

Office of Environmental Health and Safety
Department of Compliance and Risk Management

Division of Business and Finance

UNIVERSITY CHEMICAL HYGIENE PLAN

March 2013

1. Purpose
 1. This KSU University Chemical Hygiene Plan (UCHP) establishes the minimum requirements for compliance with OSHA's "Standard for Exposure to Hazardous Chemicals in Laboratories", 29 CFR 1910.1450 to minimize exposure of laboratory personnel to health and physical hazards presented by hazardous chemicals used in laboratories at Kent State University.
2. Scope
 1. This policy applies to all academic and research laboratories at Kent State University and its branches.
3. Definitions
 1. Laboratory Employee
 1. For the purposes of this policy, a Laboratory Employee is any person (faculty, researcher, assistant, staff, student) working or conducting research in a laboratory listed in the above Scope.
4. Responsibilities
 1. KSU Environmental Health and Safety Committee
 1. Provide oversight and assistance for managing the university's laboratory chemical safety program.
 2. Department Chairperson.
 1. Appoint a Chemical Hygiene Officer (DCHO).
 2. Develop a Departmental Chemical Hygiene Plan (DCHP) to implement and ensure compliance with The KSU Chemical Hygiene Plan
 3. Principal investigators and laboratory supervisors.
 1. Ensure laboratory functions in accordance with DCHP.
 2. Ensure all students and employees working in their labs comply with DCHP and UCHP.
 3. Prepare Safe Operating Procedures (SOP) on all equipment, procedures and hazards specific to the laboratory in which they will be working
 4. Ensure all people working in the laboratory have received training on equipment, procedures and hazards specific to the laboratory in which they will be working.
 5. Enforce rules and requirements of the UCHP, DCHP and SOPs specific to the laboratory.
 4. Employees. PI, GAs, Faculty, Students, Visiting Scientists, etc
 1. Follow all provisions, rules and requirements of the UCHP, the DCHP, departmental SOPs and laboratory SOPs.
 5. The Departmental Chemical Hygiene Officer is responsible for coordinating the implementation of the KSU Chemical Hygiene Plan and for providing technical assistance to laboratory workers.
 6. Facilities Planning and Operation, Environmental Health and Safety Office, Manager of Research and Laboratory Safety.
 1. Manage the KSU laboratory safety, radiation safety, laser safety and biosafety programs.
 2. Determine Industrial Hygiene monitoring requirements.
 3. Coordinate with Occupational Physician the medical examination requirements of exposed laboratory workers.
 4. Monitor and inspect laboratories to determine compliance with federal, state and local health and safety regulations.
 5. Assist with the development of safety training and education programs for CHP participants.
 6. Annually review the University Chemical Hygiene Plan implementation.
 7. Develop and publish Safety Bulletins as guidelines for compliance with regulations and generally accepted laboratory safety procedures.
5. Departmental Chemical Hygiene Plans
 1. Each Department covered under the scope of this policy will develop a Departmental Chemical Hygiene Plan and make it available for all person a covered by the Plan.

6. Information to be Given to All Affected Employees

1. Each department shall ensure that all Laboratory Employees in the department who are involved in the laboratory use of hazardous chemicals receive the information and training required by this policy.
 1. Laboratory personnel who have had training under the Chemical Hygiene Plan are not required to have Hazard Communication training.
 2. The following information shall be provided to laboratory personnel at the time of initial assignment to the laboratory.
 3. "Occupational Exposure to Hazardous Chemicals in Laboratories" 29 CFR 1910.1450
 4. Location of the University and/or Departmental Chemical Hygiene Plan.
 5. The permissible exposure limits and recommended exposure limits for chemicals are found on the Safety Data Sheet for that chemical. Permissible Exposure Levels are also found in OSHA PEL, 29 CFR 1910.1000 available at Manager, Laboratory Safety Office. ACGIH recommended exposure levels are available at the Manager, Laboratory Safety Office.
 6. Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory are found in the "Health Effects" section of the Safety Data Sheet for the chemical.
 7. Additional safety reference material available on campus includes:
 1. Safety Data Sheets (SDS) received from the chemical supplier. These are available on-line; see your supervisor or Departmental Chemical Hygiene Officer for instructions on how to access the system. SDS of chemicals unique to a specific laboratory are maintained in that laboratory and in the Department Chemical Hygiene Officer's office.
 2. The following are available from the Manager, Laboratory Safety.
 1. Prudent Practices for Handling Hazardous Chemicals in Laboratories. National Research Council. Washington, D.C. National Academy Press, 1981.
 2. CRC Handbook of Laboratory Safety 4th edition. A.K. Furr, ed. Boca Raton, FL: CRC Press, 1995.
 3. Improving Safety in the Chemical Laboratory: A Practical Guide 2nd ed. J. A. Young, ed. New York: Wiley: 1991.
 4. Safe Storage of Laboratory Chemicals: A. Pipitone, ed. New York: Wiley, 1984.
 5. Dangerous Properties of Industrial Materials 7th ed. N.I. Sax and R.J. Lewis, Sr. eds. New York: Van Nostrand Reinhold, 1987.
 6. Laboratory Health and Safety Handbook. R.S. Stricoff. New York: Wiley: 1990.
 7. Destruction of Hazardous Chemicals in the Laboratory. G. Lunn and E.B. Sansone. New York, Wiley, 1991
 8. Hazardous Laboratory Chemicals Disposal Guide. M.A. Armour, Ph.D. Boca Raton, FL: CRC Press, 1991
 9. Information on laboratory safety will be furnished to all affected employees throughout the year by periodic laboratory safety meetings, mailings and postings.

7. Initial Training for All Affected Employees

1. General Laboratory Safety Training
 1. General laboratory safety training will be given to all Laboratory Employees by Office of Risk Management, Manager Laboratory Safety.
 2. Sessions for new Laboratory Employees will be at the beginning of each semester.
 3. Laboratory Employees starting work in the middle of the school year will be trained on an as-needed basis.
 4. Initial laboratory safety training will consist of:
 1. The contents of the OSHA standard, which governs the use of potentially hazardous chemicals in laboratories [29 CFR 1910.1450]. A full copy of the standard will be made available during initial training.
 2. The availability and details of UCHP and DCHP.
 3. A general understanding of the signs and symptoms associated with overexposure to hazardous chemicals used in the laboratory as found on the MSDFS,
 4. The location and availability of reference material concerning the hazards, safe handling, storage, and disposal of hazardous chemicals.
 5. General training on how laboratory employees can protect themselves from the potential

hazards of the chemicals they work with including work practices, personal protective equipment, and emergency procedures.

2. Laboratory Specific Training
 1. Laboratory specific training will be provided by the Principle Investigator and will consist of:
 1. Methods and observations that may be used to detect the presence or release of a unique hazardous chemical they may be using in that lab.
 2. The physical and health hazards of unique hazardous chemicals in the work area.
 3. Safe Operation Procedures for
 4. The measures that can be taken to protect self from these hazards, including specific procedures the Department has implemented to protect persons from exposure to hazardous chemicals, such as engineering controls, appropriate safe work/lab practices, emergency procedures, and personal protective equipment to be used.
 2. Location of Safety Data Sheet for the chemicals used in the laboratory.
 3. Department training will be given by Principle Investigator or Supervisor of the affected employee.
 4. Appendix F contains recommended documentation to use for recording training.

8. General Laboratory Safety Rules

1. Know the location of emergency showers, eyewash fountains, first aid kits, emergency exits, spill kits, and fire alarm pull stations. Know the location of the nearest telephone. In an emergency, call 911 from a campus phone.
2. Know the location of Safety Data Sheets.
3. No smoking, food, beverage, smokeless tobacco, or application of cosmetics in the laboratory, except in designated areas in which no chemicals are used or stored.
4. Dress appropriately. Long hair, neckties, or loose clothing should be tied back or otherwise secured. No sandals, open-toed or perforated shoes in the laboratory. Shorts or skirts are not to be worn when working with chemicals in a laboratory.
5. Appropriate eye protection will be worn at all times in laboratories.
6. Wear the appropriate personal protective equipment for the chemicals you are working with.
7. Comply with warning signs and labels.
8. Laboratories with special or unusual hazards should be posted with appropriate warning signs including: laser warning signs, radioactivity warning signs, biological hazard warning signs, etc.
9. Do not directly smell or taste any chemical. Do not pipette or siphon by mouth.
10. Containers should be closed when not in use.
11. Always add acid to water. (Alphabetically, acid comes before water).
12. Perform only those experiments or procedures that you are authorized to do by the person in charge of the lab.
13. Report all injuries, fires, and accidents to your supervisor or instructor and Risk Management 2-4996. All fires shall be immediately reported by dialing 911.
14. If you have a question about a procedure or the hazards of a chemical, ask your supervisor or instructor before performing the procedure.
15. Never work alone in a laboratory or chemical storage area unless appropriate means are available to summon assistance.
16. Access to emergency equipment, safety showers, eye wash stations, and exits must never be blocked.
17. All chemicals must be labeled with at least the identity of the contents of the container and the potential hazards associated with the chemical.
18. Waste materials must be properly labeled and stored in an appropriate manner.
19. Wash promptly with mild soap and water after any chemical contacts the skin.
20. Avoid inhalation of chemicals. Do not "sniff" chemicals to determine their identity or for other reasons.

9. Safe Laboratory Procedures

1. Each laboratory must develop safe operating procedures for hazardous operation such as pot stills, Rotovaps, PCR, etc, and substances with special hazards such as HF, peroxide formers, phenol, etc.
2. Safety Bulletin of SOPS and guidelines can be found on Risk Management Website
3. Appendix B lists Particularly Hazardous Substances.

10. Labeling

1. All containers of hazardous substances shall be appropriately labeled. The manufacturer's label shall not be removed from a container as long as the material or residues of the material remain in the container.
2. All original containers will be labeled with a barcode generated by the inventory system.
3. All containers must be dated when opened.

4. All containers stored in common use storage areas, refrigerators or cabinets will be labeled with person responsible for the material.
5. All secondary containers into which hazardous substances are transferred or prepared shall also contain labels that provide the following information.
 1. Identity of the hazardous substance. (Chemical name and supplier code number, or, if a synthesized material, a lab book number or reference number.)
 2. Date of preparation or transfer.
6. All hazardous materials collection containers should be labeled with the following:
 1. Type waste in container (e.g. Non-Halogenated, Halogenated, Acid, Base, etc.)
 2. Identity of chemicals added on container or listed on a separate sheet.
 3. Statement or statements that call attention to the particular hazardous properties of the material (e.g., flammable, corrosive, etc.)
 4. Labeling is not required for portable containers into which hazardous chemicals are transferred from labeled containers that are intended only for the immediate use of the individual who performs the transfer.
7. Where hazardous materials are transported by piping systems, above ground pipes shall be labeled by:
 1. Preferably by stenciling the name or abbreviation of the chemical and an arrow, indicating direction of flow of the material, or,
 2. Permanently marking or attaching tags of metal or other suitable material naming the material transported on or near valves.

11. Safety Data Sheets

1. SDS sheet must be obtained before working with a chemical and kept in laboratory during use.
2. SDS for chemicals unique to a specific laboratory will be kept in that laboratory.
3. SDS for unique chemicals must accompany that chemical if it is transferred to another lab in or outside the University.
4. If a material synthesized at KSU is transferred out of the University and it is not an article, a SDS must accompany that material. If an SDS does not exist, one must be prepared prior to the transfer. The principal investigator is responsible for ensuring that an SDS is generated and goes with the shipment. SDS generation should be coordinated with the Manager, Laboratory Safety.

12. Chemical Storage

1. Shelves used for chemical storage shall be of substantial construction and adequately braced. Shelves shall be provided with a lip or guard when used for the storage of individual containers, except when containers are stored in a hazardous material storage cabinet.
2. Chemicals must not be stored on shelves more than five feet above the floor.
3. Containers are to be arranged in such a manner as to allow all labels to be seen. When this is impossible, the shelf may be labeled with a list of contents.
4. Chemicals should not be stored on the floor and should not protrude into traffic areas.
5. Materials that are sensitive to light shall be stored in containers designed to protect the contents from light.
6. Food shall not be stored or consumed in areas where toxic chemicals are used or stored.
7. Hallways and stairways should not be used as storage areas.

13. Flammable Liquid Storage

1. Flammable liquids have flash points below 100 F. Combustible liquids have flash point between 100 F and 140 F.
2. All secondary containers of flammables greater than 4 liter shall be of the safety can type meeting NFPA standards.
3. Storage of more than 25 gallons of flammable liquids shall be in flammable liquid storage cabinets meeting OSHA or NFPA 30 Flammable Liquid Codes.
4. Flammables shall not be stored in the same cabinet as oxidizers or water-reactive materials.
5. No more than a one a day supply of flammable liquids may be kept on a bench top, typically less than a liter.

14. Corrosives Storage

1. Corrosives shall not be stored under sinks or in other areas where plumbing, equipment, or shelving could be damaged by corrosive effects.
2. Strong acids ($\text{pH} < 2$) and strong bases ($\text{pH} > 12$) shall be stored separately. Where amounts are small, separation can be achieved by either all the acids or all the bases being stored in separate containers such as bottle carriers, spill pans, or other secondary containment.

3. Corrosives will be stored cabinet designed for their storage.

15. Approvals

1. The Department Chair will institute a review mechanism and designate an individual or committee to give approval for the following items:
 1. Prior approval will be obtained from the appropriate designee for the following:
 2. For operations that are to be left unattended.
 3. For new operations involving pressurized or very exothermic reactions.
 4. Working after normal office hours.
 2. Approval to continue or proceed will be obtained from the appropriate designee:
 1. When there is a failure of equipment, especially safety control measures such as fume hoods, clamp apparatus or temperature control.
 2. When the procedure produces unexpected potentially hazardous results.

16. High Hazardous Substance Precautions

1. This section will apply to laboratory use of chemicals defined as "particularly hazardous substances" in Appendix B of this plan.
2. Departments will establish designated areas for the use of particularly hazardous substances. A designated area may be the entire laboratory, an area of the laboratory, or a fume hood or glove box. High hazard substances shall be limited to designated areas.
3. The location of the designated area shall be posted and persons working within the designated area shall be informed of the hazardous substances used there. A sample posting for designated areas is given in Appendix C.
4. When planning research project and before using a chemical for the first time, always consult the manufacturer's Safety Data Sheet (SDS) to determine if the material meets the definition of a high hazard chemical. If the material meets the definition, attempt to find a less hazardous substitute material. If a substitute material cannot be found, follow the manufacturer's recommendations.
5. Storage or consumption of food, storage or use of containers of beverages, storage or application of cosmetics, smoking, storage of smoking materials, tobacco products or other products for chewing, or the chewing of such products, shall be prohibited in designated areas.
6. All high hazard materials should be handled so as to prevent skin contact, accidental ingestion, and inhalation.
7. Use of containment devices and methods for particularly hazardous substances.
 1. Containment devices and methods should be used to minimize exposure to persons and to prevent contamination of areas outside the designated area.
 2. Use of particularly hazardous substances in a manner that may produce vapors, dusts, mists, particularly hazardous gases or other airborne particulates shall be under a laboratory hood, in a glove box, or in a closed system.
 3. Laboratory fume hoods in which other substances are used shall have an average face velocity of 100 linear feet per second, with no area falling below 70 linear feet per second.
 4. All mouth pipetting of high hazard chemicals is strictly prohibited. Liquid transfers must be made using pipette bulbs, automatic pipetting devices, or syringes.
 5. Work surfaces that may become contaminated with particularly hazardous substances shall be protected from contamination.
 6. When working with regulated carcinogens, laboratory vacuum systems shall be protected with a double cold trap or with disposable absolute filters.
 7. When working with beta-propiolactone, bischloromethyl ether, methyl chloromethyl ether, or ethyleneimine, a double cold trap shall be used.
 8. Persons working in the designated area shall remove protective equipment and wash their hands and forearms before engaging in other activities or before eating, drinking, smoking, or using toilet facilities.
 9. Appropriate protective gloves should be worn. Nitrile rubber gloves provide the greatest measure of protection. If there is a question as to the proper glove material for a specific purpose, consult laboratory supervision or the SDS
8. Procedures for safe removal of contaminated waste
 1. All waste contaminated with particularly hazardous substances should be collected in impervious containers that are compatible with the contaminant.
 2. Wastes contaminated with different substances that are incompatible shall not be placed in the same container.

3. Contaminated sharps, contaminated broken glassware, etc. should be placed in a sturdy container such as a cardboard box and sealed before placing in a collection container.
4. All containers should be labeled with the contaminant(s) and if the contaminant is a carcinogen, the words "Cancer-suspect Agent."

9. Decontamination procedures

1. Laboratory workers should consider whether or not decontamination of designated areas is appropriate. Decontamination procedures will vary according to the type of substance used.
2. Small spills should be cleaned up immediately and the area decontaminated.
3. All spills that can not be cleaned up by lab employees are to be reported immediately to the DCHO and UCHO.

10. Special precautions for Reproductive Toxins

1. Women of child bearing age must be apprised of the chemicals in their work area that are known to be embryotoxic and/or affect the reproductive system. Males must also be apprised of the chemicals in their work area that are known to affect the male reproductive system. Documentation of such notification will be maintained by laboratory supervision.
2. All employees who believe they may be pregnant or have confirmation of pregnancy should notify their supervisor immediately. Following notification, a determination will be made if there are chemicals being used in the individual's work area that may present a potential hazard to the developing fetus. If such materials are being used, the employee may need to be transferred to another assignment for the duration of her pregnancy.

17. Housekeeping, maintenance, and inspections

1. Housekeeping

1. Laboratories should be kept free of clutter. Working areas should be cleaned up at the end of each operation and at the end of each day.
2. Small spills of chemicals should be cleaned up immediately. Spills that require cleanup measures beyond general housekeeping by laboratory personnel should be reported to DCHO.
3. Safety showers, eyewash fountains, and fire extinguisher shall be free from any obstruction that would prevent access and use. Access to emergency exits shall be kept clear at all times.
4. Circuit breaker panels shall have an unobstructed clearance of 30".
5. The floor shall be kept clean and free of slip hazards by reasonable cleaning and immediate clean up of spills.
6. Old containers, compromised containers, and solid chemical wastes should be disposed of promptly and not allowed to accumulate.

2. Inspection and Maintenance of protective devices.

1. Temperature control and over-temperature shutoff devices on heating equipment should be tested in accordance with manufacturer recommendations to ensure proper operation.
2. All automatic shutoff devices should be tested in accordance with manufacturer recommendations to ensure proper operation.
3. Records of inspection and testing of above equipment will be maintained in the Department for three years.
4. Fume hood performance will be checked annually.
5. Explosion shields and isolation devices should be visually inspected by the user for cracks or other damage before each use.
6. Safety showers and emergency eyewash fountains will be inspected monthly. Tags indicating date inspected and the inspector's name will be attached on or near the shower or eyewash.

18. Personal Protective Equipment

1. Each Department will coordinate establishing requirements for PPE and list those requirements in the Department Chemical Hygiene Plan.
2. Respirator use will be governed by the KSU Health and Safety Manual.
3. Eye and Face Protection
 1. Safety eye protection will be worn at all time in laboratories.
 2. Safety goggles (liquid and vapor tight) shall be worn when setting up, taking down or monitoring experiments involving non corrosive chemicals.
 3. Face shields shall be worn for any operation involving corrosives.
4. Skin Protection.
 1. When working with those substances that are readily absorbed by the skin, or with substances that

are highly corrosive to the skin, appropriate protection shall be provided by the department to protect the laboratory worker from skin contact.

2. Skin protection may take the form of shields, isolation of the procedure, gloves, aprons, or other such protective equipment.
3. Gloves and aprons should be selected according to the chemical resistance of the protective material to the chemical to be used. This information can be obtained by the supplier of the product and is usually presented in a chemical resistance chart in the supplier's catalog. The Manager, Laboratory Safety should be contacted to assist in selecting the proper personal protective equipment.

19. Medical Consultation and Examinations.

1. The University shall provide all persons involved in the laboratory use of chemicals an opportunity to receive medical attention, including any follow-up examinations the examining physician determines to be necessary, under the following circumstances:
 1. Whenever a laboratory employee develops signs or symptoms associated with a hazardous chemical to which the employee or student may have been exposed in the laboratory;
 2. Where industrial hygiene monitoring in a laboratory reveals an exposure level routinely above the action level (or in the absence of an action level, the Permissible Exposure Limit) to a substance listed by OSHA requiring medical examinations; or
 3. Whenever an event takes place in the laboratory such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure.
2. Any employee showing signs or symptoms they believe are due to exposure while working in the laboratory must immediately report to the Department Chemical Hygiene Officer who will immediately notify the Manager, Laboratory Safety for determination of need for medical examination.
3. All medical examinations in accordance with this document shall be performed by or under the direct supervision of a licensed physician and shall be provided at no cost to the exposed laboratory employee.
4. The University is required to provide the following to the physician:
 1. The identity of the hazardous chemical(s) to which the laboratory employee or laboratory student may have been exposed and a copy of the SDS, if available;
 2. A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and
 3. A description of the signs and symptoms of the exposure that the laboratory employee or laboratory student is experiencing, if any.
5. The examining physician will submit to KSU a written statement containing the following. The written statement from the physician may not discuss or reveal any findings that are not specifically related to the occupational exposure to the hazardous chemical(s).
 1. Any recommendations for additional medical examinations or follow-up.
 2. The results of the medical examination and any tests that were conducted in conjunction with the examination that are specifically related to the exposure and that are not considered medically confidential.
 3. Any medical condition uncovered during the course of the examination that may place the employee at increased risk as the result of exposure to the hazardous chemical(s).
 4. A statement that the physician has informed the employee of the results of the consultation or examination and of any medical condition that may require further examination or treatment.

20. Laboratory Ventilation

1. General laboratory ventilation should not be less than six air changes per hour.
2. All local exhaust ventilation systems should be checked every six months to assure they are mechanically operable. During these checks, routine maintenance, as recommended by the manufacturer will also be performed
3. Any employee, who has reason to believe that a local exhaust ventilation system is not functioning properly, shall immediately report the suspected problem to their supervisor and DCHO. The Supervisor will request, via a work order, that the Physical Plant Services Department inspect the system to assure that it is operating properly.
4. All local exhaust ventilation systems shall be checked every 12 months to assure that there is adequate air flow. Fume hoods should have a minimum face velocity of 100 linear feet per minute with no area below 70 fpm measured with the sash in the normal operational height.
5. Records of all measurements made to check the operability and adequacy of laboratory exhaust ventilation systems will be maintained in the Physical Plant Services Department.
6. Laboratory personnel must recognize and be aware that:

1. Laboratory fume hoods are a backup for other safety devices such as traps and condensers.
2. All equipment used in a fume hood should be kept at least six inches from the front edge.
3. All equipment must be effectively secured to prevent it from being inadvertently knocked over and broken.
4. Fume hood sashes must be kept in a position that will provide an adequate air flow while reactions or procedures are being conducted.
5. Fume hood fans should be left running whenever there are chemicals present in the hood, regardless of whether or not a procedure is being performed.
6. Fume hoods should not be used to store chemicals or apparatus.
7. Personnel must be aware of procedures to follow if the power to a local exhaust ventilation system should fail.

21. Hazardous Waste

1. Hazardous waste shall be disposed of according to EHS Policy.

22. Records

1. Records documenting training will be kept for length of employment plus 30 years.
2. Records of audits or inspections will be kept for 5 years by the department conducting the audit.

23. Corrective Actions

1. Compliance with procedure will be evaluated during audits and laboratory visits by Manager, Laboratory Safety and Department Chemical Hygiene Officer.

Appendix A

Universal Laboratory Procedures **Error! Bookmark not defined.**

1. Compressed Gases
 - 1.1. Compressed gases should not be transferred from one container to another except by the manufacturer or distributor. Exception - refilling SCBAs from breathable air cylinders by authorized personnel.
 - 1.2. Containers shall be legibly marked to identify the contents and give the appropriate precautionary information (e.g., flammable).
 - 1.3. Containers shall be stored upright and secured, with caps on when not being used.. Combustible material or formed metal chains are not recommended to secure cylinders. Chains or other securing mechanisms should be located between one-third and two-thirds of the height of the container.
 - 1.4. Oxygen and oxidizing gases shall be stored separately from flammable and highly combustible material.
 - 1.5. Pressure reducing regulators should be used when withdrawing contents from the cylinder.
 - 1.6. Valve outlets and pressure relief valves should be directed away from personnel at all times.
 - 1.7. Valves on cylinders being moved, cylinders that are not in use, or on empty cylinders shall be closed and capped.
 - 1.8. Do not exchange regulators or other appliances used with one gas with similar equipment used with other gases. Oils and lubricants should not be used on fittings for oxygen or other oxidizing gases.
 - 1.9. Do not force connections that do not fit.
 - 1.10. Use transport dollies to move cylinders.
2. Cryogenic Materials
 - 2.1. The primary hazard of cryogenic materials is their extreme coldness. They and all surfaces they cool can cause severe burns if allowed to contact the skin.
 - 2.2. Cryogenic fluids shall be stored or handled only in containers designed for such use.
 - 2.3. When personal contact with a cryogenic fluid is possible, (as when preparing cold baths or dispensing liquid nitrogen) full face shields should be worn. Wearing of watches, rings, or other items that may trap the cryogenic material should be avoided.
 - 2.4. When gloves are worn while handling cryogenic materials, they should be dry, impervious and loose enough to be easily tossed off the hands.
 - 2.5. Lab coats should be worn over shorts and short skirts while handling cryogenic materials. Open toe shoes and sandals should not be worn.
 - 2.6. Cryogenic materials should be dispensed and used in areas with good ventilation. Laboratory workers should avoid lowering their head into dry ice chests or directly over cooling baths. When transporting dry ice, or materials packaged in dry ice, the package should not be carried in the passenger compartment of the vehicle.
 - 2.7. Cryogenic material may provide an oxygen enriched atmosphere by condensing and fractionating air. This situation may increase the fire and explosion hazard of flammable and combustible materials being cooled or materials located in the vicinity of the operation.
 - 2.8. Dry ice should be added to cooling baths (or liquid added to dry ice) in small increments, allowing the foaming stop before each addition.
3. Peroxidizable Materials
 - 3.1. Peroxidizable materials should be purchased in amounts that are expected to be used within six months to one year. This practice will help ensure that others are used up before the manufacturer's expiration date.
 - 3.2. Peroxidizables, either opened or unopened, should be disposed of or tested for peroxides upon reaching the manufacturer's expiration date, or upon one year after receipt. If positive for peroxides, the peroxides may be removed or the materials may be disposed of by submitting a "Request for Chemical Pick-up" to Chemical Hygiene Officer. Please be sure to label the date that the test for peroxides was performed and the date peroxides removed (if applicable). The new expiration date will be three months after the date tested for materials in List A, and one year after the date tested for materials in List B.
 - 3.3. Containers should be marked with the date opened and, in the absence of a manufacturer's expiration date, with the date received. Containers should also be marked with the date that the last test for peroxides was done.
 - 3.4. Ethers should be disposed of without opening if there are visible crystals around the cap, or if the container is in a grossly corroded condition. Crystals visible in the container should be brought to the attention of the instructor, principal investigator or staff research assistant.
 - 3.5. Leave at least 10 percent bottoms when distilling peroxidizables. The flask can be rinsed with equal amounts of a solvent such as ethanol and considered as waste.
 - 3.6. Test for peroxides before distilling (even previously unopened ethers) and upon three months after opening List A and after one year of opening List B materials:

- 3.6.1. List A Peroxide hazard on storage
 - 3.6.1.1. Test or dispose in 3 months
 - 3.6.1.1.1. Isopropyl ether; Divinyl acetylene; Vinylidene chloride; Potassium metal; Sodium amide
 - 3.6.2. List B Peroxide hazard on concentration
 - 3.6.2.1. Test or dispose in 12 months
 - 3.6.2.1.1. Isopropyl ether; Diethyl ether; Divinyl acetylene; Tetrahydrofuran; Vinylidene chloride
Diacetylene; Potassium metal; Methyl acetylene; Sodium amide; Dioxane; Acetal
 - 3.6.2.1.2. Decahydronaphthalene (Decalin); Tetrahydronaphthalene (Tetralin)
 - 3.6.2.1.3. Ethylene glycol dimethyl ether; Cyclohexene; Vinyl ethers
 - 3.6.2.1.4. Diethylene glycol dimethyl ether; Dicyclopentadiene
4. Perchloric Acid
 - 4.1. Use goggles for eye protection whenever the acid is handled
 - 4.2. In wet combustion with perchloric acid, treat the sample first with nitric acid to destroy easily oxidizable matter.
 - 4.3. Any procedure involving heating of the perchloric acid should be conducted in a ventilated hood equipped with water wash down.
 - 4.4. Perchloric acid hoods should be constructed of materials that are acid resistant, non-reactive and impervious to perchloric acid, such as stainless steel.
 - 4.5. Organic material should not be stored in the perchloric hood.
 - 4.6. Do not allow perchloric acid to come in contact with strong dehydrating agents (concentrated sulfuric acid, anhydrous phosphorous pentoxide, etc.)
 - 4.7. Perchloric acid should be used only in standard analytical procedures from well recognized analytical texts. Researchers should take the properties and hazards of perchloric acid into consideration before use.
 - 4.8. If a laboratory hood or exhaust system has been exposed to perchloric acid heated above ambient temperature, tests should be conducted for explosive perchlorates before any inspection, cleaning, maintenance, or any other work is done on any part of the exhaust system or hood interior.
 5. Pyrophoric Chemicals
 6. Hydrofluoric Acid
 7. Bromine
 8. Electrical Equipment
 - 8.1. General
 - 8.1.1. Extension cords shall not be used as permanent wiring. Power strips that are equipped with an over current protection device (circuit breaker) may be used. A power strip will not be plugged into another power strip.
 - 8.1.2. Electrical receptacles must not rest on laboratory bench tops.
 - 8.1.3. Power cords on appliances should be inspected for damage regularly. Frayed or otherwise damaged cords should be replaced before using.
 - 8.1.4. To eliminate exposed wiring, outlet boxes or junction boxes shall be provided with cover plates and receptacles shall be provided with faceplates.
 - 8.1.5. Ground-fault circuit interrupters should be used over sinks and in other wet areas. Ground-fault circuit interrupters should be actuated every six months to insure proper function.
 - 8.1.6. Over current protection devices (circuit breakers) on panes shall be individual labeled to indicated the equipment or location of equipment served by the device.
 - 8.2. Laboratory Refrigerators and Freezers
 - 8.2.1. Laboratory refrigerators or freezers used for storing or cooling flammable liquids will be in compliance with NFPA 45 - Fire Protection for Laboratories Using Chemicals, section 9.2.2.2 and A.9.2.2.2.
 - 8.2.2. All refrigerators and freezers will be appropriately labeled for the storage of chemicals, flammables or food.
 - 8.2.3. An inventory of all containers in each refrigerator and freezer must be available.
 - 8.3. Electrical apparatus
 - 8.3.1. Unattended electrical heating equipment should be provided with an automatic reset over-temperature shutoff switch, in addition to normal temperature controls.
 - 8.3.2. While air powered mixers are preferred, electric motors may be used to drive blenders or stirrers in open containers of flammable liquids or combustible liquids heated above their flash points provided they meet Class I, Division 2 locations as defined in Article 500-5 of the National Electrical Code.
 - 8.3.3. Electrical equipment and apparatus in cold rooms should be protected from moisture due to condensation.
 - 8.3.4. All apparatus use in the laboratory must be approved by a recognized approval agency (UP, ASTM, etc) or meet accepted NFPA or ANSI standards.
 - 8.4. Exposed live current

- 8.4.1. Only experienced researchers who have been trained to work safely with test instruments and equipment on energized circuits may remove enclosures and guards to perform testing on energized electrical circuits.
9. Working Alone
 - 9.1. Working with hazardous chemicals alone, especially after regular hours in a laboratory, poses an additional risk to life and property. If an unanticipated event occurs and the researcher is incapacitated, available safety equipment, such as emergency showers, fire extinguishers, or antidotes, become worthless to provide emergency assistance to injured individuals or to mitigate the losses incurred.
 - 9.2. Each Department Chemical Hygiene Plan needs to incorporate a working alone procedure suited to the needs of the area served by the Plan.
 - 9.3. Some provisions that may be adapted by the Department are as follows:
 - 9.3.1. Prohibiting working alone in laboratories, or prohibiting working alone for certain procedures.
 - 9.3.2. Buddy system
 - 9.3.3. Arrange with someone working nearby to periodically check on one another
 - 9.3.4. Remote monitoring
 10. Unattended Operations
 - 10.1. Unattended electrical heating equipment should be provided with an automatic over-temperature shutoff switch, in addition to normal temperature controls.
 - 10.2. Unattended operations that depend on a flowing cooling water supply should be provided with an automatic reset shutoff device that will shut off the heat supply upon loss of cooling water.
 - 10.3. Arrangements should be made, where possible, to periodically check unattended operations for abnormal conditions.
 - 10.4. For operations left running after normal hours, leave the lights on and leave a sign on the door indicating that an unattended procedure is in progress. The sign should also give emergency phone numbers in case of incident.
 11. Glassware
 - 11.1. Accidents involving glassware are a leading cause of laboratory injuries.
 - 11.2. Careful handling and storage procedures should be used to avoid damaging glassware. Damaged items should be discarded or repaired.
 - 11.3. Adequate hand protection should be used when inserting glass tubing into rubber stoppers or corks or when placing rubber tubing on glass hose connections. Tubing should be fire polished or rounded and lubricated, and hands should be held close together to limit movement of glass should fracture occur. The use of plastic or metal connectors should be considered.
 - 11.4. Glass blowing services are provided by Chemistry Department, contact Diane Skok ext. 3900.
 - 11.5. Vacuum-jacketed glass apparatus should be handled with extreme care to prevent implosions. Equipment such as Dewar flasks should be taped or shielded. Only glassware designed for vacuum work should be used for that purpose.
 - 11.6. Hand protection should be used when picking up broken glass. (Small pieces should be swept up with a brush into a dustpan).
 - 11.7. Proper instruction should be provided in the use of glass equipment designed for specialized tasks, which can represent unusual risks for the first time user. (For example, separatory funnels containing volatile solvents can develop considerable pressure during use).
 12. Laboratory (Fume) Hood Usage
 - 12.1. The Department Chemical Hygiene Officer and Manager, Laboratory Safety will periodically inspect laboratory hoods to determine proper function and adequate face velocity. The following are considerations for the laboratory hood users that will facilitate optimum hood performance.
 - 12.2. Manager, Laboratory Safety should be consulted for new hood installation.
 - 12.3. Laboratory hoods should not be relied upon to provide explosion (blast) protection unless specifically designed to do so.
 - 12.4. When perchloric acid is evaporated or heated above ambient temperatures in a laboratory hood, the hood should be specifically designed for perchloric acid.
 - 12.5. For new installations or modifications of existing installations, fixed electrical services and their controls should be located external to the hood and within easy reach.
 - 12.6. For new installations or modifications of existing installations, controls for other services (gas, air, water, etc.) should be located external to the hood and within easy reach.
 - 12.7. Sash openings should be kept to a minimum.
 - 12.8. Chemicals and apparatus should be located within the hood and should be kept at least six inches behind the plane of the sash.

12.9. Personnel should keep their faces outside the plane of the sash.

12.10. Storage in hoods should be kept to an absolute minimum.

Appendix B

High Hazardous Substances **Error! Bookmark not defined.**

High hazardous substances - these include "regulated and select carcinogens," "reproductive toxins," and "substances with a high degree of acute toxicity."

1 Regulated carcinogen - any of the following substances or any substance containing more than 0.01% of the substances OSHA has determined to be carcinogenic.

OSHA Regulated Carcinogens

2-Acetylaminofluorene	Acrylonitrile
4-Aminodiphenyl	Asbestos
Benzene	Benzidine (and its salts)
bis-Chloromethyl ether	Dibromochloropropane (DBLP)
3,3 -Dichlorobenzidine (and its salts)	4-Dimethylaminoazobenzene
Ethylene dibromide	Ethyleneimine
Ethylene Oxide	Formaldehyde
Inorganic Arsenic	Methyl chloromethyl ether
4,4-Methylene bis (2-chloroaniline)	alpha-Naphthylamine
beta-Naphthylamine	4-Nitrobiophenyl
Nnitrosodimethylamine	beta-Propiolactone
Vinyl Chloride	

- 2 Select carcinogen - any substance that meets one of the following criteria:
- a. Any substance regulated by OSHA as a carcinogen
 - b. Any substance listed by the NTP as "Known to be Carcinogenic".
 - c. Any substance listed as a Group I carcinogen by the IARC.
 - d. Any Group 2A or 2B IARC substance or NTP "Reasonably Anticipated to be Carcinogenic" substance that produces a statistically significant tumor incidence under the following criteria:
 - i. Lifetime inhalation exposure at <10 mg/M3.
 - ii. Repeated skin applications of <300 mg/Kg/week.
 - iii. Repeated oral doses of <50 mg/Kg/day.
 - iv. The specifics of what "repeated" means in Items 2 & 3 above are not spelled out in 29 CFR 1910.1450, thus discretion will be used in determining the applicability of these definitions.

Select Carcinogen list.

Substance	Source
2-acetylaminofluorene	OSHA, NTP
acrylonitrile	OSHA, NTP
adriamycin	NTP
aflatoxins	NTP, IARC
aluminum production	IARC
4-aminobiphenyl	OSHA, IARC, NTP
1-amino-2-methylantraquinone	NTP
o-aminoazotoluene	NTP
amitrole	NTP
o-anisidine	NTP
o-anisidine hydrochloride	NTP
arsenic	OSHA, IARC, NTP
asbestos	OSHA, IARC, NTP
azathioprine	IARC, NTP
benzene	OSHA, IARC, NTP
benzidine	OSHA, IARC, NTP
benzotrithloride	NTP
beryllium and Be compounds	OSHA, NTP
betel quid with tobacco	IARC

N,N-bis(2-chloroethyl)-2-naphthylamine (chlornaphazine)	NTP
bischloroethyl nitrosoarea	OSHA, IARC, NTP
bis(chloromethyl) ether and chloromethyl methyl ether (technical grade)	NTP
1,3 butadiene	IARC, NTP
1,4 butanediol dimethanesulfonate (myleran)	NTP
cadmium and Cd compounds	NTP
carbon tetrachloride	NTP, IARC
chlorambucil	NTP
chlorendic acid	NTP
chlorinated paraffins (C12, 60% chlorine)	NTP
4-chloro-o-phenylene diamine	NTP
1-(2-chloroethyl)-3-cyclohexyl-1-nitrosoarea (CCNU)	NTP
1-(2-chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosoarea (methyl CCNU)	IARC
chloroform	NTP
3-chloro-2-methyl propene	NTP
chromium (hexavalent) and Cr compounds	IARC, NTP
C.I. Basic Red 9 monohydrochloride	NTP
p-cresidine	NTP
cyclophosphamide	IARC, NTP
dacarbazine	NTP
diethylstilbestrol	IARC, NTP
DDT	NTP
di(2-ethylhexyl)phthalate	NTP
2,4-diaminoanisole sulfate	NTP
2,4 diaminotulene	NTP
1,2-dibromo-3-chloropropane	OSHA, NTP
1,2 dibromoethane (EDB)	OSHA, NTP
1,4 dichlorobenzene	OSHA, NTP
3,3-dichlorobenzidine	NTP
3,3-dichlorobenzidine dihydrochloride	NTP
1,2-dichlorethane	NTP
dichloromethane(methylene chloride)	NTP
diepoxybutane	NTP
di(2-ethylhexyl)phthalate	NTP
diethylsulfate	NTP
3,3-dimethoxybenzidine	NTP
diglycidyl resourcinol ether	NTP
dimethyl sulfate	NTP
4-dimethylaminoazobenzene	OSHA, NTP
3,3-dimethylbenzidine	NTP
dimethylcarbamoyl chloride	NTP
1,1-dimethylhydrazine	NTP
dimethyl vinyl chloride	NTP
1,4-dioxane	NTP
Direct Blue 6	NTP
Direct Black 38	NTP
epichlorohydrin	NTP
erionite	NTP
estrogens	IARC, NTP
estradiol benzoate	
estradiol monopalmitate	
estradiol 17 beta	
estrone	
ethinyl estradiol	
mestranol	
ethyl acrylate	NTP
ethyleneimine	OSHA
ethylene oxide	OSHA
ethylene thiourea	NTP
formaldehyde	OSHA, NTP

hexachlorobenzene		NTP
hexamethylphosphoramide		NTP
hydrazine and hydrazine sulfates	NTP	
hydrazobenzene	NTP	
iron dextran complex		NTP
kepone(chlordecone)		NTP
lead acetate		NTP
lead phosphate	NTP	
lindane	NTP	
hexachlorocyclohexane		
γ-hexachlorocyclohexane		
β-hexachlorocyclohexane		
melphalan		IARC, NTP
8-methoxypsoralen(methoxsalen) with Ultraviolet A therapy (PUVA)	IARC, NTP	
2-methylaziridine(propyleneimine)	NTP	
4,4-methylenebis(N,N-dimethyl) benzenamide (Michler's base)	NTP	
methyl chloromethyl ether	OSHA	
4,4-methylenebis(2-chloroaniline)(MBOCA)		OSHA, NTP
4,4-methylenedianiline and its dihydrochloride	NTP	
metronidazole		NTP
Michler's ketone	NTP	
Mineral oils, untreated and mildly treated	IARC	
Mirex		NTP
MOPP (combined therapy with nitrogen mustard, vincristine, procarbazine and prednisone) and other combined chemotherapy including alkylating agents)	IARC	
mustard gas(sulfur mustard)		IARC, NTP
2-naphthylamine	IARC, NTP	
alpha naphthylamine		OSHA
beta naphthylamine		OSHA
nickel and Ni compounds	IARC, NTP	
4-nitrobiphenyl	OSHA	
nitrilotriacetic acid		NTP
5-nitro-o-anisidine		NTP
N-nitrosodiethylamine	NTP	
P-nitrosodiethylamine		NTP
N-nitrosomethylvinylamine		NTP
N-nitrosomorpholine		NTP
N-nitrosornicotine		NTP
N-nitrosopiperidine		NTP
N-nitrosopyrrolidine		NTP
N-nitrososarcosine		NTP
norethisterone		NTP
nitrofen	NTP	
nitrogen mustard hydrochloride	NTP	
2-nitropropane	NTP	
N-nitroso-N-ethylurea	NTP	
N-nitroso-N-methylurea	NTP	
N-nitrosodi-N-butylamine	NTP	
N-nitrosodi-N-propylamine		NTP
N-nitrosodiethanolamine	NTP	
4,4-oxydianiline	NTP	
oxymetholone		NTP
polycyclic aromatic hydrocarbons(PAHs)	NTP	
benz(a)anthracene		
benzo(b)fluoranthene		
benzo(j)fluoranthene		
benzo(k)fluroanthene		
benzo(a) pyrene		
dibenz(a,h) acridine		

dibenz(a,j)acridine		
dibenz(a,h)anthracene		
7H dibenzo(c,g)carbazole		
dibenzo(a,e)pyrene		
dibenzo(a,h)pyrene		
dibenzo(a,i)pyrene		
dibenzo(a,l)pyrene		
indeno(1,2,3-cd)pyrene		
5-methylchrysene		
phenacetin		IARC, NTP
phenazopyridine hydrochloride	NTP	
phenoxybenzamine hydrochloride	NTP	
phenytoin and its sodium salts	NTP	
polybrominated biphenyls(PBB)	NTP	
polychlorinated biphenyls(PCB)	NTP	
procarbazine hydrochloride		NTP
progesterone		NTP
1,3 propane sulfone		NTP
beta propiolactone		OSHA, NTP
propylene oxide	NTP	
propylthiouracil	NTP	
reserpine		NTP
saccharine		NTP
safrole		NTP
selenium sulfide	NTP	
streptozocin		NTP
sulfallate		NTP
talc containing asbestos fibers	IARC	
2,3,7,8-tetrachlorodi-benzo-p-dioxin(TCDD)	NTP	
tetrachloroethylene(perchloroethylene)	NTP	
thioacetamide		NTP
thiourea	NTP	
thorium dioxide	NTP	
tobacco products	IARC	
toluene diisocyanates		NTP
o-toluidine and o-toluidine hydrochloride	NTP	
toxaphene		NTP
2,4,6-trichlorophenol		NTP
tris(2,3-dibromopropyl)phosphate	NTP	
tris(1-aziridinyl)phosphine sulfide	NTP	
treosulfan		IARC
urethane	NTP	
vinyl chloride		OSHA, IARC, NTP

3. Reproductive toxins - Reproductive toxins are chemicals or other hazards that may manifest themselves in lethal effects on the fertilized egg, developing embryo or fetus or have teratogenic effects in the fetus. In addition, certain reproductive toxins may cause infertility in males and females. The following is a list of chemicals that have been found to have at least one of the above effects.

[Source: Zenz, Occupational Medicine, Second Edition, Yearbook Medical Publishers, 1988.]

<u>Substance</u>	<u>Effect</u>
anesthetic gases (halogenated gases)	fetal effects
benzene	decreased fertility

cadmium	fetal effects decreased fertility
carbaryl	decreased fertility
carbon disulfide	decreased fertility increased menstrual bleeding
carbon monoxide	decreased fertility, fetal effects
chlordecone(kepone)	decreased fertility
2-chlorobutadiene(chloroprene)	decreased fertility
dibromochloropropane(DBCP)	decreased fertility
diethylstilbestrol(DES)	decreased fertility adenocarcinoma in offspring
ethylene dibromide	decreased fertility fetal effects
ethylene oxide	fetal effects
ethylene thiourea	fetal effects
glycidyl ethers	testicular degeneration decreased fertility fetal effects
ionizing radiation (x-rays and gamma rays)	decreased fertility fetal effects
lead	decreased fertility fetal effects
mercury	fetal effects
microwaves	fetal effects
polychlorinated biphenyls(PCB)	decreased fertility fetal effects
vinyl chloride	decreased fertility fetal effects

Fetal effects may include: spontaneous abortion, low birth weight, still births, neonatal deaths, congenital anomalies and behavioral or developmental disabilities.

Decreased fertility may include both male and female fertility disorders.

Chemicals that affect the reproductive capabilities including chromosomal damage (mutations) and effects of fetuses (teratogenesis).

4. Highly Toxic Material. Check SDS of chemical substance under consideration for toxicity status.
 - a. A material that has an oral LD₅₀ of # 50 mg/Kg when administered to albino white rats that weigh between 200 and 300 grams.
 - b. A material that has a dermal LD₅₀ of # 200 mg/Kg in 24 hours or less when applied to the bare skin of albino rabbits that weigh between two and three kilograms.
 - c. A material that has an inhalation LC₅₀ of # 200 ppm or 2 mg/M³ in one hour or less when administered to albino rats that weigh between 200 and 300 grams.

Appendix C

Sample Posting for Designated Areas **Error! Bookmark not defined.**

WARNING:
Designated Area
for use of:

*

- * "Select Carcinogens"
- "Reproductive Toxins"
- "Highly Toxic Chemicals"

Appendix D

Definitions

CHO	See Chemical Hygiene Officer and University Chemical Hygiene Officer.
CHP	See Chemical Hygiene Plan.
Chemical Hygiene Plan	A written document that details how Kent State University will manage the hazardous chemicals that are present and used in its laboratories.
Departmental Chemical Hygiene Officer	The individual who has responsibility for administering Hygiene Officer a particular department's Chemical Hygiene Plan.
Hazard Communication	A written program developed and instituted by Kent State University in order to comply with the OSHA Hazard Communication Standard (29 CFR 1910.1200). This program sets forth the policies and procedures regarding Safety Data Sheets, container labeling, and employee training administrated by the Office of Risk Management.
Hazardous Chemical	Any chemical that may present a physical hazard or a health hazard.
Health Hazard	A chemical for which there is statistically significant evidence that acute or chronic health effects may occur in exposed employees.
HMIS	Hazardous Material Identification System. A labeling and hazard rating system developed by the National Paint and Coatings Association.
Label	Any written, printed or graphic sign or symbol displayed on or affixed to containers of hazardous chemicals. A label should identify the hazardous material, appropriate hazard warnings, and name and address of the manufacturer or other responsible party.
SDS	Safety Data Sheet. Developed and provided by the chemical manufacturer to inform employers of the properties and hazards of the chemical.
Non-Routine Task	A task that is conducted on an infrequent or non-routine basis that involves the potential exposure to hazardous chemicals (i.e., tank cleaning).
OSHA	Occupational Safety and Health Administration. OSHA is part of the Department of Labor and is the regulatory and enforcement agency for safety and health in the industrial sector.
Physical Hazard	A chemical that is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive), or water-reactive.
University Chemical Hygiene Officer	The individual in the Research and Graduate Studies Division who has been designated as the Manager, Laboratory Safety. This individual is charged with the overall administration of the university's compliance with OSHA's Laboratory Safety Standard.

Appendix E

Laboratory Inspection Report

Department _____ Date _____

CHO _____

Inspector (Print) _____ (Sign) _____

Building _____ Room(s) _____

SA NI

- | | | | |
|-----|-----|----|--|
| ___ | ___ | 1. | General |
| ___ | ___ | a. | Hazard warning signs at entrance(s) |
| ___ | ___ | b. | Laboratory contacts list at entrance |
| ___ | ___ | c. | Work area separated from study/social areas |
| ___ | ___ | d. | Laboratory Hygiene Plan written and available, including
Lab specific Written Safe Operating Procedures
Lab specific Material Data Sheets Available
Emergency response and evacuation plan posted |
| ___ | ___ | e. | Equipment in good condition, preventive maintenance plan in place |
| ___ | ___ | 2. | Exiting |
| ___ | ___ | a. | Exits and exit ways clearly marked |
| ___ | ___ | b. | Exit ways are clear of slip, trip and fall hazards |
| ___ | ___ | c. | Doorways are unobstructed and door is usable as an exit |
| ___ | ___ | 3. | Fire |
| ___ | ___ | a. | Class ABC fire extinguisher in laboratory, near door or on path of egress |
| ___ | ___ | b. | Fire extinguishers are unobstructed and have been serviced yearly |
| ___ | ___ | c. | Trash and combustible materials are removed on a regular basis |
| ___ | ___ | d. | Flammable and combustible liquids are limited to less than 25 gallons for each
laboratory, or are stored in approved flammable cabinets |
| ___ | ___ | e. | Fire Blankets available |
| ___ | ___ | g. | Refrigerators used for flammables are flammable material storage units or explosion
proof. |
| ___ | ___ | h. | Two well-separated exits |
| ___ | ___ | I. | Flammables not stored along path of egress |
| ___ | ___ | 4. | Housekeeping and Sanitation |
| ___ | ___ | a. | Floor areas are free of debris, spilled liquid and tripping hazards |
| ___ | ___ | b. | A minimum of 24 inches of aisle spaces are maintained |
| ___ | ___ | c. | Equipment not placed so as to create a hazard |
| ___ | ___ | d. | The laboratory is free of clutter |
| ___ | ___ | e. | Safety showers and eye washes are unobstructed |
| ___ | ___ | f. | Food is consumed or stored only in areas where no toxic chemicals and/or radioactive
materials are stored or used. |
| ___ | ___ | 5. | Electrical |
| ___ | ___ | a. | Circuit breaker panels are unobstructed |
| ___ | ___ | b. | No circuits overloaded with extensions cords or multiple connection |
| ___ | ___ | c. | Electrical cords and plugs in good repair |
| ___ | ___ | d. | Extension cords not used for permanent wiring |
| ___ | ___ | e. | Apparatus equipped with three-pronged plugs or double insulated |
| ___ | ___ | f. | Unattended electrical heating equipment is provided with manual reset automatic shutoff
devices. |
| ___ | ___ | g. | Automatic shutoff devices (when present) have been tested and are functioning properly |
| ___ | ___ | h. | Electrical equipment, where flammable vapors may be present, are listed for the
environment |

- | | | | |
|-----|-----|-----|--|
| ___ | ___ | I. | Motors non-sparking |
| ___ | ___ | j. | Heating apparatus equipped with redundant temperature controls |
| ___ | ___ | k. | Circuits, equipment provided with ground-fault interrupters as needed |
| | | 6. | Chemical Handling |
| ___ | ___ | a. | Shelves used for chemical storage are sturdy, well braced and have a guard. |
| ___ | ___ | b. | All containers of hazardous substances are properly labeled. |
| ___ | ___ | c. | Mechanical pipetting aids are available and are used when applicable |
| ___ | ___ | d. | Compressed gas cylinders strapped firmly into place, cylinders not in use capped, oxidizing and reducing gasses segregated |
| ___ | ___ | e. | Flammables and oxidizers are stored separately |
| ___ | ___ | f. | Strong acids and strong bases are separated either in separate cabinets or in separate containment within a cabinet. |
| ___ | ___ | g. | Peroxidizable materials have not reached the manufacturers expiration date, or test negative for peroxides and the new expiration date is clearly marked on the container. |
| ___ | ___ | h. | Leaking containers have been repaired, replaced or properly disposed of. |
| ___ | ___ | I. | Spills have been cleaned up. |
| ___ | ___ | j. | Containers for collecting used hazardous materials are properly labeled and kept closed. |
| ___ | ___ | k. | All work generating toxic and hazardous fumes done in hoods |
| ___ | ___ | l. | Work capable of causing an explosion behind protective barriers, vacuum vessels taped, etc. |
| ___ | ___ | m. | Chemicals not stored over 7 feet off of floor |
| | | 7. | Materials Handling and Storage |
| ___ | ___ | a. | Material is stored so as to not create a hazard. The material is stacked, blocked or otherwise secured against sliding or collapse. |
| ___ | ___ | b. | Employees are trained in and practice safe lifting techniques. |
| | | 8. | Guards and Guarding |
| ___ | ___ | a. | All machines are guarded at their point of operation and have power transfer and other moving parts guarded or have some other means or method that provides equivalent protection to the operator(s) and other employees in the vicinity. |
| ___ | ___ | b. | All guards and shields are in place and have been maintained to be functionally as effective as they were when new or they are effective in satisfying the guarding requirements of OSHA . |
| | | 9. | Equipment |
| ___ | ___ | a. | Refrigerators in laboratories are marked to indicate whether they are explosion proof, modified or non-explosion proof. |
| ___ | ___ | c. | Glassware used for vacuum work is designed for such work. |
| | | 10. | Ventilation |
| ___ | ___ | a. | Fume hoods have been inspected within the last year and are so marked. |
| ___ | ___ | b. | There is a visual indicator that shows the hood is operating. |
| ___ | ___ | c. | Storage in fume hood is kept to an absolute minimum. |
| ___ | ___ | d. | Fume generating apparatus kept 6 inches behind the vertical plane of the sash. |
| ___ | ___ | e. | Evaporation or heating of perchloric acid is done only in a hood specifically designed for perchloric acid. |
| ___ | ___ | g. | Laboratory at negative pressure with respect to corridors |
| ___ | ___ | h. | Hoods located in low traffic draft-free zones |
| ___ | ___ | I. | Hoods capable of maintaining 85-100 fpm face velocity with sash at normal use position |
| ___ | ___ | k. | Hoods not used for storage of surplus materials |
| | | 11. | Personal Protective Equipment |
| ___ | ___ | a. | All required Personal Protective Equipment (PPE) is available, in good repair and personnel are trained in its use |
| ___ | ___ | 1. | Appropriate gloves to protect chemicals, hot or cold objects or against nicks and cuts. |
| ___ | ___ | 2. | Appropriate aprons, coveralls and/or rain gear available to protect employees from splashes or other exposure to hazardous materials. |
| ___ | ___ | 3. | Appropriate eye protection (safety glasses, goggles, face shields, etc.) available |

Appendix F

NEW LABORATORY EMPLOYEE
ORIENTATION CHECKLIST

Employee Name	Department	Laboratory #/Name
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TO BE GIVEN BY CHEMICAL HYGIENE OFFICER		
ITEMS COVERED	DATE	Employee Initials
Explanation of OSHA Laboratory Standard		
Explanation of University Chemical Hygiene Plan		
Access to Copy of OSHA Regulation		
Location of University and Departmental Chemical Hygiene Plans		
Contents of SDS		

TO BE GIVEN BY SUPERVISOR		
ITEMS COVERED	Date	Employee Initials
Hazards of Chemicals Unique to the Laboratory		
Special Hazard Controls and Safety Procedure for the Laboratory		
Location of Emergency Equipment (Eyewash fountains, Safety Showers, First Aid Supplies, Spill Kits, etc)		
Emergency Procedures		
Location and Use of Personal Protective Equipment (Gloves, Eye and Face Protection, Explosion Shields, etc.)		
Chemical Hazards and Understanding the SDS		

Signature	Date
Employee	
Chemical Hygiene Officer	
Supervisor	

