UNIVERSITY OF DETROIT MERCY

CHEMICAL HYGIENE PLAN

AUGUST 3, 2017

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I. Operating Procedures

A. General

1. The Chemical Hygiene Plan (CHP) applies to all University of Detroit Mercy laboratories which adhere to the following:

    a. Chemical manipulations are carried out on a laboratory scale and in containers of a size that can be easily and safely manipulated by one person.
    b. Multiple chemical procedures are used.
    c. Protective laboratory procedures and equipment are necessary to minimize the potential for employee and student exposure to hazardous chemicals.
    d. The procedures involved are not part of a production process whose function is to produce commercial quantities of materials, nor do the procedures in any way simulate a production process.

2. Staff and students shall follow the Chemical Hygiene Plan to promote their health and safety.

3. The laboratory supervisor or the Chemical Hygiene Officer (CHO) is to be contacted with any safety questions, concerns, or to report unsafe conditions.

4. Unauthorized persons are not allowed in the laboratory. Student assistants and students enrolled in University of Detroit Mercy courses in the specific course may participate in laboratory exercises.

5. Plan safety procedures before beginning any operation.

6. Follow standard operating procedures at all times.

7. Always read the Safety Data Sheets (SDSs) and the label before using a chemical.

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8. Know the location and proper use of safety equipment.

9. Make others aware of special hazards associated with your work.

10. Report all injuries, accidents, incidents, and near misses to the laboratory manager. In the event of questionable or certain non-conformance situations, please see the Compliance Policy and Corrective Measures form for instruction in Appendix A.

11. Properly dispose of chemical wastes. See appendix B for disposal requirements.

12. Generally textbooks, laboratory manuals, and other instructional materials designate the safety precautions needed for a particular laboratory activity. These precautions shall be followed in conjunction with the Chemical Hygiene Plan.

B. Laboratory Safety and Hygiene Practices. See appendix C for PPE requirements.

1. Individuals in the laboratory

    a. Eating, drinking, smoking, gum chewing, applying cosmetics, and taking medicine in laboratories where hazardous chemicals are used or stored is strictly prohibited.
    b. Horseplay in University of Detroit Mercy laboratories is forbidden and may result in disciplinary action.
    c. Touching, smelling, tasting, and other inappropriate close contact with chemicals is strictly forbidden.
    d. Never pipette by mouth. Always use a bulb or other device for suction.
    e. Wear appropriate Personal Protective Equipment (PPE) at all times.
    f. Confine long hair and loose clothing, wear full length pants and tops, and always wear a shoe that fully covers the foot.
    g. Use appropriate ventilation when working with hazardous chemicals.
    h. Hands are to be washed with soap and water immediately after working with any laboratory chemicals, even if gloves have been worn.
    i. Food, beverages, cups, and other drinking and eating utensils cannot be stored in areas where hazardous chemicals are handled or stored.

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j. Operation of hotplates, running water, and open flames shall not be left unattended.

2. Students in the laboratory

   a. Report all accidents, injuries, chemical spills, equipment malfunctions, and glass breakage to the instructor immediately, no matter how trivial they may seem. The Department of Public Safety will evaluate cuts, burns, accidental ingestion of chemicals, or inhalation of fumes.
   b. Learn the location of the fire extinguisher, eye wash station, first aid kit, and safety shower.
   c. Must perform only authorized experiments.
   d. Must only carry out laboratory work under the direct supervision of an instructor or designated staff member.
   e. Shall read lab directions ahead of time and follow all verbal and written instructions.

C. Housekeeping

1. All laboratory areas must be kept clean and orderly.

2. Keep pathways clear by placing extra items (books, bags, etc.) in designated areas or under the work tables. If under the tables, ensure that these items cannot be stepped on.

3. Place all chemical and biological wastes in appropriate, segregated receptacles that are properly labeled. See instructor if labels are missing, defaced, or unclear.

4. Only water may go down the drain unless instructed otherwise by the instructor.

5. Notify the instructor of any lab spills as soon as possible.

6. Never block access to emergency equipment, safety showers and eyewash stations, or exits.

7. Keep all cabinets and drawers closed when not in use to avoid catching and bumping hazards.

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8. Do not store chemical containers on the floor.

D. Chemical Procurement

1. Efforts are to be made to order chemicals in small quantities and purchased only in the quantity sufficient for the declared use.

2. Chemicals will only be accepted with adequate labeling and corresponding Safety Data Sheets. If received without Safety Data Sheets, this information is to be obtained from the chemical provider before the chemical is put into service.

3. Chemical invoices are to be reviewed and compared to the actual shipment for accuracy.

4. Chemical SDS information is to be reviewed for proper handling, storage, and disposal before a substance is received and placed in storage for use.

5. All chemicals received are to have a unique ID number associated with that chemical.

E. Chemical Storage and Distribution

1. All chemicals shall be kept in tightly closed, sturdy, and appropriate containers.

2. Chemicals shall be stored based on the reactive nature and compatibility group of the chemicals. Chemical incompatibility is a required section of the SDS and is to be referenced before placing in storage.

Separate Acids from:	**Separate Oxidizers from:**
Bases – Possible violent exothermic reaction	**Acids** – May form toxic and/or explosive compounds
Most Metals – Production of flammable hydrogen gas	**Organic materials** – Especially when mixed with flammables, may ignite
Sulfides – Forms toxic and flammable hydrogen sulfide gas	**Metals** – May form explosive compounds
Azides – May form toxic and flammable phosphine gas	**Reducing Agents** – Extreme reactions or explosions may occur

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Oxidizers – May form toxic and/or explosive compounds	**Ammonia** (anhydrous or aqueous) – Produces toxic chloroamine vapor
Cyanides – Forms toxic and flammable cyanide gas	**Combustible materials** (paper, alcohols, common solvents) – May result in fire.
Chlorinated compounds – Forms toxic chlorine gas	

3. Large containers and containers with reactive chemicals, such as acids and bases, shall be on low shelves.

4. Flammable chemicals shall be stored in approved storage containers and in approved flammable chemical storage cabinets.

5. No combustible material, such as paper products, shall be stored in the chemical storage rooms. No trash/recycling receptacles shall be kept in the chemical storage rooms.

6. All storage areas shall be securely locked when not in use. Storage and preparation areas shall only be accessible to those persons authorized to access the chemicals.

7. Chemicals shall not be distributed for purposes other than instruction within the science departments without the prior approval of the CHO. Chemicals transferred to other locations off campus shall be accompanied by their applicable SDS information. All University employees who transfer and receive chemicals shall have appropriate training in their use, storage, and disposal.

8. Refrigerators used to store flammable chemicals shall be of explosion proof or of lab safe design.

9. Chemicals transported in elevators shall be protected from breakage and carried in secondary containers, such as unbreakable tubs, that will contain spills. All chemicals transported in elevators shall be carried by cart, not by hand. The elevator shall not be used by the public during transportation of significant quantities (over 100 grams) of chemicals.

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F. Compressed Gases (See appendix F for handling requirements)

1. A compressed gas is defined as any material or mixture having in the container either an absolute pressure greater than 276 kPa (40 lb/in²) at 21°C (70°F), or an absolute pressure greater than 717 kPa (104 lb/in²) at 54°C (130°F), or both; or any liquid flammable material having a Reid vapor pressure greater than 276 kPa (40lb/in²) at 38°C (100°F).

2. Gas cylinders shall only be moved from one location to another with the protection cap securely in place. A wheeled gas cylinder carrier will be used when moving a cylinder. Cylinders shall be moved by tilting and rolling them on their bottom edges.

3. Both full and empty cylinders shall only be stored where they may be securely restrained by straps, chains, or a suitable stand.

4. An "Empty" label shall be placed on a cylinder and the cylinder shall be considered empty when there is still a slight positive pressure in it.

5. An empty cylinder shall be returned to the designated compressed gas accumulation area as soon as possible after having been emptied or when it is no longer needed.

6. Cylinders shall not be exposed to temperatures above 50°C.

7. Store flammable gases separately from oxidizer gases.

G. Waste Minimization and Disposal (*See appendix B for disposal regulations*)

University of Detroit Mercy is considered a small quantity generator according to Michigan Hazardous Waste Rules. Under the Resource Conservation and Recovery Act (RCRA), while a waste minimization program is not required, a good faith effort is required and acknowledged by the following certification stated in 40 CFR Part 262.27 and located in section 15 of the Uniform Hazardous Waste Manifest: "I am a small

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quantity generator. I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford."

1. Employees shall minimize generation of hazardous waste by:

    a. Using microscale labs and selecting less hazardous materials.
    b. Ordering chemicals in quantities that are likely to be consumed in one year or less.
    c. Avoiding the inadvertent accumulation of hazardous waste. Potential waste materials are surplus, old, and/or unnecessary chemicals.

2. All hazardous materials shall be disposed of in accordance with Michigan Hazardous Waste Management rules.

    a. Only non-hazardous, non-vaporous, non-fuming, non-flammable, aqueous solutions between pH 5 and pH 9 may be poured down the drain.
    b. Hazardous waste shall never be placed in any common solid trash container.
    c. Twice annually hazardous waste is appropriately packaged, labeled and transported offsite to a RCRA permitted Treatment, Storage and Disposal Facility (TSDF) for analysis and treatment.
    d. Waste is generated and contained near the point of generation, which never exceeds the 55gal satellite accumulation requirements.
    e. Unlabeled containers apparently containing liquid and/or solid chemicals shall be treated as hazardous waste and disposed of using the procedures described above.

H. Accidents – Procedures and Contact Information

1. Eye Contact: Promptly flush eyes with large amounts of water for a prolonged period (15 minutes), occasionally lifting the lower and upper lids. Seek medical attention.

2. Ingestion: Try to determine the chemical ingested. Contact poison control for instruction. Seek medical attention immediately and contact Public Safety.

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American Association of Poison Control Centers

Phone: 1-800-222-1222

Department of Public Safety Contact Information-24 Hour Emergency

You can reach the DPS from any campus phone by dialing:

McNichols Campus – 1234

Corktown Campus and Riverfront Law School – 1123

Non-University Telephones dial (313) 993-1123

3. Skin Contact: For both solid and liquid chemical contact, dust off excess solid if applicable, promptly flush the affected area with water, and remove any contaminated clothing. If irritation persists after washing, seek medical attention.

4. Inhalation: Move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. When breathing is difficult, properly trained personnel may assist the affected person. Contact public safety and/or seek medical attention.

5. Clean-up: Promptly clean up spills using appropriate personal protective equipment (PPE), equipment, and proper disposal. Locate appropriate spill cleanup kits in areas where minor spills may occur.

I. Spills

1. Any spill or release of a hazardous chemical, biological or radioactive material must be reported to the Department of Public Safety, with the exception of small volume spills in teaching and research laboratories that would normally be cleaned up by trained University personnel in accordance with applicable state and federal regulations.

2. If the chemical in the spill is judged to present an immediate hazard, evacuation is to be absolute, and the area shall be isolated until the Department of Public Safety is contacted.

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3. If hazardous vapors are present, the area shall be isolated, and the Department of Public Safety contacted. Only Department of Public Safety personnel trained in the use of respirators may enter the area.

4. If a volatile, flammable material is spilled, immediately extinguish flames such as Bunsen burners and evacuate the area. Consult the SDS for appropriate cleanup procedures. If the quantity exceeds the employee's ability or training to handle the spill, seal the area and contact the Department of Public Safety.

5. If there is no immediate danger (flammability, toxicity, reactivity, corrosivity), cleanup procedures listed on the SDS shall be followed. Appropriate PPE shall be used.

6. A spill kit shall be maintained in each laboratory working with chemicals. It will be clearly marked "Spill Kit - For Safety Emergency Only." Spill kits shall be inspected and stocked frequently by the storeroom manager.

7. If the spill is a hazardous chemical, all of the materials involved in the cleanup will be considered to be hazardous waste and must be disposed of as such.

II. Facility, Safety and Control Measures

A. Laboratory Design

1. All work surfaces (e.g., bench tops, counters, etc.) must be impervious to the chemicals and materials used in the laboratory.

2. Wet laboratory areas must have chemically resistant, impermeable, slip resistant flooring.

3. Doors should have view panels to prevent accidents caused by opening the door into a person on the other side and to allow individuals to see into the laboratory in case of an accident or injury, and should open in the direction of egress.

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4. There must be adequate in-laboratory storage cabinets to store reagents and chemicals and to provide segregation of incompatible materials. Storage design is to be based on projected quantities and waste management practices.

5. The laboratory shall have a means of securing specifically regulated materials such as controlled substances regulated by the Drug Enforcement Administration and radioactive materials, select agents, etc. (i.e., lockable doors, lockable cabinets etc.), where applicable.

6. Each laboratory using hazardous materials, whether chemical, biological, or radioactive, should contain a sink for hand washing.

B. Ventilation and Engineering Controls

1. A laboratory ventilation system should include the following characteristics and practices:

    a. Heating and cooling should be adequate for the comfort of workers and operation of equipment.
    b. A negative pressure differential must exist between the amount of air exhausted from the laboratory and the amount supplied to the laboratory to prevent uncontrolled chemical vapors from leaving the laboratory.
    c. The air in chemical laboratories is to be continuously replaced so that concentrations of odoriferous or toxic substances do not increase during the workday.
    d. Laboratory air should not be recirculated but exhausted directly outdoors.
    e. Ventilation must be inspected and maintained on a regular basis. There should be no areas where air remains static or areas that have unusually high airflow velocities.

2. Fume hoods are ventilated, enclosed workspaces intended to capture, contain and exhaust harmful or dangerous fumes, vapors and particle matter generated by procedures conducted with hazardous chemicals.

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a. Fume hoods are provided in each laboratory and provide extra protection via a hood sash.

3. Biological Safety Cabinets (BSC)

   a. BSCs are designed to provide personnel, environmental, and product protection when appropriate practices and procedures are followed. Three kinds of biological safety cabinets, designated as Class I, II and III, have been developed to meet varying research and clinical needs.

      i. Class I BSC

         A. Provides personnel and environmental protection, but does not provide product protection.
         B. Similar in terms of air movement to a chemical fume hood, but has a HEPA filter in the exhaust system to protect the environment.
         C. Unfiltered room air is drawn in through the work opening and must maintain an inward flow with a minimal velocity of 75 linear feet per minute.
         D. Class I BSCs are used specifically to enclose equipment or procedures with potential to generate aerosols.

      ii. Class II BSC

         A. The Class II BSCs provide personnel, environmental, and product protection.
         B. All Class II cabinets are designed for work involving microorganisms assigned to biosafety levels 1, 2, 3 and 4.
         C. Room air is drawn through the face opening of the cabinet at a minimum measured inflow velocity of 100 lfm.

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iii. Class III BSC

A. The Class III BSC was designed for work with highly infectious microbiological agents and for the conducting of hazardous operations and provides maximum protection for the environment and the worker.
B. Both supply and exhaust air are HEPA filtered.
C. Exhaust air must pass through two HEPA filters, or a HEPA filter and an air incinerator, before discharge directly to the outdoors.
D. Class III cabinets are not exhausted through the general laboratory exhaust system.

b. A BSC must be routinely inspected and tested by training personnel, following strict protocols, to verify that it is working properly. This process is referred to as certification of the cabinet and must be performed annually.

C. Safety Equipment and Inspections (*See Appendix D on Inspection Tags*)

1. The CHO shall ensure that adequate emergency equipment is available in the laboratory and inspected periodically to ensure that it is functioning properly. Records of these inspections will be held in the office of the CHO.

2. Emergency equipment items available include: eyewash station and safety shower, fire extinguishers of the appropriate type, telephone, fire blanket, and identification signs, where applicable.

3. Laboratories may or may not have a basic first aid kit present. The need is dependent on the type of hazards and level of risk associated within the laboratory. A fully stocked first aid kit is located in the laboratory manager's office and is inspected regularly.

4. Multipurpose ABC type fire extinguishers are available in each laboratory, as well as class D and clean room fire extinguishers where necessary.

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5. Eyewash and Shower Stations

    a. Plumbed eyewash stations provide at least 0.4 GPM of tepid, potable water for 15 minutes.

        i. Plumbed eyewash stations are activated weekly for maintenance and documented on an inspection tag.
        ii. Eyewash units are inspected annually for compliance.

    b. Self-contained eyewash stations provide at least 0.4 GPM of tepid, potable water for 15 minutes.

        i. Weekly inspections are required according to manufacturer's specifications and documented on an inspection tag.
        ii. Annual inspections are required for compliance.

    c. Shower stations provide a tepid, potable water supply at a minimum of 20 GPM for 15 minutes.

        i. Showers are activated weekly for maintenance and documented on an inspection tag.
        ii. Annual inspections are required for compliance.

6. Inspection tags must contain the following information:

    a. Date
    b. Initials of inspector
    c. Additional comments, if any, pertaining to the function of the inspected system.

D. Personal Protective Equipment (*See appendix C on PPE requirements*)

1. The Occupation Safety and Health Administration (OSHA) requires PPE to meet the following ANSI (American National Standards Institute) standards:

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a. Eye and Face Protection (USA Standard for Occupational and Educational Eye and Face Protection)
b. Head Protection
c. Foot Protection
d. For hand protection, there is no ANSI standard for gloves but OSHA recommends that selection be based upon the tasks to be performed and the performance and construction characteristics of the glove material. For protection against chemicals, glove selection must be based on the chemicals encountered, the chemical resistance, and the physical properties of the glove material.

2. It is the responsibility of the University to provide appropriate safety and emergency equipment for employees and students.

3. Protective apparel must be compatible with the required degree of protection for the substances being handled.

4. Chemical splash safety goggles must be worn at all times when working with chemicals and when a splash hazard exists. Eyeglasses, even with side shields, do not provide adequate protection against chemical splashes.

5. A face shield (in addition to safety goggles) are to be used when there exists a possibility of explosion or implosion.

6. Protective eyewear must be worn when working with lasers or other wavelengths of light that are damaging to the eye.

7. Gloves that are appropriate to the degree of hazard must be worn at all times when handling hazardous material.

8. Lab coats or aprons made of chemically inert materials must be worn in the laboratory.

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E. Administrative controls

1. Inventory Control and Safety Data Sheets (See appendix E for SDS information)

    a. A chemical inventory is maintained and updated regularly by the laboratory manager.
    b. Unneeded items are to be discarded or returned to the storeroom.
    c. MSDSonline is used to maintain updated SDS information and is immediately available to all personnel in the science departments.
    d. Safety Data Sheets (SDSs)
    SDSs are intended to provide comprehensive information about a substance or mixture for use in workplace chemical management.

        i. Before starting any task, the SDS to the specific chemical being handled is to be consulted.
        ii. The format of an SDS includes:

            A. Identification
            B. Hazard(s) identification
            C. Composition/information on ingredients
            D. First-aid measures
            E. Fire-fighting measures
            F. Accidental release measures
            G. Handling and storage
            H. Exposure controls/personal protection
            I. Physical and chemical properties
            J. Stability and reactivity
            K. Toxicological information
            L. Ecological information
            M. Disposal considerations
            N. Transport information
            O. Regulatory information
            P. Other information

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2. Standard Operating Procedures (SOPs)

For laboratory work at University of Detroit Mercy which involves the use of Hazardous Chemicals, standard operating procedures have been provided to reduce potential safety and/or health hazards caused by such use. These procedures include various engineering control measures such as laboratory fume hoods, maintenance procedures including testing proper function of equipment, and the use of appropriate Personal Protective Equipment (PPE) and the maintenance of such equipment. See Appendix G and H for SOP forms.

3. Hazard Identification and Labels

For all labeling of chemicals in secondary containers and for re-labeling purposes, HMIS (Hazardous Materials Information System) labels are used to notify employees in the workplace of associated hazards. The NFPA (National Fire Protection Association) fire diamond label is intended for emergency response personnel and are placed in all areas where fire hazards exist. Both labeling systems must be consistent with OSHA's revised Hazard Communication Standard 2012, which is currently in alignment with the new Global Harmonization Standard (GHS).

HMIS – New Version

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HMIS – Old Version

NFPA

Both HMIS and NFPA labeling systems scale hazards numerically from 0 (least hazardous) to 4 (extremely hazardous). *See appendix D for GHS and HMIS/NFPA information and labeling practices*.

Labeling requirements are as follows:

a. The existing label on a container entering the workplace from a supplier must not be removed, altered, or defaced.
b. If a chemical is transferred to a secondary container, the new container shall have an adequate identifying label to include:

    i. The identity of the chemical
    ii. The concentration
    iii. Appropriate hazard warnings (HMIS, NFPA labeling, etc.)
    iv. Portable containers must comply with the labeling requirements listed above if any of the following events occur:

        A. The material is not used within the work shift of the individual who makes the transfer,
        B. The worker who made the transfer leaves the work area,

C. The container is moved to another work area and is no longer in the possession of the worker who filled the container,

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D. Labels on portable containers are not required if the worker who made the transfer uses all of the contents during the work shift.

c. Flammable cabinets and cabinets containing acids and bases must be labeled appropriately.
d. Refrigerators must be labeled prohibiting food, beverage, and other consumables of the like. Labeling must also warn of hazards associated within the unit.

4. Signs and Posters

a. Emergency contact phone numbers are posted by every phone or on every door where hazardous chemicals are used or stored.
b. Signs are posted indicating the location of exits, evacuation routes, safety showers, eyewash stations, fire extinguishers, and other safety equipment if not already visible.

5. Inspection, Incident, and Training Reporting

a. Inspection reports

i. Reports must be completed and retained by the CHO.
ii. Safety equipment must be marked to indicate the date and the results of the last inspection conducted by the CHO or other experienced professional.
iii. Records indicating the dates of repairs and regular maintenance of safety equipment are to be retained by the CHO.

b. Training records will be retained by the CHO.

c. Incident reports will be completed by the Department of Public Safety.

d. Medical and Exposure records will be retained by the Wellness Center.

e. Waste disposal records will be retained by the CHO.

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6. Exposure Monitoring

a. If there is reason to believe that exposure levels for a regulated substance have exceeded the action level or permissible exposure limit, the Department of Public Safety shall ensure that the employee or student exposure to that substance is measured.

b. If a substance has an exposure monitoring requirement and if there is reason to believe that exposure levels for that substance routinely exceed the action level or in the absence of the action level, the permissible exposure level (PEL), the Department of Public Safety must be notified.

c. In the event that an employee is exposed to levels of a hazardous chemical exceeding the established PEL or TLV (threshold limit value), or shall the employee exhibit signs of symptoms of such exposure, the employee shall be provided appropriate medical treatment by contacting the Department of Public Safety.

III. Safe Work Practices

A. Job Hazard Assessment

A Job Hazard Analysis (or Assessment) is a technique that focuses on job tasks as a way to identify hazards before they occur. It focuses on the relationship between the worker, the task, the tools, and the work environment. The goal is to recognize workplace hazards and eliminate or control them as early as possible to help prevent injuries and illnesses.
A JHA is required by OSHA under the following regulation:

1910.132(d) (2)
The employer shall verify that the required workplace hazard assessment has been performed through a written certification that identifies the workplace evaluated; the person certifying that the evaluation has been performed; the date(s) of the hazard assessment; and, which identifies the document as a certification of hazard assessment.

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A one-time Job Hazard Analysis for each task shall be completed in writing by employees and kept on file in the office of both the laboratory manager and the CHO. When completing the Job Hazard Analysis form (See appendix G for JHA instructions and report form), the following should be considered:

1. What can go wrong?
2. What are the consequences?
3. How could it arise?
4. What are other contributing factors?
5. How likely is it that the hazard will occur?

B. Chemical Hazard Awareness

A health hazard as defined by OSHA is "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, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system and agents which damage the lungs, skin, eyes, or mucous membranes." Chemicals pose both health and physical hazards. To recognize these hazards, an understanding of chemical exposure, chemical 'phases,' associated health effects, toxicity and chemical symptoms are essential.

1. Routes of exposure:
   Chemicals enter the body in the following ways:
   a. Inhalation: Breathing in vapors, gas or dust in the air is the easiest and fastest means of exposure to chemical substances because these substances are readily absorbed in the respiratory tract.
   b. Absorption (skin contact): The most common path for chemical exposure is on the skin or in the eyes. Skin damage may occur, and/or consequently be absorbed through the skin into the bloodstream.

c. Ingestion: Ingestion of chemical substances usually occurs accidentally or unknowingly. This can happen when chemicals have spilled or settled onto food, beverages, cigarettes, beards, or hands.

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d. Injection: Though less common in most workplaces, it can occur when a sharp object (e.g., a needle) punctures the skin and injects a chemical (or virus) into the bloodstream.

e. Once chemicals have entered your body, some can move into your bloodstream and reach internal "target" organs, such as the lungs, liver, kidneys, or nervous system.

2. Chemical Phases

a. Chemicals take several phases, some more noticeable than others. They can be in the form of solids, liquids, dusts, vapors, gases, fibers, mists, and fumes.

i. Solids and liquids are easier to recognize since they can be seen.
ii. Dusts and mists may or may not be visible, depending upon their size and concentration.
iii. Fumes, vapors, and gases are usually invisible.

3. Toxicity

Toxicity is defined as the degree to which a substance (a toxin or poison) can harm humans or animals. The toxicity of a substance is influenced by several factors but not limited to:

a. Route of exposure
b. Dose
c. Duration of exposure
d. Frequency of exposure
e. Species

4. Acute and Chronic Health Effects

a. Acute effects are short-term, immediate side effects from chemical exposure. They may be minor, like nose or throat irritation, or they could be serious, like eye damage or passing out from chemical vapors.

b. Chronic effects are long-term effects that arise from years of chemical exposure and are usually permanent.

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5. Symptoms of Chemical Exposure

a. The following table lists some common chemical exposure symptoms and their possible causes.

Head	Dizziness, headache	Solvents, paint, ozone, smoke (including tobacco)
Eyes	Red, watery, irritated, grainy feeling	Smoke, gases, various dusts, vapors from paint and cleaners
Nose and Throat	Sneezing, coughing, sore throat	Smoke, ozone, solvents, vapors from paint and cleaners
Chest and Lungs	Wheezing, coughing, shortness of breath, lung cancer	Metals fumes, various dusts, smoke solvents, vapors from paint and cleaners
Stomach	Nausea, vomiting, stomachache, diarrhea	Some metal fumes, solvents, paint vapors, long-term lead exposure
Skin	Redness, dryness, rash, itching, skin cancer	Solvents, chromium, nickel, detergents and cleaners, paint on skin
Nervous System	Nervousness, irritability, sleeplessness, tremors, loss of balance or coordination	Long-term solvent exposure, long-term lead exposure

Reproductive System	For men: Low sperm count, damage to sperm For women: Irregularities in menstruation, miscarriage, damage to egg or fetus	Lead, toluene, some other solvents, ethylene oxide gas

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IV. Training

A. Training for Employees

1. The University shall provide employees with information and training to ensure that they are aware of the hazards of chemicals present in their work area.

2. The University shall provide Right-To-Know training opportunities for all laboratory employees at risk. The goal is to assure that all individuals at risk are adequately informed about the work in the laboratory, its risks, and what to do if an emergency occurs.

    a. Employees shall be trained on potential biological and chemical hazards in the laboratory and on the Chemical Hygiene Plan. This training shall be provided to all employees who work in the laboratory, as well as those who are required to enter a laboratory where chemical exposure may occur.
    b. Employees shall be trained in measures to protect themselves from exposure to hazardous chemicals and biological agents, including the location and proper use of protective equipment and emergency equipment.
    c. All laboratory employees shall be trained to read and understand SDSs.
    d. All employees shall be trained in labeling and storage procedures.

3. The training programs exhibit the following qualities:

    a. Commitment to workplace safety

b. Identifying hazards and assessing risk
c. Development of written programs and processes. The following are some common regulations required by OSHA to have written programs.

i. Hazard Communication Program.
ii. Respiratory Protection Program.
iii. Personal Protective Equipment.
iv. Bloodborne Pathogens Program.

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d. Educating employees.
e. Investigate/report all accidents and incidents.
f. Yearly evaluations of safety processes

B. Training for Students

1. Faculty shall provide a safe environment for student learning by providing safety training to students.

2. At the beginning of the term and prior to laboratory activities, class time shall be devoted to safe laboratory practices.

3. Instruction in laboratory safety shall be provided to all students enrolled in laboratory classes. Students enrolling after safety instruction has taken place shall receive instruction prior to being permitted to engage in laboratory activities.

4. The extent of student training shall be based on their course of study, the laboratory facility, University policies, the Chemical Hygiene Plan, and the level of chemical handling and potential exposure to hazardous chemicals.

5. Safety training shall include the importance and the content of the label and of safety data sheets. As appropriate, the student shall also be introduced to other sources of chemical safety information.

C. Access to Information

1. Employees and students shall be informed of the location, availability, and content of the "Laboratory Standard" 29 CFR Part 1910 and the Chemical Hygiene Plan.

2. Employees and students shall be informed of the location, availability, and use of personal protective equipment and emergency equipment as outlined in the Chemical Hygiene Plan.

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3. Employees shall know the location and availability of SDS's.

4. Medical records shall be furnished upon request within 24 hours.

v. Responsibilities

A. Department Chair or Dean

1. Assumes responsibility for personnel engaged in the laboratory use of hazardous chemicals.

2. Provides the CHO with the support necessary to implement and maintain the CHP.

3. After receipt of laboratory inspection report from the CHO, the laboratory supervisors meet with the CHO to discuss cited violations and to ensure timely actions to protect trained laboratory personnel and facilities and to ensure that the department remains in compliance with all applicable federal, state, university, local and departmental codes and regulations.

4. Provides budgetary arrangements to ensure the health and safety of the departmental personnel, visitors, and students.

B. Chemical Hygiene Officer

1. Establishes, maintains, and revises the Chemical Hygiene Plan.

2. Creates and revises safety rules and regulations.

3. Monitors procurement, use, storage, and disposal of chemicals.

4. Conducts regular inspections of the laboratories, preparation rooms, and chemical storage rooms, and submits detailed laboratory inspection reports to administration.

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5. Maintains inspection and personnel training records.

6. Monitors inventory and SDS records.

7. Assists in developing and maintaining adequate facilities.

8. Seeks ways to improve the Chemical Hygiene Plan.

C. Laboratory Manager

1. Understands applicable environmental health and safety rules, including the contents of the CHP.
2. Identifies hazardous conditions or operations in the laboratory and notifies the CHO and other laboratory staff.

3. Collaborates with the CHO to establish SOPs and hazard assessments to effectively control or reduce hazards.

4. Ensures that all laboratory personnel that work with hazardous chemicals receive appropriate training.

5. Ensures that appropriate PPE (e.g., laboratory coats, gloves, eye protection, etc.,) and engineering control equipment (e.g., chemical fume hood, BSC) are made available, in good working order, and being used properly.

6. Actively enforces all applicable safety procedures and ensures that the CHP is followed by lab staff and all visitors.

D. Laboratory Staff

1. Ensure that students comply with the CHP and do not operate equipment or handle hazardous chemicals without proper training and authorization.

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2. Always wear PPE that is compatible to the degree of the hazard of the chemical.

3. Follow all pertinent safety rules when working in the laboratory to set an example.

4. Review laboratory procedures for potential safety problems before assigning to students.

E. Students

1. Read, understand, and follow all safety rules and regulations that apply to the area.

2. Plan and conduct each operation in accordance with the institutional chemical hygiene procedures.

3. Promote good housekeeping practices in the laboratory or work area.

4. Notify the instructors of any hazardous conditions or unsafe work practices.

5. Use PPE as appropriate for each procedure that involves biological or chemical hazards.

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