CASE Safety Manual

Working in the laboratory and shop presents many hazards to address with proper instruction. The following are safety concerns all students should be informed and reminded of when working with laboratory supplies and equipment.

General Safety Rules

1. Students need to be aware of clean up procedures for each activity they complete. The laboratory must remain clean at all times.
2. Students need to know the safety features of the classroom, such as fire exits, fire extinguishers, first aid kit, Safety Data Sheet (SDS) information, wash station, and telephone.
3. Students must know the proper way to report accidents. Report all accidents according to local school district policy.
4. Any unsafe behavior exhibited by students may result in their removal from laboratory/shop activities. Ensure that students are aware of classroom policies and the consequences of risky behavior.

Laboratory/Shop Safety Features

Ensure a safe environment by implementing the following recommended minimum safety items in the laboratory area. Additional details for each course are listed throughout the course.

Minimum Features:

- Eyewash station
- Fire extinguishers
- Fire blanket
- First aid kit
- Flammable waste can
- SDS binder
- Sharps container
- Spill kits – acid and base
- Flammable storage cabinet
- Flammable waste container

Additional recommended items:

- Chemical shower
- Goggle sanitizer
- Biosafety cabinet
- Broken class receptacle

Personal Protective Equipment

When working in a laboratory or shop, personal protective equipment (PPE) should be a routine and a habit. Require students to wear proper PPE at all times. Minimum PPE requirements include safety glasses and a laboratory apron or shop coat. Additional equipment, such as chemical goggles and heat resistant gloves, may be needed for specific activities. Consider requiring a dress code for days of laboratory experimentation or shop work, including pants and close-toed shoes with any long hair tied back.

First Aid Kit

A first aid kit must be available in every laboratory and school facility in case of minor medical injuries. A body fluids spill kit should be available. Follow precautions to clean up and dispose of bodily fluids. Most school districts have bloodborne pathogen training for district employees but not students. The teacher needs to inform students of the potential risk of coming into contact with bodily fluids.

Chemicals

Exposure to chemicals will be an issue for students. Students will need detailed instructions for handling and using chemicals. The teacher will also be responsible for the disposal of chemicals according to school district policy. Also, all chemicals used in the laboratory must have a current SDS on file and available for students and emergency personnel to access.

For some corrosive and caustic chemicals, all students and teachers must have the following personal protective equipment available.

- Safety glasses and goggles for eye protection
- Aprons
- Gloves
- Spill kit

Any injury resulting from chemical exposure must be treated immediately by medical personnel. Follow the school district policy for handling chemical-related injuries.

SDS Records

A safety data sheet (SDS) is available for all hazardous chemicals. SDS contain information about emergency precautions in case of spills, ingestion, or other accidental uses. Every SDS uses a specific format so users can find information readily. Keep a set of SDS for all items stored or used in the work area available at all times. Most items ordered from vendors are shipped with SDS; be sure to save and file appropriately. For chemicals purchased locally, many SDS can be found online at **http://www.ilpi.com/msds/** and printed for inclusion in the SDS folder.

Chemical Spill Kits

In the occurrence of a chemical spill, proper cleanup materials and procedures are critical to health and safety. Refer to the SDS for any item spilled to review proper cleanup methods. The minimum components to include in a spill kit are sand, an absorbing agent, and neutralizers. Absorbing agents may be kitty litter, fire blankets, or absorbent pads. Be sure to have both acid and base neutralizers. Always wear proper personal protective equipment while cleaning the spill.

Chemical Storage

Store all items used in the laboratory or shop in a dedicated and organized storage area. Glassware and other commonly used equipment should be stored where it is accessible to students when needed, but placed in a safe and secure area, such as a cabinet or drawer, when not in use. Organize chemicals by category in a secure, locked area designed for chemical storage with proper ventilation and temperature control. Keep work areas clear and free of unnecessary equipment or materials.

Chemical Disposal

Dispose of all materials according to procedures outlined in the SDS. Some chemicals may be diluted or neutralized to a safe level for disposal in trash or sink, but always check the label and SDS first.

Allergies

Students will be exposed to many substances, both natural and chemical. Some of the materials that may trigger allergic reactions are:

- Food substances
- Chemical indicators
- Latex gloves

Be aware of any physical symptoms, including:

- Skin rashes
- Sneezing and coughing
- Loss of breath or breathing problems
- Signs of faintness or unresponsive behavior

Report all incidences of allergic reactions to laboratory substances according to the policy of your school. In non-serious cases, the teacher may need to provide gloves, respirators, or other personal safety equipment for the student.

Cutting Instruments

For several activities, tools with sharp cutting edges are used. The teacher must provide specific instructions for the safe use of these cutting instruments. Students will need to know how to hold the tool, how much pressure to exert, and what surface to cut on to protect them and the equipment.

If an injury should result from a cutting instrument, the teacher must follow first aid practices according to school policy and report all accidents to the main office. It will be essential for the teacher to demonstrate the proper use of scalpels and monitor students closely for dangerous techniques.

A first aid kit must be available in every laboratory and school facility in case of minor medical injuries. A bodily fluids spill kit should be accessible and follow precautions to clean up and dispose of bodily fluids. Most school districts have bloodborne pathogen training for district employees but not students. The teacher needs to inform students of the potential risk of contact with bodily fluids.

Electrical Hazards

Common electrical hazards, such as plugs and cords, are present in laboratory situations. However, the biggest concern for wet laboratory activities using electrical devices is an electrical shock due to moisture conduction. The teacher will need to plan activities accordingly to prevent potential electrical shock when using electronics near liquids. It is also essential to check all electrical equipment to ensure all cords and connections are adequately insulated and in good shape.

Fire Safety

Agricultural classrooms, labs, and shops commonly have combustible materials such as gasoline, ethanol, and cleaning solvents. A fuel source, heat, and oxygen are all needed to sustain a fire. Extinguish fire by eliminating one of the three components. Review these basic fire safety guidelines with students.

- Know the location of all fire extinguishers, fire blankets, and first aid kits.
- Work in properly ventilated areas to avoid the accumulation of flammable fumes.
- Review emergency plans and procedures.
- Store flammable materials in proper safety containers and cabinets.
- Do not complete electrical work near combustible or flammable material.
- Store flammable and combustible liquids in proper, labeled containers.
- Mark all traffic areas and paths to all exits.
- Keep traffic areas and exit paths free from debris.

Glass

Glass containers, slides, and equipment will be used in the laboratory. It is important to remind students of the fragile nature of these items, as some students may not identify them as consisting of glass. Equip each laboratory with tools to clean up broken glass and dispose of it to prevent injury. Do not throw broken glass into the wastebasket as it poses a risk of harm to janitorial staff. Proper storage is essential to protect glass objects from breakage.

If cuts result from broken glass, contact your front office personnel immediately and follow procedures set by your local school district for handling the injury. Be aware of the district policy for cleaning up blood resulting from cuts and inform students of the dangers.

Lifting

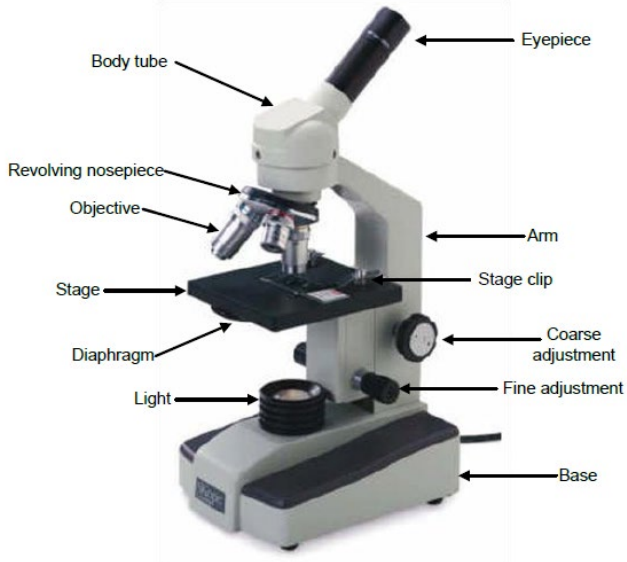
Laboratory supplies and projects may present a risk to students in terms of injury from lifting heavy items. Be aware of district policies concerning lifting heavy objects. A good thumb rule is to make special accommodations with equipment moving anything over 50 pounds. It is a teacher's responsibility to prevent students from lifting heavy objects without providing the proper equipment to do it safely.

Microscope Care and Operation

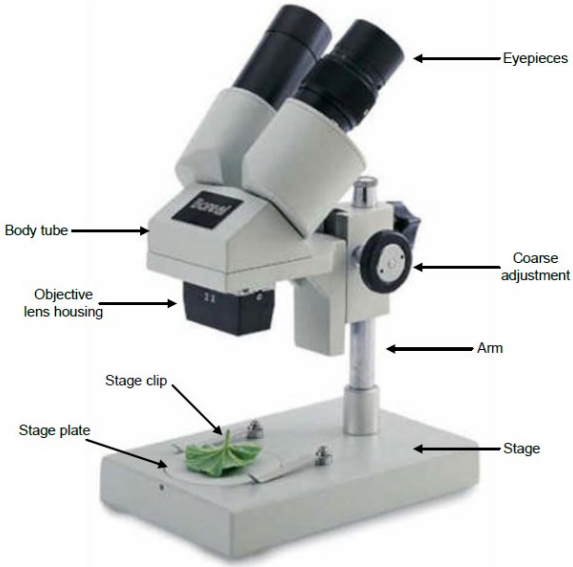
Microscopes are commonly used in the laboratory setting. Throughout the year, there will be opportunities to observe organisms and tissues at the microscopic level. Proper care and use of microscopes are essential for accurate observations as well as laboratory safety.

A microscope is an instrument that produces an enlarged image of an object. Microscopes used most often are light microscopes, which use light to enlarge the image. The two types of microscopes used in this course include compound light microscopes and stereomicroscopes. Use a compound light microscope to view tiny objects that have been prepared on a slide. Use stereomicroscopes to study larger specimens and to observe the surfaces of structures.

Parts of the Microscope



Compound Light Microscope



Stereomicroscope

General Procedures for Microscope Use

- When moving a microscope, always pick up the microscope by the arm with one hand and use the other hand under the base for support. Use both hands while carrying the microscope.
- Place the microscope securely on the workspace well away from the edge.
- If the microscope has a power cord, secure the cord on the desk or countertop. Do not allow the excess cord to hang down where a passerby could snag it.
- Grasp the plug firmly when plugging and unplugging the microscope, do not pull on the cord.
- Always begin observations with the revolving nosepiece set to the low-power objective.
- Do not touch the glass part of the lenses with your finger; use a piece of lens paper to clean the viewing area.
- To determine the magnification power of an objective setting, multiply the magnification of the eyepiece by the magnification of the objective.

Focusing the Compound Light Microscope

1. Turn the revolving nosepiece so the lowest power objective is in the viewing position.
1. Use the coarse adjustment to move the objectives and the stage as far apart as possible.
2. Place a slide on the stage using the stage clips.
3. With the objective set at the lowest magnification, use the coarse adjustment knob to bring the stage and objective as close together as possible without touching the slide to the objective.
4. Looking into the eyepiece, focus the objective by slowly raising the lens using the coarse adjustment.
5. Use the fine adjustment to complete focusing.
6. When the specimen is centered and focused at low power, rotate the revolving nosepiece to a higher power. Avoid contact between the slide and the objective lens.
7. Use only the fine adjustment to focus on higher powers.

Noise

Equipment, including engines and power tools, produce noise with sound intensity harmful to a student's ears. Sound intensity is measured in decibels from 0-140. Prolonged exposure to noise at high decibel levels could lead to hearing loss over time. Ear protection, such as earplugs and earmuffs, have a noise reduction rating. The rating number is the number of decibels the protection reduces the noise exposure intensity. Determine the exposure of sound intensity and compare to OSHA standards for acceptable levels of sound intensity and duration to select hearing protection needed in your shop.

Respiratory Protection

Airborne chemicals can occur in many forms, including mists, dust, vapors, gasses, and fumes. Students must have proper respiratory protection, and facilities must be equipped with adequate ventilation to prevent student exposure to airborne chemicals. Review SDS sheets for all shop materials and chemicals to determine the type of respiratory protection needed. Also, review all OSHA standards for ventilation requirements needed for planned shop activities and ensure those standards are met before starting those activities.

Physical Burns

Burns can happen from alcohol and Bunsen burners used for some laboratory exercises. Treat burns according to school district policy.

Tools

An agricultural laboratory has various tools available for students to use when conducting activities or building projects. Each tool will have specific safety concerns associated with it. Complete proper instruction before using a new tool. Keep all tools in appropriate storage areas to prevent the handling of tools not necessary for the activity.

Hand Tools

Quality hand tools provide a safe and productive environment in the agricultural lab and shop settings. Students should follow these guidelines when working with hand tools.

- Wear proper PPE, such as safety glasses, ear protection, and protective clothing.
- Secure hair and loose clothing.
- Work in areas with quality lighting and visibility.
- Receive permission from the supervising teacher before operating any tool.
- Inspect tools for damage before using. Do not use a damaged tool.
- All personnel are a safe distance away from the tool operator.
- Use tools for the intended purpose.
- When using cutting tools, point away from the body.
- Keep sharp cutting instruments concealed and protected when not in use.
- Move tools with sharp edges or points with the pointed end in the downward position.
- Do not carry tools in pockets
- Keep all cutting tools properly conditioned and sharp.
- Keep tools free of debris such as oil and grease.
- Report all injuries to supervising teachers.

Power Tools

Students should use power tools and equipment for their intended use. Students can reduce the risk of accidents by following these guidelines.

- Follow manufacturer operating instructions when operating power tools.
- Inspect power tools for damage before using. Do not use a damaged power tool.
- Wear proper PPE, including eye, ear, and head protection.
- Do not wear loose clothing, ties, or rings that could be caught in moving parts.
- Use UL® approved power tools installed in compliance with the NEC®.
- Do not use electrical tools in wet or damp areas.
- Keep the power switch in the off position before connecting a tool to a power source.
- Fasten all safety guards in place before starting.
- Keep power cords out of traffic areas to avoid tripping.
- Keep hands and arms away from moving parts.
- Tools needing repair or service should be shut off, locked out, tagged out, and disconnected.
- Consult OSHA for additional rules and regulations for tool operation at **https://www.osha.gov/SLTC/etools/machineguarding/intro.html**.