# CHARLOTTE MECKLENBURG SCHOOLS
# CHEMICAL HYGIENE PLAN (CHP)
# 2007

## MISSION

The purpose of this document is to outline appropriate procedures for CMS science teachers to follow when using chemicals in their teaching and learning, as well as inform all people likely to be handling chemicals on the approved procedures for dealing with accidents.

## CMS Science Safety Committee

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**For references and explanations of this CHP, refer to:**

**29 CFR § 1910 OSHA Subpart Z - Toxic and Hazardous Substances**

**29 CFR § 1910.1450 - Occupational Exposure of Hazardous Chemicals in Laboratories**

**29 CFR § 1910.1200 - Hazard Communication**

**29 CFR § 1910.1030 - Bloodborne Pathogens**

**Science Laboratory Safety Manual, Linda M. Stroud, 2006**

**S&SCS Chemical Inventory CD**

## Development and implementation:

- This Chemical Hygiene Plan is a written program developed and implemented by the Charlotte Mecklenburg School system.
- The CMS CHP is written to determine local protocols.
- Each middle and secondary school in CMS must write a school specific CHP which details an action plan to meet the CMS system wide CHP standards.
- Successful development and implementation of a CHP needs the full commitment of the local Board of Education, administrators at all levels, science teachers, science students and parents/guardians.
- Success and sustainability of the CHP depends upon the cooperation of all stakeholders in chemical hygiene and laboratory safety
- Professional development training (including but not limited to the Hazard Communication Standard of 1986 and Laboratory Safety) is required for all science teachers when first hired and up-dated as new information becomes available. Administrators should also receive professional development regarding science laboratory safety. If a non-science teacher is assigned to teach in a science classroom/laboratory, professional development regarding the associated hazards is also required. Professional standards recommend that science teachers teach in sciences laboratories and non-science teacher are not to be assigned to teach in science laboratories.

## Purpose of the Charlotte Mecklenburg Schools CHP is to:

- Outline information which directly protects employees and indirectly students and others working in school laboratories from health hazards associated with hazardous chemicals in the laboratory.
- Detail the processes and precautions intended to minimize chemical exposure.
- Establish a chain of command to handle specific safety responsibilities within CMS and specific school sites.
- Protect the environment from contamination with hazardous chemicals utilized in the school laboratory.
- Ensure appropriate management of chemicals in CMS.

## Employees covered by the CHP:

- Individuals assigned to laboratory workplace that may be exposed to hazardous chemicals in the course of his or her work assignment (teachers).
- Employees because of their workplace assignments that may be required to enter a laboratory where potential exposures may occur (administrators, maintenance and custodial staff).
- Occasional visitors to the laboratory are not included in the definition of employee; however, it is prudent practice and required by NC G.S. § 115C-169 (b) that visitors were appropriate eye protection if they visit during a time that a lab operation is underway.

## Responsibility:

- The Superintendent of CMS has the ultimate responsibility for the Chemical Hygiene Plan (CHP) for the school district, and must, with other employees, see that it is implemented and provided with continuing support.
- The Principal of each school has the ultimate responsibility for the Chemical Hygiene Plan (CHP) for his/her school and must, with other employees, see that it is implemented and provided with continuing support.

## Local Availability of the CHP:

- The plan will be available to all employees at the central office for review and copies located in other areas within CMS as deemed appropriate by the superintendent/designee. **(on the CMS website**)
- The plan will be available to all employees in the school office for review and copies located in other areas within the school as deemed appropriate by the principal/designee.

## Local Review of the CHP:

- The CMS CHP will be reviewed on an annual basis by the CMS Safety Committee and updated as necessary.
- The school-specific plan will be reviewed on an annual basis by the committee appointed by the principal/designee and updated as necessary.

## The CMS Chemical Hygiene Plan addresses :

**Part 1 – Identification and Inventory of hazardous chemicals**

**Part 2 – Minimization of exposure to employees**

**Part 3 – Responsibilities of CMS, the superintendence, the science curriculum specialist, other administrators, Chemical Hygiene Officer, employees, and other identified stakeholders**

**Part 4 – Discussion of safe procedures**

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**Part 14- Steps to address chemical safety**

# Part 1 – Identification and Inventory of hazardous chemicals:

- Exercise "universal precaution" at all times.
- Chemicals prohibited from use in schools by OSHA and EPA should be purged appropriately.
- Labs will be conducted in a manner that prevents employee exposure to OSHA regulated substances in excess of permissible exposure limits (PELs). NC OSH has more strict PELs than OSHA.
- A complete chemical inventory will be maintained of all chemicals / locations / amounts / date received / shelf life.
- Other information should be included on the chemical inventory as deemed necessary by CMS or site specific CHO.
- All chemicals will be reviewed by the CMS Safety committee to determine "absolute need" in the science instructional program.
- A 1:1 correspondence of all chemicals on-hand and their Material Safety data Sheet (MSDS) must be maintained and made readily accessible upon request.
- The MSDSs for all chemicals will be reviewed by the Safety Committee to review associated hazards of "absolute need" chemicals.
- Chemicals requiring with a NFPA Health Hazard rating above 1 are banned from use.
- Chemicals requiring use of a respirator as personal protective equipment are banned from use.
- Laboratory chemicals must be properly labeled to identify any hazards associated with them for employee information and protection.
- Labels on incoming containers of hazardous chemicals must not be removed or defaced.
- Unlabeled chemicals MUST be disposed of promptly as determined by local/state/federal disposal procedures.
- When dispensing chemicals from one container to another, the new container MUST be properly labeled with the chemical name and hazards. All containers should be labeled in this manner.
- MSDSs should be referenced to determine details about chemicals.
- Laboratory areas that have special hazards (bio) (microwave ovens) should have warning signs
- NFPA diamonds should be affixed to the outside of buildings and storerooms that house chemicals with the highest hazard rating of any chemical within the storeroom.
  (A Fire Department can legally refuse to fight a fire in a building that contains unknown chemicals.)
- Chemicals will be organized by the NIOSH/Flinn or Fisher System for secondary schools and the Fisher System for middle schools.
- Mercury, mercury compounds and mercury containing lab instruments (thermometers, barometers etc) will not be used. N.C. 1502 § G.S.
- Sometimes (usually for IB or AP science classes), chemicals will be required that are on an EPA hazard list – e.g. silver nitrate. In these cases a justification process should be in place to obtain needed chemicals.
- Household chemicals require an MSDS when brought into the school for use in the laboratory.

## Part 2 – Minimization of exposure to employees:

- Use of laboratory is restricted to science teachers and students only.
- Personal protective equipment and instructions on proper use of this equipment will be provided to employees as appropriate.
- The storage, distribution and methods of handling hazardous chemicals will be conducted in a manner which minimizes the potential for accidents and incidents of employee/student exposure.
    - Work conducted in the lab and its scale must be appropriate to the facilities available.
- Special consideration of the quality of the ventilation system includes paying attention to the following characteristics
    - Adequate general system which ensures that laboratory air is continually and appropriately circulated includes the following:
        - well-ventilated and temperature controlled chemical storerooms
        - chemical storerooms should have a separate exhaust fan
        - science departments should have a separate ventilation system
        - quality and quantity of ventilation should be evaluated when installed or obtained and regularly monitored
        - ductless fume hoods MUST be available for middle or secondary schools – students and for demonstrations
        - when schools are considering remodeling, appropriate measures to correct ventilation issues in science classrooms and storerooms needs to be prioritized.
    - Adequate sinks and counter space
    - Proper storage for specific hazardous materials must take into consideration each of the following categories:
        - flammables
        - corrosives
        - poisons
        - acids.
    - Adequate and appropriate Emergency Equipment MUST include:
        - fire extinguishers
        - fire blankets
        - spill containment materials
        - a communication system
        - lighting
        - heat/smoke alarms
        - water/gas/electrical shut-offs.
    - Adequate and appropriate Safety Equipment MUST include:
        - eyewash stations
        - drench showers
        - eyewash/drench combination.
    - Proper disposal of chemical/biological waste

## Part 2 – Minimization of exposure to employees (continued):

- Signage should be posted to:
  - show the location of safety showers, eyewash stations, fire protection equipment, eyewash/drench combination units
  - identify the type of waste that can be safely deposited in waste containers
  - remind employees and students that no consumption or storage of food or drink is allowed in the lab
  - remind employees and students food / chemicals / biological specimens are not to be stored together in a refrigerator
  - prohibit students from the chemical storeroom
  - mark exits and non-exits in a laboratory.
- Traffic patterns should be analyzed to minimize employees entering the chemical storeroom and to prohibit students from the chemical storage area.

- Other factors to consider in evaluating the degree of exposure potential from the use of a particular chemical include the:
  - chemical's volatility, flammability and reactivity
  - potential for unplanned chemical reactions
  - high heat of reaction
  - amount of time employees/others will be exposed
  - sensitivity due to asthma, allergies, pregnancy, etc
  - potential for generating aerosols
  - potential for uncontrollable release
  - chronic effects of chemicals are unknown.

## Part 3 – The responsibilities of CMS superintendent, Curriculum Specialist, other administrators, Chemical Hygiene Officer, employees, and other identified stakeholders:

- Implementation of this plan shall be the responsibility of the Laboratory Safety Program Manager (LSPM) and the Chemical Hygiene Officer (CHO) for CMS.

- Responsibility for chemical hygiene and laboratory safety is shared by all administrators and those who work / use the lab.

### Key Personnel

The **Superintendent** of CMS has the responsibilities of the CHO but may appoint qualified designees. Appointment of designees must be customized to match personnel qualifications. The LSPM and CHO could be the same person. Personnel qualifications must be utilized to determine appointment and match responsibilities. Support and authority must be given to these individuals to ensure compliance of all affected personnel.

**Program Manager (LSPM):** This person:

- liaisons with Superintendent, the Charlotte Mecklenburgl Board of Education (BOE), the CMS general counsel and other levels of administration on matters of chemical hygiene and laboratory safety
- oversees record keeping
- submits reports as required to the NC State BOE and OSHA
- coordinates laboratory safety training for all personnel:
    - New teachers/employees must receive laboratory safety training before starting to work.
    - Veteran employees MUST receive training when new information is received. Veteran employees MUST receive a safety update course every three to five years.
- maintains careful records of all employee safety training
- monitors and assists the CHO with implementation, annual review and updates of the CHP
- stays abreast of current information that may affect laboratory safety
- is responsible for sustainability of the Customized Comprehensive Laboratory Science Safety Program.

**Chemical Hygiene Officer (CHO)** – This person:

- coordinates the CMS umbrella CHP with the site (school) specific CHP
- collaborates with LSPM to compile BOE requests and reports
- maintains records detailing efforts and results of:
    - safeguards to minimize employee exposure
    - exposure monitoring if applicable
    - accidents and incidents reports and medical consultations and examinations.
- provides access to the CHP
- provides technical assistance to schools and employees on the CHP

**Chemical Hygiene Officer (CHO) (continued) This person:**

- conducts on-going evaluation of chemicals being used in the LEA
- ensures that employees are provided with necessary training for CHP compliance
- monitors the standards and requirements for the LEA
- coordinates the CHP with Right-to-Know and HazCom, and Bloodeborne Pathogens requirements
- approves purchase of all chemicals for the LEA
- coordinates CHP annual review and updates as needed
- ensures the availability of MSDSs and relevant reference materials.
- stays abreast of current information that may affect laboratory safety

- maintains a list of site-specific Chemical Safety Coordinators in schools and works with these individuals to monitor procurement, usage and disposal of chemicals used in the school laboratory program
- communicates current information that may affect laboratory safety to site-specific CHO and is responsible for sustainability of the CHP.

**Science Teachers:**

- Each science teacher is responsible for:
  - planning and conducting every laboratory operation in accordance with the CHP.
  - instructing students and modeling for students appropriate chemical hygiene habits and laboratory safety procedures.
  - following locally determined protocols to procure equipment, chemicals and materials.
  - reporting accidents and incidents.
  - notification/documentation of issues and concerns related to laboratory safety and chemical hygiene. (Teachers should have documentation in their plan books, showing they include safety in all lab experiences).
  - ensuring that all students have a CMS Safety contract signed by parents, before participating in lab experiences.
- Teachers should request information and/or training when unsure about appropriate procedures or attributes of a hazardous chemical.

## Site Specific Science Safety Committee:

- Is appointed by the Principal
- Coordinates the implementation of the CMS CHP at the school site
- Determines site specific roles and responsibilities
- Establishes a clear chain of command at the school level for the CMS CHP procedures.

## Students:

Appropriate chemical hygiene and laboratory safety tenets must be taught to and demonstrated by all students who use the laboratory. Laboratory reports MUST document that students have applied safety protocols in the lab. Assurance that students understand laboratory safety tenets should be assessed throughout the year.

## Part 4 - Discussion of safety procedures:

- Employees must:
  - exercise "universal precaution" for all chemicals
  - not minimize the risk associated with chemicals
  - adhere to the CMS CHP
  - minimize their own health and safety risks.
- Teachers must decide:
  - use of chemicals based on MSDS information and facilities/equipment available
  - if substitutions are warranted and can be safely made
  - can microchemistry / green chemistry be used
  - consider costs of waste disposal.

**If risks outweigh the educational benefits, the school site Safety Committee will eliminate the chemical from the instructional program.**

- General guidelines include; but are NOT limited to:
  - Open-toed shoes are not allowed in labs.
  - Never leave a heat source unattended.
  - Always add acid to water (alphabetical) not water to acid.
  - Eating, drink, chewing gum, application of cosmetics, and manipulation of contact lenses are not allowed in science laboratories or chemical storerooms.
  - No one works alone in a science lab or storeroom.
  - "Wafting" technique should be used to test chemical odors and only when directed to do so.
  - No chemical should be tasted.
  - Never pipette by mouth.
  - Lab preparations should be kept secure from all non-participating users.
  - Refrigerators used to store chemicals/specimens will not be used to store food.
  - Household refrigerators are not used to store chemicals.
  - Refrigerators used to store flammable chemicals must meet NFPA, OSHA and local fire codes.
  - All storage areas should be secure.
  - Storage and prep areas are accessible to personnel authorized by the Safety Committee.
  - Chemicals will not be transferred from the chemistry storeroom without approval of the site-specific CHO. (**This becomes a major issue when small schools are formed within 1 traditional school and the site-specific CHP must include procedures for this process.)**
  - The site-specific CHO will not transfer chemicals to others without the others being trained in the use, storage, disposal and risks of chemicals.
  - The site-specific tracking system for all chemicals must be in place.
  - Transfer of chemicals must be documented by the site-specific CHO.
  - The amount of chemicals on-site will be minimized
  - Sites must adhere to NFPA or locally determined fire safety codes for amounts/transfer of equipment/procedures for flammables.
  - Students work in the laboratory with chemicals under the direct supervision of a qualified science teacher. See Appendix for CMS Student Safety Contract.
  - Students are not allowed access to stored chemicals.
  - See Flinn at: www.flinnsci.com for more safety rules.

## Part 5 – Determination of lab facilities and equipment needed:

- Information on the MSDSs will be used to determine personal protective equipment and facilities needed when working with a specific chemical.
- Exit doors will be clearly marked and clear of obstructions.
- Non-exit doors will be clearly marked.
- Locally determined standards for fire safety equipment MUST be followed.

## Part 6- Discussion of procedures for procurement, distribution and storage of chemicals:

The activities and personnel involved in purchasing or otherwise acquiring chemicals for the laboratory must be performed in accordance with the CHP.

The school site/CMS specific procedure for chemical procurement includes:

- All chemical purchases for laboratory use must be approved by the site-pecific and the CMS CHO.
- Chemical procurement should consist of minimum amounts needed for immediate use.
- Stockpiling of chemicals for future use for any reason is discouraged.
- Chemicals requiring the use of a respirator as personal protective equipment are banned from school use.
- All substances must be received and inspected by the site-specific CHO.
- No containers without adequate identification by proper labeling procedure and MSDS will be accepted.
- No chemicals are allowed to be “donated” to the school.

The school site/CMS specific process for chemical storage includes:

- The site-specific CHO works in conjunction with the LEA CHO and LSPM to sustain a Customized Comprehensive Laboratory Science Safety Program-i.e. a chemical management system.
- Chemicals will be segregated in a well-identified area with a localized exhaust system.
- Chemicals will be shelved and place in appropriate cabinets by the NIOSH/Flinn System or the FISHER System for secondary schools and the FISHER System for middle schools.
- Chemical storerooms will remain locked at all times.

## Part 6- Discussion of procedures for procurement, distribution and storage of chemicals:

- Access to chemical storerooms will be minimized. No students are allowed entry.
- Storerooms/stockrooms will be under the control of the site-specific CHO who is responsible for safety an inventory control.
- Stored chemicals must be examined periodically (at least bi-annually) for replacement, deterioration and container integrity.
- Storage shelves, brackets, cabinets, locks, and specialized cabinets MUST be examined at least annually for replacement, corrosion and appropriate functionally.
- Storage shelves MUST have lips on shelves that store chemicals and glassware.
- Quantities MUST be kept to a minimum, even for chemicals which are not considered hazardous.
- Chemicals must be stored in a temperature controlled space; away from heat sources and direct sunlight.
- Incompatible materials must be segregated for storage.
- Chemical stock must be rotated to minimize expiration of shelf life.

## Part 7 – Actions to address chemical exposure problems:

**Each school MUST include the specific telephone numbers and procedures to be followed to transport an employee to the hospital!**
**School policy for accidents must be clearly outlined here.**
**School laboratory employees should not be handling materials that are acutely or chronically toxic. Therefore, regular medical surveillance and monitoring is not justified. It is also assumed that school laboratory employees are working in a facility that is appropriate for the chemicals being used.**

- If there is reason to believe that exposure levels have exceeded the PEL, the CHO should ensure that the exposure is measured.
- In the absence of PELs, the TLVs and/or OSHA's action level should be reference. Remember, NC OSH PELs are more stringent that OSHA's.
- The animal or human median inhalation lethal concentration information (LCs) may also be used as a guideline.
- The employee must contact the CHO to initiate medical treatment.
- Employees that work with hazardous chemicals will be provided an opportunity to receive medical attention whenever an overexposure to a hazardous chemical is suspected.
- If an event occurs resulting in the likelihood of exposure to a hazardous substance, the affected employee shall be provided an opportunity for a medical consultation/examination.
- A consultation with qualified medical personnel will determine the need for a medical examination.

- Medical examination will be performed by a NC licensed physician. The local emergency room could be utilized.
- Examinations will be provided at no expense and loss of pay for the employee.
- The CHO must provide the following information:
  - MSDS for the chemical(s) involved.
  - Description of the conditions of the exposure.
  - Signs and symptoms (if any) that the employee is experiencing.
- Records will be maintained for the number of years the employee worked at the site plus 30 years after the employee left CMS. MSDSs must be kept for the same period of time.

## Part 8. – Implementation of a plan for monitoring safety equipment and storage areas:

- Yearly inspection of all facilities, operations and equipment will be made by the CMS CHO in conjunction with the site-specific Principal, CHO and the CMS Safety Committee.
- Inspection forms will be submitted according to local protocols. (See Part 13-Chemical Waste Disposal Program)
  - The CMS Safety committee will submit a copy of their forms to the CMS CHO and to the school principal.
  - School principals have 30 days to create an action plan to deal with any safety issues observed and recorded.
  - The CMS Chemical Hygiene Officer will work with the school to remove any potential chemical hazards.
  - A report of the changes made at any school will be submitted to the CMS CHO.
- Self-monitoring inspections must be documented according to local protocols and OSHA.
  - Eyewashes will be flushed, tested and logged weekly.
  - Emergency showers will be tested and logged monthly.
  - Ventilation/fume hood will be tested and logged quarterly**.**

## Part 9 – Establishment of a process for recording and retaining chemical hazard records:

**Chemical Inventory Records**

- A centralized, computerized chemical inventory must be maintained.
- The inventory notes the location, quantity and shelf life information for all chemicals used in the lab and in the chemical storeroom.
- Copies of the Chemical Inventory must be located in the storeroom, school office and CMS central office. The local Fire Department that serves the school should be

offered a copy of the Chemical Inventory. Other locations may be required as determined by the Superintendent/CMS CHO and School Safety Committee.

**Records of equipment/facilities inspections:**

- Equipment should be tagged to indicate dates and results of inspections and the name of the inspector.
- Dates of regular maintenance, replacement, removal and/or repair of equipment/facilities should be kept.

**Training Records:**

- CMS will maintain training records for at least 5 years if not more.

**Incident/exposure records:**

- Incident/chemical exposure reports must be completed for any incident.
- Medical examination/consultation information must be kept by the CMS CHO for the number of years the employee was employed by the school plus 30 years after the employee stops working in CMS.

**Waste disposal records:**

- CMS will retain records of hazardous waste disposal.
- Records will meet or exceed NCDENR/EPA requirements. Manifests which are obtained from the Waste Disposal Company that removes the chemicals from the school must be kept-"Cradle to Grave."

## Part 10 – Establishment of a plan for posting chemical hazard signs and labels:

- Signage must be posted to show the location of safety showers, eyewash stations, fire protection equipment and eyewash/drench combination units.
- Fire extinguishers must be labeled to show the type of fire for which they are intended. Fire extinguishers must be within 75 ft of the hazard area.
- Waste containers must be labeled to show type of waste that can be safely deposited in the container.
- Signage must remind employees and students that no consumption or storage of food or drink is allowed in the lab.
- Signage which prohibits students from the chemical storeroom must be posted.
- Laboratory areas that have special hazards (bio)must have warning signs.
- NFPA diamonds must be affixed to the outside of buildings that house the chemical storeroom as well as the chemical storeroom door.
- Chemical storage is labeled and organized by the NIOSH/FLINN or FISHER System for secondary schools and the FISHER System for middle schools.
- Warning signs for microwave ovens must be posted on the door of the room that houses the microwave oven.

## Part 11 – Development of a written emergency plan to address accidents involving chemicals:

**Refer to the School Fire Evacuation Plan which is located in the CMS Safety and OSHA Compliance Handbook. (This is a white 3-ring binder distributed to all school principals. Additional copies may be obtained by contacting the Safety Department. )**

- If the chemical involved in a spill is considered by the site-specific CHO to present an immediate hazard, evacuation of the site is merited.
- The site-specific CHO must supply the following information to emergency personnel:
    - MSDS(s) for chemical(s) involved
    - Inventory of all chemicals on site
    - MSDSs for all chemicals on site
    - Description of the incident
    - Identification of those with possible exposure
- The site-specific CHO will notify the principal and the principal will notify appropriate CMS personnel and medical/emergency personnel. This process will follow other CMS established procedures and protocols for emergencies.
- If hazardous vapors exist, the area must be isolated and no students or staff should be allowed to enter the area until emergency personnel determine that it is safe to enter.
- If the HVAC System is operating, shut it off to minimize the circulation of vapors to other areas of the building/school. Check with emergency personnel if opening windows prior to leaving the area is advisable-that is without endangering anyone.
- The CMS CHO is responsible for requesting needed assistance with clean-up.
- The CMS CHO must request assistance if there is any reason to believe that employees involved in the clean-up will be in hazardous situation.
- If the site-specific CHO determines there is no immediate danger, clean-up procedures listed on the MSDS should be followed for clean-up. Local and state regulations may require modification of MSDS clean-up procedures. Size and type of chemical spill is important in making this determination. List procedures for acid spills, (concentrated and dilute); alkali spills, organic solvent spills, flammable spills.
- Appropriate personal protective equipment must be used.
- A spill kit must be accessible in each science lab. These do not have to be ordered from a scientific supply house. A 5 gallon bucket of dry sand for diking spills, sodium carbonate (swimming pool supply house), vermiculite or kitty litter (without baking soda) will suffice. Kitty litter with baking soda will neutralize an acid.
- If a volatile, flammable material is spilled, the science teacher must follow locally determined steps for fire safety and consult MSDS for clean-up procedure.
- If a spill/fire exceeds the site-specific ability or training to handle it, locally determined protocols for fire safety must be followed.

## Part 12 – Science laboratory safety professional development program for stakeholders:

- The professional development program will be an on-going process.
- The training an employee receives should be determined by the nature of his/her work assignment and potential for exposure.
- Therefore, if non-science teachers are assigned to teach in a science classroom / laboratory, (**not recommended and against professional standards**), the teacher MUST receive training regarding potential exposure to hazards.
- Employees must understand the laboratory standards, MSDSs and the CMS and site-specific CHP.
- Employees must be trained in measures they may take to minimize chemical exposure.
- Students will be provided instruction and must demonstrate proficiency in laboratory safety. (Non-science students assigned to a science classroom/laboratory as well).
- Depth of laboratory safety instruction will be aligned with:
  - the age of the student
  - the NC Standard Course of Study for Science
  - the facilities/equipment in use
  - CMS and school site CHP and policies.
- The content of the MSDS must be part of laboratory safety instruction.
- Prior to laboratory work, instructional time must be devoted to laboratory safety. Teachers MUST document this in their plan books.
- Safety should be an on-going and integral part of assessment and laboratory reports. Department chairs should sign up to receive free Science Dept Safety Training notes, from www.flinnsci.com/contact_safety.asp to get 5-10 minute safety training notes delivered by email.
- Professional development for new employees should occur each year before they begin classes/science laboratories. Veteran employees should receive professional development as new information is received and from a class every 5 years.

## Part 13 –Chemical waste disposal program:

- The disposal of chemical waste must align with EPA/NCDENR Hazardous Waste Division requirements. Local county/city regulations may also be applicable.
- **To arrange for disposal of hazardous chemicals the Chemical Hygiene Officer and/os School Chemical Hygiene Officer shall:**
  - **List each chemical by name as it appears on the container**
  - **List the estimated quantity of each chemical to be removed**
  - **List the type of container (i.s brown glass) in which the chemical is contained**
  - **Provide an MSDS for each chemical**
  - **List the room location of the chemical to be removed.**

**This information should be sent to the Safety Department at safety@cms.k12.nc.us or courier #785. The CMS Safety Director will coordinate with the CMS Environmental Health & Safety Manager, Building Services and an approved waste disposal company to remove the chemicals.**

  - Once chemicals are assigned "absolute need" status for the instructional program, a list of laboratory experiments that have hazardous wastes for disposal should be made. The list should show the end products of the experiments.

- Fume hoods and/or sinks must NOT be used to store chemical waste products.
- Waste containers should:
  - be labeled "Hazardous Wastes"
  - show the types of waste that can be safely deposited
  - have previous labels removed
  - be labeled with the full names of the contents, amounts/percentages
  - be kept closed when not adding to the contents
  - have secondary containment
  - be kept clean. In particular, the outside of the container must be free of residues.
- Broken glass contaminated with hazardous chemicals must be treated as hazardous waste.
- Empty containers that previously contained hazardous waste must be treated as hazardous waste.
- Only compatible waste may be stored together.
- Biological specimens that are preserved with formaldehyde must be treated as hazardous waste.
- Refer to MSDS or Flinn Catalog to determine appropriate storage/disposal of waste products.
- Even though a MSDS of a specific chemical may indicate "Water soluble" be careful in how much is disposed of down a drain at any one time. Be sure the solution is very dilute and washed down with copious amounts of water. Also, be sure to check with local city and county regulations before disposing down the drain. Small amounts of certain water soluble chemicals may upset the microbial balance of a city sewage or water supply system. Sources of pollution can be traced back to point of origination.

## Part 14-CMS Standard Operating Procedures to ensure safety

- Science teachers should not have hall duty when lab preps need to be monitored.
- Science teachers should teach in science classrooms/laboratories; non-science teachers/classes should not be assigned to science classrooms/laboratories.
- It is the responsibility of the science teacher to maintain a clean and safe work environment. Most accidents in labs occur because the science room is messy, with many pieces of equipment in the room. Therefore, ALL science teachers

must work to keep their rooms free of clutter, so that students can work on labs safely.

- Accidents involving glassware are a leading cause of injuries in science lab. Careful storage and handling procedures should be followed.
- Teachers and administrators should be alert to unsafe conditions and see that they are corrected.

## The CMS School System Comprehensive Science Safety goals are to:

- Generate and maintain a high level of prevention/safety consciousness.
- Assist in the education of employees and students about the merits of science laboratory safety.
- Foster understanding of the roles and responsibilities that each stakeholder must assume for science laboratory safety.
- Enable all science teachers who use chemicals, glassware, heat, cutting tools and other materials to observe safety measures to protect themselves and their students.
- Develop a CHP review process which evaluates the effectiveness of the overall plan and identifies the need for updates to ensure that employees and students are adequately protected and educated about science safety.

# Appendix A

## Student Safety Contract

# I. PURPOSE

Science is a hands-on laboratory class. You will be doing many laboratory activities which require the use of hazardous chemicals. Safety in the science classroom is the #1 priority for students, teachers, and parents. To ensure a safe science classroom, a list of rules has been developed and provided to you in this student safety contract. These rules must be followed at all times. Two copies of the contract are provided. One copy must be signed by both you and a parent or guardian before you can participate in the laboratory. The second copy is to be kept in your science notebook as a constant reminder of the safety rules.

# II. GENERAL RULES

1. Conduct yourself in a responsible manner at all times in the laboratory.
2. Follow all written and verbal instructions carefully. If you do not understand a direction or part of a procedure, ask the instructor before proceeding.
3. Never work alone.
4. No student may work in the laboratory without an instructor present.
5. When first entering a science room, do not touch any equipment, chemicals, or other materials in the laboratory area until you are instructed to do so.
6. Do not eat food, drink beverages, or chew gum in the laboratory.
7. Do not use laboratory glassware as containers for food or beverages.
8. Perform only those experiments authorized by the instructor. Never do any thing in the laboratory that is not called for in the laboratory procedures or by your instructor.
9. Carefully follow all instructions, both written and oral.
10. Unauthorized experiments are prohibited.
11. Be prepared for your work in the laboratory.
12. Read all procedures thoroughly before entering the laboratory.
13. Never fool around in the laboratory. Horseplay, practical jokes, and pranks are dangerous and prohibited.
14. Observe good housekeeping practices. Work areas should be kept clean and tidy at all times. Bring only your laboratory instructions, worksheets, and/or reports to the work area. Other materials (books, purses, backpacks, etc.) should be stored in the classroom area.
15. Students are never permitted in the science storage rooms or preparation areas unless given specific permission by their instructor.
16. Know what to do if there is a fire drill during a laboratory period; containers must be closed, gas valves turned off, fume hoods turned off, and any electrical equipment turned off.
17. Handle all living organisms used in a laboratory activity in a humane manner. Preserved biological materials are to be treated with respect and disposed of properly.
18. When using knives and other sharp instruments, always carry with tips and points pointing down and away.
19. Always cut away from your body.
20. Never try to catch falling sharp instruments.
21. Grasp sharp instruments only by the handles.
22. If you have a medical condition (e.g., allergies, pregnancy, etc.), check with your physician prior to working in lab.

# III. CLOTHING

1. Any time chemicals, heat, or glassware are used, students will wear laboratory goggles. There will be no exceptions to this rule!
2. Contact lenses should not be worn in the laboratory unless you have permission from your instructor.
3. Dress properly during a laboratory activity.
4. Long hair, dangling jewelry, and loose or baggy clothing are a hazard in the laboratory.
5. Long hair must be tied back and dangling jewelry and loose or baggy clothing must be secured.
6. Shoes must completely cover the foot. No sandals allowed.
7. Lab aprons have been provided for your use and should be worn during laboratory activities.

# IV. ACCIDENTS AND INJURIES

1. Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the instructor immediately, no matter how trivial it may appear.
2. If you or your lab partner are hurt, immediately yell out **"Code one, Code one"** to get the instructor's attention.
3. If a chemical splashes in your eye(s) or on your skin, immediately flush with running water from the eyewash station or safety shower for at least 20 minutes. Notify the instructor immediately.
4. When mercury thermometers are broken, mercury must not be touched. Notify the instructor immediately.

# V. HANDLING CHEMICALS

1. All chemicals in the laboratory are to be considered dangerous. Do not touch, taste, or smell any chemicals unless specifically instructed to do so. The proper technique for smelling chemical fumes will be demonstrated to you.
2. Check the label on chemical bottles **twice** before removing any of the contents.
3. Take only as much chemical as you need.
4. Never return unused chemicals to their original containers.
5. Never use mouth suction to fill a piper. Use a rubber bulb or pipette pump.

6. When transferring reagents from one container to another, hold the containers away from your body.
7. Acids must be handled with extreme care. You will be shown the proper method for diluting strong acids. Always add acid to water, swirl or stir the solution and be careful of the heat produced, particularly with sulfuric acid.
8. Handle flammable hazardous liquids over a pan to contain spills. Never dispense flammable liquids anywhere near an open flame or source of heat.
9. Never remove chemicals or other materials from the laboratory area.
10. Take great care when transporting acids and other chemicals from one part of the laboratory to another. Hold them securely and walk carefully.

## VI. HANDLING GLASSWARE AND EQUIPMENT

1. Carry glass tubing, especially long pieces, in a vertical position to minimize the likelihood of breakage and injury.
2. Never handle broken glass with your bare hands. Use a brush and dustpan to clean up broken glass. Place broken or waste glassware in the designated glass disposal container.
3. Inserting and removing glass tubing from rubber stoppers can be dangerous.
   Always lubricate glassware (tubing, thistle tubes, thermometers, etc.) before attempting to insert it in a stopper.
   Always protect your hands with towels or cotton gloves when inserting glass tubing into, or removing it from, a rubber stopper. If a piece of glassware becomes "frozen" in a stopper, take it to
   your instructor for removal.
4. Fill wash bottles only with distilled water and use only as intended, e.g., rinsing glassware and equipment, or adding water to a container.
5. When removing an electrical plug from its socket, grasp the plug, not the electrical cord. Hands must be completely dry before touching an electrical switch, plug, or outlet.
6. Examine glassware before each use.
7. Never use chipped or cracked glassware.
8. Never use dirty glassware.
9. Report damaged electrical equipment immediately. Look for things such as frayed cords, exposed wires, and loose connections. Do not use damaged electrical equipment.
10. If you do not understand how to use a piece of equipment, ask the instructor for help.
11. Do not immerse hot glassware in cold water; it may shatter.

## VII. HEATING SUBSTANCES

1. Exercise extreme caution when using a gas burner. Take care that hair, clothing and hands are a safe distance from the flame at all times.
2. Do not put any substance into the flame unless specifically instructed to do so.
3. Never reach over an exposed flame.
4. Light gas (or alcohol)burners only as instructed by the teacher.
5. Never leave a lit burner unattended. Never leave anything that is being heated or is visibly reacting unattended.
   Always turn the burner or hot plate off when not in use.
6. You will be instructed in the proper method of heating and boiling liquids in test tubes.
7. Do not point the open end of a test tube being heated at yourself or anyone else.
8. Heated metals and glass remain very hot for a long time. They should be set aside to cool and picked up with caution. Use tongs or heat-protective gloves if necessary.
9. Never look into a container that is being heated.
10. Do not place hot apparatus directly on the laboratory desk. Always use an insulating pad. Allow plenty of time for hot apparatus to cool before touching it.
11. When bending glass, allow time for the glass to cool before further handling.
12. Hot and cold glass have the same visual appearance. Determine if an object is hot by bringing the back of your hand close to it prior to grasping it.

## VIII. QUESTIONS

1. Do you wear contact lenses? Yes_____ No_____

2. Are you color blind? Yes_____ No_____

3. Do you have allergies? Yes_____ No_____

   If so, list specific allergies

   _____

   _____

   _____

# IX. CONTRACT/AGREEMENT

**I, _____, (student's name)** have read and agree to follow all of the safety rules set forth in this contract. I realize that I must obey these rules to ensure my own safety, and that of my fellow students and instructors. I will cooperate to the fullest extent with my instructor and fellow students to maintain a safe lab environment. I will also closely follow the oral and written instructions provided by the instructor. I am aware that any violation of this safety contract that results in unsafe conduct in the laboratory or misbehavior on my part, may result in being removed from the laboratory, detention, receiving a failing grade, and/or dismissal from the course.

Student Signature_____Date_____

**Dear Parent or Guardian:**

We feel that you should be informed regarding the school's effort to create and maintain a safe science classroom/laboratory environment.

With the cooperation of the instructors, parents, and students, a safety instruction program can eliminate, prevent, and correct possible hazards.

You should be aware of the safety instructions your son/daughter will receive before engaging in any laboratory work. Please read the list of safety rules above. No student will be permitted to perform laboratory activities unless this contract is signed by both the student and parent/guardian and is on file with the teacher.

Your signature on this contract indicates that you have read this Student Safety Contract, are aware of the measures taken to ensure the safety of your son/daughter in the science laboratory, and will instruct your son/ daughter to uphold his/her agreement to follow these rules and procedures in the laboratory.

Parent/Guardian
Signature_____Date_____

**As your teacher** I promise to maintain the organization and cleanliness of the lab, research potential hazards for each lab, provide you with necessary safety precautions, and facilitate lab clean-up to provide you with a safe environment in which to work.

Teacher
Signature_____Date_____

# Appendix B

## Hazardous Chemical Reference List

## HAZARDOUS CHEMICAL QUICK REFERENCE

It is imperative that science educators be prepared to deal with hazards associated with chemicals. Absolute need must be determined for each chemical on the school laboratory inventory list/database,all proper handling and storage procedures for chemicals must be strictly followed. Science Educators and students must be aware of the properties of chemicals before using them.
This document is not totally inclusive. It is a representative listing of hazardous chemicals.
**ALWAYS REFERENCE MSDS.**

## EXPLOSIVES/FLAMMABLES

Not recommended for use or storage in schools.

- Benzoyl peroxide
- Picric Acid
- Ethyl Ether
- Perchloric acid
- Diisopropyl ether
- Carbon disulfide
- Formaldehyde
- Potassium metal

## CARCINOGENS

Not recommended for use or storage in schools unless absolute need is determined and all proper handling and storage procedures are followed.

**KNOWN CARCINOGENS AND PROBABLE CARCINOGENS**

- 1,2-dibromo-c-chloropropane
- Benzidine
- 3,3-dichlorobenzidine
- Coke oven emissions
- 4-diemthylaminoazobenzene
- Formaldehyde
- Acrylonitrile
- Methylene chloride
- B-napthylamine
- Vinyl chloride
- Benzene
- 2-acetylaminofluorene
- Cadmium
- 4-aminodiphenyl
- Ethylene oxide
- 4-nitrobippheyl
- Inorganic arsenic
- Asbestos
- N-nitrosodimethylamine
- 1,3-butadiene
- bis(chloromethyl) ether and its salt
- Ethylenediamine
- N-nitrosodimethylamine
- Methyl chloromethyl ether
- alpha naphthylamine
- Methyienedianiline
- B-propiolactone

## ANIMAL CARCINOGENS OR MUTAGENS

Although information concerning human health hazard is incomplete, these chemicals must be handled only with great caution. Not recommended for use or storage in schools unless absolute need is determined and all proper handling and storage procedures are followed.

- Acetamide
- Lead II acetate
- Ammonium dichromate
- Potassium chromate
- Anthracene
- Silver nitrate
- Cobalt powder
- Sodium nitrate
- 1,4-dioxane
- Toluene
- Indigo carmine
- Ammonium chromate
- Osmium tetraoxide
- Aniline and salts
- Pyrogallic acid
- Beryllium carbonate
- Sodium dichromate dihydrate
- 1,2-dichloroethane
- Thioacetamide
- Hydroquinone
- Acrolein orange
- Nickel (II) acetate
- Ammonium bichromate
- Potassium permanganate
- Antimony oxide
- Sodium azide
- Colchicine
- Sodium nitrite
- Formaldehyde
- Urethane

**REMOVE FROM SCHOOLS IF ALTERNATIVES CAN BE USED**

These chemicals must be removed from the schools if alternatives can be used. For those that must be retained, amounts must be kept to a minimum. Evaluation included toxicity, carcinogenicity, teratogenicity, flammability, and explosive propensity.

| | | |
|---|---|---|
| ____ Acetamide | ____ Cyclohexane | ____ Methyl oleate |
| ____ Acid green | ____ Cyclohexene | ____ Nickel II carbonate |
| ____ Aluminum chloride | ____ Dichioropdophenol sodium salt | ____ Nickel II acetate |
| ____ Ammonium bichromate | ____ 2,4,-Dinitrophenol | ____ Paradichlorobenzene |
| ____ Ammonium oxalate | ____ Iron II sulfate | ____ Pentane |
| ____ Ammonium vanadate | ____ Formaldehyde | ____ Petroleum ether |
| ____ Antimony | ____ Formalin | ____ 1 - p h e ny l |
| ____ Antimony oxide | ____ Fuchsin | ____ 1-2-thiourea |
| ____ Antimony potassium tartrate | ____ Gasoline | ____ Phenylthiocarbamide |
| ____ Barium chloride | ____ Hematoxylin | ____ Potassium chlorate |
| ____ Barium oxalate | ____ Hydrogen sulfide | ____ Potassium chrornate |
| ____ Benzene | ____ Hydroquinone | ____ Potassium periodate |
| ____ Beryllium carbonate | ____ Iso-amyl alcohol | ____ Potassium permanganate |
| ____ Bromine fluid | ____ lso-butyl Alcohol | ____ Salol |
| ____ Bromine | ____ Iso-pentyl Alcohol | ____ Sodium Bromate |
| ____ Cadmium acetate | ____ Magnesium chlorate | ____ Sodium Chlorate |
| ____ Cadmium bromide | ____ Mercury II bichloride | ____ Sodium fluoride |
| ____ Cadmium carbonate | ____ Mercury II iodide | ____ Sodium oxalate |
| ____ Cadmium chloride | ____ Mercury II nitrate | ____ Sodium nitrate |
| ____ Cadmium, metal | ____ Mercury II oxide | ____ Sodium silicofluoride |
| ____ Cadmium sulfate | ____ Mercury II sulfide | ____ Sudan III |
| ____ Carmine | ____ Mercury II sulfate | ____ Sulfamethazine |
| ____ Catechol | ____ Mercury I chloride | ____ Toluene |
| ____ Chromic acid | ____ Mercury I nitrate | ____ Trichloroethylene |
| ____ Chromium acetate | ____ Mercury I oxide | ____ Urethane |
| ____ Cobalt, metal | ____ Methyl ethylketone | ____ Xylene |
| ____ Cobalt nitrate | | |

## HIGHLY TOXIC SUBSTANCES

Not recommended for use or storage in schools unless absolute need is determined and all proper handling and storage procedures are followed. All necessary precautions must be taken to limit exposure to these highly toxic chemicals.

| | | |
|---|---|---|
| _____ Adrenaline | _____ Nicotine | _____ Barium hydroxide |
| _____ Osmium tetraoxide | _____ Chlorine | _____ Phosphorous (white) |
| _____ Colchicine | _____ Phosphorous pentoxide | _____ Mercury |
| _____ Potassium cyanide | _____ Mercury II chloride | _____ Potassium |
| _____ Mercuric II iodide | _____ Silver cyandide | _____ Mercuriy II nitrate |
| Sodium cyanide | Mercuriy II Oxyide | _____ Mercury II sulfate |

## CORROSIVE OR IRRITATING SUBSTANCES

**Care must be taken to prevent contact with the skin, especially the eyes. All proper handling and storage procedures must be adhered to.**

| | | |
|---|---|---|
| _____ Acetaldehyde | _____ Iodine (crystals) | _____ Acetic ACID |
| _____ Lead II carbonate | _____ Acetic anhydride | _____ Lithium |
| _____ Aluminum chloride | _____ Methyl ethyl ketone | _____ Ammonia |
| _____ Methyl methacrylate | _____ Ammonium dichromate | _____ Methyl salicylate |
| _____ Ammonium oxaiate | _____ Naphthalene | _____ Antimony pentachloride |
| _____ Nitric acid | _____ Antimony oxcide | _____ Oxalic acid |
| _____ Antimony trichloride | _____ Phosphorous (white) | _____ Bismuth Trichloride |
| _____ Phosphorous pentoxide | _____ Bromine | _____ Phthalic Anhydride |
| _____ Calcium carbide | _____ Potassium Chromate | _____ Calcium Fluoride |
| _____ Potassium cyanide | _____ Calcium oxide | _____ Potassium Fluoride |
| _____ Catechol (pyrocatechol) | _____ Potassium metal | _____ Chlorine |
| _____ Potassium hydroxide | _____ Copper II bromide | _____ Potassium Permanganate |
| _____ Copper II chloride | _____ Sodium metal | _____ Copper II nitrate |
| _____ Sodium cyanide | _____ Copier II sulfate | _____ Sodium Ferrocyanide |
| _____ p-dichlorobenzene | _____ Sodium hydroxide | _____ Diethyl Phthalate |
| _____ Sodium sulfide | _____ Ethyl methacrylate | _____ Disodium Hexafluorosilicate |
| _____ Iron Hi chloride | _____ Tin IV chloride | _____ Hexachlorophen |
| _____ Sulfuric acid | _____ Hydrochloric acid | _____ Sulfuric Acid, fuming |
| _____ Hydrofluoric acid | _____ Titanium trichloride | _____ Hydrogen Peroxide (30%) |
| _____ Toluene | _____ Hydrogen sulfide | _____ Trichlorotrifluoroethane |
| _____ Hydroquinone | _____ Turpentine | |

# Appendix C
## Animal Use In The Laboratory

## Animal Use in the School Laboratory

The use of live animals and dissection of animals in the science laboratory requires special attention. NSTA supports the use of live animals in the K-12 laboratory because it often stimulates student interest in science. Science fairs, clubs and competitions may also generate additional use of animals in their investigations. It is imperative that teachers and students follow certain prudent practices whenever live animals are used or dissection of animals occurs.

It is prudent practice to align the use of any organism with the North Carolina Standard Course of Study and professional standards. PROFESSIONAL STANDARDS=SOP=LAW

### PROCUREMENT PROCEDURES

- Be sure you can justify the animal being in the science laboratory regarding curriculum (NCSCS) and pedagogy.
- Develop sound laboratory observation investigations.
- Use animals that have been obtained from a reputable animal dealer (live animals) or scientific supply house.
- It would be wise to have animals examined by a veterinarian to determine the animals are healthy, parasite and disease free.

### HOUSEING

- Animals MUST be kept in a clean, sanitary cage.
- Sterilize cage, feed, water, bedding and exercise apparatus when new animals are brought into the science laboratory.

### CARE

- Familiarize yourself with the animal's habits, diet requirements and behavior.
- Do not conduct experiments on animals that cause pain or malnutrition.
- Maintain cleanliness in terrariums and aquariums so organic materials do not act as a reservoir for microorganisms. Remove mineral accumulations with a vinegar solution and rinse.
- Protect animals from pesticides and chemical cleaning agents used in the laboratory.

## CARE-WEEKENDS, HOLIDAYS

- Animals must be cared for over weekends and holidays.
- Require a signed letter of permission form the student's parent(s)/guardian(s) if a student takes the animal home.
- The teacher is responsible for any injury the student incurs because of the animals.
- Animals are not to be transported on public transportation (e.g., school buses).
- Animals must be fed their proper diet with essential nutrients.
- Animals MUST be fed at least every 12 hours.
- Sick animals must be cared for by a veterinarian.
- Likewise if an animal dies, have a veterinarian determine the cause. This is precautionary protection.

## RULES

- Do not allow students to mistreat animals.
- Do not allow students to handle the animals unless under direct supervision.
- Do not allow students to handle the animals without thick leather or wire mesh gloves.
- Do not allow animals to walk around the laboratory or the cage to be unlocked.
- Post a notice on the cage: "DO NOT UNLOCK THIS CAGE OR HANDLE THE ANIMAL WITHOUT TEACHER'S SUPERVISION."
- All students must wash their hands for 15 seconds with antibacterial soap after handling animals. Warn students not to touch their faces or mouths to prevent possible infections.

## WASTE

- Waste must be stored in double bagged trash liners, tied securely, and labeled. Custodians must be informed in writing that teachers will be disposing of animal wastes.
- In disposing of animal waste, be aware that movement by the animal on cage liners and in wood chips may cause the release of fungal and bacterial spores into the classroom or laboratory. These spores can be drawn into the school ventilation system as well causing respiratory infections and allergic reactions.

## GENERAL PROTOCOLS

- Do not sell or give animals away.
- Avoid contact between animals and humans if either is suffering from disease.
- Keep laboratory animals isolated from wild animals.
- Only the student assigned responsibility for animal care must have direct contact with the animals.
- Do NOT release ANY animals into the environment, especially into non-indigenous environments.

**FIRST AID**

- Remember to use appropriate PPE to protect yourself against bloodborne pathogens.
- Wash the area with an antibacterial soap.
- Due to possible allergic reactions, teachers should not apply any type of antibacterial ointment or cream.
- If bleeding, apply first aid as per LEA policy.
- Call appropriate personnel for medical help.
- Notify the administration and have the administration inform the parents(s) / guardian(s).
- Fill out an accident form immediately.

**Poisonous animals must not be kept in the classroom. These include (but are not limited to):**

- Reptiles and fish
- Black Widow or Brown Recluse spiders
- Scorpions
- Bees, wasps, hornets and other stinging insects
- Animals at high risk of being rabies carriers

**The following may be kept with specific cautions:**

- Turtles and snakes (possible Salmonella)
- Mammals (possible allergy aggravant)
- Tarantulas (possible allergy aggravant)
- Birds (possible Psittacosis, Histoplasmosis or bird flu)

**Refer to the following position statements for information regarding responsible use of animals in the science laboratory:**

NSTA Position Statement: *Responsible Use of Live Animals and Dissection in the Science Classroom*
www.nsta.org-select "Publications," then "Position Statements"

NSELA Position Statement: *Code of Practice on the Use of Animals in Science Education*
www.nsela.org-select "Publication," then "Position Papers"

**INVERTEBRATES**

Invertebrates are often used for observation and learning investigations (e.g., Drosphilia).

- Do not us, under any circumstances, killing jars that use carbon tetrachloride or potassium cyanide under any circumstances.
- A pint jar with a screw top lid, with absorbent cotton or tissue in the bottom to absorb the liquid, makes an excellent killing jar.
- Always use anesthetizing kits. The chemicals are relatively harmless and effective and may be purchased from biological supply companies.
- If alcohol is used in killing jars, be sure to label the jar "FLAMMABLE" and "TOXIC."

## CHICK EMBRYOLOGY

It is essential to understand the hazards associated with hatching eggs in the laboratory. All parts of the incubator must be UL approved. The NCDPI Insurance Section has found that many of these incubators are out of compliance and may cause fire hazards. Some are maed of STYROFORAM™ with a light bulb as the heat source. The temperature in such a system can get high enough to cause a fire. Some incubators use a sealed heating element that can possibly fail and cause the same result. Additionally, students may be burned or get electrical shocks from such a system. Animal life cycles are a part of the NCSCOS; however, safer organisms can be used for K-8 study.

**Hazards:**

- Chicken and duck eggs are not sterile. The reproductive and digestive system of hens empty into the same orifice, causing egg shell contamination.
- Viruses may breach the porous shell-which can have as many as 10,000-17,000 pores-and become dispersed in the laboratory and school ventilation system.
- Inadequate washing of hands occurs due to absence of water in laboratories, especially in elementary and middle schools.
- Disposal of fecal/bedding waste may release viral and bacterial spores. They may become airborne and dispersed in the school ventilation system due to permeability of the shell. (Refer to section on wastes above).
- Chicks require care over weekends and holidays.
- Fires have been known to occur with the use of incubators.

**Associated specific diseases:**

- Salmonella
- Histoplasmosis (fungal) from fecal droppings after hatching
- Psittacosis (bacterial)
- Bird flu

## DISSECTION

Specimens for dissection must be obtained from a reputable scientific supply house and shipped in low toxicity preservatives. Follow supply house instructions for handing and disposal of specimens. Be sure to keep these instructions for your records in the event of "need-to-know" protocols.

**Procuring, storing and disposing of specimens:**

- Assess needs and order enough material for a year. Do not store specimens from year to year since deterioration may occur. (Refer to Part 13 of the document for specifics.)
- Keep specimens in their original containers until used and place in an area not accessible to students.
- Consider purchasing certain specimens, such as fish and squid, from the frozen food section of a local grocery store.
- Never use animals killed on highways or other non-preserved specimens.
- Thoroughly rinse freeze dried, rehydrated specimens in a dilute 10% alcohol-water solution for 24 hours before use.
- If dissection is to be completed at a later time, specimens must be placed in labeled plastic bags or sealed containers to prevent deterioration.
- Bag (double bag trash liners), label, tie and dispose of used, deteriorated or dissected specimens according to local protocols.
- Inform maintenance staff of contents of the bag.

**Protocols:**

- Follow local SOPs regarding acceptable excuses for non-participation in animal dissection.
- Send a note home to parent(s)/guardian(s) informing them of animal dissections and alternatives.
- Use computer programs, simulations and / or models as alternatives when necessary or prudent due to lack of equipment, personal protective equipment or proper specimens.
- Students must wear appropriate PPE during dissection, (e.g., gloves, apron, splash goggles).
- Instruct students in the safe use of dissection instruments.
- Thoroughly rinse preserved specimens in running water before use.
- Take care to avoid cuts or scratches when using and cleaning scalpels and needles.
- Do not allow surgery to be performed on any living animal.
- Do not kill any animals in the laboratory.
- Do not exceed the OSHA Formaldehyde Standard (29 CFR 1910.1048) stating that a person's exposure must not exceed 0.75 ppm at an 8-hour time-weighted average (TWA).
- Students may have allergies to preservatives.
- Students must wash hands after dissections.
- Thoroughly disinfect all equipment and tabletops with bleach after dissections.
- Discard chemical preservatives according to the disposal instructions in the MSDS for the preservative.
- Follow local, state and national policies regarding dissection and use of live animals in the laboratory.

**Ensure the humane treatment of animals both for the well-being of the animal and for the emotional well-being of the students.**

**Resources**

North Carolina Association for Biomedical Research, NCABR, Box 25459, Raleigh, NC 27611-25459

A source of reliable information on animal care and handing. Monthly newsletters are available by requesting to be added to their mailing list.
**www.ncabr.org**

## RELEASING NON-INDIGENOUS ORGANISMS

There are many incidences of organisms being released into non-indigenous environments. Often, the lack of natural predators or competition allows organisms to become nuisances and / or be destructive to the environment. The release of the rabbit in Australia, flathead catfish in North Carolina waters, duckweed in freshwater lakes and ponds, and kudzu are a few examples. These invasive species create havoc in the natural habitat and can disrupt the native food webs.

# Appendix D
## Plant Use In The Laboratory

## PLANTS/MUSHROOMS

Edible and non edible (toxic) mushrooms are difficult to identify by experts. The spores of these organisms also pose allergic response problems in may students. Therefore, the utmost care is recommended in using mushrooms in the laboratory.

## MISTAKEN IDENTITIES

There are many instances of poisoning and death among people who gather their own wild mushrooms. In many cases these tragedies occur with individuals who have gathered fungi their entire lives and consider themselves familiar with edible and poisonous varieties of these mushrooms. Incidents of poisonings are very high among Asian immigrants who colleced edible mushrooms in their countries of origin that were visually identical to poisonous varieties here in the US.

In a particularly ironic and tragic instance, the patriarch of a prominent California wine growing family was killed after ingesting a poisonous mushroom that was not originally indigenous to the US. The irony was that this particular species of poisonous fungi was inadvertently brought to the US half a century earlier by his vintner grandfather in the soil of pots holding Portuguese cork trees for growth and use at his family's vineyard.

## PRECAUTIONS

**Using plants in the** science laboratory requires precautions. Pigment extraction poses inhalation and fire hazards. Pollen, sap and plant juice may contain allergens and toxins which are also hazards.

**In handling plants or plant experimentation, it would be prudent to follow these suggestions:**

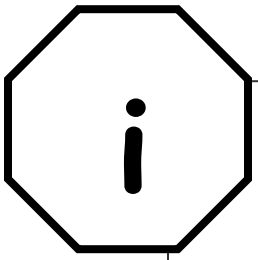
- Students must wash their hands, arms, and faces as soon as possible with soap and water after handling plants.
- Use insect repellent to repel mosquitoes, chiggers and ticks: however, note the possibility of student allergies when conducting outside studies.
- Advise students to bring their own repellents to absolve the teacher of this type of responsibility.
- Obtain and keep on file parental permission slips for students to apply insect repellents.
- Report any accident per school policy immediately.
- Follow the LEA policy when first aid is required.
- Teachers MUST be on constant alert for incidences of students coming into contact with an allergen while being supervised.

**Chlorophyll/ Pigment Extraction:**

- Most solvents used are highly flammable and vapors are toxic.
- No open flames in the laboratory when using flammable solvents.
- Use a water bath when using a hotplate as a heat source.
- Never heat alcohol directly over a hotplate or any heat source.
- Have a fire extinguisher nearby in the event of an accidental fire.
- Have a good ventilation in the laboratory to minimize vapor inhalation.

**PLANT SOP**

- No toxic plants or plant parts are to be used in the laboratory.
- Be aware that many plants produce pollen or sap that are allergens.
- Do not allow any student to chew or taste any plant or plant part.
- Wash hands thoroughly when finished with handling plants.
- Remember, no food or drink in the laboratory.
- No unfamiliar cultivated or wild flowers are to be used in the laboratory.
- Seeds may be chemically treated to prevent insect/mold damage. Be sure to ask science supply house or places of purchase if seeds have been treated.
- Keep plants free of pests, and use only non-allergenic pesticides and insecticides.



**WEB REFERENCES TO POISONOUS PLANTS IN NC**
Poisonous Plants of North Carolina, Dr. Alice B. Russell, department of Horticultural science; In collaboration with : Dr. James W. Hardin, Dept. of Botany
**www.ces.ncsu.edu/depts/hort/**

**POISONOUS PLANTS AND YOU**
LEARN NC, a program of the University of North Carolina at Chapel Hill
**www.learnnc.org/lessons/**

| COMMON NAME | PLANT PART | SYMPTOMS | METHOD OF EXPOSURE |
|---|---|---|---|
| **Aloe** | Sap of leaves | Dermatitis, diarrhea, abdominal cramps | Ingestion |
| **Azalea Mountain Laurel Rhododendron** | All parts Honey made from flower nectar | Nausea, vomiting, respiratory, loss of balance | Ingestion |
| **Bracken Fern** | All parts | Possible carcinogen, vomiting, diarrhea | Ingestion |
| **Castor Bean** | Seeds | Two or more beans can cause death in adults | Ingestion |
| **China Berry** | Berries | Breathlessness sensation | Ingestion |
| **Chrysanthemum** | Leaves, stems | Dermatitis | Ingestion |
| **Crocus** | All parts | Burning pain in mouth, nausea, vomiting. Ingesting one plant can cause death | Ingestion |
| **Daffodil, Narcissus, Hyacinth** | Bulbs | Nausea, vomiting, diarrhea | Ingestion |
| **Dumb cane, some Philodendrons, Diffenbachia,** | All parts | Severs burning of mouth, swelling of tongue; Death if air passage is blocked | Ingestion |
| **Elephant's Ear** | All parts | Affects skin, mouth, throat, resulting in throat swelling, breathing difficulties, burning pain, and stomach upset | Ingestion |
| **Foxglove** | Leaves | Source of digitalis which can cause irregularity in heartbeat or pulsed mental confusion, digestive upset. Can be fatal. | Ingestion |
| **Holly** | Berries | Nausea, vomiting, diarrhea / | Ingestion |
| **Hydrangea** | Leaves, branches, buds, flowers (most) | Gastroenteric distress, labored breathing, coma conf and fibrillary twitching due to cyanide poisoning | Ingestion |
| **Jasmine** | Flowers, nectar | Voluntary muscles, muscle rigidity and weakness, dizziness, loss of speech, dry mouth, visual disturbances, trembling of extremities, profuse sweating, respiratory depression, convulsions | Ingestion |
| **Lily of the Valley** | Leaves, flowers | Digestive upset, mental confusion, irregular heartbeat | Ingestion |
| **Mistletoe** | Berries | Gastrointestinal irritation, diarrhea, cardiovascular collapse | Ingestion |
| **Oaks** | Acorns, young leaves | Frequent urination, constipation, | Ingestion |
| **Oleander** | Leaves, stems, seeds | Depression coupled with gastrointestinal distress, vomiting, diarrhea (which may be bloody), abdominal pain, irregularities in heart rate | Ingestion |
| **Poison Hemlock** | All parts | Affects skin, mouth, throat, resulting in throat swelling, breathing difficulties, burning pain, stomach upset | Contact Ingestion |
| **Poison Ivy** | All parts | Skin, mucous membrane irritant | Contact Inhalation of smoke |
| **Poison Oak** | All parts | Skin, mucous membrane irritant | Contact Inhalation of smoke |
| **Poison Sumac** | All parts | Skin, mucous membrane irritant | Contact Inhalation of smoke |
| **Pokeweed (Pokeberry)** | All parts | gastrointestinal irritation (colic, bloody diarrhea). Rarely: anemia, possibly death. Birth defects and tumors may also be possible. | Ingestion |
| **Sprouting green potatoes** | Green parts, Leaves | "Hypothermia, paralysis, shock, fever, headache, green under the skin, vomiting, diarrhea, hallucinations, loss of sensation | Ingestion |
| **Tobacco** | All parts | Respiratory problems, carcinogen | Ingestion Inhalation of smoke |
| **Tomato** | Leaves, vines, stems | Headache, vomiting, diarrhea, sweating, respiratory, depression | Ingestion |
| **Wisteria** | Pods, seeds, bark | Gastroenteric irritation, nausea, vomiting, diarrhea, dehydration, collapse | Ingestion |