

# **BROWARD COLLEGE**

## **SCIENCE LABORATORY**

### **SAFETY MANUAL**

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Broward College

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Broward College

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## INTRODUCTION AND ACKNOWLEDGEMENTS

This laboratory safety training manual is intended to be a multipurpose document. It may be utilized for orientation purposes when training new laboratory personnel. It may also be a tool used to facilitate annual training for currently employed laboratory personnel. Due to its varied contents, it may also be used as a resource manual and a source of general information for the laboratory worker.

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## SAFETY GUIDELINES

### Emergency and Hazard Control Equipment

The functions and uses of several standard pieces of safety equipment are listed below. If the laboratory in which you work is lacking some of the equipment, it is recommended that you investigate the feasibility of obtaining it, as these are the basic and minimum pieces of safety equipment found in a laboratory setting.

#### Fume Hoods

- Fume hoods are work cabinets that remove hazardous vapors from laboratory experiments.
- By raising and lowering the sash (glass window), the airflow through the hood varies.
- A fume hood functions as a physical barrier between the experiment and the laboratory worker, to protect against splashes, spills, small fires and explosions.
- Fume hoods are not to be used as storage sites.
- The sash must be kept in the downward (closed) position when the fume hood is not in use.
- Hoods must be kept clean and free of chemical residues.
- An airflow maintenance check, with a piece of tissue, should be performed daily.
- Metered airflow maintenance checks should be performed periodically.
- A specific hood should be designated for perchloric acid use only.

#### Fume Hood Repair Procedure

- Initiate an RS-1 (request for services) form for in-house repair by the college's Physical Plant Department.

- If Physical Plant cannot repair the fume hood, contact either the original vendor, the manufacturer or a local repair service company.

## SAFETY GUIDELINES

### Emergency and Hazard Control Equipment

#### Fire Extinguishers

- Emergency fire alarms should be sounded for all fires.
- Fire extinguishers are to be used on manageable fires.
- Specific extinguishers need to be used with specific classes of fires. See the chart on the following page to determine the type of extinguishers available and their uses. 1
- Fire extinguishers are inspected annually by the campus Security department.
- The campus Physical Plant department should be contacted for the following reasons:
  - Fire extinguisher malfunction.
  - Date on extinguisher is expired
  - Fire extinguisher needs recharging.
  - Fire extinguisher is missing.
- An incident report should be filed with the campus Security department each time an extinguisher is used.

## COMPARISON OF FIRE EXTINGUISHER TYPES

<u>TYPE</u>	<u>ADVANTAGES</u>	<u>DISADVANTAGES</u>	<u>NOTES</u>
<u>HALON</u> <u>CLASS A, B, C,</u> <u>OR B, C</u>	<ul style="list-style-type: none"> <li>- <u>Quick Fire</u></li> <li>- <u>Knockdown</u></li> <li>- <u>Will Reach</u> <u>Hidden Fires</u></li> <li>- <u>No Damage to</u> <u>Equipment</u></li> <li>- <u>Good Visibility</u></li> <li>- <u>Good Discharge</u> <u>Range</u></li> <li>- <u>Heat Absorber</u></li> </ul>	<ul style="list-style-type: none"> <li>- <u>Requires Rapid</u> <u>Discharge</u></li> <li>- <u>More Expensive</u></li> <li>- <u>Personnel Hazard</u> <u>(Halon 1211)</u></li> <li>- <u>Not for Deep-Seated</u> <u>Fires</u></li> </ul>	<ul style="list-style-type: none"> <li>- <u>Most Common</u> <u>System for</u> <u>Electrical/Electronics</u></li> <li>- <u>Maximum</u> <u>Effectiveness</u></li> <li>- <u>Requires Rapid</u> <u>Detection</u></li> </ul>
<u>DRY</u> <u>CHEMICAL</u> <u>CLASS A,B,C</u>	<ul style="list-style-type: none"> <li>- <u>Good on</u> <u>Oil/Grease</u></li> <li>- <u>Good Knockdown</u></li> <li>- <u>Low Cost</u></li> </ul>	<ul style="list-style-type: none"> <li>- <u>Limited Personnel</u> <u>Hazard</u></li> <li>- <u>Equipment Damage</u> <u>Likely</u></li> <li>- <u>Clean-Up Required</u></li> <li>- <u>Not Suitable For</u> <u>Hidden Fires</u></li> </ul>	<ul style="list-style-type: none"> <li>- <u>Compatible With</u> <u>Other Agents</u></li> <li>- <u>Subject to</u> <u>Equipment</u> <u>Interference</u></li> </ul>
<u>CARBON</u> <u>DIOXIDE</u> <u>CLASS B, C</u>	<ul style="list-style-type: none"> <li>- <u>Good Fire</u> <u>Suppression</u> <u>Capability</u></li> <li>- <u>Will Reach</u> <u>Hidden Fire</u></li> <li>- <u>Good Visibility</u></li> <li>- <u>No Equipment</u> <u>Damage</u></li> <li>- <u>No Clean-Up</u></li> <li>- <u>Quickest Way to</u> <u>Cool a Fire</u></li> </ul>	<ul style="list-style-type: none"> <li>- <u>May Be Toxic To</u> <u>Personnel</u></li> <li>- <u>May Cause</u> <u>Thermal/Static (Shock)</u> <u>Damage</u></li> <li>- <u>Heavy Vapor Settles</u> <u>Out Limiting Total</u> <u>Discharge Range</u></li> </ul>	<ul style="list-style-type: none"> <li>- <u>Secondary Choice To</u> <u>Halon When Fighting</u> <u>B &amp; C Fires</u></li> </ul>

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## **SAFETY GUIDELINES**

### **Emergency and Hazard Control Equipment**

#### **Eyewash Fountain**

- The eyewash fountain provides a soft stream or spray of aerated water.
- The eyewash fountain is an emergency first response piece of equipment, used to flush a chemical or substance from the eyes.
- Attempts to neutralize or counteract a chemical in the eye in most cases, may cause further injury; therefore, plain water should be used.
- In treating certain chemical splashes, such as H<sub>2</sub>SO<sub>4</sub>, (sulfuric acid) a commercially prepared neutralizing buffer should be used before flushing the eyes with water.
- The proper use of the eyewash fountain involves flushing open eyes for fifteen minutes.
- The campus Security department should be contacted and an accident report filed for every incident requiring the use of the eyewash fountain.
- The eyewash should be inspected once a month and the inspection date should be logged on a tag attached to the eyewash fountain.

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## **SAFETY GUIDELINES**

### **Emergency and Hazard Control Equipment**

#### **Safety Shower**

- The safety shower is a first response piece of safety equipment that provides a large quantity of water capable of immediately drenching a person.
- The shower can be used to extinguish clothing when on fire or wash a chemical splash from the body.
- The proper use of the shower, for a chemical splash, requires fifteen minutes of flushing with water and the removal of all contaminated clothing.
- Do not attempt to neutralize or counteract the chemicals splashed, a plain water wash from the emergency shower should be used.
- For extinguishing burning clothing on a person, place the person under the shower and run the shower until the fire is extinguished.
- The campus Security department and medical personnel must be contacted immediately, and an accident report filed.
- The shower should be inspected once a month and the inspection date should be logged on a tag attached to the shower.

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## **SAFETY GUIDELINES**

### **Emergency and Hazard Control Equipment**

#### **Fire Blanket**

- The fire blanket is a reusable blanket of a closely woven fabric.
- The fire blanket has a variety of uses which are listed below:
  - The blanket may be used to smother small fires and hood fires.
  - The blanket may be used as a first aid tool to cover an injured person to help prevent shock.
  - The blanket may be draped over a person's head and shoulders to function as a barrier and protection from extreme heat while exiting a burning room.

#### **Note:**

- The one use of the fire blanket that is **not recommended** is using the blanket to extinguish burning clothes.
- Rolling a burning person in a fire blanket can cause smoke inhalation as a result of the "chimney effect."
- Rolling a burning person in a fire blanket can also increase the severity of the burns by containing heat next to the person.

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## **SAFETY GUIDELINES**

### **Personal Protective Equipment**

The function of personal protective equipment is to provide a barrier against chemicals and harmful organisms. The appropriate type of protective wear must be used in specific cases. Frequently used protective equipment and general information regarding their correct use are examined below:

#### **Gloves**

- Specific chemicals are incompatible with certain glove materials. To ensure that the correct glove is used when handling a specific chemical, refer to the chart on the following page.
- Gloves must be inspected before each use by checking for discoloration, punctures or tears in the gloves.
- Before removing, remember to wash gloves with soap and water to remove residue.
- After removing gloves, wash hands thoroughly.

#### **Disposable gloves**

- Disposable gloves should be used for all dissections of fresh and preserved specimens and should be discarded afterwards.
- Disposable gloves should be worn doubled when handling any human body fluids, such as blood, urine, semen, vaginal secretions and saliva, including any equipment contaminated with human body fluids; and must be discarded appropriately afterwards.
- Disposable gloves should be worn when handling sphagnum moss, to prevent sporotrichosis, an uncommon infection resulting from a fungus *Sporothrix schenkii*.
- Disposable gloves should be worn when handling specimens that may trigger allergic reactions to the skin, such as poison ivy and other known irritants.
- For additional protection when using gloves, apply a coat of hand lotion before putting on gloves.
- It is not recommended that disposable gloves be worn as a substitute for the appropriate chemical-compatible gloves, when handling chemicals.

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GLOVES FOR THE WORKPLACE

<u>CHEMICALS</u>	<u>VITON (10 MIL)</u>	<u>BUTYL (17 mil)</u>	<u>SILVER SHIELD (3 MIL)</u>	<u>PVA</u>	<u>NEOPRENE UNSUPPORTED</u>	<u>NEOPRENE SUPPORTED</u>
Acetaldehyde						
Acetic Acid Glacial						
Acetone						
Acetonitrile						
Anilina						
Butyl Acetate						
Carbon Tetrachloride						
Chloroform						
Cyclohexane						
Cyclohexanol						
Cyclohexanone						
Dibutyl Phthalate Phthalate						
Dioxene						
Ethyl Acetate						
Ethyl Alcohol						
Ethyl Ether						
Formaldehyde(37% water)						
n-Hexane						
Hydrochloric Acid (37%)						
Methylene Chloride						
n-Pentane						
Sodium Hydroxide (50%)						
Sulfuric Acid (3 molar)						
Toluene						

Definitions:

R = Recommended

NR = Not Recommended

RD = Resists Degradation

- = Data Not Available

\* = Tested for 1-1.9 hours breakthrough time. No other information available.

## SAFETY GUIDELINES

### Personal Protective Equipment

#### Protective Eyewear

Varying degrees of protection can be provided by an assorted selection of eyewear.

- Spectacle type eyewear with side shields should be provided for visitors in the laboratory.
- Goggle-type eyewear, having air vents to prevent fogging, providing total eye protection, should be used for most laboratory activities.
- Eyewear should be cleaned frequently to prevent obscured vision.
- People wearing prescription glasses must wear goggles/eyewear over their prescription glasses.
- Contact lenses are not recommended when working in the laboratory.
- Eyewear must be worn in the following situations:
  - To protect against the impact of flying objects, particles and dust.
  - During all dissections.
  - When handling microbiological cultures.
  - When handling human body fluids and equipment contaminated with human body fluids.
  - To prevent splashes to the eyes when handling chemicals.

## SAFETY GUIDELINES

### Personal Protective Equipment

#### Protective Apparel

- Different types of apparel are available depending on the degree of protection required.
- Two commonly used forms of protective apparel are lab coats and aprons.
- A lab coat's main function is to protect clothing from spills and splashes.
- A contaminated lab coat must be removed immediately and laundered.
- Aprons provide better protection from corrosive and irritating liquids than lab coats.
- Aprons of nitrile latex are acid and alcohol resistant.
- For maximum protection, an apron should be worn over a lab coat.

## SAFETY GUIDELINES

### Personal Protective Equipment

#### Respirators/Particle Masks

- Respirator face masks have specific cartridges that are compatible with chemicals being used.
- Below is a list of the types of filters available from various vendors:
  - Acid gas
  - Formaldehyde
  - Organic vapor
  - Dust/mist/fumes/HEPA.

#### Face Shields

- Face shields provide protection for the face, throat, and ears but provide minimal eye protection.
- Face shields provide protection from flying glass or fragments when using a vacuum system.
- For maximum protection, safety goggles must be worn in conjunction with a face shield.

#### Hot Mitts/Insulated Gloves

- Hot mitts must be used when handling hot glassware and materials being immediately removed from an autoclave.
- Insulated gloves should be used when handling dry ice or anything exposed to extreme temperatures.

## SAFETY GUIDELINES

### General Laboratory Procedures

A variety of safety procedures should be implemented in the college laboratories. These guidelines are examined in this section of the manual.

### Glassware Handling

At times handling glassware may seem innocuous; however, there are many hidden hazards involved. Some basic safety rules pertaining to glassware handling are listed below:

- Cut glass with an approved glass cutter or triangular file.
- Use a dust pan for cleaning broken glass.
- Use gloves when cleaning broken glass.
- Fire-polish all cut edges.
- Allow glass to cool before handling.
- Discard broken glass in appropriately labeled receptacles.
- Never attempt to catch falling glass.
- Only use clean, dry glassware.
- Discard broken thermometers appropriately after removal of mercury.
- Discard chipped or cracked glassware.
- Do not use beakers as scoops.
- Do not use glassware for food or beverage consumption.
- Lubricate glass tubing, thermometers and funnel stems with water, soap or glycerol before placing into stoppers.
- To free frozen stoppers and glassware, run hot water on the neck of the bottle or use a mechanical stopper remover.

## SAFETY GUIDELINES

### General Laboratory Procedures

#### Personal Hygiene

Personal hygiene in the laboratory must be stressed and constantly be in the forefront of a laboratory worker's mind.

- General personal hygiene guidelines are listed as follows:
  - No food or beverages should be consumed in the lab.
  - No applying of cosmetics or lip balm in the lab.
  - No smoking in the lab
  - No running in the lab.
  - Shoes must be worn at all times when in the lab.
  - Professional behavior must be maintained at all times.
  - Do not lick stamps or labels in the lab.
  - Keep fingers, pens and pencils out of your mouth when in the lab.
  - Wash hands frequently when in the lab and before leaving the lab.
  - Keep hands away from your face and head when in the lab.
  - Do not handle contact lenses when in the lab.
  - To evaluate a chemical by its odor, waft the chemical vapors towards your face, with your hand, and gently sniff.

- Hairspray and acrylic nails due to their flammability, should not be worn while in the lab.
- Long, loose hair must be pulled back when there is the potential of its catching on fire or falling into chemicals.

## SAFETY GUIDELINES

### General Laboratory Procedures

#### Appropriate Clothing

Laboratory workers must use common sense in their choice of dress for the laboratory setting.

- Some basic guidelines are listed below:
  - No long ties should be worn in the lab.
  - No long scarves should be worn in the lab.
  - No dangling jewelry should be worn in the lab.
  - No shorts should be worn in the lab.
  - No short skirts should be worn in the lab.
  - No tank tops should be worn in the lab.
  - Contact lenses are not recommended to be worn while in the lab.
  - Closed-toe flat shoes must be worn in the lab.

## SAFETY GUIDELINES

### General Laboratory Procedures

#### Laboratory Housekeeping

Sound housekeeping procedures are critical for a safety conscious laboratory.

- Some general housekeeping practices are as follows:
  - Clean up all spills immediately.
  - Wipe down counters between laboratory sessions.
  - Be sure to replace and securely tighten all caps.
  - Wipe bottles of residue before putting out for laboratory use and putting away for storage.
  - Pick up all foreign objects from the floor to prevent slipping and tripping hazards.
  - Keep all doors, drawers and cabinets closed.
  - Mark all refrigerators with information on contents and designated use.
  - No food or beverages for human consumption should be stored in laboratory refrigerators.
  - Do not drink or eat from laboratory glassware.
  - Always have a clear means of egress, by keeping doors and aisles unblocked and uncluttered.<sup>(5)</sup>
  - Periodically check exit signs to ensure that they are functioning properly.
  - Kitchen-type equipment, such as knives, cutting boards, and blenders, that are used in a laboratory capacity, should not be used in food preparation for human consumption.

## SAFETY GUIDELINES

### General Laboratory Procedures

#### Electrical Safety

Some common electrical safety rules are listed below:

- Unplug electrical appliances by pulling from the plug and not the cord.
- Become familiar with the location of circuit breakers in the laboratory
- To prevent tripping, do not place wiring on the floor.
- Eliminate and/or repair frayed and worn wiring.<sup>(5)</sup>
- Do not overload electrical outlets.<sup>(5)</sup>
- Make sure that appliances are off when inserting and removing plugs from outlets.

#### Miscellaneous Safety Rules

- Never mouth-pipette.
- Avoid working alone in the laboratory when possible.
- Keep laboratory doors and prep-room doors locked.
- To prevent contamination, hold stoppers while dispensing solution.
- Become familiar with the location of gas, electric and water shut-off valves in the laboratory.
- Do not leave chemicals out overnight in student laboratory areas.

## SAFETY GUIDELINES

### Chemical Laboratory Procedures

The chemical laboratory has inherent safety principles that are outlined below.

### Chemical Storage

Any laboratory that houses chemicals must correctly store the chemicals using a safe and orderly system.

### General Storage Rules

- Store the minimum quantity of chemical necessary
- Keep the storage room locked when unattended.
- Chemicals should not be stored above eye-level, if possible.<sup>(5)</sup>

### Storage Facility

- When considering the storage facility, the following should be considered:
  - Select personnel should have access to the chemicals to control chemical accessibility.
  - The facility should be temperature and humidity regulated and have adequate ventilation.
  - Storage shelves must be stable and non-corrosive and have a one-half inch lip at the front edge.
  - Spill clean-up kits should be located near the chemical storage area.
  - All storage cabinets should have locks.

## SAFETY GUIDELINES

### Chemical Laboratory Procedures

#### Chemical Storage Groups

To prevent incompatible chemicals from reacting with each other, the following list classifies chemicals into eight groups:

1. flammable chemicals – such as alcohols
2. toxic chemicals – such as arsenic and cyanides
3. bases – such as sodium hydroxide
4. oxidizers – such as chlorates and nitrates
5. potential explosives – such as ethyl ether
6. oxidizing acids – such as sulfuric and nitric acids
7. general chemicals – such as sugars and sodium chloride
8. chemicals requiring refrigeration – such as hydrogen peroxide (30% and over), cinnaldehyde, acetaldehyde.

#### Flammable Chemical Storage Cabinets

- All flammable solvents and solid chemicals must be stored in a flammable storage cabinet.
- Flammable storage cabinets must be vented to the outside.<sup>(5)</sup>
- The quantity of flammable chemicals stored should not exceed the cabinet's capacity.

## SAFETY GUIDELINES

### Chemical Laboratory Procedures

#### Explosion-Proof Refrigerators

- Chemicals that have the potential to be explosive should be stored in an explosion-proof refrigerator.
- Chemicals such as ethyl ethers, and picric acid are two examples of potential explosives.

#### Acid Storage Cabinets

- Acids should be stored in labeled acid cabinets.
- Acetic acid is incompatible with, and should not be stored with chromic, nitric, and perchloric acids.
- Perchloric acid is incompatible with, and should not be stored with sulfuric acid.
- Nitric acid should be stored separately from other chemicals.

## SAFETY GUIDELINES

### Chemical Laboratory Procedures

#### Special Chemical Handling

Certain chemicals require special handling precautions.

- A few more examples are set out below:
  - Paper towels drenched in nitric acid and perchloric acid may spontaneously ignite.
  - Picric acid becomes highly explosive when dry.
  - Ethers, aldehydes, most alkenes, and vinyl compounds can form peroxides and become explosive. (3)
  - When diluting concentrated sulfuric acid, an ice bath is recommended to cool the solution.
  - Acid carrier buckets should be used to transport chemicals.
  - Potassium (K) and phosphorus (P) are ignitable in air. (3)
  - Sodium (Na) and water are incompatible and react violently with each other. (3)

## SAFETY GUIDELINES

### Chemical Laboratory Procedures

#### Labeling

All chemicals must have a clean legible label stating the following:

- Chemical name
- Concentration (if applicable)
- Date received
- Purchase order number
- Information about chemical hazard class,  
such as:
  - Corrosive
  - Carcinogen
  - Oxidizer, etc. (4)
- Vendor/manufacturer's name
- Precautionary information (4)
- First aid in case of emergency (4)
- Requirements by ANSI Z.129.1  
(American National Standards Institute).

## SAFETY GUIDELINES

### Chemical Laboratory Procedures

#### Record-Keeping

Keeping an accurate record of the quantity of chemicals purchased, used and discarded is required. “From the cradle to the grave” is sometimes used to explain the extensive details needed for chemical records.

- An annual chemical inventory is required by the Florida Department of Education Chapter 6A2 law. (3)
- Keeping an annual inventory helps determine which chemicals are infrequently used.
- Keeping an annual chemical inventory helps to bring to attention expiration dates on chemicals. (Any chemical over five years old is considered expired.)

## SAFETY GUIDELINES

### Chemical Laboratory Procedures

#### Material Safety Data Sheets (MSDS)

- Material safety data sheet (MSDS) provides information about a specific chemical.
- A material safety data sheet (MSDS) will detail the following information about the chemical:
  - the chemical's synonyms.
  - The chemical's physical properties
  - Proper handling procedures.
  - Proper protective equipment to be worn when using the specific chemical.
  - First aid and emergency procedures.
  - Proper spill clean-up procedures.
  - Proper disposal procedures.
- Every chemical in the laboratory must have an MSDS sheet available and on the premises.
- Before using a chemical, the MSDS must be reviewed to ensure proper handling protocol.
- In case of a spill, Refer to the MSDS.
- A copy of an MSDS should be sent to Purchasing Department or to the department placing the order, by the manufacturer, for each chemical shipped.
- According to the Florida Right-To-Know Law, an MSDS must be available to an employee within five working days.
- An MSDS must be kept on file for up to 30 years, even if the chemical is no longer present in the laboratory.

A sample material safety data sheet is provided on the following pages.<sup>(5)</sup>

**SEE MSDS SAMPLES**

See MSDS samples

## SAFETY GUIDELINES

### Chemical Laboratory Procedures

#### Chemical Definitions

Below are definitions of some commonly used hazardous chemicals.

**Hazardous Chemical:**

A chemical that is explosive, flammable, poisonous, corrosive, reactive or radioactive; and requires specific handling techniques due to the potential danger it may cause to the public and the environment. (8)

**Explosive Materials:**

Compounds or mixtures that can instantaneously cause the release of gas and heat by explosion. (8)

**Flammable Liquid:**

Any liquid having a flash point below 100 degrees F (37.7 degrees C). (8)

**Oxidizer:**

A substance that produces oxygen which can trigger combustion of other materials. (8)

**Corrosive Material:**

A liquid or solid that has the capacity to destroy skin, tissue or has a corrosive effect on steel or aluminum. (8)

**Carcinogen:**

A cancer-producing chemical or substance. (8)

**Poison:**

A chemical that can kill, injure or destroy a living organism. (8)

## SAFETY GUIDELINES

### Biological Laboratory Safety Procedures

To prevent self contamination, cross-contamination and to ensure safe handling, some general areas of biological safety are examined below.

### General Procedures for Specimen Handling

When dealing with specimens, the hazards can appear to be minute yet are often insidious. Some basic guidelines to follow when dealing with potential biological hazards are as follows:

- Become familiar with the organisms you will be handling.
- Work in a clean, uncontaminated area or fume hood, when warranted
- Know what procedures you will be performing and all precautions to be taken.
- Wear appropriate protective clothing.
- Properly discard the specimens after completing the laboratory procedure.
- Decontaminate the work area and equipment used.
- Discard gloves and other contaminated materials appropriately.
- Thoroughly wash hands with soap and water after completing the laboratory procedure.

## SAFETY GUIDELINES

### Biological Laboratory Safety Procedures

#### Preserved Biological Specimen Handling

The greatest hazard presented by preserved specimen handling pertains to the chemicals used in preservation process of the specimens. The most commonly used fixative and/or preservative is formaldehyde, a known carcinogen.

Some precautions to take when handling preserved specimens are as follows:

- Wear proper protective clothing, such as goggles, gloves and lab coat or apron.
- Thoroughly wash the specimens before use.
- Work in a well ventilated area.

Some preserved specimens still retain hazards event though preserved.

- Venom from poisonous snakes retains its toxicity after specimen preservation <sup>(9)</sup>
- Eggs from female ascaris worms (*Ascaris lumbricoides*) may still be viable and can be transmitted to humans by improper hygiene practices.

## SAFETY GUIDELINES

### Biological Laboratory Safety Procedures

#### Live and Fresh Biological Specimen Handling

Living specimens present a different set of hazards to the laboratory worker than do preserved specimens.

- Some animal parasites may be passed onto humans if proper hygiene standards are not followed.
- Certain plant specimens can cause allergic reactions in some people. Often it is a part of the plant such as seeds, berries or leaves that cause the allergic reaction.
- A few examples of allergy-stimulating plants are listed below:
  - Nightshade
  - Poison ivy
  - Water hemlock
  - Oleander
  - Yew <sup>(9)</sup>
- Some fungal spores may also produce allergic reactions.
- Aspergillus, may cause aspergillosis in immune depressed people.

### Microorganisms

- When dealing with microorganisms, the best approach to use is the assumption that all microorganisms are pathogenic.
- The use of proper aseptic technique and good hygiene practices will help to eliminate the chance of contamination and infection.

### SAFETY GUIDELINES

### Biological Safety Procedures

#### Disinfectants

Two common disinfectants used in the laboratory are chlorine and alcohol.

#### Chlorine

- Laundry bleach (sodium hypochlorite) diluted to a 10% solution is active against many agents found in the laboratory.
- The bleach disinfectant is active against most bacteria and viruses.
- Due to chlorine's corrosive nature, other disinfectants may be preferred for certain uses.

#### Alcohol

- A 70% solution of alcohol is a common disinfectant used in the laboratory.
- An alcohol-based disinfectant is suitable for general use.

#### Other

- Disinfectants which are phenolic or iodine based are also available, as well as commercially manufactured ones such as Code 4™ by Ali Medical Inc.

## SAFETY GUIDELINES

### Biological Safety Procedures

#### General Procedures for Handling Human Body Fluids

(13)

Although there are specific procedures to follow when dealing with human body fluids, common guidelines exist for all experiments dealing with human body fluids.

- Wear protective clothing when dealing with body fluids, contaminated equipment and surfaces.
- Wear double disposable gloves.
- No mouth-pipetting of human body fluids.
- When centrifuging human body fluids, centrifuge tubes should be capped to prevent aerosolization; and particle masks, goggles, gloves and lab coats should be worn.
- Contaminated equipment will be sorted into the following categories:
  - Disposable sharps
  - Disposable non-sharps
  - Non – disposable equipment.
- Laboratory set-ups for exercises that use human body fluids should have appropriate sharps and non-sharps receptacles accessible and well-identified.

- All receptacles for contaminated waste must be labeled with:
  - Date of use
  - Campus address
  - Contact phone number
  - College biohazardous waste generator identification number

## SAFETY GUIDELINES Biological Safety Procedures

### Disposable Sharp Equipment (13)

- A sharp is classified as :

Any disposable contaminated object that can penetrate the skin, such as:

- slides
- coverslips
- toothpicks
- test tubes
- centrifuge tubes
- capillary tubes
- blood lancets
- needles
- scalpels
- any glass

### Disposable Non-sharp Equipment (13)

-A non-sharp is defined as:

Any disposable contaminated object that cannot penetrate the skin, but has the presence of human body fluids on it such as:

- alcohol swabs
- lens paper
- bibulous paper
- paper towels
- disposable gloves

- face masks
- melted plastic Petri dishes

### Non-disposable Equipment

- Non-disposable equipment is:

Equipment that come in contact with and has the presence of human body fluids on it, such as:

- hemoglobinometer
- hemacytometers
- glass test tubes
- pipets
- centrifuges
- centrifuge shields
- test tube racks

### Blood experiments

Exercises that require the use of students' blood should follow the protocol detailed below:

- All contaminated slides, coverslips, capillary tubes and lancets must be discarded in a regulation sharps container.
- All contaminated alcohol swabs, lens and bibulous paper, gloves, and paper towels must be discarded in a regulation biohazardous non-sharps red bag.
- All contaminated countertops must be decontaminated with a 10% bleach disinfectant solution (or other suitable disinfectant).
- Any contaminated non-disposal equipment should be submerged in or swabbed with a 10% bleach disinfectant solution (or other suitable disinfectant solution) and then washed.
- If autolet-type lancets are used, platforms, as well as lancets, must be discarded, in a sharps container, after each use.

## SAFETY GUIDELINES

### Biological Safety Procedures

#### Urine Experiments

In urinalysis exercises, the following guidelines should be followed:

- All disposable sharps, such as capped centrifuge tubes, rigid plastic urine cups, slides, cover slips and pipets must be discarded in a regulation biohazardous sharps container.
- All contaminated disposable non-sharps items, such as cardboard and soft plastic urine cup lids, urine test dip sticks, icto test pads, gloves, face masks and paper towels must be discarded in a regulation biohazardous non-sharps waste red bag.
- All contaminated non-disposable equipment such as urinometers, urinometer floats, forceps and centrifuges should be either submerged in 10% bleach or swabbed with a 10% bleach disinfectant solution (or other suitable disinfectant) and then washed.
- All contaminated countertops must be swabbed with a 10% bleach disinfectant solution or other suitable disinfectant.

## Biological Laboratory Safety Procedures

### Saliva and Cheek Cell Experiments

Exercises that use students' saliva or cheek cells should follow the procedures outlined below:

- All contaminated disposable sharps, such as test tubes, slides, coverslips and tooth picks must be discarded in a regulation biohazardous sharps container.

#### Saliva and Cheek Cell Experiments (contd)

- All contaminated disposable non-sharp materials, such as paper towels, lens paper and bibulous paper must be discarded in a regulation biohazardous non-sharps waste red bag.
- When non disposable tubes are used, they should be submerged in a 10% bleach disinfectant solution (or other suitable disinfectant) and then washed.
- All contaminated countertops should be swabbed with a 10% bleach disinfectant (or other suitable disinfectant).

## SAFETY GUIDELINES

### Emergency Procedures

#### Chemical Spills

- The hazardous nature of the chemical spilled determines the seriousness of the spill.
- Spills of one liter or greater of a liquid and one pound or greater of a solid should be handled according to MSDS sheets.
- The quantity of the chemical spilled becomes irrelevant when the chemical spilled is highly corrosive, flammable or toxic.

#### General Spill Clean-Up Procedures

Some general guidelines apply for most spill clean-ups. They are as follows:

- Do not panic.
- Contact the campus Security department, or dial 911 if the spill is life-threatening.
- Treat the spilled material as **hazardous**, unless you are **absolutely** certain that the chemical is non-toxic.
- Evacuate the building if necessary.
- Don protective equipment, such as gloves, goggles, face shield, apron, boots, and lab coat if necessary.
- Stop the source of the spill, if possible.
- Cover floor drains with floor drain mats.
- Evacuate from spill area.
- Have contaminated personnel remove all contaminated clothing and wash under the emergency shower and eyewash, if necessary.

## SAFETY GUIDELINES

### Emergency Procedures

#### General Spill Clean-Up Procedures (cont.)

- Attempt to determine the chemical's identity by:
  - Having the person working with the chemical identify the chemical.
  - Looking for labels on bottles, gas cylinders, etc.
  - Testing the chemical with Ph paper, Ph meter or removing a sample for flammability.
  
- Once the chemical has been identified:
  - Refer to the MSDS sheet for clean-up information.
  - Use the appropriate spill clean-up material.
  - Dike the spill with spill pillows, spill socks or absorbent material.
  - Neutralize the spill.
  - Collect the spilled material for proper disposal (refer to MSDS sheet for disposal procedures).

## SAFETY GUIDELINES

### Emergency Procedures

#### Spill Clean-Up Equipment

Some commonly used pieces of equipment used in spill clean-up are listed below:

- sponge
- paper towels
- scoops and shovels
- floor drain mats/covers
- personal protective equipment
- waste disposal bags or containers
- spill absorption/neutralization media
- dust pan
- forceps

## Categories of Spills

Spills are categorized by the chemicals involved in the spill.

These categories are:

- acids
  - bases
  - flammables
  - mercury
- Specific spill clean-up kits are available for each type of chemical category.
  - Absorbent spill socks and pillows are also available.
  - If spill kits are not available:
    - Charcoal may be used to absorb a flammable liquid spill.
    - Caustic soda may be used on an acid spill.
    - Citric acid may be used on an inorganic base spill.
  - Mercury spills may be picked up with a vacuum-type mercury spill clean-up gun, sponge-type clean-up kit or absorbent powder clean-up kit.

## SAFETY GUIDELINES

### Emergency Procedures

#### Accidents

Accidents are defined as incidents involving spills, fire, injuries, or illnesses.

Accident investigations should examine the cause and the factors that contributed to the accident.

#### Common Causes of Laboratory Accidents (5)

- Lack of personal protective equipment:
  - Either protective equipment is unavailable, inappropriate or not being used.
- Poor Communication:
  - This can occur as a result of incomplete or misunderstood directions between supervisor and employee or poor or inadequate labeling of chemicals.
- Poor Ventilation:
  - Poor ventilation results from hood malfunction or disuse, or inadequate fresh air circulation in the laboratory.
- Poor Laboratory Safety Awareness:
  - This can occur from eating, drinking, applying cosmetics, mouth pipetting and other inappropriate behavior in the laboratory setting.
- Inadequate Supervisor Responsibilities:
  - Examples of this are poor housekeeping, and lack of enforcement of safety procedures and policies.
- Electrical Hazards
- Storage Problems
- Inadequate Emergency Procedures and Equipment
- Lack of Personal Responsibilities

## SAFETY GUIDELINES

### Emergency Procedures

#### Accident Prevention

Many accidents can be prevented by increasing awareness and by eliminating the common causes of accidents (previously described).

- Some other areas of prevention are as follows:
  - Use ladders, not chairs, to reach inaccessible items.
  - Keep cabinet and closet doors closed, to prevent injuries.
  - Pick up foreign objects on the floor, to prevent slips and falls.
  - Keep aisles, stairs and doorways clear.
  - Use proper lifting procedures.

#### Lifting Procedures

- Keep your body close to the load to be lifted.
- Be sure you have solid footing.
- Bend your knees, do not use your back muscles.
- Do not twist while holding the load, reposition your feet to turn.
- Use a step ladder when placing the load above chest level.
- Use dollies or carts to move heavy loads.
- If a load is too heavy to lift alone, ask for assistance.

## SAFETY GUIDELINES

### Emergency Procedures

#### Record-Keeping and Reporting

- All accidents, no matter how small, must be reported and recorded.
- A record is kept to help determine hazards and to eliminate them in the future, rather than to place blame.
- A copy of the accident/incident report should be kept in the laboratory files.

#### Key Contact Personnel

If the accident is life threatening.....**call 911**

If the accident is not life threatening.....call  
Campus Security then call Department Head then  
call Laboratory Manager

#### Emergency Telephone Numbers

The following telephone numbers should be posted  
by each laboratory telephone:

Campus Security  
Local Police Department  
Local Fire Department

**CHEMTREC (spills) 1-800-424-9300**

**TOXIC SUBSTANCE INFORMATION**

**CENTER 1-800-367-4378**

**POISON INFORMATION CENTER<sub>(10)</sub> (Tampa,  
Fl) 1-800-282-3171**

**EPA REGION 4 (Atlanta, GA) 1-404-881-4727**

## SAFETY GUIDELINES

### Emergency Procedures

#### First Aid

- Each laboratory is stocked with a first aid kit.
- The kits are for self-treatment only.
- Laboratory staff should not assist in the application of first aid.
- These kits should not contain aspirin or ammonia inhalants.
- Whenever the kit is used, the campus Security department must be contacted.
- An accident report must be completed and a record kept for the laboratory files.
- Only trained and certified personnel should attempt CPR, using proper personal protective equipment.

## SAFETY GUIDELINES

### Emergency Procedures

#### Bomb Threats <sup>(6)</sup>

- When a bomb threat is received, the person receiving the call should:
  - Give a pre-arranged, verbal or written signal to alert anyone present at the time, to monitor the call and attempt to record and/or trace the telephone call.
  - Refer to the bomb threat check list and complete it for the call.
  - Remain calm and concentrate on the exact wording of the message and other details which could prove valuable in evaluating the threat.
- When a threat is received, the person receiving the call should immediately notify the appropriate college or campus personnel:

<u>Location</u>	<u>Person</u>
North Campus	Provost
Central Campus	Provost
South Campus	Provost
Center for Health Sciences	Executive Director
Ft. Lauderdale Center	Vice President of Business Affairs
All Locations	Campus Security Department Head
Evenings	Security

THREAT CALL CHECK LIST

DATE \_\_\_\_\_ TIME OF CALL \_\_\_\_\_

CALL RECEIVED BY \_\_\_\_\_

RECORD THE EXACT LANGUAGE OF THE THREAT: \_\_\_\_\_

WHEN IS IT SET FOR? \_\_\_\_\_

WHERE IS IT? \_\_\_\_\_

WHAT KIND OF BOMB? \_\_\_\_\_

HOW MANY BOMBS? \_\_\_\_\_

WHAT DOES THE BOMB LOOK LIKE? \_\_\_\_\_

WHY ARE YOU DOING THIS? \_\_\_\_\_

WHO ARE YOU? \_\_\_\_\_

VOICE ON THE PHONE:

MAN \_\_\_\_\_ WOMAN \_\_\_\_\_ CHILD \_\_\_\_\_ AGE \_\_\_\_\_

INTOXICATED \_\_\_\_\_ SPEECH IMPEDIMENT \_\_\_\_\_

ACCENT \_\_\_\_\_ OTHER \_\_\_\_\_

BACKGROUND NOISE:

MUSIC \_\_\_\_\_ CHILDREN \_\_\_\_\_ AIRPLANE \_\_\_\_\_

TALK \_\_\_\_\_ TRAFFIC \_\_\_\_\_ OTHER \_\_\_\_\_

TYPING \_\_\_\_\_ MACHINES \_\_\_\_\_

FOR EMERGENCY COORDINATOR CALL \_\_\_\_\_

REMEMBER, THE INTENT IS USUALLY NOT TO KILL. STAY COOL.  
KEEP TALKING.

## SAFETY GUIDELINES

### Emergency Procedures

#### Fire or Explosion (6)

##### General Responsibilities of Staff

Any person discovering a fire or explosion must:

- Immediately sound the alarm by voice, rush to the nearest fire alarm box and activate it
- In the case of a small fire, or a fire in an early stage, use appropriate spill pillows, absorbent powder or fire extinguisher to keep fire under control.
- In case of an explosion, potential explosion or uncontrollable fire, exit the building immediately, close doors and report the condition as outlined below:
  - Call the switchboard operator by dialing "O", campus Security department or 911.
  - Give the following information:
    1. Location (Building and room numbers)
    2. Type of fire or explosion, if possible (i.e. trash, electrical, chemical).
    3. Your name
- Faculty and staff in affected building:
  - Must evacuate the building in accordance with posted instructions for evacuation.
  - Supervise and assist in the evacuation of any physically handicapped students.
    - Keep all students a safe distance from the affected building and maintain a clear path of access for emergency vehicles.

## SAFETY GUIDELINES

### Emergency Procedures

#### Interruption of Power <sup>(6)</sup>

Electrical power failures may occur at any time during the college's operational hours.

Depending on the cause, the interruption may last from a few seconds to several hours.

Based on the time of day, location within a building, equipment being used and type of activity being performed, the power interruption may create conditions ranging from momentary inconveniences to a severe hazard.

#### General Responsibilities

Any individual in an area affected by a power failure shall:

- Limit movement.  
Emergency lights, where provided are required to come on within 10 seconds and remain on for at least 1 ½ hours.
- Secure equipment:  
Turn off or disconnect any equipment that could be damaged or cause injury when power returns (i.e. computers, projectors, hot plates).

## DISPOSAL PROCEDURES

### Chemical Waste

Broward College is registered as a small quantity generator under the U.S. EPA and Florida Department of Environmental Regulations.

Disposal of all hazardous wastes will be coordinated through a bid with a licensed and insured waste management contractor, and the Fort Lauderdale Center's Physical Plant (761-7548).

All available steps should be taken to minimize the types and quantities of hazardous materials which end as wastes <sup>(7)</sup>

Listed below are chemical disposal procedures for chemicals that are listed as waste:

- Waste produced from students during laboratory sessions should be collected in clearly labeled containers.
- The labels should be specific, describing:
  - The chemicals in the container.
  - The total quantity of chemical in the container.
  - The date(s) the waste was collected.
- Detailed label information helps prevent mixing incompatible chemicals.
- Appropriate waste containers should be used for storing hazardous waste.

-Unknown chemicals (stored in containers that have missing labels, or names of chemical mixtures) must be analyzed before adding to the list of collected waste.

-Chemicals in rusting containers, or with lids and containers that are cracked, should be listed as waste.

-Chemicals that are outdated should be considered as waste. Usually a five year shelf life is a guideline for disposing of a chemical.

-Ether should be discarded after one year, if unopened.

-An opened ether bottle should be considered waste after three months.

## DISPOSAL PROCEDURES

### Chemical Waste (cont.)

- Mercury collected in small amounts, usually from broken thermometers, can be neutralized by the contents of the mercury spill kit.
- If large amounts of mercury are collected, the following procedures should be utilized:
  1. Source who will recycle mercury:  
Mercury Refining Company  
Railroad Avenue  
Albany, New York 12205  
1-800-833-3505
  2. Procedure
    - Put mercury in original or similar container (plastic or glass) using a narrow mouth bottle.
    - Place this container in a wide mouth plastic bottle.
    - Use absorbent material (such as newspaper) to pack around the original container. Screw on wide mouth cover tightly!
    - bag. Fold the bag over and tie tightly with a rubber band or a tie strip.
    - Put this in a cardboard box- use suitable size. Ship UPS.

MARK OUTSIDE OF CARDBOARD BOX  
EXACTLY AS SHOWN:

RQ MERCURY METALLIC  
ORM-B  
NA 2809





## DISPOSAL PROCEDURES

### Biological Waste

#### Human Body Fluids <sup>(13)</sup>

To prevent the spread of bloodborne pathogens, such as HIV and Hepatitis B viruses, the college utilized an outside contractor, Med-X Inc., to remove biohazardous waste.

- All biohazardous waste that is contaminated with human body fluids, such as urine, blood, semen, vaginal secretions or saliva, is to be discarded in appropriately labeled waste containers.
- The waste containers are well labeled and red, to symbolize biohazardous waste.
- A biohazardous waste receptacle is classified as either as a sharps container or a non-sharp container. (The differentiation between these two types of containers is described on pages 34 and 35 “Handling of Human Body Fluids.”)

#### Disposal of Microorganisms

- Bacterial and fungal cultures in disposable glass culture tubes are first autoclaved, and then discarded in a red biohazardous sharps container, for Med-X removal.
- Plastic disposable Petri dishes of bacterial and fungal cultures are autoclaved, until melted, and discarded in a red biohazardous waste non-sharps bag for Med-X removal.
- Both of the above containers are ultimately placed in a 30 gal. cardboard Med-X disposal box prior to removal by Med-X.

## GOVERNMENTAL REGULATIONS

### Florida State Right-to-Know Law<sup>(11)</sup>

- Requires vendors of toxic substances to supply information on the toxic substance to the purchaser (i.e. your employer).
  - The employer must provide the employee with the information received from the vendor.
- The employer will also provide the proper training regarding handling of toxic substances.

### Who is Covered Under the Right-to-Know

- Any employee who has hired on or after January 1<sup>st</sup>, 1985, and who may be exposed , under normal conditions or emergency conditions, to a toxic substance within his workplace is covered by the law.

### Your Rights and Duties Under the Right-to-Know Law

- An employee has the following rights under the Florida Right-to-Know:
  - To obtain a copy of an MSDS (Material Safety Data Sheet) within five (5) working days, for any toxic substances to which an employee has been exposed in the work place.

Five (5) stipulations on this right are as follows:

1. The request must be in writing
2. The employer may require an employee to file a request for an MSDS and receive the information during non-working hours, so as not to interfere with any job duties.
3. The employer has five (5) working days to locate and provide an employee with the MSDS.  
If the employee is not working due to sickness or a vacation day, the five day requirement does not apply.

## GOVERNMENTAL REGULATIONS

### Florida State Right-to-Know Law (cont.)

#### Rights and Duties Under the Right-to-Know Law (cont.)

4. If the employer does not have an MSDS in his possession at the time of the request, the employer is required to obtain the MSDS from the manufacturer, vendor or BC's Purchasing department.  
If the employer is in the process of obtaining the MSDS, he is **NOT** required to provide the MSDS until he receives the requested MSDS.
5. The employee has the right to refuse to work with the toxic substance if the employer has the MSDS and fails to provide it to the employee.
  - The following are exceptions to the above conditions:
    - o The right of an employee to refuse to work, covers **ONLY** that part of his duties which would require working with the toxic substance.
    - o The employee is still required to fulfill all other job duties.
    - o If the employer is in the process of getting the requested MSDS, the employee does not have the right to refuse to work with the toxic substance during this time.
    - o Employees must accept a transfer to another job that does not require working with the toxic substance, if the employer requests it.
    - o The employee has protection against discharge, discipline or discrimination for exercising his right under the law.

- The employee is not protected for other violations that are not covered under the Right-to-Know Law (such as violating work rules).

## GOVERNMENTAL REGULATIONS

### Florida State Right-to-Know Law (cont.)

#### Rights and Duties Under the Right-to-Know Law (cont.)

- Each employee, within 30 days of employment, and yearly thereafter, must receive instructions on the health hazards of each toxic substance, how to handle each substance safely, and emergency procedures pertaining to the toxic substance.
- The training will be presented, by the employer, in a written form or by other means, such as films and discussions.
- The instructional training will include the following:
  - A discussion of the employee's rights and duties under the Florida Right-to-Know Law.
  - A list and location of toxic substances that the employee may be exposed to within his work place.
  - A material safety data sheet will provide chemical information such as:
    - Common names
    - Proper and safe handling
    - First aid and antidotes
    - Adverse health effects
    - Emergency procedures
    - Clean up of spills
    - Other pertinent facts regarding the chemical, that the employee may come in contact with on the job.

This will meet any training obligation of the employer. It is recommended that the employee read the MSDS, when possible, before using any toxic substances.

- The employer may require the worker to sign a contract (see page 56 of this manual) to be filed as evidence of training for the Florida Right-to-Know Law.

- The employee is expected to apply the training received, regarding the toxic substances, while performing his job duties.

## GOVERNMENTAL REGULATIONS

### Florida State Right-to-Know Law (cont.)

Further information on toxic substances can be obtained from the

TOXIC SUBSTANCE INFORMATION CENTER  
2551 EXECUTIVE CENTER CIRCLE WEST  
TALLAHASSEE, FL. 32301-5014  
TELEPHONE NUMBER- 1-800-367-4378

### Chemical Hygiene Plan

Broward College has written a Chemical Hygiene Plan which satisfies the OSHA-mandated Laboratory Hazardous Communication Standard.

A copy of the Chemical Hygiene Plan is located in the Science Department office and in science laboratories on each campus.

Broward College  
SAFETY TRAINING AND ORIENTATION CONTRACT

I have received the following safety training:

- Chemical Hygiene Plan
- Florida Right-to-Know Law
- Proper procedure for handling chemicals
- Proper procedure for handling hazardous chemical waste
- Proper procedure for handling biohazardous waste
- Proper procedure for handling preserved specimens
- Proper procedure for handling live specimens
- Proper chemical storage
- Emergency Procedures
- Location of safety equipment in my workplace
- Location of Material Safety Data Sheets in my workplace
- Location of the emergency equipment in my workplace
- Proper hygiene practices for the laboratory
- Appropriate clothing for the laboratory
- Proper personal protective apparel

Name: \_\_\_\_\_  
Date: \_\_\_\_\_  
Department: \_\_\_\_\_  
Campus: \_\_\_\_\_

Witness: \_\_\_\_\_  
Date: \_\_\_\_\_

## Broward College

## FLORIDA RIGHT-TO-KNOW LAW CONTRACT

I have received (\_\_\_\_\_annual,\_\_\_\_\_ orientation) training on the Florida Right-To-Know Law.

Mode of Training:      Verbal      \_\_\_\_\_  
                                  Written      \_\_\_\_\_  
                                  Video      \_\_\_\_\_

I am familiar with the purpose and use of Material Safety Data Sheets.

I am familiar with the location of Material Safety Data Sheets in my workplace.

I am familiar with the process used to obtain a Material Safety Data Sheet.

I know I am to refer to a Material Safety Data Sheet when handling a chemical for the first time.

Name: \_\_\_\_\_  
 Date: \_\_\_\_\_  
 Department: \_\_\_\_\_  
 Campus: \_\_\_\_\_

Witness: \_\_\_\_\_  
 Date: \_\_\_\_\_

General Storeroom and Laboratory Safety	Yes	No	N.A.
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All accidents, even minor ones, are recorded, and routine reports are submitted.			
An alarm for evacuating each laboratory is provided, frequently tested, and the alarm control is readily accessible.			
A general alarm system for the entire building, and emergency and security services are provided.			
Household-type refrigerators are not used for chemical storage unless modified by removing electrical controls to outside the cabinet, including lights and butter bin, and door closures replaced with magnets.			
Refrigerators are never used for food.			
Laboratory has at least two exits.			
Laboratory sinks have rubber or plastic mats in the sink and on the drain, and soap and hot water are available at each sink.			
Drainage from laboratory sinks is kept separate from drainage of other facilities.			
Beakers are not used for drinking.			
Disposable cups are provided near the drinking fountain.			
Personnel have been instructed never to taste chemicals for identification purposes, and to smell chemicals only by wafting a small amount of vapor toward the nose with the hand.			
Personnel have been instructed to pipet only by mechanical means, never by mouth.			
Bottles are never filled with materials other than that called for on the label, and are always labeled before filling.			
Contents of unlabeled containers are always thrown away.			
Chemical handling and storage information on new or unfamiliar chemicals are read before proceeding to use them.			
Chemicals are never removed from the laboratory, except under specific instructions from the supervisor.			
Personnel are instructed to perform no unauthorized experiments.			

<b>Materials Handling in Storeroom and Laboratory</b>	<b>Yes</b>	<b>No</b>	<b>NA</b>
Large glass containers of liquid chemicals, other than flammable liquids, oxidizing agents, and acids, are provided with protective covering to prevent shattering and splashing in case of breakage.			
Gas cylinders are capped, supported to prevent rolling or tipping, and placed away from heat sources and open flames.			
Inclinators on casters are used for handling carboys and other large vessels.			
Hand carts are used for moving cylinders—they are never rolled on their bottoms or handled by their valves.			
Chlorine or hydrogen sulfide cylinders are always handled by more than one person.			
Gas cylinders are always clamped tightly in place after being positioned for use.			
Large containers of dangerous reagents are not stored in the laboratory: e.g., standard 5-pint bottles of concentrated acids.			
Flammable solvents amounting to more than 1 pint are kept in safety cans.			
All containers of mercury are kept well stoppered.			
Large containers of chemicals are stored on or near the floor.			
Drums containing liquid chemicals are mounted horizontally and securely braced to prevent rolling.			
Drum taps are spring closing and have locking pins.			

<b>First Aid Supplies and Medical Services</b>	Yes	No	Na
First aid supplies are readily available, and have been approved by a consulting physician.			
An emergency room staff with medical personnel specifically acquainted with chemical exposure and proper treatment is readily accessible.			
Blankets are readily available for shock cases and for protection of the injured.			
Supervisors are trained in resuscitation.			
First aid cabinets are clearly labeled.			

<b>Fire Protection</b>	Yes	No	Na
An automatic sprinkling system is installed in the laboratory building and a fire hose is available.			
Proper types of fire extinguishers are available for various types of fires.			
At least one large back-up fire extinguisher of the dry chemical type is located outside each laboratory.			
Open flames or spark-producing equipment is kept away from flammable vapors and liquids.			
All new personnel are required to actually operate various types of fire extinguishers.			

<b>Personal Protection</b>	Yes	No	NA
Face masks or goggles are worn where there is danger of splashing chemicals or flying particles.			
Goggles are worn when working with glass apparatus used in combustion or other high temperature operations and at reduced or elevated pressures.			
Eye protection is required for all personnel where chemicals are stored and handled.			
Facilities for flushing the eyes in case of chemical contamination are available.			
Personnel are instructed in the location and use of all safety equipment.			
Safety shower is available within easy access to all personnel and is tested on a regular basis.			
Safety shower valves are plainly labeled, open readily in either direction, and remain open until manually closed.			
Protective gloves are always worn when transferring hazardous chemicals.			
Proper goggles for protection from infrared and ultraviolet light are worn when working with these rays.			
A static grounding line is included in the storeroom and connected to drums dispensing flammable liquids.			
A container of an acid neutralizer is at hand where acids are poured.			
Apparatus and glass tubing does not project beyond the front shelf limits.			
Bulky and fragile apparatus is clamped to the shelf to prevent jarring or knocking it off.			
Ridges are along the edges of shelves to prevent glass reagent bottles from rolling or jarring off.			
Chemicals which might react together to produce dangerous fumes, fires, or explosions, are stored away from each other.			
Volatile liquids are kept away from heat sources, sunlight, and electrical switches.			
Special cabinets are available for storing flammable and combustible chemicals.			

Flammable or combustible liquids are drawn from or transferred into vessels, containers, or portable tanks by a device fitting into the top, with an approved self closing valve.			
Dispensing of acids, ammonia, etc. from carboys or drums is done in a separate room equipped with an exhaust fan.			
Signs of OSHA size and color are used to direct traffic flow, warn of hazards, and give information.			
A file of publications on laboratory safety is readily available.			
Personnel are not permitted to work alone in the laboratory.			
Personnel are required to confine their hair, if long.			
Periodic checks are made of the ventilation system.			
A separate room is provided for work with explosive materials and all open flames and electrical contacts that are not explosion-proof have been eliminated from room.			
Drying ovens have doors that open automatically when the pressure is increased slightly from heat.			
Dangerous materials used in the laboratory are kept to small quantities.			
Dangerous materials, such as cyanides, arsenates, carcinogens, etc. are followed step by step from the time they leave the storeroom to their final disposition.			
All cancer suspect agents are so labeled.			
Refuse is not allowed to remain in the laboratory overnight.			
Storeroom has well lighted exit, no blind alleys, and is properly ventilated.			
All glass apparatus is borosilicate glass except reagent bottles, measuring equipment, stirring rods, and tubing.			
Tongs designed for specific uses are kept at hand.			
A good housekeeping program is set up and enforced and work benches and tables are kept free of chemicals, scraps of paper, dirty glassware, etc.			
Handling, carrying, or working with dangerous materials is not permitted by inadequately trained or unauthorized personnel.			
Emergency telephone numbers are posted in a conspicuous place in the laboratory.			
Reagents and chemicals are not stored in lockers.			
Cover glasses are used to prevent spattering when liquids are heated on hot plates.			
Heating mantles are used to heat flammable liquids.			
Fume hoods are effective enough to eliminate all strong odors including mercaptans and pyridine (at least 100 ft. per minute flow at the hood surface), and checked at frequent intervals by a velometer.			
Fume hoods have safety glass windows or safety shields for use with potential explosives.			
Safety shields are used in front of glassware assemblies that are fragile, subject to heat shock, or contain flammable or explosive chemicals.			
Acid bottles are always rinsed on the outside before being opened.			
All acid bottles are kept tightly stoppered when not in use.			
Laboratory personnel have been taught to always pour acid into water, never water into acid.			
Dewar flasks and large vacuum vessels are screened, taped, or contained in a metal jacket.			
Vacuum desiccators are shielded with guards.			
Combustible chemicals, volatile liquids, mercury globules, and acids are cleaned up immediately after spillage.			
Storeroom has a window or door opening directly to the outside of building.			
Storeroom has a large blower capable of changing the air in the entire room quickly.			
The laboratory is inspected often and thoroughly for unsafe conditions, and action is taken promptly to correct them.			
Supervisors are familiar with OSHA regulations as applied to laboratories.			
Ether and other chemicals that form peroxides are labeled with date received and opened.			
Discipline is maintained and rules enforced with all personnel, and visitors are required to follow the same safety rules.			
Practical jokes of any kind are not tolerated at any time.			

<b>LASER SAFETY</b>	YES	NO	NA
Laser beams are always directed into nonreflecting and fire resistant backgrounds when not in use.			
Laser circuits are designed to avoid accidental pulsing and to minimize electrical shocks from power supplies, capacitors, and other equipment.			
Laboratory personnel are kept at a reasonable distance from all sides of the anticipated path of beams.			
The level of general illumination is high in areas where lasers are operated.			
Personnel are warned never to look into the primary laser beam or directly into specular reflections of the beam or the pump source, and never to aim the laser beam with the eye.			
Personnel are warned to be especially cautious with lases that operate in the infrared region.			
Personnel are warned not to let the laser beam strike exposed skin surfaces.			
Personnel using laser beams are required to have ophthalmological examinations at regular intervals.			

<b>Radiation Safety</b>	Yes	No	Na
Monitors for radioactive materials are present, and detection instruments for radiation are used.			
Respiratory protection against radioactive materials is available.			
Complete clothing changes are provided when necessary.			
Areas in which radioactive materials are used are clearly marked and restricted, and special areas in radioactive materials laboratories are set aside for eating, smoking, applying cosmetics, etc.			
Working surfaces and equipment are made of nonporous and chemical materials.			
Absorbent paper is available for radioactive spills on nonporous surfaces, and paper is discarded at frequent intervals as contaminated waste.			
All apparatus, containers, etc. used in the laboratory from storage to disposal are plainly marked with date, isotope, decay products, and type of radiation emitted.			
Decontamination procedures are used in restricted areas.			
Medical examinations for radioactive laboratory personnel are made at least once a year, and complete records of personnel exposed to radiation are maintained.			
Air samples are taken at frequent intervals to check for radioactive contamination.			
Radioactive materials are used in a closed system, and spot checks for leaks are made at frequent intervals.			

<b>Waste Disposal</b>	Yes	No	Na
Volatile and corrosive materials are never poured down a sink or drain.			
Acids are disposed of by pouring down an acid sewer, using much flushing water.			
Sodium and potassium materials are destroyed by slowly adding them to ethanol.			
Janitors and other maintenance personnel are instructed in proper methods of disposal, and disposal areas are located well away from the building and protected from trespassers.			
Waste material is not allowed to accumulate on the floors, in corners, or under shelves and tables.			
<b>Electrical Safety</b>	Yes	No	NA
All electrical connections are encased in heavy rubber, and worn			

connections are replaced promptly when there is any sign of thinning insulation.			
Personnel are instructed to check to see if wire is dry before connecting it, and never to operate electrical equipment with damp hands, when standing in or near water, or if liquid has been spilled on it.			
Electrical equipment which is operated in areas exposed to flammable vapors is explosion-proof.			
Electric outlets for fume hoods are placed outside the hood.			
All electrical outlets should carry a grounding connection requiring a 3-prong plug.			

Total YES response _____
Total NO response _____
Total NA (Not Applicable) response _____

Score = $\frac{\text{YES response} \times 100}{123 - \text{NA response}}$
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TYPE	ADVANTAGES	DISADVANTAGES	NOTES
HALON CLASS A, B, C OR B, C	<ul style="list-style-type: none"> <li>- Quick Fire Knockdown</li> <li>- Will Reach Hidden Fires</li> <li>- No damage to Equipment</li> <li>- Good Visibility</li> <li>- Good Discharge Range</li> <li>- Heat Absorber</li> </ul>	<ul style="list-style-type: none"> <li>- Requires Rapid Discharge</li> <li>- More Expensive</li> <li>- Personnel Hazard (Halon 1211)</li> <li>- Not for Deep-Seated Fires</li> </ul>	<ul style="list-style-type: none"> <li>- Most Common System for Electrical/Electronics</li> <li>- Maximum Effectiveness Requires Rapid Detection</li> </ul>
DRY CHEMICAL CLASS A, B, C	Good on Oil/Grease		