ANATOMY AND PHYSIOLOGY LABORATORIES

2023

Anatomy and Physiology teachers and their students face a wide range of potential hazards. This includes dangers associated with the chemicals used to preserve specimens, the use of dissection tools, and physical activities used in the study of human physiology. Effective control of such hazards involves both the recognition of each hazard and the development of control procedures.

Complete the Waste Disposal Form for removal of all waste (chemicals and broken glass) at the end of each semester. The Science/STEM Coordinator (Dr. Chaundra Creekmur; creekch@boe.richmond.k12.ga.us) will facilitate removal.

AP1: Required Materials for the High School Anatomy and Physiology Lab

1. Broken Glass Container
2. Sharps Disposal Box
3. Biohazard Bags
4. Household Bleach
5. Spill Kit
6. First Aid Kit
7. Fire Extinguisher
8. MSDS Notebook
9. Chemical Waste Disposal Containers

AP2: Eye Protection

Teachers owe their students a duty of care. A teacher must reasonably address all foreseeable dangers inherent in any laboratory experiment or demonstration that will be performed in the science laboratory or classroom. A teacher must also instruct and ensure that students demonstrate the proper use of protective equipment.

AP2.1 What is your obligation?

An important obligation of science teachers is to provide students with appropriate eye protection. **Provision and Maintenance of PPE - 29 CFR §1910.132(d) Personal Protective Equipment, General Requirements Standard** requires a hazard assessment to determine PPE needs and teachers must be trained in use and care of goggles.

AP 2.2 What circumstances require eye protection?

Eye protection is a must in any hazardous laboratory activity or demonstration in science. Protection of the eyes is essential in any laboratory activity. Eye protection is required (but not limited to):

1. When chemicals, glassware, or a heating source is being used
2. When working with solid materials or equipment under stress, pressure, or force that might cause fragmentation or flying particles
3. When an activity generates projectiles, or uses elastic materials under stress, or causes collisions
4. When dust or fumes are present
5. When using preserved specimens

AP 2.3 Choosing the best eye protection

Only safety goggles provide the level of protection needed for your laboratory activities when dealing with hazardous liquids or solids. A safety goggle fits the face surrounding the eyes; it should have a soft pliable flange, which seals around the eyes snugly to protect the eyes. In addition, safety goggles, with side shields or without side shields, provide adequate protection for laboratory activities involving use of solids such as meter sticks, projectiles, etc. Safety goggles should also be the standard for eye protection when chemicals, glassware, a heating source, or preserved specimens are being used.

AP 2.4 Disinfecting Goggles

1. When using the safety goggle cabinet, the ultraviolet light timer should be set for a minimum of ten (10) minutes. Sanitation of goggles is accomplished best by usage of a UV cabinet. Treatment with UV light will destroy the goggles over several years.
2. Hot soapy water and thorough drying between use of shared goggles is also recommended by the ACS.
3. Chemical Disinfection: After student use, wash the goggles in soapy water followed by a ten (10) minute rinse in five percent bleach solution (10:1 ratio - 10 parts water to 1 part bleach). The goggles should be allowed to air dry.

AP 2.5 What is the current recommendation for wearing contact lenses?

1. The American Chemical Society Committee on Chemical Safety states that contact lenses can be worn in the laboratory provided that approved eye protection is worn as required of others in the laboratory.
2. The National Institute for Occupational Health and Safety (NIOSH) recommends that workers be permitted to wear contact lenses when handling hazardous chemicals provided adequate face and eye protection is worn.
3. The Council of State Science Supervisors states that contact lenses can be worn provided "specially marked, non-vented safety goggles are available to contact lens wearers".
4. The Occupational Safety and Health Administration (OSHA) believes that contact lenses do not pose additional hazards to the wearer and has determined that additional regulation addressing the use of contact lenses is unnecessary.
    a. The agency wants to make it clear, however, that contact lenses are not eye protection devices. If eye hazards are present, appropriate eye protection must be worn instead of, or in conjunction with, contact lenses."
    b. Regulations (Preamble to Final Rules) Personal Protective Equipment for General Industry (Amended Final Rule, April 1994) Section 3- III Summary and Explanation of the Final Rule 1910.133, p. 16343.

AP3: Glassware

AP 3.1 Injuries from Glassware

Glassware is the number one source of injury in the laboratory setting. More students are cut by damaged glassware and burned by heated glassware that are harmed by any other object or circumstance in the lab. To ensure the safety of students in the middle school laboratory, substitute plastic lab ware for glassware where possible. New plastics like polycarbonate (Lexan®) have been successfully used for laboratory containers. While not useful for heating, the plastic is clear and extremely hard and can be used for almost all water soluble compounds. Beakers, flasks, graduated cylinders, and thermometers now are available in plastic. Check with your science supply company.

AP 3.2 General Cautions

AP 3.2.1 Broken Glass

1. Use glassware that is without defect and has smooth edges.
2. One of the most important ways to prevent glassware related injuries is to check the pieces for chips or cracks. Any damaged glassware should be disposed of in the appropriate container.
3. Glassware should have no cracks, chips, or scratches. In particular, be wary of "star cracks" that can form on the bottom of beakers and flasks. Any glassware with such cracks should be properly disposed of immediately.
4. All glass tubing should be fire-polished.

AP 3.2.2. "Frozen" Glass

Be careful with glassware that is "frozen." Only teachers, wearing goggles and gloves, should try to release the "frozen" glassware. If this fails, discard the glassware. Some common cases of "frozen" glassware are:

1. nested beakers that have been jammed together.
2. stoppers that cannot be removed from bottles.
3. stopcocks that cannot be moved.

AP 3.2.3 Hot Glass

1. Use only Kimax® or Pyrex® brand glassware when heating substances. Common glass can break or shatter, causing serious injuries in the lab.
2. Use care when working with hot glass. Hot glass looks exactly the same as room temperature glass.
3. Do not leave hot glassware unattended, and allow ample time for the glass to cool before touching.
4. Check the temperature of the glassware by placing your hand near, but not touching, the potentially hot glass.
5. Have hot pads, thick gloves, or beaker tongs available for grasping hot glassware.
6. Never set hot glassware on cold surfaces or in any way change its temperature suddenly. Even a Pyrex® or Kimax® beaker will break if cold water is poured into a hot beaker.

AP 3.2.4 Glass Tubing

1. Make sure that the tubing is without chips or cracks.
2. Use the appropriate diameter tubing for the task.
3. When breaking tubing:
    a. Use gloves or towels to protect hands when breaking glass tubing. Use goggles to protect the eyes.
    b. Scratch the glass once with a file or score.
    c. Wrap the glass in a towel. Place the thumbs together opposite the scratch. Pull and bend in one quick motion.
    d. Fire polish the broken ends: hold the glass so that the sharp end is in the top of the flame of a gas burner. Rotate the tube so all sides are heated evenly, causing the sharp edges to melt and become smooth.
    e. Place the glass on insulating material to cool.

AP 3.2.5 Bending

Bending glass tubing is often necessary. Follow these procedures:

1. Place a wing-top attachment on a gas burner and heat the area of the glass to be bent while holding it with one hand on each end, rotating to ensure even heating.
2. When the glass is soft and pliable, remove it from the flame and quickly bend to the desired shape.
3. Place on insulating material until cool.

AP 3.3 Types and Appropriate Use of Glassware

To prevent glassware related injuries always use the correct type of glass for the task you are doing.

AP 3.3.1 Proper Use

Each type of glassware has its proper use and should be used only for its intended purpose.

1. **For measuring volume**:

   pipets burets graduated cylinders

   dropper pipets volumetric flasks

2. **For storing solids and liquids:**

   bottles vials

3. **For containing reactive chemicals during experiments:**

   beakers flasks test tubes

   crucibles watch glasses test plates

4. **For transferring liquids and gases**:

   glass tubing funnels pipets

5. **For measuring temperature:**

   digital thermometers alcohol thermometers

AP 3.5 Cleaning

1. Clean glassware immediately after use. The longer glassware sits, the harder it is to clean.
2. Use laboratory-grade detergents or liquid dishwashing detergent such as Dawn® for cleaning glassware.
3. When using brushes, make sure to use the appropriate size brush; make sure the metal part of the brush does not scratch the glass.
   Rinse glassware with deionized water.
4. Allow glassware to air dry on paper towels, drying pads, or drying racks.

AP 3.6 Disposal

1. Defective glassware should be disposed of correctly.
2. Glassware should be disposed of in a separate container from normal trash. Such container should be clearly labeled **BROKEN GLASSWARE ONLY**.
3. When handling broken glassware, wear gloves or use a dustpan and broom. Do not pick up broken glass with bare hands.

AP 4: Microscope Handling

1. **DO NOT ALLOW STUDENTS WITH ACTIVE EYE INFECTIONS TO USE MICROSCOPES!**
2. Provide students with alcohol wipes to clean lenses before or after use.
3. Microscopes must be carried upright, with one hand supporting the arm of the microscope and the other hand supporting the base. Nothing else should be carried at the same time.
4. Microscope must be positioned safely on the table, NOT near the edge.
5. After plugging the microscope into the electrical outlet, the cord should be draped carefully up onto the table and never allowed to dangle dangerously to the floor.
6. The coarse adjustment must NEVER be used to focus a specimen when the 40x or oil immersion lens is in place.
7. When finished with the microscope, the cord should be carefully wrapped around the microscope before returning it to the cabinet.
8. All prepared microscope glass slides are to be returned to their appropriate slide trays; wet mount preparations are to be disposed of properly.

9. Malfunctioning microscopes should be reported to the department chairperson/laboratory safety manager.

AP 5: Dissections

The use of preserved animal specimens in instruction should be carefully planned to provide learning that cannot otherwise be achieved. Dissection activities should enable students to develop a greater respect for life. **ALL** such activities, particularly those involving the use of vertebrates should be undertaken by students only when they are prepared and have the maturity to appreciate fully the significance of the instructional activity.

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AP 5.1 General Considerations

1. Most biological supply houses sell specimens that are preserved in methanol or other low toxicity preservatives. When ordering new specimens for dissection, be aware that specimens preserved in formaldehyde are not permitted for use in the State of Georgia.
2. Some schools may have older specimens which are still stored in formaldehyde or formalin. Formaldehyde and formalin are listed as carcinogens by the EPA and are strong irritants. Good room ventilation is required when working with these specimens.
    a. Any specimen held in a formalin solution should be soaked in a water bath in a fume hood for 24 hours and then thoroughly rinsed under running water for several minutes before use.
    b. The soak solution should be placed into a hazardous waste container and appropriately labeled with the name of the contents, the amount of solution, and the date generated.
    c. Facilities and Maintenance should be contacted for pick-up and disposal. Document the date of contact and the date of pick-up.
3. While not required, it is suggested that dissections should be performed **only** by those students who have obtained a permission note signed by a parent.
4. **Work surfaces should be decontaminated once per class and after any spill of materials. A 1:10 household bleach and water solution may be used for disinfection.**

AP 5.2 Student Instruction

1. **Students should be instructed in the safe use of dissection instruments.**
   a. Scalpels and dissecting instruments should be sterilized before and after experiments.
   b. Pointed dissection probes, scalpels, razor blades, scissors, and microtome knives must be used with great care, and placed in a safe position when not in use.
   c. Scalpels and other sharp instruments are only to be used to make cuts in the specimen, never as a probe or a pointer.
   d. Leave scalpel blades in the original package when pushing the scalpel onto the blade. Hold the blade in the package securely, keeping the cutting edge away from fingers. Use tweezers, forceps, or a hemostat to remove the blade, always pushing the blade away from the body.
2. Avoid holding the specimen in the hand during dissection. A waxed pan or similar device should be used for holding the specimen in place.
3. When cutting with a scalpel or other sharp instrument, forceps may be used to help hold the specimen. **NEVER** use fingers to hold a part of the specimen while cutting.
4. Cut down on the specimen and not up toward the body of the student or teacher.
5. Hands should be thoroughly washed after dissection activities.

AP 5.3 Preserved Specimens

1. When specimens are being removed from the preservative solution, rubber gloves should be worn or forceps or tongs should be used, depending on the size of the specimen.
2. Use chemical splash goggles to protect against splashes and fumes.
3. **Preserved specimens should be thoroughly washed (including the abdominal cavities of large specimens) before being handled by the students.**
4. Preservative fumes may be irritating to the eyes, nose, and throat. Adequate ventilation should be provided whenever preservative fumes are present.
5. Specimens are to be clearly labeled and stored in designated containers or cabinets when not in use.

AP 5.4 Disposal

1. **Body parts or scraps of the specimen should NOT to be disposed of in the sink or trash.**
    a. **Body parts and tissue specimen should be placed into resealable plastic bags then placed into red biohazard bags. The bags should be labeled with the contents and the date the waste was generated.**
    b. **Facilities and Maintenance should be contacted for pick up and disposal. Document the date pick-up was requested and the date it occurred.**
3. Containers designated for the disposal of sharps (scalpel blades, razor blades, needles; dissection pins, etc.) and containers designated for broken glass must be present in each laboratory. Never dispose of any sharp object in the regular trash containers.
4. All biohazardous disposable glass items (i.e., slides, cover slips, Pasteur pipets, etc.) dissecting pins. or other sharp objects must be disposed of properly in the **Biohazard Sharps Container, NOT** the regular trash or waste bags.

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AP 6: Spills

Accidents do happen in the Anatomy and Physiology lab, and, in the event of a spill or accident, it is important that the teacher knows the correct procedures to follow.

AP 6.1 Spills

A spill kit should be prepared prior to starting anatomy labs. It should include all items required to clean up a spill, including disinfectant, paper towel, gloves and plastic bags and containers for disposal.

1. Students must report all spills to the teacher.
2. Only the teacher or laboratory safety manager should be allowed to clean up such spills.
3. If the spill is large or has caused a lot of splashing, aerosols may have been produced and the room should be evacuated for 90 minutes.

AP 6.1.1 Liquid Spills

1. Small (less than 1.0L) liquid spills should be covered with paper towels soaked in disinfectant (e.g. Sodium Hypochlorite with 1 % available chlorine) for at least 20 minutes.
    a. The area should be cleaned with fresh paper towels soaked in disinfectant.
    b. ALL paper towels should then be placed in a biohazard bag for disposal
        - Make sure the bag is sealed and labeled.
        - Notify Facilities and Maintenance for pick-up and disposal. Document the date pick-up was requested and the date it occurred**.**
2. In the event of a large spill (1.0L or more):
    a. Evacuate the room immediately.
    b. Contact an administrator and then contact Facilities and Maintenance and provide the following information
        - Your name and the name of the school
        - Location of spill
        - Content and approximate amount of spill
        - Time of spill

AP 6.1.2 Spills on the Body

1. The teacher must be informed immediately.
2. Contaminated clothing should be removed and the affected area washed vigorously with soap and water.
3. Medical attention may be sought if required.
4. The incident must be documented in the first aid &/or OHSW records.
5. Contaminated clothing must be disinfected before washing.

AP 6.1.3 Cuts and Puncture Wounds from Contaminated Sharp

1. Immediate first aid must limit contamination to the wound and to first aid personnel.
2. Any cut or puncture wound, caused by contaminated glass or sharps, must receive immediate medical attention.

AP 6.2 Contaminated Broken Glassware

1. Contaminated broken glassware should never be picked up directly with the hands.
2. It should be cleaned up using aids such as brush and dustpan, forceps or cotton wool swabs.
3. Follow the procedure for liquid spills.
4. All aids must be disinfected following use

AP 7: Disposal and Cleanup

AP 7.1 Disinfectants

Disinfectants and antiseptics (disinfectants for use on living surfaces e.g. skin) vary in their ability to kill bacteria, viruses, fungi, spores and protozoa. Disinfectants should always be diluted and used according to the manufacturer's instructions. The Material Safety Data Sheet should also be consulted for specific protective equipment and ventilation requirements. The following types of disinfectants are suitable for use in schools.

AP 7.1.1 Alcohols

Alcohols have good activity on bacteria, and fungi but less on viruses and poor activity on spores. 70% ethanol is rapid acting and dries quickly. 90% ethanol is good for viruses. 100% ethanol is NOT an effective disinfectant. 60-70% Isopropyl Alcohol (Propan-2-ol) is also effective.

AP 7.1.2 Chlorhexidine

Chlorhexidine has good activity on gram-positive bacteria but less activity on gram negative bacteria, viruses and fungi and poor activity on spores. It has low toxicity and irritancy and so is a good antiseptic. 0.5% for face - 4% for other skin. It is often combined with alcohol, which may dry the skin.

AP 7.1.3 Sodium Hypochlorite

Household bleach has good activity on bacteria, fungi and viruses, but less activity on spores. Varying amounts of available chlorine in hypochlorite solutions are required for different purposes. They must be prepared fresh daily from the concentrated stock

solution to ensure the correct level of available chlorine. 1% for spills, 0.25%for discard jars, 0.1% for cleaning benches and 0.05-0.1% for equipment and instruments.

AP 7.1.4 Providone-Iodine

Tincture of Iodine as 10% aqueous or alcoholic solutions is also suitable as skin disinfectant but it stains.

AP 7.1.5 Other

DO NOT USE quaternary Ammonia compounds as they are not effective disinfectants against many bacteria and viruses. Peracetic acid, aldehydes and phenolic disinfectants are considered too hazardous for use in schools.

AP 7.2 General Cleanup

All contaminated items should be decontaminated prior to reuse or disposal. Items for reuse should be immediately placed in disinfectant and soaked according to the manufacturer's instructions, prior to washing. (e.g. 25% Sodium Hypochlorite solution, soaked overnight)

AP 7.2.1 Glassware and Sharps

1. All biohazardous dissecting pins, scalpel blades, or other such items must be disposed of in the **Red Biohazard Sharps Container**, NOT in the regular trash.
2. All bio hazardous disposable glass items (i.e., slides, cover slips, Pasteur pipets, etc.) must be disposed of properly in the **Red Biohazard Sharps Container.**

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AP 7.2.2 Dissecting Pans

1. All solid debris should be removed from the tray.
2. Dissecting pans should be washed with soapy water.
3. Allow the solution to sit in the pan for a minimum of 10 minutes, then rinse thoroughly and allow to air dry.

AP 7.2.3 Dissecting Tools

1. Scalpels, probes, and other related tools should be carefully wiped with a paper towel to remove solid debris.
2. Tools may be placed in a 5:1 ratio of water and hypochlorite solution or a similar alcohol solution to clean and sterilize them.
3. Tools should be allowed to sit in the solution for a minimum of 90 minutes; leaving them in the solution overnight is preferable.
4. If necessary, dissecting tools may be autoclaved.

AP 8: Special Concerns

AP 8.1 Thermometers

1. **MERCURY FILLED THERMOMETERS ARE NOT ALLOWED IN RCSS SCHOOLS.**
2. Alcohol laboratory thermometers should be used in general laboratory activities.
3. For more advanced applications, a digital laboratory thermometer may be used.
   a. Care should be taken to choose a digital thermometer that contains a changeable battery; some are not changeable.
   b. The battery is a button cell battery and may contain 5-50 mg of mercury; it should be recycled through a battery collection program.

AP 8.2 Using Microtomes

Microtomes are commonly instruments used in laboratories to section tissues. These devices pose potential hazards to users during sectioning and/or the cleaning process. It is strongly recommended that teachers use prepared slides whenever possible.

AP 8.2.1 Training

1. Training must be documented and provided by a knowledgeable and responsible person within the laboratory before any work is completed.
2. Standard Operation Procedures should be made available to all users and posted near the point of operation.

AP 8.2.2 Appropriate PPE

A lab apron, chemical splash goggles, and nitrile gloves must be worn while handling tissues to be sectioned.

AP 8.2.3 Sharpness of Blade

1. A microtome blade is extremely sharp and must be handled carefully.
2. The rotary handle of the microtome must always be set in the locked position when changing a paraffin block or the blade.
3. A new blade should be placed in the blade holder and clamped before the rotary wheel lock is released.
4. Wrist guards should be added where possible.
5. Once the blade is seated and secured the rotary wheel lock can be released and the knife and holder advanced to the specimen block.
6. If adjustments need to be made to the specimen, remove the blade from the housing.

AP 8.2.4 Removal of the blade

1. Disposable blades must always be removed using forceps or a similar instrument.
2. Do not remove the blade holder from the microtome with a blade present or transport the housing with the blade present. .
3. Dispose of used microtome blades in the Biohazard Sharps Container.
4. The Biological sharps container must be kept adjacent to the microtome to reduce the distance that a blade would be moved
5. For microtomes with reusable blades cut resistant gloves must be used when removing and sharpening the blade.

AP 8.2.5 Microtome cleaning

1. Before the microtome is cleaned, the rotary wheel must be locked and the blade removed from the blade holder.
2. Use caution other components of the microtome may also have sharp edges.

3. Cut resistant gloves must be worn under nitrile gloves when a microtome is being cleaned.
4. Follow manufacturer's recommendations for cleaning the microtome.
5. All use cleaning materials and solutions should be treated as hazardous waste and secured in the appropriate containers.
6. Contact Facilities and Maintenance for pick-up and disposal. Document the date the pick-up was requested and the date the pick-up occurred.

AP 8.3 Using Centrifuges

AP 8.3.1 Operating Procedures

1. Check tubes for cracks/chips.
2. Use matched sets of tubes, buckets, etc.
3. Tightly seal all tubes and safety cups.
4. Ensure that rotor is locked to spindle and bucket seated.
5. Close lid during operation.
6. Allow to come to complete stop before opening.

AP 8.3.2 Safe Operation

1. Use safety cups whenever possible.
2. Disinfect weekly and after all spills or breakages.
3. Lubricate O-rings and rotor threads weekly.
4. Do not operate the centrifuge without the rotor properly balanced.
5. Do not use rotors that have been dropped.
6. Contact your centrifuge rep for specific information.
7. If you suspect leakage occurred from the centrifuge, leave the area, do not open the centrifuge for at least 30 minutes to allow aerosols to settle, then access situation while wearing appropriate PPE and taking necessary precautions.

AP 8.4 Human Studies

1. **Any lab activity involving the use of bodily fluids or tissues collected from students is forbidden in RCSS laboratories.**

2. Non-invasive, nonstressful laboratory activities using students as experimental organisms are encouraged.
    a. These include physiological measurements such as, pulse, heart rate, breathing rate, hearing, sight, etc.
    b. These activities need to be closely supervised by the teacher due the risk of physical injury, heart palpitations, shortness of breath, overheating, fainting and death.

AP 9: Chemical Safety in the Anatomy and Physiology Laboratory

All teachers should be familiar with the RCSS Chemical Management policy that addresses how chemicals should be properly stored, labeled, and secured, as well as who should have access to these chemicals and chemical storage locations. The following guidelines are provided for teachers in order to reduce the risk of chemical accidents and ensure that chemicals and products in their schools are stored and handled safely

AP 9.1 Procurement of Chemicals

1. Prior to ordering, determine whether the chemical is in stock.
2. Order only quantities that are necessary for the project. Remember: **"Less is better**".
3. Upon receipt of the chemical, make sure the date received and the owner's initials are on the label.

AP 9.2 Labeling of Chemical Containers

1. No unlabeled substance should be present in the laboratory at any time!
2. Use labels with good adhesive.
3. Use a permanent marker (waterproof and fade resistant) or laser (not inkjet) printer.
4. Print clearly and visibly.
5. Replace damaged, faded, or semi-attached labels.

AP 9.2.1 Commercially Packaged Chemicals

1. Verify that the label contains the following information:
    a. Chemical name (as it appears on the MSDS)
    b. Name of chemical manufacturer
    c. Necessary handling and hazard information

2. Add:
    a. Date received
    b. Date first opened
    c. Expiration or ―use by date (if one is not present)

AP 9.2.3 Secondary Containers and Prepared Solutions

1. When a material is transferred from the original manufacturer's container to other vessels, these vessels are referred to as ―secondary containers.
2. Label all containers used for storage with the following:
    a. Chemical name (as it appears on the MSDS)
    b. Name of the chemical manufacturer or person who prepared the solution
    c. Necessary handling and hazard information
    d. Concentration
    e. Date prepared
    f. Expiration or ―use by date

AP 9.2.4 Containers in Immediate Use

1. These chemicals are to be used within a work shift or laboratory session.
2. Label all containers in immediate use with the following:
3. Chemical name (as it appears on the MSDS)
4. Necessary handling and hazard information

AP 9.3 Material Safety Data Sheets (MSDS)

1. There must be an MSDS on file for every chemical compound in use in the lab.
2. At a minimum, MSDS information should be located in all chemical storage rooms and cabinets and in a central place within the school (away from the chemicals), as well as a central location for the school district.
3. A copy must be kept in an area that is accessible to all individuals during periods of building operations.
4. If no MSDS is available for a product because a) the manufacturer no longer exists; or b) the manufacturer cannot be identified from the label that material should be considered

hazardous waste and disposed of in a manner consistent with federal and state regulations.

AP 9.4 Proper Chemical Storage

Guidelines for chemical storage must follow **O.C.G.A 45-22-2, O.C.G.A. 25-2, OSHA Standard 29 CFR 1910, and NFPA 45: Standard on Fire Protection for Laboratories Using Chemicals** and **NFPA 30: Flammable and Combustible Liquids Code.**

1. Hazardous chemicals in schools should be stored in accordance with MSDS specifications
2. Chemicals should not be stored in areas that are occupied by or accessible to students, such as classrooms or restrooms
3. Chemicals should be stored in a central, secure location.
4. Organize chemicals first by **COMPATIBILITY**—not alphabetic succession (refer to section entitled Shelf Storage Pattern).
5. Store alphabetically within compatible groups.

AP 9.5 Proper Storage and Disposal of Chemical Waste

The following guidelines are provided to schools and administrators and should be used for storing and disposing of hazardous waste:

AP 9.5.1 Chemical Waste Labeling

1. Clearly and permanently label each container as to its contents and label as hazardous waste
2. All containers used for chemical waste should be labeled with the following:
    a. HAZARDOUS WASTE
    b. Chemical name (as it appears on the MSDS)
    c. Accumulation start date
    d. Hazard(s) associated with the chemical waste
    e. Approximate amount
    f. Date generated

AP 9.5.2 Segregation and Storage of Waste

1. Separate waste containers are required to properly segregate waste for disposal.
2. The following waste categories should be used:
    a. Chlorinated Solvents
    b. Cyanides
    c. Hexavalent Chrome
    d. High pH Alkaline Solutions
    e. Hydrofluoric Acid
    f. Low pH Acidic Solutions
    g. Nitric Acid
    h. Non-Chlorinated Solvents
    i. Oxidizers
    j. Palladium
    k. Reducing Agents
    l. Sulfides

AP 9.5.3 Storage Guidelines

1. Chemicals that are stored for disposal off-site should be placed in suitable closed containers and should be clearly marked with the contents. If the chemicals are a RCRA hazardous waste, the school must ensure that they are transported offsite for proper disposal.
2. Store all waste in containers that are in good condition and are compatible with their contents. Avoid using metal containers; certain chemicals can cause the metal to corrode and the container to leak.
3. Store waste in a designated area away from normal laboratory operations and to prevent unauthorized access. Store waste bottles away from sinks and floor drains.
4. Do not completely fill waste bottles; leave several inches of space at the top of each waste container. Securely cap all waste bottles.

AP 9.5.4 Disposal of Hazardous Waste

1. **THE USE OF SINKS FOR THE DISPOSAL OF CHEMICALS IS STRICTLY PROHIBITED!**
    a. When rinsing glassware that contained chemical, discard the first rinse volume into the appropriate waste container.
    b. Subsequent rinses can be discarded to the sink.
2. Water/air reactive wastes are restricted by waste disposal companies and must be deactivated prior to disposal.
    a. This is particularly true of materials which ignite or release gases on contact with air or water.
3. Dispose of chemically contaminated paper and disposable clothing in approved solid waste containers.
4. Do not treat hazardous waste on-site. Exception: Acids may be neutralized with sodium bicarbonate in a 50-50 ratio by weight.
5. Contact Facilities and Maintenance for pick-up and disposal. Document when pick-up was requested and when it occurred.

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AP 9.5.5 Record Keeping

1. Reassigned samples must be re-labeled with the new custodian's name and the date the waste was generated and stored.
2. A waste management log must be maintained and should indicate how and when the waste was generated, how and when it was isolated and stored, by whom it was generated and stored, and date and method in which it was disposed.

AP 9.6 Drug-Related Items

1. **THE FOLLOWING SUBSTANCES ARE NOT ALLOWED IN RCSS LABS!**

a. **Acetaldehyde**	f. **Histamine**
b. **Adrenalin**	g. **Nicotine**
c. **Colchicine**	h. **Testosterone**
d. **Caffeine**	i. **Thiourea**
e. **Ethyl Alcohol (grain)**	j. **Tobacco**

AP 10: Electrical Hazards

AP 10.1 Burns and Shock

1. Many electrical devices become quite hot while in use.
    a. In addition, "shorted" dry cells and batteries can produce very high temperatures.
    b. Students should never grasp a recently operated device or wiring without first checking for excess heat.
2. Students must be warned of the high death potential present even when the voltage is low.
    a. The severity of an electrical shock depends primarily on the amount of current to which a person is exposed.
    b. Since the current is related to the resistance and voltage, these two factors, as well as the part of the body involved and the duration of the contact, determine the extent of injuries to the victim.
    c. If the skin is wet or the surface broken, the resistance drops off rapidly, permitting the current to flow readily through the bloodstream and body tissues.

AP 10.2 Electrical Safety

AP 10.2.1 Batteries

1. A battery is an unregulated source of current capable of producing large currents when resistance is low.
    a. When short-circuited, connecting wires can become very hot, raising the risk of burns. Short-circuited mercury batteries may even explode.
    b. Chemical leakage from batteries is a potential hazard, especially in the case of wet cells that contain caustic chemicals such as sulfuric acid.
2. Certain types of batteries are rechargeable while others are not.
    a. Carbon-zinc and nickel-cadmium type batteries can be recharged.
    b. Do not, however, attempt to recharge a completely dead carbon-zinc battery, a leaking or corroded battery, or any battery that carries a warning against recharging.
    c. Such batteries can cause damage to the charger and may explode, causing personal injury.

d. Lead-acid batteries can be recharged but produce explosive hydrogen gas during the process.
e. They should only be recharged in a well-ventilated area with an appropriate charger.

3. Do not discard any battery in the trash.
   a. Contact Facilities and Maintenance for pick-up and disposal. Document the date of the request and the date the pick-up occurred.

AP 10.2.2 Circuit Loads

1. Most school laboratory electrical circuits have a maximum power rating of 1,500 watts (if fuses are 15 amp) or 2,000 watts (if fuses are 20 amp).
2. The total power load on a circuit should not exceed these values.
3. The individual power rating is usually found printed on a plate somewhere on the apparatus.

AP 10.2.3 Extension Cords.

1. Use extension cords only when there is no convenient way to connect equipment directly to a receptacle.
2. If an extension cord must be used, it should be checked for damage, proper grounding, and electrical capacity.
3. An extension cord should be marked with its capacity in amperes and watts and the total load should not exceed these values.
4. If the cord is unmarked, assume that it is 9 amperes or 1,125 watts.
5. If an extension cord becomes very warm to the touch, it should be disconnected and checked for proper size.
6. In general, science laboratories should be equipped with sufficient receptacles to minimize extension cord use.

AP 10.2.4 Fuses/Circuit Breakers.

1. Replace blown equipment fuses with fuses of the same amperage.
2. Replace fuses with the equipment unplugged.

3. Failure to use the correct fuse can cause damage to equipment and overheating.
4. Frequent blowing of circuit fuses or tripping of circuit breakers usually indicates that the circuit is overloaded or a short exists.
5. Circuit breakers and fuses that are tripped or blown should be turned on or replaced only after the cause of the short or overload is removed from the circuit.

AP 10.2.5 Grounding

1. Use grounded 3-prong plugs when available.
2. If the outlet is 2-prong, use an adapter and secure the ground wire to the cover-plate screw on the outlet.
3. Any apparatus with a metallic case or exposed metal parts should be checked to make sure that the case is grounded.
4. Such ungrounded appliances should be retrofitted with a ground wire and three-pronged plug.
5. The use of ground-fault interrupters should be considered.

AP 10.2.6 Power Cords

1. Any power cord should be inspected periodically and replaced immediately if frayed or damaged.
2. Apparatus should be located to keep power cords away from student traffic paths.
3. When removing the cord from an outlet, the plug should be pulled, not the power cord.
4. Wet hands and floors present a hazard when connecting or disconnecting electrical apparatus.

AP 11: Fire Hazards

Fire is a real danger in any laboratory setting, and all teachers need to be aware of how to prevent fires. In the event a fire does occur, teachers need to know how to respond appropriately. The following information is provided as guidance in preventing or combatting fires in the science laboratory.

AP 11.1 Preventing Burns and Fires

AP 11.1.1 When planning to heat materials or use open flames

1. instruct students on STOP DROP AND ROLL in the event clothing catches fire
2. make sure students know how to evacuate the classroom in the event of a large fire
3. know the location of the nearest fire extinguisher and know how to use it.
4. have a bucket of sand or a fire blanket nearby in the event that the nearest fire extinguisher too far outside of the classroom.

AP 11.1.2 When heating materials

1. **DO NOT USE ALCOHOL BURNERS! T**hey are extremely hazardous. Safer alternatives to alcohol burners include candles and hot plates.
2. **DO NOT USE STERNO HEATERS!**
3. make sure that the area surrounding a heat source is clean and has no combustible materials nearby.
4. do not allow students to work with hot materials, such as very hot water.
5. do not use household glass. Use only borosilicate laboratory glassware, such as Kimax™ or Pyrex™ when heating substances.
6. do not heat common household liquids, such as alcohol or oil; these are flammable and should not be heated. Heat only water or water solutions.
7. handle all hot materials using the appropriate type of tongs or heat resistant gloves (those made of asbestos or thick silicon rubber).

AP 11.1.3 When using Hot Plates

1. do not use hotplates designed for use in home kitchens. Use only laboratory type hot plates. These are sealed against minor spills.
2. do not place the hot plate on paper or wooden surfaces.
3. place the hot plate in a location where a student cannot pull it off the worktop or trip over the power cord.
4. never leave the room while the hot plate is plugged in, whether or not it is in use.
5. keep students away from hot plates that are in use or still hot, unless you are right beside the students and have given them specific instructions.
6. make sure that the hotplate is both unplugged and cool before handling a hotplate. You can check to see if a hot plate is still too hot by placing a few drops of water on the surface. If the water does not evaporate, it should be cool enough to touch.

AP 11.1.4 When using open flames

1. use only safety matches. Make sure the matches are stored in a secure place between uses.
2. closely supervise students when they use matches. Make sure students are dressed properly (baggy clothes are tucked in, long sleeves are rolled up, smocks/aprons are properly tied) and have long hair/braids tied up.
3. closely supervise students when they use candles. Make sure students are dressed properly (baggy clothes are tucked in, long sleeves are rolled up, smocks/aprons are properly tied) and have long hair/braids tied up.
4. use tea candles that are short and wide, and cannot be knocked over in normal use.
5. place all candles in a “drip pan,” such as an aluminum pie plate, that is large enough to contain the candle if it is knocked over.
6. never leave the room while a flame is lit or other heat source is in use.

AP 11.1.5 Bunsen Burner Safety Guidelines

Bunsen burners present fire hazards. They produce an open flame and burn at a high temperature, and as a result, there is potential for an accident to occur. For the safety and convenience of everyone working in a laboratory, it is important that the following guidelines be observed.

1. Remove all papers, notebooks, combustible materials and excess chemicals from the area.
2. Tie-back any long hair, dangling jewelry, or loose clothing.
3. Inspect hose for cracks, holes, pinch points or any defect and ensure that the hose fits securely on the gas valve and the burner. Replace all hoses found to have a defect before using.
4. Notify others in the laboratory that the burner will be in use.
5. Have the sparker/lighter available before turning on the gas.
6. Utilize a sparker/lighter with extended nozzle to ignite the burner. Never use a match to ignite a burner.
7. Adjust the flame by turning the collar to regulate air flow and produce an appropriate flame for the experiment (typically a medium blue flame).
8. Do not leave open flames unattended and never leave the laboratory while the burner is on.
9. Shut off gas when its use is complete.
10. Allow the burner to cool before handling. Ensure that the main gas valve is off before leaving the laboratory.

AP 11.2 In the event of a large, uncontainable fire

1. evacuate the classroom immediately.
2. locate and pull the nearest fire alarm.
3. notify public safety and/or administration about the fire. Make sure you include the location and source (chemical, paper, petroleum) of the fire.

AP 11.3 In the event of a small, containable fire

1. identify the type of fire. The table below lists the four classes of fires and methods for extinguishing them:

Class	To Fight Fires Involving	Method to Extinguish
A	wood, paper, cloth	Use water or dry chemical extinguisher.
B	gasoline, alcohol, paint, oil, or other flammable liquids	Smother by using carbon dioxide or dry chemical extinguisher.
C	fires in live electrical equipment	Cut off power to electrical equipment. Use ABC or carbon dioxide fire extinguisher.
D	metals (Na, K, Mg, etc.)	Scoop dry sand onto fire.

2. Use the appropriate method to extinguish the fire.
3. File an incident report.

AP 11.4 In the event a student's clothes catch fire

1. Roll the child on the floor to smother the fire. Use a fire blanket if one is available. Do not direct a carbon dioxide (CO_2) fire extinguisher at an individual because such extinguishers produce dry ice that can cause frostbite. Periodically check on the location and condition of fire extinguishers.
2. **DO NOT ATTEMPT TO ADMINISTER FIRST AID TO ANY BURNS THE CHILD MAY HAVE SUSTAINED!** Immediately notify the school administrator, school nurse, and public safety.