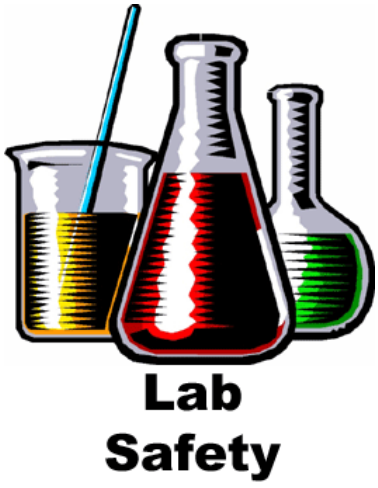
LABORATORY STANDARD PROCEDURAL GUIDE AND REFERENCE MANUAL

ATLANTA METROPOLITAN STATE COLLEGE'S

Created By

Environmental Health, Safety, & Compliance



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1. Atlanta Metropolitan State College Statement of Responsibility

It is the responsibility of Atlanta Metropolitan State College (AMSC), as an employer, to take every reasonable precaution to provide a work environment that is free from recognizable hazards for its employees in accordance with the "general duty" clause of the Occupational Safety and Health Act, Section 5(a)(1).

Furthermore, AMSC is voluntarily following the requirements by the Occupational Safety and Health Administration (OSHA) Occupational Exposure to Hazardous Chemicals in Laboratories standard, (the Laboratory Safety Standard - 29CFR 1910.1450) to ensure that the necessary work practices, procedures policies are implemented to protect all employees working in AMSC owned and operated laboratories from hazardous chemicals in the work area.

Atlanta Metropolitan State College and its employees have the responsibility to be well informed regarding hazardous chemicals and risks associated with using hazardous chemicals in the laboratory environment.

The goal of the Atlanta Metropolitan State College's Laboratory Safety Manual is to minimize the risk of injury or illness to employees and students by ensuring that they have the training, information, support and equipment needed to work safely in College laboratories. Please note that the absence of a particular issue or procedure from this Manual does not necessarily indicate that the procedure or operation is safe. It is not possible to address all situations that may be encountered in the laboratory. It is the responsibility of Department Deans, Department Chairs, Principal Investigators, and laboratory personnel to identify and address outstanding laboratory safety issues.

This manual will be reviewed on a regular basis. As changes are made to this Manual updated versions will be available electronically on the Atlanta Metropolitan State College Intranet Website. Additionally, Academic Vice President, Institutional Effective Vice President, SMHP Department Dean, and SMHP Department Chair will be sent a notification email of the updated Manual to forward to all of the faculty and staff.

Comments and questions for improving the manual are welcome and encouraged. Please send comments to the AMSC EHS & Compliance Director via email (sduggal@atlm.edu) or call: 404-756-4044

The following laboratory safety procedures must be followed by all Atlanta Metropolitan State College SMHP Department personnel where activities involve the storage and use of hazardous materials in a laboratory.

A **hazardous material** is any item or agent (biological, chemical, physical) which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors.

Toxicity is the capability of a chemical to produce injury. Almost any substance is toxic when taken in doses exceeding the "tolerable limits".

Hazard is the probability that an injury will occur or rather the prospect that an individual will receive a toxic dose. It is incumbent upon the hazardous materials user to know the relative hazard of the materials in use.

Many items sold as consumer goods, office products, household utility products and cleaning supplies are not considered "hazardous". These products are exempted from certain labeling requirements; however, since Atlanta Metropolitan State College is classified as a Conditionally Exempted Facility of hazardous waste, the AMSC is required to manage these and all other hazardous chemicals for proper disposal. Chemicals that have Health, Flammable, Reactive, or Specific Hazard ratings of 3 or 4 are generally the materials that are identifiable as "hazardous materials" and it is these chemicals which pose the greatest risk and should be managed first.

With regard to this Manual, a **Laboratory** is defined as any area where hazardous materials may be stored or used as a part of teaching and research and may include, but is not limited to:

- Science Laboratories - Chemistry, Biology, and Physics etc.
- Fine Art Studios - Painting, Sculpture, Ceramics, Wood/Metal Working, Jewelry, etc.

2. RESPONSIBILITIES

2.1 Laboratory Safety Committee (LSC)

The Laboratory Safety Committee integrates the process of identifying hazards, evaluating the risks presented by those hazards and managing the risks of hazards of the experiment to be performed into the experimental design process. This interaction is the basic elements of a hazards identification, evaluation, and control process.

The research laboratory is a unique, ever-changing environment. Research experiments change frequently and may involve a wide variety of hazards (for example, chemical, physical, biological, radiological, and so forth). The individuals or teams of people conducting the experiments can be at varying stages of their education and career. Their backgrounds and experiences will vary, but hazard identification, hazard evaluation, and hazard mitigation in laboratory operations are critical skills that need to be part of any laboratory worker's education. Furthermore, integrating these concepts into research activities is a discipline researchers must establish to ensure a safe working environment for themselves and their colleagues.

Atlanta Metropolitan State College's Laboratory Safety Committee (LSC) serves to advise the AMSC President and Vice President for Institutional Effectiveness on policies, procedures, and issues regarding Laboratory Health and Safety. Other responsibilities of the LSC include:

- Establish and review laboratory safety policies and procedures which are designed to:
- Maintain compliance with Local, State, and Federal regulations regarding laboratory safety and the purchase**,** transportation, use, handling, storage and disposal of all hazardous materials.

- Protect and optimize safety for all faculty, staff, students, visitors and community members from hazardous materials.
- Establish procedures for monitoring the purchase, use, storage and disposal of hazardous materials.
- Review and advice on corrective actions recommended by the Laboratory Safety Staff from the Division of Science, Math, & Health Professions.
- Recommend training programs on laboratory safety practices and procedures that will result in faculty, staff and students having a continuing awareness of safe laboratory practices and proper hazardous materials use, storage, and disposal.
- Evaluate the various programs involved with laboratory safety compliance on an annual basis.

2.2 Departmental Deans/Departmental Chairs

Department Deans and Department Chairs have the following responsibilities related to Laboratory Safety:

- Ensure that prior to the initiation of research, each Principal Investigator using hazardous materials implements the College Laboratory Safety Manual within their respective laboratory space(s).
- Ensure that all Principal Investigators, Laboratory Personnel, students and other authorized personnel allowed access to the laboratories where hazardous materials are used have received all necessary and required training in laboratory safety policies and procedures.
- Ensure that appropriate facilities and safety equipment are available and appropriate PPE is used for research and teaching activities involving hazardous materials,
- Provide leadership and support of laboratory safety.

2.3 The Principal Investigator

A Principal Investigator (PI) is a faculty member (assistant professor, associate professor, professor, or instructor including adjunct faculty), a research professional, an academic professional, or laboratory coordinator who is associated with or provides guidance to a laboratory or laboratories using hazardous materials.

Responsibilities of the PI related to laboratory safety include:

- Ensuring that all laboratory personnel have the proper training before allowing them to work in a laboratory using hazardous materials. Training shall include (but not be limited to):
- Ensure that job specific safety protocols for laboratory equipment and hazardous materials are followed.

- Ensure that laboratory personnel have the ability to locate and communicate knowledge and comprehension of the LABORATORY SAFETY MANUAL, and the information related to Safety Data Sheets (SDS) and all safety and compliance training required by Atlanta Metropolitan State College's policy.
- Ensure that training records are readily available.
- Ensure that all applicable safety and compliance records are maintained as required by Federal, State and Local regulations and Atlanta Metropolitan State College's policy.

2.4 Laboratory Personnel

Laboratory Personnel may include faculty members, research professionals, research assistants, academic professionals, laboratory coordinators, laboratory assistants, or students who are associated with a laboratory or laboratories using hazardous materials.

Responsibilities of Laboratory Personnel related to laboratory safety include:

- Obtain training on protocols, hazard controls, specific hazards and emergency procedures before working in a laboratory or facility using hazardous materials.
- Learn all job specific safety protocols for laboratory equipment and hazardous materials within the laboratory.
- Complete all safety and compliance training that is required by the Atlanta Metropolitan State College Laboratory Manual policy.
- Maintain current training records (i.e. keep the certificate within reach and remember to perform annual training in accordance to the Manual).
- Ensure that all applicable safety and compliance records are maintained as required by Federal, State and Local regulations and AMSC policy.
- Comply with all policies, regulations, and procedures regarding the proper procurement, storage, use, transportation and disposal of all hazardous materials being used.
- Immediately inform the supervisor of any hazardous situation or situation that has the potential to become hazardous.
- Follow all laboratory protocols and standard operating procedures.
- Do not proceed with a process unless safety is addressed and is completely understood.
- Wear the appropriate personal protective equipment and personal apparel which must include low heeled, closed toed shoes and garments covering the legs. Shorts, sandals, flip-flops, short skirts, tank tops/open midriff tops, and dangling jewelry are not allowed when working or in the direct vicinity of hazardous material.
- If personnel observe issues that pose a risk and have not been addressed, the supervisor and/or PI are to bring it to the attention of the Department Chair and EHS Director.

3. Laboratories Standard Operating Procedures

The EHS has developed generic standard operating procedures relevant to safety and health considerations when laboratory work involves the use of hazardous chemicals. Where the scope of hazards are not adequately addressed by this general document, laboratory departments should develop standard operating procedures for work area specific operations. Standard operating procedures must be provided to all affected laboratory employees. The Standard Operating Procedures in this document specify minimum regulations and recommendations.

Note: "Prudent Practices for Handling Hazardous Chemicals in Laboratories" (National Research Council, 1981) was used as the basis for the standard operating procedure guidelines.

3.1 General Safety Principles

The following guidelines have been established to minimize hazards and to maintain basic safety in the laboratory:

- Examine the known hazards associated with the materials being used. Never assume all hazards have been identified. Carefully read the label before using an unfamiliar chemical. When appropriate, review the Safety Data Sheet (SDS) for special handling information. Determine the potential hazards and use appropriate safety precautions before beginning any new operation.
- Be familiar with the location of emergency equipment fire alarms, fire extinguishers, and emergency eyewash and shower stations and know the appropriate emergency response procedures.
- In the beginning of each laboratory course, the first laboratory session must be on lab safety which includes: showing the lab safety video and collecting signatures of students on the lab safety forms, verifying lab safety training. All signed lab safety forms must be retained in the Science, Mathematics and Health Professions Division office for at least three years.
- Avoid distracting or startling other workers when they are handling hazardous chemicals.
- Use equipment and hazardous chemicals only for their intended purposes.
- Always be alert to unsafe conditions and actions and call attention to them so that corrective action can be taken as quickly as possible.
- Wear eye and face protection and impervious lab coats when using the chemicals.
- Always inspect equipment for leaks, tears and other damage before handling a hazardous chemical. This includes fume hoods, gloves, goggles, etc. Also, do not use equipment with cracked, worn or loose cords.
- Do not taste or smell hazardous chemicals

3.2 Health and Hygiene

The following practices have been established to protect laboratory employees from health risks associated with the use of hazardous chemicals:

- Avoid direct contact with any hazardous chemical. Know the types of protective equipment available and use the proper type for each job.
- Restrain long hair, loose clothing and dangling jewelry; always wear footwear which fully covers the feet.
- Wear proper protective equipment (PPE) such as: lab coat, eye protection, face shields, gloves etc.
- Use safety glasses in all experiments in which solutions or chemicals are heated. Never leave any heat source unattended.
- Use mechanical pipetting devices; mouth pipetting is prohibited.
- Use appropriate safety equipment whenever exposure to gases, vapors or aerosols is suspected and ensure exhaust facilities are working properly.
- Place contaminated glassware, plastic ware or disposable materials in a disposable autoclave bag for autoclaving or directly into a 10% bleach solution before decontamination and reuse of disposal.
- Wear disposable gloves when handling blood and other body fluids, mucus membranes non-intact skin or items and surfaces soiled with blood or body fluids. Cover open carts with a sterile bandage before donning gloves, then wash hands immediately with soap and water before leaving the laboratory and before eating or drinking.
- Replace personal protective equipment as appropriate.
- Laboratory employees shall be familiar with the symptoms of exposure for the chemicals with which they work and the precautions necessary to prevent exposure.
- Inform the instructor if you are pregnant, taking immunosuppressive drugs, or have any medical condition that might require special precautions in the lab.
- Use disposable gloves and safety glasses when dissecting preserved materials and live animals.
- Always keep one hand behind your back when measuring current or voltage. If you use both hands, your body may actually become part of the circuit, with the current flowing across your chest and heart regions, which is very dangerous.
- Pets are not allowed in the science laboratories at any time.
- No Children are allowed to enter in the lab areas.

3.3 Food and Drink in the Laboratory

Do not eat, drink, store food or apply cosmetics in any of the laboratories. Remember AMSC is a smoke free campus.

3.4 Housekeeping

Safety follows from good housekeeping practices. Use the following guidelines to maintain an orderly laboratory:

- Keep work areas clean and uncluttered with chemicals and equipment. Clean up work areas upon completion of an operation or at the end of each workday, including floors.
- Dispose of wastes per the Atlanta Metropolitan State College's Waste Disposal Guide.
- A separate waste receptacle must be designated for non-contaminated glass. Follow guidelines established for disposal of contaminated glass.
- Clean spills immediately and thoroughly, as per the guidelines established in section 4.0 of this document.
- Do not block exits, emergency equipment or controls or use hallways and stairways as storage areas.
- Assure hazardous chemicals are properly segregated into compatible categories

3.5 Chemical Handling and Storage (In General)

The decision to use a hazardous chemical should be a commitment to handle and use the chemical properly from initial receipt to disposal.

- Information on proper handling, storage and disposal of hazardous chemicals and access to related Safety Data Sheets should be made available to all laboratory employees prior to the use of the chemical.
- Always purchase the minimum amount necessary to maintain operations.
- Chemical containers with missing or defaced labels or that violate appropriate packaging regulations should not be accepted.
- Chemicals utilized in the laboratory must be appropriate for the laboratory's ventilation system
- Chemicals should not be stored on high shelves and large bottles should be stored no more than two feet from floor level.
- Chemicals shall be segregated by compatibility.
- Chemical storage areas should be labeled as to their contents.
- Storage of chemicals at the lab bench or other work areas shall be kept to a minimum.
- Any chemical mixture shall be assumed to be as toxic as its most toxic component.

- Substances of unknown toxicity shall be assumed to be toxic.
- Highly flammable chemicals must be handled in the fume hood.
- When mixing baths, always add acid to water and not the reverse.
- Always store acids in a cabinet whose material of construction is compatible with an acid.

3.6 Chemical Storage Safety (For Specific Chemicals)

a. Acids

- Store large bottles of acids on low shelf or in acid cabinets.
- Segregate oxidizing acids from organic acids, flammables and combustible materials.
- Segregate acids from bases and active metals such as sodium, magnesium, potassium, etc.
- Acids should be separated from chemicals that can generate toxic gases on contact, such as sodium cyanine and iron sulfide.
- Use bottle carrier for transporting acid bottles.
- Have spill control pillows or acid neutralizers available in case of spill.
- Acids will oxidize Flammable cabinets and cause them to quickly rust. Therefore the acids should never be stored in Flammable cabinets.

Notice: Never add water to acid. Always add acid to water.

Strong Oxidizing Acids

Examples:

Chromic Acid	Nitric Acid	Hydrobromic Acid
Perchloric Acid	Iodic Acid	Sulfuric Acid

Organic Acids

Examples:

Acetic Acid	Phenol	Benzoic Acid
Trichloracetic Acid		

b. Bases

- Segregate bases from acids
- Store solutions of inorganic hydroxides in polyethylene containers.
- Have spill control pillows or caustic neutralizers available for spills.
- Bases will oxidize Flammable cabinets and cause them to quickly rust. Therefore, bases should never be stored in Flammable cabinets.

Examples:

Ammonium Hydroxide	Calcium Hydroxide	Bicarbonates
Potassium Hydroxide	Carbonates	Sodium Hydroxide

c. Flammable Chemicals

- Store in approved safety cans or cabinets
- Segregate from oxidizing acids and oxidizers.
- Keep away from any source of Ignition: flames, heat or sparks.
- Know where firefighting equipment is stored and how to use.
- If volatile flammable liquids are stored in a refrigerator it must be in an explosion-proof (lab-safe) refrigerator.

Flammable solids

Examples:

Benzoyl peroxide	Phosphorous, yellow	Calcium Carbide
Picric Acids		

Flammable Gases

Examples:

Acetylene	Ethylene Oxide	Ammonia
Formaldehyde	Butane	Hydrogen
Carbon Monoxide	Hydrogen Sulfide	Ethane
Methane	Ethyl Chloride	Propane
Ethylene	Propylene	

d. Oxidizers

- Store in a cool, dry place.
- Keep away from flammable and combustible materials, such as paper or wood.
- Keep away from reducing agents such as Zinc, alkaline metals, formic acid.

Oxidizers – Solids

Examples:

Ammonium Dichromate	Nitrates	Ammonium Perchlorate
Periodic Acid	Ammonium Persulfate	Permanganic Acid
Benzoyl Peroxide	Peroxides, Salts of	Bromates
Potassium Dichromate	Calcium Hypochlorite	Potassium Ferricyanide
Chlorates	Potassium permanganate	Chromium Trioxide
Potassium Persulfate	Ferric Trioxide	Sodium Chlorite,
Sodium Hypochlorite	Ferric Chloride	Sodium Dichromate
Iodates	Iodine	Sodium Nitrate
Sodium Perborate		

Oxidizing Acids (Nitric, Periodic) should be separated from organic acids, flammables, and combustible materials.

Nitric Acid and Periodic Acid

Separate Nitric and Periodic Acids from other acids. This may be accomplished by placing in an unbreakable chemical resistant carrier or separate secondary containers.

e. Pyrophoric Substances

- These ignite spontaneously on contact with air. Store in a cool, dry place.

Examples:

Boron	Iron*	Cadmium
Lead*	Calcium	Manganese*
Chromium*	Nickel*	Cobalt*
Phosphorous, Yellow*	Diborane	Titanium*
Dichloroborane	2-Furaldehyde	Zinc

***Finely divided metals form a pyrophoric hazard.**

f. Light Sensitive Chemicals

- Avoid exposure to light
- Store in amber bottles in a cool, dry place.

Examples:

Bromine	Oleic Acid	Ethyl Ether
Potassium Ferricyanide	Ferric Ammonium Citrate	Silver salts
Hydrobromic Acid	Sodium Iodide	Mercuric Salts
Mercurous Nitrate		

g. Carcinogens

- Label all containers as Cancer Suspect Agents.
- Store according to hazardous nature of chemicals, e.g., flammable, corrosive.
- When necessary, store securely.

Examples:

Antimony Compounds	Acrolonitrile	Arsenic compounds
Benzene	Benzidine	Chloroform
Bereyllium	Dimethyl Sulfate	Cadmium compounds
Dioxane	Chromates, Salts of	Ethylene Dibromide
Beta-Naphthylamine	Hydrazine	Vinyl Chloride
Nickel Carbonyl		

h. Peroxide-forming Chemicals

A variety of chemicals can form highly explosive peroxide compounds as impurities when exposed to air over a period of time. This problems is most common in **ethers**, but also occurs in a variety of other organic compounds as well as in some alkali metals and amides. As a result, great care must be taken to prevent the formation of peroxide in these chemicals.

Preventing the formation of Peroxides is dependent on careful inventory control of peroxide-forming chemicals. Most peroxide-forming chemicals are sold commercially with inhibitors to prevent the formation of the peroxides. These are effective until the container is first opened.

After a container is opened, the chemical comes in contact with air and may begin to form peroxides.

Peroxide-forming chemicals shall:

- Shall be stored in air-tight containers in a dark, cool, and dry place.
- Be labeled with the date received and date opened.
- Used up or disposed of on or before the recommended storage time has expired as indicated by the manufacture or the expiration date on the container.

The following list is composed of potentially reactive/explosive peroxide forming chemicals:

Acetal	Decahydromnapthalene	Ethyl Methyl ether
Acrolein	Diacetylene	Ethylene Glycol Dimethyl Ether
Acrylic Acid	Dibutyl Ether	Ethylene Glycol Ethers
Acrylonitrile	Dicyclopentadiene	Furan
Aldehydes	Diethyl ether	Isopropyl ether
Allyl ethyl ether	Diethylene glycol	Methyl isobutyl ketone
Allyl phenyl ether	Diethylene glycol diethyl ether	Methyl acetylene
Anhydrous Ether	Diethylene glycol mono-o-butyl ether	o-Methylanisole
Benzyl ether	Diisopropyl ether	Methyl Methacrylate
Benzoyl-n-butyl ether	Dimethyl ether	m-MethylphenetolePhenetole
Bromophenetole	Dimethyl isopropyl ether	Organic ethers >1 year old
Butadiene	1,4Dioxane	Perchloric Acid
p-Chloroanisole	p-Dioxane	Tetrahydrofuran
Chloroprene	Divinyl ether	Potassium Amide
Chlorotriflouroethylene	Divinylacetylene	Potassium Metal
Cumene		Sodium Amide
Cyclohexene		
Cyclooctene		
Cyclopentene		

i. Picric Acid and other Polynitroaromatic Compounds

Picric acid is commonly used in labs and is relatively safe in the form it is sold. It is ordinarily sold with 10% water added for stabilization. However, Picric Acid can become explosive when it is allowed to dry out or when it forms certain metal salts. The following steps should be taken to store Picric Acid:

STEP 1: Never allow Picric Acid to be stored in container with metal caps or come in contact with any metal.

STEP 2: Check Picric Acid frequently to ensure it remains damp. Add water if needed.

STEP 3: Never attempt to open a bottle of old or very dry Picric Acid.

j. Tollen's Reagent

Tollen's Reagent (Ammonia Cal Silver Nitrate) can form highly explosive silver fulminate over time after it has been used. To avoid this problem, add dilute nitric acid to Tollen's Reagent immediately after use.

k. Sodium Azide

Sodium Azide may form highly explosive heavy metal azides if contaminate or used improperly. **Disposal of sodium azide solutions to sanitary sewer may cause the formation of lead or copper azide in the plumbing which could potentially cause a serious explosion.** Sodium azide should never be heated rapidly or stored in containers with metal components.

l. Water-Reactive Chemicals

Water-Reactive Chemicals shall be kept in a cool and dry place. Metal specific Class D extinguishers shall be made available in laboratories where one pound or greater quantity of water-reactive materials are used or stored. Store alkali metals like sodium and potassium in mineral oil or in an inert atmosphere. NOTE: Lithium may react with nitrogen to form nitrides. ALWAYS WEAR SAFETY GOGGLES, GLOVES, LAB COAT AND CLOSED-TOED SHOES WHILE WORKING WITH WATER-REACTIVE CHEMICALS.

3.7 Compressed Gases

Special systems are needed for handling materials under pressure. Cylinders pose mechanical, physical and/or health hazards, depending on the compressed gas in the cylinder.

- Cylinders with regulators must be individually secured. Cylinders shall never be gang-chained (chained in groups).
- When storing or moving a cylinder, have the valve protection cap securely in place to protect the stem.
- Cylinders must be secured in an upright position at all times. Use suitable racks, straps, chains, or stands to support cylinders against an immovable object, such as a bench or a wall, during use and storage. Do not allow cylinders to fall or lean against one another.
- Use an appropriate cart to move cylinders.
- Never drain a cylinder completely empty. Leave a slight pressure to keep contaminants out.
- Oil or grease on the high pressure side of an oxygen cylinder can cause an explosion. Do not lubricate an oxygen regulator or use a fuel gas regulator on an oxygen cylinder. Use an oxygen approved regulator.
- Always wear goggles or safety glasses with side shields when handling compressed gases.
- Always use appropriate gauges, fittings, and materials compatible with the particular gas being handled.
- When work with a toxic, corrosive, or reactive gas is planned, the EHS should be contacted for information concerning specific handling requirements. Generally, these gases will need to be used and stored with local exhaust ventilation such as a lab hood or a gas cabinet designed for that purpose.

3.8 Transferring Of Chemicals

No transfer of chemicals is allowed from floor to floor and across the hallways of the science laboratories. Precautions should be taken when transporting chemicals from one laboratory to another on the same side of the floor/hallway. Use a cart that is suitable for the load and one that has high edges to contain leaks or spills.

3.9 Unattended Operations

At times, it may be necessary to leave a laboratory operation unattended. Follow these basic guidelines in the design of an experiment to be left unattended:

- Always check with your laboratory supervisor to determine if it is necessary to leave a laboratory operation unattended. If necessary, develop a protocol with your laboratory supervisor for the unattended operation of potentially dangerous equipment or methods. Develop a protocol for potential interruptions in electric, water, inert gas and other services and provide containment for toxic substances as part of the protocol.

- A warning notice must be posted in the vicinity of the experiment if hazardous conditions are present.

3.10 Working Alone

Students must work in groups of at least two people, when working in the laboratory after class hours. No single person is allowed to work in the laboratory by himself/herself. **Also, No Student is allowed to work in the lab without any authorized supervisor. Also staff/ faculty is strongly urged to accompany other person while working in the laboratory; "Safety First" is "Safety Always." ~Charles M. Hayes. In case of an accident in the laboratory where the person is seriously injured, contact public safety at 404-756-4044 and report the incident/accident.**

3.11 Storage and Disposal of Hazardous Waste

All hazardous waste is stored in a central accumulation area designated separately in both Biology and Chemistry laboratories in the McMillan Science building. The chemical waste storage area must be equipped with fume hood, fire suppression, and audible fire alarm. **Do not dispose of hazardous waste in dumpsters or drains**

3.12 Hazardous Waste Management Guidelines

Potentially Hazardous chemicals must be disposed of in accordance with federal and state regulations and procedures established by **Atlanta Metropolitan State College's Environmental Health, Safety, and Compliance (EHSC) Unit**. Please contact AMSC's EHSC director before discarding of any potentially hazardous chemical.

The following guidelines will assist hazardous waste management:

1. The disposal of hazardous chemicals by way of the sanitary sewer system is totally prohibited.

2. All lab personnel must be familiar with the location and composition of all waste products in the lab.

3. Use microscale techniques, the lab personnel should know the hazardous chemical substitute or process of modification to reduce the amount of waste generated.

4. **Hazardous Waste containers must remain closed all the time except when actually adding or removing waste.** Do not leave a solvent bottle or any bottle of waste chemical open with a funnel in it for the sake of convenience. This is one of the most common citations from audit inspectors. Open containers violate state and federal regulations.

5. **Stoppers, cork bottles and flasks are unacceptable. Bottles with broken or crack screw caps are also unacceptable. Parafilm and aluminum foil covers are strongly discouraged**.

6. **<u>Never throw hazardous chemicals in the trash.</u>**

7. **Never pour hazardous chemical down sinks, toilets, floor drains or on the ground.**

8. Label each bottle with the words **"Hazardous Waste"** and exact contents on the label (include percentage and water content). **Do not use abbreviations or chemical formulas for the hazardous waste, print full name in English, as emergency responders may not recognize the abbreviations or formulas.** Also write the start date and fill date on hazardous waste containers. Even water bottles need to be labeled as water.

9. Waste containers and lids **must** be compatible with the waste chemicals stored in them.

10. All containers holding hazardous waste should be in **good conditions** and are **not** in danger of leaking.

11. **The Satellite Accumulation Area (SAA)** should always be very close or near the point of generation and under the control of the person generating the waste.

12. Each Satellite Accumulation Area must be posted designating it as the Satellite Accumulation Area and **Authorized persons only.**

13. SAA and any chemical storage area must be labeled **NO SMOKING.**

14. All the labs and chemical storage areas should have sign posted for NO FOOD and DRINKING.

15. Use plastic trays and/or metal trays, tubs or safety cabinet for the secondary containment (Use high density polyethylene trays). Use compatible containers for your waste. Store only one hazard class per tray, tub or cabinet. **No use of Foam Matting for the secondary containment.**

16. **Do not** evaporate residual solvent in fume hoods. Use condensers on all distillation and concentration procedures.

17. Equip the facility with fire extinguishers, fire control equipment, spill control equipment, and decontamination equipment.

18. Have a telephone or two way radio available at or near the point of hazardous waste generation.

19. Ship all hazardous waste using a hazardous waste manifests, comply with manifest rules and keep manifests for at least three years on record. (For EHSC Director)

20. Always use a licensed hazardous waste transporter. (For EHSC Director)

21. Comply with land disposal restrictions. (For Haz-Mat Vendor)

22. Maintain an update list of names, addresses and phone numbers of all persons acting as emergency coordinators. (see Laboratories Standard Procedural Guide and Reference Manual)

23. Maintain an update list of all emergency equipment.

24. Disposal of aerosol cans should be done properly. Empty cans should be stored separately and label as empty aerosol cans. Do not throw empty aerosol cans in the trash.

25. Generally empty chemical containers are not considered hazardous waste, the container must be completely empty, that is all of the contents that can be removed by normal means must be removed and residue must be less than 1%. The word “empty” must be written across the label. The container may then be disposed of in the regular trash.

26. Containers should be arranged in such a way that the heavy containers should be on the lower shelves and smaller/lighter containers on the higher shelves

27. The following chemicals should always be packed in separate containers/boxes:

    a. Concentrated or fuming sulfuric acid

    b. Perchloric acid

    c. Nitric acid

    d. Cyanide compounds

    e. Water sensitive compounds

    f. Shock sensitive compounds

g. Chemical mixtures containing different hazard class chemicals

28. **No chemicals under the sinks**

29. **No chemicals under the fume hoods. Except those labelled as SAA.**

30. Old chemicals (Passed Shelf Life) need to be checked. Rusty, dusty and crusty chemical containers need to be considered very old and should not be on the laboratory shelves. They should be disposed as a hazardous Waste.

31. Storage of gas cylinders should be proper upright position in chains. **No gang chains**. Label the cylinders properly like, in use, empty cylinder or full cylinder.

32. Reorganize chemical storage in laboratories by hazard class rather than alphabetically.

4. Emergency/Medical Procedures

a. Basic Steps for Emergency and Spill Response

Releases of hazardous substances that pose a significant threat to health and safety or that, by their very nature, require an emergency response regardless of the circumstances surrounding the release or the mitigating factors are emergency situations. The following definitions designate an emergency situation:

1. The situation is unclear to the person causing or discovering the spill.
2. The release requires evacuation of persons.
3. The release involves or poses a threat of:
    - Fire, suspected fire, explosion or other imminent danger
    - Conditions that are Immediately Dangerous to Life and Health (IDLH)
    - High levels of exposure to toxic substances.
4. The person(s) in the work area is uncertain they can handle the severity of the hazard with the personal protective equipment (PPE) and response equipment that has been provided and/or the exposure limit could easily be exceeded.

b. Types of Emergencies

The AMSC contingency plan is intended to outline the college's response to fires, explosions, spills, and releases at the chemical storage area. This response is divided into two categories; small scale incident and large scale incident. Small scale incidents are defined as those where the material/waste have received the mandatory Chemical Specific Right-to-Know training

allowing them to response to small scale incidents within their department. For large scale incidents, the City of Atlanta Fire Department is the designated emergency responder. A copy of this contingency plan and a copy of the campus' Hazardous Chemical Inventory is on file at Fire Station #20, 590 Manford Rd., Atlanta, GA 30310.

At AMSC, the Department of Campus Safety has been designated as the organization for receiving and dispatching emergency reports. All requests for emergency assistance to the City of Atlanta Department should be made through Campus Safety (by pre-arranged mutual agreement between AMSC and the City of Atlanta Fire Department). Campus Safety will escort the emergency responders from the campus entrance to the site of release. For all large scale incidents involving hazardous materials/waste, the first arriving fire officer becomes the officer in charge and shall be designated as the incident commander.

Name of Emergency	How to Respond	Emergency contact
Small scale Fire	It can be contained within the facility and suppressed by dry chemical fire suppression. For Example: ABC dry fire extinguisher.	• Contact Public Safety at 404-756-4040 and EHS Unit in charge at 404-756-4044.
Large scale Fire	Contact Laboratory Emergency Response Team immediately.	• Contact Public Safety at 404-756-4040/4474. • Contact EHS Unit at 404-756-4044. • Contact SMHP Dean at 404-756-4025/4028. • Contact.
Small scale spill	It can be handled by the laboratory supervisor/instructor using spill kits containing absorbent pads, pillows, socks, disposal bags etc.	• Contact Laboratory supervisor at 404-756-4025. • Contact EHS unit in charge at 404-756-4044.
Large scale spill	Contact Laboratory Emergency Response Team Immediately.	• Contact Public Safety at 404-756-4040/4474. • Contact EHS unit in charge at 404-756-4044. • Contact MKC enterprises at 770-457-1341. • Contact SMHP Dean at 404-756-4025/4028.
Explosions	Contact Laboratory Emergency Response Team immediately	• Contact Public Safety at 404-756-4040/4474.
Accident, Serious Injury or Illness	Contact Laboratory Emergency Response Team immediately	• Contact Public Safety at 404-756-4040/4474 • Contact EHS Unit at 404-756-4044 • Contact SMHP Dean at 404-756-4025/4028

5. AMSC Laboratory Emergency Response Team

The AMSC contingency plan recognizes the limited capability of AMSC to respond to large scale incidents and is designed to integrate emergency procedures involving hazardous materials/waste into those already established for other emergency situations (i.e. storms, floods, riots, etc...) The laboratory emergency response team outlined below will respond to all small scale incidents in which personnel training and equipment are adequate:

The Environmental Health and Safety & Compliance Director should be contacted immediately in the event of an accident regardless of the scale.

1. Sunita Duggal, Director
   Environmental Health, Safety & Compliance
   Academic Building, Rm. 129
   ph.: 404-756-4044 or 678-623-1188

2. Dr. Bonita Flournoy, Dean
   Science, Mathematics & Health Professions
   MacMillan Science Building, Rm.218
   ph.: 404-756-4025/4028 or 678-623-1172

3. Mr. Cedrick Daphney, Academic Professional for Chemistry/Lab Coordinator
   Science, Math and Health Profession Division
   MacMillan Science Building, Rm. 207
   ph.: 404-756-4025/4028/3789

4. Ms. Tameka Little, Academic Professional for Biology/Lab Coordinator
   Science, Math and Health Professions Division
   MacMillan Science Building, Rm. 211
   Ph. 404-756-4025/4028 or 678-623-1289

The Emergency Response Coordinator will be responsible for alerting appropriate emergency response team, securing the affected area, determining if evacuation is necessary and directing all emergency procedures until the appropriate City of Atlanta response unit arrives. At the arrival of City of Atlanta's emergency responders, AMSC's Campus Safety will escort them from the campus' entrance to the site of release. AMSC's Campus Safety will assume the position of Incident Commander and will assist City of Atlanta emergency responders as needed.

5. Chief Antonio Long, Emergency Response Coordinator for Campus Safety

   Academic Building, Rm. 205 ph.: 404-756-4040/4474

Conversely, releases that do not pose significant safety or health hazards to person(s) in the immediate vicinity or to the person(s) cleaning releases, do not have the potential to become emergencies within a short time frame are not emergency situations. The following situations ARE NOT emergency situations:

A. The person causing or discovering the release understands the properties and can make an informed decision as to the exposure level.

B. The release can be appropriately cleaned by the lab personnel.

C. The materials are limited in quantity, exposure potential, or toxicity and present minor safety or health hazards to persons in the immediate work area or those assigned to clean up the activity.

D. Incidental releases of hazardous substances that are routinely cleaned up by laboratory personnel need not be considered an emergency.

6. Scheduling of the Laboratories Training/Inspections/Chemical/Bio-hazardous Pickup

Project Name /Inspection	**Duration/ Year**	**Person Responsible**	**Administrative follow-up and approval**
Chemical Hazardous Waste Pick-up (preparation phase)	Once or twice per year	SMHP Chemistry & Biology Laboratory Coordinator /Supervisor	Dean SMHP/Departmental Unit Head
Scheduling of Chemical Hazardous Waste pick-up	Once or twice per year	EHS & Compliance Director	VP institutional effectiveness
Bio-Hazardous Waste Pick-Up (preparation phase)	Two times per year May/June and December of every year	SMHP Biology Laboratory Coordinator/Supervisor	Dean SMHP/Departmental Unit Head
Scheduling of Bio-Hazardous Waste Pick-Up	Two times per year May/June and December of every year	EHS & Compliance Director.	VP institutional effectiveness.
Semi Annual Hazardous Chemical Inventory List	Two Times Per Year May/June and December of every Year	Laboratory Coordinator / Supervisor	Dean SMHP /Departmental Unit Head
Laboratories Inspections (All Laboratories) (Preparation Phase)	Year round	Laboratory Coordinator/Supervisor	Dean SMHP/Departmental Unit Head
Laboratories Inspections including research laboratories (Compliance issues)	Every six to eight weeks	EHS & Compliance Director	VP Institutional effectiveness
Laboratory Safety Training/EHS Trainings	Twice a year	EHS & Compliance Director	VP Institutional effectiveness
Training for Laboratory and Research Faculty	Each Semester	EHS & Compliance Director	VP Institutional effectiveness
Broken Glass Container (preparation phase)	As needed	SMHP Laboratory coordinator/supervisor	Dean SMHP/Departmental Unit head
Broken Glass Container Pick-Up	As needed	AMSC facilities Director	VP fiscal affairs

7. Inspection Forms

The Following Inspection forms will be used to inspect the laboratories

1. Laboratory Safety- Monthly Inspection Checklist (See Appendix B)
2. Safety Shower Test Record/Inspection Log (See Appendix C)
3. Eyewash Station Inspection Log (See Appendix D)

All of these forms will be available in PDF form on the AMSC Intranet Website

The First level of safety measurement of laboratories will be the monthly inspection reports in writing to the laboratory area Coordinator/Supervisor and the copies of the reports will be sent to the appropriate Unit Heads / Departmental Dean.

The Second Level of safety measurement of laboratories is the escalation notification to the concerned area administration in writing

8. EHSC Documents

For more details please see the list of Environmental Health, Safety, and Compliance documents as follows:

Document Name	Purpose
AMSC Chemical Hygiene Plan	• Provides laboratory safety standards accordance with compliance standards. • It's a general guide for handling hazardous chemicals in the laboratory. • Helps to achieve a safe and healthy work environment.
AMSC Right-To-Know Communication Plan	• It provides the written information on how to manage and communicate about the handling of hazardous chemicals. • How to safely work with the hazardous chemicals. • It ensures the implementation of the training needs, while working with the hazardous chemicals, for the AMSC employees.
AMSC Hazardous Waste Contingency Plan	• It deals with the appropriate emergency procedures for hazardous waste. • It ensures the safety and well-being of both AMSC employees and the surrounding community.
AMSC Emergency Response Plan	• It provides the procedures for the protection of lives and AMSC property. • It provides information about specific emergency procedures such as: bomb threats, chemical spills, fire , explosions, severe weather
Laboratories Standard Procedural Guide and Reference Manual	• This manual provides a safe work environment that is free from recognizable hazards for its employees and students.

All of these documents can be found on the AMSC Intranet Website

9. Lab Safety and Research Committees

Committee Name	Purpose	Committee Chair
Laboratory Safety Committee	To ensure the AMSC's laboratory safety standards with the USG's laboratory safety standards.	Mrs. Sunita Duggal Phone: 404-756-4044 Email sduggal@atlm.edu
Institutional Bio-Safety Committee (IBC)	The purpose of this committee is to establish guidelines on campus to reduce the risk of potential injury and /or exposure to infectious agents in teaching and research laboratories. All research projects involving live laboratory animals /toxins need the prior approval from the IBC and IACUC committee chair.	Dr. Vasanta Chivukula Phone: 404-756-4742 Email:vchivukula@atlm.edu
Institutional Animal Care and Use Committee (IACUC)	This Committee deals with the research teaching or testing of the laboratory animals.	Dr. Dave Hudson Phone: 678-623-1209 Email: dhudson@atlm.edu

10. AMSC LABORATORY SAFETY GUIDELINES FOR BIOLOGY AND CHEMISTRY

1. Know where to find exits, fire extinguisher, fire blanket, chemical shower, eye wash station, first-aid kit, broken glass containers, and clean up materials for spills.

2. To ensure safe use, all personnel and students must use appropriate PPE like lab coat, goggles/glasses, nitrile gloves, closed-toed shoes, and long pants. Persons who wear contact lenses in the laboratories should also wear eye protection.

3. Eating, drinking, smoking, handling eye contact lenses, applying cosmetics, and storing food for human consumption is not permitted in any laboratories.

4. Inform the instructor if you are pregnant, taking Immunosuppressive drugs, or have any medical condition that might require special precautions in the lab.

5. Restrain long hair, loose clothing, and dangling jewelry.

6. Use safety glasses in all experiments in which solutions or chemicals are heated. Never leave any heat source unattended.

7. Disinfect work surfaces at the beginning and end of every lab period with 10% bleach (sodium hypochlorite) and/or soap/detergent solution with paper towels to clean the laboratory tables.

8. Keep liquids away from the edge of lab benches. Disinfect or decontaminate any equipment that comes into contact with live material or body fluid. Body fluids can be disinfected with 10% bleach. Moist heat, in the form of steam under pressure (autoclaving sterilization technique) is the most dependable medium for the destruction of all forms of microbial life.

9. Do not clown around or engage in horseplay in the lab.

10. Properly label glassware and slides.

11. Use mechanical pipetting devices; mouth pipetting is prohibited.

12. Place contaminated glassware, plastic ware, or disposable materials in a disposable autoclave bag for autoclaving or directly into a 10% bleach solution.

13. Wear disposable gloves when handling blood and other body fluids, mucous membranes, nonintact skin or items and surfaces soiled with blood or body fluids. Cover open cuts with a sterile bandage before donning gloves. Wash hands immediately after you remove gloves.

14. To prevent contamination by needle stick injuries, use only new needles and lancets. Do not bend, replace in sheaths, or remove needles from syringes following use. Place used needles and lancets in a 10% bleach for decontamination.

15. Broken glass can be disposed of in two ways. If it is not contaminated with bio hazardous agents, the broken glass can be placed in the broken glass containers. If it is contaminated with bio-hazardous agents, the broken glass must first be decontaminated (autoclaving or chemical disinfection) prior to disposal with broken glass. Broken glassware must not be handled directly, instead it must be removed using a brush and dust pan, tongs, or forceps.

16. Report all spills or accidents to the instructor immediately. Also report all spills to AMSC'S Environmental Health, Safety, and Compliance Office at 404-756-4044.

17. Use tools and equipment correctly, as directed by your Instructor. Don't use equipment with cracked, worn or loose cords.

18. Make sure equipment is off before plugging it in or when changing circuit connection.

19. Don't work on equipment with wet hands, clothes, or shoes, or when the floor is wet. Remember, dampness reduces the contact resistance, and increases the chance of dangerous shocks.

20. Keep one hand behind your back when measuring current or voltage. If you use both hands, your body may actually become part of the circuit, with the current flowing across your chest and heart regions, which is very dangerous.

21. Highly flammable chemicals are to be handled in the fume hood.

22. Always store acids in a cabinet whose material of construction is compatible with an acid.

23. When mixing chemical, always add acid to water and not the reverse.

24. No students (except research scholars) is allowed to work in the lab with any authorized supervisor. All other laboratory personnel including research scholar must work in groups of two during afterhours.

25. Pets are not allowed in the science laboratories at any time.

26. No children are allowed to enter in the lab areas.

27. In case of an accident in the laboratory where a person is seriously injured, contact campus safety @ x4040 and report the emergency.

28. Don't dispose of hazardous chemical waste into dumpsters or drains. Always use the secondary hazardous container labeled for that particular hazardous waste provided by lab personnel. Close the container tightly after pouring the contents.

29. Wash your hands and remove protective clothing before leaving the lab.

11. AMSC ANIMAL USE AND WASTE DISPOSAL HANDLING PROCEDURES

Section 1.1 Preserved Animals

Animals preserved in ethanol, isopropanol, formaldehyde (formalin), or Caro safe require special handling during use and disposal in the laboratory.

1. To ensure safe use all personnel and students must utilize appropriate PPE like lab coat, goggle/glasses, nitrile gloves, closed-toe shoes, and long pants. Persons who wear contact lenses in the laboratories should also wear eye protection.

2. Eating, drinking, smoking, handling contact lenses, applying cosmetics and storing food for human consumption is not permitted in the laboratories

3. During the dissection laboratories, all preserved animals should be removed from the storage refrigerator (4°C) and put the animal on dissection pans appropriate to the size of the animal.

4. Any ethanol, isopropanol, formaldehyde, or Caro safe in the bags in which the animal was delivered must be emptied immediately in the secondary container labeled as hazardous waste formaldehyde…etc. and it should disposal as hazardous chemical waste. The bags must be kept on the laboratory bench to allow for storing the animal. You can always double the bag for storage of animal(s) after finishing the laboratory session to prevent the leaks.

5. **Do not discard any cut tissues from the animals into the lab sinks, trash, table tops, or dissecting pans.** ALL TISSUES CUT OR REMOVED FROM THE ANIMAL MUST BE DISPOSED OF IN A SEPARATE BIOHAZARDOUS WASTE BAG PROVIDED BY THE INSTRUCTOR. LABEL THE BIOHAZARDOUS BAG AND STORE IN A DESIGNATED FREEZER AT -20°C. At the end of the laboratories sessions, the waste bio-hazardous bag will be picked up by the Stericycle- Bio-hazardous Vendor.

6. In case if the animals are wet from preservatives before dissection, students or personnel can wrap the animals in paper towels prior to storage for drying purposes. Once the drying process is done, **please do not** throw the wrapped paper towels in the regular trash cans, instead put the paper towels in a separate plastic bag and store the bag at hazardous waste chemical satellite accumulation area site. These paper towels will be disposed of as a chemical hazardous waste.

The liquid waste from preserved animals will be handled as a chemical hazardous waste and solid waste (animal cut tissues) will be handled as a bio-hazardous waste.

7. Animals and plants not associated with the work being performed are not permitted in the areas where infectious material and/or animals are preserved/housed or are manipulated.

8. Place contaminated glassware, plastic ware, or disposable materials in a disposable autoclave bag for autoclaving or directly into a 10% bleach solution for decontamination and reuse of disposal.

9. Disinfect work surfaces at the beginning and end of every lab period with 10% bleach (sodium hypochlorite) and/or soap/detergent solution with paper towels to clean the laboratory tables.

10. All sharps, needles, lancets etc. must be disposed of in appropriate sharp containers. Disposable needles must not be bent, sheared, broken, recapped, removed from disposal syringes, or otherwise manipulated by hand before disposal. Sharp containers should be located as close to the work site as possible.

11. Non-disposable sharps must be placed in a hard-walled container for transport to a processing area for decontamination preferably by autoclaving.

12. Dissecting tools (scalpels, needles, scissors, forceps etc.) used to dissect the animals must be washed with soap and water and then dry with paper towels once you are done with the laboratory. It is strongly suggested to sterilize the dissecting tools by autoclaving at least two to three times per semester.

13. Dissecting pans/trays must be washed and dried thoroughly before storing them.

14. Broken glass can be disposed of in two ways. If it is not contaminated with bio hazardous agents, the broken glass can be placed in the broken glass containers. If it is contaminated with bio-hazardous agents, the broken glass must first be decontaminated (autoclaving or chemical disinfection) prior to disposal with broken glass. Broken glassware must not be handled directly, instead it must be removed using a brush and dust pan, tongs, or forceps.

Section 1.2 Live Research Animals, Field-Collected and Non-Preserved Animals

Live animals, field-collected specimens, and purchased animals (i.e. at markets) are all considered bio-hazardous waste when disposing of carcasses. As such, they require special handling during use and disposal will be done as mentioned in section 1.1 by Stericycle Bio-hazardous Vendor.

To ensure safe use of these animals, all personnel and students must utilize proper PPE like lab coat, goggle/glasses, nitrile gloves, closed-toe shoes, and long pants. Persons who wear contact lenses in the laboratories should also wear eye protection. Follow the disposal procedures as approved by Institutional Animal Care and Use Committee (IACUC) protocol if live animals are used.

Field-Collected animals and non-preserved animals are often preserved in a chemical preservative such as formaldehyde and alcohols, at which point personnel and students must follow the procedures as mentioned in Section 1.1 Preserved Animals. Care of live animals, while living, must comply with the Principle Investigator (PI) or instructor's approved IACUC protocol. These protocols include euthanasia techniques, often chemical (i.e. MS-222), which render carcasses bio-hazardous chemical waste. Upon euthanasia and no need for further use, or death by causes, both of which must be reported in the end of year report to IACUC. Animal carcasses and all tissues must be stored in labeled bio-hazardous bags and stored in the designated freezer at -20°C until picked up by Stericycle Bio-hazardous Vendor. **Do not discard any cut tissues from the animals into the lab sinks, trash, table tops, or dissecting pans.**
Other normal AMSC Laboratory procedures as mentioned in Section 1.1 must be followed for clean-up, storage, and disposal.

12. AMSC LABORATORY SAFETY GUIDELINES FOR MICROBIOLOGY/BIOTECHNOLOGY/BIOMEDICAL LABORATORIES

1. Know where to find exits, fire extinguisher, fire blanket, chemical shower, eye wash station, first-aid kit, broken glass containers, and clean up materials for spills.

2. To ensure safe use all personnel and students must use appropriate PPE which must include lab coats, goggles/glasses, nitrile gloves, low heeled, closed toed shoes, and garments covering the legs. Shorts, sandals, flip-flops, short skirts, tank tops/open midriffs tops, and dangling jewelry are not allowed in the laboratory. Persons who wear contact lenses in the laboratory should wear eye protection.

3. Eating, drinking, smoking, handling eye contact lenses, applying cosmetics, and storing food for human consumption is not permitted in the laboratory.

4. Inform the instructor if you are pregnant, taking Immunosuppressive drugs, or have any medical condition that might require special precautions in the lab.

5. Restrain long hair and loose clothing.

6. Disinfect work surfaces at the beginning and end of every lab period with 10% bleach (sodium hypochlorite) and/or soap/detergent solution with paper towels to clean the laboratory tables.

7. Keep liquids away from the edge of lab benches. Disinfect or decontaminate any equipment that comes into contact with live material or body fluid. Body fluids can be disinfected with 10% bleach. Moist heat, in the form of steam under pressure (autoclaving sterilization technique) is the most dependable medium for the destruction of all forms of microbial life.

8. Don’t clown around or engage in horseplay in the lab.

9. Properly label glassware and slides.

10. Use mechanical pipetting devices; mouth pipetting is prohibited.

11. Use safety glasses in all experiments in which solutions or chemicals are heated. Never leave any heat source unattended.

12. Persons must wash their hands after working with potential hazardous materials and before leaving the laboratory.

13. Perform all procedures to minimize the creation of splashes and/or aerosol.

14. Broken glass can be disposed of in two ways. If it is not contaminated with bio hazardous agents, the broken glass can be placed in the broken glass containers. If it is contaminated with bio-hazardous agents, the broken glass must first be decontaminated (autoclaving or chemical disinfection) prior to disposal with broken glass. Broken glassware must not be handled directly, instead it must be removed using a brush and dust pan, tongs, or forceps.

15. Decontaminate all cultures, stocks, and other potentially infectious materials before disposal by autoclaving (121°C and 15 psi for 15 minutes).

16. All sharps, needles, lancets etc. must be disposed of in appropriate sharp containers. Disposable needles must not be bent, sheared, broken, recapped, removed from disposal syringes, or otherwise manipulated by hand before disposal. Sharp containers should be located as close to the work site as possible.

17. Non-disposable sharps must be placed in a hard-walled container for transport to a processing area for decontamination preferably by autoclaving.

18. Report all spills or accidents to the instructor immediately. Also report all spills to AMSC'S Environmental Health, Safety, and Compliance Office at 404-756-4044.

19. Pets are not allowed in the science laboratories at any time.

20. No children are allowed to enter in the lab areas.

21. In case of an accident in the laboratory where a person is seriously injured, contact campus safety @ x4040 and report the emergency.

22. Don’t dispose of hazardous chemical waste into dumpsters or drains. Always use the secondary hazardous container labeled for that particular hazardous waste provided by lab personnel. Close the container tightly after pouring the contents.

23. Immediately turn off the gas if gas burns from a leak in the burner or tubing.

24. If electrical equipment cracks, snaps or begins to give off smoke, do not attempt to connect/disconnect it. Call your instructor immediately.

25. Wash your hands and remove protective clothing before leaving the lab.

13. Biosafety Levels

The Centers for Disease Control (CDC) and the National Institute of Health (NIH) have developed standard procedures providing protection against biological hazards. The publication *Biosafety in Microbiological and Biomedical Laboratories* provides specific descriptions of combinations of microbiological practices, laboratory facilities, and safety equipment, and recommends their use in four biosafety levels of operations with infectious agents. These biosafety levels are BSL1, BSL2, BSL3, and BSL4.
The biosafety levels described in the NIH Guideline for research involving rDNA molecules are based on and consistent with the biosafety levels. A biosafety level (BSL) is based on the potential hazard of the agent and the functions of the laboratory. BSL1 is for work with agents that pose the least hazard and BSL4 is for work with agents that pose the greatest hazard. Here at AMSC the biology laboratories are designed only for BSL1 and BSL2 agents.

Physical Containment of Experiments

There are different degrees of risk involving bio-hazardous research which requires different levels of containment. The term "containment" is used in describing safe methods for managing bio-hazardous agents in the laboratory environment where they are being stored or handled. Primary containment, the protection of personnel and immediate laboratory environment from exposure, is provided by good technique and the use of appropriate safety equipment that has been properly designed, located, installed, and maintained. Secondary containment, the protection of the environment external to the laboratory from exposure to bio-hazardous agents, is provided by a combination of facility design and operational practice.

Biosafety Level 1

Biosafety Level 1 (BSL-1) is suitable for working with agents not known to cause disease in healthy adult humans, and of minimal potential hazard to laboratory personnel and the environment (including plants and other animals).

Standard Microbiological Practices (BSL-1)

1. The laboratory personnel must enforce the institutional policies that control access to the laboratory.

2. Work surfaces are decontaminated at least once a day and following any spill viable material. Contaminated equipment must be decontaminated according to local, state or federal regulations before it is sent for repair or maintenance or packaged for transport or surpluses.

3. All contaminated liquid and solid waste are decontaminated prior to disposal.

4. Eating, drinking, smoking, and applying cosmetics are not permitted in the work area.

5. Perform all procedures to minimize the creation of splashes and/or aerosol.

6. Persons must wash their hands after working with potentially hazardous materials and before leaving the laboratory.

7. Mechanical pipetting devices must be used. Mouth pipetting is prohibited.

8. To ensure safe use all personnel and students must use appropriate PPE which must include lab coats, goggles/glasses, nitrile gloves, low heeled, closed toed shoes, and garments covering the legs. Shorts, sandals, flip-flops, short skirts, tank tops/open midriffs tops, and dangling jewelry are not allowed in the laboratory. Persons who wear contact lenses in the laboratory should wear eye protection.

9. All sharps, needles, lancets etc. must be disposed of in appropriate sharp containers. Disposable needles must not be bent, sheared, broken, recapped, removed from disposal syringes, or otherwise manipulated by hand before disposal. Sharp containers should be located as close to the work site as possible.
10. Non-disposable sharps must be placed in a hard-walled container for transport to a processing area for decontamination preferably by autoclaving.

11. A sign incorporating the universal biohazard symbol must be posted at the entrance of the laboratory when infectious agents are present. The sign may include the name of the agent(s) in use, and the name and phone number of the Principal Investigator (PI).

Biosafety Level 2

Biosafety Level 2 (BSL-2) is suitable for work involving agents of moderate potential hazard to personnel and environment (including plants and other animals). The practices, equipment, and laboratory design are appropriate for clinical, diagnostic teaching, and basic research with a broad spectrum of indigenous moderate risk agents associated with human disease and/or which may negatively impact the environment. Laboratory procedures which generates aerosols may increase the risk and therefore ought to be conducted in a biological safety cabinet and/or other primary containment equipment. BSL-2 facilities and procedures are those that are basic in a good quality laboratory working with microorganisms, genetic materials, cell/tissue cultures, and carcinogens.

In addition to the BSL-1 Standard Microbiological Safety Procedure, the following special practices are implemented for BSL-2:

1. Access to the laboratory is limited or restricted by the laboratory personnel when work with bio-hazardous agents is in progress. The laboratory personnel has the final responsibility for accessing each circumstance and determining who may enter or work in the laboratory or animal rooms. Keeping laboratory doors closed during experiments is recommended. Persons who are at increase of acquiring infection or for whom infection may be unusually hazardous are not allowed in the laboratory or animal rooms. For example, persons who are immunocompromised or immunosuppressed may be at risk of acquiring infections.

2. The Principal Investigator is responsible for providing training for laboratory personnel in the potential hazards and safety procedures. Knowledgeable personnel work more efficiently and effectively in the laboratory by reducing the risk of accidents that could result in personal injury or loss of research effort. Georgia Law "Public Employee Hazardous Chemical Protection and Right To Know Act of 1988" (The Official Code of Georgia Annotated Title 45 Chapter 22) and Department of Labor Regulations (Chapter 300-3-19) provide requirements for training of employees using hazardous chemicals. This "best practice" should also be applied to bio-hazards.

3. When research involves working with or storing bio-hazardous agents in the laboratory, a hazard warning sign incorporating the universal biohazard symbol is posted on the access door. The Principal Investigator is ultimately responsible for informing persons, including emergency personnel, of any special requirements for entering the laboratory.

4. Before leaving the laboratory areas, protective clothing (lab coats, aprons etc.) is removed and left in the laboratory. This practice helps prevent infectious agents from being carried from laboratory on contaminated clothing.

5. Special care is taken to avoid contamination of skin and mucus membranes with infectious materials, appropriate personal protective equipment (gloves, goggles, face shields, etc.) should be worn when handling infectious materials. Blood borne Pathogens and Universal precautions trainings must be considered.

6. Spills and accidents which result in exposure of people or environment to infectious materials and/or rDNA molecules are immediately reported to the Principal Investigator, to the Biosafety Officer/EHSC Director and to the Institutional Biosafety Committee. Exposure may require medical evaluation, treatment, and surveillance.

7. Laboratory equipment should be routinely decontaminated. Spills involving infectious materials must be contained, decontaminated, and cleaned up by laboratory personnel properly trained and equipped to work with infectious material. Equipment must be decontaminated before repair, maintenance, or removal from the facility.

8. Decontaminate all cultures, stocks and other potentially infectious materials before disposal using an effective method (autoclaving).

9. Materials to be removed from the facility for decontamination must be packed in accordance with applicable local, state, and federal regulations.

14. LAB SAFETY GUIDELINES FOR PHYSICS

Most people are everyday users of electrical and electronic devices such as televisions, radios, and VCRs without ever really being aware of the potential danger presented by the voltages and currents used within the equipment. Unfortunately, many people are so unaware of the potential for injury that they will regularly disregard the safety devices manufacturers build into the equipment. You may know someone who has removed the ground prong, or cut off the "wings" of a polarized plug for a piece of equipment "because the darn plug wouldn't fit into the wall socket". You may have also heard about houses burning down because someone would replace a blown fuse with a penny.

There are many other examples of poor judgment in dealing with electricity. Most dangerous situations involving electricity and electronics can be avoided if the user is aware of the potential for danger, and takes the necessary precautions.

It is fairly common knowledge that most automobile accidents occur within 25 miles of home. Why? Part of the reason is that a driver in familiar surroundings will often be more relaxed and therefore less attentive to the other drivers nearby, and more prone to make a mistake that can easily lead to serious injury. In fact, the more familiar you become in using that device. When you are working as a technician, this carelessness could easily lead to a severe electrical shock. **Electric shock can be lethal! Therefore is it advisable to follow basic safety rules at all times.**

Many people have the mistaken impression that high voltages are necessary in order for you to receive a severe electrical shock. Actually, in certain situations, a typical flashlight battery could produce a lethal shock. The reason this can happen is that the voltage doesn't actually shock you, the current that flows through your body does! A current as small as ten one-thousandths of an ampere (10mA) can cause muscular paralysis and prevent you from letting go of a "live conductor. Often shocks with currents of greater than 100 mill amperes are fatal. The flashlight battery mentioned above quite easily produces sufficient current to cause severe or possibly fatal shock.

Of course, you don't see stories in the newspaper about people dying from electrical shocks from using flashlights. Flashlight batteries can be used safely because the resistance of dry human skin normally measures several hundred thousand ohms, and therefore limits current flow to very low values, which are usually below the thousand ohms, and therefore limits current flow to very low

values, which are usually below the threshold of sensation. However, when the skin if damp or wet, the contact resistance can decrease to less than 100 ohms, in which case the voltage can be lethal. Remember, low voltage does not mean safe voltage. You should always be cautious and exhibit a safety conscious attitude.

If you always follow safe practices, you will protect yourself, and the others who work with you, from unnecessary dangers. The following rules will give you a general guideline to creating a safety conscious attitude. As your knowledge and experience grow, you will become more aware of specific safety rules and practices. Study the following rules. While many may sound like common sense to you, some may be unfamiliar. Ask your instructor about any that you do not understand. Your instructor may also wish to expand this list, or elaborate on those of particular importance in the laboratory environment.

1. **Don't clown around or engage in horseplay.** A playful push may cause a fall or injury, and can easily distract someone.
2. **Do not talk to or distract another student** while working. Always keep your mind on your work.
3. **Observe proper lifting methods for heavy objects.**
4. **Report all injuries to your instructor at once**, no matter how slight. Reporting the injury will allow your instructor to initiate any necessary medical attention which will help reduce the possibility of complications.
5. **Use tools and equipment correctly**. If you don't understand how to operate a tool or piece of equipment, ask your instructor for assistance.
6. **Get your instructors approval before starting work** if you are unsure of your circuit wiring, etc...
7. **Do not use equipment with cracked, worn, or loose cords**.
8. **Make sure equipment is off before plugging it in, or when changing circuit connections**.
9. **Do not work on equipment with wet hands, clothes, or shoes, or when the floor is wet**. Remember, dampness reduces the contact resistance, and increases the change of dangerous shocks.
10. **Keep one hand behind your back when** measuring current or voltage. If you use both hands, your body may actually become part of the circuit, with

the current flowing across your chest and heart regions, which is very dangerous.

11. **Watch out for hot components**. Current flowing through a circuit can cause components to become extremely hot. Wait for components to cool off before touching them.
12. **Don't wear jewelry while working on electrical equipment.** Jewelry is normally made of metal, typically gold or silver, and will provide a low resistance path for current.
13. **Don't use a pencil to "probe around" with a circuit.** While a pencil is made of wood, it has a graphite core, which is good electrical conductor.
14. **Items of loose clothing, such as ties, should be secured before working on any equipment with moving parts.**
15. **Report any defective tool or equipment, or any condition you feel is unsafe, to your instructor**
16. **Verify that capacitors have discharged** before measuring or handling than. Some capacitors may store a lethal charge for a long time period after power has been removed from the circuit.
17. **Do not tamper safety devices. NEVER defeat an interlock switch. Do not remove equipment grounds, or use adaptors that defeat ground connections.**
18. **Shut off power if an accident occurs.**
19. **If a victim has received a serious electrical shock, artificial respiration should be initiated as soon as possible in order to restore breathing, and competent medical attention should be provided as soon as possible.**

15. Commonly Observed Violations of Daily Laboratory Operations

1. Contaminated glassware, plastic ware or disposable materials.
2. Disposable petri plates.
3. Glassware not labeled properly.
4. Hazardous waste secondary containers are not labeled properly.
5. Broken glassware containers are not maintained properly.
6. Disposable materials like: toothpicks, needles, lancets, and syringes are not disposed of properly.
7. Spills are not cleaned properly.
8. Hazardous waste is not stored properly at a satellite accumulation area.
9. Hazardous waste is not labeled properly. All hazardous waste containers should be marked with the words "Hazardous Waste"; please use red hazardous waste labels.
10. Hazardous waste containers are not tightly closed.
11. Hazardous waste containers are not marked with an accumulation start date.
12. Hazardous waste containers contains the stains of the chemicals on the body of the container (transferring/pouring issue).
13. Lab surfaces/work area is not disinfected properly.
14. Emergency Telephone numbers are not posted in each laboratory.
15. Students, staff and faculty not using the personal protective equipment such as: lab coats, eye protection, face protection and gloves.

16. Attached Appendices

Appendix A: Definitions
Appendix B: Laboratory Safety- Monthly Inspection Checklist
Appendix C: Safety Shower Test Record/Inspection
Appendix D: Log Eyewash Station Inspection Log
Appendix E: Laboratory Safety Form

Appendix A

DEFINITIONS

Change control: The management process for requesting, reviewing, approving, and carrying out and controlling changes to agreed-upon deliverables or operational boundaries. It is sometimes referred to as "Change Management."

Chemical exposure hazard: A chemical for which there is evidence that acute (immediate) or chronic (delayed) health effects may occur in an exposed population. Exposure is related to the dose (how much), the duration and frequency of exposure (how long and how often), and the route of exposure (how and where the material gets in or on the body), whether through the respiratory tract (inhalation), the skin (absorption), the digestive tract (ingestion), or percutaneous injection through the skin (accidental needle stick). The resulting health effects can be transient, persistent, or cumulative; local (at the site of initial contact with the substance), or systemic (after absorption, distribution, and possible biotransformation, at a site distant from initial contact with the substance).

Chemical Safety Levels (CSLs): Defined levels of hazard (1 through 4):

CSL Level 1: Minimal chemical or physical hazard. No concentrated acids or bases, toxics, carcinogens or teratogens. Less than 4 liters of flammable liquids. No fume hood required. Typical examples include science undergraduate teaching and demonstration labs, research lab with minor chemical usage, laser labs (below Class 2B), and microscopy rooms.

• **CSL Level 2:** Low chemical or physical hazard. Small amounts, less than 1 liter of concentrated acids or bases, possesses none or limited amounts of toxic or high hazard chemicals. Less than 40 liters of flammable liquids in use. May need a fume hood for some activities. Typical examples include: chemistry/biochemistry teaching and demonstration labs and standard biomedical research labs.

• **CSL Level 3:** Moderate chemical or physical hazard. Lab contains concentrated acids, bases, toxic, other high hazard chemicals, or cryogenic liquids. Carcinogens or reproductive toxins are handled. Corrosive, flammable, toxic compressed gases in cabinets or fume hoods. Larger volumes of flammable liquids in the lab. Special hazards in limited quantities may be in the lab with Environmental Health and Safety (EH&S) approval (for example, hydrofluoric acid, pyrophoric chemicals, or cyanides). Labs are fume hood or local exhaust intensive. Some uses of a glove box for air reactive chemicals or quality control. Examples include chemistry research, pharmacology, chemical engineering, and pathology labs, as well as other chemical-intensive research labs.

• **CSL Level 4:** High chemical or physical hazard. Work with explosives or potentially explosive compounds, frequent use or larger quantities of pyrophoric chemicals. Use of large quantities or extremely high hazard materials with significant potential for Immediately Dangerous to Life

and Health (IDLH) conditions in the event of uncontrolled release or foreseeable incident. Use of glove box for pyrophoric or air-reactive chemicals.

Consequence: The most probable result of a potential incident.

Exposure: The concentration or amount of a particular agent (chemical, biological, electrical, electromagnetic field (EMF), or physical) that reaches a target organism, system or subpopulation in a specific frequency for a defined duration.

Failure modes and effects analysis (FMEA): An evaluation of the means that equipment can fail or be improperly operated and the effects the failures can have on the process.

Fault tree analysis (FTA): A graphical model that illustrates combinations of failures that will cause one specific failure of interest. It is a deductive technique that uses Boolean logic symbols to break down the causes of an event into basic equipment and human failures.

Globally Harmonized System (of Classification and Labeling of Chemicals) [known commonly as GHS]: A worldwide initiative to promote standard criteria for classifying chemicals according to their health, physical, and environmental hazards. It uses pictograms, hazard statements, and the signal words "Danger" and "Warning" to communicate hazard information on product labels and safety data sheets in a logical and comprehensive way.

Hazard: A potential for harm. The term is often associated with an agent, condition, or activity (a natural phenomenon, a chemical, a mixture of substances, a process involving substances, a source of energy, or a situation or event) that if left uncontrolled, can result in an injury, illness, loss of property, or damage to the environment. Hazards are intrinsic properties of agents, conditions, or activities.

Hazard analysis: A term used to express the complete process of hazard identification, evaluation, and control.

Hazard control: A barrier, such as a device, measure, or limit, used to minimize the potential consequences associated with a hazard.

Hazard evaluation: The qualitative and, wherever possible, quantitative description of the inherent properties of an agent or situation having the potential to cause adverse effects. (Adapted from the World Health Organization definition for "hazard characterization")

Hazard identification: The identification of the type and nature of adverse effects that an agent, operation or equipment has as inherent capacity to cause in an organism, system or (sub) population.

Hazard operability (HazOp) analysis: A technique whereby a multidisciplinary team uses a described protocol to methodically evaluate the significance of deviations from the normal design intention.4

Job hazard analysis: A systematic approach to address hazards by looking at a task and focusing on the relationship between the laboratory worker, the task, the tools, and the work environment in order to identify the hazards and reduce risk.

Laboratory: A facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a nonproduction basis. For the purposes of this document, a laboratory can be any location where research occurs.

Laboratory scale: used to describe work with substances in which the containers used for reactions, transfers, and other substance handling are designed to be easily and safely manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

Laboratory worker: Refers to career lab staff, PIs, undergraduate students, graduate students, postdoctoral researchers, volunteers, or visiting scholars.

Likelihood: The probability of occurrence, or how likely the complete sequence of events leading up to a consequence will occur upon exposure to the hazard. This term is often associated with descriptors such as almost certain, likely, possible, unlikely, and rare.

Management of change analysis: An evaluation of the potential safety consequences of planned changes to experimental apparatus, materials, procedure, location or other key parameters conducted prior to implementation of the proposed changes and how identified risks should be managed.

Near-miss: An event in which an injury or loss did not occur, but could have. The conditions of the event are often readily identified as precursors to an accident or loss. These are sometimes termed as ‘near-hit’. These events are indicators that the existing hazard controls, if any, may not be adequate and deserve more scrutiny.

Physical hazard: A class of hazards that include cold, ergonomics, explosions, fire, heat, high pressure, high vacuum, mechanical, nonionizing radiation, ionizing radiation, noise, vibration, and so forth.

Principal investigator (PI): The individual who has primary responsibility for performing or overseeing the research. In some instances, the PI is also referred to as the project manager for the research project.3

Risk: The probability or likelihood that a consequence will occur.

Standard Operating Procedures (SOPs): A written series of steps that can be followed to correctly and safely obtain a desired outcome. In laboratories, SOPs are typically developed for repetitive procedures which are known to have associated hazards where injury, property loss, or productivity loss could result if the steps are not followed precisely.

Appendix B

Laboratory Safety- Monthly Inspection Checklist

Class _____ Instructor/Supervisor _____
Dates of Inspection _____ Room Number_____

Inspection Items	Response		Comments (Deficiencies/Compliance)
	Yes	No	
1. Fire extinguishers, fire blankets, chemical shower, eye wash station, first-aid kit, broken glass container, and clean up materials for spills are present and in good working condition.			
2. Does not allow eat, drinking, smoking, storing food, or applying cosmetics in the lab.			
3. Lab Safety Guidelines Sheets with student signatures are filed in the SMHP Division Office			
4. Does not allow unrestrained long hair, loose clothing, and dangling jewelry in the lab.			
5. Lab coat, or other protective clothing worn properly			
6. Safety glasses worn when solutions or chemicals are used. Heat source properly attended			
7. Work surfaces disinfected at the beginning and end of every lab period (Biology Only)			
8. Liquids are kept away from the edge of the lab benches. Equipment is disinfected that come in contact with live material or body fluid			
9. Doesn't not allow clowning around or engaging in horseplay in the lab.			
10. Glassware labeled properly.			
11. Does not allow pipetting of mechanical devices or mouth pipetting.			
12. Places contaminated glassware, plastic ware, or disposable materials in a disposable autoclave bag for autoclaving or directly into a 10% bleach solution before decontamination...			
13. Wears disposable gloves when handling blood and other body fluids, mucous membranes, non- intact skin or items and surface soiled with blood or body fluids.			
14. Uses disposable gloves and safety glasses when dissecting preserved materials and live animals			
15. Needles and Lancets are placed in a 10% bleach solution after use.			

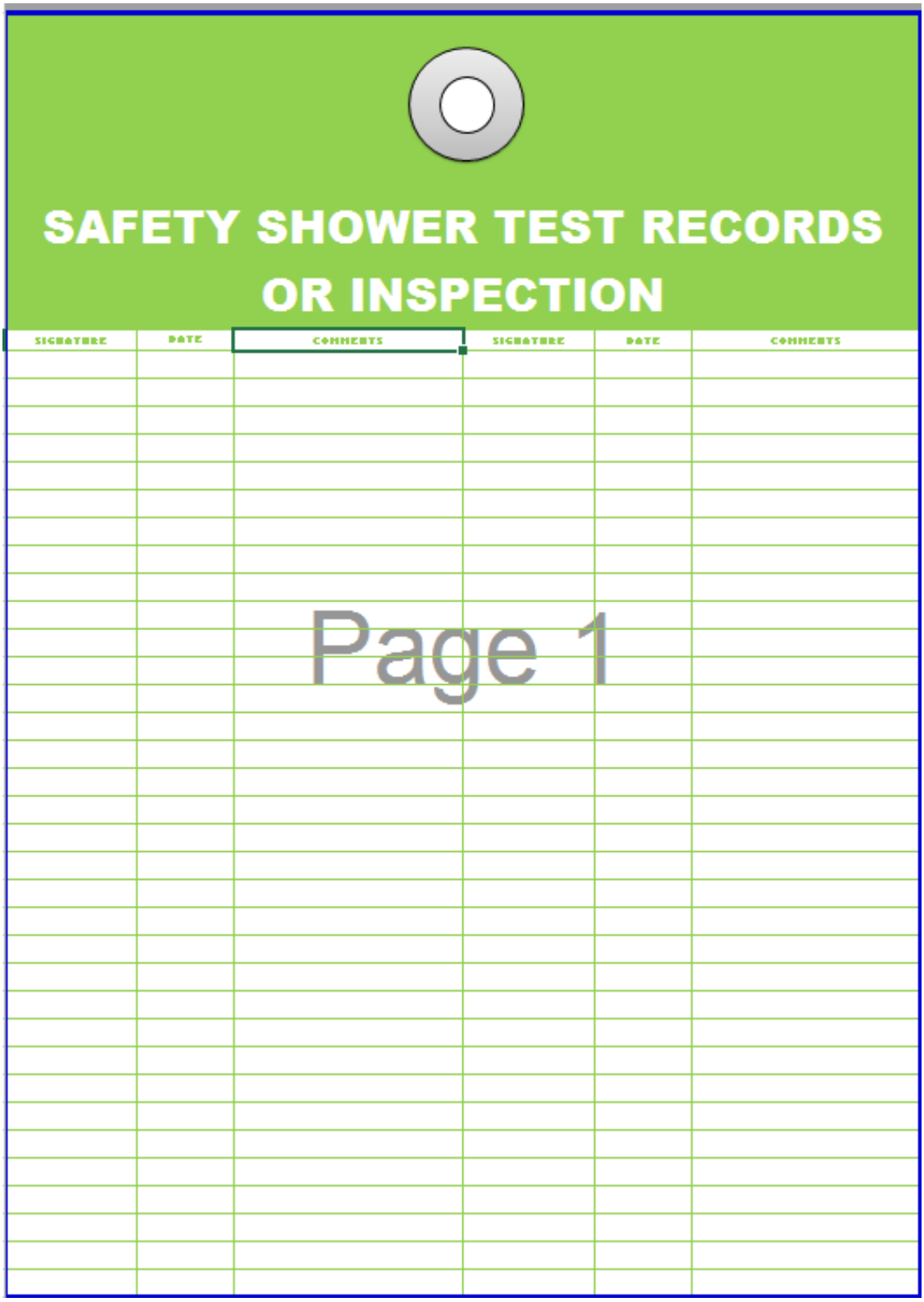
Inspection Item			Comments (Deficiencies/Compliance)
	Yes	No	
16. Reports spills or accidents immediately to EHS & RTK unit @ 404-756-4044			
17. Equipment is not worn, does not have cracks, or loose cords.			
18. Equipment is turned off properly.			
19. Highly flammable chemicals are handled in the fume hood			
20. Acids are appropriately stored in a cabinet.			
21. The authorized supervisor should be in the lab with students at all times.			
22. Children are not allowed in the lab area			
23. Campus Safety contact information is posted in the laboratory.			
24. Students wear ear plugs when operating equipment that generates a loud noise.			
25. The lab environment is not loud and conducive for learning			
26. Student wear closed shoes, which cover the entire feet.			
27. Hazardous and bio-hazardous waste are properly disposed (e.g. not in dumpsters or drains).			
28. Secondary containers with hazardous chemicals are closed and labeled.			
29. Excess chemicals are not stored in the laboratory.			

Additional Comments and/Remarks

_____
_____
_____
_____
_____

Inspectors Signature _____ Date _____

Appendix C



SAFETY SHOWER TEST RECORDS OR INSPECTION

SIGNATURE	DATE	COMMENTS	SIGNATURE	DATE	COMMENTS

Page 1

Appendix D

EYE WASH STATION INSPECTION/TEST RECORDS

SIGNATURE	DATE	COMMENTS	SIGNATURE	DATE	COMMENTS

Appendix E

Laboratory Safety Form
Science. Math and Health Professions Division
Atlanta Metropolitan State College

Course/Section: _____ Student Name: _____

I was made aware of basic laboratory safety procedures on

_____ By _____

(Date) (Lab Supervisor/Instructor)