LMU | School *of* Mathematics & Sciences
LINCOLN MEMORIAL UNIVERSITY

School of Mathematics and Sciences Teaching Laboratories Policy Manual

2023-2024

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LINCOLN MEMORIAL UNIVERSITY

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Chapter 1: Introduction

1.1 Lincoln Memorial University Policy Statement

Lincoln Memorial University is committed to maintaining a safe environment for its students, academic appointees, staff, visitors, and members of the general public. Further, it is dedicated to minimizing the impact of its operations on the environment surrounding its campuses and laboratory sites. The University has a commitment to promote effective loss reduction and loss prevention measures of the University's property and casualty exposures. It is the policy of the University to conduct its operations in conformance with applicable laws, regulations, and relevant published standards and practices for health, safety, and environmental protection.

Policies are set in compliance with federal OSHA, EPA, DOE, NIH, and USDA codes as well as State of Tennessee guidelines. Further, university-wide standards are maintained, in addition to best practices in the natural science disciplines. Policies are also recommended by faculty who serve as the primary enforcers.

Changes to operational and safety policies can be recommended to the applicable department chair so that discussion and decision may occur at regular or emergency meetings of natural science faculty. For changes affecting one department alone, that department has the authority to make the change in policy and practice. For changes affecting more than one department, faculty from the affected departments must vote after discussion. The Dean(s) over the impacted programs have the authority to implement policy or veto policy change proposals with reasonable justification. The authority to implement or change operational or safety policies and practice rest in the hierarchy of the administrative structure and is dependent on the breadth of the impact of the policy or changed policy.

The LMU Institutional Biological and Chemical Safety Committee will be informed of policy changes. The Chair of the IBCSC is Hana Hess (hana.hess@lmunet.edu) or (865-585-2432).

1.2 Students with Disabilities Policy

LMU is committed to providing reasonable accommodations to assist students with disabilities in reaching their academic potential. Students that have a disability which may impact performance, attendance, or grades in a course, please contact Amanda Dunn, Director of Accessible Education Services, to discuss specific needs. amanda.dunn@lmunet.edu and/or 423-869-7121

1.3 Laboratory Access

Students have access to labs for receiving instruction in courses for which they are registered and should attend all sessions as detailed in the course syllabus. Any additional time beyond the normally scheduled lab period must be authorized by the instructor. Unauthorized access to lab space or materials is prohibited and may result in disciplinary action. Students must be supervised in the lab facilities, and in no instance shall students be allowed to work alone.

Student lab assistants have access to the lab suite for which they are assisting. Student lab assistants are expected to respect any space that is posted as limited access at certain times for purposes of lab setup and use. Student lab assistants also must have immediate access to their faculty supervisor when working.

Staff must have authorization for access to the laboratories. Security should be notified prior to staff members working in the labs after hours. Access is granted to staff members as needed to accomplish their job functions. Security will be notified of the personnel and boundaries of access for each staff member working in labs. Instructors, including adjunct instructors, are granted access to their teaching, storage, and preparation space.

1.4 Safety Training

Safety training is mandatory for all personnel using the laboratories, and supervisors are expected to arrange for this training. The supervisor may conduct training themselves or arrange for another authorized person to conduct the training. Having another person conduct training does not release the supervisor from responsibility for the employee's competence or performance of safety functions. Any specific safety training must be arranged as appropriate to the expected hazards for a specific role.

In the instructional setting, students are to be trained as appropriate for the tasks and hazards that they will face, including review of specific SDS content for materials to be used in each lab session. It is imperative that safety equipment and engineering controls be explained to students. At the beginning of each laboratory course, students must be presented with the Safety Standards Compliance Agreement. This agreement outlines the expectation of safe behaviors, dress, and attitude for working in the laboratory. Each student must sign this agreement for each laboratory course in the Natural Sciences disciplines, or others using those facilities. These are kept on file, by the laboratory coordinator, for a minimum of one year. Each item on this agreement must be reviewed and understood by each student before normal lab activities commence. Failure to comply with these standard practices shall be reason to dismiss a student from the class session until corrective action is taken or attitude toward compliance is positive.

1.5 Incident Reporting

LMU strives to provide a safe and healthy campus community as free as possible from recognized hazards.

The following incidents shall be reported and investigated in accordance with established procedure:

i. An injury, exposure-related illness, or near miss; and

ii. That involves a member of the University community; and

iii. That occurs on university property; or

iv. That occurs off university property while engaged in university business or activities.

Employees are responsible for reporting any injury and exposure-related illness involving students and/or third parties to Risk Management. The steps in reporting an accident/incident in the laboratory are as follows:

i. Notify campus security (423-869-6911) if an ambulance is needed
ii. Report incident information to Hana Hess at 865-585-2432
iii. Fill out an incident report within 24 hours
iv. Report incident information to Dean and Department Chair
v. If applicable, report incident information to the LMU Insurance Department

Chapter 2: Emergency Response

2.1 Spill Control

Spill control is to be administered when a substance spills, splatters, or splashes. If the substance is acidic, baking soda and kitty litter (clay) should be poured on the spill until it is fully absorbed and neutralized. If the substance is basic, use a weak acid, such as, dilute acetic acid to neutralize the spill. The spill should then be disposed of properly, according to the composition of what was spilled. If hazardous spills occur, please notify the lab coordinator after primary containment has occurred. Each laboratory is equipped with a brush and dustpan, as well as spill cleanup kits.

2.2 Eye Wash and Safety Showers

Safety showers and eye washes are for emergency use if anyone is exposed to an irritant or hazardous material in the laboratory. Eyewashes are intended to immediately flush the eyes to remove and dilute any contaminant. Contact lenses should be removed, if possible, as they can trap the contaminant in the eyes. Contaminated eyes should be flushed for a minimum of 15 minutes.

Whole body exposure should be treated with flushing by shower to remove the material; this does often require removal of clothing. Modesty should be protected. If the safety shower is necessary, uninvolved persons should exit the lab until all clear is signaled. Showers and eye washes are routinely tested for functionality and the maintenance tag is signed upon test completion. All test dates are recorded by the laboratory coordinator.

2.3 Burns

A burn occurs when skin comes in contact with extreme cold, heat, chemicals, or radiation. A heat burn is one of the most common injuries encountered in the laboratory setting. Another common injury in the laboratory setting is a chemical burn, which occurs when living tissue is exposed to a corrosive substance, such as a strong acid or base. A radiation burn occurs when tissue is exposed to ultraviolet light, high frequency microwaves and radio waves, or ionizing radiation. Ionizing radiation is a result of radioactive materials, and at this time there is no source of ionizing radiation in the undergraduate teaching laboratories that may result in exposure.

For chemical burns, first remove the cause of burn by removing excess chemical from the skin and any contaminated clothing. Rinse the affected areas with cool water for a minimum of 15 minutes. After initial treatment follow up with a medical professional as needed.

Radiation burns caused by exposure to UV light should be treated by applying cold compresses to the affected skin. Keeping the skin moist by using products like aloe or a moisturizing cream will help speed up recovery time. After initial treatment follow up with a medical professional as needed.

The first step in caring for a heat burn is to remove the heat source. For first and small second-degree burns, allow the skin to cool by running under cool water for a minimum of 15 minutes. Do not use ointments. For a large second-degree burn, help protect it from friction and pressure with a non-stick dressing and seek medical care as appropriate. For a third-degree burn, use a non-stick, dry bandage, and seek medical attention immediately.

2.4 First Aid Kit

First aid kits are provided in each laboratory. They contain supplies to manage minor injuries that may result from work in the lab. These are intended to be supplies for first responders and for minor cuts. Remember, bleeding wounds should be elevated, cleaned, and wrapped in a sterile bandage. Gloves and eye protection must be worn to minimize exposure to bodily fluids. For major injury, contact campus police and security (423-869-6911) first to get medical care in route, **then** Hana Hess at 865-585-2432.

2.5 Ductless Fume Hood Use and Testing

Fume hoods are located in all of the teaching laboratories. Ductless fume hoods use activated carbon filters to remove toxins from the airstream. Unlike traditional ducted fume hoods, ductless fume hoods return clean, conditioned air to the lab. All organic and volatile chemicals, including formaldehyde, should be handled in a fume hood when possible. Chemicals which are acutely toxic, carcinogens, or reproductive toxins must be carefully handled in a fume hood.

Fume hoods should not be used as permanent storage areas, all chemicals should be returned to an appropriate storage area. The fume hood filters will be replaced as needed and properly disposed of. Fume hoods are routinely tested for air flow as well as filter saturation. A detailed log of the tests and maintenance are maintained by the laboratory coordinator

Chapter 3: Chemical Storage and Disposal

3.1 Storage

Storage cabinets of varying types are located inside the laboratory stock rooms. One of these types is a SafeStore cabinet, these units are filtered cabinets used for storage of noxious or odorous chemicals. SafeStore cabinets isolate and trap chemical vapors to prevent exposure and cross contamination, as well as eliminate ecological impact through chemical or particulate release into the environment. The SafeStore units should be utilized for storage of volatile chemicals, including alcohols, acetone, or any organic solvents.

Caustic acid cabinets are used to isolate volatile acids including, hydrochloric acid, sulfuric acid, and hydrobromic acid. Nitric acid must always be isolated from any other chemical.

Flammable chemicals should be stored in flammable marked cabinets, some of which are located beneath fume hoods in addition to stand-alone cabinets. These chemicals should also only be handled under fume hoods. Flammable chemicals require more care than non-volatile chemicals as they can ignite at room temperature. It is important to remember that it is the vapor and not the liquid itself that is more easily ignited.

Chemical resistant shelves are designated for storage of non-volatile, non-flammable pure reagents in storage rooms of both the chemistry and biology lab suites. In the biology suite, chemicals are to be organized alphabetically, with volatile/odorous compounds in the SafeStore. In the chemistry suite, inorganic and organic chemicals are organized by functional group, and volatile/odorous compounds are located in the SafeStore. Acids are stored in the caustic acids cabinets located in the preparation room between the organic and general chemistry laboratories.

Chemicals not in active use are to be returned to the appropriate position on the shelves or in the safety cabinets. Any chemical not in the supplier's original packaging that needs to be stored should be labeled with the composition, date, and potential hazards.

3.2 Absolute EtOH

Ethanol is commonly used in the laboratory setting as a solvent, antiseptic, and aid for molecular biology. It is stored in the locked flammables chemical storage units. Undiluted ethanol is highly flammable and should be carefully handled under a fume hood. Make sure to wear the appropriate PPE, including gloves and goggles, when dealing with this hazardous substance.

3.3 Compressed Gasses

Large, compressed gas cylinders must be clearly marked with the chemical/trade name and anchored to a bench, a wall, or chained in the transport cart away from equipment that produces heat. All compressed gas cylinders must be at least 20 feet away from combustible chemicals. No transportation is permitted unless the regulator is removed, and the safety cap is firmly in place over the control valve. Lecture cylinders should be secure from rolling or falling at all times; preferably clamped in position. Each gas cylinder present in MANS 422 is alphabetically labeled for organizational purposes.

3.4 Cryogens

We have two types of cryogens: liquid Nitrogen (N2) and liquid Helium (He). These are kept in room 119 with limited access behind a locked door. Both materials must be handled with personal protective equipment in place: lab coat, protective apron, thermal shielding gloves and face mask. Contact with human tissue kills the affected tissue like a high-temperature thermal burn.

If an individual is exposed to a cryogen, the following procedures are to be followed:

1) Remove the victim from the cryogen
2) Remove any clothing that may interfere with circulation to frozen tissues
3) Do not rub the affected area
4) Immerse the area in a warm water bath – Never use hot water or dry heat!
5) If the affected area is the eyes, flush with warm water for no less than 15 minutes
6) Seek immediate medical attention
7) Report the incident immediately to Hana Hess (865-585-2432) , Dr. Stephen Everly, and Dr. Adam Rollins.

3.5 Chemical Disposal Process

Chemical waste is disposed of once a year by a waste disposal company. **No waste should ever be poured down the sink!** Labeled, empty containers are kept on hand for collection and storage of waste. These containers are labeled with either acidic aqueous waste, aqueous waste, halogenated organic waste, or non-halogenated organic waste. Date of addition as well as chemical composition should be noted when adding waste to these bottles.

Acidic Aqueous wastes	Aqueous wastes
For pH ≤ 5; not oxidizing or predominately organic	For pH ≥ 5-9; not oxidizing or predominately organic
Halogenated Organic wastes	**Non-Halogenated Organic wastes**
For organic waste that includes halogens	For organic waste, not including halogens

When chemical containers are emptied, barcodes need to be noted before disposal of the container to ensure accuracy of inventory. To do this, place containers that need to be disposed of in the chemical drop zones denoted by red squares in the prep rooms.

3.6 Biohazardous Waste

Any waste item that has been in contact with living cells (including bacteria) is considered biohazardous and needs to be autoclaved before disposal. These items should **never** be disposed of in the garbage. Biohazard bins are provided in all biology labs for this waste and should never be allowed to get more than 2/3 full. No liquids or sharps are to be thrown away in the biohazard bin, there are biohazard sharps containers for items such as broken glass slides, needles, etc.

3.7 Preserved Specimens

Specimens preserved in Carolina's Perfect Solution can be disposed of in the regular trash destined for a landfill or incinerator. The specimens are not classified as federally hazardous waste and do not represent a biohazard. After draining fluid off the specimens into the appropriate carboy, double bag the specimens and place them in

the trash. The preservation fluid may **not** be disposed of in regular trash. Specimens not preserved in Carolina's Perfect Solution should be disposed of using the same procedures as biohazardous waste.

Any preserving fluid needs to be collected in a carboy and water used to rinse preservation fluid off of specimens is to be poured into the carboy as well. The carboy needs to be labeled with type of fluid (ex. ethyl alcohol 70% or formalin 10%). When at capacity, the carboy will be disposed of by a waste disposal company. Waste disposal is extremely expensive, please make sure to only pour specimen fluid or rinse water in the carboy.

3.8 Fresh or Live Specimens

Fresh or live specimens, including bacteria, must be decontaminated before disposal. This may happen one of two ways: either by placing in a 10% bleach mixture for a minimum of one hour, or by autoclaving. Fresh animal body wastes and parts are disposed of as biohazardous waste. The laboratory coordinator should be notified if large quantities of fresh samples are being used, to ensure prompt disposal.

3.9 Waste Containers

Waste containers are located in each of the laboratories. Waste containers in the chemistry suite include: broken glass containers, acidic aqueous waste containers, aqueous waste containers, halogenated organic waste containers, and non-halogenated organic waste containers. The biology laboratories containers include those above as well as: biohazard sharps, biohazard containers, and carboys for preserved specimen fluid.

3.10 Sharps

A "sharp" is defined as: any contaminated object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires. Sharps waste is to be disposed of in the appropriately labeled sharps boxes. Biohazardous sharp waste will then be picked up by Medical Waste of America and disposed of properly. Always assume that used needles and other sharps are contaminated, unless otherwise known.

3.11 Broken Glass and Serological Pipettes

Broken glass containers are located in each of the laboratories for discarding broken glassware and serological pipettes. Serological pipettes have a high potential for tearing bags, even if they are plastic and should be disposed of with broken glass. Once full, the containers are to be taped around each side. All seams are to be taped as well, including the opening in the lid. Once the container is sufficiently taped closed, it is to be discarded with all other trash. No biohazardous waste is to be disposed of in these containers.

Chapter 4: Use of Instruments

4.1 Instruments

Laboratory instruments may not be used without training by a qualified individual. This training must include hands-on demonstration and safety instruction. The operations manual for the instrument must be accessible to all users. If there are questions regarding the function or use of the equipment, please contact the lab coordinator.

The use of laboratory instruments can be harmful to the user, if not properly trained. Some instruments in the laboratories emit UV light which may harm skin and eyes. These instruments may not be operated without all shields in place.

4.2 Microscopes

Microscopes are available in each of the biology teaching laboratories. Microscopes are inventoried and numbered. They should be returned to the appropriate shelf after every use based on the numerical categorization. If there is a question regarding the function or use of the microscope, please contact the lab coordinator. Nonfunctional microscopes should be tagged and set aside for repair.

4.3 Autoclaves

Before using an autoclave, training and authorization is required. Only authorized personnel may use the autoclave. Periodic autoclave specific training will be provided to users by the lab coordinator.

There are two autoclaves in the undergraduate teaching laboratories and another in the 422 Research lab. Autoclaves are pressure vessels with flow-through steam engineered to destroy all living cells (complete sterilization). This live steam is very dangerous! Autoclaves must be checked regularly for leaks and failing parts by a professional, as such, please notify lab coordinator of any unusual smells, sounds, etc.

Spills are to be prevented by properly filling vessels and by using catch trays. A properly filled vessel is no more than 1/2 filled to allow space for boiling once the pressure is released. Dry and liquid waste is to be autoclaved in trays. Hazardous liquids are not

to be rinsed down any drain. The tray is to be rinsed while hot to remove agar and nutrient residues. Agar is never to be poured down the drain.

Cleaning should occur while the autoclave is cool. Detergent and water rinse should be used. Absorbent material should be used to prevent washing solution from going down the autoclave chamber drain.

Autoclaves are tested quarterly with spore forming bacterial test vials or chemical indication strip so that sterilization ability can be certified. Records of this testing are kept on file for 3 years. Autoclaves are certified by the State of Tennessee Boiler Inspector, and this certificate is displayed alongside the machine.

4.4 NMR

Nuclear Magnetic Resonance is a technique for determining the magnetic moments of nuclei by subjecting a substance to high-frequency radiation and a large magnetic field. The technique is used as a method for determining the structure of a substance. A superconducting magnet uses two types of cryogens, liquid helium and liquid nitrogen. Cryogenic liquids can be handled easily and safely provided certain precautions are obeyed.

PPE including lab coats, eye protection, and cryogenic-appropriate gloves will be worn by all individuals when handling cryogenic liquids in the NMR laboratory.

All personnel with be adequately trained before working with the NMR, and all health and safety procedures will be observed. The operation of pacemakers, biostimulators, and neurostimulators may be affected or even stopped in the presence of static or changing magnetic fields. The operation of equipment may also be directly affected by the presence of strong magnetic fields. Watches, cameras, and credit cards may be magnetized and irreparably damaged if exposed to fields above 10 gauss.

It is extremely important to understand the purpose of the two clearly marked zones in the NMR area (room 119). The exclusion zone is defined as the area (rooms and hallways) inside the magnet's 5 gauss line. Individuals with cardiac or other mechanically active implants must not enter this area. One must also be aware of the extension of the magnetic field; the magnetic field surrounds the magnet in a three-dimensional fashion. Warning must be given to individuals who are potentially at risk, not only on the same floor as the magnet, but also on the levels above and below the magnet. The security zone is defined as the room that houses the magnet. The security zone is established to prevent ferromagnetic (iron, steel, or magnetic) objects from becoming projectiles. For this reason, ferromagnetic objects shall not be allowed inside the security zone.

4.5 Magnetic Field Hazards

Due to the size of the magnet present in the NMR, large attractive forces may be exerted on equipment/magnetic subjects in proximity to the magnet. The force may become large enough to move the equipment uncontrollably towards the NMR magnet. Because of this hazard, smaller metallic pieces may become projectiles (keys, screwdrivers, wrenches, etc.). Large equipment such as gas cylinders and carts could cause bodies or limbs to become trapped between the equipment and the magnet. Remember, the closer to the magnet, the larger the force and the larger the subject mass, the larger the force. The NMR we have in room 119 is a shielded type that exerts a magnetic force 300 cm from the vessel. This area is clearly marked with adhesive yellow and black caution tape 300 cm in each direction from the center of the vessel.

4.6 Avoiding a Magnet Quench

Liquid nitrogen and liquid helium are used in the NMR laboratory, and both are extremely hazardous. In order to prevent accidental exposure to liquid cryogens, and to avoid asphyxiation in the event of a magnet quench, the following precautions should be taken when entering the NMR laboratory:

- No person may use cryogenic liquids in the NMR laboratory without being trained in the safe handling of such substances.
- Before using cryogenic liquids in the NMR laboratory, the NMR Facility director, Dr. Everly, must be notified. Cryogenic liquids are not for general use.
- In the event of a magnet quench (that is, the sudden evaporation of cryogenic liquids in the magnet), all individuals present must immediately and orderly exit the NMR laboratory. A magnet quench is usually obvious from the loud rushing sound of the evaporated gases escaping the magnet and may displace sufficient oxygen to cause asphyxiation. Since helium is less dense than air, exiting the laboratory by crawling on the floor is recommended. Doors to the laboratory should be left open to aid in the dispersal of helium and nitrogen gases.
- Any accidental exposure to cryogenic liquids must be reported to Hana Hess (865-585-2432), Dr. Stephen Everly, and Dr. Adam Rollins.

In the event of a large spillage, evacuate the area immediately. Provide adequate ventilation in the room to avoid oxygen depletion. Helium can displace air in the upper area of a room and cold nitrogen can displace air in the lower area. Coming in contact with cryogenic substances in liquid or vapor form may produce cold burns on the skin similar to those caused by heat. There is also a particular fire danger if the cold surfaces are covered with oil or grease, which are combustible. Self-ignition could occur; therefore the appropriate PPE is absolutely necessary!

Chapter 5: Personal Protective Equipment

5.1 Introduction to PPE

Personal Protective Equipment (PPE) is defined as any device or clothing – head, eye, face, foot or respiratory protection worn to shield against biological, chemical, or physical hazards. Personal Protective Equipment plays a significant role in the laboratory. It is extremely important that chemicals and other substances used in an experiment are evaluated, so proper Personal Protective Equipment is chosen and used.

5.2 Eye Protection

Eye protection is a form of PPE and must be utilized in the laboratory setting. Eye protection is most important when dealing with chemicals, bacteria, bodily fluids, or any substance that may splash, splatter, or shatter in one's eyes/face. Goggles and face shields are examples of eye protection. Goggles are more commonly used in the laboratory setting. Face shields are intended for use when the entire face needs protection. This shields the face and eyes from flying particles, metal sparks, and chemical/biological splashes. Exercise sound judgment when choosing appropriate eye/face protection. If eye/face protection fails and eyes are exposed to a biological/chemical hazard, immediately proceed to the closest eye wash station and flush for a minimum of 15 minutes. Do not rub eyes. Seek medical attention immediately. If the affected person wears contact lenses, these must also be removed, and eyes thoroughly flushed.

5.3 Protective Clothing and Shoes

Protective clothing is crucial in the laboratory environment. Close-toed shoes must be worn. Hair that is long enough to move in your face must be tied back. Shirts must always cover the midriff. Pants, skirts, or dresses will be worn to cover the thighs and knees. Capri pants are allowed. A lab coat may be purchased for your personal use. Any loose hanging items (hoodie strings, long necklaces, etc.) need to either be tied up, or taken off, especially if working with open flame.

5.4 Gloves

Gloves are another form of PPE. Due to the potential for latex allergies, disposable nitrile gloves are used in all of the teaching laboratories. It is important to choose a glove that provides adequate protection from specific hazard(s). Always inspect gloves for leakage before using. Also, confirm that the gloves fit properly by ensuring they are long enough to cover the skin between the top of the glove and the sleeve of the lab coat.

Immediately discard worn or torn gloves or gloves that are, or may have become, contaminated. Proper glove removal includes pulling one glove off, and while still holding the first glove, pulling the second glove off, therefore safely tucking the first glove into the second glove. Gloves are then to be disposed of in proper receptacles according to their contamination level. Always wash your hands after removing gloves, even if they appear not to be contaminated. Avoid contaminating "clean" equipment: remove gloves and wash hands before touching anything else. Never reuse disposal gloves.

Insulated gloves are to be used when extreme temperatures can irritate or burn hands. These must be worn when removing items from the autoclaves to prevent serious burns. Insulated gloves are also required when working with liquid nitrogen or liquid helium to prevent tissue damage due to frostbite.

5.5 Aprons

Aprons may be used in the laboratory setting to protect clothing from splashes, spills, and to protect the body from contamination of harmful substances. These add an additional layer of protection.

Chapter 6: Housekeeping

6.1 Teaching Labs

It is very important, for the safety of everyone involved, to keep the teaching laboratories clean and clutter-free. All chemicals, glassware, microscopes, or other supplies are to be stored in the appropriate places, and tabletops are to be wiped down and sanitized after each lab period.

6.2 Preparation Rooms

Preparation rooms are to be used for the set-up and break-down of experiments. As such, countertops should be wiped down and sanitized after each lab period. Glassware is to be rinsed and placed in the dishwasher. Waste that needs to be autoclaved should be placed in an autoclave bag, **loosely** twisted by hand, placed in an autoclave pan, and autoclaved at the appropriate setting by an authorized user. When cooled, the autoclaved waste may be placed in the waste container. Do not use red bags for on-site autoclave trash.

6.3 Organization

Organization is the key to a smoothly functioning laboratory. In the preparation rooms, all drawers and cabinets are to be labeled explaining the contents. Glassware is to be neatly organized by size on the shelves in the storage room. In order to prevent injury, damage, and egress in emergencies, it is extremely important to keep aisle ways and exits clear of obstruction. Poorly maintained machinery, tools, a messy work area, and cluttered aisles can all contribute to injuries occurring.

Chapter 7: Equipment Use

7.1 Microscopes

There are microscopes located in each biology lab. The microscopes are to be returned to the storage cabinets and the appropriate numbered spot after each lab period. Users of the microscope should clean oil from lenses (100x) and carry and put away the microscopes, including lowering the stage, turning to the lowest magnification, turning the microscope off, winding the cord around the cord hold. Then, with one hand on the base and one hand on the arm of the microscope, carry it to the storage cabinet space with the matching tag to the microscope.

7.2 Carts

Carts available for use in the biology and chemistry suites. They may be used to move equipment. Please return all carts to the lab retrieved from when finished.

7.3 Microwaves

As with any electrical appliance, microwaves should be used with caution. These microwaves are to be used for laboratory experiments only. No food or drink shall be heated in these microwaves. No sealed containers may be heated in a microwave unless the microwave is specifically designed for synthesis as is the organic unit in room 238. Only the special vials may be used in it with training and supervision.

7.4 Ice Machines

There is one ice machine located in the biology suite (109A) and one ice machine located in the chemistry suite (201A). Place the ice scooper back in the appropriate place when done and notify the lab coordinator immediately of any leaks.

7.5 Dishwashers

There are four dishwashers – two in the biology suite (109a and 122a) and two in the chemistry suite (201a and 238b). Dishwasher detergent is located under the sinks, next to each dishwasher. They are for anyone to use, but please make sure to empty them after each cycle. Test tubes, volumetric flasks, and burets cannot be cleaned in dishwashers and must be washed by hand. Pegboards are used for drying glassware that is too large to be placed in the dishwasher.

7.6 Vacuum, Air, Gas

The vacuum nozzles are found in the fume hoods in the biology and chemistry laboratory areas and on the tabletops of all the benches in the chemistry and physics laboratories. A vacuum trap must be used to reduce entry of liquid contaminates into the vacuum system. This vacuum is at 2944 watts.

The air nozzles are found in the fume hoods in the laboratory area. The pressure is 43.5 psi.

Gas nozzles are found on the tabletops of all of the benches in the biology teaching laboratories. Natural gas is 43.5 psi. Students must be trained and monitored when using natural gas.

Each of the operations noted above (vaccum, air and gas) have external cut offs in the hallway outside the laboratories. It is very important to identify these before using gas, air, or vacuum in case of emergency.

7.7 Teaching Technology

Each teaching laboratory has a professor's desk complete with computer and Crestron controller and SmartBoard Sympodium. Common lab supplies are also provided in the professor's desk. Any issues with the teaching technology must be immediately communicated to Information Services. A work order may be requested at ext. 7411 or helpdesk@lmunet.edu.

Chapter 8: Material Orders

8.1 Process for Ordering

The process for ordering materials is as follows:

1) Submit a completed Math and Science purchase requisition form to Department Chair. If you do not have a copy of this form, please contact the lab coordinator.

2) After approval from the Department Chair, it will be sent to the lab coordinator where a custom quote will be requested from the manufacturer.

3) A requisition will be created, and if approved by the Dean, it is submitted to the Finance Department.

4) Once the purchase order is approved and returned to the lab coordinator, it is then sent to the company for purchase.

8.2 Receiving an Order

Once the order is received, the items that have arrived are checked off the packing slip, which is included in the shipment, and the purchase order. All paperwork, invoices, or other proof of purchase are filed away with the corresponding purchase order. It is extremely important to keep all paperwork that comes with a delivery – especially if the item is defective, broken, or needs to be returned.

If you receive a delivery, please make sure the paperwork is given to the lab coordinator.

8.3 Adding to Inventory

After the order is received and all paperwork is properly filed away, the item(s) are taken to the proper place in the preparation or storage area and the person who requested the items are notified. The newly received items are then added to the current inventory.

8.4 Capital Equipment

All capital equipment, such as the autoclaves, spectrometers, and thermocycler with a purchase price of over $1,000 are inventoried individually. This inventory may be accessed by contacting the laboratory coordinator. It is extremely important to contact the lab coordinator, if there is a question about the maintenance, use, or functionality of any of this equipment.

8.5 Chemical Inventory

All chemicals in the Math and Natural Sciences Building are inventoried. The corresponding SDS sheets are available through the online SDS Database found here, QR codes located in each lab, as well as paper copies located in the prep rooms.

8.6 Consumable Inventory

Consumables are stored in the preparation and storage areas of each laboratory. Should you need more, please contact the lab coordinator. Typical consumables kept on hand at all times include petri dishes, sterile swabs, pipets, pipet tips, microscope slides, cover slips, gloves, and Kimwipes.

Chapter 9: COVID-19 Information

LMU will continue to monitor and assess the impact of COVID-19 and provide updates as needed. If you have any questions regarding COVID-19 and LMU's response plan, please visit https://www.lmunet.edu/covid.php for the most up to date policy information.

For further assistance or clarification about anything covered in this manual, please contact Hana Hess at 865-585-2432 or Hana.Hess@lmunet.edu.

Appendix I

Biology and Anatomy Laboratory Safety Rules

Always follow the directions of the lab instructor and/or lab assistant. A well-planned experiment includes safety planning and disposal of wastes. Everyone must work safely in the lab.

LABORATORY CONDUCT

- Do NOT eat, drink, or chew anything in the lab. Leave food and drinks outside the lab door. You may exit the lab to consume drinks in the hallway if necessary.
- Wear eye protection every time indicated and/or when you believe your eyes should be protected. This may be purchased in the bookstore and used in every lab as needed.
- Hair that is long enough to hang in your face will need to be tied back.
- Close-toed shoes must be worn at all times.
- Pants, skirts, or dresses will be worn to cover the thighs and knees. Capri pants are ok. Shirts must always cover the midriff. A lab coat may be purchased for your personal use.
- Students are not permitted to work in the lab alone or use materials without permission.

WORKING WITH AND DISPOSING OF MATERIALS

- In laboratory courses you may be using materials or equipment with inherent hazards. It is your responsibility to follow safety protocols and warnings. This includes the use of personal protective items, such as safety goggles and gloves. If you have questions about materials, equipment, or procedures, you should ask your instructor or the Natural Sciences Laboratory Coordinator, Hana Hess at 423-869-6246.
- You may work with hazardous materials. Hazards may be encountered via skin contact, ingestion, or by inhaling. It is your responsibility to know what you are working with and take precautions to prevent exposure when handling these materials. Safety Data Sheets (SDS) are available for the hazardous materials you may use in a specific lab exercise or experiment.
- Needles and blades are disposed in Biohazard Sharps containers located in the lab.
- Broken and used glass is disposed in the cardboard “glass only” boxes located in the lab.
- Biohazard materials include body fluids and microorganisms. Any items containing or made contact with these materials are to be deposited in the containers provided (labeled with a biohazard symbol) located in the lab. They will be subsequently treated with heat sterilization by approved personnel. No glass is to be deposited in biohazard waste disposal containers. Glass that contains biohazard materials are to be disposed of in the biohazard labeled sharps containers.
- No hazardous materials may EVER be put down the drain. Hazardous chemical materials are caustics, poisons, carcinogens, and mutagens. These may be organic or aqueous and are to be put in separate labeled containers. Your instructor will direct you as to where to dispose of these materials.
- Some instruments in the labs emit UV light which will cause harm to skin and eyes. These instruments may not be operated without all shields in place and without supervision of an instructor.

STUDENTS WITH DISABILITIES POLICY

LMU is committed to providing reasonable accommodations to assist students with disabilities in reaching their academic potential. If you have a disability which may impact your performance, attendance, or grades in this course, please contact Amanda Dunn, Director of Accessible Education Services, to discuss your specific needs at at amanda.dunn@lmunet.edu and/or 423-869-7121.

POLICY FOR STUDENTS WITH MEDICAL CONDITIONS

If you have or acquire any medical condition that may affect your use of or ability to come into contact with substances used in required laboratory experiences, or to safely work in the lab environment, you are advised to consult with your physician regarding participation in any lab and advise your instructor. The School of Mathematics and Science faculty and administration will make every effort to work with your personal physician in attempting to determine the level of risk to you.

My signature indicates that I understand the expectations and rules above and agree to abide by them. I also understand that if my dress or behavior is not compliant, I will be dismissed from lab to correct it and may return to complete my assigned work should time permit.

Signature: _____ Date: _____

Printed Name: _____

Course: _____ Instructor: _____

Appendix II

Chemistry Laboratory Safety Rules

Safety in the chemistry laboratory is largely a matter of common sense. If you remain aware of your surroundings and stay focused on the task at hand, you should emerge from your laboratory session unscathed. The most important consideration in lab should be your safety and the safety of those working near or around you. Never work alone, and always protect yourself and others from the possible hazards that exist in the chemical lab. The main hazards associated with the lab are fire and chemical exposure.

Fire:

The possibility of fire during a lab period is remote but real. Most fires that occur are usually limited to a small area. Normally we will not be dealing with such a large amount of flammable material that the whole lab would be affected. A portable fire extinguisher is available if the situation warrants its use. If we have a large fire, we will quickly evacuate the lab. We are not firefighters and there is nothing in the lab valuable enough to risk injury to anyone.

To minimize the risk of fire, follow the following guidelines:

--- Place all unnecessary papers, books, and backpacks away from your immediate working area.

--- Remain aware of an operating bunsen burner, if used. Do not allow loose clothing or long hair to ignite.

--- When using flammable solvents, a hot plate is the preferred method for heating.

--- If you are not sure how a material should be heated, ask the instructor.

If a fire occurs, follow these guidelines:

--- Calmly notify the instructor.

--- Attempt to contain/extinguish the fire. Shut off the bunsen burner. Push burning debris into the sink and add water.

--- If you are on fire, do not panic. Stop, drop and roll is the best option. Fire blankets are also available.

--- If the fire is too large to quickly stop, evacuate the room quickly.

Chemical Exposure:

To prevent unwanted exposure to chemicals, follow these guidelines:

--- Always wear protective goggles! You will receive only one reminder during the semester. If caught without your goggles again, you will fail that lab. If you err once more, you will fail the course. **This is the most important safety guideline. Many chemicals we will use in the lab are corrosive and can quickly damage your eyes**.

--- Do not wear shorts or sandals to lab. You will not be allowed to participate in lab in improper attire. Long pants and shoes can minimize the impact of spilled chemicals or hot liquids on your skin.

--- Do not eat or drink anything at all while in the lab. Leave food and drinks outside the lab door. You may exit the lab to consume drinks in the hallway if necessary. Do not chew gum or tobacco. Do not taste test anything that you see.

--- Gloves and aprons are available for your use.

--- Wash your hands before you leave lab for the day.

--- Use all noxious and volatile substances in the fume hood.

If you are exposed to unwanted chemicals, follow these guidelines:

---The best treatment usually will be to immediately rinse the affected area with copious amounts of water. For small areas, use the sink. If you somehow manage to coat your entire body with an unwanted substance, safety showers are available for rinsing.

--- If you get something in your eye, the first step is to find the eyewash station and rinse your eyes for a minimum of fifteen minutes.

---If noxious vapors or gases bother you, leave the room to get some fresh air.

---Again do not panic, we will not be using lethal substances in the lab. A thorough rinse with water should alleviate any exposure problem.

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Policy for students with medical conditions

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Miscellaneous rules:

1. No unauthorized experiments of any sort. If you are caught doing this, the instructor will assign a grade of zero for that particular lab.
2. Never perform lab work unsupervised.
3. No horseplay or running in the lab. Do not squirt water or acetone at each other.
4. Clean up your bench area while you work. A cluttered lab bench increases the chance for a fire or spill.
5. If you are unsure about a step or procedure, ask for assistance.
6. During the semester the instructor will provide additional information on safety as it pertains to each lab.

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Signature: _____ Date: _____

Printed Name: _____

Course: _____ Instructor: _____

Appendix III

Physics Lab Safety Rules

Follow the directions of the lab instructor and/or lab assistant.

Encourage everyone to work safely in the lab.

Refrain from eating anything, drinking anything, or chewing gum in the lab. Leave food and drinks outside the lab door. You may exit the lab to consume drinks in the hallway if necessary.

Wear eye protection every time indicated and/or when you believe your eyes should be protected. This may be purchased in the bookstore and used in every lab as needed.

Hair that is long enough to move in your face will need to be tied back.

Close-toed shoes must be worn.

Pants, skirts, or dresses will be worn to cover the thighs and knees. Capri pants are ok. A lab coat may be purchased for your personal use.

Shirts must always cover the midriff.

Sharps include blades, broken glass, and needles. These are disposed in the containers provided. Needles and blades are disposed in Biohazard Sharps containers while glass is disposed in glass boxes in each lab.

Biohazard materials include body fluids and microorganisms. These are to be deposited in the containers provided and treated with bleach and/or heat sterilization by approved personnel.

No hazardous materials may EVER be put down the drain. Hazardous chemical materials are caustics, poisons, carcinogens, and mutagens. These may be organic or aqueous and are to be put in separate labeled containers. Containers should be labeled with date of addition, composition (%) of waste, and total volume.

A well-planned experiment includes safety planning and wastes disposal.

Students are not permitted to work in the lab alone or use materials without permission.

Turn down and off any electronic equipment before making any hardware changes or storing equipment after lab. Check power supplies or function generators before plugging in or powering up to ensure that they have been left in a safe operating condition or state.

In this laboratory course you may be using materials or equipment with inherent hazards. It is your responsibility to follow safety protocols and warnings. This includes the use of personal protective items, such as safety goggles and gloves. If you have questions about materials,

equipment, or procedures, you should ask your instructor or the Natural Sciences Laboratory Coordinator: Hana Hess 423-869-6246.

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Signature: _____ Date: _____

Printed Name: _____

Course: _____ Instructor: _____

Appendix IV
Sport and Exercise Science Lab Safety Rules

Follow instructions and additional lab specific safety information provided by instructors.

Always wear appropriate personal protective equipment (PPE) according to the needs of the specific lab. These items include but are not limited to: closed-toe shoes, goggles, and/or gloves.

Before engaging in physical activity, ensure you are reasonably able to complete the activity and have no medical conditions that could be exacerbated by exercise.

Avoid risky or unauthorized actions during physical activities such as excessive weightlifting or improper technique.

Stay hydrated and take breaks when necessary to prevent overexertion.

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Signature: _____ Date: _____

Printed Name: _____

Course: _____ Instructor: _____