

Utah State University
Department of Chemistry & Biochemistry

Safety & Security Policies Manual

Revised February 1st, 2023

**For Faculty, Staff, Graduate Students, Undergraduate Employees,
and Others Working and/or Performing Related
Functions in the Chemistry and Biochemistry Facilities.**

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General Duty Clause

There is a “General Duty Clause” as part of the Federal Register and U.S. Department of Labor Occupational Safety and Health Administration Regulations that basically states that “Every employer under the Act furnish to his employees a place of safe employment which are free from recognized hazards, and that employees comply with standards, rules, regulations and orders issued which are applicable to their own actions and conduct.”

INTRODUCTION

The USU Chemistry and Biochemistry Department is committed to the concept of providing a safe and healthy environment for students, staff and faculty, as well as teaching appropriate respect for safety while engaged in scientific pursuits. Personal safety of each individual associated with the department is of primary importance. Through the Department faculty and the Department Safety Committee, every effort is made to ensure the availability and maintenance of all physical, chemical, biological, mechanical, radiological facilities, and equipment required for safety as per federal, state, local, and University policy.

Through Chemistry Stores, an auxiliary research support division of the Chemistry and Biochemistry Department, an appropriate inventory of safety related supplies is maintained and available to the entire campus community.

Safety awareness training sessions are presented annually to members of the Department. **New Department members are required to attend.**

Random inspections will be conducted by the Department Safety Committee quarterly, with emphasis on varying aspects of providing a safe and healthy working environment. Each laboratory will be inspected at least twice a year.

SAFETY PHILOSOPHY

In an effort to familiarize department personnel with safety as it applies to our Department, the Department Safety Committee is attempting to elaborate on our understanding as to the way we, as University personnel, are expected to view and respond to safety concerns.

The safety industry uses many acronyms. We deal regularly with such agencies as NRC, OSHA, EPA, NIH, CDC, NFPA, DOT and USU EH&S. Each regulatory agency, although closely related, deals primarily with those areas implied by their name. The Environmental Protection Agency (EPA) deals with hazards to the environment such as waste chemicals, highly toxic chemicals, air quality and many others. They would likely issue citations for such things as illegal industrial chemical releases, improper labeling of waste, improper waste disposal records, and chemical containers open to the atmosphere. The Nuclear Regulatory Commission (NRC) obviously deals with radioactive materials and would potentially cite an organization for having unlicensed isotopes, improper use, improper training of workers, and improper security. The Occupational Safety and Health Association is in place to protect workers in the occupational workplace. OSHA would cite institutions for noncompliance with the laboratory safety standard, electrical hazards, lack of personal protective equipment, and lack of physical protection such as belt guards or

improperly secured gas cylinders. The Department of Transportation (DOT) regulates such things as proper packaging, labeling, and placarding of transportation vehicles. The National Fire Protection Association (NFPA) regulates such things as proper fire exits, clear wide corridors, proper alarm systems, proper building occupancy loads, and ensures that proper fire safety equipment is available. Much of the NFPA package of regulations is enforced through building codes. The National Institute of Health (NIH) through the Center for Disease Control (CDC) provides policy concerning such things as biohazards. They would address such items as proper ventilation of biohazard areas, labeling, proper autoclaving and disposal, specific procedures for handling infectious materials, and would help ensure that proper protective facilities are in place before specific biohazards can be handled. Any of these national agencies have the authority to levy significant fines for violations.

At USU we generally deal directly with four levels of safety related efforts. They are the State of Utah USU Office of Risk Management, the USU Environmental Health and Safety Office, the Department of Chemistry and Biochemistry Safety Committee, and the USU Fire Marshall's Office.

They are viewed as colleagues, advisors and helpers and offer assistance, aid and suggestions. The Office of Risk Management works closely with state agencies to enable our University to be insurable. They are involved with most of the regulatory agencies mentioned previously. In past years, our Department has worked closely with this office on such items as fire loss recovery, and theft loss recovery. The Utah State University Environmental Health and Safety Office deals with all safety related issues. This Office has several professionals trained in differing aspects of safety. They have people highly trained in such things as radiation safety, chemical safety, fire safety, hazardous waste disposal, and industrial hygiene. The Chemistry and Biochemistry Department has a safety committee charged with assessing the safety for our Department. We serve as the contact with the USUEH&S to facilitate communication, inspections, and in general assist the Department in making ours a safe and environmentally conscious place to work. The Safety Committee of the Department of Chemistry and Biochemistry consists of three to four members of the Department appointed by the Department Head. The Committee works closely with members of the Department to ensure that research and teaching activities comply with Federal, State, University, and Departmental safety policies and procedures. The committee performs regular inspections addressing such items as fire safety, chemical safety, industrial hygiene, radiation safety, and biohazards. For the protection of all personnel, the Chemistry and Biochemistry Safety Committee and Department Head maintains records of all safety related incidents and/or accidents. Reports on accidents, except the very minor, are **mandatory**. For this reporting purpose, an incident involving human blood, skin irritation, or the accidental defacing or breakage of scientific equipment where chemicals are involved is not considered minor.

BIOHAZARD/BIOSAFETY

Departmental safety practices relative to chemical hazards must be followed for all biohazard agents. Additional practices must be followed which are applicable to the level of biohazard in use. These are as follows.

Initial approval must be secured prior to grant application where any known or suspect biohazards are to be used.

The responsibilities of the Laboratory Director or principle investigator are to maintain written standard operating procedures for all activities having to do with biohazards. All accidents or incidents must be reported to the Department Safety Committee. Access to biohazard areas must be controlled per applicable federal regulations. Very strict housekeeping practices are mandatory and subject to regular inspection.

Additional information on Biosafety is available in the Laboratory Safety Program section in this document. Specific practices outlined in HHS publication NO. (CDC) 93-8395 or later must be followed. This publication is the CDC/NIH, US Department of Health and Human Services Manual of BIOSAFETY IN MICROBIOLOGICAL AND BIOMEDICAL LABORATORIES. For more info visit <http://cdc.gov/labs/BMBL.html>

ENVIRONMENTAL PROTECTION

The University Office of Environmental Health and Safety operates under interim authorization as a research agents containment center in cooperation with state and local authorities.

Out of concern for the safety of everyone in our buildings, we have adopted a policy regarding protective containers for bottles. Persons transporting hazardous chemicals from room to room anywhere in the Maeser/Widtsoe facilities, are required to use a rubber or plastic carrying container over the primary container. We realize the inconvenience; however, it would be minor compared to the repercussions of a spill. Most labs have containers available. New containers are available in Chemistry Stores.

The USU Chemistry and Biochemistry Department normally generates small volumes of a diverse grouping of waste research materials. These groupings consist of unused, obsolete, or outdated chemicals which remain in their original containers, or consist of spent chemicals and chemical mixtures.

It is a firm Departmental policy that no hazardous waste is allowed into the sewer system. Persons caught violating this policy will be severely reprimanded.

In compliance with University policy, the USU Environmental Health and Safety Office provides blank "Hazardous Waste" labels. It becomes the

responsibility of lab personnel to accurately determine all constituents and complete the appropriate blanks on the label. The label must then indicate date, building and room, responsible investigator, total volume, and contents by percent. Waste must remain in the lab where it is generated until pickup. All waste containers must have secure fitting caps, in place at all times. Upon notification by the principal investigator, specified TA, RA or lab technician, the University Safety Technician picks up the properly labeled waste. The technician compares the physical properties of the waste per the label to those expected. Proper disposal is then undertaken according to federal, state, and university regulations.

The University Research Agents Containment Center under the direction of the USU Environmental Health and Safety Office was conceived and built in response to an ongoing need to properly dispose of a wide variety of hazardous wastes. It was the result of an obligation to protect people and the environment consistent with rapidly changing federal, state, and local regulations.

After chemicals are picked up from the generating labs, an appropriate process of analysis is undertaken. Such characteristics as ignitability, reactivity, corrosivity, and compatibility are considered. Steps are taken to render highly reactive chemicals unreactive, etc. The waste containment center stores chemicals in properly labeled individual containers, then in vermiculite (sufficient to absorb), then in plastic covers, then in approved 55 gal. metal containers. The drums are approved for transport and disposal as per DOT and EPA regulations. Normally, waste chemicals are transferred to a licensed commercial facility for burial. Burial currently occurs at a designated site. Radiological waste is prepared, then transferred by a licensed commercial company. Accurate records are maintained indicating container contents, date of final closure, and disposal dates.

USU has been recognized as a leader in developing a working Research Agents Containment Center including the construction of an appropriate building along with complete plans addressing such topics as: designated emergency coordinators, security and sampling methods, spill containment, evacuation plans, personal injury, environmental intrusion, and interaction with local authorities.

LABORATORY SAFETY STANDARD

The Occupational Safety and Health Administration (OSHA) recognized the need for a regulation that focused on the unique nature of laboratory work; thus, the Laboratory Standard (29CFR1910.1450) was developed. This performance-oriented rule is intended to provide laboratories with the flexibility of implementing safe work practices and procedures specific to their workplace while at the same time reaching the important goal of reducing workplace accidents and injuries. The Lab Standard requires the development of a Chemical Hygiene, this plan must be modified to include detailed protections that are specific to each laboratory and its workers. A boiler plate Chemical Hygiene Plan outline is

available from USU Environmental Health and Safety website at <http://www.research.usu.edu/ehs/chemical/chemical-hygiene>.

RADIATION SAFETY PROGRAM

Researchers are permitted to possess and use radioactive materials and devices according to the conditions of its Radioactive Materials License. Anyone that wishes to possess and use radioactive materials or devices must first obtain authorization from the Radiation Safety Committee. All radioactive materials or devices, of any kind or amount, must be inventoried and documented by radiation safety staff. Training is required annually for all users. If you anticipate the use of radioactive materials or have questions please contact the Radiation Safety Officer 435-797-7423.

INTRODUCTION FOR GRADUATE TEACHING AND RESEARCH ASSISTANTS

As a member of the Department of Chemistry and Biochemistry, teaching and research assistants, both graduate and undergraduate, perform an important role contributing to the success of the department. Your position is your license to study, perform research, teach, and/or assist others toward the mission and goals of the Department and University. The objective is to become a successful steward of the profession. Your ability, enthusiasm, and willingness to help may mean the difference between success and failure for many. In varying roles, you may have significant influence on the image of the Department. As a member of the Department, full cooperation with other faculty and staff members is essential. Be a "professional" in the best sense of the term. It is imperative that each individual pursue his/her role in a safe and conscientious manner. Neatness in the labs will perpetuate orderly thinking and result in a more systematic approach to all problems encountered.

The Department of Chemistry and Biochemistry has specific policies regarding most aspects of the educational experience provided by this Department. The University has many written policies including such things as course examinations, academic dishonesty, building access, fees, employee regulations, equal opportunity, and affirmative action. Department policy exists on such items as orientation exams, TA workshops, graduate student advisors, curriculum, seminars, Ph.D. candidacy exams, final requirements for advanced degrees, building use, building security, and safety.

It is your responsibility to be familiar with and comply with these policies.

Reasonable accommodation will be provided for all persons with disabilities in order to ensure equal participation in programs within the Department of Chemistry and Biochemistry.

Considerable coordination is required with faculty to ensure that all teaching assistants use the same approach, grade with the same criteria, and attend meetings

pertaining to specific laboratory or lecture classes and recitations. Similar coordination is necessary in all areas of the Department to ensure that all functions are performed in a safe, effective, and professional manner.

It is your responsibility to arrange for a substitute should you be unable to meet your scheduled teaching assistant or support assignment for any reason. Notify your superior or the person in charge of your laboratory, class, or recitation period if you are to be absent.

Failure to comply with stated departmental policy may lead to written reprimand and/or other appropriate action relative to your status and progress in the department.

FACILITY SECURITY

- A. Building Security Passes.
 - 1. Regular building hours are 7:00 a.m. to 7:00 p.m.
 - 2. Photo Identification Building Passes are required for all persons authorized to be in the Maeser Lab and Widtsoe buildings after regular building hours, except for organized classes or help sessions that begin at/or before 7:00 p.m.
(SEE C. Use of classrooms after hours.)
 - 3. Security Building Permit requests can be obtained from Department Office in ML140. Security personnel have full authority to remove from the building, any persons without the Building Security Pass.

- B. Faculty and Visitor Responsibilities
 - 1. Persons authorized to use the CAB building after hours will be issued keys, which will serve as certification of authorization.
 - 2. Departmental personnel are responsible to lock, turn off lights, and secure their area before leaving the building.
 - 3. Visitors are discouraged from being in the laboratories.
 - 4. Children under 14 years of age and other minors are NOT permitted in laboratories. Children over that age must be under the direct supervision of an adult.
 - 5. Visitors must wear eye protection and be informed, by their host, of the dangers inherent in any particular laboratory.
 - 6. No pets are allowed in the buildings.

- C. Use of classrooms after hours.
 - 1. During the normal course of academic events, there is frequent need to schedule classes after 5:00 p.m.
 - a. Arrange for classrooms and/or teaching labs through the Chemistry Office.
 - b. Be certain to begin the classes no later than 7:00 p.m.

2. You are responsible for making certain that everyone leaves the building immediately after the class and that doors are secure and lights are off.
- D. Working after hours in research labs.
1. The "buddy system" of lab usage is to be used after hours. Known hazardous lab procedures after hours are not permitted while working alone.
 2. When working (studying) in your office or laboratory, it is suggested that you leave your door open.
 3. When you leave your office or lab, take your key and lock the door behind you.
 4. It is suggested you tell someone where you will be and when you expect to be returning home. Be sure to contact that person if your plans change.
 5. **Do not prop main building doors open at any time.** Over the past several years we have experienced intermittent problems with persons rigging doors enabling them or their friends to get into the buildings after hours. **This activity will not be tolerated.**
- E. Key Requests.
1. Keys can be ordered from Department Office in ML140.
 2. All key requests must be approved by the Department Business Manager and signed by the Department Head.
 3. Keys may be picked up at the Key Office one week after they are ordered.
A \$25.00 deposit will be requested for the first key issued.
 4. Keys are not to be loaned.
 5. Keys are issued for specific areas. Faculty and Departmental offices are off limits without specific permission.
 6. Instrument rooms and major scientific instruments are limited to authorized persons only. It is the individual's responsibility to contact the appropriate faculty person to secure proper training and authorization.
Special safety precautions exist with many instruments. These precautions are in place to protect people, the environment, and the instrument. They must be included in SOPs and followed.
 7. Upon termination, keys must be returned to the Key Office. Your deposit will then be refunded.
 8. Failure to return your keys will result in no grades and no degree.
- F. Entry without a key
1. If you are authorized to be in the building and are locked out of the building, call USU Security from any campus phone. Call the USU

Police at ext. 797-1939. Also, if you are locked out of an individual room call USU Police.

They will respond and upon proper identification will open the door(s).

- G. Proper identification is:
 - 1. A USU student identification card or faculty/staff ID card, and
 - 2. Photo ID Building Security Pass.

- H. Unauthorized persons are those persons without keys to the rooms in which they may be encountered. Some unauthorized persons are easily identified, such as children.
 - 1. No unauthorized persons are to be in the building after hours (7:00 p.m. to 7:00 a.m., weekends and holidays)
 - 2. In the event such persons are encountered, please ask them to leave or notify the USU Security Police at extension 797-1939.
 - 3. Notify the Department Business Manager of any incident of unauthorized persons in the building or specific rooms for future reference.

Please be aware of anything or anyone unusual, keep doors locked when the room is not occupied. **The Chemistry and Biochemistry facilities are high security buildings.**

If you observe anything of a curious nature, **PLEASE** report it to University Police (797-1939). Don't hesitate to call the University Police. If you notify them, record the time and the name of the dispatcher.

- I. Tours will normally be conducted by the Department Business Manager. Any exception must be approved by the Department Business Manager and the Department Head.

DRIVERS TRAINING FOR DEPARTMENT EMPLOYEES

By State Administrative Rule #R37, and University policy, all University employees who operate (or who may operate in the future) any University vehicle, or their own vehicle on University business, must attend a Driver's Training course given under the direction of the State Division of Risk Management.

Defensive Driving Training has been added to the annual compliance training required of all USU employees in the USU Institutional Learning System (ILS) (Adobe Captive). This training is required every odd year. You will leave the USU ILS and log in to the Utah Learning Portal where you will be prompted to create an account if this is your first time. Upon completion of the online test in the Utah Learning Portal you will be emailed a certificate of completion. You will attach this

certificate in the USU ILS module. USU Risk Management will then review and approve your submission. For more training info visit <https://www.usu.edu/risk/vehicles/drivers-training>.

DEPARTMENTAL OFFICE GUIDELINES

- A. The main office is located in ML 140.
 - 1. The copy room, ML 145, is off limits to students except by approval from office staff.
Ask one of the Office Staff if you need something in ML 145.
 - 2. Only Department related material will be copied on the office copy machines.
 - a. Photocopy machines for personal use are located in the Student Center and various places around campus.

- B. Payroll for Graduate Students is completed by the Graduate Program Coordinator. Payroll for other employees is completed by Business Services.
 - 1. Graduate students on contract are paid on the 1st of each month. Undergraduate students and other non-contract employees will be paid on the 10th and 25th business days of each month.
 - 2. Contact the Graduate Program Coordinator or Business Services if there is a problem or question regarding your pay.

STUDENT STOCKROOM POLICY (ML 149 & W103, W116, W018)

- A. Safety is the first priority in the student stockrooms. Stockroom personnel are responsible to know and observe Departmental and University safety regulations. They must read and sign this Safety and Security Policy Manual.

- B. Stockrooms are off limits to everyone except faculty and stockroom personnel.

- C. Cash financial transactions are not allowed.

- D. Broken or non-functioning supplies should be checked back from the student to the Student Stockroom. Ground joints, etc. are valuable even if the item is broken.

- E. Stockroom Assistants are responsible to check and keep near full all acid and other stock reagent chemicals in student labs and the Student Stockroom. The Stockroom Assistants make up the lab preps (stock solutions).

- F. Stockroom assistants are responsible to maintain general neatness in the stockroom.
 - 1. Wash any dirty glassware.

2. Keep work benches, desk, and records neat, clean, and in order.
- G. Stockroom Assistants are responsible to: Department Head, faculty member in charge of course, lab coordinator, and main stockroom supervisor.
 - H. Stockroom Assistants are not to engage in long social discussions with friends during stockroom hours.

CHEMISTRY STORES POLICY (W129)

Chemistry Stores serves the entire campus community providing access to laboratory supplies, laboratory glassware, and scientific chemicals. As part of Chemistry Stores, a scientific Glassblowing Shop is available.

Laboratory apparatus, chemicals, and supplies are purchased and stocked for resale. Sources of supply are constantly monitored to ensure the best possible pricing. Purchasing decisions are made on such factors as suitability, price, delivery and service. A modest markup is programmed to enable the auxiliary service to break even financially. Discounts are available on full cases or large orders of various items. Limited delivery service is also available.

Special orders from Chemistry Stores customers are placed to the vendor within 24-48 hours of receipt. Special orders may be delivered and customers are notified on the same day shipments arrive. Chemistry Stores takes a markup of 10% or \$10.00, whichever is less on special orders and delivery. Chemistry Stores maintains open accounts with several vendors enabling rapid turnaround time on orders. Stock items have a programmed markup adjusted annually based upon inventory and sale data from the previous year. Discounts can be applied depending on such factors as quantity purchased, age of stock, condition of stock item, etc.

The Blackboard system is used to process OCC numbers on p-cards. Index numbers are not used to process payment. Orders may be placed by walk-in, email or phone. Hours are 8:45 a.m. to 4:45 p.m.

Chemistry Stores has several hundred safety data sheets (SDS - formerly MSDS – M=material) on file. These are label as MSDS and are several years old. Alternatively, there are good sources online for finding up-to-date SDS information including the manufacturers of chemicals. Some online resources are listed later in this document.

PRECAUTIONS: Chemistry Stores products are not for cosmetic, drug or household application. Our acceptance of purchase number or payment is with the assumption that only qualified individuals, trained and familiar with procedures suitable to the products ordered, will handle them. On our customers must rest the entire burden of safe storage, handling, application, and disposal of all products purchased from Chemistry Stores. No chemicals (and some other stock items, i.e. needles and syringes) are sold to off-campus businesses or private individuals for use.

POLICIES FOR OPERATIONS: In order to comply with state and federal regulations, the following policies apply.

1. State appropriated funds and federal funds flow to the operation only in payment of legitimate charges.
2. All expenditures from the service department's account are directly related to the operation of that service enterprise.
3. Charge rates for services (labor, materials, equipment usage, etc.) are based on the cost to the service enterprise of providing such services.
 - a. In the long run there is no accumulation of profits or losses in the service operation's fund balance.
 - b. Consistent and equal rates are charged to all on campus users, including those within related departments.
 - c. Detailed records (invoices) are maintained documenting the charges to all users. Such invoices indicate dates, rates, hours, materials, etc.
 - d. No charges are made in advance of services rendered.

PRICING: Prices prevailing at the time of delivery will apply. Current prices will be furnished upon request. A select few (usually non-scientific) items are stocked for convenience only. On these items, competitive pricing may be difficult yet a reasonable effort is made to be competitive on all items.

Chemistry Stores **DOES NOT** accept chemical waste.

RETURNED GOODS POLICY: All returns must be authorized by ChemStores Manager. Items not authorized for return are opened chemicals or items whose shelf life has expired, special orders (restocking fees may apply), and items that have been sold at closeout discount rates.

INSTRUMENT REPAIR AND MAINTENANCE

Scientific instrument repair and maintenance service is provided under the direction of the Chemistry and Biochemistry Department for the entire University. Priority is given to those Departments in the College of Science. This enterprise has facilities for restoration and repair of a wide range of electrical instruments. It also has a stock of standard parts as well as the capability of securing special parts in a timely manner when necessary. Equipment in need of repair should be cleaned and sanitized before it is taken to the Instrument Repair Shop. All inquiries should be directed to the electronics technician at ext. 7-1614, ML290. Work will normally

be handled on a first come, first served basis, as parts and supplies are available. Payments are made using USU index numbers.

A "Research Support Invoice" is filled out by the customer at the beginning of the project, which acts as the work order of record.

GLASSBLOWING SHOP

Chemistry Stores provides glassblowing services for all University departments. The glassblowing shop aids in securing special apparatus not stocked and/or not normally available. Rough sketches included with the work order indicating dimensions and tolerances necessary will speed up glass work. Special orders are not returnable.

When breakage occurs to some portion of an item, it is very often possible to repair the item at considerable savings. Incoming used material should be very clean. Work will be handled on a first come, first served basis. Payment is handled through the P-card system.

Inquiries should be directed to the glassblower at ext. 7-1617, W129A.

Borosilicate and quartz glass are handled.

A "Research Support Invoice" is filled out, by the customer at the beginning of each project which acts as the work order of record. The glassblowing operation is an "as needed" part-time enterprise.

MACHINE AND WOOD SHOP

The tools and machinery in the CAB Machine & Wood Shop present a serious safety hazard. Anyone who would like access to the machine shop needs to be cleared by Dr. Nick Dickenson before using the hand tools or machinery. Tools may be taken from the shop area but must be returned daily. We rely on the honor system to see that tools are returned to their proper place. Limited personal use is allowed.

BUILDING CHANGES

Any physical changes, such as adding or removing cabinetry, plumbing or electrical fixtures, made in your assigned laboratory areas, other than simply rearranging lab space, require approval by the Department Head before the change is made. If a major change is suggested this will first be considered by the Building and Space Committee. In most instances the cost of the change will be assessed to the faculty member requesting the change.

SAFETY SUPPLIES

Chemistry Stores maintains a wide selection of safety supplies. These items may be purchased using normal procedures. Some of the items stocked include: safety cans, lab coats, safety goggles, spill clean-up kits, gloves, absorbent bench protectors and mats, first aid kits, implosion nets, face shields, pipetting devices, respirators for dust and various gases, hood trays, aprons, acid bottle carriers, gas cylinder clamps, safety funnels, tongs, safety signs, and foot protection.

Your assistance in maintaining the USU Chemistry and Biochemistry Department as a safe and effective work place is mandatory. If you have any questions or comments, please feel free to contact members of the Safety Committee.

GAS CYLINDERS

An attempt is made to maintain accurate records by the Chemistry Stores Coordinator on all gas cylinders in the Chemistry and Biochemistry Department buildings. These records are open to everyone to help determine the status of any cylinder at any time.

All cylinders must have caps in place before moving. Lab gas will not pick up the empty cylinders unless they have the proper cap. As a result, you continue to pay demurrage. Always return the cylinder cart to the cart area near Chemistry Stores so that it is available for use.

GENERAL SAFETY GUIDELINES

FOR EMERGENCY HELP DIAL 911

- A. Smoking is not allowed in University buildings or within 25 feet from the buildings.
- B. Food or drink must not be stored in laboratory refrigerators or other areas of potential biological or chemical hazard. Food containers should not be used as storage vessels for laboratory materials. Food and drink consumption present possible routes for ingestion of hazardous microorganisms or chemicals and are not allowed in laboratories.
- C. Contact lenses are strongly discouraged for laboratory work especially when potentially dangerous chemical fumes, vapors, and liquids are present, which may damage the contact lenses and irritate the eyes severely.
 - 1. If contact lenses are worn, the wearer should be especially diligent in wearing eye protection (goggles or safety glasses and a full-face shield) when handling potentially hazardous chemicals or biological materials.
 - 2. Every employee in the laboratory should know who the persons are that wear contact lenses, what type, and be instructed on how to remove the lenses in case of an emergency.
 - 3. In case of an accidental splash in the eyes of a person wearing contact lenses, it is imperative that the lens be removed immediately and the eyes be flushed with copious amounts of water for at least 15 minutes.
- D. Eye and face protection are important laboratory concerns.
 - 1. Eye protection must be worn in the lab at all times.

2. Special precautions should be considered when performing such activities as:
 - a. preparations of reagents (chemicals, acids).
 - b. packaging and unpacking of potentially hazardous reagents.
 - c. handling, pouring, or mixing any caustic or corrosive materials.
 - d. working on autoanalyzer lines.
 - e. working on tissue processors.
 - f. sharpening microtome knives (full face shield is required).
 - g. working with glassware under pressure or vacuum (full face shield is required).

- E. Clothing: It is recommended that standard laboratory coats or gowns be worn when working in the research laboratory areas.

- F. Shoes: Shoes should cover the entire foot. Sandals, clogs, and other open-toed or open-heeled shoes do not cover enough foot and are not allowed.

- G. Gloves: Disposable gloves must be available when required. Appropriate gloves are to be worn at all times when handling hazardous materials. No one type of glove is appropriate for all types of chemicals. Glove compatibility should be checked prior to use. Glove compatibility information is available from the glove manufacturer. Gloves should not be worn in the hazardous environment then worn to other areas such as offices. The person wearing contaminated gloves could easily contaminate such items as door knobs or computer keyboards where the normal users would not normally wear gloves.

- H. Hair should not be worn in a style such as would impair vision, cause distractions during job functions, or come in contact with work surfaces or moving equipment.

- I. Hand washing is necessary before eating, drinking, smoking, before leaving the laboratory, and after taking off rubber gloves.

- J. Pipetting by mouth is not allowed. Physical pipettors (bulbs, fillers, bottle top, controllers, etc) must be used.

- K. Exits and aisles must not be obstructed by equipment, chairs, supplies, or trash. Doors to the laboratory must be kept closed, exit doors must not be blocked, locked, or obstructed in any way to inhibit egress.

- L. Hood Openings - All fume hoods should be inspected annually. The EH&S office will place a magnet with the inspection date and indicate whether the hood passed or failed inspection. Always make sure the fume hood is operational before use. If any hood in your laboratory is not functioning properly, contact Department Staff Assistant (797-0544) to initiate a work order through facilities.

- M. Good housekeeping is an essential aspect of laboratory safety.
1. Laboratories must be kept clean and free of accumulations of trash or unused materials.
 2. Reagents and equipment must be stored in an organized fashion and returned to their designated locations whenever they are not in active use.
 3. Storage Areas: Make efficient usage of storage areas. Clean clutter including outdated chemicals or chemicals which are not being used.
 4. Chemical Storage: Check storage equipment for compatibility with chemicals to be stored. Make sure all containers are labeled, including water containers.
 5. Work surfaces must be cleaned regularly. Where a potential for microbiological contamination may exist, surfaces must be cleaned with a suitable disinfectant.
 6. Particular attention must be given to minimizing volumes of flammable liquids to minimal quantities and storing laboratory chemicals according to compatibility and according to federal regulations including the use of flammable solvent storage cabinets.
 7. Hood Storage: If hoods are being used for storage of small equipment and containers, identify the hood as such if used for storage only. Waste stored in hoods needs to be disposed of on a regular basis.
- N. Glassware.
1. Inspect before using. Do not use broken or chipped glassware.
 2. Do not attempt to remove stoppers on glass by excessive force.
 3. Dispose of broken or discarded pieces in a specially marked separate container which should be available in every lab. Infectious material should be decontaminated before disposal.
 4. Hot glass containers should be handled with heat resistant gloves.
 5. Broken glassware should be picked up with a brush and pan - NOT with the fingers.
- O. Safe Handling of Flammable Liquids.
1. Use flammables only in well-ventilated areas (hoods).
 2. Do not permit any open flames in flammable-vapors area.
 3. Do not use old, poorly maintained equipment which might generate sparks or overheat.
 4. Sufficiently isolate or otherwise control all ignition sources - ovens, electrical hot plates, electric motors, etc.
 5. Heating and drying of flammable liquids should be done in the appropriate hood.
 6. Equipment used for heating flammables must be in good condition and have automatic disconnects in the event of overheating.
 7. Keep hot surfaces away from flammables.
 8. Clean spills immediately, using proper procedures.
 9. Maintain a minimum stock of flammables.
 10. Personal protective equipment must be available for required uses.

11. Allow for rapid unencumbered exit when using flammables.
12. Flammable liquids that need to be kept at or below refrigerator temperatures, must be stored only in explosion-safe refrigerators or freezers.
13. Flammables and oxidizers must be stored separately.
14. Know the location of the nearest fire extinguisher.
15. Do not work alone when using hazardous flammable liquids.

P. Procedures for Chemical Spills of Potentially Hazardous Materials.

The Laboratory Safety Program section of this manual contains a detailed discussion of chemical spill response. A spill response plan should be developed for each laboratory and all personnel should be trained accordingly.

1. Clear the affected areas.
2. Check for individual involvement
3. Isolate the spill
4. Contact Emergency Response immediately if there is fire, personal contamination, or injury.

Q. Emergency Procedures for Chemical Burns.

1. Remove contaminated articles and clothing.
2. Flush the contaminated skin area with large quantities of water for at least 15 minutes. For medium or major exposure, secure help immediately.
3. With burns from heat, never open any blisters.
 - a. if minor, gently clean with water and cover with a sterile dressing.
 - b. if major, gently clean with water and cover the affected area. Treat for shock (keep the patient warm and resting).
4. DO NOT use oils, fats, or sodium bicarbonate on the burned area unless specifically advised to do so by a physician.
5. DO NOT apply salves or ointments, since these may increase skin absorption.
6. The victim should be taken to a hospital immediately for further treatment.

R. Substitute for Chromic Acid Cleaning Solution.

The Environmental Health and Safety Office (EH&S) is encouraging laboratories and service facilities that use chromic acid cleaning solutions for cleaning and labware to try a commercial substitute.

Spent chromic acid solution is regulated under EPA's Hazardous Waste Program outlined under the Resource Conservation and Recovery Act. As a result, the cost for proper disposal is very high.

EH&S is requesting chromic acid users to try NOCHROMIX (distributed by Curtis Matheson and available in Chemistry Stores). This strong inorganic oxidizer contains no metal ions and is easily disposed. In addition, it appears to be less expensive than chromic acid solution.

S. Emergency Eye Treatment.

Should you or a co-worker get acid or any solution in the eyes, it is CRITICAL that the eyes be THOROUGHLY washed for 15 minutes. Be sure the eyeball is being properly washed. If necessary, hold the eyelid open and hold the head in the eye wash fountain for the injured party. Secure medical assistance as soon as is reasonably possible.

In case of eye injuries, you must depend on each other for fast assistance. Remember, a few seconds wasted could mean the loss of a person's eyesight.

T. Emergency Procedure for Electrical Shock.

1. Shut off the current.
 - a. Use heavy rubber gloves, dry rope, or dry, blunt stick to push the victim or current source aside.
 - b. BE SURE YOUR HANDS ARE DRY AND YOU ARE ON A DRY SURFACE.
 - c. Call for emergency assistance as soon as is reasonably possible.
2. Start artificial respiration immediately and send for an AED.
 - a. AED should be attached to the victim when it arrives. It will guide you on what to do. Do not regard early rigidity or stiffening as a sign for ceasing artificial respiration. Once CPR has been started you must continue until exhausted or emergency help arrives.
3. Keep the victim warm, using blankets against the body.

U. Cuts.

1. Minor cuts.
 - a. Wash with water.
 - b. Apply an antiseptic.
 - c. Cover with a bandage or sterile dressing.
2. Severely bleeding cut or puncture.
 - a. Check for glass in the wound
 - if none, cover and apply pressure on the cut.
 - if glass is embedded, apply pressure above the wound or at a pressure point.
 - b. Elevate wound.
 - c. Get help immediately.

V. Fumes

Should anyone complain of dizziness or headache during a lab take them to fresh air and make them rest. Unless the symptoms rapidly disappear, get medical help (DIAL 911) and do not permit them to move until help arrives. If toxic fumes are detectable clear the lab of other students and thoroughly ventilate the room before permitting resumption of work. Contact the EH&S office to evaluate the air quality.

W. First Aid Summary.

Even if the safety measures outlined are followed to the letter, it is almost certain that some minor accidents will occur, such as cuts, burns, or spilled chemicals. The person will look to the closest individual for aid, so you must be ready should the occasion arise. Become familiar with basic first aid procedures and where the first aid supplies are located.

1. In all cases of major injuries, common sense rules apply. Get emergency help as soon as reasonably possible (Dial 911)
2. Most important rules.
 - a. Keep the patient breathing.
 - b. Stop the heavy bleeding
 - c. Treat for shock.
 - d. Get the patient to the hospital quickly.

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Work Related Injury or Illness (Emergency or Nonemergency)

1. Report the injury or illness to your supervisor
2. Go to Logan Regional Hospital

Work-Med hours

716-5478 (then press 1)

Hours: Mon-Thurs 8:30 am to 5:00 pm

Fri 8:30 am to 4:00 pm

- a. Go to the Emergency Room Check-in desk.
 - b. During Work-Med hours, inform personnel that you are checking in for Work-Med. After hours, check into the Emergency Room.
 - c. Inform Work-Med that you work for USU in the Chemistry and Biochemistry Department (They have the USU Work-Med insurance information in their office).
 - d. Know the name of chemical or fumes you have been exposed to if at all possible. Have SDS information if possible.
 - e. During Work-Med hours, call ahead if convenient, and the check-in desk will be notified that an injured person is coming.
 - f. In case of serious injury, WORK-MED will transfer patient into Emergency Room for the needed treatment.
3. After treatment contact the Department Staff Assistant for the paperwork. 797-0544
Maeser Lab 140

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Lab Waste Disposal

Many hazards are connected with the disposal of waste. Follow a few simple rules.

1. Before leaving the lab clear the lab benches and sinks of all papers, matches, and other waste materials.
2. **Insoluble, hazardous, reactive, flammable, or any other waste chemicals are not to be put into the sinks.**

Federal law requires a special label on such chemicals.

This label is available in Chemistry Stores, or from the Environmental

Health and Safety Office.

Do not take chances with unknown chemicals.

Unlabeled chemicals will not be tolerated in the department.

3. If you know there will be waste, be certain a clearly labeled waste container is available.
The janitors will not empty containers that have chemicals in them.
They will report the location of the offending container and the responsibility will be on the person in charge of that area.
4. Waste containers should be kept securely closed at all times other than when actually transferring liquids.
5. The Chemistry Stores keeps extra HAZARDOUS WASTE LABELS for use as needed. The labs should try to have a few clean, used bottles which can be used for waste. Please check with nearby labs if you need extra used bottles.
6. Users of radioactive materials and biohazard materials must be familiar with and comply with regulations governing those wastes and document that they are knowledgeable concerning the use of the materials.

GENERAL FIRE SAFETY

A. Emergencies.

1. Know how to report a fire. (CALL **911**) (PULL BOXES)
2. Know proper procedures on what to do when notified of a fire or discovering one yourself.
3. Do not delay reporting of any reportable incident.

B. Person Discovering a Fire.

1. If a fire is very small in nature and the person feels he/she can handle it, an attempt should be made to extinguish it.
2. If fire cannot be extinguished, then the following should be done in this order:
 - a. close doors in immediate area. This will help to contain fire and smoke to the immediate area and prevent it from rapidly spreading.
 - b. activate manual alarm box nearest you.
 - c. call fire department: DIAL 911. Report nature and location of fire. The Fire Marshall, 797-1979, should be notified no matter how small the fire.
 - d. remove other flammable materials from the area if possible. In any fire, remember THE SAFETY OF PEOPLE COMES FIRST.
 - e. meet the fire department when they arrive to provide information and location of fire, etc.
 - f. take any fire extinguishers that have been used to the stockroom. Do not leave an empty or partially used extinguisher in the laboratory.

C. Occupants of Building.

1. Close doors.
2. Evacuate building via nearest exit.
3. Do not use elevators.
4. Avoid smoke filled areas.

- D. Fire Extinguishers.
1. Know their locations in your area.
 2. Be familiar with the various types of extinguishers and how to operate them.
 3. Extinguishers should be readily accessible and never obstructed.
- E. Housekeeping.
1. **Good laboratory housekeeping is mandatory.**
 2. Don't allow combustible waste material to accumulate.
 3. Use proper trash containers for discarded material.
- F. Flammable Liquids.
1. Use extreme care when handling flammable liquids.
 2. Be sure flammable liquids are properly stored.
 - a. All quantities over 10 gallons should be stored in approved flammable storage cabinets for each laboratory.
 - b. Keep quantities of flammable liquid storage to a minimum.
 3. Always attempt to use flammable liquids in fume hoods or other well-ventilated areas.
 4. Keep ignition sources away from flammable and combustible liquids.
 5. Do not store flammable liquids in refrigerators or cold rooms unless such units are designed and approved for such use.
 6. Keep proper closures on containers.
 7. Flammable liquid storage cabinets shall have doors that are well fitted, self-closing, and equipped with a latch. Storage cabinets are to remain closed except when adding or removing containers.
- G. Means of Exit.
1. Do not block aisle-ways or exits.
 2. Know where the building exits are located.
 3. Have at least two different emergency exit routes planned out.
 4. Do not block open fire doors. Fire doors are designed to prevent rapid spread of fire and smoke in the event of a fire. Keep them closed.

CHEMISTRY AND BIOCHEMISTRY TEACHING LABS

ALL LABORATORY STUDENTS IN CLASSES MUST RECEIVE SAFETY TRAINING AND SIGN THE SAFETY AGREEMENT DURING THE FIRST LAB MEETING.

CHECK-IN AT BEGINNING OF SEMESTER

- A. The students must check the apparatus in their locker against the list on the check-in sheet.
- B. Instruct the student to exchange broken or chipped glassware at the stockroom.
- C. Do not issue any locker to a student, other than those on your class list. This ensures that the student is properly registered for the course and section.

DURING THE LAB

1. Be prepared for the laboratory.
2. Read the experiment thoroughly.
3. Anticipate any hazards that may be associated with the experiment.

4. Determine that adequate equipment is available in the student desk or student stockroom.
5. Be familiar with the operation of the necessary equipment.

Faculty may conduct T.A. meetings to review general procedures as well as to determine specific cautions, procedures, or methods. Pre-experiment discussions are helpful with faculty and T.A.'s as well as in the teaching laboratory with students.

Equipment stocked in the student stockroom is direct property of the department. If and when the stockroom needs to restock, the stockroom attendant should purchase the necessary items from Chemistry Stores.

Extreme caution should be exercised to ensure that students return stockroom items to the student stockroom immediately at the end of the lab session. This ensures that the next lab group has access to adequate equipment or glassware items.

During the lab, move about the lab and observe any unsafe or improper practices. Monitor progress to ensure that students are able to finish the experiment with adequate time for cleanup or help the students with an appropriate stopping time where the experiment could be continued during the next lab session.

Instruct and observe the students to ensure that special equipment is used and stored correctly, clean and ready for the next group.

Report any problems to the stockroom personnel and ask them to report the problem to the appropriate responsible person. Equipment problems can be reported to the faculty in charge of the lab, the Department Business Manager, the glassblower or the electronics technician.

Under no conditions are students allowed to work in the teaching labs without supervision. Students must always wear safety glasses while in the lab. Prescription glasses are not safety glasses. Shorts, tank tops and open shoes are not allowed.

Students should be cautioned about wearing dangling articles such as ties or long necklaces that might catch on equipment or knock over containers.

Coats, scarves, packs and similar items should be kept off workbench tops.

Cleaning Labs: It is your responsibility to see that your students clean their share of the lab. Pay special attention to hoods, balances, and other small equipment.

At the designated ending time all equipment shall be turned off and the door locked as the last person (the T.A.) leaves the lab. Guard against theft or damage of departmental equipment.

LAB WASTE/ CHEMICAL DISPOSAL

It is the responsibility of the TA's in cooperation with the Lab Coordinator to determine that all waste containers are properly capped and labeled at all times. Near the last week of labs a list of the waste should be prepared which includes the quantity and complete description of the contents of the waste container by percent. As appropriate, the TA is to notify the EH&S office that the waste is ready for pickup. HAZARDOUS WASTE HANDLING instruction posters are posted in all labs. As with all activities in the respective labs, the faculty should oversee this necessary part of the process to ensure effectiveness and avoid duplication of effort.

CHECK-OUT AT END OF SEMESTER

- A. Have the student unlock their locker and set out their equipment on the bench for you to check.
- B. Check each locker individually. Read Standards for Equipment.

- C. Make certain their student desk keys are returned.
- D. Complete the check, LOCK THE LOCKER, then sign the check-out sheet.
- E. Return the completed check-out sheet to the student stockroom.
- F. Be efficient at check-out time.
 - 1. This will mean fewer problems and less delay at check-in time next semester.
 - 2. It also means the Department will give away less equipment as refills for lockers.

HOUSEKEEPING PROTOCOL

- 1. The chain of command is Department Head, Faculty, Lab Coordinator, Teaching Assistant, and Student. The Department Safety Committee and student stockroom personnel are auxiliary to the chain of command.
- 2. It is the responsibility of respective Faculty to follow up with individual Teaching Assistants to ensure compliance.
- 3. If Teaching Assistants fail to require students to clean up and straighten up, it becomes their responsibility to perform the functions without delay.
- 4. During the first TA meeting of the semester with the Faculty person in charge, and with the Lab Coordinator, the lab should be inspected for any existing hazards or problems.
- 5. At the beginning of each laboratory period any hazards or housekeeping problems should be noted, and forwarded to the Faculty person in charge of your lab. As appropriate, the faculty may communicate the problem to other faculty or the safety chairperson.
- 6. During and at the end of the lab period, the TA should check the lab for problems with housekeeping, no safety glasses, food in the lab, frayed electrical cords, chipped or broken glassware, unlabeled containers, containers without lids, improperly labeled waste, security, adequate safety supplies, spills, unsafe practices, and any other housekeeping or unsafe conditions. Appropriate action should be taken to correct deficiencies. The TA's responsibilities are not complete for the day until the lab is clean and ready for the next session.
- 7. At the end of the semester it is the responsibility of the TA to see that proper checkout is performed by the students, that the individual student drawers, glassware, and equipment items are left clean and ready for the next use. Likewise, per the chain of command, the TAs must report to the respective Faculty who are ultimately responsible for teaching the student laboratory.

SAFETY STANDARDS FOR EQUIPMENT ITEMS

- A. All equipment in the locker must be listed on the checkout sheet.

- B. All glassware must be clean, dry, and in good condition.
- C. Equipment must be usable.
 - Clamps must work.
 - Wire gauze must be whole.
 - Brushes must be usable for the purpose intended.
 - The indicating material should rise in a thermometer when the bulb of the thermometer is held in the hand. The column should not be separated.
 - Burettes and pipettes should be scrutinized closely.
 - Check each item of the Standard Taper Lab Kit.
 - Check that stoppers and plugs are functioning.
- D. All excess equipment should be removed from the locker and returned to the issuing stockroom.

Safety Information Internet Links

<http://www.cdc.gov/niosh/topics/chemical-safety/default.html>

<http://hazard.com/msds/>

<http://www.knovel.com/knovel2/default.jsp>

<http://www.sigmaaldrich.com>

<http://www.msdssearch.com>

<http://www.cdc.gov>

<http://www.osha.gov>

<http://www.cdc.gov/od/sap/docs/salist.pdf>

<http://www.safety.queensu.ca/biocom/bio.htm>

LABORATORY SAFETY PROGRAM

UTAH STATE UNIVERSITY

Department of Chemistry and Biochemistry

The Utah State University Department of Chemistry & Biochemistry is committed to meet its obligations under the Occupational Safety and Health Administration Laboratory Safety Standard (29CFR1910.1450) and Title III of the Superfund Amendments and Reauthorization Act (SARA). This document consists of the following sections:

- A. Overview
- B. Emergency number posting
- C. Container Labeling
- D. Secondary Labels
- E. Material Safety Data Sheets
- F. MSDS on Research Chemicals
- G. Chemical Inventory
- H. Non-Routine Tasks
- I. Custodial Services and Physical Plant
- J. Employee Training and Information
- K. Required ACS Literature
- L. Chemical Hygiene Plan (CHP)
- M. Standard Operating Procedures (SOP)
- N. Particularly Hazardous Chemicals
- O. Biohazard/Biosafety
- P. Chemical Storage
- Q. Spill Response Guidelines
- R. University Accident Reporting Procedure
- S. University Accident Report Form
- T. Departmental Accident Report Form
- U. Safety Agreement Form

A. Overview

This Laboratory Safety Program is intended to ensure that both employers and employees are aware of the dangers associated with hazardous materials in their work place and the employees are provided with adequate information so they can work as safely as possible. These documents outline and provide a review of the specific requirements for container labeling, Safety Data Sheets (SDS), and training; and outline responsibilities within our operation.

Day-to-day responsibilities of working safely lie with the supervisors and their employees.

B. Emergency Number Posting

It is required that emergency call numbers be posted on the lab doors. This posting is to

include a minimum of two lab personnel who are familiar with the layout and inherent hazards in the lab. These numbers may be posted either on the outside or the inside of the door.

C. Container Labeling

It is the policy of the Chemistry Department that no original container of chemicals will be released for use until the following labeling information is verified.

- a. Containers are clearly labeled as to the contents.
- b. Appropriate hazard warnings are noted.
- c. Name and address of the manufacturer are listed.
- d. Label is in English, prominently displayed and not damaged.
- e. Label is stamped with the date received.

D. Secondary Labels

To ensure that employees are aware of the chemical hazards of materials used in their work areas, it is mandatory to label all secondary containers.

Labels are required on portable containers in which hazardous chemicals are transferred. The identity label (including the appropriate hazard warnings) will be obtained or prepared by the employee making the transfer, and prominently displayed on the container.

Our safety is best assured and achieved by reading the Hazard Warning on the label and by following that warning. The only exception is where we have special written procedures and have provided specialized equipment or processes to protect the user. Date labeling is necessary for peroxide forming materials such as ethers.

E. Safety Data Sheets (SDS)

1. The SDS is the primary means we will use to convey the necessary specific information about the hazards of the chemicals we use. The chemical manufacturers are responsible to provide us with the SDS. The chemical manufacturer must include 12 different items about their product that provide us with adequate information to use the chemical safely.

The SDS are available to all employees for review during their work shift. If the SDS is not available or new chemicals in use do not have SDS, SDS information is available on the internet. **All labs must have SDS available on computer, computer disk or hard copy.**

2. An acceptable SDS must contain adequate information for the following 12 items.
 - a. Identity of product used on the label.
 - b. Chemical and physical characteristics.

- c. Physical hazards (fire, explosions, reactivity).
- d. Health hazards.
- e. Permissible Exposure Limits (PEL) or Threshold Limit Values (TLV).
- f. Carcinogenicity.
- g. Safety handling precautions.
- h. Control measurements.
- i. Emergency and first aid procedures.
- j. Date of preparation or last change.
- k. Name, address, and telephone number of responsible person preparing the SDS.
- l. Primary route of entry.

Many SDS are available on the chemical manufacturer or distributors web site. Also, the Environmental Health & Safety Office has links, on their website at <http://www.ehs.usu.edu>, to SDS resources.

F. Safety Data Sheets - Research Chemicals

Chemicals prepared during a research project must be evaluated by the research supervisor for possible hazards. The substances should be compared with chemicals having similar functional groups and properties. Except for chemicals that can be shown to exhibit no hazards, the research supervisor shall prepare an SDS for these substances before the chemicals are further used in the research laboratory or transported.

The SDS must include those physical properties that have been measured. The hazards may be specified by citing the hazards of closely related compounds; this information may be copied from the SDS for the related compounds.

G. Chemical Inventory

A variety of chemicals are used in departmental labs. Most of these chemicals are used in small quantities (pertains to the size of the container as well as quantities used in teaching and research procedures). Copies of the inventory must be kept in the lab. The laboratory chemical inventory must be updated regularly and should be referred to prior to ordering any chemical. It is recommended that as part of the chemical inventory you include the primary hazard associated with each chemical (e.g. flammable, acutely toxic, corrosive, etc.). This information is helpful in identifying hazards, identifying chemicals that will require SOPS, maintaining appropriate chemical storage, and completing the USU Emergency Response Information forms. The Emergency Response Information for each room in the department needs to be updated annually. Current chemical inventories make this process much easier.

H. Non-Routine Task

Occasionally employees are required to perform non-routine tasks that can be potentially

hazardous. Prior to beginning work on such projects, each affected employee will be given information by their supervisor about hazardous chemicals to which they may be exposed during such activity. The information will include:

- a. Specific chemical hazards.
- b. Protective and safety measures the employees must take.
- c. Measures the laboratory has taken to lessen the hazards, including ventilation, respirators, presence of another employee, and emergency procedures.

I. Custodial Services and Physical Plant

To ensure that outside contractors work safely in our laboratory, it is the responsibility of the supervisor (PI) to provide outside contractors the following information.

- a. The information of hazardous chemicals to which they may be exposed on the job site. SDS for every chemical in the laboratory need not be provided to the contractor. Rather, SDS for those chemicals presenting a potential for exposure would be provided.
- b. Custodial Services are limited to cleaning up of floors and emptying regular trash. Cleaning does not include cleanup of cabinets or benches containing chemicals, thus minimizing contact with hazardous chemicals.
- c. No laboratory chemicals or glass are allowed in conventional waste containers. Custodians are not allowed to dispose of any wastes, such as chemicals, biohazards, or radioactive materials.

J. Employee Training and Information

1. New employees will attend health and safety orientations. Employees include: faculty, classified personnel, professional personnel, post-doctoral fellows, reaching assistants, research assistants, students performing research in research laboratories, and other student workers.
2. All employees must receive information and training by the Chemistry Department Safety Committee and/or the USU Environmental Health and Safety Office on the following:
 - a. An overview of the requirements contained in the Laboratory Safety Program.
 - b. Location and availability of the labs written Chemical Hygiene Plan and SDS.
 - c. Examples of methods and observation techniques that can be used to determine the presence or release of hazardous chemicals in the work area.
 - d. How to read labels and review SDS to obtain appropriate hazard information.
 - e. After attending the training class, each employee must receive the ACS Safety in Academic Chemistry Lab Handbook (acs.org), and understand the Department's policies on Laboratory Safety.

3. Research Laboratories: The faculty supervisor of each research laboratory has the responsibility to inform and train all personnel (i.e. faculty, post-doctoral fellows, and graduate and undergraduate students doing research or other work in this laboratory) working under his/her supervisor. This training must include the following:
 - a. Location and availability of the Labs written Chemical Hygiene Plan, the file of SDS for hazardous chemicals in the laboratory, and the inventory of chemicals present in the research laboratory.
 - b. Potential physical and health effects of the hazardous chemicals in the research laboratory.
 - c. Protecting the immediate and local area environment from contamination.
 - d. Methods and observation techniques used to determine the presence or release of hazardous chemicals in the work area.
 - e. How to lessen or prevent exposure to these hazardous chemicals through use of control/work practices and personal protective equipment.
 - f. Steps the research supervisor has taken to lessen or prevent exposure to these hazardous chemicals.
 - g. Safety and emergency procedures to follow if they are exposed to these hazardous chemicals.
 - h. Notification will also be conducted when a new hazardous chemical is introduced in the research laboratory.
 4. Storerooms and Preparation Rooms: The Lab Coordinator has the responsibility to inform all employees working in the student storerooms of the following:
 - a. Location and availability of the Department's written Laboratory Safety Program, the file of SDS for hazardous chemicals in the laboratory, and the inventory of chemicals present in the teaching labs and stockrooms.
 - b. Potential physical and health effects of the hazardous chemicals that are directly handled, as differentiated from dispensing sealed reagent containers.
 - c. Methods and observation techniques used to determine the presence or release of hazardous chemicals in the work area.
 - d. How to lessen or prevent exposure to these hazardous chemicals through use of control/work practices and personal protective equipment.
 - e. Safety and emergency procedures to follow if they are exposed to these hazardous chemicals.
- K. Required ACS Literature will be provided. ([Safety in Academic Chemistry Laboratories - A Publication of the American Chemistry Society.](https://www.acs.org/about/governance/committees/chemical-safety/publications-resources.html))
- L. Chemical Hygiene Plan The written Chemical Hygiene Plan is the core of the OSHA Laboratory Safety Standard and affords flexibility in providing the type of worker protection appropriate for a specific workplace

It is the responsibility of the Principal Investigator to ensure that lab personnel are

trained, understand, and implement the procedures as directed in the CHP. Remember the CHP needs to be reviewed at least annually. This review must be documented.

A Boiler plate Chemical Hygiene Plan outline on the USU Environmental Health and Safety website at <http://www.ehs.usu.edu> as previously indicated.

M. Standard Operating Procedures (SOP)

According to the Lab Standard, the Chemical Hygiene Plan must be capable of protecting employees from health hazards associated with work conducted in that laboratory. The Standard Operating Procedure (SOP) is the mechanism by which safety and health considerations are conveyed to the laboratory worker.

SOPs are mandatory for all laboratory activities involving hazardous chemicals. In practice, such procedures can be generalized (e.g., lab safety rules; such as, safety glasses must be worn in the lab) and should state the obvious. A Standard Operating Procedure must be developed prior to use of any particularly hazardous chemical. SOPs, developed by the principal investigator, should establish appropriate work practices, methods of control, measures for the use and maintenance of personal protective equipment, and special precautions for work with particularly hazardous substances or processes.

N. Particularly Hazardous Chemicals

The following classes of chemical are considered particularly hazardous:

Allergen (Sensitizer): A foreign agent or substance that is capable of causing an immune response in an individual. In most cases, initial exposure results in a normal response, but repeated exposures lead to progressively stronger and abnormal responses.

High Acute Toxicity: Acute toxicity is the adverse effects resulting from a single dose or single exposure to a substance. Ordinarily refers to effects occurring within a short time following administration. A chemical is considered acutely toxic if the LC_{50} (inhalation) = <200 ppm, the LD_{50} (dermal route) = < 200 mg/kg body weight, or the LD_{50} (ingestion) = < 50 mg/kg body weight.

Physical Hazards: A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive), or water reactive.

Reproductive Toxins: Health hazard that targets the human reproductive system; includes teratogens and mutagens.

Regulated Chemicals: Use of any chemical that has an OSHA substance specific standard should be reviewed to ensure potential exposures do not exceed action levels or permissible exposure limits (PELs). Employee exposures must be maintained at or below permissible exposure limits (PELs) for chemicals specified in 29 CFR 1910

Subpart Z.

Select Carcinogen (High Chronic Toxicity) A select carcinogen meets one of the following criteria:

- 1) It is regulated by OSHA as a carcinogen; or
- 2) It is classified as a “**Known**” or “**Anticipated**” carcinogen by the National Toxicology Program (NTP); or
- 3) It is classified as a “**1, Human**”, “**2A, Probable**”, or “**2B, Possible**” carcinogen by the International Agency for Research on Cancer (IARC)

Activities involving use of any of the above chemicals requires the development of a Standard Operating Procedure. All lab personnel should be trained and work conducted according to the established SOP.

O. Biosafety/Biohazards

Departmental safety practices relative to chemical hazards must be followed for all biohazard agents. Additional practices must be followed which are applicable to the level of biohazard in use. These are as follows.

Initial approval must be secured prior to grant application where any known or suspect biohazards are to be used.

All biohazard materials must be transported in a non-breakable, leak proof container properly labeled, and in a secondary container, also labeled.

Lab coats and eye protection must be worn at all times when biohazard materials are being used anywhere in the laboratory.

Personal protective equipment may not be worn outside of the lab area. This policy includes gloves and lab coats. Hands must be washed before leaving the lab.

All biohazard materials must be properly stored and out of use before maintenance is conducted. Maintenance personnel must be notified about any potentially hazardous materials being used in the laboratory before any maintenance is to be done in the area.

Double gloving is required for Bio Level #2 work or above.
Respiratory protection is required for Bio Level #2 work or above.

A current list of trained personnel must be posted near the entrance of the Lab.

An inventory of current biohazard materials must be posted (INSIDE) near the entrance to the lab.

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BioLevels:

- BSL Level #1 Any activity related to teaching and research involving well characterized agents that are not known to consistently cause disease in healthy bio-organisms such as otherwise healthy humans, and of minimum hazard to personnel and the environment.
- BSL Level #2 Work with agents of moderate potential hazard to animals or personnel and the environment. Lab personnel have specific training in handling pathogenic materials. Work is directed by competent management. Access is limited to work areas. Extreme precautions are taken with sharps and any activities creating aerosols and splashes. Work is performed in a confined containment mechanism or cabinet.
- BSL Level #3 Research, production, clinical, diagnostic, and teaching work with indigenous exotic agents, well known or unknown which may cause serious, potentially serious, and/or potentially lethal disease by exposure. Specific training is required. All work is done in biosafety cabinets. The laboratory has special protective design to confine release of any agents or contaminated materials.
- BSL Level #4 Agents or materials that pose known high risk of infectious and/or life threatening impact. Specific training and certification is required. Strict handling protocols are followed. Security is strictly in place. Control information and procedures are practiced and written and readily available. Restrictive structural facilities only, are allowed.

Information is available by contacting the Biosafety Officer in the EH&S Office. Specific practices outlined in HHS publication NO. (CDC) 93-8395 or later must be followed. This publication is the CDC/NIH, US Department of Health and Human Services Manual of BIOSAFETY IN MICROBIOLOGICAL AND BIOMEDICAL LABORATORIES. For more info visit <https://www.cdc.gov/labs/BMBL.html>.

P. Chemical Storage

One of the first steps to successful chemical inventory management is to minimize the number and quantity of chemicals stored in your laboratory. A chemical inventory must be maintained and updated regularly. Chemicals that are contaminated or past their shelf life should be disposed of through the EH&S Hazardous Waste program.

General Storage Recommendations:

1. Do not store chemicals alphabetically as a general group. This may result in incompatible chemicals stored next to each other. At a minimum, chemicals should be segregated and stored according to hazard class such as, flammable, oxidizer, corrosive (acids or bases), highly reactive, toxic/regulated, and low hazard. Incompatible chemicals that are not separated into different groups can react and explode or generate heat, fire, or toxic or flammable gases. The storage area must be adequate to separate the different groups from each other. Storage of chemicals should be restricted to specifically designated and clearly labeled areas within the laboratory. Provide a definite storage place for each

chemical and return the chemical to that location following use. Avoid storing chemicals on bench tops, except for those chemicals currently being used.

2. Label all chemical containers appropriately.
3. Store chemicals at appropriate temperature and humidity levels. Do not expose stored chemicals to heat or direct sunlight.
4. Chemicals or chemical waste should NEVER be stored on the floor.
5. Ensure that security procedures are adequate to prevent unauthorized access to stored chemicals.

Q. Spill Response Guidelines

PRE-INCIDENT

1. Inventory all chemicals in the laboratory or work area.
2. Obtain a MSDS for each chemical on the chemical inventory.
3. Become familiar with the chemical hazards of the materials you are working with.
4. Determine classes or categories of chemicals based on spill response needs, e.g. acids, caustics, flammable, and etc.
5. Purchase or determine where readily available appropriate clean up equipment can be obtained. This includes:
 - a. spill media
 - b. PPE
 - c. brooms, aspirators, etc.
 - d. containers
 - e. waste labels
6. Understand the use and limitations of all spill clean-up equipment.
7. Know how to contact additional help for high hazard releases or injury.
 - a. Emergency: 911
 - b. Campus Police: 911 or 797-1937
 - c. EH&S Office: 797-2892

POST-INCIDENT

NOTE: THE NUMBER ONE PRIORITY IN THE EVENT OF A CHEMICAL SPILL IS THE PROTECTION OF HUMAN HEALTH AND SAFETY.

1. Immediate actions to be taken by all involved employees.
 - a. Clear the affected area.

- b. Check for individual involvement.
 - c. Isolate the spill (if it is safe to do so).
 - d. Contact Emergency if any personal contamination or injury.
2. Determine the level of risk.
- a. What chemical is involved?
 - b. How much is involved?
 - c. Where is the location of the spill?

For LOW RISK situations, follow step 3.

For HIGH RISK situations, follow step 4.

3. Low Risk Spills

- a. Do not work alone, use a minimum of two workers.
- b. Inform supervisor, principal investigator, and/or emergency including Safety Office of the spill and the status of the response.
- c. Use proper protective equipment:
 - i. Proper gloves
 - ii. Body protection, tyvek
 - iii. Chemical resistant footwear
 - iv. Appropriate spill control media
 - v. Appropriate clean-up equipment
- d. Follow clean-up steps 5-9.

4. High Risk Spills

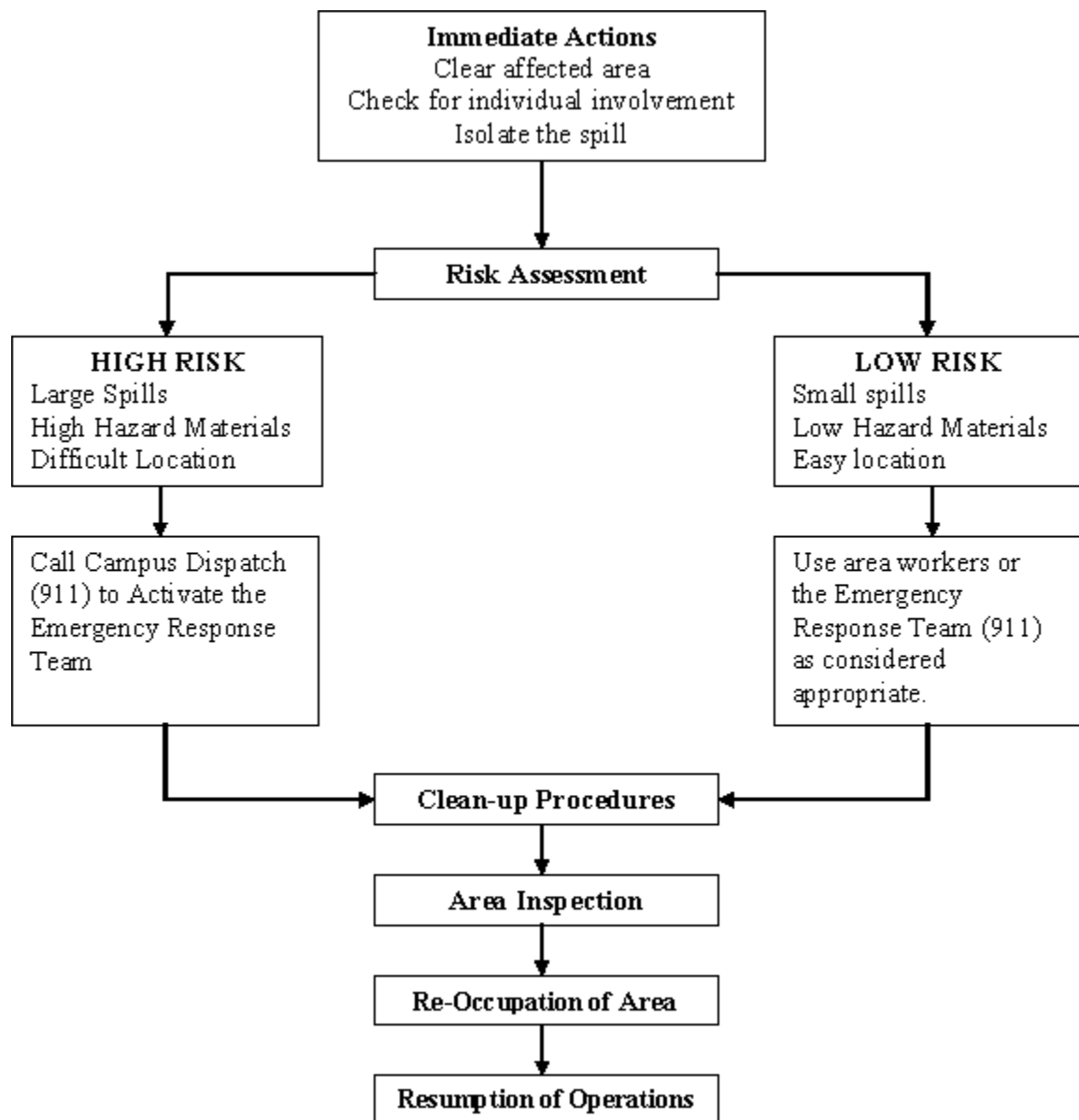
- a. Activate the Campus Emergency Response Team by dialing 911 on any University phone. This will connect you with campus dispatch where you can request support from:
 - i. Fire department
 - ii. Police
 - iii. Ambulance
- b. Remain available to provide information to the response team.

5. Ensure personal safety of response personnel.

6. Clean-up, containerize, and decontaminate the area.

- a. Control the source of the leak.
- b. Contain free liquids by diking and absorbing, if appropriate.
- c. Place all spill residues in an appropriate container. Maintain fire protection as necessary.
- d. Label waste for pick-up and disposal.
- e. Decontaminate and salvage equipment, as needed.

7. Analyze the affected area for proper decontamination and safety.
 - a. Use monitoring and detection equipment. Contact the Environmental Health and Safety Office for assistance.
 - b. Check area equipment for unresolved problems.
 - c. Check area floors, walkways for hazards.
8. Re-stock all response equipment.
 - a. Re-stock spill supplies.
 - b. Re-stock PPE and other equipment, as needed.
9. Release areas for resumption of activities.
10. Spill Response Procedures Matrix



Department Accident Report Forms, available in the Department Office or from the Department Business Manager, must be completed for all accidents.

UNIVERSITY ACCIDENT/INCIDENT REPORTING PROCEDURE*

***The Department complies with University Policy regarding accident reporting.**

The following procedures should be followed in the event of any significant accident or incidents involving bodily injury to persons or damage to property:

IMMEDIATELY:

1. Determine extent of injury or damage as quickly as possible.
2. Within the University area, contact the University Police (797-1939) if professional medical or other emergency help is needed. The police will contact the ambulance or other emergency help required. If outside the area, contact the local police and other emergency help as needed directly. (911)
3. Secure the scene of the accident as much as possible to prevent further damage.
4. Refrain from statements regarding probable liability or inferences of commitment for the University.
5. If there is personal injury or seemingly significant property damage (\$1,000 or more), contact Ting Xue (797-8338) who will contact Risk Management Services (797-1844).
6. Request the names of any witnesses that might be otherwise unknown or unavailable at later investigative follow-up.

SUBSEQUENTLY:

1. Have lab instructor or advisor complete the Accident/Incident Report form RMS 91-2 and submit a copy to the Department Business Manager.
2. If the injured person is an employee of the University, complete an Employee's Report of Injury or Occupational Disease form and submit it to the Department Business Manager.
3. Any inquiries about the accident or incident by attorneys, insurance or private investigators, or other persons not representing the University's interests (other than police investigators) should be referred to Risk Management Services for an official response.

4. For University policy on Insurance Liability visit:
<http://www.usu.edu/riskmgt/liability.html>.
5. **NOTE:** Personal equipment or property not owned by USU is not covered by USU insurance. This property must be insured by an outside source such as homeowners or renter's insurance. **USU does not replace personal property.**

SAFETY INSPECTIONS

1. The department safety committee will conduct random safety inspections quarterly. Every laboratory will be inspected twice per year. EH&S will conduct a department wide inspection annually. Both inspections will be conducted without prior notification.

Issues to be considered to prepare for a safety inspection:

Housekeeping
Housekeeping
Housekeeping
Up-to-date Chemical Hygiene Plan*
Current chemical inventory
Current MSDS files
First Aid kit
Safety Glasses*
Properly secured gas cylinders*
No Food or drink in lab
Frayed electrical cords
Chipped glassware
Unlabeled containers*
Containers without lids*
Excessive solvent storage*
Incompatible chemicals
Properly labeled waste*
Biohazards and radiological hazards are labeled
Less than 15 gallons of hazardous waste*
Overfull hoods
Blocked exits*
Proper clothing (no shorts or sandals)
Security (lock door, shut off lights)
Emergency numbers posted*
Labeled containers for broken glass
No outdated chemicals
Adequate safety supplies*
 ie: Disposable gloves
 First Aid Kits
 Aprons
 Pipetting aids
 Safety cans
 Acid carriers
 Respirators
 Fire extinguishers

Safety signs
Lab coats
Bench protectors
Hood trays

*Significant fines have been levied at Utah State University by federal and state agencies for failure to comply.

This is a sample list, and cannot be interpreted to be complete. Department personnel may be subject to reprimand for continued failure to observe these issues.

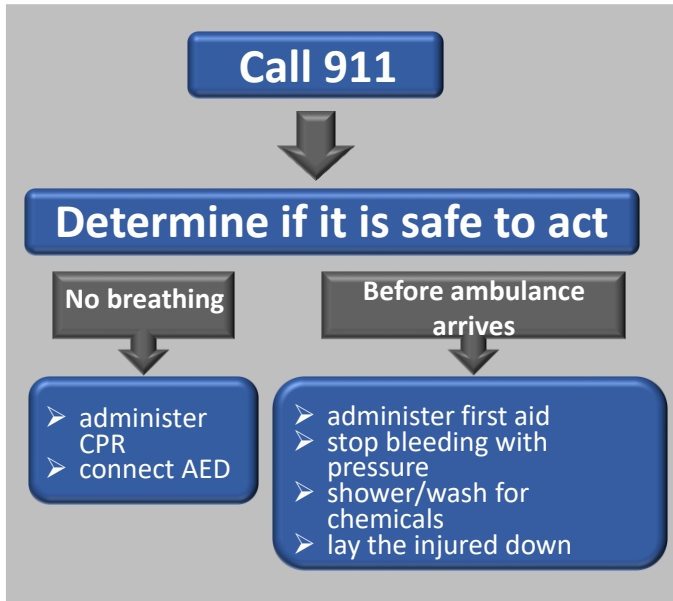
2. Inspection results will be distributed to the PI.
3. In addition to the department safety regulation, the PI will post and distribute specific safety regulations to the group members and a copy will be sent to the department office.
4. Each lab will have a folder containing ACS regulations/protocols, Department Safety & Security Policies Manual and Standard Operating Procedures (SOP) particular to that laboratory. This folder should be in the lab at all times and should be in a clearly designated location.

ACTIONS FROM SAFETY INCIDENT

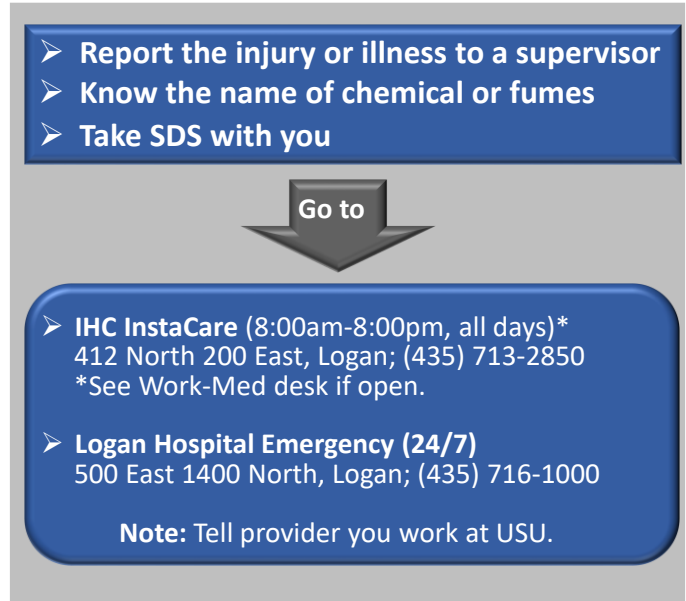
1. Person who is responsible for the incident will need to comply with the following:
 - A. Provide both oral and written reports to the supervisor and indicate the remedy actions that will be imposed. It will be under the discretion of the PI to decide if it is to be reported to the Safety Committee and EH&S. PI will only have discretion over reporting minor incidents.
 - B. For major incidents, provide both oral and written reports to the safety committee and indicate the actions that will be imposed. PI will report to the safety committee and EH&S.
 - C. A detailed report will be filed with the Department. The incident report form is available from the department office and on the following pages. The forms (incident and near-miss) are also available on the department's website at [Training & Reporting Forms | Chemistry & Biochemistry USU](#).
 - D. Faculty, students and staff should be aware that safety infractions may lead to disciplinary actions including having to attend safety seminars, etc...
2. Safety Seminars
 - A. Schedule safety refresher seminar yearly.

Injury Response Chart (Research Labs)

Serious injury



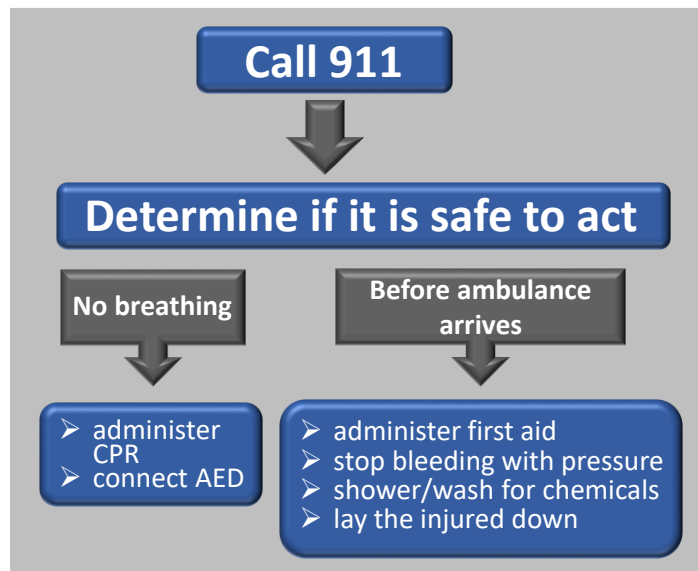
Minor injury



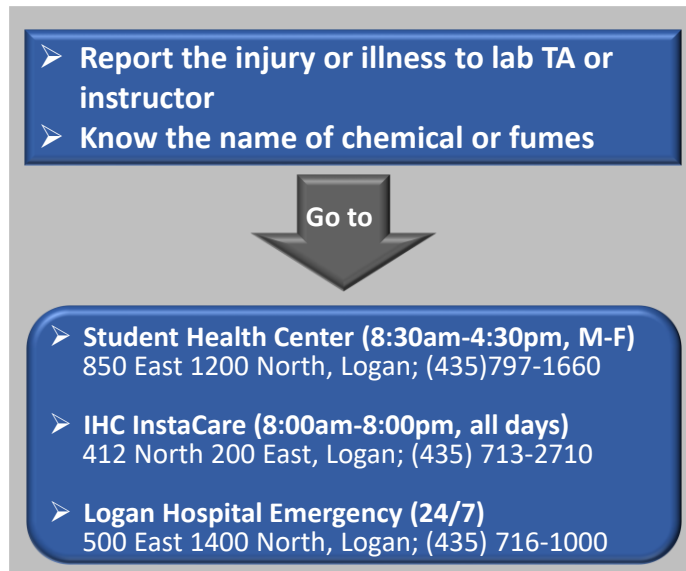
- Employees and volunteer researchers conducting research in research labs are covered by USU's workers compensation for injuries that occur at work.
- After treatment contact department to complete paperwork: (435) 797-0544; Maeser Lab 140
File [Incident Reporting Form](#) and USU [Workers' Compensation Employee Injury Report](#)

Injury Response Chart (Teaching Labs)

Serious injury



Minor injury



- Student will clarify if she/he would like the teaching lab assistant or instructor to make the necessary arrangements to be transported by ambulance to the Logan Regional Hospital emergency room or by university police escort to the university student health center.
- In the event of a serious accident, leaving the student incapable of requesting a specific course of action, the student will be transported by ambulance to the Logan Regional Hospital emergency room.
- Student is financially responsible for all medical expenses associated with the accident.
- After treatment contact department to complete paperwork: (435) 797-0544; Maeser Lab 140. File [Incident Reporting Form](#)

LABORATORY SAFETY AGREEMENT

SAFETY RULES

1. Know the location and use of: fire extinguisher, fire blanket, fire exits, safety shower, eye wash fountain, spill kits, and first aid kits.
2. The USU Police Emergency phone number is 911.
3. Wear safety goggles at all times. Contact lenses are not advised.
4. Wear sensible clothing, no shorts, short skirts, capris, open-toed shoes, clogs, or sandals allowed. Long hair must be tied back. Wear protective clothing while handling dangerous substances.
5. Do not smoke, eat, or drink in the labs.
6. Prevent cuts and burns. Discard broken or chipped glassware. Be aware and keep your neighbors aware of hot objects. Heat materials only in beakers, flasks, and porcelain ware; never heat graduated cylinders, burets, pipets, or watch glasses.
7. Report immediately any accident, no matter how minor, to the lab assistant or instructor.

8. Be aware and cautious of other's activities as well as your own.
9. Avoid all flames if flammable solvents are in use nearby. Most solvents other than water are flammable.
10. PIPETING BY MOUTH IS NOT ALLOWED Use a pipetting device to pipet all liquids.
11. NEVER CONDUCT UNAUTHORIZED EXPERIMENTS.
12. Never work alone in the lab.
13. Follow all safety precautions given by instructor or lab assistants in prelab or during lab. If you miss prelab, check with an instructor before you start lab.
14. Keep all toxic and/or volatile materials in the fume hood.
15. Label all containers.
16. Clean up after yourself.
17. The individual student is responsible for any medical expenses or damage to personal clothing during the lab.

GLOSSARY

ABSORPTION	To take in and make part of an existing whole, for example, a sponge absorbs water.
ACS	American Chemical Society
ACID	Any chemical which undergoes dissociation in water with the formation of hydrogen ions. Acids have a sour taste and may cause severe skin burns. They turn litmus paper red and have pH values of 0 to 6.
ACUTE EFFECT	An adverse effect on a human or animal body, that takes place soon after exposure. Examples include dizziness, nausea, skin rashes, inflammation, tearing of eyes, unconsciousness, and even death.
AIR-PURIFYING RESPIRATOR	Type of personal protective equipment that uses a special filter or chemical cartridge to remove specific airborne hazards from contaminated air before the wearer inhales it.
ANESTHETIC	A chemical that causes a total or partial loss of sensation. Overexposure to anesthetics can cause impaired judgment, dizziness, drowsiness, headache, unconsciousness, and even death. Examples include alcohol, paint remover, and degreasers.
APPROPRIATE	Suitable or fitting for a particular purpose.
ASPHYXIAN	A vapor or gas which can cause unconsciousness or death by suffocation (lack of oxygen). Most simple asphyxiants are harmful to the body only when they become so concentrated that they reduce oxygen in the air, normally about 21%, to dangerous levels (16%) or lower). Asphyxiation is one of the principal potential hazards of working in confined spaces. Some chemicals like carbon monoxide function as chemical asphyxiants by reducing the blood's ability to carry oxygen.
BOILING POINT	BP - The temperature at which a liquid changes to a vapor state, at a given pressure; usually expressed in degrees Fahrenheit at sea level pressure (760 mmHg, or one atmosphere). For mixtures, the initial boiling point or the boiling range may be given. Flammable materials with low boiling points generally present special fire hazards.
BIOHAZARD	Bio is a prefix meaning life or related to life or living. Of Greek origin. Hazard is synonymous with risk, danger, chance of harm, chance of trouble. One then must assume that BIOHAZARD is a material of known or unknown chemical makeup

that may, or has been suspect, or has been proven, to constitute some level of threat to life or living (biological) things. We normally think of Biohazard in terms of threat to mankind or mammals. Another way of looking at it is that these so called “Biohazards” constitute a threat to human well-being as determined in biological research experimentation or experience. There is then an implication that exposure by any of many routes such as inhalation, or injection or indigestion, and certainly dependent on qualitative and quantitative values, translates to danger. There are four levels or rated Biohazards. Each level is a set of criteria established by research and experimentation considering many conditions, that may be present or are necessarily present that contribute to the “level” of danger. Level #1 being the lowest level deemed hazardous by the same experimentation to be worthy of mention. Level #4 being of the highest established danger using the same standards. Most human infections and viruses are level #1. Some human related diseases such as Ebola and anthrax are usually level 3 or 4 depending on (for instance) their friability (potential to become airborne). The NIH has developed a specific list of the commonly known “Biohazards” which are available on campus. There is a University Policy that any research being conducted under auspices of Utah State University which uses any of the materials on the list must be approved by the Institutional Biohazard Committee. That approval comes before the grant application is approved by the Sponsored Programs Office. Regular inspections occur thereafter.

CARCINOGEN

A substance or agent capable of causing or producing cancer in mammals, including humans. A chemical is considered a carcinogen if:

- A) It has been evaluated by the International Agency for Research Cancer (IARC) and found to be a carcinogen or a potential carcinogen; or
- B) It is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP)(latest edition); or
- C) It is regulated by OSHA as a carcinogen.

A list of Select Carcinogens is available from the Safety Office.

CAB

Chemistry and Biochemistry

CAS

Chemical Abstracts Service. A Columbus, Ohio organization which indexes information published in Chemical Abstracts by the American Chemical Society and provides index guides by which information about particular substances may be located in the abstracts when needed. CAS numbers identify specific chemicals.

CAUSTIC	(ALKALI) Any chemical substance which forms soluble soaps with fatty acids. Alkalies are also referred to as bases. They may cause severe burns to the skin. Alkalies turn litmus paper blue and have pH values from 8 to 14.
CHEMICAL HYGIENE PLAN	Written documentation of a comprehensive chemical hygiene program in the laboratory, as required by the OSHA lab Standard (29 CFR 1910.1450). Model Chemical Hygiene Plans are available from the USU Safety Office.
CHEMICAL NAME	The scientific designation of a chemical in accordance with the nomenclature system as developed by the International Union of pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Services (CAS) rules of nomenclature.
CHRONIC EFFECT	An adverse effect on a human or animal body, that can take months or years to develop after exposure. Examples include cancer and irreversible damage to certain organs.
CHRONIC EXPOSURE	Long-term contact with a substance.
COMBUSTIBLE	Able to catch on fire and burn.
COMBUSTIBLE LIQUID	Any liquid having a flashpoint at or above 100 degrees Fahrenheit (37.8 degrees C), but below 200 degrees Fahrenheit (93.3 degrees C) or higher, the total volume of which make up ninety-nine (99%) or more of the total volume of the mixture.
COMMON NAME	Any designation or identification such as code name, code number, trade name, brand name, or generic name used to identify a chemical other than by its chemical name.
COMPRESSED GAS	(1) gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 degrees Fahrenheit (21.2 degrees C); or (2) a gas or mixture of gases having in a container, an absolute pressure exceeding 104 psi at 130 degrees Fahrenheit (54.5 degrees C); or (3) a liquid having a vapor pressure exceeding 40 psi at 100 degrees Fahrenheit (37.8 degrees C) as determined by ASTM D-323-72.
COMPLY	Act in accordance
CONCENTRATION	The relative amount of a substance when combined or mixed with other

substances. Examples: 2ppm hydrogen sulfide in air, or a 50 per cent caustic solution.

CONTINUED

Regular or frequent recurrence

CORROSIVE

A chemical that causes visible destruction or irreversible alterations in living tissue by chemical action at the site of contact. For example, a chemical is considered to be corrosive when tested on the intact skin of albino rabbits by the method described by the DOT in Appendix to 49CFR part 173, it destroys or irreversibly changes the tissue following an exposure period of 4 hours. This term shall not refer to action on inanimate objects. Two common examples are caustic soda and sulfuric acid.

CRYOGENIC

Health hazard that freezes body tissues on contact.

DELAY

To put off action-unnecessarily

DIKE

A barrier constructed to control or confine hazardous substances and prevent them from entering sewers, ditches, streams, or other flowing waters.

DOT

United States Department of Transportation/ regulates transportation of chemicals and other substances.

DOT HAZARD CLASS

DOT requires that hazardous materials offered for shipment be labeled with the proper DOT hazard class. These classes include corrosive, flammable liquid, organic peroxide, ORM-E, poison b, etc. The DOT hazard class may not adequately describe all the hazard properties of the material.

DUST

Airborne particles formed from solids.

EPA

United States Environmental Protection Agency; Primary agency responsible for the enforcement of federal laws protecting the environment.

EXPLOSIVE

A chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subject to sudden shock, pressure, or high temperature.

EXPOSURE

Being actually subjected to a hazardous chemical in the course of employment through any route of entry (inhalation, ingestion, skin contact, or absorption, etc.) The Federal Hazard Communication Standard also includes both accidental and possible exposures in the definition of exposure.

EXPOSURE LIMIT	The maximum amount of chemical in a given volume of air to which workers may be exposed, as averaged over a specified period of time. Most people can be exposed to this airborne limit for an entire working lifetime without developing health effects.
FAILURE	Non performance of something expected
FIRE HAZARD	Chemical material that ignites and burns easily, or that causes or supports fire in other materials; includes pyrophorics, combustibles, and oxidizers.
FLAMMABILITY LIMITS	The range of gas or vapor concentration in the air that may ignite or explode if an ignition source is present.
FLAMMABLE SOLID	A solid, other than a blasting agent or explosive, as defined in 29 CFR 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard.
FLAMMABLE LIQUID	(1) a gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen percent (13%) by volume or less; or (2) a gas that at ambient temperature and pressure, forms a range of flammable mixtures with air, wider than twelve percent (12%) by volume, regardless of the lower limit.
FLASH POINT	The temperature at which a liquid will give off enough flammable vapor to ignite if an ignition source is present. There are several flash point test methods and flash points may vary for the same material depending on the method used, so the test method is indicated when the flash point is given (150 PMCC, 200 TCC, etc.).
FUME	Tiny airborne particles that can form when a solid is melted.
FUME HOOD	Enclosure with appropriate air flow, to contain an action or reaction, i.e., 5 to 6 foot work space.
GAS	Physical form of a chemical that is easily compressed and expands to fill its container; has a boiling point below room temperature, hence is a gas at room temperature.
HAZARD COMMUNICATION STANDARD	Written document that describes how an employer or facility complies with all requirements of the Federal Hazard Communication Standard (29 CFR 1910.1200).

HAZARDOUS MATERIALS

Any chemical which is a physical hazard or a health hazard, or when combined with other chemicals may present a hazard.

HAZARDOUS CHEMICAL INVENTORY

List of all hazardous chemicals known to be present in a given workplace; identity/name of chemicals used on this list must match the identity/name used on the warning labels and MSDS's.

HAZARDOUS INGREDIENTS

The hazardous substances that make up a mixture.

HEALTH HAZARD

A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes.

HOUSEKEEPING

An administrative control that involves containing and removing chemical hazards - e.g., vacuuming, proper storage and handling, prompt removal.

INDIGENOUS

Native, natural, inherent, or originating in.

IGNITABLE

Capable of being set afire.

IMMEDIATE EFFECT

Health effect that appears right away - either during the exposure or shortly afterwards.

INCIDENT

An unexpected occurrence or event of consequence.

INCOMPATIBLE

Materials which could cause dangerous reactions from direct contact with one another are described as incompatible.

INDUSTRIAL HYGIENIST

Expert in the recognition, evaluation, and control of safety and health hazards.

INFLAMMABLE

Same as flammable.

INGESTION

The way that a chemical enters the body if you swallow it; an exposure route.

INHALATION

The way that chemical enters the body when you breathe it through your nose or mouth; an exposure route.

IRRITANT

A substance which, by contact in sufficient concentration for a sufficient period of

time, will cause an inflammatory response or reaction of the eye, skin, or respiratory system. Symptoms include (reddening, itching, tearing, irritation). The contact may be a single exposure or multiple exposures. Some primary irritants: chromic acid, nitric acid, sodium hydroxide, calcium chloride, amines, metallic salts, chlorinated hydrocarbons, ketones, alcohols.

LABORATORY STANDARD

Regulation passed by OSHA which governs chemical hygiene in laboratories. This standard is formally referred to as "Exposure to Hazardous Chemicals in Laboratories", 29 CFR 1920.1450.

MANDATORY

Obligatory, ordered.

MEDICAL MONITORING

Type of administrative control that involves physical examinations and/or lab tests to establish an individual's baseline health status and check the effectiveness of other controls used to protect an individual from health hazards.

MELTING POINT

The temperature at which a solid substance melts becomes liquid. Ice melts at zero degrees C.

MINOR

Small, secondary, unimportant.

MSDS

Material Safety Data Sheet. Contains specific health and safety information required by the Federal Hazard Communication Standard for any hazardous substance. There is no standard format for a MSDS. They will vary in length, format and appearance, depending on the manufacturer or supplier, who must provide a MSDS for each hazardous chemical they produce.

MUTAGEN

A material alters a cell's genetic information and may lead to undesirable inherited conditions.

NIOSH

National Institute for Occupational Safety and Health of the Public Health service, U.S. Department of Health and Human Services (DHHS); Federal agency which - among other activities - tests and certifies respiratory protective devices and air sampling detector tubes, recommends occupational exposure limits for various substances and assists OSHA and MSHA in occupational safety and health investigations and research.

NONFLAMMABLE

Not easily ignited, or if ignited, not burning rapidly.

NRC

This acronym is used to refer to the following:
Nuclear Regulatory Commission
National Response Center
National Research Council

OLFACTORY	Relating to the sense of smell. The olfactory organ in the nasal cavity is the sensing element that detects odors and transmits information to the brain through the olfactory nerves.
OSHA	Occupational Safety and Health Administration of the U.S. Department of Labor. Federal agency with safety and health regulatory and enforcement authorities for most U.S. industry and business.
OSHA LAB STANDARDS	Regulation governing chemical hygiene in chemical laboratories. Defines procedures and exposure limits, etc.
OXIDIZER	A chemical other than a blasting agent or explosive as defined in 29 CFR 1910.109(a) that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases. Chlorate (ClO ₃), permanganate (MnO ₄), and nitrate (NO ₃) compounds are examples of oxidizers.
PERSONAL PROTECTIVE EQUIPMENT	Equipment that protects the individual who wears it by placing a barrier between that individual and a hazard; includes protective eyewear, face shields and masks, gloves, boots, hats, clothing, and respirators.
pH	The symbol relating the hydrogen ion (h) concentration to that of a given standard solution. A pH of 7 is neutral. Numbers increasing from 7 to 14 indicate greater alkalinity. Numbers decreasing from 7 to 0 indicate greater acidity.
PHYSICAL	A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophori, unstable (reactive), or water-reactive.
POLICY	A definite course of action
PPE	See Personal Protective Equipment.
PPM	Parts per million. Generally used to express small concentrations of one substance in a mixture (comparable to mg/L).
RACC	Research Agents Containment Center-USU's hazardous chemical and radioactive waste collection, segregation and packaging facility, located in the motorpool compound.
RCRA	Resource Conservation and Recovery Act (1976, 1980, 1984); regulates management and disposal of hazardous materials and waste currently being

generated, treated, stored, or distributed.

REACTIVITY	A description of the tendency of a substance to undergo chemical reaction with the release of energy. Undesirable effects - such as pressure buildup, temperature increase, formation of noxious, toxic, or corrosive by-products may occur because of the reactivity of a substance to heating, burning, direct contact with other materials or other conditions in use or in storage.
REPRIMAND	A severe, normally formal rebuke or reprisal.
ROUTES OF ENTRY	The means by which material may gain access to the body, for example, inhalation, ingestion, and skin absorption.
SAFETY AGREEMENT	A document signed by the laboratory student indicating that the individual has been instructed and agrees to follow safety practices as outlined.
SAFETY TRAINING	Specific training course offered by the Utah State University Environmental Health and Safety Office staff.
SCBA	Self-Contained Breathing Apparatus. A respiratory protection device that consists of a supply or a means of respirable air, oxygen, or oxygen generating material, carried by the wearer.
SKIN	A notation, sometimes used with PEL or TLV exposure data; indicates that the stated substance may be absorbed by the skin, mucous membranes, and eyes - either airborne or by direct contact - and that this additional exposure must be considered part of the total exposure to avoid exceeding the PEL or TLV for that substance.
SKIN ABSORPTION	Ability of some hazardous chemicals to pass directly through the skin and enter the blood stream.
SMOKE	An airborne mixture of fire gases, dust, and fumes.
SOLUBILITY	The amount of a substance that can be dissolved in a solvent, usually water.
SOLVENT	Usually, a liquid in which other substances are dissolved. The most common solvent is water.
SPILL OR LEAK PROCEDURES	The methods, equipment, and precautions that should be used to control or clean up a leak or spill.
SPLASH PROOF GOGGLES	Eye protection made of a non-corrosive material that fits snugly against the face, and has indirect ventilation ports.

STANDARD TAPER (T)	Glassware connecting joint, ground and tapered to form gas and liquid tight seal. Generally two part, inner and outer.
STATUS	The position of an individual in reaction to others
STOCKROOM PERSONNEL	Persons, normally undergraduate students, hired on a part-time basis, to assist with dispensing and check-in of materials necessary for the operation of the teaching laboratory.
SUBSTITUTION	Engineering control that involves replacing a chemical, process, or piece of equipment with a less hazardous one.
SYSTEMIC TOXICITY	When a toxic effect occurs at a body part some distance from the point of contact, the substance is said to have a systemic effect. Systemic toxicity is also known as remote effect.
TERATOGEN	A substance or agent to which exposure of a pregnant female can result in malformations in the fetus. An example is thalidomide.
THERMAL	Involving heat.
TOXIC SUBSTANCE	Any substance which can cause acute or chronic injury to the human body, or which is suspected of being able to cause diseases or injury under some conditions.
TOXICITY	Description of the degree of health hazard associated with exposure to a chemical.
UN NUMBER	A registry number assigned to dangerous commonly carried goods by the United Nations Committee of Experts on the Transport of Dangerous Goods. This UN number is required in shipping documentation and on packaging as part of the DOT regulations for shipping hazardous materials.
UNDERGRADUATE TEACHING ASSISTANT	An undergraduate TA is generally a student majoring in chemistry and biochemistry with an exceptional academic record demonstrating the ability to assist the faculty in resource rooms, recitations, teaching labs, and grading papers.
UNSTABLE	A chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shock, pressure, or temperature. These chemicals are also referred to as reactive.

USU EH&S	Utah State University Environmental Health and Safety.
VAPOR DENSITY	The density of the gas given off by a substance. It is usually compared with air, which has a vapor density set at 1. If the vapor is more dense than air (greater than 1), it will sink to the ground; if it is less dense than air (less than 1), it will rise.
VAPOR PRESSURE	The pressure exerted by a saturated vapor above its own liquid in a closed container. Vapor pressures reported on MSDS's are in mm of mercury at 68 degrees F (20 degrees C), unless stated otherwise. An increase in temperature will increase the vapor pressure of a material. The lower the boiling point of a substance, the higher its vapor pressure.
VENTILATION	Circulating fresh air to replace toxic air.
VISCOSITY	A relative measure of how slowly a substance pours or flows. Very viscous substances, like molasses, pour very slowly. Slightly viscous substances, like water, pour and splash easily.
WASTE DISPOSAL METHODS	Proper disposal methods for contaminated material, recovered liquids or solids, and their containers.
WATER REACTIVE	A chemical that reacts with water to release a gas that is either flammable or presents a health hazard. Also denoted dangerous when wet.