# CHEMICAL HYGIENE PLAN

## SCHOOL OF PURE AND APPLIED SCIENCES

## FLORIDA SOUTHWESTERN STATE COLLEGE

**Updated by: Nina Infantado, Chemical Hygiene Committee**
**Last Review Date: 2/28/2020**

**Most items in this document are directly adopted from Laboratory Safety Guidance (OSHA 3404-11R 2011) by Occupational Safety and health Administration.**

# Table of Content

# Section 1: Introduction

The purpose of Chemical Hygiene Plan is to provide safe practices and protocols for maintaining safe environment for students, faculty, staffs, workers and visitors. The Chemical Hygiene Plan (CHP) is written in compliance with the following federal and state regulations:

- 29 CFR 1910.1450 "Occupational Exposures to Hazardous Chemicals in Laboratories"
- 29 CFR 1910.1200 "Hazard Communication"
- 40 CFR 260.xx "General Hazardous Waste Management"
- National Fire Protection Association Requirements

CHP provide guidelines for prudent practices and procedures for the use of chemicals in the laboratory. The Laboratory standard requires that the CHP set forth procedures, equipment, PPE and work practices capable of protecting workers from the health hazards presented by chemicals used in the laboratory. The following information are included in the CHP:

*Standard Operating Procedures (SOPs):* Prudent laboratory practices which must be followed when working with chemicals in a laboratory. These include general and laboratory-specific procedures for work with hazardous chemicals.

*Control Measures:* Implementation of various measures to reduce worker exposure to hazardous chemicals including engineering controls, the use of personal protective equipment (PPE) and hygiene practices.

*Information and Training:* Required information and training to ensure that laboratory users are apprised of the hazards of chemicals in the areas and related information.

*Medical Consultations and Examinations:* Provisions for medical consultation and examination when exposure to a hazardous chemical has or may have taken place.

The appendices at the end of this document also contain the essential information for laboratory personnel. CHP should be reviewed annually, at a minimum, by the Chemical Safety Committee and updated accordingly.

# Section 2: Responsibilities

Responsibility and accountability throughout the organization are key elements in a strong safety and health program. The welfare and safety of each individual depends on clearly defined roles within the team and personal responsibility.

### 2.1 Florida SouthWestern State College

Florida SouthWestern State College, through the support of our President, Provost, and The Dean of School of Pure and Applied Sciences, is to promote the Laboratory Safety Practices and provide the necessary measures. Among those includes designating Chemical Hygiene Committee, informing faculty and staffs on health and safety policies, and implementing the policies.

## 2.2 Chemical Hygiene Committee

Chemical Hygiene Committee will develop and implement appropriate laboratory safety policies and practices. Responsibilities include, but are not limited to:

- Establishes, maintains, and revises chemical hygiene plan.
- Assists Key Safety Personnel in developing and maintaining adequate facilities.
- Advising administrators on improved laboratory safety policies and practices.

## 2.3 Key Safety Personnel

The key safety personnel of each laboratory room must be assigned. Laboratory manager(s) are in charge of teaching labs and hence they will be the main contacts for any safety issues regarding the teaching labs. Research labs will have assigned person(s) who is/are most knowledgeable about hazardous materials and processes that occur in the room. The safety personnel are responsible for:

- Monitoring procurement, use, and disposal of chemicals in the lab.
- Standard Operating Procedures (SOPs) for all hazardous substances, equipment, conditions and activities are in place.
- Performing routine housekeeping inspections and inspections of emergency equipment.
- Ensuring appropriate audits are maintained.
- Knowing current legal requirements concerning regulated substances.
- Seeking ways to improve the laboratory safety program.

## 2.4 Laboratory Instructors/ Research Advisors

Laboratory instructors and research advisors, collectively called laboratory supervisors, have overall responsibility for chemical hygiene in the laboratory. They will ensure that:

- Appropriate training has been provided to the users/students.
- Laboratory users know and follow chemical hygiene rules.
- Know the current legal requirements concerning regulated substances.

## 2.5 Laboratory Users

Laboratory users are defined as the person(s) actually working in the laboratories. These users must:

- Get proper training and learn safety rules.
- Plan and conduct each operation in accordance with chemical hygiene procedures, appropriately using PPE and engineering controls.
- Develop good personal chemical hygiene habits.
- Report all accidents, potential hazards, and potential chemical exposures immediately.

# Section 3: Hazard Communication

Hazard Communication Standard (29 CFR 1910.1200) is designed to protect against injuries and illnesses caused by the chemical source. The goal is to provide employers and workers with sufficient information to recognize, evaluate, and control chemical hazards and take appropriate protective measures.

### 3.1 Chemical Inventory

It is expected that up-to-date record of the chemical inventory is kept by Laboratory Key Personnel.

### 3.2 Hazard Identification and Labels

Every chemical and chemical waste must be properly labeled. Labels on the containers of hazardous chemicals are not to be removed or defaced. If a chemical has been transferred to a secondary container, the new container should be labeled with chemical name, formula, and concentration if it is in solution. Unlabeled bottles should not be opened and such chemicals should be disposed of immediately as hazardous waste.

### 3.3 SDS

Safety data sheets (SDS) or formerly known as material safety data sheets (MSDS) for chemicals that workers may be exposed to must be made available. Each storage area with chemicals in the room must have a binder or electronic version of SDSs for corresponding chemicals. SDS can be obtained by requesting from the chemical company or downloaded from the manufacturer's website.

### 3.4 Signs and Posters

In order to inform the laboratory users as well as non-laboratory users such as custodians, contractors, emergency responders, and guests of the hazards associated with the laboratories, appropriate signs should be posted outside of the room. Prominent signs of the following types should be posted inside:

- Emergency telephone numbers of emergency personnel/facilities, and Campus Safety
- Location signs for safety showers, eyewash stations, other safety and first aid equipment, and exits
- Warnings at areas or equipment where special or unusual hazards exist.

### 3.5 Training

Laboratory employees and students must have proper training before conducting work in the laboratory. A list of required training is provided below for safety communications. It is not assumed that everyone needs all the training listed. Individual training requirements should be based on work assignments mandated by the class professor or research professor. Laboratory

safety training is a minimum requirement before beginning work in the laboratory and other specific trainings may be given later as per needed basis.

### 3.5.1 Laboratory Safety Training

Every person working in the lab must complete Laboratory Safety Training which include the following basic safety practices:

- Review of general safety practices in a laboratory (Appendix A)
- Awareness of the reference materials such as Safety Data Sheets (SDS) and Chemical Hygiene Plan (CHP) available.
- Proper handling of the hazardous chemicals and wastes
- Proper use of PPE and Engineering Controls
- Locations of emergency equipment such as eyewash stations, showers, and exit routes

### 3.5.2 Biosafety Training

Persons working with biohazard materials must be trained prior to the beginning of work. All persons entering the BioSafety Level 2 (BSL2) and above room must complete the specific biosafety training regarding the materials used in the room.

### 3.5.3 Specific Hazardous Chemical or Process

Laboratory instructors and research advisors are responsible for giving training for specific hazards associated with the chemicals or processes used in their laboratory. The topics may include but not limited to the following:

- Review of specific hazards and exposure limits
- Use of engineering controls and personal protective equipment to lessen hazards
- Performing specialized procedures
- Operating specialized equipment and standard operating procedures
- Chemical exposure monitoring
- Signs and symptoms associated with exposure to hazardous chemicals
- Procedures for handling and disposing hazardous wastes
- Fire safety and emergency procedures

Documentation of Training – All documentation of training must be secured in accordance with COP 08-0817 (Appendix F).

# Section 4: Control Measures to Minimize Exposures

## 4.1 Engineering Controls

### 4.1.1 Ventilation Systems

Laboratories should have proper ventilation in place to prevent the spreading of fumes and contaminating agents from the laboratory to outside areas. The laboratory doors should be kept closed.

### 4.1.2 Chemical Fume Hoods

Fume hoods are the local exhaust systems that will prevent any hazardous substances from recirculating inside the building. A properly operating and correctly used laboratory fume hoods can eliminate volatile liquids, dusts, and mists. It is strongly encouraged that laboratory fume hood will be used when working with hazardous chemicals. However, fume hoods are NOT for storage of chemicals or hazardous materials. The hood sash should be kept closed when a person is not working.

Laboratory fume hoods must be inspected on an annual basis and tagged with the last date of inspection. Individuals in each lab are responsible for monitoring the malfunction of the hoods and notifying the facilities. Always evaluate the condition of the hood by checking for:

- Improper storage of materials inside the fume hood
- General cleanliness
- Physical damages to the fume hood such as broken sash
- Lighting, fume hood indicator, airflow monitor, and alarm, etc.

### 4.1.3 Biological Safety Cabinets

Biological safety cabinet (BSC) is required for safe manipulation of moderate and high-risk infectious agents such as Biosafety Level 2 (BSL 2) and 3 (BSL 3) agents. BSCs protect laboratory workers and the immediate environment from infectious aerosols generated within the cabinet.

### 4.1.4 Flammable Storage Area

Chemicals with a flash point below 93.3 °C (200 °F) should be considered fire hazard chemicals and must be stored in a proper flammable storage cabinet. Flammable chemicals are ones with flash point below 37.8 °C (100 °F) and chemicals with flash point between 100 °F – 200 °F are defined as combustible. No more than 60 gallons of flammable liquids, nor more than 120 gallons of combustible liquids may be stored in a flammable storage cabinet. For certain flammable chemicals that need refrigeration, the refrigerator used must be approved for flammable storage.

## 4.2 Administrative Controls

### 4.2.1 Developing Chemical Hygiene Plan

FSW recognizes that its employees and students engage in the laboratory experiments that use hazardous chemicals from time to time. Therefore, in order to provide safe work zone, chemical hygiene plan is developed and implemented.

### 4.2.2 Developing Standard Operating Procedures

Standard Operating Procedures (SOP) for the use of hazardous processes, equipment, or chemicals must be developed. These are written instructions of step by step procedures in performing a certain experiment or process for properly handling the hazardous materials. SOPs should be written by laboratory personnel who are most knowledgeable and involved with the process.

## 4.3 Personal Protective Equipment

Personal protective equipment (PPE) is required for everyone entering a laboratory containing hazardous chemicals. Key Laboratory Personnel should identify the required level of personal protective equipment and practices needed for each hazardous chemical or process.

### 4.3.1 Eye Protection

All persons entering the laboratory must wear appropriate eye protection when hazardous chemicals, materials, or equipment is being used. Safety glasses are the standard eye protection equipment used. However, safety goggles may be required if there is a risk of chemical splash. Safety goggles differ from safety glasses in that they form a seal with the face, therefore isolating the eyes from the hazard. Face shields may also be required when working with potentially explosive chemicals. While working with UV lamp or UV-transilluminator, a UV blocking goggles should be used to prevent damage to the eyes.

### 4.3.2 Hand Protection

Latex, nitrile, or rubber gloves are available in every lab for safe handling of hazardous chemicals and biological wastes. It is important to remember that gloves degrade over time, so they should be changed as necessary for adequate protection. For handling hot glasswares and equipment, heavy duty gloves made for specific purposes must be worn. Gloves should be selected based on the type of hazards involved.

- Latex – not the first choice as many develop allergies to this material.
- Nitrile – protects against most chemicals and infectious agents.
- Rubber – protects against mild corrosive materials.
- Neoprene – protects against most solvents, oils, and mild corrosive materials.

For an extensive list of chemicals and compatibility of gloves can be found on the following reference websites:

(http://pub.extranet.fsu.edu/sites/safety/safetywiki/Wiki%20Pages/OSHA%20Glove%20Selection%20Chart.aspx) and (http://www.sc.edu/ehs/LabSafety/gloves.htm).

- Do NOT wear gloves when touching common surfaces such as telephones, computers, and door knobs.
- Do NOT wear gloves outside of the lab (or wear on only one hand). When transporting hazardous materials between the labs, use secondary containers that can be carried without gloves.

#### 4.3.3 Body Protection

The clothing for the lab must be chosen appropriately and should present minimal exposed skin. Lab coats or lab aprons can also be worn for extra protection. If needed, protective sleeves may also be worn for maximum coverage from the hazards. The lab coats should be fire-resistant and worn fully buttoned with sleeves rolled down. In the case of splatter and spills, remove the lab coat promptly to minimize skin contact with hazardous chemicals.

- Do NOT wear lab coats outside of the laboratory except when transporting hazardous materials from one place to another.
- Do NOT launder lab coats with other clothing.

#### 4.3.4 Respiratory Protection

Hazardous materials should be handled in the chemical fume hood or biosafety cabinet. Therefore, respiratory protection is generally not needed in a laboratory. However, certain conditions may pose the requirement for the respiratory protection. These include but not limited to:

- Accidental spill of chemicals outside the fume hood.
- Performing an unusual operation that cannot be conducted under a fume hood or biosafety cabinet.
- When weighing powdered chemicals that produce dust.

Disposable filtering masks can be used for dusts but for chemicals that are extremely toxic, use appropriate mask defined by applicable regulations.

### 4.4 Laboratory Safety Equipment

FSW provides the following in every laboratory room:

- First aid kit
- Safety showers and eyewash units for the incidents of chemical spills and splashes
- Fire blankets and fire extinguishers in the case of fire
- The laboratories are also equipped with the sprinkler systems for the highest security from fire.
- Laboratory doors have view panels to prevent accidents and for the rescuers to see through during fire or accidents.

All safety equipment should be accessible at any time. Do not store or leave any objects near and on the path to the safety equipment. Laboratory Key Personnel should check all safety equipment regularly and report any problems. Fire extinguishers must be inspected regularly. The view panels of the laboratories must not be blocked at any time.

Spill kits must be available for specific hazards of the chemicals used in the laboratory. Amorphous silica spill absorbents may be used for all types of spills, except hydrofluoric acid spills. Hydrofluoric acid can be neutralized with sodium bicarbonate or use clay absorbent.

# Section 5: Handling of Hazardous Materials

By OSHA's definition, a hazardous material is anything that presents a physical hazard or health hazard. The examples that pose physical hazards are combustible and flammable materials, oxidizers, pyrophoric materials, compressed gases, and operating certain equipment. Health hazards include carcinogens, toxic agents, irritant or corrosive chemicals, and certain biological agents that can cause diseases.

### 5.1 Chemicals

Handling chemicals must be done only by trained personnel. SDS and label information should be read before using a chemical for the first time. It must be ensured that proper engineering controls and PPE are in place for handling of any hazardous chemicals.

Chemical Procurement:

- Information on proper handling, storage, and disposal should be known by the person purchasing the chemical.
- Proper protective equipment and handling and storage procedures should be in place before receiving a shipment.
- Only the minimum amount of the chemical needed to perform the planned work should be ordered.
- Only containers with adequate labels should be accepted.

Chemical Storage:

- Chemicals should be stored according to the hazard category and compatibility.
- SDS and information on label should be followed for storage requirements.
- Maintain the existing labels on every container. If it was defaced, it must be replaced immediately with a new label containing chemical identification and appropriate hazard warnings.
- Chemical shipments should be dated upon receipt.
- Peroxide formers should be dated upon receipt, again dated upon opening, and stored away from heat and light with tightfitting, nonmetal lids.
- Oxidizers, reducing agents, and fuels should be stored separately to prevent contact.
- Chemicals should not be stored in the chemical hood, on the floor, in areas of egress, on the benchtop, or in areas near heat or in direct sunlight.
- Store acids in a dedicated acid cabinet. Nitric acid may be stored there also BUT only if it is kept isolated from all other acids.
- Laboratory-grade, flammable-rated refrigerators and freezers should be used to store sealed chemical containers of flammable liquids that require cool storage. Do not store food or beverages in the laboratory refrigerator.

- Highly hazardous chemicals should be stored in a well-ventilated and secure area designated for that purpose.
- Flammable chemicals should be stored in a spark-free environment and in approved flammable-liquid containers and storage cabinets.
- Chemical storage and handling rooms should be controlled-access areas. They should have proper ventilation, appropriate signage, diked floors, and fire suppression systems.

More information on the proper storage of chemicals along with the incompatible chemicals are listed on the Appendix B.

Transporting chemicals:

- Secondary containment devices, such as bins or buckets, should be used when transporting chemicals.
- The transport container should be break-resistant when transporting chemicals outside of the laboratory or between stockrooms and laboratories.
- High-traffic areas and day/time should be avoided.

### 5.2 Biological Agents

Biological agents include bacteria, viruses, fungi, other microorganisms and their associated toxins. They have the ability to adversely affect human health in a variety of ways, ranging from relatively mild, allergic reactions to serious medical conditions, even death. MSDSs on infectious agents are available at: http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/index- eng.php. Depending on the severity of hazard, biological safety cabinets should be used when handling the biological agents.

- Get appropriate training before starting any work.
- Wear personal protective equipment. Change gloves when contaminated or glove integrity is compromised. Remove gloves and wash hands before leaving the laboratory.
- Decontaminate work surfaces after completion of work and after spill or splash of potentially infectious materials.

### 5.3 Specific Chemical Hazards

Over 400 chemicals that are commonly used in the laboratories including toluene, xylene, acrylamide, and formaldehyde are considered air contaminant and usage must be controlled. The symptoms are listed below for quick determination of possible exposure.

| Chemical Name | Exposure Routes | Symptoms | Target Organs |
|---|---|---|---|
| Toluene | - Inhalation<br>- Ingestion<br>- Skin and/or eye contact<br>- Skin absorption | - Irritation of eyes & nose<br>- Weakness, exhaustion, confusion, euphoria, headache<br>- Dilated pupils, tearing<br>- Anxiety<br>- Muscle fatigue<br>- Insomnia | - Eyes<br>- Skin<br>- Respiratory system<br>- Central nervous system<br>- Liver<br>- Kidneys |

| | | | |
|---|---|---|---|
| | | - Tingling, pricking, or numbness of skin<br>- Dermatitis<br>- Liver & kidney damage | |
| Xylene | - Inhalation<br>- Ingestion<br>- Skin and/or eye contact<br>- Skin absorption | - Irritation of eyes, skin, nose, throat<br>- Dizziness, excitement, drowsiness, incoherence, Staggering gait<br>- Corneal vacuolization (cell debris)<br>- Anorexia, nausea, vomiting, abdominal pain<br>- Dermatitis | - Eyes<br>- Skin<br>- Respiratory system<br>- Central nervous system<br>- GI tract<br>- Blood<br>- Liver<br>- Kidneys |
| Formaldehyde | - Inhalation<br>- Ingestion<br>- Skin and/or eye contact | - Irritation of eyes, skin, nose, throat, respiratory system<br>- Tearing<br>- Coughing<br>- Wheezing<br>- Dermatitis<br>- Potential occupational nasal carcinogen | - Eyes<br>- Skin<br>- Respiratory system |
| Acrylamide | - Inhalation<br>- Ingestion<br>- Skin and/or eye contact<br>- Skin absorption | - Irritation of eyes, skin<br>- Ataxia (staggering gait), numb limbs, tingling, pricking, or numbness of skin<br>- Muscle weakness<br>- Absence of deep tendon reflex<br>- Hand sweating<br>- Tearing<br>- Drowsiness<br>- Reproductive effects<br>- Potential occupational carcinogen | - Eyes<br>- Skin<br>- Central nervous system<br>- Peripheral nervous system<br>- Reproductive system (in animals: tumors of the lungs, testes, thyroid and adrenal glands) |

### 5.4 Others

**Radiation:** Everyone must wear the appropriate eye and face protection when working with or around intense light radiation. A few examples are ultraviolet (UV) light, infrared (IR) light, lasers, and light source from welding.

**Autoclave and Sterilizers:** Steam sterilization is heating in an autoclave utilizing steam under a pressure of 15 psi to achieve a chamber temperature of at least 121 °C (250 °F) for a minimum of 15 minutes. Proper training must be obtained before operating autoclave. Users must be aware of the conditions for appropriate decontamination such as longer run time for large, dense loads. The following is the general guidelines for operation of autoclave.

- Before using the autoclave, check inside the autoclave for any items left by the previous user that could pose a hazard (e.g. sharps).
- Check the materials to ensure that they are compatible with the autoclave.
- Never placed items directly on the autoclave floor. All sterilization/decontamination must be done in a **secondary heat resistant container or tray** to collect any leaked materials.
- Liquids must be autoclaved in bottles designed to withstand autoclaving temperatures. They should **NOT** be sealed to allow pressure equalization. To avoid spillage, do not put more than 2/3 of the volume of the bottle or container.
- Autoclavable bags should be used for solid, non-sharp, infectious waste and disposed of appropriately.
- Make sure the door of the autoclave is fully closed (latched) and the correct cycle has been selected before starting the cycle.
- When the cycle is complete, wait 10 minutes and open the door slowly. Keep your head, face, and hands away from the opening.
- Wear heat-resistant gloves when opening the autoclave door after a cycle. If there is a sharps hazard (e.g. biological waste), wear heat AND cut resistant gloves.
- **Do not autoclave items containing corrosives, solvents or volatiles or radioactive materials.**

Spore testing should be performed annually to make sure that the autoclave is operating properly and adequate for the decontamination of biohazard wastes. Discontinue use immediately and post a sign alerting others if autoclave does not pass the test. Contact the appropriate company for the service.

**Centrifuges:** Without proper handling, centrifuges operate under high speed and high volume can pose dangerous threats. The problems may arise from unbalanced rotors and operator error. An operator must have knowledge of the manufacturer's recommended instructions and the hazards associated with the centrifuge.

- Ensure that the rotor and tubes are thoroughly clean and dry before centrifuge use.
- Do not overfill centrifuge tubes; overfilling centrifuge tubes may cause unwanted leaks and spills.
- Use a fume hood or safety cabinet if aerosols are anticipated or suspected. Use centrifuge safety cups when dealing with infectious organisms.
- Be sure to balance the tubes against each other and within the rotor when loading the centrifuge. For example, when spinning only two tubes, place them on opposite sides of the rotor. Do not place them next to each other. Also, be sure the densities of the materials in the tubes are similar.
- Do not open the lid until the rotor has stopped spinning.

**Compressed Gases:** Although the gas itself may not be flammable, reactive or toxic, compressed gases can be extremely dangerous due to the high pressure and potential explosion.

- Compressed gases must be handled by trained personnel only.
- Personnel must use appropriate PPE, including eye protection.

- Regulators must be used to safely reduce pressure using an appropriate pressure regulator, and must include two gauges indicating cylinder pressure and outlet pressure.
- Cylinders must always be stored in the upright position and secured from tipping over.

**Cryogens and Dry Ice:** Cryogenic use involves ultralow temperature liquid or solid of materials that are normally gases at room temperature. A few examples include liquid nitrogen, liquid helium, and dry ice. Even brief contact with small amounts of cryogenic material may result frostbite and destroy skin or eye tissue permanently. Cryogens will rapidly boil and get converted to a gas which will displace oxygen. Asphyxiation may occur when cryogenic materials are stored or handled without adequate ventilation.

- When using cryogens indoors, the room must be well ventilated. Oxygen monitor is suggested if more than a few liters of cryogenic materials is used or stored.
- Immediately evacuate the area if the oxygen reading indicates below 19.5% oxygen.
- Always wear protective gloves that are well insulated.
- Always wear safety glasses to protect your eyes.
- Wear loose, long sleeves and pants, and close-toed shoes.
- Remove watches and other jewelry on the hands and wrists before working on cryogens.
- Never make direct contact with cryogenic liquids or cryogenic pipes.
- Use containers that are made specifically for ultralow temperatures, such as Dewar flasks.
- Fill containers slowly to minimize thermal shock to the container, and do not overfill.
- Cover dewars when the liquid is not being transferred, but do not tightly plug, as warming cryogens will expand and increase the pressure inside the container, which could result in explosion.
- Keep the dewar upright. Do not bump or drop.

# Section 6: Hazardous Waste Management

Hazardous chemical waste is defined as any unwanted or unusable chemical that exhibits hazardous characteristics and poses potential hazard to individuals, environment, or public health. Some examples include:

- Chemicals from laboratory experiments
- Opened surplus chemicals
- Expired chemicals
- Carcinogens and cytotoxic agents
- Prescription drugs and controlled substances
- Thermometers and other items containing mercury
- Spill clean-up materials, contaminated rags and absorbents
- Used oil – motor, vacuum pump, lubricating
- Used solvents
- Batteries
- Heavy metal containing waste or products (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver)

Wastes and other contaminated materials from experiments should be collected and disposed of appropriately. Satellite accumulation area is where the waste is generated and temporarily stored in a small amount which is generally a laboratory classroom or research lab. Each waste type should be stored in a compatible container pending transfer or disposal. Never store chemicals or solutions in homemade bottles such as peanut butter jars or soda bottles. Waste containers should be clearly labeled and kept sealed when not in use. Incompatible waste types should be kept separate to ensure that heat generation, gas evolution, or another reaction does not occur. Waste containers should be stored in a designated location that does not interfere with normal laboratory operations. Ventilated storage and secondary containment may be appropriate for certain waste types. In order to prevent waste accumulation in the working areas, laboratory managers should collect the wastes from satellite accumulation areas regularly for appropriate disposal.

### 6.1 Identification

Wastes classes must be identified during the collection and separated based on their identity. Solid wastes must be kept separately from the solvent wastes and organic solvents wastes must be isolated from the aqueous wastes. When collecting organic solvents, separate halogenated wastes from non-halogenated wastes. Carcinogens such as ethidium bromide waste must be collected and appropriately labeled with warning sign.

### 6.2 Labeling

Waste containers must be appropriately labeled with the identity of the chemical(s) in the container, writing full names - do not abbreviate. Labels should include the accumulation start date and hazard warnings as appropriate. Surplus chemical to be discarded must be in the original container with “HAZARDOUS WASTE” printed in large, easily recognizable letters.
Biohazard wastes must be clearly labeled with the phrase and international biological hazard symbol. Use appropriate bags such as red or orange-red, puncture resistant, biohazard-labeled bags.

### 6.3 Disposal

Non-regulated wastes or non-hazardous wastes that are inert or innocuous may be disposed of in the trash. Determination on whether a material is inert or innocuous should be verified by consulting the material safety data sheet, container label, or reference manual. All hazardous wastes must be disposed of according to the regulations required by Florida Department of Environmental Protection.

Biohazard Wastes: Biological wastes that may contain a human pathogen must be disposed of as biomedical waste. As defined by 64E-16 F.A.C., all biomedical waste must be disposed of within thirty days of generating the waste. They shall be treated by steam, incineration, or an alternative process to decontaminate prior to disposal.

Biohazard Sharps: Needles, needle-syringe units, scalpels, and razor blades, contaminated with biological materials, are consider biohazard sharps. All biohazard sharps are consider biohazard

waste and must be placed into a red, puncture resistant plastic needle box and discarded as biohazard waste. Broken or unbroken glassware such as Pasteur pipettes should be considered as biohazard sharps and disposed of accordingly.

After decontamination, liquids may be poured down the sink with plenty of water. Do NOT pour melted agar into sink – allow it to cool and solidify for disposal as solid waste in garbage bags.

### 6.4 Minimizing Waste

Hazardous waste management requires not only the above practices, but also requires efforts to minimizing waste. Below are some common waste minimization strategies.

- Reduce chemical purchases. Many hazardous waste come from unused, expired chemicals. Careful considerations must be made when purchasing chemicals and purchase only the amount necessary. Many chemicals degrade over time so purchase the amount needed only for up to 3 years if purchasing the chemicals in bulk for lesser price.
- Do not accept donated chemicals or free samples unless they meet specific needs. These chemicals are usually of unknown age and unknown purity if the bottles are not sealed, and become a future waste problem. Since the cost of disposing can exceed ten to fifty times the cost of the chemical, it is more economical to buy a new one as needed.
- Substitute less hazardous chemicals and/or apply microscale approach whenever possible. This practice results not only in the safer procedures, but also reduces chemical wastes to dispose of.
- Clearly mark the contents of all chemical containers to prevent the generation of unknowns.
- Neutralize, quench, or destroy hazardous by-products if possible after the experiments.

## Section 7: Inspections

Laboratory inspections should be conducted annually to ensure safety and compliance with all applicable regulations and guidelines. When deficiencies are noted during an inspection, the appropriate corrective actions shall be communicated to the supervisor.

## Section 8: Emergencies

All laboratory employees should be familiar with emergency plans and aware of the laboratory safety equipment such as eye wash stations, safety showers, fire blankets, fire extinguishers, fire alarm pull stations, and spill kits.

**For all emergencies, call 911 or Public Safety 239-489-9203 (Ext. 11203 on campus phone).**

## 8.1 Accidents

Laboratory supervisors are responsible for reporting all accidents and near misses to the Public Safety Department. In the case of accidents, injured person must be sent to medical treatment facility and the medical personnel must be provided with copies of SDS(s) for the chemical(s) involved in the accident.

## 8.2 Fire Related Emergencies

If there is fire or smoke in the laboratory or in the building, immediately follow the instructions:

- Pull the fire alarm and call 911 or Public Safety number posted on the lab sign.
- If a person has been trained and is comfortable using portable fire extinguisher, the individual may try to contain the fire that is small.
- Shut off the equipment and evacuate the area.
- Close doors.
- Remain outside of the affected area to provide details to the emergency responders.

Every person must evacuate the building when the fire alarm sounds. The Fire Department will determine when it is safe to return. Do not go back into the building until the alarm stops and Fire Department gives clearance to re-enter.

If someone's clothing catches on fire, use three words – stop, drop, and roll. A fire extinguisher may be used by another person to put out the fire. Report any burn injuries to the supervisor immediately and seek medical treatment.

Report to Public Safety Department every time a fire extinguisher is discharged and ask for a replacement.

## 8.3 Spills

Chemical and biological spills are the most common accidents in the laboratory. Laboratory instructors/research advisors must be familiar with handling the incidental spills and the hazards of the chemicals they normally handle. If the spill is too large or highly hazardous, call the Public Safety Department. Follow these procedures for the spills:

- Immediately alert everyone in the room about the spill.
- Eliminate potential sources of ignition.
- Tell everyone to leave the immediate area.
- Attend to any persons who may be contaminated. Contaminated clothing must be removed and go under safety show for no less than 15 minutes.
- If medical attention is needed, call 911 or Public Safety.

Cleaning up a minor spill

- Refer to the Safety Data Sheet for hazard information.
- Acquire personal protective equipment appropriate to the hazards.

- Obtain spill kit and spread spill control materials over the entire spill area, working from the outside to the center.
- Once the spill has been controlled, absorbed and neutralized, use a brush and consolidate the spill by sweeping inward. Scoop and collect in a suitable container.
- Label the container appropriately for waste disposal.

### 8.4 Weather Related Emergencies

During severe weather conditions, it is suggested that laboratory operations involving hazardous materials or processes are not performed. Power outages are likely during these conditions and the engineering controls such as chemical fume hood or biosafety cabinet will not be operational. If the power is interrupted:

- Immediately stop all laboratory work.
- Stabilize chemical reactions or other work taking place.
- Close all chemical containers.
- Shut-off and unplug equipment.
- Close chemical fume hood sashes.

## Section 9: Medical Consultations

All laboratory workers shall receive an appropriate medical consultation whenever an event takes place in the work area such as spill, leak, explosion, or other circumstances that may result in hazardous exposure. Employee must notify the accident and the case of exposure to hazardous conditions/chemicals to Public Safety Department as well as to the supervisor. Exposure assessment will be conducted by the Public Safety **NOT** by the Laboratory Key Personnel. All accidents should be fully documented and all consultations/examination should be conducted or supervised by a licensed physician. The employer will provide the following should the employee seeks to get medical attention:

- Consultation/examination at no cost
- Identity of the hazardous chemical(s) or condition(s)
- Description of the conditions under which the exposure occurred
- Description of signs and symptoms that an employee is experiencing

**In event of any serious injury or exposure, immediately call 911 and seek medical treatment. Do NOT wait for an exposure assessment to be performed.**

For any medical consultation/examination, the person responsible for the employee must ensure that the attending physician provides a written opinion which includes:

- Results of medical examination and tests
- Any recommendation for further medical treatment

- Any medical condition the employee had in prior to exposure which may increase the risk of exposure to hazardous chemical found in the incident
- A statement that the employee has been informed by the physician of the results and recommendations of the consultation/examination.

The written opinions must not reveal specific findings or diagnoses that are unrelated to the incident.

# Appendix

A. General Practices in the Laboratory
B. Chemical Storage
C. Overnight Reaction/Incubation Form
D. Documentation of Training
E. Accident Report Form
F. COP 08-0817

# Appendix A

## General Practices in the Laboratory

1. Unauthorized persons should not be allowed in the laboratory.
2. Unauthorized experiments should not be performed.
3. Eating, drinking, smoking, gum chewing, applying cosmetics, and taking medicine are not allowed in laboratories.
4. Read the lab directions ahead of time and plan safety procedures before beginning any operation.
5. Follow standard operating procedures at all times.
6. Always read the SDS and label before using a chemical.
7. Wear appropriate PPE at all times as determined by the laboratory instructor. To protect your skin from splashes, spills and drips, always wear appropriate clothing and closed-toe shoes. Tie back long hair.
8. Use appropriate ventilation when working with hazardous chemicals.
9. Pipetting should never be done by mouth. Always use a bulb or other devices.
10. Hands should be washed with soap and water immediately after working with any laboratory chemicals, even if gloves have been worn.
11. Know the location and proper use of safety equipment. Never block access to emergency equipment, showers, eyewashes, or exits.
12. Properly dispose of chemical wastes.
13. Make others aware of special hazards associated with your work.
14. Report all injuries, accidents, incidents, and near misses.
15. Report unsafe conditions to the laboratory supervisor.

# Appendix B

# Chemical Storage Guidelines

Adopted from http://www.ehso.com/ChemicalStorageGuidelines.htm

Storage information of chemicals can be found on Safety Data Sheets (SDS). Proper storage of chemicals require segregating the chemicals based on the type and compatibility as well as using appropriate engineering controls.

Table 1. Basic Chemical Segregation

| Hazard Class of Chemical | Recommended Storage Method | Examples | Incompatibilities |
|---|---|---|---|
| Corrosives - Acids | Store separately in acid storage cabinet. Segregate oxidizing acids (i.e., Chromic, nitric, sulfuric, and perchloric acids) from organic acids | Acetic acid Phenol<br>Sulfuric acid Chromerge<br>Nitric acid<br>Perchloric acid<br>Chromic acid<br>Hydrochloric acid | Flammable liquids, flammable solids, bases, oxidizers |
| Corrosives - Bases | Store in separate corrosive storage cabinet. Store solutions of inorganic hydroxides in labeled polyethylene containers. | Ammonium hydroxide<br>Sodium hydroxide<br>Calcium hydroxide | Flammable liquids, oxidizers, poisons, and acids |
| Flammable Liquids | Store in flammable storage cabinet and away from sources of ignition. Store highly volatile flammable liquids in an explosion-proof refrigerator. | Acetone Benzene<br>Diethyl ether Methanol<br>Ethanol Toluene<br>Glacial acetic acid | Acids, bases, oxidizers, and poisons |
| Flammable Solids | Store in a separate dry, cool area away from oxidizers, corrosives, flammable liquids | Phosphorus, yellow<br>Calcium carbide<br>Picric acid<br>Benzoyl peroxide | Acids, bases, oxidizers, and poisons |
| General Chemicals - Non-reactive | Store on general laboratory benches or shelving preferably behind glass doors and below eye level. | Agar<br>Sodium chloride<br>Sodium bicarbonate<br>Most non-reactive salts | See specific MSDS. |

| | | | |
|---|---|---|---|
| Oxidizers | Store in a spill tray inside a chemical storage cabinet. Separate from flammable and combustible materials. | Ammonium persulfate<br>Ferric chloride<br>Iodine<br>Sodium hypochlorite<br>Benzoyl peroxide<br>Potassium permanganate<br>Potassium dichromate<br>Peroxides, perchlorates, chlorates, nitrates, bromates, superoxides. | Separate from reducing agents, flammables, and combustibles. |
| Poisons/Toxic Compounds | Store separately in vented, cool, dry area, in unbreakable chemically-resistant secondary containers and in accordance with the hazardous nature of the chemical. | Aniline<br>Carbon tetrachloride<br>Chloroform<br>Cyanides<br>Heavy metals compounds, i.e., cadmium, mercury, osmium<br>Oxalic acid<br>Phenol<br>Formic acid | Flammable liquids, acids, bases, and oxidizers.<br>See specific MSDS. |
| Water-Reactive Chemicals | Store in dry, cool location, protect from water fire sprinkler. | Sodium metal<br>Potassium metal<br>Lithium metal<br>Lithium aluminum hydride | Separate from all aqueous solutions and oxidizers. |
| Carcinogens | Label all containers as "Cancer Suspect Agents". Store according to the hazardous nature of the chemical, using appropriate security when necessary. | Benzidine<br>Beta-naphthylamine<br>Benzene<br>Methylene chloride<br>Beta-propiolactone | See specific MSDS. |
| Teratogens | Label all containers as "Suspect Reproductive Hazard". Store according to the hazardous nature of the chemical, using appropriate security when necessary. | Lead and mercury compounds<br>Benzene<br>Aniline | See specific MSDS. |
| Peroxide-Forming Chemicals | Store in air-tight containers in a dark, cool, dry area. See Table 3 for recommended storage time limits. | Diethyl ether<br>Acetaldehyde<br>Acrylonitrile | See specific MSDS. |
| Strong Reducing Agents | Store in cool, dry, well-ventilated location. Water reactive. Segregate from all other chemicals. | Acetyl chloride<br>Thionyl chloride<br>Maleic anhydride<br>Ferrous sulfide | See specific MSDS. |

Table 2. Common Incompatible Chemicals

*Chemicals listed in **Column A** should not be stored with or used near items in **Column B**.*

| ***Column A*** | ***Column B*** |
|---|---|
| Acetic acid | Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates |
| Acetic anhydride | Hydroxyl-containing compounds such as ethylene glycol, perchloric acid |
| Acetone | Concentrated nitric and sulfuric acid mixtures, hydrogen peroxide |
| Acetylene | Chlorine, bromine, copper, fluorine, silver, mercury |
| Alkali and alkaline earth metals such as powdered magnesium, sodium, potassium | Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens |
| Ammonia (anhydrous) | Mercury, halogens, calcium hypochlorite, hydrofluoric acid |
| Ammonium nitrate | Acids, metal powders, flammable liquids, chlorates, nitrites, sulfur, finely divided organic or combustible materials |
| Aniline | Nitric acid, hydrogen peroxide |
| Arsenical materials | Any reducing agent |
| Azides | Acids, heavy metals and their salts, oxidizing agents |
| Calcium oxide | Water |
| Carbon, activated | All oxidizing agents, calcium hypochlorite |
| Carbon tetrachloride | Sodium |
| Chlorates | Ammonium salts, acids, metal powders, sulfur, finely divided organic or combustible material |
| Chlorine dioxide | Ammonia, methane, phosphine, hydrogen sulfide |
| Chromic acid and chromium trioxide | Acetic acid, alcohol, camphor, glycerol, naphthalene, flammable liquids in general |
| Copper | Acetylene, hydrogen peroxide |
| Cumene hydroperoxide | Acids (organic or inorganic) |
| Cyanides | Acids |
| Flammable liquids | Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens, other oxidizing agents |
| Fluorine | All other chemicals |
| Hydrides | Water |
| Hydrocarbons (e.g., butane, propane, benzene) | Fluorine, chlorine, bromine, chromic acid, peroxides |
| Hydrocyanic acid | Nitric acid, alkalis |
| Hydrofluoric acid (anhydrous) | Ammonia (aqueous or anhydrous) |

| | |
|---|---|
| Hydrogen peroxide | Copper, chromium, iron, most metals or their salts, any flammable liquid (i.e., alcohols, acetone), combustible materials, aniline, nitromethane |
| Hydrogen sulfide | Fuming nitric acid, oxidizing gases |
| Hypochlorites | Acids, activated carbon |
| Iodine | Acetylene, ammonia (aqueous or anhydrous), hydrogen |
| Mercury | Acetylene, fulminic acid, ammonia |
| Metal hydrides | Acids, water |
| Nitrates | Acids |
| Nitric acid (concentrated) | Acetic acid, acetone, alcohol, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy metals |
| Nitrites | Acids |
| Nitroparaffins | Inorganic bases, amines |
| Oxalic acid | Mercury and silver and their salts |
| Oxygen | Oils, grease, hydrogen; flammable liquids, solids, or gases |
| Perchloric acid | Acetic anhydride, alcohol, bismuth, paper, wood, grease, oils |
| Permanganates | Concentrated sulfuric acid, glycerol, ethylene glycol, benzaldehyde |
| Peroxides, organic | Acids (organic or mineral), avoid friction, store cold |
| Phosphorus, white | Air, oxygen, alkalis, reducing agents |
| Potassium | Carbon tetrachloride, carbon dioxide, water |
| Potassium chlorate | Sulfuric and other acids, ammonium salts, metal powders, sulfur, finely divided organics, combustibles |
| Potassium perchlorate (see also chlorates) | Sulfuric and other acids |
| Potassium permanganate | Glycerol, ethylene glycol, benzaldehyde, sulfuric acid |
| Silver and silver salts | Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid |
| Sodium | Carbon tetrachloride, carbon dioxide, other chlorinated hydrocarbons, water |
| Sodium nitrate | Ammonium nitrate and other ammonium salts |
| Sodium peroxide | Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural |
| Sulfides | Acids |
| Sulfuric acid | Chlorates, perchlorates, permanganates |

# Appendix C

## Unattended Overnight Experiment Notice

For unattended operations, laboratory lights should be left on (unless the operation is light sensitive) and signs should be posted to identify the nature of the experiment and hazard classification. Information should be clearly posted indicating who to contact in the event of an emergency. The following template may be used.

Experimenter's Name:

Phone Number:

Faculty Advisor:

Phone Number:

Date/Time Started:

Expected Date/Time to be completed:

**Hazard Information** (check all apply)

- ☐ Flammability
- ☐ Air Sensitivity
- ☐ Water Sensitivity
- ☐ Bio-hazard
- ☐ Toxic
- ☐ Other (explain)

# Appendix E

## Hazard or Accident Report Form

Employees should inform their supervisor if they identify a hazard in the workplace. Hazards may include unsafe conditions, damaged or improper equipment, inadequate procedures, missing safety equipment, and contaminant.

The employee's supervisor has the primary responsibility to investigate the reported hazard. All incidents require the completion of Accident-Incident Report Form 8.17, which will be provided by Public Safety, in addition to the completion of Workers' Compensation Report Form, which will be provided by Human Resources.

Public Safety will provide procedures for reporting incidents.

**Lee Campus**
8099 College Parkway
Fort Myers, Florida 33919
Building D, Room 101
239-489-9203

**Collier Campus**
7505 Grand Lely Drive
Naples, Florida 34113
Building A, Room 100
239-732-3712

**Charlotte Campus**
26300 Airport Road
Punta Gorda, Florida 33950
Building N, Room 105
941-637-5608

**Hendry Glades**
1092 E. Cowboy Way
LaBelle, FL 33935
Building A, Room 118
863-674-6017

| College Operating Procedures (COP) | FLORIDA SOUTHWESTERN STATE COLLEGE |
|---|---|

**Procedure Title:** Laboratory Safety
**Procedure Number:** 08-0817
**Originating Department:** Public Safety

**Specific Authority:**

| | |
|---|---|
| Board Policy | 6Hx6:1.02; 6Hx6:7.03 |
| Florida Statute | 1001.65; 1013.11 |
| Florida Administrative Code | (SREF) Chapter 4.2 (6) Toxic Substance Safety Precautions. |

**Procedure Actions:** 01/01/04; 07/01/09

**Purpose Statement:** To establish a procedure for the safe operation of all campus science laboratories. All laboratory rules and regulations shall apply to all campuses and facilities leased by Florida SouthWestern State College.

---

**Guidelines:**

To establish a procedure for the safe operation of all campus science laboratories. All laboratory rules and regulations shall apply to all campuses and facilities leased by Florida SouthWestern State College.

School Chemistry Laboratory Safety Guide http://www.cdc.gov/niosh/docs/2007-107/

**Procedures:**

I. Florida SouthWestern State College's science laboratories have guidelines in place to ensure compliance with all federal and state health, safety, and sanitation requirements. Inspections shall be conducted annually to ensure compliance with all federal and state requirements. Records shall be kept as required by code or law.

II. The Department of Public Safety and the laboratory paraprofessionals are responsible for overseeing that all campus laboratories adhere to the guidelines set forth. Laboratory paraprofessionals shall oversee the training for instructors and students. This shall include, but not be limited to, laboratory general safety, security and housekeeping. Students enrolled in science classes will be required to read the laboratory rules and sign statements indicating that they have read and agreed to abide by all classroom rules before classroom experiments may proceed.

III. Annual pre-inspections of all campus science labs shall be carried out by Public Safety and science paraprofessionals. They shall oversee the proper labeling and storage of chemicals, including chemical and biological waste products, suitable chemical storage, eye, face and body protection, decontamination methods, proper ventilation, fire protection, emergency shut off locations and who/where to call for help in the event of an emergency. Disposal of waste substances deemed hazardous shall be coordinated and disposed of by an authorized, licensed agency.

IV. An annual safety inspection shall be conducted under the State Requirements for Educational Facilities (SREF) as set forth by the Florida Department of Education.