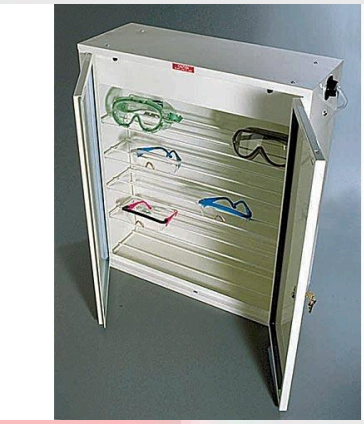
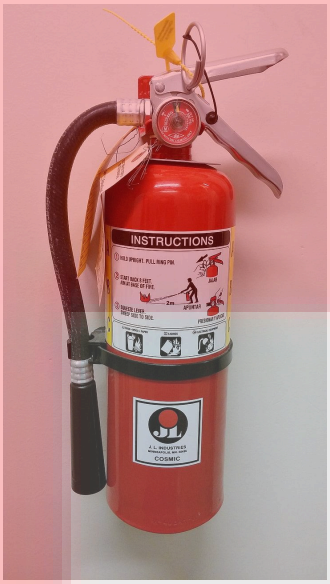
SCIENCE SAFETY MANUAL

Red Clay Consolidated School District

Revised 2021 - Reviewed 2023





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I. ACKNOWLEDGEMENTS

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II. FOREWORD

The purpose of this document is to provide a framework for science teachers in the Red Clay Consolidated School District to conduct science instruction in a safe and responsible manner. Safety is everybody's responsibility. Safety procedures, like curriculum and classroom management, must be planned and implemented consistently to become effective. This document will provide the following for the science classroom instructor or administrator:

- An outline of safer practices for a variety of classroom situations. Included are policies that promote safety and specific cautions against practices that are considered unsafe for schools.
- A list of procedures and persons responsible for accountability of safer practices as well as information about whom to contact in case of problems.

Additionally, this document will provide the means for Red Clay educators to enact the provisions of Title 14 Education, Delaware Administrative Code, Regulation 885: Safe Management and Disposal of Chemicals in the Delaware Public School System. The details of this Science Safety Plan will be enforced through Red Clay Administrative Memorandum 7001.04 Science Safety.

III. DEFINITIONS

Administrative Control:	A practice enforced in the classroom, the school, or the District to ensure safe practice. Examples of administrative controls include (but are not limited to) staff safety training, inspections of science classrooms, and enforcing progressive discipline for behavior that endangers safety.
ANSI:	American National Standards Institute
Aseptic Technique:	Procedures used when working with micro-organisms or with sterile materials that ensure that 1) the materials being handled are not contaminated with environmental microorganisms and 2) the environment is not contaminated with the materials being handled. Aseptic technique also includes disinfection procedures and correct PPE for these procedures.
Autoclave:	(noun): A jacketed chamber designed to create a humidified atmosphere of 121 degrees Celsius and 15 psi air pressure to enable sterilization using pressurized steam. (verb): to sterilize in an autoclave using pressurized steam.
Biosafety Level 1:	A description of microbiological work in which microorganisms are not known to cause disease in healthy persons or animals. Work can be safely performed on an open laboratory bench with appropriate PPE (described in the document) and proper aseptic technique.
Building Science Safety Officer	A teacher of science at each school who will act as a point person for science safety issues. For most schools this person will be the representative to the Red Clay Science Curriculum Council. For high schools, this person may specifically be a chemistry teacher.
Chemical:	Any element, compound, or mixture of elements and/or compounds. The term "chemical" will also apply to common household materials (e.g. vinegar, bleach).

Chemical Hygiene Plan:	The Red Clay Consolidated Chemical Hygiene Plan
Chemical Inventory:	A list of all materials and Chemicals for which a Safety Data Sheet (SDS) must be maintained
Chemical Name:	The scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name which will clearly identify the chemical for the purpose of conducting a hazard analysis.
Chemical Procurement:	The acquisition of any chemical(s)
Common Name:	any designation or identification such as a code name, code number, trade name, brand name, or generic name used to identify a chemical other than its chemical name.
Corrosive:	Causing visible destruction of or irreversible alterations in, living tissue by chemical action at the site of contact.
DDOE:	Delaware Department of Education
Delaware Hazardous Information Act	Delaware Code Title 16, Health and Safety, Regulatory Provisions Concerning Public Health, Chapter 24, Hazardous Chemical Information
Disinfection:	Killing most (not necessarily all) microorganisms (usually from skin or an inanimate surface)
Dissection:	Cutting formerly living tissue (animal or plant) for the purpose of analysis, observation, or experimentation.
District:	The Red Clay Consolidated School District
Emergency Hazardous Spill Procedure	A procedure taken by emergency responders to clean up spills that are too dangerous to perform.by staff who lack specialized training
Engineering Control:	A physical modification to a process, or process equipment, or the installation of additional equipment with the goal of preventing the release of contaminants and improving safety conditions. Examples of engineering controls include (but are not limited to) a chemical fume hood, a continuous flow eyewash, or a second exit to a laboratory.
Explosion:	A sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.
Exposure (expose):	An instance where an individual is subjected to or potentially subjected to a hazardous chemical through any route of entry (inhalation, ingestion, skin contact or absorption).
Euthanasia:	Referring to animals, the humane killing of animals used for instruction.

Fixative: A chemical solution used to halt biological processes in formerly living tissue. This is done to prevent decomposition and to stabilize tissues for further study.

Formalin: A 37-40 % solution of formaldehyde (methanal) in water used as a fixative.

Friable asbestos: Material containing more than 1 % asbestos that can be crushed or pulverized to a powder by the pressure of a human hand.

GFCI: Ground Fault Circuit Interrupter. A circuit breaker integrated into an electric receptacle that senses circuit variances (spikes) and interrupts the flow of electricity quickly to prevent damage due to excessive electric current.

GHS: Globally Harmonized System of Classification and Labeling of Chemicals

Hazard: A source of harm to persons, animals, property, or the environment.

Hazardous Chemical: Any element, compound or mixture of elements and/or compounds which presents a physical hazard (definition #1) or health hazard.

Health Hazard: Chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed persons. The Safety Data Sheet (SDS) will provide information to determine whether or not the chemical is a health hazard.

Horseplay: Physical boisterous play.

Instructional Space: A room or defined space used for an educational activity such as a classroom, a laboratory, a field, a special building, greenhouse, or any other space where educational activities may take place.

Laboratory (unit): An enclosed space used for experiments or tests. (NFPA Standard 45, section 3.3.36, 2013 revision page 20)

NFPA: National Fire Protection Association

NSTA: National Science Teaching Association

NIOSH: National Institute of Occupational Safety and Health

Non-hazardous material: Any element, compound or mixture of elements and/or compounds which do not present a physical hazard or health hazard as indicated by the Safety Data Sheet (SDS).

OSHA: Occupational Health and Safety Administration

PEL: Permissible Exposure Limit (OSHA). The legal limit for exposure to a chemical substance in a workplace that is at an acceptable level not to cause adverse effects. PEL (often expressed as Threshold Limit Value or Time Weighted Average) is usually expressed in parts per million (ppm) or mg/m^3.

Physical Hazard:

1. A chemical which is identified by the SDS as a combustible liquid, a compressed gas, Explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

2. An obstacle or other situation in the environment that has the potential to cause physical harm to persons or property. Examples include tripping hazards, slipping hazards, potential for persons to be injured from falling, or potential for items to fall on persons.

PPE: Personal Protective Equipment. Protective apparel designed to reduce the likelihood of harm to persons at the point of contact with hazardous materials. Examples of PPE include (but are not limited to) chemical splash goggles, protective gloves, and laboratory aprons.

Preservative: A chemical solution used for storage of fixed biological tissue. Ideally, preservatives delay decomposition of material and maintain the integrity of tissue until it can be studied.

Regulation 885: Title 14 Education, Delaware Administrative Code, Regulation 885: Safe Management and Disposal of Chemicals in the Delaware Public School System

Risk: The likelihood that a hazard might cause harm in a given situation and setting combined with the potential consequences of that harm.

Sanitization: Reduction of numbers of microorganisms to safer levels (i.e. kitchen sanitization)

SDS: Safety Data Sheet. A document that accompanies any chemical stored, used, or purchased in schools to provide particular hazard and safety information. The SDS is required by the Hazard Communication Standard of OSHA. The format of the SDS conforms to the Globally Harmonized System of Classification and Labeling of Chemicals

Short circuit: A complete circuit in which current flows through a circuit with low resistance. This situation results in a build-up of heat, which can lead to a fire hazard or an electrocution hazard.

Spill--emergency: Uncontrolled release of a hazardous substance that requires use of specialized kits, containment procedures, and/or cleanup procedures by trained teams.

Sterilization: Killing all living organisms in an environment, including microbial spores

Wild (animal or plant): Referring to a living thing that has come directly from nature, rather than from a biological supply company.

IV. SAFETY PHILOSOPHY OF THE RED CLAY CONSOLIDATED SCHOOL DISTRICT

Laboratory inquiry and investigation are the hallmarks of effective science instruction at all levels and all grades. All laboratory work, whether it occurs with chemicals, with electricity, with living organisms, or in a natural outdoor environment, poses some degree of risk.

The Red Clay Consolidated School District provides an effective and consistent safety plan that follows the following format:

- ❖ Ongoing safety training of students and staff throughout the school year
- ❖ Annual documented training of science students and science instructors **before** any laboratory instruction begins.
- ❖ Modeling of safe procedures by all Red Clay staff.
- ❖ Accountability of hazardous materials used in science instruction in Red Clay schools, including communication of information about hazards and risks in science education at the school level and at the district level.

Questions about the content of this Science Safety Manual or about Red Clay Administrative Memorandum 7001.4, which enforces the provisions herein, should be directed to the Red Clay Director of Curriculum and Instruction or to the Red Clay Supervisor of Science.

V. SAFETY RESPONSIBILITIES OF THE CLASSROOM TEACHER

Classroom teachers are expected to provide a standard of safety in their teaching environments. This standard of safety is called the Duty of Care. The Council of State Science Supervisors (CSSS) breaks Duty of Care into three basic duties of the science teacher that relate to **laboratory safety**.

- ❖ Duty of Instruction: adequate instruction before a laboratory activity.
- ❖ Duty of supervision: adequate supervision of students that they behave properly to avoid foreseeable dangers.
- ❖ Duty of maintenance: assurance that the teacher maintains the safest environment possible and that equipment for instruction functions properly.

1. Guidelines for Duty of Instruction:

    a. Safety expectations should be posted in the classroom in a prominent place.

    b. Students must be thoroughly instructed in those safety considerations and procedures relevant to the class before any potentially hazardous work begins. This instruction must be:

        - accurate
        - appropriate to setting
        - appropriate for the maturity of the audience, and
        - current.

Teachers will assess understanding of safety rules regularly, and document such instruction in the form of a safety agreement. Students and their parents/guardians will sign this agreement as soon as students join the class. Teachers must review the expectations contained in the agreement with students. (NOTE: the safety agreement is also written in Spanish).

c. The teacher will identify and clarify any specific hazards involved with individual activities and the precautions necessary to reduce the risk of these hazards. This instruction will include:

- proper handling and disposal of materials
- possible (but realistic) hazards associated with each procedure
- ways to create a safe learning environment
- the necessary course of action if a hazardous situation should occur, .

More details about necessary hazard and safety training for students are given in the next section of this document.

2. Guidelines for Duty of Supervision:

a. The most effective way to reduce the risk of harm in any classroom is with clear consistent standards of behavior, including consequences for infractions. Misbehavior and horseplay create an unsafe environment for all, and must never be tolerated.

b. Students must be supervised by a teacher or other authorized personnel at all times. During laboratory activities, teachers must be able to see any location in the student work area and to move quickly to those areas when safety issues arise.

c. If the teacher is absent from school, laboratory work must not be left as a substitute lesson plan. If the teacher will be absent for an extended period of time, the long term substitute must have a science background and be informed of safety practices within the year before taking the assignment.

d. Materials for laboratory exercises will be stored securely away from the student areas when not in use.

e. The level of supervision must be appropriate to the age of the students, the degree of inclusion, and the hazardous nature of the work.

f. The teacher and the administration must ensure that students have adequate workspace and that all areas where students are working are accessible by the teacher.

g. Teachers are encouraged to attend training in the use of a fire extinguisher, in first aid, and in cardiopulmonary resuscitation and to renew this training as appropriate.

3. Guidelines for Duty of Maintenance:

   a. All chemicals will be properly labeled as described in the Chemical Hygiene Plan (this document. Teachers will store chemicals according to NIOSH guidelines. https://www.cpsc.gov/s3fs-public/NIOSH2007107.pdf. The provisions of the Chemical Hygiene Plan are followed for use, storage and disposal of all chemicals. **Teachers should only prepare sufficient quantities of working solutions of chemicals to complete a given activity. At the end of the activity, surplus quantities of working solutions must be discarded if they will not be used in a reasonable amount of time (usually 1-2 years).**

   b. Teachers monitor and arrange for necessary maintenance on apparatus used in student instruction. Defective equipment must either be repaired or discarded if repair is impossible. Until repairs or replacement has occurred, defective equipment must not be used and must be removed from the work area.

   c. Teachers and administrators must work together to keep safety equipment functioning properly. Safety equipment (e.g. fire extinguishers, safety showers) are inspected and serviced after use as directed by manufacturer's specifications or industry standards. Teachers will file maintenance work orders per district procedures for correction of any hazards or defects in the physical environment that might compromise safety, with a copy of the maintenance order sent to the building principal.

   d. Fire extinguishers and safety showers in each school are inspected annually. Continuous flow eyewashes are tested weekly (or according to manufacturer's specifications). Teachers must communicate with the chief custodian to be sure all fire extinguishers are identified and inspected.

VI. THE SCHOOL SAFETY PROGRAM AND TEACHERS' RESPONSIBILITIES

The most effective way to ensure adequate safety practices in the classroom is for safety instruction to occur throughout the year as an integral part of every activity.

1. A Building Science Safety Officer for each school should be identified early in the school year by the building principal or designee.This safety officer will be the point of contact in the building for all matters relating to chemical safety and science safety issues. For high schools, this should be a chemistry teacher. For other schools, this will be the Science Curriculum Council member.

2. Science teachers will introduce the safety program by providing students with safety instruction that includes notifications of their rights and responsibilities relating to laboratory safety. Laboratory safety training must precede all laboratory work and become an integral part of the science curriculum.

   Safety instruction for students that occurs before laboratory work begins will include (but not be limited to) the following:

- Behavior expectations during laboratory work, including consequences for behavior infractions that jeopardize safety.

- Locations, indications for use, and procedures for use of all SDS sheets, safety equipment and PPE.

- Standard procedures for obtaining materials, using materials during lab, obtaining help from the instructor, returning materials after laboratory work, and disposal of waste materials.

- How to read labels on containers

- Locations and explanations of specific hazards (including health hazards and physical hazards) found in the instructional space, and safety actions to be taken to avoid or mitigate harm or injury.

- Emergency procedures to prevent or control exposure to hazardous materials, which include engineering controls, PPE, and evacuation procedures.

- Other relevant safety information needed. Students must also be reminded that safety will be discussed throughout the instructional year.

- A personal copy of the Laboratory Safety Agreement that includes a list of *core* precautions to be used with students in all courses. Additional precautions that are specific to a course or a laboratory experiment may be added as needed.

3. Before beginning any activity, the teacher will review the particular safety rules and procedures most appropriate to the activity, and answer all student questions prior to beginning. Once work has begun, the teacher will monitor the students' activities closely.

4. Careful planning is expected for all activities. The following questions can be used to guide safety planning for a particular unit or activity.

   - What are the hazards?
   - What are the "worst case" scenarios and how can I prepare for them?
   - What practices, safety equipment, and protective facilities are prudent and appropriate?
   - Have I performed a "dry run" of the activity to prepare for any potential problems?
   - Is there adequate staff support to deal with unforeseen hazards?

5. Teachers should only conduct laboratory exercises that conform to district and/or state curriculum and instruction guidelines and to the Next Generation Science Standards.

6. According to the Delaware Hazardous Chemical Information Act, all science teachers must provide training to students of their rights and responsibilities when working with hazardous substances. Teachers will obtain and keep documentation that students have received this instruction. Likewise, under this Act, teachers will be provided with annual training of these same rights and responsibilities.

7. Teachers should only conduct laboratory experiments when a school nurse or medical staff member is present in the building. If teachers are conducting an experiment after the school day (in preparation for later instruction), they should ensure that another teacher is present or nearby that is familiar with the risks associated with the procedure.

8. Teachers must report any injury that occurs as a result of a laboratory exercise, however minor, to the school nurse and to the Science Supervisor in a timely manner. If a student is injured, the parent/guardian will be contacted immediately by the teacher or the nurse. If the incident is serious enough that the student cannot be moved, the teacher must summon the nurse and keep the area around the student clear. All situations requiring first aid must be assessed and treated by the nurse. During the school day, teachers may not administer medications (including topical agents or cough drops) to students. Medication administration is the responsibility of the school nurse. NOTE: see Administrative Memorandum 8012.3 Assistance With Medications on Field Trips for further discussion of this topic..

9. Laboratory experiments should only occur in locations with adequate space. The amount of recommended space for a given activity may vary, but will depend on the following factors:

   - The number of persons (students and adults) in the work area
   - The nature of the activity
   - The overall design of the classroom
   - The number, age, and special needs of the students

   The NFPA requirement for educational laboratories is 50 ft^2 per student (NFPA 101-2012, Table 7.3.1.2 Occupant Load Factor Table and the NSTA recommendation for class size in laboratories is a maximum of 24 students (Overcrowding in the Instructional Space).

   Teachers will advise administrators when there is insufficient space for safe laboratory instruction and discuss options. In addition, the work area will be arranged so that the teacher may circulate around the classroom and supervise students. Compartmentalization (creation of small secluded workspaces) hampers the teacher from supervising students properly and can lead to improper and unsafe laboratory behavior going undetected.

10. Teachers must ensure that appropriate laboratory apparel and etiquette are observed. In particular, certain lab activities may require the following:

    a. Chemical splash goggles or safety glasses with side shields must be worn if there is a danger of projectiles in the lab. Chemical splash goggles must be worn when certain labs with chemicals, glassware, or heat (hot plates or open flame) occur. Goggles that meet ANSI standard Z87.1 are appropriate for all of these situations, and are specifically required for certain chemistry labs. Contact lenses are not restricted; however, teachers should determine which students wear contact lenses during lab. If any material gets into the eyes, contact lenses must be removed immediately.

    b. Laboratory aprons should be worn in chemistry class when necessary.

    c. Protective gloves (vinyl or nitrile—NEVER LATEX) must be worn when students will handle micro-organisms or preserved specimens. Laboratory workers should not eat, drink, chew gum, or apply cosmetics (this includes lip balm) when working with chemicals or biological materials.

    d. If open flames or high-speed motors are used, students with shoulder length hair will secure it behind their shoulders. In these situations, students will also secure loose fitting clothing and remove dangling jewelry.

    e. If a lab exercise is being performed as a teacher demonstration, teachers will enforce the same safety expectations as they would enforce if students were performing the lab exercise.

f. Appropriate materials for cleaning up spills during a laboratory exercise must be available in the lab. The specific materials needed for cleaning up will depend on the investigations being performed at the time.

g. Teachers are responsible for modeling appropriate laboratory etiquette. Modeling is the most effective teaching method. Also, visitors to the class (including administration) are required to use any precautions or safety equipment (e.g. eye protection) required of students.

11. Teachers should be aware of any health concerns of students that laboratory work may affect. These might include allergies, disabilities, temporary or chronic illnesses, or pregnancy. Teachers should work with the school administration, the school nurse, and the students' families to obtain current and accurate information. **Because of the increasing frequency and life threatening nature of latex allergies resulting from airborne latex particles, no activities involving latex balloons or latex gloves will be assigned. This restriction applies to both laboratory work and to teacher demonstrations.**

12. Teachers must report any hazardous or potentially hazardous change to equipment or facilities in writing to the head custodian and to the principal immediately through maintenance work orders and processed according to Red Clay Board Policy 5009. Teachers should retain a copy of the report, and follow up with the progress of the report as needed until correction has been achieved. Until the hazard has been corrected, the teacher must suspend any laboratory work that could pose a danger to others as a result of the hazard. If the teacher experiences a significant delay in the repair (from the time of report to correction of the hazard), the teacher will inform the Science Supervisor of the situation for follow-up and completion.

13. Teachers must not leave students engaged in laboratory work unsupervised at any time for any reason. If the classroom must be evacuated during laboratory work, the teacher must ensure that no hazardous conditions exist before leaving the room. If the teacher is absent from school, laboratory work must not be left as a substitute lesson plan.

14. Teachers and administrators must be sure that all safety equipment in the classroom is well maintained and easily accessible. Repairs to or replacement of safety equipment must be documented through work orders or purchase orders as appropriate.In particular,

    a. Safety showers, eyewashes, and fire extinguishers should be unobstructed and prominently labeled at all times.

    b. Chemical fume hoods should not be used to store chemicals or other materials.

    c. Classrooms must have immediate access to a class ABC fire extinguisher. Classrooms/laboratories that work with flammable materials should also have a fire blanket. The District Chemical Hygiene Officer will determine if a classroom or laboratory needs to have a fire blanket. These should be in a location to allow access in 30 steps or within 10 seconds. Teachers should communicate with the chief custodian about the location of all fire extinguishers. **If a fire extinguisher is deployed at any time for any reason, the principal and the chief custodian must be notified immediately with all relevant details.**

    d. Adequate ventilation must be maintained as described in the Chemical Hygiene Plan (section X). Any work that generates hazardous or noxious gases must be performed in a functional fume hood. This includes work that generates odorless hazardous gases.

e. Exits from the room must be clearly labeled and easily accessible to all students, especially those with assistive devices (e.g. wheelchairs, walkers, crutches). The evacuation procedure must be explained to students before any laboratory work begins (preferably the first day of school), and special evacuation arrangements for students with assistive devices must be outlined and submitted to the principal. Each room must post the evacuation plan prominently.

15. Teachers must ensure that students clean up their work area after completing laboratory activities. In addition, teachers must be sure that students wash their hands after laboratory work or any time they must leave the laboratory area as needed.

16. **Teachers must never tolerate inappropriate behavior or unauthorized experiments in the laboratory.** One person's misconduct poses a hazard to everybody else in the laboratory. Students who engage in physical horseplay, sabotage of others' work, or unauthorized "experiments" must be removed from the laboratory immediately and properly disciplined according to the procedures in the Red Clay Student Code of Conduct).

VII. RESPONSIBILITIES OF THE BUILDING SCIENCE SAFETY OFFICER (HIGH SCHOOL)

1. Act as liaison among science teachers, building and district administration, and facilities staff regarding science safety issues.

2. Maintain the science chemical inventory for the school, including the inventories of chemicals maintained by individual teachers. This inventory is updated annually (over the summer if possible) and shared with the building principal, the chief custodian, the school nurse, and the District Science Supervisor.

3. Oversees and approves all chemical orders by the science department.

4. Maintain a supply of Safety Data Sheets (SDS) for all chemicals in the science chemical inventory. Copies of these are shared with the building principal, the chief custodian, and the school nurse.

5. Assist teachers with maintenance requests related to safety equipment.

6. Assist District Science Supervisor with identifying and coordinating disposal of hazardous wastes.

7. Assist the District Science Supervisor with annual review of the district science safety manual.

VIII. RESPONSIBILITIES OF THE BUILDING ADMINISTRATORS

The school's administration needs to cooperate fully with science teachers to maintain a safer environment for laboratory investigation.

1. Principals need to ensure that the facilities for science instruction meet all requirements for safety. Although laboratory investigation is a crucial part of effective science instruction, a safe environment is an absolute prerequisite for laboratory investigation. This includes provision of ABC fire extinguishers, fire blankets, and appropriate protective eyewear with sanitizing goggle cabinets. Principals also need to ensure that chemicals are stored in secure storage facilities with limited access as described in the Chemical Hygiene Plan (this document)..

2. The number of students in a science classroom and the allotted space for laboratory work are crucial components of laboratory safety. When class sizes in laboratories exceed 24 students, the likelihood of laboratory accidents increases as class size increases (NSTA 2020). As students are scheduled in science classes, administrators need to work with teachers and guidance counselors to ensure that science classes are small enough to allow adequate room for students to move easily and to allow teachers to supervise students safely.

3. Principals will not schedule science classes to routinely meet in classrooms that are not dedicated to science instruction. If such scheduling is necessary, the affected classes should have access to an appropriate laboratory on those days when students will conduct experiments.

4. Principals will not schedule teachers of subjects other than science to teach regular classes in science classrooms **unless those teachers have received safety training and that training has been documented by the District Science Supervisor**. If a hazardous situation involving science materials should occur, the teacher may not be equipped to intervene.

5. Principals must respond to maintenance requests that affect the safety level of the classroom promptly. If there is a delay in processing such requests, the principal should keep the teacher informed. These requests may include repair of eyewashes, stocking of fire extinguishers, and availability of appropriate safety goggles.

6. Administrators need to enforce appropriate disciplinary actions for safety infractions according to the severity of the infraction. If a student's or teacher's behavior in the science laboratory poses a consistent safety hazard to the rest of the class or school community, that student or teacher should be removed from science classes where the hazards exist and appropriate interventions should be pursued.

7. Principals are expected to maintain an inventory of all chemicals on hand and the SDS for each chemical.

IX. RESPONSIBILITIES OF THE DISTRICT SCIENCE SUPERVISOR/CHEMICAL HYGIENE OFFICER (Regulation 885, Section 4.1.1):

The District Science Supervisor will function as the District Chemical Hygiene Officer. Duties of the Chemical Hygiene Officer include the following:

1. Hold safety meetings as needed with representatives from the following:
   - Elementary School
   - Middle School
   - High School
   - Nursing
   - Facilities and Maintenance
   - Administration
   - District office (Curriculum/Instruction, Public Safety, other departments as needed)

   These meetings will address issues relevant to laboratory safety at the classroom level, the school level, and the district level. The committee will also review and revise the District Science Safety Plan.

2. Coordinate Building Science Safety Officers.

3. Maintain current records of each District school's chemical inventory and provide schools with any needed SDS.

4. Assist teachers and administrators in meeting safety requirements. This assistance may include recommendations about instructional space usage, chemical storage, chemical disposal, and clean-up of chemical spills.

5. Coordinate with the District Communications Officer about the release of information to the public pertaining to science safety or science instruction.

6. Conduct yearly safety audits of science instructional spaces and submit reports of these audits to building and District administration.

7. Coordinate the collection of hazardous waste by a DDOE approved hazardous waste disposal company.

8. Provide safety information and annual safety training to District science teachers and other staff as needed.

9. Attend state level safety meetings and disseminate information from these meetings to district personnel as needed. This will include sending required assurances and lists of surplus chemicals for hazardous waste collection to the DDOE Science Education Associate each year by November 15.

10. Provide prior authorization for new laboratory operations, procedures, or activities proposed by District educators.

11. Obtain and document six hours of training as a Chemical Hygiene Officer every five years.

X. CHEMICAL HYGIENE PLAN

1. Goal

- To protect persons, property, and the environment from foreseeable harm by hazardous chemicals in Red Clay schools through prudent practices of chemical procurement, management, use, storage, and disposal.

- To mitigate harm to persons, property, and the environment from accidents related to hazardous chemicals in Red Clay schools through effective emergency response procedures.

2. Management of the Chemical Hygiene Plan (Regulation 885, Section 4.1)

The Chemical Hygiene Plan will be accessed on the school District intranet (Curriculum and Instruction pages) as well as the District public internet (Curriculum and Instruction pages). A paper copy of the Chemical Hygiene Plan will be housed in each school's main office or the building principal's office.

The District's Chemical Hygiene Officer will review the Chemical Hygiene Plan each academic year by May 1, and submit a written record of this review to the Deputy Superintendent of the Red Clay Consolidated School District, with any recommendations of changes to the Plan.

The Chemical Hygiene Officer will arrange for training of science staff on the Chemical Hygiene Plan each school year during the August in-service day. The Chemical Hygiene Officer will also ensure that new science teachers that are hired after August are trained on the Chemical Hygiene Plan as soon as possible after hire.

3. Duties of the Chemical Hygiene Officer (Regulation 885, section 4.1.1)

See above section.

4. Standard Operating Procedures (Regulation 885, section 4.1.2)

The following guidelines will be used in connection with science instruction involving chemicals and chemical apparatus.

a. Delaware Hazardous Chemical Information Act

Delaware's Hazardous Chemical Information Act requires that all employees and students who may be exposed to hazardous chemicals be provided access to information regarding these chemicals effective January 1, 1985. This Act specifies three Rights (that the "employee or student" has) and three Responsibilities (that the "employer or teacher" has). The rights and responsibilities follow one from the other:

The student has the right to know:

- What materials in their work environment are hazardous in any way.

- How the materials are dangerous.

- How to protect themselves against the hazards that the materials pose.

The teachers have the responsibility to:

- Tell the students about any materials and procedures they will be exposed to that may be harmful to them in any way.
- Inform the students of the exact nature of the hazards posed.
- Teach the students how to protect themselves against the hazards posed by materials or procedures with which they will be working.

b. Prior Authorization for New Laboratory Operations, Procedures, or Activities (Regulation 885, Section 4.1.1.7)

The Chemical Hygiene Officer will create a list of approved procedures that will be accessible by all District science teachers. When science educators wish to perform a new laboratory activity or demonstration that has not been previously approved in the District, they need to obtain prior approval from the District Chemical Hygiene Officer. The procedure for obtaining prior approval for laboratory activities or demonstrations is as follows:

i. The teacher will contact the Chemical Hygiene Officer at least five days before the procedure will begin to determine if the procedure has been previously approved. If it has been approved, the Chemical Hygiene Officer will provide the teacher with all necessary safety actions to be followed.

ii. If the procedure has not been previously approved, the teacher will submit a request to the Chemical Hygiene Officer for approval. The request will include the following:

- A copy of the laboratory procedure, including any chemicals.
- The date when the procedure will begin
- Copies of SDS sheets of all chemicals
- The source (text or on-line) of the procedure
- The foreseeable chemical, physical, and biological risks
- A review of the safety actions that will be taken to reduce these risks (e.g. Engineering Controls, Administrative Controls, PPE).
- A plan (including date) to run the procedure before it is used with students
- Signed approval by the building principal or designee.

iii. The Chemical Hygiene Officer will review the request for prior approval and respond to the teacher (**copied response to the building principal**) within three days of the date when the procedure will begin. The Chemical Hygiene Officer will create a list of approved procedures that will be accessible by all District science teachers. If the procedure is not approved, the Chemical Hygiene Officer will meet with the teacher (before the desired date if possible) to discuss needed revisions.

iv. **NOTE: The building principal is responsible for ensuring safety within the school. Therefore, the principal may deny permission for a laboratory procedure to occur, even if the Chemical Hygiene Officer has already approved it.**

c. Chemical Procurement:

i. Before purchasing new chemicals, teachers will check the chemical inventory in their building to assess the need for the purchase. The following will be considered **before** purchasing chemicals:

- Is the chemical on the "acceptable to use" list for the grade level being taught? Since chemicals needed for science instruction in grades K-8 are provided in the science materials from the Delaware Science Coalition, teachers of these grades will consult with the District Chemical Hygiene Officer before purchasing chemicals for instruction.
- Will amounts be used within 3 years?
- Can the chemical be stored properly?
- Can the chemical (or waste products from the chemical) be locked away from access by students?
- Can the chemical be disposed of safely?
- Are there appropriate and sufficient safety apparatus and personal protective equipment for using this chemical?
- Is the teacher properly trained to use this material?
- Is use of this chemical age and grade appropriate for students?

ii. Upon receiving new chemicals, teachers will write the date (including year) of receipt and the date the bottle is opened on the manufacturer's label. The teacher will also retain the Safety Data Sheet (SDS) that arrives with the chemical, and update the chemical inventory with the new acquisition. It is suggested that a line be drawn with permanent marker on the bottle to indicate the full level. This will help monitor the rate of use.

iii. The SDS contains detailed information of all hazardous information about a chemical. Manufacturers of chemicals are required by law to ship a current SDS with every chemical. The collection of SDSs for all chemicals held by the school will be provided to the principal. Additionally, the collection will also be kept in the chemical storage area.

iv. Schools and teachers are not to accept donated chemicals from industry, other institutions of learning, or private donors. Because of evaporation, decomposition, or hygroscopy, the purity of such chemicals cannot be guaranteed. Furthermore, transporting such chemicals may constitute a hazard. Any chemical orders should be approved by the Building Science Safety Officer.

d. Chemical Use and Management (Regulation 885, Sections 3 and 10):

i. Ideally, work with hazardous chemicals should occur in laboratory spaces providing 50 square feet of work space per student. Teachers must determine if the risk posed by a hazardous material can be managed in the space and with the class at hand. **The teacher is ultimately responsible for determining if a laboratory procedure or laboratory materials are safe to use in class.**

ii. Teachers may only use chemicals approved for their grade level (see "Lists of Chemicals Used in Red Clay Schools"). Questions about these chemicals may be directed to the District Chemical Hygiene Officer.

iii. Teachers should only provide sufficient chemicals for a given experiment and avoid providing excess chemicals to classes. When possible, choose activities that employ micro-quantities of chemicals. Labels on individual chemical containers for student use containing less than 100 ml must contain certain identifying information:

- Name or chemical formula of the reagent
- Concentration (if in solution)
- Date of preparation if possible
- The hazard

iv. In some cases, reagent bottles may be labeled with a letter or number (for example, if the chemical is an unknown for identification). The teacher will have an identification key for the unknowns and will provide hazard information about the unknowns to the students before work begins. When the lab exercise involving the unknown chemicals is over, the bottle will be labeled with the name of the chemical(and all of the information listed above).

v. Laboratory spaces where hazardous chemicals are used must have appropriate engineering controls. Basic engineering controls and PPE (to avoid inhalation or skin contact with hazardous materials) include the following:

- ABC fire extinguisher in reach of any part of the room within 10 seconds.
- Non-asbestos fire blanket
- Continuous flow eyewash.
- Safety shower or drench hose.
- Chemical splash goggles that conform to ANSI Z87.1.
- Labeled broken glass containers
- Appropriate spill cleanup materials (as indicated by SDS).

NOTE: Each of the above items must be clearly labeled.

Other engineering controls and PPE may be required for specific chemical hazards. These may include (but are not limited to)

- Chemical fume hood
- Safety shield (for demonstrations)
- Gloves to protect from specific chemical hazards
- Laboratory coats or laboratory aprons
- A second exit to the laboratory space

vi. Immediately before beginning any activity, the teacher will review the particular safety rules and procedures most appropriate to the activity, and answer all student questions prior to beginning. - Once started, the teacher will monitor the students' activities closely. **The teacher is ultimately responsible for determining if a laboratory procedure (or any procedure) is safe to use in class.**

vii. Heating of materials requires special attention, especially at lower grades. Flammable liquids must never be used around open flames, sparks, or ignition sources. Heating should be done with a hot plate, a heating mantle, or a water bath whenever possible. Tea candles may be a source of heat in middle school laboratory work, but no other open flame is appropriate before 9th grade. Any time heat is used (regardless of the heat source), all persons must tie back shoulder length hair and secure loose clothing and jewelry. Also, chemical splash goggles (ANSI Z87.1 or equivalent) must be worn while heat sources are used.

viii. Glass should be handled with care. All glassware that students handle should be fire polished beforehand whenever possible. Students should use particular care in handling microscope slides and cover slips (which cannot be fire polished). Only teachers should insert glass tubing into rubber stoppers. Pipetting must be done using a bulb or other suction device—**mouth pipetting is expressly forbidden.** When heating glassware, it is important to remember that hot glass looks exactly like cool glass. Use appropriate equipment to handle hot glass (e.g. tongs, test tube holders). When liquids are heated in a test tube, the opening of the test tube must be pointed away from all others. The teacher should work with students to ensure the optimum work arrangement to allow this to happen.

ix. Teachers must report any injury that occurs as a result of a laboratory exercise, however minor, to the school nurse and to the Science Supervisor in a timely manner. If a student is injured, the parent/guardian should be contacted as soon as possible and no later than by the end of the day. If the incident is serious enough that the student cannot be moved, the teacher must summon the nurse and keep the area around the student clear. All situations requiring first aid must be assessed and treated by the nurse. During the school day, teachers may not administer medications (including topical agents or cough drops) to students. Medication administration is the responsibility of the school nurse. NOTE: see Administrative Memorandum 8012.3 Assistance With Medications on Field Trips for further discussion of this topic..

x. The student workplace must be uncluttered. The only things students should bring to the laboratory workstation are the materials needed to do the activity. Laboratory experiments shall only occur in locations with adequate space. For a laboratory instructional space, adequate space is a minimum of 50 square feet per student. The amount of recommended space for a given activity may vary, but will depend on the following factors:

- The number of persons (students and adults) in the work area
- The nature of the activity
- The overall design of the classroom
- The number, age, and special needs of the students

xi. Teachers will advise administrators when there is insufficient space for safer laboratory instruction. In addition, the work area will be arranged so that the teacher may circulate around the classroom and supervise students. Compartmentalization (creation of small secluded workspaces) hampers the teacher from supervising students properly and can lead to improper and unsafe laboratory behavior going undetected.

xii. Teachers must ensure that appropriate laboratory apparel and etiquette are observed. In particular, certain lab activities may require the following:

- Chemical splash goggles or safety glasses with side shields must be worn if there is a danger of projectiles in the lab. Chemical splash goggles must be worn when certain labs with chemicals, glassware, or heat (hot plates or open flame) occur. Goggles that meet ANSI standard Z87.1 are appropriate for all of these situations, and are specifically required for certain chemistry labs. Contact lenses are not restricted; however, teachers should determine which students wear contact lenses during lab. If any material gets into the eyes, contact lenses must be removed immediately.

- Laboratory aprons should be worn during certain chemistry labs.

- Protective gloves (vinyl or nitrile—NEVER LATEX) when students will handle micro-organisms or preserved specimens. Laboratory workers should not eat, drink, chew gum, or apply cosmetics (this includes lip balm) when working with chemicals or biological materials.

- If open flames or high-speed motors are used, students with shoulder length hair should secure it behind their shoulders. In these situations, students should also secure loose fitting clothing and remove or secure dangling jewelry.

- If a lab exercise is being performed as a teacher demonstration rather than as a lab, teachers will enforce the same safety expectations as they would enforce if students were performing the lab exercise. If there is a danger of any demonstration items reaching the viewers (e.g. projectiles) a safety shield with a minimum thickness of 3/16 inches (4.7 mm) will be used.

- **Teachers are responsible for modeling appropriate laboratory etiquette. Modeling is the most effective teaching method. Also, visitors to the class (including administration) are required to use any precautions or safety equipment (e.g. goggles) required of students.**

xiii. (Regulation 885, Section 8.1) Teachers are required to advise students of their rights and responsibilities relating to laboratory safety. Laboratory safety training must precede all laboratory work and become an integral part of the science curriculum. The teacher will obtain and keep documentation that students and parents have been informed of safety expectations.

Instructional staff shall provide annual training in the safe management of chemicals to all students in instructional areas that use chemicals. The training shall be age and grade appropriate for the students and shall include at least the following:

- An overview of the school safety program
- The location of all hazardous chemical containers in the instructional area
- An explanation of how to read labels on containers
- The location, availability and content of Safety Data Sheets (SDS) and an explanation of how they are used
- An explanation of the nature of health hazards and physical hazards associated with the use of all hazardous chemicals (regardless of quantity) to which they may be exposed
- An explanation of the proper handling, storage and disposal methods for each of the hazardous chemicals present in the instructional area
- Measures taken by the instructional staff and school personnel to prevent or control exposure such as engineering controls, personal protective equipment, and emergency procedures for spills or leaks.

xiv. Teachers should be aware of any health concerns of students that laboratory work may affect. These might include allergies, disabilities, temporary or chronic illnesses, or pregnancy. Teachers should work with the school administration, the school nurse, and the students' families to obtain current and accurate information. **Because of the increasing frequency and life threatening nature of latex allergies resulting from airborne latex particles, no activities involving latex balloons or latex gloves will be assigned. This restriction applies to both laboratory work and to teacher demonstrations.**

xv. Teachers must ensure that students clean up their work area after completing laboratory activities. In addition, teachers must be sure that students wash their hands after laboratory work or any time they must leave the laboratory area as needed.

xvi. **Teachers must never tolerate inappropriate behavior or unauthorized experiments in the laboratory.** One person's misconduct poses a risk to everybody else in the laboratory. Students who engage in physical horseplay, sabotage of others' work, or unauthorized "experiments" must be removed from the laboratory immediately and properly disciplined according to the procedures in the Red Clay Student Code of Conduct). In addition, the offender's parent/guardian should be informed within 24 hours by the classroom teacher. Sections j-l are part of Duty of Supervision.

xvii. Teachers will report any hazardous or potentially hazardous building conditions (including but not limited to defective or missing fire extinguishers, defective continuous flow eyewashes, defective chemical fume hoods) in writing to the chief custodian and the principal as soon as these are discovered. Teachers should retain a copy of the report, and follow up with the progress of the report as needed until correction has been achieved. Until appropriate control measures have been implemented, the teacher must suspend any laboratory work that could pose a danger to others as a result of the hazard. Section m is part of Duty of Maintenance.

xviii. Be sure that any time students work with chemicals, there is adequate ventilation. The general laboratory ventilation system should provide a source of air for breathing and for input to local ventilation devices, ensuring that laboratory air is continually circulated, and direct air flow into the laboratory from non-laboratory areas and out to the exterior of the building. General laboratory ventilation should operate at a rate of 4 room air changes per hour.

There must be at least one fume hood for each laboratory where hazardous chemicals are being used. Chemical fume hoods must be vented to the outside, not within the building. With the sash raised to 12 inches, air should enter the fume hood at 60-to-125 linear feet per minute - checked annually with a velocity meter or anemometer. Teachers with chemical fume hoods will maintain written documentation of all tests. Chemical fume hoods must not be used for storage of chemicals or other materials.

e. Chemical Storage (Regulation 885, Sections 5-7); ***NOTE: This section will pertain to high schools with chemical storage needs. Elementary schools and middle schools store fewer chemicals, less hazardous chemicals, and smaller amounts of chemicals than high schools. Middle schools and elementary schools that need to store chemicals will contact the District Chemical Hygiene Officer for specific guidance.***

i. Schools must take inventory of all chemicals annually. Inventories should be conducted by at least two adults at a time. Students must not assist in this process. The inventory should contain the following information:

- name of the chemical (either name or formula)
- physical state of the chemical (e.g. crystals, powder, aqueous solution. For solutions, the concentration should be included.)
- amount on hand (actual amount, not just taken from the labels)
- date purchased (if known)
- location on where the chemical is stored (including shelf location)
- a “sign out/sign in” procedure for when chemicals are used (see suggested sign out/in sheet in Appendix D)

Copies of the inventory should be available to all teachers using the stored chemicals, to the school nurse,to the chief custodian, and to the principal. A copy must be sent to the District Chemical Hygiene Officer each year. In addition, a copy of the current inventory and paper copies of the most current SDS of each stored chemical should be housed in the main office (or principal’s office) and in the chemical storeroom.

ii. Chemicals must be stored in a dedicated room with limited access. **The chemical storeroom is never to be used for general storage (i.e. of furniture or books). Only chemicals and items related to chemical storage may be stored in the chemical storeroom. Furniture or books may become contaminated with chemical residue.**

Only teachers who use the chemicals for instruction, the custodial staff, and the principal should be granted unlimited access. **STUDENTS MUST NOT BE PERMITTED IN THE CHEMICAL STOREROOM AT ANY TIME.**

Access to the room will be with a card reader. Card access is limited to the following:

- Building Science Safety Officer
- Science teachers who teach chemistry (note: other teachers who may need chemicals from the room for instruction will request them from the Building Science Safety Officer).
- Building administrators
- Chief custodian and fireman
- District Chemical Hygiene Officer
- District Public Safety Officer

The room will also be accessed with a key (in case of a power failure that disables the card reader). The building principal will retain the key.

Features of the chemical storeroom (high schools):

- The room must be well ventilated, with at least six air exchanges per hour, ventilated to the outside, drawing vapors from the floor.

- Well lighted.

- Be equipped with ceiling mounted smoke detectors and ABC fire extinguishers.

- be close to telephone access to the main office.

- The door facing the outside has a sign warning that hazardous chemicals are stored. In addition, the NFPA diamond with the highest hazard level of each category is displayed (blue = health, red = flammability, yellow = reactivity.)

  Chemicals must be stored according to chemical compatibility. The chemical storage pattern described by NIOSH https://www.cpsc.gov/s3fs-public/NIOSH2007107.pdf is to be used.

iii. Certain chemicals (acids, flammables, strong oxidizers) must be stored in specialized cabinets labeled “ACIDS” (only all-wood cabinets are used to store acids), FLAMMABLES, or STRONG OXIDIZERS. Nitric acid (HNO_3) in any concentration must be stored separately from any organic compounds and from other acids (especially acetic acid).

iv. Chemicals that do not require specialized cabinets (described above) must be stored on non-reactive shelving. Shelves that house stored chemicals must be secured to walls and must be equipped with lips at least 1 cm in height. These provisions prevent chemical containers from rolling off the shelf and falling.

v. The chemical storage room will have at least one universal spill kit for cleaning up emergency spills. These can be purchased commercially. The quantity and components of the universal spill kit will depend on the nature and the quantities of hazardous chemicals being stored, but universal spill kits are expected to contain the following (as a minimum):

- Chemical splash goggles (ANSI Z87.1): at least two pair
- Protective gloves (based on the hazards being stored--consult SDS of stored chemicals for guidance): at least two pair.
- Laboratory aprons, at least two
- One 5 gallon bucket with a lid
- Large permanent marker for labeling waste
- Plastic broom, plastic dustpan, large heavy duty plastic bags for cleanup and disposal.
- One 8 quart bag of vermiculite as an absorbent.
- Approximately 5 lb. sand or clay (non-reactive) cat litter for containing a spill (to be used in a ring around a small spill.)
- Approximately 5 lb dry sand (in addition to the above) if alkali metals are stored (for resultant fire. An ABC fire extinguisher is not suitable for a burning metal fire.
- Approximately 5 lb. sodium bicarbonate or sodium carbonate for neutralizing acid spills
- Approximately 5 lb. citric acid or sodium bisulfate for neutralizing alkaline spills

Specific instructions for cleaning up spills will be included with each spill kit.

vi. The shelving in the chemical storeroom should be clearly labeled with the families of chemicals stored (e.g. sulfates, halides, carbonates). Chemical families stored on the same shelf should be separated by either a physical partition or by a space of 15 cm or more.

The shelving should be inspected regularly to ensure that damage has not occurred. If damage to the shelving has occurred, or if any water appears on shelving in the chemical storeroom, the chemicals should be removed from the shelf and the problem identified and corrected immediately.

vii. Chemicals must never be stored above eye level nor on the floor. Teachers should not climb ladders or furniture to reach chemicals. If the desired chemical is out of reach, the teacher should use a sturdy step-stool (or seek assistance) to move the chemical to a lower height that is within reach from standing on the floor. Chemicals must never be stored above, below, or in a sink.

viii. Refrigerators that contain chemicals must never be used for food, and vice-versa. All refrigerators should be inventoried and cleaned as needed. Refrigerators used for storing chemicals should be designed for laboratories and must be labeled "LABORATORY MATERIALS ONLY--NO FOOD" or with similar language. Flammable materials **must** be stored in an explosion proof refrigerator.

ix. Chemicals and solutions will only be stored in properly labeled containers designed for chemical storage. Household bottles (e.g. baby food jars, soda bottles) do not provide adequate protection for the chemical. The integrity of bottle closures should be checked during the chemical inventory and chemicals with compromised closures (e.g. cracked lids, "frozen" ground glass stoppers) will be disposed of using approved procedures.

Chemical labels should be compliant with GHS. If the chemical has been prepared on site (i.e. a "working solution), the label must contain, at a minimum, the following information:

- Name or chemical formula of the reagent
- Concentration (if in solution)
- Date of preparation and last name of preparer
- Hazard information (determined from the SDS)

Chemicals without labels, or chemicals that appear to be different from the identity on the label should be identified for hazardous waste disposal and segregated from chemicals in use. Do not assume the identity of a chemical without a label based on its appearance and location in the storeroom. If there is no label, it could be anything. **These labeling requirements and chemical storage requirements also apply to chemical waste.**

x. When chemicals are used in student laboratory exercises, the students must not use the stock bottles. Instead, place sufficient chemicals into labeled beakers for student use. Excess chemicals must never be returned to the stock bottle as this could compromise the purity of the stock and possibly cause a dangerous reaction with impurities from the lab. Chemicals should not be stored in classrooms as a general rule.

xi. Chemicals prepared for laboratory instruction must adhere to the safety provisions indicated by the SDS. Chemicals must always be transported in an appropriate transport container (based on the characteristics and quantities of the chemicals being transported) to prevent spilling or dropping.

xii. The chemical storage room should not be cleaned routinely by custodial staff unless they have received hazardous materials training specific to the chemical hazards of the room.

f. Chemical Disposal (Regulation 885 Section 9)

i. Schools should only retain enough of any chemical to be used in 3 years. Unless there are specific plans to use surplus chemicals in a reasonable period of time, they should be identified to the District Chemical Hygiene Officer to be discarded according to federal, state, and local regulations.

ii. Teachers discarding chemicals need to pay close attention to proper disposal procedures as outlined on the SDS. Additional guidance about disposal of chemicals may be obtained from the manufacturer of the chemical or a licensed hazardous waste disposal company. The District Chemical Hygiene Officer will assist with determining proper disposal procedures.

iii. Solid waste must never be discarded in the sink. Even if it is water soluble, the solid can clog the drain.

iv. Before disposing of liquid materials in a sink, consult with Red Clay Department of Maintenance and Facilities for guidance. In addition, consult the SDS of the chemical. Be aware that different chemicals may have unexpected reactions when combined in the sink. To avoid these reactions, flush the sink with running water for five minutes after each type of chemical is discarded. If sinks are not used for more than a week at a time, run water through them every week to prevent gases from building up in the drain.

v. Broken glass should be discarded in a labeled box made of hard plastic or corrugated cardboard. The box should be taped shut and disposed of carefully. Again, be mindful of what chemicals (if any) are on the broken glass before discarding. If broken glass contains chemicals that must be disposed of as hazardous waste, the glass itself must also be disposed of in the same manner. Students must not attempt to clean up broken glass—they must call for the teacher's assistance.

vi. It is strongly advised that at the end of the school year, all working solutions of chemicals be properly discarded and the reagent bottles cleaned. Besides ensuring that students will work with the best quality materials possible, this practice will minimize problems associated with surplus chemicals. From year to year, teachers may change teaching assignments, labels may fade or deteriorate, and solutions may dry out. After many years, it becomes impossible to remember what was in a particular bottle.

vii. Each school year, schools will prepare a list of hazardous chemicals that have been identified for disposal by a licensed hazardous waste removal company. This list will include chemicals identified from all parts of the school; this includes science, career and technical education, maintenance and facilities, nutrition, nursing (including wellness centers), and any other area of the school. The list will consist of the following information:

- Name of the chemical (if the chemical is unlabeled, physical description of the chemical).
- Quantity of the chemical (approximate). The quantity may be in terms of mass, volume, or unit (e.g. number of thermometers).
- Current location (these chemicals must be secured in a storage area inaccessible by students, and where undesired chemical reactivities will not occur).

This list will be sent to the District Chemical Hygiene Officer no later than October 31 of the school year. The District Chemical Hygiene Officer will send a copy of each list to the Science Education Associate at DDOE (with copies sent to the Director of Curriculum and Instruction and the Superintendent of Red Clay) no later than November 15. If additional chemicals are discovered at the school after October 31, these will also be reported, and an amended report will be sent to DDOE.

viii. DDOE will arrange for removal of the identified hazardous chemicals as required by Regulation 885, Section 9.2.1. The District Chemical Hygiene Officer will coordinate with the licensed hazardous waste removal company to collect the wastes in a manner to minimize disruption to school operations and to allow for safe and quick removal of materials. The Chemical Hygiene Officer will sign all manifest paperwork from the hazardous waste removal company. Copies of the manifest paperwork will be retained by the Chemical Hygiene Officer, the Manager of Facilities and Maintenance, and each affected building principal for five years. Fees for hazardous waste removal will be paid by the schools where the wastes originated (as indicated by the submitted lists of hazardous wastes).

ix. Certain hazardous materials must be removed immediately upon discovery. These wastes include the following:

- Hazardous spills that constitute an imminent threat to persons, property, or the environment.
- Radioactive materials.
- Controlled or illegal substances
- Any material containing friable asbestos
- Shock sensitive or highly reactive (with water, oxygen, or carbon dioxide) materials. These include (but are not limited to) the following:

  - picric acid (especially if crystals have formed).
  - sodium azide (crystal)
  - peroxides other than hydrogen peroxide.
  - materials that form peroxides over time (see list below):

Acetal	Ethylene glycol ether acetates
Acetaldehyde	Formic Acid
Furan	Dioxanes
Methyl Acetylene	Chlorofluoroethylene
3-Methyl-1-butanol	Cumene(isopropylbenzene)
Methyl-isobutyl ketone	Cyclohexene
4-Methyl-2-pentanol	2-Cyclohexen-1-ol
Cyclopentene	4-Penten-1-ol
Decahydronaphthalene(decal in)	1-Phenylethanol
Diacetylene(butadiyne)	Tetrahydrofuran
Dicyclopentadiene	Tetrahydronaphthalene
Diglyme	Vinyl Ethers
Diethyl ether	Potassium metal

In all of these cases, schools must contact the District Chemical Hygiene Officer, the Manager of Public Safety, and the Manager of Facilities and Maintenance for guidance.

5. Emergency Procedures:

Each Red Clay building files an emergency plan with the Assistant Superintendent for District Operations (Administrative Memorandum 5012.3). Specific emergency situations related to science instruction are clarified below:

a. Personal injury: If students, staff, or visitors are injured during a laboratory activity, the injury must be reported to the nurse immediately, and to the principal and District Chemical Hygiene Officer in a timely manner. If a student is injured, the parent/guardian should be contacted immediately by the teacher or the nurse. If the incident is serious enough that the student cannot be moved, the teacher must summon the nurse and keep the area around the student clear. All situations requiring first aid must be assessed and treated by the nurse. During the school day, teachers may not administer medications (including topical agents or cough drops) to students. Medication administration is the responsibility of the school nurse. NOTE: see Administrative Memorandum 8012.3 Assistance With Medications on Field Trips for further discussion of this topic..

b. Evacuation: If laboratory work creates a situation requiring persons to evacuate a work area, the building emergency plan will be followed. All classrooms and chemical storage areas must post the building approved evacuation plan. If an emergency evacuation occurs, the District Public Safety Officer and (for science related incidents) the District Chemical Hygiene Officer will be notified. If the emergency warrants that the building be evacuated, the building's District Emergency Plan will go into effect.

c. Chemical Spills: Each chemical spill is unique, and procedures for handling spills will vary based on quantity of spilled material, nature of spilled material, and many other factors.

   i. Teachers and students should be trained to recognize and practice cleanup procedures for minor spills of non-hazardous materials that may occur in routine laboratory work. Teachers must also be trained to recognize which spills of hazardous materials they may clean and which must be deferred to experts for cleanup.

   ii. Students must not clean up spills of hazardous materials or of any broken glass. If these spills occur, students must summon the teacher and caution others in the vicinity to move away from the area of the spill. Students (and all others) must be cautioned not to step into any part of the spill when moving away.

   iii. Teachers will consult the SDS of the spilled chemical for guidance on cleaning up the spill. Factors to consider when cleaning up (or getting assistance with cleaning up) a spilled chemical:

   - chemical composition of the spilled material
   - physical state or characteristics of the spilled material (i.e. liquid, powder, containing broken glass).
   - proximity to other chemicals.
   - proximity to unprotected persons.

   The teacher is ultimately responsible for determining if a laboratory procedure (or any procedure) is safe. This responsibility includes spill cleanup.

iv. When a teacher has completed cleaning up a spill from a low-hazard spill (following procedures indicated by the SDS and other reliable information), the cleaned area should also be cleaned by a school custodian as soon as possible. Note that this procedure does not apply to a chemical spill within the chemical storeroom (see emergency hazardous spill procedures below).

Any teacher who judges that a spill is too hazardous to clean up by themselves will initiate emergency hazardous spill procedures (described below).

v. Emergency hazardous spill procedures will be implemented in the following circumstances:

- The spill involves a hazardous chemical that will generate an aerosol or cause the PEL to be exceeded during clean-up.
- The size of the spill and/or the hazardous nature of the chemical make it too dangerous for personnel without specialized training to clean up.
- The chemical is likely to extend to a high traffic area.
- The spill occurred in the chemical storeroom (where it might cross-react with other chemicals while cleaning is occurring.
- Cleaning the chemical is likely to injure the staff member cleaning.
- Other reasons identified by the teacher or staff member.

vi. Teachers and staff members will follow the following emergency hazardous spill procedures, adjusting as the situation warrants:

a) Evacuate students and others from the area of the spill. With assistance, restrict the site (with signage or by other means) to prevent unintended trespassing.

b) If appropriate (consult SDS), contain the spill with a non-reactive substance by enclosing the spill completely.

c) Inform the building principal and the chief custodian immediately of the situation. Contact the District Public Safety Officer that an evacuation has occurred. Contact the District Chemical Hygiene Officer of the situation so that trained hazardous waste personnel can be contacted. Custodial staff must not attempt to clean the spill.

d) Follow all directions indicated in the building Emergency Plan filed per Administrative Memorandum 5012.3.

e) If the spill is flammable or creates an explosion hazard, pull the fire alarm and evacuate the building.

f) Do not return to the location of the hazardous spill until it has been cleared as safe by emergency personnel.

c. Use of Emergency Equipment: Maintenance and routine testing of safety equipment will be documented and retained by the responsible parties. Testing documentation will include date of test, signature of person performing the test, and results. Documentation must also occur If the equipment is used in an actual emergency.

i. ABC Fire Extinguisher: The ABC fire extinguishers may only be used by teachers (never students) who have been trained to use them after students have been evacuated if the fire is small enough to be extinguished. If the fire is larger than the size of a waste basket or is actively spreading, the teacher must evacuate immediately, and pull the fire alarm (if it has not already been pulled). Safety to persons is the priority; if a teacher is uncertain about his or her ability to use the ABC fire extinguisher on a fire, the teacher and students will evacuate as described.

ii. Fire Blanket: Classrooms that work with hazardous chemicals or heat sources must have a wool fire blanket, easily accessible and properly labeled. Once a year (preferably before the start of school) the fire blanket should be unfolded and refolded to reduce stiffness in case of an emergency. A fire blanket will extinguish small fires by removing oxygen. If a fire blanket is used to extinguish a fire, the District Public Safety Officer and the building principal must be notified (so that incident reports can be filed). Fire blankets are also suitable for rapidly extinguishing fires that occur on a person. If this occurs, the school nurse must also be notified and the person be offered a prompt medical examination

iii. Continuous flow eyewash: Classrooms that work with hazardous chemicals must have a continuous flow eyewash. Ideally, this unit will be a free-standing unit, often coupled with a safety shower (see below). However, a continuous flow eyewash unit that is attached to a laboratory faucet is also acceptable. The continuous flow eyewash must be accessible within 10 seconds from any location in the room. It must deliver a flow of water that is not injurious to the eyes. The water temperature must be between 60 and 100 degrees Fahrenheit (16-38 degrees Celsius). Continuous flow eyewash units must be tested weekly by engaging until water flow runs clear. If the flow does not clarify within a few seconds, a maintenance work order must be completed. Until the unit is repaired or replaced, work with hazardous chemicals cannot be performed.

If a chemical splashes into a person's eyes, the eyewash must be engaged immediately, flushing the affected person's eyes for at least 15 sustained minutes. The school nurse must be summoned to the person immediately, and additional medical care must be offered.

NOTE: Squeeze bottle eyewashes are not acceptable as an eyewash in a science classroom. They cannot deliver 15 sustained minutes of continuous flow, and it is impossible to flush both eyes simultaneously.

iv. Emergency Shower/drench hose: Classrooms and laboratories that work with hazardous chemicals must have a safety shower or drench hose (or have access to one within 10 seconds). This unit (which may be integrated with the continuous flow eyewash as described above) must be operated with a pull chain, deliver a water flow of 20 gallons/minute with a temperature between 60-100 degrees Fahrenheit (16-38 degrees Celsius). These must be tested annually. The shower or drench hose must not be positioned above electrical equipment.

6. **Safety Training and Timeline for Safety Inspections (Regulation 885, Sections 8 and 11):**

a. Safety training of staff: The District Chemical Hygiene Officer will be responsible for providing safety training of secondary science staff who are likely to be exposed to hazardous chemicals. This training will occur each year before staff are expected to use hazardous materials during instruction. Included are all teachers, substitute teachers, para-professionals, and other staff that will be exposed to hazardous materials during science class. The training will be face-to-face, will document staff in attendance, and will consist of the following:

- Duty of Care and associated behaviors (Duty of Supervision, Duty of Instruction, Duty of Maintenance).
- Hazard Analysis, Risk Assessment, Safety Actions
- Location, care, and use of engineering controls and PPE.
- Specific hazards in the workplace
- Location of Chemical Hygiene Plan and SDS
- Emergency procedures

b. Inspections of science classrooms and chemical storerooms:

Each school year, the District Chemical Hygiene Officer will conduct an inspection of each classroom where science is taught (middle and high schools) and each chemical storeroom (high schools) for compliance to the Chemical Hygiene Plan. Reports of each inspection will be provided to the building principal, the department chair or Science Curriculum Council representative, the Manager of Facilities and Maintenance, and the Director of Curriculum and Instruction. The purpose of these inspections will be to provide guidance to staff on safety issues and to allow for appropriate maintenance requests related to safety (i.e. engineering controls) to be completed in a timely manner.

Science Safety Timeline:

Action	Persons responsible	Completion date
Science safety training of staff (teachers, para-professionals)	Chemical Hygiene Officer	August, before start of school year, and upon hire of new staff. (documentation of training necessary)
Safety training of students	Science teachers	Start of year, and ongoing (signed Laboratory Safety Agreement necessary)
Completion of chemical inventory (high schools)	Qualified staff (usually teachers of chemistry)	By October 31
Report to DDOE of surplus chemicals for removal (yes) (no), Regulation 885 assurance document, current Chemical Hygiene Plan	Chemical Hygiene Officer	November 15 (Regulation 885, Section 9.2.1, Section 11)
Science classroom safety inspections	Chemical Hygiene Officer	May 1
Annual review of Chemical Hygiene Plan	Chemical Hygiene Officer and designated persons	May1 (documentation necessary)

XI. BIOLOGICAL SAFETY

The following guidelines will be followed in connection with science instruction involving biology and life sciences.

1. Use of animals

   a. Live animals can be used in a variety of situations in science classes at all levels. If possible, animals should be obtained from a reliable biological supply center (e.g. Carolina, Wards). Vertebrates from the wild should not be brought into the classroom.

   b. The teacher is responsible for providing the animal with appropriate living quarters. This includes providing sufficient space for all animals, ensuring adequate sanitation, protection from adverse conditions, temperature regulation, proper feeding and watering regimens, and provision for offspring. Care must be taken to prevent the animal's escape. If the animal should escape, the principal and the head custodian should be notified immediately and every attempt to recover the animal should be made.

   c. If live animals are maintained in a classroom, the teacher must make provisions for the animals feeding and cleaning for when school is closed, especially over several days.

   d. If students are required to handle the animals, they must wash their hands before and after handling the animal. Students wash their hands for a minimum of 20 seconds with soap and water. Use of alcohol based hand sanitizer (65 % or more isopropyl alcohol) is recommended after washing, especially after handling animals or animal products. These same sanitizing practices must be followed if students handle animal bedding or bird and/or reptile eggs.

   e. All animals may bite, so students must be thoroughly instructed on safe and humane care of the animal. If a student is bitten, scratched, or otherwise injured by an animal, the nurse must be notified immediately, and the offending animal isolated for further examination.

   f. Euthanasia of animals should only be conducted as follows:

      i. Euthanasia should only be carried out by an adult and only after the activity had ended. It should not be performed in the presence of students. Euthanasia should not be part of an ongoing laboratory activity.

      ii. Only invertebrate animals and fish should be euthanized by the teacher. The preferred method of euthanasia of these organisms is by freezing. This is done by placing the animal into a plastic zip-lock bag (aquatic animals may be placed into a covered cup of water), and placed into a freezer (0 degrees Fahrenheit/- 17 degrees Celsius) overnight. The remains must be disposed of as soon as possible after death has occurred.

         Other arrangements should be made for other vertebrates. Crayfish, aquatic plants, and snails must never be released to the wild. Organisms may only be sent home with students if written consent from parents/guardians has been obtained first.

      iii. Animal corpses should be double bagged and disposed of in an approved manner so that no environmental risk is introduced.

g. Certain live animals must never be used in a science classroom. These include (but are not limited to)

- Stinging insects (bees, wasps, hornets)
- Venomous spiders
- Disease vectors (mosquitoes, ticks, fleas)
- Venomous snakes (note: non-venomous snakes may be kept in a science classroom with the principal's permission.)
- Tortoises (these are correlated with Salmonella outbreaks.) All reptiles are natural reservoirs of *Salmonella* species of bacteria.
- Scorpions
- Aggressive carnivorous fish (piranha)
- Exotic invasive species (plant and animal) known to endanger local ecosystems

2. <u>Use of humans or human biological materials</u>

a. Any instruction that involves studying characteristics of persons in the class must ensure safety of the students and maintain the dignity of the subjects of inquiry. Procedures must cause no more discomfort than would occur from reasonable exercise. Any injuries that occur to students must be reported to the school nurse immediately.

b. Teachers will not conduct laboratory activities that involve drawing blood or involve other human body fluids. Mock blood type analysis and mock urinalysis (using synthetic materials) may be performed with a simulated system (available from science supply vendors).

c. Tasting of food must never occur in a laboratory. If a scientific investigation involves collecting tasting data (for example, human genetics), the tasting (food only) must occur in a location approved for meal consumption (such as the cafeteria).

d. Teachers will explain to students that any data collected on them is for educational purposes only and not to be used to diagnose medical conditions. If students have questions or concerns about their own health, they should be directed to the school nurse or other medical professionals.

3. Use of preserved animals

   a. Animals or animal parts for dissection must be preserved in a non-formaldehyde containing preservative only. Any animals that have been preserved in formalin or formaldehyde containing preservatives are discarded as a chemical hazard (contact the Science Supervisor). Formaldehyde is a suspected carcinogen (cancer causing agent). Many vendors that supply preserved animals use formalin as a fixative, then transfer the fixed specimens to a less toxic preservative. This is permitted, provided that the vendor can document that the average airborne formaldehyde concentration of the preservative and the fixative are below 0.1 ppm.

   b. Only preserved animals that have been purchased from a biology supply company should be dissected. These specimens must come with an SDS for the preservative and an SDS of the preserved material. Never allow students to dissect animal corpses found in the wild. Decaying animal remains should never be dissected, even if they have been appropriately preserved.

   c. Dissections must be performed in rooms with good ventilation with 4 changes of air per hour or more. The animal is washed thoroughly with water before cutting. Once the initial incision is made, the internal organs are rinsed thoroughly with water.

   d. Students performing dissections must wear appropriate safety equipment:

      - Laboratory apron
      - Vinyl or nitrile gloves
      - Chemical splash goggles (ANSI Z87.1)

   e. Only scalpels or dissection scissors may be used to cut the specimen—bare razor blades provide inadequate control while cutting. Dissecting instruments must be sharp. The teacher must maintain close supervision of students and account for all dissecting apparatus before and after the lesson. Teachers should remind students of possible adverse occurrences during a dissection (dizziness, anxiety, cuts, skin irritation from preservative, cuts, allergic reaction), and assess students for any signs of these occurrences. Scalpels must be accounted for throughout the lesson and at the end.

   f. Teachers are advised to use effective grouping strategies during dissections. Only one group member should handle the specimen and dissecting instruments at a time.

   g. Incisions are always be made away from the student and away from other group members.

   h. Some students are unable to participate in animal dissections for a variety of different reasons. Students must be given the option of completing an alternate activity for full credit in lieu of a dissection. This alternate activity must address the same science standards and be of comparable rigor to the dissection. The use of virtual dissections (computer simulations that provide the same information as a dissection without the use of actual tissue) is encouraged.

   i. All dissected parts must remain in the dissecting tray until they are discarded. Before performing a dissection, the teacher should consult with custodial services and the SDS for directions on proper disposal of remains.

4. Use of plants

Plants and plant parts provide a convenient and rich source of living data for laboratory science. Certain safety protocols apply to using plants in science instruction.

a. Before starting any work involving plants or plant products, teachers need to determine what allergies students may have. Students should never work with any material for which they have exhibited an allergic reaction. Teachers should be aware of the symptoms of an allergic reaction (see https://www.aaaai.org/conditions-and-treatments/allergies)

b. Laboratory exercises involving horticulture performed in the classroom should generally be done with commercially purchased potting soil. Naturally occurring soils frequently contain molds, parasites, stinging insects, or other hazardous impurities. Therefore, investigations with naturally occurring soils must be supervised carefully by the teacher.

c. Cultivated plants should be well cared for and given plenty of room to grow. Sick or overcrowded plants tend to become breeding grounds for molds, which can present an allergic or respiratory hazard in the classroom. Bringing plants (including seeds) from the wild for cultivation is discouraged because of the risk of disseminating molds. Plants and seeds should be purchased commercially. If plants or soils develop visible mold, the moldy parts should be removed immediately and discarded in a sealed plastic bag to prevent further contamination.

d. When working with flowering plants, take care to avoid dispersing large amounts of pollen. This can trigger an allergic reaction in some people even if such a reaction has never occurred before.

e. Plants that are known to be poisonous or extremely allergenic may not be brought into a classroom. When students conduct laboratory investigations outside, they should be instructed to recognize potentially hazardous plants growing indigenously, such as poison ivy, poison oak, stinging nettle, and jimsonweed. Students must never taste any plant or fungus growing outside. Many plants are extremely poisonous if ingested (e.g. toadstools, buttercup, azalea). In addition, plants may have been sprayed with insecticides, or have been exposed to animal waste. Any incidence of jimsonweed growing on or near school property should be reported to the principal and the Delaware Department of Natural Resources and Environmental Control (DNREC) immediately.

f. Any tobacco demonstrations, including those relating to the components of tobacco smoke, are forbidden.

5. Use of microorganisms

   a. Microorganisms used for study in the K-12 science laboratory must be Biosafety Level 1 and be obtained through commercial vendors. Random sampling of school environments to obtain representative microorganisms is not to be practiced. The consequences of culturing a human pathogen warrant that environmental culturing of microorganisms should be discontinued. Microorganisms should never be cultured from a human or animal source (e.g. throat culture). Whenever possible, the least hazardous microorganism should be used for a procedure.

   b. Correct aseptic technique must be demonstrated and modeled before students work with microorganisms. Students should practice all techniques with uninoculated materials (e.g. tubes of water, uninoculated agar) before handling microorganisms.

   c. Culture media that are used to grow microorganisms must be steam sterilized (in an autoclave or similar device) at 121° C and 15 psi for at least 15 minutes before use. Equipment for culturing may be sterilized in the same way or by incineration.

      Culture media that has supported growth of microorganisms should be sterilized at 121° C and 15 psi for at least 30 minutes before disposal. If this is not possible, the cultures must be saturated with a 10 % bleach solution for 60 minutes before disposal. NOTE: immersion in bleach is considered disinfection, not sterilization. Students are not permitted to operate steam sterilizers (autoclaves or pressure cookers).

   d. Culture media must be clearly labeled with the type of media (this can be done with color coded caps on culture tubes and stickers on Petri plates as long as a legend is readily accessible), the source of the inoculum, name of the organism (if known), the student's name, and date of inoculation. If the sterility of the culture medium is questionable, it is considered contaminated and must be isolated and sterilized immediately.

   e. Students working with microorganisms should wear appropriate apparel and PPE at all times. This includes chemical splash goggles (ANSI Z87.1), lab aprons, and vinyl or nitrile gloves. Because this work may involve using laboratory burners, hair that reaches the shoulder must be tied back. Students must wear closed toed shoes when working with microorganisms.

   f. If a culture is spilled on student belongings, the contaminated items must be disinfected. Saturating the items with freshly made chlorine bleach for 10 minutes constitutes adequate disinfection. Students should never clean up culture spills. The area of the spill should be restricted until the teacher can decontaminate it.

   g. If a culture spill occurs on a student's skin, the student should wash the affected area thoroughly with soap, followed by disinfection with alcohol-based sanitizing gel. The school nurse must examine the area immediately.

   h. If the culture spill occurs in the eyes or any mucous membrane, the affected area must be rinsed immediately using the continuous flow eyewash for 15 minutes. The nurse must be brought to the student immediately to assess the incident.

   i. If a culture or Petri plate containing colonies of microorganisms is observed by students, the closure should be sealed with tape or paraffin wrap. Because of the risk of dropping or breaking culture tubes and Petri plates, teachers will not pass cultures around the classroom for inspection. Rather, the cultures should be set up at lab stations and students should move from station to station to inspect the cultures.

j. Any culture that develops mold (evidenced by powdery or cottony growth) will be taped closed and discarded immediately. Molds and mold spores can cause severe respiratory symptoms. They spread quickly throughout a school and are difficult to remove.

k. Non-disposable Inoculating loops and needles must be sterilized in a laboratory burner until they glow orange for five seconds before and after inoculation. Because of the possibility of creating contaminated aerosols, the loop or needle must be cooled for approximately ten seconds before use. Students should not cool a hot loop or needle by immersing it into a sterile part of an agar plate.

l. Biohazardous waste requiring sterilization must be placed in a bag with a biohazard label. The bag should be sealed and sterilized when it is half full. The biohazard bag must be sealed when not in use and sterilized within a week from when waste is first introduced to it.

m. Because of the possibility of infectious conjunctivitis (“pink eye”), microscope eyepieces should be disinfected by wiping with 70 % isopropyl alcohol after use. Students suffering from infectious conjunctivitis may not come to school until cleared by a physician.

n. Refrigerators that contain specimens used for scientific study must never be used for food, and vice-versa. These refrigerators will be clearly labeled “No food. Micro-organisms only” or with similar language. All refrigerators should be inventoried monthly and cleaned as needed.

o. Teachers will not conduct laboratory exercises involving microscopy of epithelial cheek cells. Respiratory infections can be transmitted through this procedure.

XII. PHYSICAL SAFETY:

1. <u>Heat, Fire, and Cold:</u>

   a. Tea candles may be used in some laboratory activities in middle school science classes. No other forms of open flames should be used as a heat source in any procedures before ninth grade. Candles should only be lit with spark lighters.

   b. Chemical splash goggles (ANSI Z87.1) must always be worn in a laboratory where a heat source is used.

   c. Students must be instructed that heat sources, hot glassware, and live steam can cause severe burns on exposed skin. If open test tubes are being heated, they should be pointed away from all others.

   d. Only borosilicate (e.g. Pyrex™ or Kimax™) glassware can be heated. Heated glassware must never be handled with bare hands, regardless of how long it has been heated. Use tongs or insulated gloves. Never heat cracked glassware, as the item is likely to shatter along the crack.

   e. Shoulder length hair must be tied back whenever an open flame is used (including lit tea candles). <u>Never leave any flame unattended.</u>

f. Bunsen burners should be lit with spark lighters, not matches or butane lighters. The gas line should be inspected for cracks or holes before use. The spark lighter should be ready to use as soon as the gas jet is engaged, to prevent harmful accumulation of gas in the room. Burners may only be extinguished by turning off the gas jet.

g. The teacher must know the location of the automatic shutoff valve for gas. Hot plates and gas jets should be checked at the end of laboratory work to be sure they are in the “off” position. Because hot plates take a certain period of time to cool off enough to be safely handled, teachers are advised to use signs to indicate that a hot plate has recently been used and may still be hot.

h. If a teacher demonstration creates a projectile hazard, or involves using a heat source, especially an open flame, a polycarbonate safety shield with a thickness of 4.5 mm or more will be placed between the audience (class) and the demonstration materials. The shield should extend 50 cm above the demonstration materials or more.

i. Frozen carbon dioxide (“dry ice”) presents similar hazards to persons as extreme heat does (i.e. severe burns (frostbite) resulting from exposure to extreme cold.) Dry ice must be handled with tongs or insulated gloves. In addition, chemical splash goggles (ANSI Z87.1) must always be worn by persons working with dry ice, especially if dry ice and water are used together. Students must never work with individual amounts of dry ice in excess of 5 grams.

2. <u>Electricity:</u>

a. Prior to using any electrical equipment, teachers should carefully read the manufacturer's instructions. Teachers conducting labs or demonstrations with electrical equipment should be familiar with the dangers of electrical shock and its treatment. The best treatment is to avoid the situation through good safety procedures.

b. When working with electrical equipment, only tools with properly insulated handles should be used. Metal articles such as rulers, pencils, pens, or probes should never be used to examine circuits. Students should remove rings, bracelets and any jewelry that might contact a live circuit when doing electrical work. Hands must be completely dry to avoid electrocution.

c. All electrical equipment having voltages exceeding 50 V must be grounded or be made of approved "double insulated" design. Grounded appliances are equipped with a three-prong plug and may never be operated with the ground prong removed or inoperative. All receptacles should be grounded in science classrooms, and receptacles that are 6 feet or closer to water sources must have a GFCI.

d. The use of extension cords in the laboratory should be minimal. They are a temporary measure and sufficient receptacles should be installed to replace them in permanent or frequent applications. When used, they are of three prong grounded design unless used with "double insulated" equipment. Since grounded extension cords can be used with all equipment,they should be the only type used in science labs. Since electrical resistance increases with the length of the cords and because of the dangers of creating a physical hazard in the classroom, extension cords should be as short as possible. Extension cords should be taped to the surface where they are used to prevent them from dangling or from becoming a tripping hazard. Extension cords must never be linked in tandem with one another.

e. **Batteries:** When working with batteries students should be advised of the dangers involved. Few students are initially aware of the dangers that can be created by cells in series (high voltage) or in parallel (high current). Teachers should be aware of the number of batteries available and of the potential for unauthorized experimentation. The following cautions should be reviewed with the students as appropriate to the activity.

   i. Experiments in electricity should be designed so that the total voltage is less than 50 volts.

   ii. Short circuits create a fire hazard due to the high currents present

   iii. Store batteries separately from any other items to prevent accidental short circuits.

   iv. Batteries must be recycled separately from other waste in accordance with state and local laws.

f. Any time students are creating a circuit, they should draw a diagram first to allow the teacher to identify possible short circuits. If possible, turn off all power when working on electrical equipment. The power leads should be the last connection made when assembling equipment and the first disconnected when disassembling equipment. If students are creating a complete circuit powered by a battery, it is recommended that a switch be included as part of the circuit. A switch will allow quick interruption of the current if it should become necessary.

3. <u>Light/electromagnetic radiation:</u>

   a. **Lasers:** . The manufacturer's cautions for lasers must be followed. Class I and II lasers commonly found in schools are believed to offer no hazard to human skin but could cause eye damage. In demonstrations, particular care must be taken so that neither the direct beam nor any mirror-like reflections strike the observer's eye since the beam could be focused onto the retina. Students should never be permitted to carry or use personal laser pointers except when they are part of a lesson and supervised by the teacher. At the end of the lesson, laser sources must be collected and inventoried.

   b. Sunlight: Direct vision of the sun for even short periods of time can cause eye damage. Mirror-like reflections may also cause injury to the eyes. Sunglasses and exposed photographic film may increase the injury caused by the sun by dilating the pupils of the eye while not blocking sufficient light, particularly in the ultraviolet range.

   If experiments are done to observe the sun, they should project an image on white paper using a lens or "camera obscura" or using an appropriate solar telescope. Measurements or observations can be made on the paper. Students should be educated on the dangers of staring at an eclipse of the sun (partial or total).

   c. Ultraviolet radiation: Proper shielding or goggles certified for ultraviolet protection are required. Protective glasses must be matched to the source.

XIII. ELEMENTARY SCIENCE SAFETY

1. Introduction:

   The National Science Teaching Association (NSTA) recognizes the importance of effective elementary science education and recommends the involvement of all education stakeholders to provide effective instruction, materials, environment, and opportunities so that all students to succeed. Recognizing that science safety is an integral part of any science experience, age-appropriate safety considerations should be implemented for younger learners.

   Each school year, a designee from each elementary school will receive in-depth safety training from the District Science Supervisor. Once trained, these elementary designees will provide safety training to the rest of the teachers in the building at the first faculty meeting of the school year.

2. Safety Responsibilities of the Classroom Teacher

   a. Science safety begins with adequate preparation of science content and pedagogy, deliberate lesson planning to include measurable student learning objectives, concrete experiences, and student preparation appropriate to the learners' age and learning readiness. Teachers assume a Duty or Standard of Care to ensure the safety of students, teachers, and staff (see Section V of this document).

   b. Safety rules should be posted in the classroom in a prominent place.

   c. Students must be thoroughly instructed in those safety considerations and procedures relevant to the class before any potentially hazardous work begins. This instruction must be

      - accurate
      - appropriate to setting
      - appropriate for the maturity of the audience
      - current.

      Teachers should assess understanding of safety rules regularly, and document such instruction in the form of a safety agreement. Parents/guardians (and when developmentally appropriate, students) (see Appendix A) will sign this agreement as soon as students join the class.

   d. Communication of safety expectations should be a three-way dialogue among the school/learning institution, the student, and the family. Students may wish to conduct some classroom activities they learned in school at home. Teachers must communicate safety considerations to families for these activities. There may be risks with some of these activities at home that don't exist in the school environment.

   e. Materials management can be a challenge in the elementary classroom. Elementary students must have clear directions for obtaining, distributing, returning, and disposing of materials. A disorganized science lesson is neither productive nor safe. Science materials should be secured when not in use to prevent student access. In many elementary schools a lack of time and space presents challenges for preparing and cleaning up materials. These challenges should be addressed by grade-level teams and administrators whenever possible.

f. Science lessons must be given adequate space and time. NSTA recommends no more than 24 students in a space that allows for at least 45 square feet/student in a multi-use laboratory/classroom. If elementary science takes place in a dedicated laboratory space, the NFPA requires 50 square feet/occupant (note that "occupant" includes students, teachers, and all other occupants) In addition, students must have sufficient time to clean up work areas and wash hands.

g. The teacher should identify hazards involved with individual activities and clarify ways to reduce the associated risks. This instruction should include:

- proper handling and disposal of materials
- possible (but realistic) hazards and risk reduction practices associated with each procedure
- ways to prevent hazardous situations
- the necessary course of action if an incident should occur.

h. The teacher will assess and minimize barriers for students with disabilities.

i. Report all injuries, including animal scratches, bites, and allergic reactions, immediately to the school nurse If a student is injured, the teacher should also contact the parent/guardian. Teachers may never administer medication (including topical agents or cough drops) to any student. If the incident is serious enough that the student cannot be moved, the teacher must summon the nurse and keep the area around the student clear. **All situations requiring first aid must be assessed by the nurse.**

j. Teachers must post emergency escape and notification plans and emergency phone numbers in each space used for science activities. These plans must be discussed with students.

k. Careful planning is expected for all activities. The following questions can be used to guide planning for a particular unit or activity.

- What are the hazards?
- What practices, safety equipment, and protective facilities are prudent and appropriate?
- Have I performed a "dry run" of the activity to prepare for any potential problems?
- Is there adequate staff support to deal with unforeseen hazards?
- What could go wrong?
- What do I need to do to be prepared if it should happen?

l. Teachers should only conduct laboratory exercises that conform to District Curriculum and Instruction guidelines and to the Next Generation Science Standards.

3. Chemical Safety

a. Chemicals used in the elementary classroom should be obtained following a procurement policy developed by the school or Delaware Science Coalition. **All interested parties must agree that the term "chemical" refers to any type of matter, including all household materials (sugar, salt, baking soda, vinegar, alcohol, hydrogen peroxide, cooking oil, and other such items**), as well as water or sand. All these items fit the definition of "chemical" discussed in this paper.

b. Chemistry activities that are not part of the Delaware Science Coalition approved curriculum must be approved by the District Science Supervisor and the building principal.

c. Chemicals must be age appropriate. Donated chemicals must never be accepted for classroom use.

d. Chemicals should be stored in a separate and secure location from the classroom. If this is not possible, the storage location must be locked and be inaccessible to students or others not authorized. Storage locations must be appropriate for the chemicals being stored, and must display appropriate signage.

e. All chemicals must display an accurate identifying label that students can understand.

f. For all chemicals (including household chemicals purchased at local stores where lab usage is significantly more frequent than home use, a Safety Data Sheet (SDS) must be retained and the date received must be recorded. usage is significantly more frequent than how a user at home would use the product. All chemicals must be appropriately labeled per the OSHA GHS Hazard Communications Standard.

g. Chemicals should not be retained for more than a year. Over time, chemicals can be “forgotten” as staff members leave the school, and chemicals may undergo hazardous decomposition.

h. Instruction to students on safer practices and establishing a culture of safety is fundamental. Students must be taught how to handle chemicals and apparatus correctly and safely, and must be taught the consequences of incorrect handling.

i. Students must be supervised closely to ensure materials are used safely, that students do not conduct unauthorized investigations or activities, and that students do not steal materials for later unauthorized experimentation. Often, students do not appreciate the hazardous nature of chemicals, even with instruction. For this reason, the teacher assumes a duty of supervision and a duty of instruction during all science investigations or activities.

j. Activities involving chemicals require all occupants in the room to wear chemical-splash goggles (ANSI/ISEA Z87.1 D3 series and other appropriate personal protective equipment). Teachers must ensure that students keep the goggles on at all times covering the eyes including after clean up and handwashing, and that if the goggles are shared, they are cleaned after each use (cleaning includes the securing strap).

k. Teachers must instruct students how to properly dispose of waste at the end of the activity or investigation. Wastes must always be disposed of according to local, state, and federal regulations.

4. Biological Safety

    a. Use of animals

        i. Live animals can be used in a variety of situations in science classes at all levels. Always purchase healthy animals from reliable sources. Discourage students from bringing personal pets to school. If pets are allowed into the room, they should be handled only by their owners (or owners' parent/guardian), and provisions should be made for proper care during the visit. Certification by a veterinarian declaring the animal disease-free isrequired.

        ii. Students may not bring animals from the wild or animal corpses into the classroom. Wild animals may transmit serious diseases and behave unpredictably.

        iii. Inquire beforehand about potential student **allergies** associated with animals. Some students are allergic to the dander produced by fur-bearing animals, as well as to mold found in animals' food and bedding.

        iv. Report animal bites and scratches immediately to the school nurse.

        v. Have a plan for removal, care, and return of animals during holidays and at the end of the school year.

        vi. The teacher is responsible for providing the animal with appropriate living quarters. This includes ensuring adequate sanitation, protection from adverse conditions, temperature regulation, proper feeding and watering regimens, and provision for offspring. Care must be taken to prevent the animal's escape. If the animal should escape, the principal and the head custodian should be notified immediately and every attempt to recover the animal should be made.

        vii. If students are required to handle the animals, they must clean their hands (wash with soap) before handling the animals, then clean and sanitize their hands (wash with soap, followed by sanitization with alcohol gel) after handling the animals. They may also wear vinyl or nitrile gloves and wash their hands after handling the animal. These precautions also apply to students handling chicken eggs and animal bedding or food. As all animals may bite, students should be thoroughly instructed on safer and more humane care of the animal. If a student is bitten, the nurse must be notified (as with any laboratory accident or injury), and the offending animal isolated for further examination.

        viii. Euthanasia of animals should only be conducted as follows:

            - Euthanasia should only be carried out by an adult and only after the activity had ended. It should not be performed in the presence of students. Euthanasia should not be part of an ongoing laboratory activity.

            - Only invertebrate animals and fish should be euthanized by the teacher. The preferred method of euthanasia of these organisms is by freezing. This is done by placing the animal into a plastic zip-lock bag (aquatic animals may be placed into a covered cup of water), and placed into a freezer (0 degrees Fahrenheit/- 17 degrees Celsius) overnight. The remains must be disposed of as soon as possible after death has occurred.

- Other arrangements should be made for other vertebrates. Unwanted crawfish or snails should not be released to the wild or given to students as pets. However, painted lady butterflies (and other native species of butterflies) may be released.

ix. Certain animals must never be used in a classroom. These include (but are not limited to)

- Fire ants (other types of ants may be kept as part of an ant farm).
- Stinging insects (bees, wasps, hornets)
- Venomous spiders
- Venomous snakes (note: non-venomous snakes may be kept in a science classroom with the principal's permission.)
- Scorpions
- Aggressive carnivorous fish (piranha)
- Exotic invasive species (plant and animal) known to endanger local ecosystems

b. Use of plants

Most elementary classrooms have an assortment of plants for both decorative purposes and learning experiences. Classroom plants can help students understand the needs of living things and can reinforce process skills such as observation, measurement, and classification. Plants are relatively easy to care for, even during weekends or brief vacation times. There are precautions and safety considerations that must be followed.

i. Be sure that students never eat any part of an unknown plant, including seeds and berries, whether in the classroom or on a field trip. Help students understand the difference between edible and nonedible plants, vegetables, and fruits.

ii. Plants that are known to be poisonous or extremely allergenic should never be brought into a classroom. Students should not touch unfamiliar plants. When students conduct laboratory investigations outside, they should be instructed to recognize potentially hazardous plants growing indigenously, such as poison ivy, poison oak, stinging nettle, and jimsonweed. Students should never taste any plant or fungus growing outside. Many plants are extremely poisonous if ingested (e.g. toadstools, buttercup, azalea). In addition, plants may have been sprayed with insecticides, or have been exposed to animal waste.

iii. Teach children to avoid touching all mushrooms they may find outdoors, since many varieties are poisonous. Symptoms of plant/mushroom poisoning may include headache, nausea, dizziness, sweating, tightness in the chest, vomiting, skin eruption, itching, or dermatitis. If a student has ingested any unknown plant, seek medical care immediately.

iv. Ascertain whether students have allergies to certain plants. Many people are allergic to pollen or mold and exposure to these should be minimized or avoided.

v. Fertilizers or plant chemicals should be labeled and locked in cabinets and a Safety Data Sheet (SDS) filed for each. Students must never handle these chemicals. Wash hands and clean nails well after use of these chemicals. Chemical splash goggles (ANSI Z87.1) and gloves should be used when handling fertilizers and plant chemicals and precautions taken for dust hazard.

vi. Always wash hands thoroughly after handling plants, especially before eating food.

vii. A common classroom activity is seed sprouting or planting. Beans and seeds from a grocery store or specifically packaged for sprouting will be safer to handle and germinate.

viii. If studying soil, it is safer to use sterilized potting soil. When students study soil that is dug up from the outside, the teacher should monitor for the presence of thorns, sharp objects, and mold. If studying soil outdoors, have students use proper tools for digging up and examining the samples.

ix. Be careful when studying aquatic plants from ponds or marshes. Pond or marsh water may contain contaminants that could cause illness. Try to avoid direct contact with water or mud unless wearing gloves; wash hands thoroughly afterward.

x. Wash all surfaces thoroughly after plant activities.

5. Physical Safety

a. Heat and Fire

i. In elementary science, only hot plates and hot water baths may be used as a heat source. Open flames are not permitted. Hot plates should only be used by the teacher. Hot plates should be plugged into outlets with Ground Fault Circuit Interrupters (GFCI), and extension cords or outlet amplifiers (“surge strips”) should not be used.

ii. Chemical splash goggles must always be worn in a laboratory where a heat source is used.

b. Electricity

i. Prior to using any electrical equipment, teachers should carefully read the manufacturer's instructions. Teachers conducting labs or demonstrations with electrical equipment should be familiar with the dangers of electrical shock and its treatment. The best treatment is to avoid the situation through good safety procedures.

ii. When working with electrical equipment, only tools with properly insulated handles should be used. Metal articles such as rulers, pencils, pens, or probes should never be used to examine circuits

iii. **Batteries:** When working with batteries students should be advised of the dangers involved

- Short circuits and parallel circuits create a fire hazard due to the high currents present. Some batteries may cause a fire hazard if short-circuited. Teachers need to monitor student work with batteries in circuits to ensure that short circuits are not created.

- Batteries should never be stored with other materials, especially metal.

iv. Any time students are creating a circuit, they should draw a diagram first to identify possible short circuits. If possible, turn off all power when working on electrical equipment. The power leads should be the last connection made when assembling equipment and the first disconnected when disassembling equipment.

6. Light/electromagnetic radiation:

   Sunlight: Direct vision of the sun for even short periods of time can cause eye damage. Mirror-like reflections may also cause injury to the eyes. Sunglasses and exposed photographic film do NOT provide sufficient filtering power to reduce sunlight to safer levels. In fact, they may increase the injury caused by the sun by dilating the pupils of the eye while not blocking sufficient light, particularly in the Ultraviolet range. If experiments are done to observe the sun, they should project an image on white paper using a lens or "camera obscura". Measurements or observations can be made on the paper. Students should be educated on the dangers of staring at an eclipse of the sun (partial or total). These same precautions must be followed when using a bright light bulb to model the sun.

XIV. FIELD TRIPS:

The teacher must exercise direct control over student science activity in the classroom. However, many worthwhile and desirable science activities can occur outside the classroom and should be encouraged. Safety consciousness, instilled as part of the science instruction program, should influence these outside activities.

1. **Red Clay Consolidated School District Board Policies and Administrative Memoranda regarding field trips must be followed:** Prior to departure on a field trip, the teacher must issue Field Trip Permission Forms to each participating student. These forms must be signed by the parent or guardian and returned prior to the trip. These permission slips, as the name implies, give parental approval for the student to make the trip, but in no way diminish the teacher's responsibility for safeguarding the students.

Red Clay Board Policies:	7004: Field Trips
Red Clay Administrative Memoranda:	7004.1 Field Trips
	7004.2 Student Data Required for Field Trips
	8012.3 Assistance with Medications on Field Trips

2. **Student Data Cards:** Important information regarding a student's state of health, medical problems, medication, allergies, phone numbers, and other information,is found on the Student Data Cards filed with the nurse. See Administrative Memorandum 8018.01 Student Data Cards for more information.

3. **Trips to wilderness areas:** On biology or geology field trips to wilderness or undeveloped areas, the following special precautions are taken:

   a. **First aid:** At least one teacher should be trained in First Aid and equipped with a First Aid kit. CPR training is also recommended.

   b. **Clothing:** Students should be required to wear appropriate dry shoes and clothing suited to the weather and terrain.

   c. **Mosquitoes and Ticks:** If the trip is taken during mosquito/tick season, the clothing should be "pest-proofed" as much as possible (long pants, long sleeved shirts, buttoned collar, wrist and ankle bindings). Head coverings should also be worn. Students need to inspect themselves for ticks before retiring.

d. **Animals and Plants:** Students should never approach any animal discovered in the wild. They are invading the animal's habitat, and the animal may react dangerously. Mammals in the wild may carry rabies. Students should also never go near animal carcasses. The animal may not be dead, and the cause of death cannot be known for certain. Teachers must remind students not to collect unauthorized specimens nor to leave any refuse (trash) behind at the field trip site. Students should be briefed on the appearance of hazardous plants and animals in the vicinity.

4. **Supervision:** There must be one adult chaperone for every ten students on a field trip. If students require assistance with medications during a field trip, an adult may assist according to the provisions in 14 DE Administrative Code 817 (Medications and Treatments) and Administrative Memorandum 8012.3 (Assistance with Medications on Field Trips). Students should travel in pairs or in groups and agree on a rendezvous place and time. Other considerations for student safety on field trips may be informed by Individualized Education Plans (IEPs) or accommodation plans. These documents must be consulted by supervising teachers as needed.

OTHER CONSIDERATIONS:

Many other issues and considerations relevant to science safety are likely to arise in any given teaching situation. Teachers and administrators are encouraged to discuss and explore these and other safety concerns in department meetings, faculty meetings, and in other appropriate discussion forums. Teachers also need to maintain a regular ongoing discussion about safety with their students throughout the year.

If particular problems or concerns develop, teachers are encouraged to speak to their Building Science Safety Officer, their building administrators, or the District Science Supervisor.

Appendix A: Laboratory Safety Agreements

SECONDARY SCIENCE LABORATORY SAFETY AGREEMENT
Red Clay Consolidated School District

Student's name:_____

School:_____ Grade:_____ Date:_____

Science is an active, hands-on process. Every precaution is taken to make the laboratory a safer place to work. However, because of the serious consequences of mistakes or carelessness, safety can only be assured by complete cooperation and compliance with instructions. To ensure a safe learning environment, all students will be instructed in science safety. Students and parents/guardians will sign this agreement. Copies of the signed agreement will be kept by the teacher and the school, and be available to the student and parent/guardian.

1. Students will act responsibly in the laboratory at all times. Running, horseplay, and pranks are unsafe and will result in removal from class and disciplinary action.

2. Students must follow all directions, both written and spoken about laboratory procedures, safety precautions, and cleaning up. Students will dispose of all waste materials according to the teacher's instructions.

3. Students will wear proper clothing in the lab according to the teacher's instructions. This may include safety goggles, lab aprons, or gloves. Shoulder length hair, loose sleeves, and dangling jewelry must be tied back when using open flames or high-speed motors. If laboratory work involves caustic, corrosive, or hot chemicals, shoes must be closed toed .

4. Students must not eat, drink, chew gum, or place anything in the mouth in labs where chemicals are being used. Tasting chemicals is forbidden, even if the chemical is edible.

5. Unauthorized experiments are prohibited. Students may not remove equipment or supplies from the lab unless authorized by the teacher.

6. Students will know the locations of safety equipment and emergency exits. Students will notify the teacher of any hazardous conditions or damaged equipment. Students should work together to maintain a safer environment, but they must wait for direction from the teacher before correcting a hazardous situation.

7. Students will clean up after themselves. The workplace should remain neat and clutter free.

8. Students will use exceptional care when working with heat or electricity. Electrical appliances should only be handled with dry hands. Hot glassware should not come in contact with cold liquids. Open flames must never be left unattended. Heated items should be handled with appropriate apparatus (such as tongs or insulated gloves), never bare hands.

9. Students must adhere to all safety precautions concerning chemicals. Test tubes must be pointed away from others, especially when they are being heated. Students will wear appropriate personal protective equipment when handling chemicals as directed by the teacher.

10. If the room must be evacuated, close all containers and turn off any gas jets, electrical appliances, and water sources (in that order).

By signing below, I acknowledge that I have received training in the safe management of chemicals, and that I have been instructed on these safety rules and the consequences for not following them. I agree to follow all of the safety rules in this agreement. I also understand that other safety rules may apply to specific classroom activities that are not listed in this agreement. I will follow these rules as well and will follow common sense at all times. I am aware that any safety violation that results in unsafe conduct or misbehavior on my part may result in my removal from the classroom and/or further disciplinary action.

_____ _____

student signature parent signature

ACUERDO DE SEGURIDAD EN EL LABORATORIO

Distrito Escolar Consolidado Red Clay

Nombre del estudiante:_____

Escuela:_____ Grado:_____ Fecha:_____

La ciencia es un proceso activo y de manipulación directa. Se toman todas las precauciones para hacer el laboratorio un lugar más seguro para trabajar. Sin embargo, debido a las serias consecuencias de errores o descuidos, solo se puede lograr seguridad mediante la cooperación y el cumplimiento absoluto de las instrucciones. A fin de garantizar un ambiente de aprendizaje seguro, todos los estudiantes recibirán instrucción en seguridad científica.Los estudiantes y los padres / tutores firmarán este acuerdo. El maestro y la escuela mantendrán copias del acuerdo firmado y estarán disponibles para el estudiante y el padre / tutor.

1. Los estudiantes actuarán con responsabilidad en todo momento dentro del laboratorio. Las corridas, los juegos y bromas pesados y ruidosos y las travesuras son inseguros y serán causa de remoción de la clase y de medidas disciplinarias.

2. Los estudiantes deben seguir todas las directivas, tanto escritas como orales, sobre los procedimientos de laboratorio, medidas de precaución y limpieza. Los estudiantes dispondrán de todos los materiales de deshecho conforme a las instrucciones proporcionadas por el maestro.

3. Los estudiantes llevarán la vestimenta adecuada dentro del laboratorio de acuerdo con las instrucciones del maestro. Esto puede incluir anteojos de seguridad, delantales de laboratorio o guantes. El cabello largo hasta los hombros, las mangas sueltas y las joyas colgantes deben ser sujetados al trabajar con flamas al descubierto o con motores de alta velocidad. Si el trabajo de laboratorio implica el uso de sustancias químicas cáusticas, corrosivas o calientes, se debe llevar zapatos cerrados.

4. Los estudiantes no podrán comer, beber, masticar gomas de mascar ni colocarse nada en la boca dentro del laboratorio cuando se utilizan sustancias químicas. Está prohibido probar sustancias químicas, ni siquiera cuando la sustancia química es comestible.

5. Están prohibidos los experimentos no autorizados. Los estudiantes no podrán retirar equipos o materiales del laboratorio a menos que estén autorizados por el maestro.

6. Los estudiantes deberán conocer la ubicación de los equipos de seguridad y de las salidas de emergencia. Los estudiantes informarán al maestro sobre situaciones peligrosas o equipos dañados. Los estudiantes deben trabajar juntos para mantener un ambiente seguro, pero deben esperar las directivas del maestro antes de corregir una situación peligrosa.

7. Los estudiantes deberán limpiar lo que hayan ensuciado. El lugar de trabajo debe permanecer prolijo y ordenado.

8. Los estudiantes serán excepcionalmente cuidadosos al trabajar con calor o electricidad. Deberán tener las manos secas siempre que trabajen con aparatos eléctricos. No se deberá poner en contacto objetos de vidrio calientes con líquidos fríos. Nunca se deben dejar descuidadas flamas al descubierto. Los objetos calientes deben ser manejados con los dispositivos adecuados (como pinzas o guantes de material aislante), y nunca con las manos desprotegidas.

9. Los estudiantes deben cumplir con todas las precauciones de seguridad con respecto a los productos químicos. Los tubos de ensayo deben estar alejados de los demás, especialmente cuando se están calentando. Los estudiantes usarán equipo de protección personal apropiado cuando manipulen productos químicos según las indicaciones del maestro.

10. En caso de evacuación de la sala, se deben cerrar todos los contenedores y apagar todas las hornallas, aparatos eléctricos, y fuentes de agua (en este orden).

Al firmar a continuación, Reconozco que he recibido capacitación en el manejo seguro de productos químicos y que he recibido instrucciones sobre estas reglas de seguridad y las consecuencias por no seguirlas. .Estoy de acuerdo en seguir todas las reglas de seguridad en este acuerdo. También entiendo que otras reglas de seguridad pueden aplicarse a actividades específicas del salón de clases que no están incluidas en este acuerdo. Seguiré estas reglas también y seguiré el sentido común en todo momento. Soy consciente de que cualquier violación de seguridad que resulte en una conducta insegura o mal comportamiento de mi parte puede resultar en mi expulsión del salón de clase y / o una acción disciplinaria adicional.

._____ _____

Firma Estudiante Firma del Padre

ELEMENTARY SCIENCE SAFETY AGREEMENT

Red Clay Consolidated School District

Student's name:_____

School:_____ Grade:_____ Date:_____

Science is an active, hands-on process. Every precaution is taken to make the laboratory a safe place to work. However, accidents happen every day in many activities. Few accidents have occurred in the elementary science classroom. However, in order to decrease the chances of any accidents occurring

1. Students will follow the teachers written and oral instructions carefully. Ask questions if you do not understand what to do.

2. Students will not taste, eat, drink, or inhale anything used in science activities.

3. Keep your hands away from your face, eyes, and mouth during science activities. Wash your hands after science activities.

4. Always wear goggles when chemicals, glass, or heat are being used and when there is a risk of eye injury from flying objects.

5. Tell the teacher if you see something/someone being unsafe.

6. Notify the teacher immediately if you have an accident or an injury, even if the injury is small.

My teacher has explained these safety rules and what will happen if I do not follow them. I understand and agree to follow all of the safety rules in this agreement.

I have received training on the safe management of chemicals from my teacher.

I also understand that other safety rules may apply to specific classroom activities that are not listed in this agreement.

I will follow these rules as well and will use common sense at all times

_____ _____

student signature parent signature

ACUERDO DE SEGURIDAD PARA CIENCIA DE estudianteS DE PRIMARIA

Distrito Escolar Consolidado Red Clay

Nombre del estudiante:_____

Escuela:_____ Grado:_____ Fecha:_____

La ciencia es un proceso activo y práctico. Se toman todas las precauciones necesarias para hacer que el laboratorio sea un lugar seguro donde trabajar. Sin embargo, todos los días ocurren accidentes en muchas actividades. En la clase de ciencia de primaria han ocurrido pocos accidentes. No obstante ello, a fin de disminuir la probabilidad de que ocurran accidentes se establecen las siguientes normas.

1. Los estudiantes seguirán cuidadosamente las instrucciones escritas y verbales de los maestros y harán preguntas si no comprenden lo que deben hacer.

2. Los estudiantes no probarán, comerán, beberán ni inhalarán sustancia alguna usada en las actividades de ciencia.

3. Mantener las manos lejos de la cara, ojos y boca durante las actividades de ciencia. Lavarse las manos después de las actividades de ciencia.

4. Usar siempre gafas de seguridad cuando se usen químicos, vidrio o calor y cuando exista riesgo de daño ocular de objetos voladores.

5. Avisarle al maestro en caso de ver algo/alguien que no sea seguro.

6. Notificar de inmediato al maestro en caso de tener un accidente o lesión, aun si la lesión es pequeña.

Mi maestro me ha explicado estas reglas de seguridad y lo que sucederá si no las sigo. Entiendo y estoy de acuerdo en seguir todas las reglas de seguridad en este acuerdo.

He recibido capacitación sobre el manejo seguro de productos químicos de mi maestro.

Comprendo y me comprometo a seguir todas las normas de seguridad establecidas en este acuerdo.

También comprendo que se pueden aplicar otras normas de seguridad a actividades específicas realizadas en clase no listadas en este acuerdo.

También seguiré dichas normas y usaré el sentido común en todo momento.

_____ _____

Firma del Estudiante Firma del Padre

Appendix B: Classroom/Laboratory and Chemical Storeroom Inspection Checklists

(**NOTE:** These documents will be electronic. They are included here for information only.)

SCIENCE SAFETY INSPECTION CHECKLIST

This form is completed for every classroom where secondary science (grade 6-12) is taught in Red Clay Consolidated School District. Inspections are completed by the Red Clay Chemical Hygiene Officer once per school year. Results are sent to the building principal and to the Manager of Facilities and Maintenance.

Evaluator :_____ Date:_____

School: _____ Room Number: _____

Classes taught (check all that apply)

- biology
- chemistry
- physics/physical science
- earth science
- environmental science

Appropriate safety equipment

Check all of the following that are seen in or accessible to the classroom

Safety Equipment	**present (yes/no)**	**Tested (frequency/no/NA)**	**Defective (yes/no)**	**Comments**
Chemical Splash goggles (ANSI Z87.1)				
eyewash				
safety shower				
ABC fire extinguisher				
fire blanket				
chemical fume hood				
Other (specify)				

Emergency safety equipment is 10 seconds from any location in the room Yes No

Eyewash, safety shower, and fire extinguisher are unobstructed and unaltered. Yes No

All equipment is in good working order. Defective equipment is removed from the work area yes no

Only science classes meet in this classroom. yes no

Broken glassware is discarded in a separate container from regular trash. yes no NA

Evacuation procedures are posted in the classroom. yes no

Students and parents have signed a district safety agreement. Copies of agreements are on file yes no

Chemicals are locked away from students when not in use. yes no

Comments (please refer to specific items)

Chemical Storage and Use Checklist

School_____ **Date _____**

Evaluator _____ **Chemical Storeroom location_____**

School has up-to-date chemical inventories and paper copies of SDS for each chemical in the chemical storeroom. yes no

Chemical storeroom is locked when not in use. yes no

The National Fire Protection Association (NFPA) "diamond" is posted at all chemical storeroom entrances denoting the most hazardous chemical in each category within. yes no

Comments

Chemical Storeroom Specifications

Chemicals are arranged by NIOSH chemical compatibility codes (e.g. halides, sulfates, etc) yes no

Special storage cabinets are provided for oxidizers, acids, and/or flammables. yes no NA

Store chemicals in appropriate places e.g., below eye level. All chemicals are stored on shelves or cabinets off the floor. yes no

Chemical storeroom has a fully stocked spill kit. yes no

Chemical storeroom contains an ABC fire extinguisher. yes no

Permanent storage area is properly marked and is locked. Students do not have access to this area. yes no

Storage shelves are securely attached to the walls. Provisions are made to prevent chemicals from slipping or rolling off shelves (e.g. 2.5 cm lips on shelves) yes no

Chemical storeroom is vented to the outside. Air is pulled from the floor to the ceiling. yes no

Comments

Chemical Purchasing, Labeling, Storage, and Disposal Checklist

Chemicals and amounts are appropriate for use within the next three years yes no

Chemicals are labelled with name (or formula), date of receipt, and hazard information yes no

Chemical can be stored and disposed of properly and safely. Chemical is appropriate for k-12 public schools. yes no

Appendix C—Appearance of Poisonous Plants That Pose a Hazard

1. Poison Ivy:

Poison Ivy, shown here with box elder.

- Grows among other plants.
- Three leaflets per branch
- Leaves have a shiny covering. Leaves are green, darkening over the summer.
- Leaflet have a jagged "mitten-shape" ("looks like mittens, itches like the dickens")
- Forms small white berries
- All parts cause painful itching within two days of contact. This characteristic is shared with poison oak and poison sumac.

2. Poison Oak:

Similar appearance and distribution to poison ivy. Leaves tend to be more oval and irregular than poison ivy.

3. Poison Sumac:

Smooth leaves, red stems, grows in wetlands, usually in muddy soils.

4. Stinging nettle:

- Plant grows in summer, about 1-2 meters tall.
- Soft green leaves 3-15 cm long. Leaves are serrated on the edges and covered in fine hairs (trichomes), which break off and stick to skin.
- Contact with trichomes releases chemicals which cause itching, stinging, and burning within seconds. Effects are temporary, but may last up to 12 hours.

5. Jimsonweed

- Dark green toothed leaves 8-20 cm long. When crushed, leaves have a foul odor.
- Trumpet shaped white flowers.
- Spiked green seed pods.
- All parts of the plant are poisonous. Ingestion of plant parts may include fever, extreme dry mouth, confusion, hallucinations, rapid heartbeat, and pupil dilation. Untreated or excessive intoxication may result in death.

Appendix D: Forms and Logbooks (note: these documents are for internal use in Red Clay)

1. Red Clay Request for Prior Authorization of New Science Procedures

2. Chemical Storage Log (including sample entries with suggested actions--make a copy of the Google Sheet for building use)

3. Testing and Maintenance Log (make a copy of the Google Sheet for building use)

4. Safety Drill Logbook (make a copy of the Google Sheet for building use).

5. Delaware Department of Education Surplus Chemical Disposal Letter--yes

6. Delaware Department of Education Surplus Chemical Disposal Letter--no

7. Delaware Department of Education Compliance Assurance of Chemical Safety

Web Links:

A. **Red Clay Consolidated School District links:**

School Board Policy 5009: Maintenance

School Board Policy 7004: Field Trips

Administrative Memorandum 5012.3: Safety and Security Guidelines for Schools

Administrative Memorandum 7001.4 Science Safety.

Administrative Memorandum 7004.1 Field Trips

Administrative Memorandum 7004.2: Student Data Required for Field Trips

Administrative Memorandum 8012.3: Assistance with Medications on Field Trips

Administrative Memorandum 8018.01: Student Data Cards

Red Clay Student Code of Conduct

B. **State of Delaware links:**

14 DE Admin. Code 885: Safe Management and Disposal of Chemicals in the Delaware Public School System

16 DE Code 24 Hazardous Chemical Information (Hazardous Chemical Information Act)

Safety First--Safe Instructional Practices in the Classroom and Laboratory (https://regulations.delaware.gov/AdminCode/title14/800/2011SafetyFirstManual.pdf)

C. **Safety resources from professional association and organization websites:**

American Chemical Society https://www.acs.org/content/acs/en/chemical-safety/resources.html

American National Standards Institute https://blog.ansi.org/

International Technology and Engineering Association
https://www.iteea.org/Resources1507/Safety.aspx

Laboratory Safety Institute https://www.labsafety.org/

National Fire Protection Association https://nfpa.org/Codes-and-Standards

National Science Educator Leadership Association (https://www.nsela.org) (membership required for safety resources)

National Science Teaching Association https://www.nsta.org/safety/

D. **Federal government websites:**

Centers for Disease Control and Prevention www.cdc.gov

Environmental Protection Agency www.epa.gov

Globally Harmonized System for Hazard Communication
https://www.osha.gov/dsg/hazcom/global.html

National Institutes of Health www.nih.gov

National Institute for Occupational Safety and Health https://www.cdc.gov/niosh/index.htm

Occupational Health and Safety Administration: "Occupational exposure to hazardous chemicals in laboratories." 29 CFR 1910.1450

E. **Other links:**

Carolina Biological Supply Co. https://www.carolina.com/

Fisher Science Education: https://www.fishersci.com/us/en/education-products.html

Flinn Scientific (includes free on-line safety videos) https://www.flinnsci.com/

Hazardous Waste Management Program of King County, Washington ("Rehab the Lab")
https://www.hazwastehelp.org/educators/rehabthelab.aspx

National Academies Press (many safety publications are available for free download):
https://www.nap.edu/

Washington Administrative Code (WAC) Chapter 296-841 Airborne Contaminants (Permissible Exposure Limits (PEL)).

F. **Printed Resources**

Flinn Chemical & Biological Catalog/Reference Manual, 2020 edition

Furr, A.K. *CRC Handbook of Laboratory Safety,* 5th Edition. Boca Raton, FL, CRC Press, 2000.

Motz, L., J. Biehle, and S. West. 2007. *NSTA Guide to Planning School Science Facilities, 2nd ed.* Arlington, VA: NSTA Press.

National Research Council. 2011. *Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards.* Washington DC, The National Academies Press.

Roy, K. *Safer Science: Be Protected!* Volume 1 and 2.

Roy, K.R. & Love, T.S. (2017). *Safer Makerspaces, Fab Labs and STEM Labs: A Collaborative Guide!* National Safety Consultants, LLC.

Ryan, K (2001). *Science Classroom Safety and the Law--A Handbook for Teachers* Batavia, IL, Flinn Scientific, Inc.

Stroud, L., and K. Roy. 2015. *Science Laboratory Safety Manual* (Third ed.). Raleigh, NC: Science & Safety Consulting Services.