazard rating system, there was the National Fire Protection Association NFPA diamond on (M)SDS. The new SDS's GHS hazard rating system is opposite of NFPA's diamond hazard score.

NFPA		New GHS	
0	Minimal Hazard	1	Severe Hazard
1	Slight Hazard	2	Serious Hazard
2	Moderate Hazard	3	Moderate Hazard
3	Serious Hazard	4	Slight Hazard
4	Severe Hazard	5	Minimal Hazard

Always be aware which hazard system you are viewing.

NFPA Diamond

Some MSDS forms abbreviate the diamond.
Example shown would be: "**NFPA 704M Rating: 1-3-0"**



Fire Hazard
4 – Below 73°F
3 – Below 100°F
2 – Above 100°F not exceeding 200°F
1 – Above 100°F
0 – Will not burn

Health Hazard
4 – Severe
3 – Serious
2 – Moderate
1 – Slight Hazardous
0 – Minimal

Special Hazard
ACID – Acid
ALK – Alkali
COR – Corrosive
OXY – Oxidizer
SA – Simple Asphyxiant
– Radioactive
– Use NO Water, Water Reactive
– Explosive
— – N/A (Can also be left blank)

Reactivity/Instability
4 – May Detonate
3 – Shock & Heat May Detonate
2 – Violent Chemical Change
1 – Unstable If Heated
0 – Stable

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Other Chemical Terms

(Primarily applies to research laboratories)

- **Peroxidizable**

  Material that can form peroxides during storage, generally after contact with the air. Special precautions must be taken to test for peroxides and routinely discard.

  Commonly used compounds can explode upon heating or distilling, but some may also be sensitive to shock or opening the container.

  NOTE: **Never** open or use any of these compounds that do not have the date opened written on the container or any test data within a year of opening.

- **Pyrophoric**

  Material that reacts or ignites upon contact with air at temperatures below 45°C, or sometimes the moisture in air, or *water* itself.

- **Spontaneously Combustible**

  Material that can ignite without an external source of heat, perhaps by reaction with oxygen in the air, by absorption of moisture, or from heat generated during processing.

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Other Health Hazard Terms

- **Asphyxiant**
  Displaces air and/or reduces the level of oxygen in the body to dangerous levels. No pain is felt, the only indication may be light-headed or sleepiness.
- **Sensitizer**
  Causes reaction, often to the skin, possibly after repeated exposure
- **Irritant**
  Causes inflammation of the skin, mucous membranes, or lungs
- **Hygroscopic**
  A material which attracts moisture. Some dry forms may create a solution upon contact with air, and some may dry out the skin
- **Vessicant**
  Causes severe, painful skin, eye and mucous membrane irritation often referred to as chemical burns or water blisters
- **Lachrymator**
  Causes tears and eye irritation
- **Sternutator**
  Irritates the nasal and respiratory passages and causes coughing, sneezing, lachrymation (tearing of the eyes), and possibly vomiting

SDS Exposure Terms & Limits

- **LD50 – Lethal Dose to 50% (of the population)**
  When this amount of chemical is taken (by contact or ingestion) 50% of the test subjects (usually mice) die. Reported in mg of substance per kg body weight. The smaller the number, the more lethal the substance is.
- **TLV – Threshold Limit Value**
  The maximum believed amount that a worker may be exposed to in the 8-hour day/40-hr week work environment for a working lifetime without adverse effect. Reported in mg/m^3 or ppm as a volume of air space in the room. Again, the smaller the number, the more harmful the substance is.
- **PEL – Permissible Exposure Limit**
  A **legal standard** of exposure in the workplace for a typical 8-hr work day. This value may not be exceeded.
- **STEL – Short Term Exposure Limit**
  The maximum amount believed (not necessarily known to be) safe for a single short term exposure (<15 minutes), which should not be exceeded. There is also a maximum instant or ceiling value within this.
- **IDLH – Immediately Dangerous to Life and Health**
  An atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or could cause irreversible or delayed adverse health effects or interfere with an person's ability to escape from a dangerous atmosphere. [29 CFR 1910.120]

Common Routes of Exposure

- **Inhalation**

  This is the most common mode of exposure. Some chemicals have no odor (like Mercury); some odors you get used to after a while (attenuated) or your nose loses the ability to smell it. Strength of odor is not equal to how toxic it may be or how concentrated it is. Chemical vapors, gases, aerosols, or mists can be absorbed through the mucous membranes of the mouth, nose, or throat.

- **Skin Contact**

  You may think of skin as barrier, but chemicals can penetrate the skin. Contact may be indirect such as when you adjust your glasses while wearing dirty gloves and then later adjust your glasses with gloves off, or contact with items contaminated by others. Chemical vapors, gases, aerosols, or mists can be absorbed through the skin.

- **Eye Contact**

  Eye exposure can be indirect through vapors, or direct via a splash (when not wearing goggles), or touching your eye while your hand or glove is contaminated by a chemical. Chemical vapors, gases, aerosols, or mists can be absorbed through the mucous membranes of the eyes.

- **Ingestion**

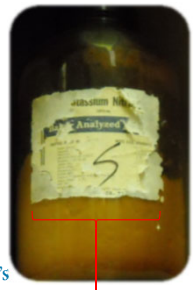
  Ingestion is usually by accident. It is avoided by never eating or drinking in the laboratory, and washing your hands after working with chemicals, not touching your face or mouth when working with chemicals (cross-contamination), etc.

- **Injection**

  This can occur by skin puncture with a dirty piece of glassware or apparatus or accidental needle injury. Breaking a piece of glassware is a common route; chemicals can enter through a cut.

Manufacturer's Container Labels

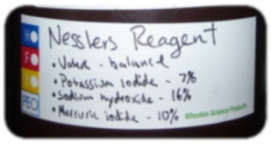
- Chemicals distributed prior to 1985 may not include hazard warnings on these labels as it was not a requirement then.
- Anything manufacturers labels after 1985 is required to specify known hazards, and the most important information from the (M)SDS sheet.
- It is **ILLEGAL** to remove or deface the original manufacturer label information as long as the container still contains the chemical.
  - You are however, allowed to add information to the primary container.
- The Hazard Communication Act requires re-labeling of primary containers if the label becomes illegible.
- If you have to replace the original label, the replacement label **MUST** include:
  - Identity of the chemical as listed on the MSDS;
  - Appropriate hazard warnings (words, pictures, symbols, combinations) for the chemical's physical and health hazards, including target organs effected.
  - Manufacturer's name and address.



This container still contains chemical and the manufacture label on this container is not legible.
It is required **BY LAW** to be re-labeled.

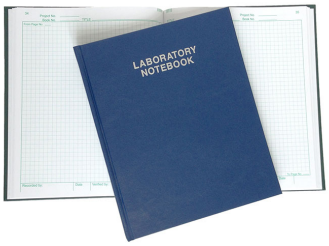
Secondary Container Labels

- When a chemical is transferred to another (secondary) container, the new container **MUST** be labeled with:
  - The chemical name as listed on the MSDS (chemical formula may be used, but **NO** acronyms or abbreviations or structures) in English.
  - Hazard warnings including words, pictures/symbols or combinations that provide general information on the hazards of the chemical.
- Unless the container is for the immediate use of the individual who made the transfer, the contents **MUST** be written on the container before it is left unattended in the lab.
- All experiment solutions prepared for other people, or for use later, **MUST** also be labeled with all the chemical contents and hazards.



Alternative Labeling Systems

There are some allowable alternatives to full labeling requirements of containers to make labeling easier for multiple or small containers:



- **Laboratory Notebook (logbook)**

  Multiple or smaller containers may have a unique ID or acronym and be formally documented in this book, readily accessible to anyone.
- **Signage**

  A sign nearby which explains what it is can also be used.
- **Outer Container**

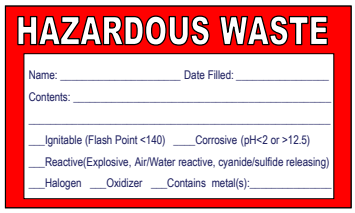
  Labeling for multiple smaller containers of an identical material. The outer container can have the full label.
- **Equipment Process Logs**

  For containers with constant material changes, such as those inside equipment. Signs, process/log sheets, operating procedures, or other similar written materials may be used in lieu of affixing labels. The alternative method must identify the containers to which it is applicable and convey both the name and hazards required.

Chemical / Hazardous Waste

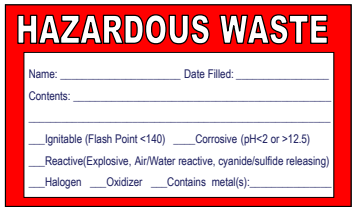
- It is your responsibility to clean up during and after your experiments.
- Used glassware should be properly solvent rinsed out, cleaned and put away.
- All chemical wastes are collected for disposal by an outside waste vendor.
- Chemical or biological waste shall be collected in their respective properly labeled waste containers.
- **Never** dump hazardous waste in regular trash or broken glass container or down the sink.
- **Never** dump contaminated glass in broken glass container. Dispose of as hazardous waste.

This is our waste label with the information the UHCL Environmental Health & Safety Department needs to properly treat and dispose of waste.



Hazardous Waste, Cont'd

- The moment a container is started for waste accumulation, it MUST contain a Hazardous Waste label, filled out completely.
- Hazardous Waste Labels must include all contents (even water) and concentrations.
- The name is a contact to ask any questions regarding the waste.
- The Hazards are required by both waste and hazard communication regulations.
- The date filled is the date it is done being used, so this is written on the last day of the experiment or when the container is full.

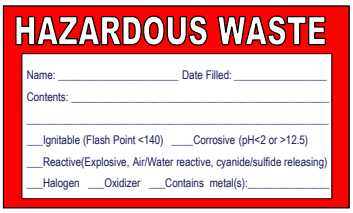


Hazardous Waste, Cont'd

Hazardous Waste includes chemicals that are one or more of the following:

- **Toxic Components** – 40 listed chemicals (Benzene, Lead, Mercury…)
- **Reactive** – Unstable, reacts violently with water or air, potentially explosive
- **Ignitable** – Liquid flash point <140°F, or non-liquid spontaneously combustible at STP
- **Corrosive –** Liquid with pH <2 or >12.5 (highly acidic or basic)
- Specific lists of chemicals regulated as hazardous that carry these characteristics, for example common solvents like *Acetone* or *Methanol*

Because of the lists and other waste requirements, all Chemical Waste is handled as Hazardous Waste until evaluated by EHS.



Non-Hazardous Waste

Non-Hazardous Trash/Solid Waste

- Paper products, plastics, and other **uncontaminated**, non-hazardous substances may be placed in the trash containers with these labels.
- **Never** place any glass (broken or not) in these trash
- **Never** place any needles or sharps in these trash containers.

Broken Glass

- Broken glass and/or glass waste must disposed of in a special cardboard box container (as shown).
- Before glass is thrown away, it must be clean of chemicals and biological contamination.
- **Never** place non-hazardous trash/solid waste as described above in these containers.
- **Never** place any needles or sharps in the glass boxes.

Non-Hazardous Waste

Sharps

- **Needles, razorblades, scalpels, probes, or other small sharp objects that could puncture a trash bag and broken glass box go in rigid sharps containers.**
- **Note and adhere to the maximum "full" line at ¾ full**
- One cited source of Needlestick injuries (and spread of infectious diseases) is from overfilled sharps containers.
- Chemically contaminated sharps get picked up by chemical waste vendor
- Sharps contaminated with blood, human bodily fluid, or biological materials get picked up by medical waste vendor

Personal Protective Equipment (PPE)

Eye Protection

- **Chemical splash safety goggles**

Safety goggles must be worn in the lab with liquids. They must be Indirect vented so liquids don't get in the eyes. These offer the best overall protection and are recommended (pictures shown). These are available in the UHCL bookstore.

Contact lenses

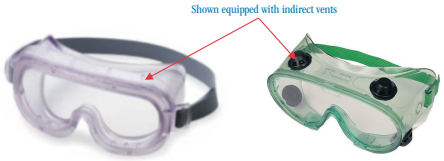
May be worn in the laboratory, but you **MUST** also wear approved safety goggles for liquids or safety glasses when working with dry materials only. Contact lenses may melt or trap chemicals against your eye, so they must be removed in the event of a chemical splash.

Prescription Eyewear

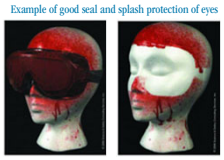
Some safety glasses and goggles will fit over them. Ordinary eye glasses **DO NOT** provide adequate eye protection for impact or chemical hazards. They **MUST** be rated Z87, have clip-on side shields, and provide adequate (large area) coverage to the eyes.

PPE, Cont'd

Chemical splash safety goggles offer the best impact protection and seal around the eyes for splashes, which is why they **are required for use with liquid chemicals**. Make sure they have a good fit and seal to your face.

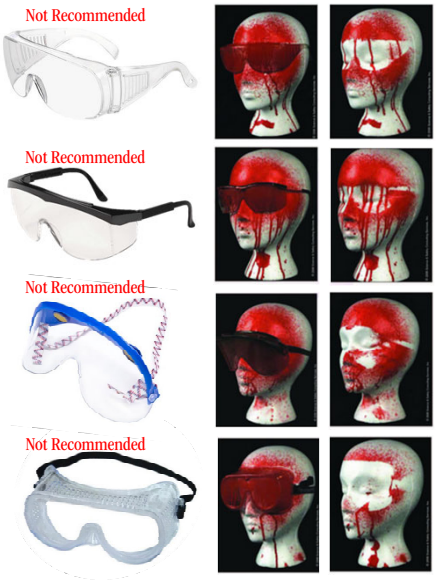


Example of good seal and splash protection of eyes



However, in the real world, if this had been an actual experiment where such a facial spray could actually occur…(next slide)

Demonstration revealing some of the limitations of eye protection with liquids



PPE, Cont'd

Where splashes to the face are likely, and cannot be engineered out, a splash shield is the proper defense for the face, with safety glasses or goggles underneath.

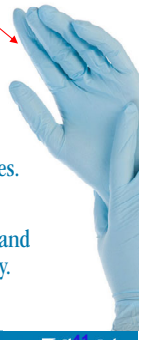
It is ultimately up to **you** to decide what is the best possible protection to minimize your exposure to hazards in the laboratory or the workplace.

Always avoid direct contact with any chemical by correctly choosing and wearing PPE.

PPE
Hand Protection

- **Gloves**

Natural rubber, butyl rubber, Viton®, PVC, nitrile…all these materials, as well as others, are possible options for laboratory gloves. They all come in different colors. Nitrile gloves are shown, and provide resistance against the widest variety of chemicals used in our labs.



Breakthrough

Is the movement of a chemical through a protective material, such as nitrile gloves.

This gradual permeation or chemical degradation of the glove/material, can be slowed or prevented by checking for the best material compatibility for the chemical being used, lowering concentrations and chemical contact time, or obtaining thicker gloves.

Gloves that are contaminated, damaged, or worn must be replaced.

Reference your chemicals SDS in **Section 8 – Exposure Control/Personal Protection** and the **chemical resistance guide** from your glove manufacturer for chemical compatibility.

PPE, Body Protection

- **Lab Coat, Clothing, etc.**

Lab Coat

MUST cover torso, upper leg, whole arms, and not too loose as to get caught on items in the lab. These are available in the UHCL bookstore.

NOTE: If your lab coat gets contaminated, simply dispose of it as chemical waste (ask your instructor for assistance) and purchase a new one. Professional laundering is optional.

Personal Clothing

Leg covering **MUST** be long (e.g. pants) and of a durable material, like denim. **NO** shorts or skirts allowed. Your legs are **NOT** to be exposed.

Foot Covering

MUST wear closed toe shoes of non-porous material like leather or polymeric substitute (e.g. vinyl) that completely cover your feet. **NO** open-toe sandals are allowed.

Hair Restraint (Ties)

Long hair **MUST** be properly secured and away from face and work space to prevent contamination and accidents.

PPE

Foot Covering

Ultimately, your shoe is a barrier, offering protection from a chemical spill coming in contact with the skin.

Choose solid footwear covering the whole foot, not porous or perforated.

Solid, one-piece top shoes made of vinyl like this medical safety shoe are ideal.

PPE, Cont'd

Correctly choosing and wearing your PPE may save you from injury.

Always put on your PPE before you enter the lab.

Anyone not properly dressed for the laboratory will not be allowed to work in the lab.

Proper Laboratory Practice

Put large articles like backpacks inside designated drawers or **designated shelves near the front room entrances of STEM labs.**

Read, understand procedures and (M)SDS

- Don't use a chemical you don't know the hazards of
- Use chemicals only as directed and for their intended purpose

Organize Workspace

- Wash your benchtop, keep clean during and after experiment
  - Clean up any spills promptly
- Take out only what you need for the experiment
- Prevent slips and trips by making sure your floor is clean, dry and clutter free

Proper Laboratory Practice, Con't

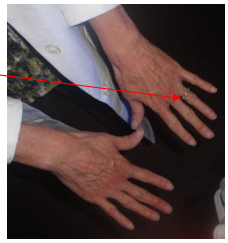
Practice proper hand hygiene, wash hands frequently, after:

- Handling chemicals (with gloves and other PPE on)
- After removing gloves
- Before you leave the lab

Practice proper hand hygiene. Otherwise, you'll miss illuminated areas like these.

When carrying large containers use lab cart or a bottle carrier

- Always support bottles from the bottom as well as side or top when carrying



Never wear jewelry while working in the labs. It can trap chemicals or puncture gloves.

Return chemicals to storage when not in use.

Turn off all equipment and disconnect electrical cords after use.

Proper Laboratory Practice, Cont'd

Other rules to remember are:

- **Never** work alone in the lab.
- **Never** eat or drink in the lab. This includes drinking water from the lab sinks or faucets. Do not bring food or drinks into the lab.
- **Never** apply any cosmetics while in the lab.
- **Never** inhale or taste laboratory chemicals.
- **Never** engage in inappropriate behavior or horseplay in the lab.
- **Never** even partially block the pathway to an exit or safety equipment, like a safety shower or fire extinguisher, not even temporarily.
- **Never** store chemicals on the floor.
- **Never** use unlabeled chemicals.
- **Never** leave a running experiment or heat source, like a Bunsen burner, roto-evaporator or hot plate unattended.
- **Never** remove chemicals from the lab without instructor authorization.
- **Always** keep aisles clear of obstacles such as boxes, chemical containers, and other storage items.
- **Always** keep work area clean and uncluttered.
- **Always** keep chemicals and equipment stowed away when not in use.
- **Always** keep drawers and cabinet doors closed.
- **Always** keep all potential trips hazards, including electrical cords off the floor.

Glassware

Some accidents can be prevent by simply inspecting glassware prior to use.

Any combination of heating, cooling, pressurizing and vacuuming of glassware will cause imperfections to break the glassware.

Look for any imperfections or discoloration. If you come across glassware that appears damaged, **Never** use it.

Carefully rinse and clean off any hazardous chemicals from it, and put in the broken glass container.

After using your good glassware always properly clean it and safely put away for future use.

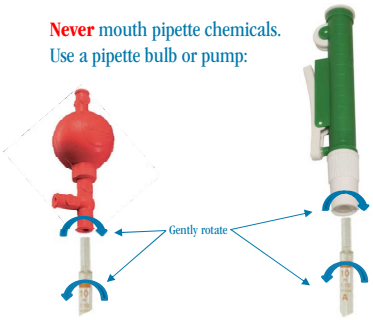
Proper Laboratory Techniques

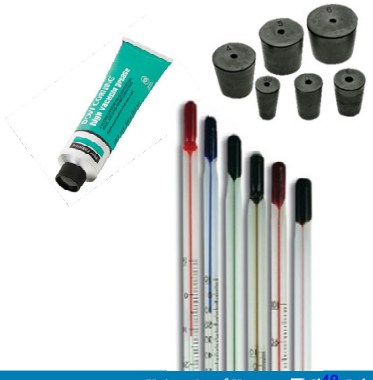
Before inserting any glass tubing, thermometers, or thistle tubes into a stopper, always lubricate it using vacuum grease or something similar.

Carefully use a gentle slow rotating motion while inserting.

Never force any type of glassware into stoppers, pipette bulb, pumps or similar as they may break and cause injury.

Never mouth pipette chemicals.
Use a pipette bulb or pump:





Laboratory Hood

- **Use a Laboratory Hood When**

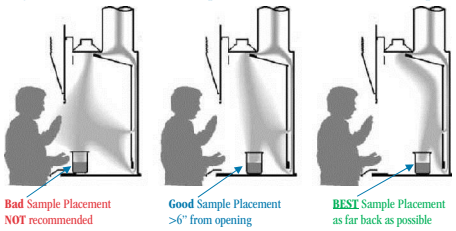
  Using volatile materials, solvents, alcohols, toxic materials, or where there is a possibility of poisonous or corrosive or irritating vapors emitted from the materials used or reaction taking place.

- **18" Sash Opening** This is one our Fume Hood Labels → <--18" Sash Height

  Lower the fume hood sash while experiments are running to protect you and other users in the lab. The sash is designed to be operated with an **18 inch** opening (about halfway up). This allows you to see through the glass, while your face and upper body are still protected.

- **Sample Placement**

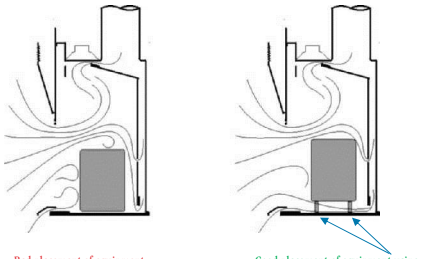
  Place your sample containing the chemical as far back as possible, **at least 6 inches** from opening.



Laboratory Hood, Cont'd

- **Fume Hood and Large Equipment**

  Position large, bulky equipment as far back as possible, and place on top of stilts to allow the best possible circulation both around and underneath the equipment.



Bad placement of equipment
NOT recommended

Good placement of equipment using stilts

Fume Hood, Cont'd

Always very that a Fume Hood is working properly. Do not use a hood without verifying these first.

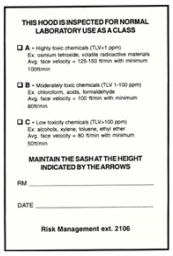
- **Velocity Flow Monitor**

  There is a constant face velocity measuring device on every fume hood, equipped with visual lights and audible alarms to indicate proper or inadequate air flow. Most flow monitoring devices display face velocity, which should be 80-100 linear feet per minute.

- **Hood Testing Certification Sticker**

  Every hood should have one of these affixed to the front of the glass sash. It contains information about hood performance, and the most recent inspection. Hoods not inspected within the past year should be immediately reported to the EHS Department.

This is one our Fume Hood Labels →



- **Maintain proper airflow:**

  Keep hoods free of clutter and extra debris, and do not block vents (baffles) at the back of hood

  Do not block front of hood opening. One person per 2.5 feet of hood width.

  Do not walk fast in front of hoods or open lab doors quickly, as this can disturb flow and cause backdrafts

Cross-Contamination

Unexpected reactions may occur when dealing with cross-contaminated chemicals.

- **Never** put unused chemicals back into stock reagent bottles.

  Returning any unused sample into the original container may jeopardize the quality and purity of that stock reagent.

- **Never** place lids directly on benchtops.

  Place container lids on a clean non-permeable surface, like a watch glass, piece of parafilm, or hold between fingers.

- **Always** take out only the amount you need.

  Dispose of unused material in the chemical waste container.

Emergency Preparedness

First things you should do when entering a laboratory is:

- Identify all the **EXITS** and **stairwells;** always have and **EXIT** strategy
- Identify the location of the **fire alarm pull station** (may be outside lab)
- Identify the location of **eye wash stations**
- Identify the location of the **safety shower**
- Identify the location of the **first aid kit**
- Identify the location of the **spill kit**
- Identify the location of the **(M)SDS**
- Identify the location of the laboratory **telephone** and **emergency numbers**

  NOTE: UHCL Campus Police can see where you're calling from when you use a UHCL Campus landline.

In an emergency, every second counts.

Remember, the way you came in isn't always the safest way out.
KNOW YOUR EXITS.

In the Event of an Emergency
Dial **911** and Contact the UHCL Campus Police
(Dial from any UHCL Campus phone)
2222
Or Direct at **281-283-2222**

Fire Safety

Be aware of the following in order to prevent a fire from happening:

- Many solvents used in the laboratory are flammable.
- **Never** use Bunsen burners to heat flammable liquids *(Acetone, Methanol, Iso-Propanol, Toluene etc.…)*
  - Use hotplates instead provided by your instructor or TA.
- Vapors from flammable solvents can also ignite with electrical sources.
- Keep containers closed and work in a fume hood with flammable materials.
- Keep water away from electrical outlets and electrical equipment.
- Keep in mind Plexi-glass and other plastics are combustible and can burn easily.

In the Event of an Emergency
Dial **911** and Contact the UHCL Campus Police
(Dial from any UHCL Campus phone)
2222
Or
Direct at **281-283-2222**

Fire Safety, Cont'd

Rules for Fighting Fires

1ST

Remember the **A's:**

- **Alert & Activate**
  Yell "Fire" to alert room
  Activate the building alarm system

- **Assist**
  Any persons in immediate danger without risk to yourself
- **Attempt**
  Only attempt to extinguish a fire only after the first two A's are completed

2ND

Fight a fire only **IF**:

- Only IF it is small fire.
  (It is small and contained)
- Only IF you are comfortable doing so.
  (Your instincts tell you it's OK)
- Only IF you can do it safely and quickly.
  (You are safe from toxic smoke)
- Only IF you have a clear pathway to an **EXIT.** (You must be able to escape!)

In the Event of an Emergency
Dial **911** and Contact the UHCL Campus Police
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Or
Direct at **281-283-2222**

Elements of a Fire

This is The Fire Triangle. Actually, its a tetrahedron, because there are four elements that must be present for a fire to exist. There must be Oxygen to sustain combustion, Heat to raise the material to its ignition temperature, Fuel to support the combustion and a Chemical Reaction between the other three elements.

Remove any one of the four elements to extinguish the fire.

The concept of Fire Prevention is based upon keeping these four elements separate.

In the Event of an Emergency
Dial **911** and Contact the UHCL Campus Police
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2222
Or
Direct at **281-283-2222**

University of Houston Clear Lake 57

Fires and Extinguisher Types

- Not all fires are the same.
- Different fuels create different fires and require different types of fire extinguishing agents.
- Some fire extinguishing agents can be used on more than one class (type) of fire.
- Others have warnings where it is dangerous to use that extinguisher agent on certain types of fire.

Class A
Class B
Class C
Class D
Class K

Class A fires are fires in **ordinary combustibles** such as **wood, paper, cloth, trash, and plastics**.

Class B fires are fires in **flammable liquids** such as **gasoline, petroleum oil** and **paint**.
Class B fires also include **flammable gases** such as **propane** and **butane**. Class B fires do not include fires involving cooking oils and grease.

Class C fires are fires involving **energized electrical equipment** such as **motors, transformers**, and **appliances**. Remove the power and the Class C fire becomes one of the other classes of fire.

Class D fires are fires in **combustible metals** such as **potassium, sodium, aluminum** and **magnesium**.

Class K fires are fires in **cooking oils and greases** such as **animal fats** and **vegetable fats.**

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Fire Extinguisher Use

Remember the Acronym **P.A.S.S.**

Pull the pin.

Aim the nozzle or hose at the base of the fire from the recommended safe distance.

Squeeze the operating lever to discharge the fire extinguishing agent.

Starting at the recommended distance, **Sweep** the nozzle or hose from side to side until the fire is out. Move forward or around the fire area as the fire diminishes. Watch the area in case of re-ignition.

In the Event of an Emergency
Dial **911** and Contact the UHCL Campus Police
(Dial from any UHCL Campus phone)
2222
Or
Direct at **281-283-2222**

Fire Extinguisher Use

Pull the pin **Aim** **Squeeze** **Sweep**

Remember the rules for fighting fires:

- Only IF it is small fire.
- Only IF you are comfortable doing so.
- Only IF you can do it safely and quickly.
- Only IF you have a clear pathway to a close exit (no fire between you and exit). Smoke can fill a room fast and overcome you quickly.
- Fire extinguishers are instrumental to have on hand quickly to prevent a small fire from growing into something unmanageable, but property is never more important than ensuring your own safety and life.

If you don't sweep side to side at the base of the fire, you may not cover the whole flame and may not be able to extinguish the fire.

In the Event of an Emergency
Dial **911** and Contact the UHCL Campus Police
(Dial from any UHCL Campus phone)
2222
Or
Direct at **281-283-2222**

Accident / Incident Reporting

All accidents, incidents, & near misses must be reported to your instructor immediately.

A Student/Visitor Incident Report must be submitted by you or your instructor to the Environmental Health & Safety Department(ehs@uhcl.edu) **within 24 hours**.

If you witness the incident, complete and submit the Witness Statement Form to ehs@uhcl.edu

Major Incidents:

1. Call **911**, and **2222** (UHCL Police) from any campus phone, or **281-283-2222**
2. Locate and perform first-aid treatment until emergency personnel arrive

Minor Incidents:

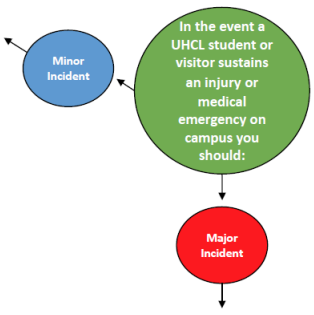
1. Locate first-aid supplies for treatment and assist as needed
2. Feel free to go to the Health Service Center, or your primary care physician.
3. Urgent care clinics can provide after hours care

** Students must carry health insurance, and are expected to get medical attention after an accident, or will be taken for medical attention in the event of an emergency; and you are responsible for these costs.*

Accident Reporting

UHCL Students

1. Locate and provide first-aid supplies for treatment and assist as needed
   OR
   Send students to the Health Service Center if necessary
   (Only UHCL Students can be provided care during normal business hours.)
2. Complete the Student/Visitor Incident Report
   (If the injured or ill person is not physically able to fill out the form, please complete the form for them.)
3. If you witness the incident, complete the Witness Statement Form
4. Send all completed documents to ehs@uhcl.edu within 24hrs of incident



UHCL Students & UHCL Visitors

1. Call 911
   AND
   Call ext.: 2222 (UHCL Police Dept.)
2. Locate and perform first-aid treatment until emergency personnel arrive.
3. Complete the Student/Visitor Incident Report
   (If the injured or ill person is not physically able to fill out the form, please complete the form for them.)
4. If you witness the incident, complete the Witness Statement Form
5. Send all completed documents to ehs@uhcl.edu within 24hrs of incident

Environmental Health & Safety x.2106
281-283-2106

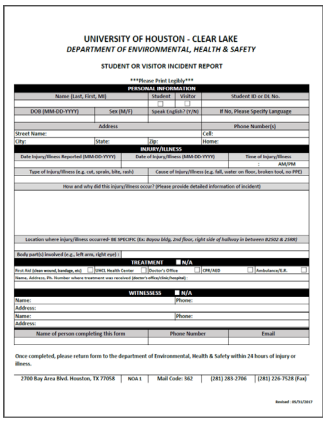
UHCL Police x.2222
281-283-2222

Health Center x.2626
281-283-2626

Accident / Incident Reporting

Submit the Incident Report or Witness Statement to the Environmental Health & Safety Department at ehs@uhcl.edu **within 24 hours.**

All Incidents are investigated by EHS for any appropriate corrective follow up measures.



UNIVERSITY OF HOUSTON - CLEAR LAKE
DEPARTMENT OF ENVIRONMENTAL, HEALTH & SAFETY

STUDENT OR VISITOR INCIDENT REPORT

Please Print Legibly

PERSONAL INFORMATION

Name (Last, First, MI) | Student ☐ | Visitor ☐ | Student ID or DL No.

DOB (MM-DD-YYYY) | Sex (M/F) | Speak English? (Y/N) | If No, Please Specify Language

Address | Phone Number(s)

Street Name: | Cell:

City: | State: | Zip: | Home:

INJURY/ILLNESS

Date Injury/Illness Reported (MM-DD-YYYY) | Date of Injury/Illness (MM-DD-YYYY) | Time of Injury/Illness AM/PM

Type of Injury/Illness (e.g. cut, sprain, bite, rash) | Cause of Injury/Illness (e.g. fall, water on floor, broken tool, no PPE)

How and why did this injury/illness occur? (Please provide detailed information of incident)

Location where injury/illness occurred- BE SPECIFIC (Ex: Bayou bldg, 2nd floor, right side of hallway in between BJ502 & 2100)

Body part(s) involved (e.g., left arm, right eye) -

TREATMENT ☐ N/A

First Aid (clean wound, bandage, ect) ☐ | UHCL Health Center ☐ | Doctor's Office ☐ | EMS/ER ☐ | Ambulance/E.R. ☐

Name, Address, Ph. Number where treatment was received (doctor's office/clinic/hospital).

WITNESSES ☐ N/A

Name: | Phone:

Address:

Name: | Phone:

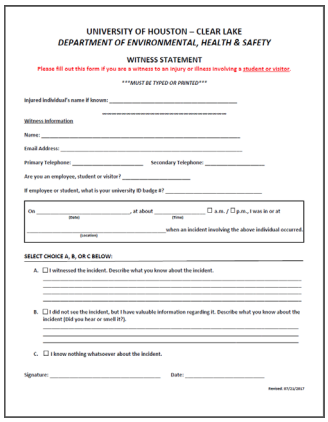
Address:

Name of person completing this form | Phone Number | Email

Once completed, please return form to the department of Environmental, Health & Safety within 24 hours of injury or illness.

2700 Bay Area Blvd. Houston, TX 77058 | NASA 1 | Mail Code: 562 | (281) 283-3706 | (281) 226-7528 (Fax)

Revised: 05/15/2017



UNIVERSITY OF HOUSTON – CLEAR LAKE
DEPARTMENT OF ENVIRONMENTAL, HEALTH & SAFETY

WITNESS STATEMENT

Please fill out this form if you are a witness to an injury or illness involving a student or visitor.

MUST BE TYPED OR PRINTED

Injured Individual's name if known: _____

Witness Information

Name: _____

Email Address: _____

Primary Telephone: _____ Secondary Telephone: _____

Are you an employee, student or visitor? _____

If employee or student, what is your university ID badge #? _____

On _____ (Date), at about _____ (Time) ☐ a.m. / ☐ p.m., I was in or at _____ (Location) when an incident involving the above individual occurred.

SELECT CHOICE A, B, OR C BELOW:

A. ☐ I witnessed the incident. Describe what you know about the incident.

B. ☐ I did not see the incident, but I have valuable information regarding it. Describe what you know about the incident (did you hear or smell it?).

C. ☐ I know nothing whatsoever about the incident.

Signature: _____ Date: _____

Revised: 07/12/2017

First Aid

In the event of an accident, follow-up with a professional medical evaluation.
Ensure those injured are under observation for a minimum of 24hrs.

Corrosives /Chemical Burns

- Wash under cold running water for at least **15 MINUTES**.

Flame Burns

- Extinguish the fire. Use fire blanket if necessary, but remove immediately.
  - NOTE: The blanket traps heat in, causing internal damage if left on a burn victim.
- Wash under cold running water for at least **15 MINUTES.**
- Apply burn gel if necessary for minor burns only

Accidental Ingestion

- Consult (M)SDS and call the local poison control center for advice: **800-222-1222**
- Do not drink anything unless instructed.

Accidental Inhalation

- Move to fresh air.

In the Event of an Emergency
Dial **911** and Contact the UHCL Campus Police
(Dial from any UHCL Campus phone)
2222
Or
Direct at **281-283-2222**

First Aid, Cont'd

In the event of an accident follow-up with a professional medical evaluation.
Ensure those injured are under observation for a period of 24hrs.

Lacerations (Cuts)

- Wash under running water with soap, allowing to bleed out slightly to cleanse the wound.
- Then compress and bandage. Encourage self-care (see Bloodborne Pathogens following)
- Seek medical attention.

Needle punctures (Injection)

- Wash under running water, allowing to bleed out slightly to cleanse the wound.
- Consult (M)SDS and call the local poison control center for advice: **800-222-1222**

In the Event of an Emergency
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2222
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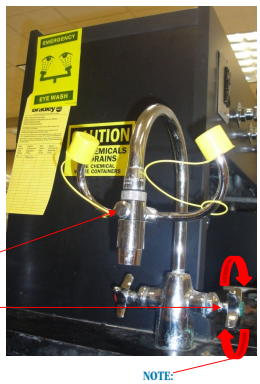
First Aid, Cont'd

In the event of an accident follow-up with a professional medical evaluation.
Ensure those injured are under observation for a period of 24hrs.

Eye Accidental Chemical Splashes

- **For the Eye Wash pictured**.
  - **FIRST Step** - you must turn the water on.
  - **SECOND Step** - pull the plug on the front of eyewash towards you.
- Leave goggles on initially under the water
  - To prevent contaminated goggles from dripping into eyes when removed.
- Hold eyelids open with fingers and thumb.
- Have someone keep you in the water.
- Wash for at least **15 MINUTES**.
- Remove contact lens if present and wash again.



NOTE:
Turning the handle clockwise opens this faucet.
Know how to operate your faucets.

In the Event of an Emergency
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(Dial from any UHCL Campus phone)
2222
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Direct at **281-283-2222**

66

First Aid, Cont'd

In the event of an accident follow-up with a professional medical evaluation.
Ensure those injured are under observation for a period of 24hrs.

BODY Accidental Chemical Splashes / Flame & Chemical Burns

- Get under Safety Shower.
- Pull metal handle off wall clip, or dangling from ceiling straight down.
- Remove affected clothing and any clothing below affected area.
- Stand under shower for at least **15 MINUTES.**
- Push up to stop if not on a timer.
- Call EHS at ext. 2106 to notify of use.

In the Event of an Emergency
Dial **911** and Contact the UHCL Campus Police
(Dial from any UHCL Campus phone)
2222
Or
Direct at **281-283-2222**

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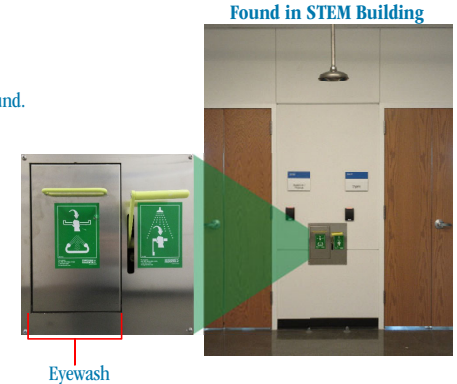
First Aid, Cont'd

In the event of an accident follow-up with a professional medical evaluation.
Ensure those injured are under observation for a period of 24hrs.

Eye Accidental Chemical Splashes

- **For the Eye Wash pictured**.
- Pull the yellow metal handle straight down, an alarm will sound.
- Leave goggles on initially under the water.
  - To prevent contaminated goggles from dripping into eyes when removed.
- Hold eyelids open with fingers and thumb.
- Have someone keep you in the water.
- Wash for at least **15 MINUTES**.
- Remove contact lens if present and wash again.
- **Do Not pull Eyewash handle except in an emergency.**

Found in STEM Building



Eyewash

In the Event of an Emergency
Dial **911** and Contact the UHCL Campus Police
(Dial from any UHCL Campus phone)
2222
Or
Direct at **281-283-2222**

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First Aid, Cont'd

In the event of an accident follow-up with a professional medical evaluation.
Ensure those injured are under observation for a period of 24hrs.

Body Accidental Chemical Splashes / Flame & Chemical Burns

- Get under Safety Shower.
- Pull the yellow metal handle straight down, an alarm will sound.
- Remove affected clothing and any clothing below affected area.
- Stand under shower for at least **15 MINUTES.**
- **NOTE: Do Not pull Safety Shower handle except in an emergency.**

Found in STEM Building

In the Event of an Emergency
Dial **911** and Contact the UHCL Campus Police
(Dial from any UHCL Campus phone)
2222
Or
Direct at **281-283-2222**

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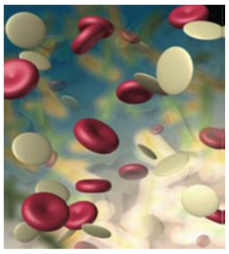
First Aid & Bloodborne Pathogens Awareness

- **Bloodborne Pathogen (BBP)**

  Any pathogenic microorganism that is present in human blood, or other potentially infectious materials (OPIM) that can cause disease in humans. An infected person may not know about it for years, therefore all blood is considered to be potentially contaminated, so handled and treated with precaution.

Some examples include:

- Hepatitis B Virus (HBV)
- Hepatitis C Virus (HCV)
- HIV / Aids
- Treponema pallidum (syphilis)
- Herpes Virus
- HTLV-I
- Mycobacterium tuberculosis



3 Most Common BBP

Hepatitis B Virus (HBV)

- Attacks the liver
- Initial symptoms are much like a mild flu
- The virus can go undetected for 10, 20, even 40 years
- Survives in dried blood for up to 1 week at room temperature

Hepatitis C Virus (HCV)

- Also Attacks and Inflames the Liver
- Similar symptoms to Hepatitis B, most common symptom is extreme fatigue
- No effective vaccine exists

Human Immunodeficiency Virus & Acquired Immune Deficiency Syndrome (HIV/AIDS)

- **Acute HIV –** This is the Initial acute infection phase. During this phase, flu like symptoms develop within 2-4 weeks after infection, sometimes 3 months later, often described as "the worst flu ever."
- **Asymptomatic HIV** – This the chronic infection period, approximately 8-12 years. Toward the middle and end of this period you may begin to have symptoms such as weight loss, fevers, chills, night sweats, abdominal issues, fatigue and muscle weakness.
- **Acquired immunodeficiency syndrome (AIDS) –** Is defined in terms of either a $CD4^+$ T cell count below 200 cells per µL or the occurrence of specific diseases in association with an HIV infection.

BBP – Routes of Transmission

Bloodborne Pathogens may be transmitted by:

- Puncture wounds caused by sharp objects
  Example- Broken glass, misuse of or accidental puncture by needle
  NOTE: Needle sticks account for about 50% of injuries!
- Contact with open wound or broken skin
- Risk increases with prolonged contact or larger areas of broken/damaged skin
- Splash into the eyes
- Sprayed or aerosolized and into nose or mouth
- **If you have been exposed to human body fluids, human cell lines, human blood, etc. report it immediately to your PI in charge and to EHS for assistance.**

Governing Laws and Regulations

Occupational Safety and Health Administration (OSHA)

- Blood Borne Pathogen Standard found in 29 CFR 1910.1030, originally adopted in 1991
- Needlestick Reduction Act modified it in 2001
- Education of and selection of sharps injury reduction devices (like self-sheathing needles)
- Keeping a (contaminated) sharps injury log

Texas Department of State Health Services (TDSHS):

- Bloodborne Pathogen Control 25 TAC 96
- Exposure Control Plan required to minimize government agency employee's exposure to BBP

Minimizing or Eliminating Biohazards

An **Exposure Control Plan** identifies all the following information:

- Engineering Controls
- Safe Work Practices & Universal Precautions
  - Treat all human blood and body fluids as if they are infectious.
- Signs and Labels
- Personal Protective Equipment
- Proper Hygiene
- Proper Waste Disposal Procedures
- Proper Spill cleanup
  - Decontaminate work surfaces frequently for preventive maintenance and after spills, using a disinfectant /sterilization solution like 10% bleach (sodium hypochlorite), 70% alcohol (Isopropanol) solution or commercial solution like Lysol (phenols).

Engineering Controls

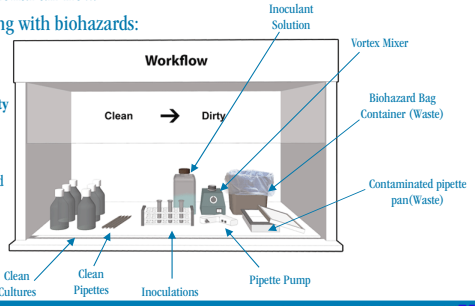
Engineering Controls – Devices that isolate or remove the BBP from the workplace.

They can include:

- Handwashing facilities
- Leak-proof containers for storage and transportation
- Sharps Injury Reduction Devices such as retractable syringes and self-sheathing needles
- Biosafety cabinet (BSC) with HEPA filter and Directional air flow.
  - Follow "clean to dirty" procedure when working with biohazards:

A typical layout for working "clean to dirty" within a Biosafety Cabinet (BSC).

Clean cultures **(left)** can be inoculated **(center)**; contaminated pipettes can be discarded in the shallow pan and other contaminated materials go into the biohazard bag container **(right)**.



Engineered Sharps Devices

Here are three examples of syringes engineered for injury reduction:

Hypodermic syringes with "**Retractable**" technology

Two types of Hypodermic syringes with "**Self-Sheathing**" feature

Sharps Injury Prevention

- Eliminate the use of sharps when possible
- If elimination is not possible, use engineered sharps devices that reduce injury
- **ALWAYS** use a puncture resistant tray to transport sharps

Use Safe Sharps Practices at all times:

- **Never** recap a used needle!
- **Never** bend or manipulate sharps
- **Never** pass sharps by hand between people
  - Place on bench, allow other to pick up instead
- **Never** attempt to catch falling sharps if dropped
- **Never** fill container more than ¾ full

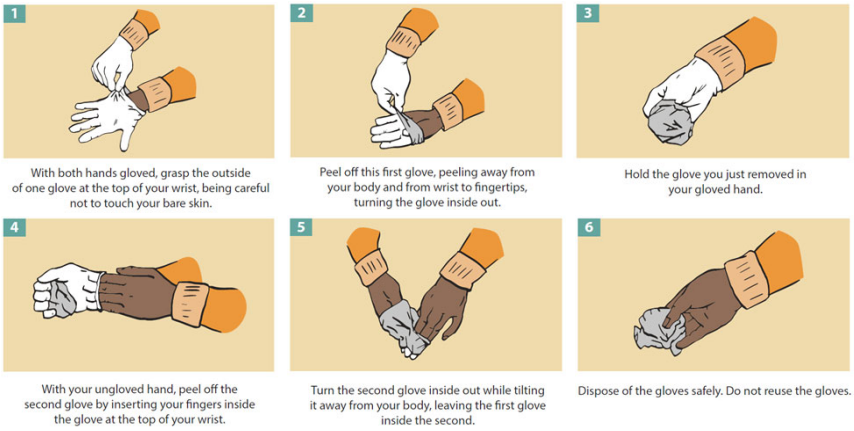
PPE for BBP

- All previously mentioned PPE applies in order to protect from contact with blood or OPIM and is required by the Bloodborne Pathogens Standard and UHCL.
- In the possibility of an event that would generate sprays or splashes of blood or OPIM:

A **face shield** must be used in conjunction with your PPE to protect mucous membranes, such as the nose, mouth and eyes from contact with any blood or OPIM during sample manipulation.

A **healthcare respirator mask** is also used to protect the nose and mouth.

How to Remove Gloves



Clean your hands immediately after removing gloves and before touching any objects or surfaces.
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Hand Hygiene

Frequent / effective hand washing is essential in reducing BBP and possible bacteria transmission such as: Methicillin Resistant Staphylococcus Aureus (MRSA) and Vancomycin Resistant Enterococcus (VRE)…

BUT unfortunately, these areas are frequently missed:

Follow the hand hygiene techniques provided, washing for a **minimum of 20 SECONDS.**
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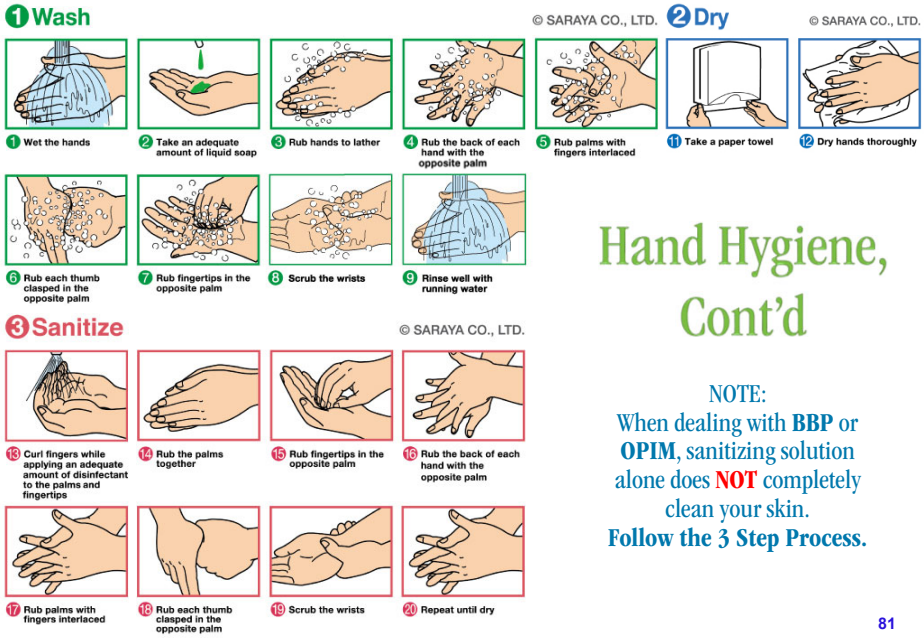
Follow the 3 Step Process:



Hand Hygiene, Cont'd

NOTE:
When dealing with **BBP** or **OPIM**, sanitizing solution alone does **NOT** completely clean your skin.
Follow the 3 Step Process.

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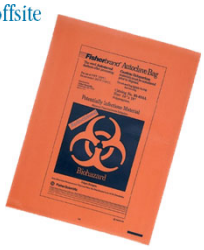
Biohazardous Waste Containers

- Must be Rigid, Leak-proof containers
- Sealed and impervious to moisture
- Closed container for aerosols
- With Proper Labeling
- Biohazard Symbol Labels on Containers
- Orange heat withstanding bags for Autoclave
- Moisture in bag when autoclaved
- Absorbent to capture free liquids when shipped offsite



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Biohazardous Waste

All Biohazard Waste is **Regulated Waste**

The following are considered Biohazardous Regulated Waste:

- **Blood** or **Other Potentially Infections Material (OPIM)** such as human bodily fluids, whether liquid, semi-liquid, or dried
- Contaminated items that would release blood or OPIM if handled or compressed
- Contaminated sharps
- Pathological or microbiological waste with blood or OPIM or medical drugs for treatment or research
- Medical waste, biological teaching and research waste

All Regulated Waste **MUST** be rendered non-infectious prior to disposal.

It should be placed in properly labeled biohazard containers and then treated by

- Autoclave (Steam Sterilization),
- Disinfection, or
- Sent off-site for Incineration.

Waste Handling & Disposal

- **Methods of Biological Waste Treatment**

Autoclaving (Steam Sterilization)
Similar to a pressure cooker, and autoclave relies on high temperature, pressure and steam, in an enclosed pressure chamber to kill or remove all forms of life on an object's surface such as bacteria, fungi, viruses, and spores.
You may see Orange heat resistant bags, and rigid leak proof containers that don't morph or melt used in this process.

Disinfection / Sterilization (Chemical)
Involves completely immersing surfaces, equipment and disposable equipment with chemicals designed to kill virtually every organism for a minimum period of 10 minutes. Some examples of solutions used are: 70-100% alcohol, 1:10 Bleach solution, iodine, phenols/Lysol, Iodine, and quaternary ammonium salts.

Incineration
Biological wastes that cannot be autoclaved or sterilized are properly packaged and professionally incinerated off-site. Properly labeled plastic sharps containers are placed in special biohazard cardboard box or tub for off-site disposal. Red bags are used in certain locations on campus for off-site disposal. When ready, they are tied in a knot and placed in biohazard box or tub, all labeled with the biohazard symbol.

Spill Clean-Up

If you spill blood or OPIM:

- Inform you instructor.
- Place paper towel(s) or other absorbent material on top.
- Wet the paper toweled area with disinfectant and let it soak for **15 MINUTES**.
- Pick up broken glass pieces with tongs or a dustpan.
  Never pick up broken glass with your hands, even if you're wearing gloves.
- Contaminated broken glass should go in a sharps container (Biohazard).
- Disinfected broken glass goes in the broken glass container (Hazardous Waste).
- Wipe up spill from outward to inward to avoid spreading it any further.

Sharps Injury Log

- An injury log must be maintained by EHS.
- Injuries are reported by supervisor to EHS Department **within 24 hours**. Incidents are investigated for any appropriate corrective follow up measures.
- Some incidents are reportable to outside agencies, like TDSHS.
- At a minimum, the log must contain, for each incident:
  - Type and brand of device involved
  - Original intended use of sharp
  - Department or area of incident
  - Description of incident

This concludes the General Laboratory and Chemical Safety Training

Thank you!

University of Houston Clear Lake