Teaching Science Lab Safety

A Guide for K-12 Science Educators

2nd Edition

by Erin Colfax

The Laboratory Safety Institue
Natick MA, 01760

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edited by Christina Dillard

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Erin Colfax

The Laboratory Safety Institute
192 Worcester Road, Natick, MA 01760
508-647-1900 Fax: 508-647-0062

Email: Info@LabSafetyInstitute.org
Website: www.LabSafetyInstitute.org

Dedicated to my
husband Matthew Colfax

You have never held me
Back from advancing
my career or educational
pursuits. Your support
has given me a chance
to continue living the
dream of experiencing
science on all seven
continents and sharing my
observations with others.

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ORIGIN OF PROJECT / GUIDE IDEA

Teaching Science Lab Safety: A Guide for K-12 Science Educators was designed to provide teachers and students with a sense of personal security and awareness in the science laboratory. Its creation was derived from the unfortunate fact that, in schools across the country, science safety is one aspect of the curriculum where too little time is spent. Accidents seem to occur on a regular basis in the school science laboratory and students and teachers are being injured. The demand for an intense and full science curriculum has limited the time spent on laboratory safety. As a result, colleges tend to have new teachers concentrate on mastering the most material rather than adequately teaching them about the strong need for safety practices and coverage in the laboratory classroom. Furthermore, most science teachers tend to spend only the first few days of a school year on science laboratory safety. Most lectures on this area consist of handing out student safety laboratory contracts and orally going over them.

After attending a Flinn Scientific Safety Lecture, participating in the Schering-Plough / NJ BISEC Summer Institute, and teaching in both private and public schools in New Jersey, I felt it was imperative that teachers not only orient themselves about laboratory safety, but inform their students as well. At the time this guide was created, I was inspired by my colleagues and students at Holy Family School to provide science teachers with an array of activities to stimulate thinking and promote safety awareness among students at all levels. In addition, the guide will enable teachers to teach several lessons about science safety and to bring peace of mind to the teacher, school administration, students, and parents.

Erin Colfax
Science Educator

A NOTE ABOUT SAFETY

Safety is an important concern in all laboratory activities. However, no safety guide can alert you to all of the hazards or anticipate the limitations of every student. Therefore, the methodologies in this guide or any safety guide cannot prevent all accidents from occurring. When you follow any of the methods described in this guide, you assume responsibility for your students and your own personal safety. Keeping informed about the current safety practices and exercising common sense are the keys to conducting safe and exciting laboratory activities.

When in doubt … ask. *But, be certain to ask someone who knows the answers.*

GUIDE OVERVIEW:

Overview

Objectives: By the end of these lessons . . .

- Teachers will know methods of preparing the classroom laboratory for safe use by students and teachers.
- Teachers will become familiar with types of science safety rules and regulations that must be adhered to in the science laboratory classroom.
- Teachers will recognize the need for teaching multiple lessons and assessing for understanding the practice of science laboratory safety.
- Students should be able to conduct a laboratory activity safely and display a level of personal responsibility.
- Students will identify first aid and safety equipment around the classroom.
- Students will be aware of regulations set forth and expectations by the teacher concerning laboratory safety.
- Students will identify instruments used in the science classroom laboratory.
- Students will recall safety rules and instruments used in the classroom science laboratory.
- Students will create posters of science safety principles for easy recognition in the classroom.
- Students will become aware of the Safety and Environmental concerns and measures taken to ensure their own and others' personal safety in the classroom.

Materials:

Computer with internet access, computer projector, overhead projector, or large monitor, rulers (2), colored markers (2 sets), poster boards (3), masking tape (3 rolls), Scissors (4), photocopies of: safety symbols (1), first aid symbols (2), pencils (2), photocopy laboratory activities, lab safety check list (1), safety improvement list (1), laboratory safety rule agreement and rules (As many as there are students), first aid in the science classroom (As many as there are students), safety violation tickets (20), safety quizzes (As many as there are students), glow germ product(1), UV light (1) and Student Apparatus List

Worksheet (As many as there are students).

Guide Description:

This guide was designed to provide teachers and students with a sense of personal security and awareness in the science laboratory. It is imperative that teachers not only orientate themselves about laboratory safety, but inform their students as well. The guide will provide the teacher with an array of activities to promote thinking and stimulate safety awareness among students. In addition, the knowledge contained in this guide will bring peace of mind to the teacher, school administration, students, and parents. Please feel free to modify any of the original text pieces to fit your school's personal science program. This guide correlates with the National Science Education Standards.

NSES: Teaching Standard "D"**:** Teachers of science design and manage learning environments that provide students with the time, space, and resources needed for learning science. In doing this, teachers

- Structure the time available so that students are able to engage in extended investigations.
- Create a setting for student work that is flexible and supportive of science inquiry.
- Ensure a safe working environment.
- Make the available science tools, materials, media, and technological resources accessible to students.
- Identify and use resources outside the school. Engage students in designing the learning environment.

NSES: Teaching Standard "E": Teachers of science develop communities of science learners that reflect the intellectual rigor of scientific inquiry and the attitudes and social values conducive to science learning. In doing this, teachers

- Display and demand respect for the diverse ideas, skills, and experiences of all students.
- Enable students to have a significant voice in decisions about the content and context of their work and require students to take responsibility for the learning of all members of the community.
- Nurture collaboration among students.
- Structure and facilitate ongoing formal and informal discussion based on a shared understanding of rules of scientific discourse.
- Model and emphasize the skills, attitudes, and values of scientific inquiry.

LESSONS:

❑ Teacher Lesson

Objectives: Teachers will know methods of preparing the classroom laboratory for safe use by students, teachers, and visitors. Teachers will become familiar with types of science safety rules and regulations that must be adhered to in the science laboratory classroom. Teachers will recognize the need for teaching a unit on science classroom laboratory safety.

- **Read all pages of this guide prior to teaching the lessons.**
- Design and alter any media, or study guides provided in this guide in order to adapt to your personal needs.
- Establish a science safety log in your classroom.

❑ Student Lesson 1

Objective: Students will become aware of the Safety and Environmental concerns and measures taken to ensure their personal safety in the classroom.

- Present the "Student Safety Orientation" via computer and/ or projector overhead.
- Identify the safety measures being taken in the classroom.

❑ Student Lesson 2

Objective: Students will be aware of regulations set forth and expectations by the teacher and school concerning laboratory safety. Students will become aware of the safety concerns and measures taken to ensure their personal safety in the classroom.

- Hand out the packet of safety rule agreements and first aid awareness information.
- Have each student read the "Laboratory Safety Rule Agreement" and "First Aid in the Laboratory" sheets silently to themselves.

- Go over each safety rule orally with students and make them aware of teacher expectations.

- Have students sign and date these papers and bring home for parent / guardian review and signature.

❑ Student Lesson 3

Objective: Students will identify first aid and safety equipment around the classroom. Students will create posters of science safety principles for easy recognition in the classroom. Students will become aware of the Safety and Environmental concerns and measures taken to ensure their personal safety in the classroom.

- Collect student "Laboratory Safety Rule Agreements" that were signed for homework.

- Start off the class period making an analogy between the kitchen and a science laboratory.

- Assign lab groups and conduct the "Science Laboratory Safety Day" Lab.

- Summarize the laboratory exercise conducted that day.

❑ Student Lesson 4

Objective: Students will identify instruments used in the science classroom laboratory.

- Hand out the Apparatus List for student use worksheet.

- Identify and show examples of each piece of laboratory equipment that will be used in the school science laboratory.

- Explain how each piece of equipment is used.

- Review and highlight safety procedures in the classroom in preparation for the science safety quiz.

❑ Student Lesson 5

Objective: Students will recall safety rules and instruments used in the classroom science laboratory.

- Science Safety Quiz

❑ Student Lesson 6

Objective: Students should be able to conduct a laboratory exercise safely and display a level of personal responsibility.

- Return science safety quizzes.
- Conduct a simple introductory science laboratory exercise in order to observe students following science safety rules and guidelines.

❑ Evaluation

Evaluations for the safety practices encouraged by this guide are ongoing. The initial form of assessment can be made after a student takes the safety assessment quiz. Students should not be permitted to participate in any laboratory exercise if he or she has not received a 100% on the quiz. If a teacher chooses to allow a student to participate in laboratory exercises without displaying a solid knowledge in science laboratory safety they may be placing themselves and their students at risk. Additional assessments can be made regularly by observing student practices in the laboratory. Teachers can further assess students by requiring a safety segment in each laboratory exercise write up.

Furthermore, to reinforce student acknowledgement and retention of laboratory safety measures, teachers can continually remind students of safety hazards and methods of protecting oneself in the laboratory as such situations arise.

Monthly safety assessment workshops should be held in each laboratory class, to refresh students of safe laboratory practices.

It is important for teachers to document in a classroom laboratory log all safety measures taken in the laboratory in order to protect their students and themselves.

TEACHER LESSON

Objectives:

Teachers will know methods of preparing the classroom laboratory for safe use by students, teachers, and visitors. Teachers will become familiar with types of science safety rules and regulations that must be adhered to in the science laboratory classroom. Teachers will recognize the need for teaching a unit on science classroom laboratory safety.

Chapter 1

Instructions:

- **Read all pages of this guide prior to teaching this program.**
- Redesign or modify any of the media, or study guides provided in this program packet in order to adapt to your personal teaching and classroom needs. (Photocopies may be made of any materials.)
- Establish a science safety log in your classroom.
- Develop a chemical supply list for individual laboratories you and your students will be using.
- Duplicate Science Laboratory Incident Report Forms for future use.
- Fill out animal use protocol review sheets for individual animals that will be caged in the laboratory as either pets, teaching aids, or for future investigations.
- **Keep all forms on file as a precaution and form of protection in case questions arise in reference to the science safety instructions and precautions you have taken as the teacher.**

LABORATORY LOG

Teacher: _____ School Year: _____

Class: _____ Date: _____

Students Absent: _____

_____

Title of Laboratory Investigation: _____

_____

Equipment and Materials Used: _____

_____

_____

_____

Possible Hazards:

- ❑ Chemical: _____
- ❑ Biological: _____
- ❑ Electrical: _____
- ❑ Physical: _____
- ❑ Mechanical: _____
- ❑ Noise: _____
- ❑ Radiation: _____
- ❑ Stress: _____
- ❑ High/ Low Pressure: _____

Safety Precautions Taken: _____

_____

_____

Attach a copy of the laboratory sheet to this log sheet. If the laboratory exercise was taken from a text, write the name of the text and the page number on this sheet somewhere.

CHEMICAL SUPPLY LIST
SCHOOL SCIENCE LABORATORY

School / Science Laboratory Information:

School Address:

_____ Room Number: _____

_____ School Phone: _____

_____ Science Teacher: _____

School Year: _____

Science Laboratory Chemical Supply List:

Name of Chemical	Amount of Chemical	Type of Container	Location	Date of Purchase	MSDS

This is a list of chemicals that are stored in the school science laboratory. Some of these chemicals may be hazardous or could potentially cause a chemical reaction if not handled and stored properly. Use caution when handling chemicals.

SCHOOL ANIMAL USE FORM

(Complete a separate form for each species)

If the animal is a vertebrate, this protocol ***must*** be followed.

Teacher: _____ Classroom: _____

School: _____ Animal Species: _____

Anticipated beginning and ending dates of animal study: _____

1. Overview
   a. Describe the intent of the animal usage in the classroom: _____
   _____
   _____

   b. Describe the qualifications of the instructor to handle animal usage: _____
   _____
   _____

   c. Describe the source of the animal: _____
   _____
   _____

2. Animal Subjects
   a. Species: _____
   b. Sex: _____
   c. Size (Length): _____
   d. Weight: _____
   e. Age: _____
   f. Source: _____
   g. Number of Species housed together: _____
   h. Known disease(s) carried by animal: _____

3. Animal Housing and Care
   a. Housing: _____
   b. Bedding: _____
   c. Diet: _____
   d. Water: _____
   e. Lighting: _____
   f. Sanitation Schedule:
      i. Cage washing: _____
      ii. Receptacle Washing: _____
      iii. Host Room Washing: _____

4. Host Room
    a. Lighting: _____
    b. Temperature: _____
    c. Noise: _____

5. Disposal of dead Animals (check all that are appropriate)
    a. ____ Disposal Company
    b. ____ Incinerate
    c. ____ Discard
    d. ____ Burial

6. Nature of Risk
    a. What risk does the animal present to those who will be interacting with it?

    _____
    _____
    _____
    _____

    b. What safety precautions will be taken to ensure minimal risk to students, the instructor and the animal?

    _____
    _____
    _____
    _____

Signatures:

I affirm that I am the principal instructor who will be working with the animals in the above review and have completed this form honestly and accurately to ensure safety of the animal subjects and those who will be interacting with it. If additional research is to be done with the animal subjects, I will consult and act in accordance with the USDA Animal Welfare Act and the PHS Guide for the care and Use of Laboratory Animals.

_____ _____

Instructor's Signature Date

I acknowledge that the animals in this review will be housed in our facility and will be treated and cared for in accordance with that which was covered by this animal review form.

_____ _____

Principal's Signature Date

SAFETY VIOLATION TICKET

SAFETY VIOLATION

Date:

Student:

Teacher:

Violation: _____

_____

_____

Penalty:

You have violated a safety rule in the science lab. As a result, five points have been deducted from your lab grade.

STUDENT LESSON 1

Objective: Students will become aware of the safety concerns and measures taken to ensure their personal safety in the classroom.

Present the "Student Safety Orientation" via computer and / or projector/ overhead.

- While showing power point slides, identify the safety measures being taken in your individual classroom. *It will be necessary for individual teachers to modify the presentation provided or create one of their own.* It may be best to use the one included with this unit as a guideline to create your own. If you want to include images in your presentation, consider using images from clip art or the Internet. (Images really enhance the power point presentation.) If you do not have access to multimedia equipment, make transparencies of each slide of the "Student Safety Orientation," to show to students.

Chapter 2

- This student safety orientation lesson is designed to fit in a time block of 55 minutes. Do not rush this lesson. Some teachers find that a 55-minute lecture is way too long. If the teacher feels that this applies to their classes, then consider dividing this lesson into sections of 20-minute segments, using a different instructional technique for each section. It is vital that students are made aware of the safety measures in place. The method by which the information is communicated to the students should be varied and fit the individual teaching style of the teacher.

- Encourage students to take notes on the information that is presented. The questions on the quiz, which will be given in another lesson, are derived from the information found throughout the "student safety orientation" and other future lessons.

- **LESSON SUGGESTIONS:**

  - **Example 1:**

    A short 20-minute segment may contain information in slides 1-4. The teacher may want to start by having students get into small groups and review the room for possible hazards. Then after five minutes, have the group return and discuss the hazards that they were able to identify. This activity would allow the teacher to easily transition into the first 4 slides of the safety orientation.

- **Example 2:**

  Another short 20-minute segment could have students developing rules that they feel would be important to following while conducting laboratory activities. The teacher could then transition into the safety orientation.

- **Example 3:**

  A good introduction lesson to proper safety practices and emergency equipment would be to have students participate in on-line training. On-line training can be a great resource, however, it is important that the teacher previews all materials first, in order to determine whether or not the training is at an appropriate level and is necessary and relevant.

- **Example 4:**

  Hold a telecommunications conference or live interview with the local fire chief. Instruct the chief to speak about what individuals should do in case of a fire in school. This video would provide a good introduction to the "Emergency Responders" Slide.

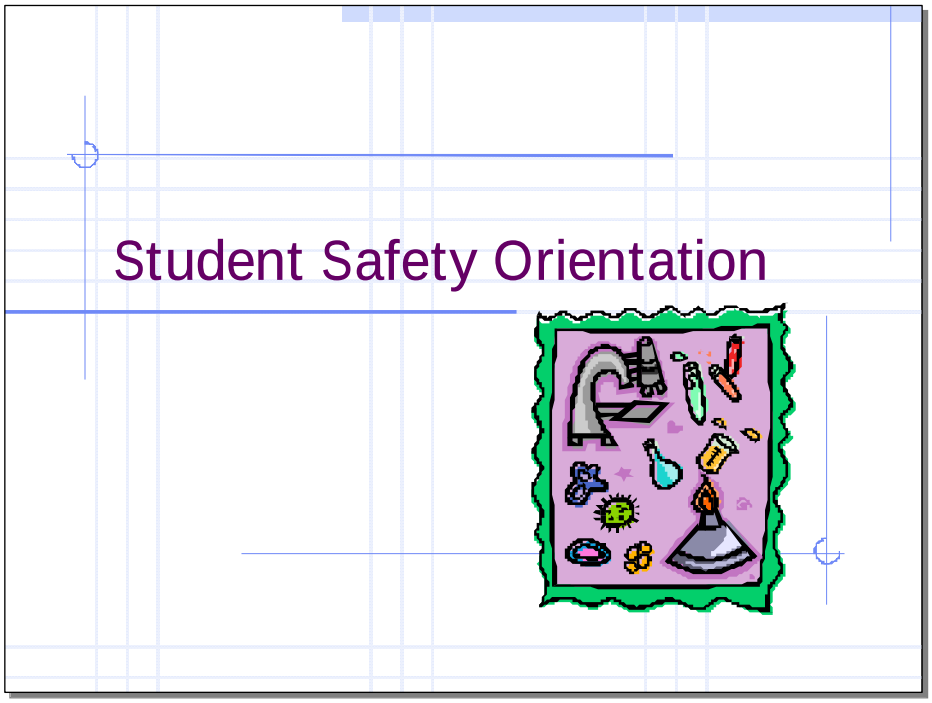
INFO LINK

Suggestions for On-Line Training:
http://www.pp.okstate.edu/ehs/MODULES/home.htm

http://www.free-training.com/osha/ppe/ppemenu.htm

➢ All Forms and symbols mentioned in the "Student Safety Orientation," are included throughout this guide. (Lab Safety Rule Agreement, Incident Report, Emergency Cards, Lab Safety Forms, Safety Quiz, and Safety Violation Tickets)

➢ In the "Resource" section of this guide there is a list of "Support Resources" to help teachers gain solid content basis on specific science safety topics. These resources include internet sites, books, journals, and videos.



Notes:

Origin of Safety Rules
School Rules
Classroom/Laboratory Rules
Lab Safety Rule Agreement
National Science Education Standards
National Science Teachers Association

Notes:

Accidents & Injuries

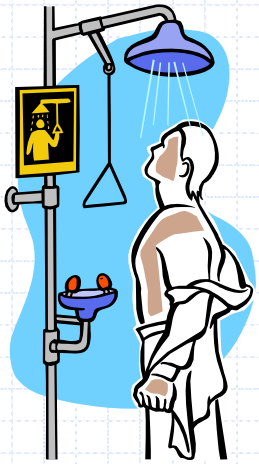
- The student must immediately report all accidents to the teacher
- The teacher must immediately contact the school nurse
- The school nurse must decide if medical care is necessary
- An incident report must be completed; one copy to parent, teacher, nurse, and school administration

Notes:

Emergency Equipment

The location and proper use must be covered for:

- Eye Wash Stations
- Safety Showers
- Classroom Phones
- Fire Blanket
- Emergency Pull Boxes
- Fire Extinguishers
- First Aid Kits
- Emergency Shut Offs



Notes:

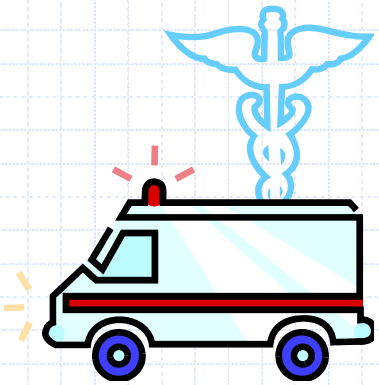
Preparing for an Emergency

- Evacuation Drills
- Locate Emergency Exits
- Identify Emergency Meeting Locations
- Discuss Shutdown Procedures

Notes:

Emergency Responders

- Teacher
- School Nurse
- Fire Department
- Emergency Medical Technicians
- CPR/First Aid/AED Certified Teacher

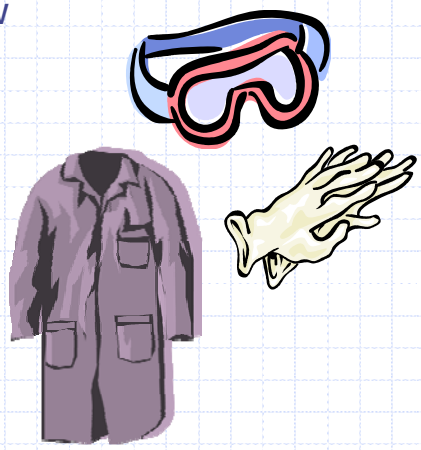


Notes:

Personal Protective Equipment

Discuss When and How to Use ...

- Eye Protection
- Face Protection
- Gloves
- Clothing
- Closed Toe Shoes
- Lab Coat / Apron
- Hair Ties



Notes:

Allergy & Asthma Communication

Information must be given on:

- Lab Safety Forms
- Emergency Cards

Notes:

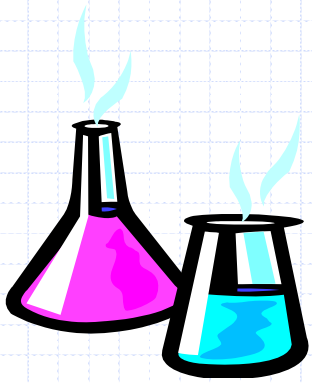
Animal & Plant Allergy Prevention

- Known allergies must be indicated on laboratory safety forms
- Early detection and intervention is important
- Notify teacher allergy symptoms maybe starting

Notes:

Routes of Allergen and Chemical Exposure

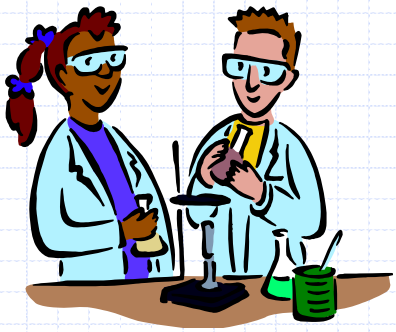
- Inhalation of aerosols, fumes, powders
- Skin/Eye Contact
- Ingestion of dander, scales, fur, urine, saliva from classroom animals
- Ingestion of pollen from classroom plants
- Injection through cuts or sharps use



Notes:

System of Communicating and Limiting Exposure

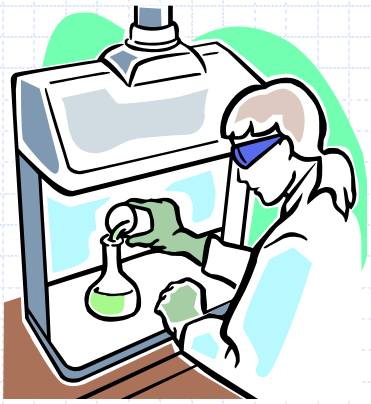
- Teacher to Student Communication
- Well Equipped Classroom Environment
- Personal Protective Equipment



Notes:

Methods of Exposure Control

- Personal Protective Equipment
- Engineering Controls
  - Fume Hoods
  - Room Air Exhaust/Ventilation
  - Windows and Doors
  - Master Shut Offs
- Administrative Controls
  - Class schedule
  - Sanitary Lab Stations
  - Proper Laboratory Techniques and Instruction



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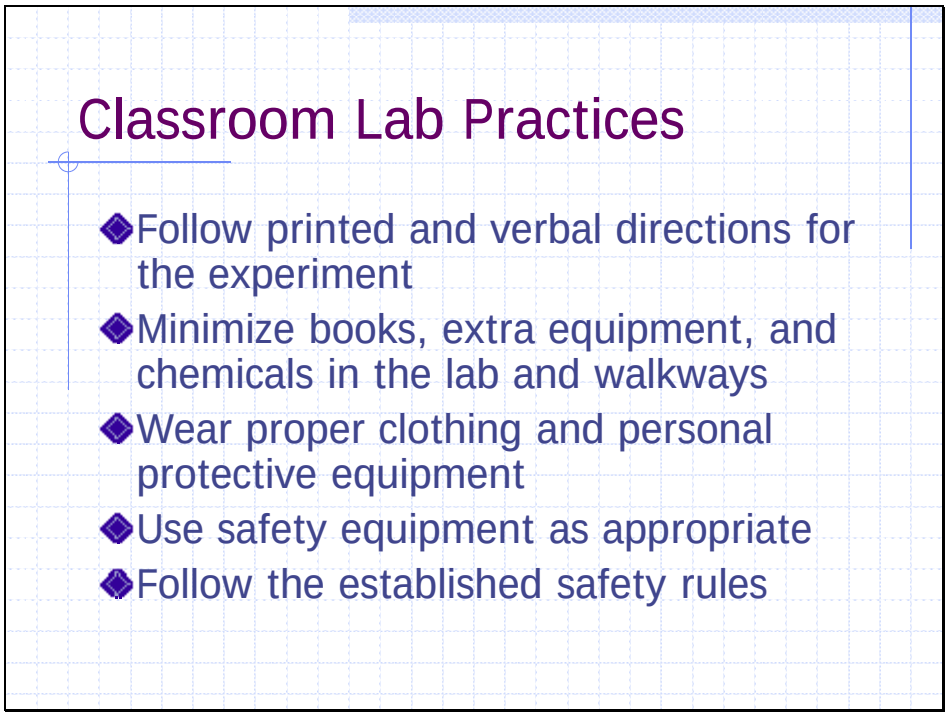
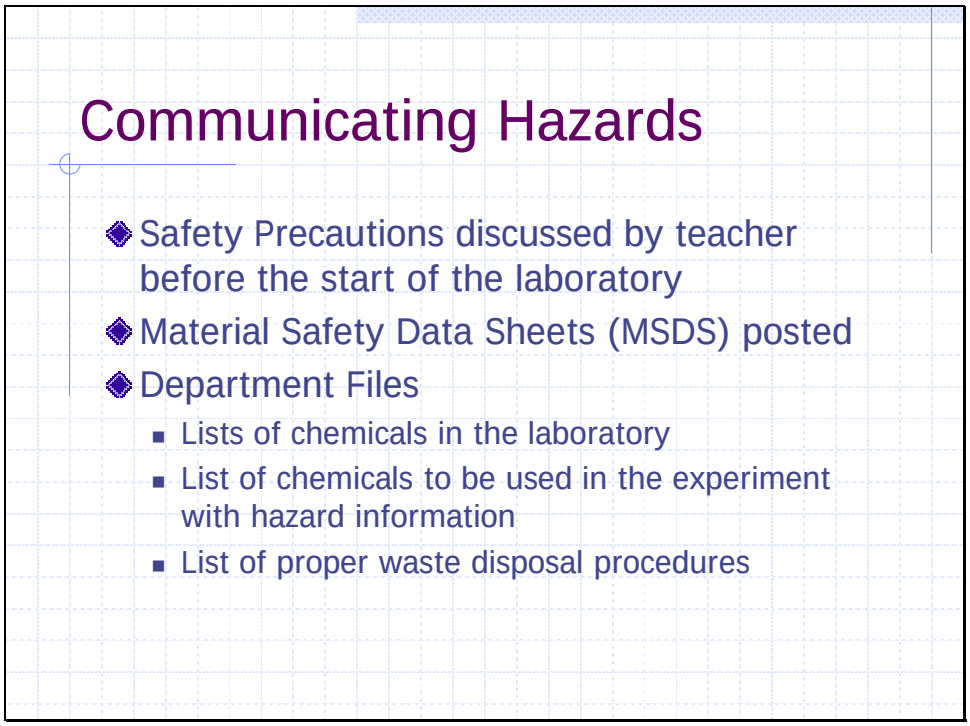

Classroom Lab Practices
Follow printed and verbal directions for the experiment
Minimize books, extra equipment, and chemicals in the lab and walkways
Wear proper clothing and personal protective equipment
Use safety equipment as appropriate
Follow the established safety rules

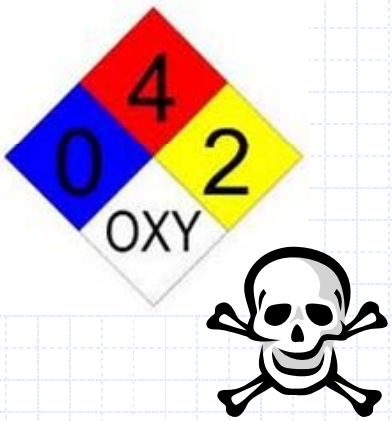
Notes:


Communicating Hazards
Safety Precautions discussed by teacher before the start of the laboratory
Material Safety Data Sheets (MSDS) posted
Department Files
Lists of chemicals in the laboratory
List of chemicals to be used in the experiment with hazard information
List of proper waste disposal procedures

Notes:

Chemical Labeling

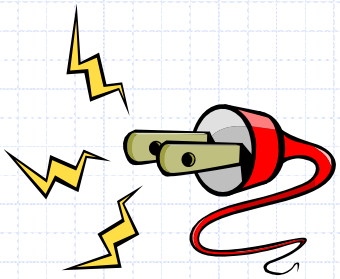
- Red : Flammability
- Blue : Health
- Yellow : Reactivity
- White : Specific Hazard
- Signal Words on Labels:
  - Danger: extreme hazard
  - Warning: moderate / intermediate hazard
  - Caution: lower hazard



Notes:

Classroom Hazard Signs

- Chemical Awareness
- Biological Awareness
- Electrical Awareness
- Physical Awareness
- Mechanical Awareness
- Noise Awareness
- Radiation Awareness
- Stress Awareness
- Hi / Low Pressure Awareness



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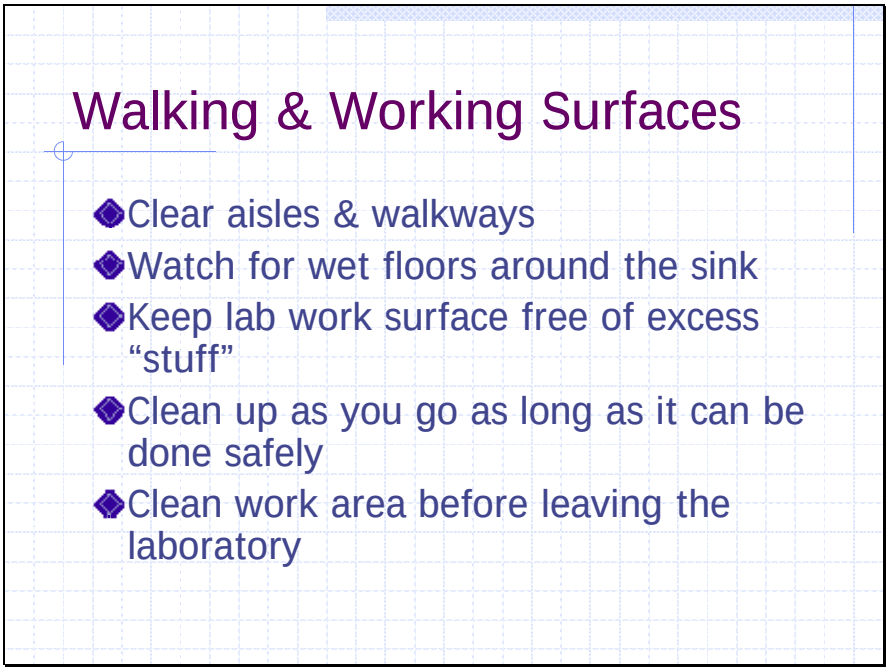
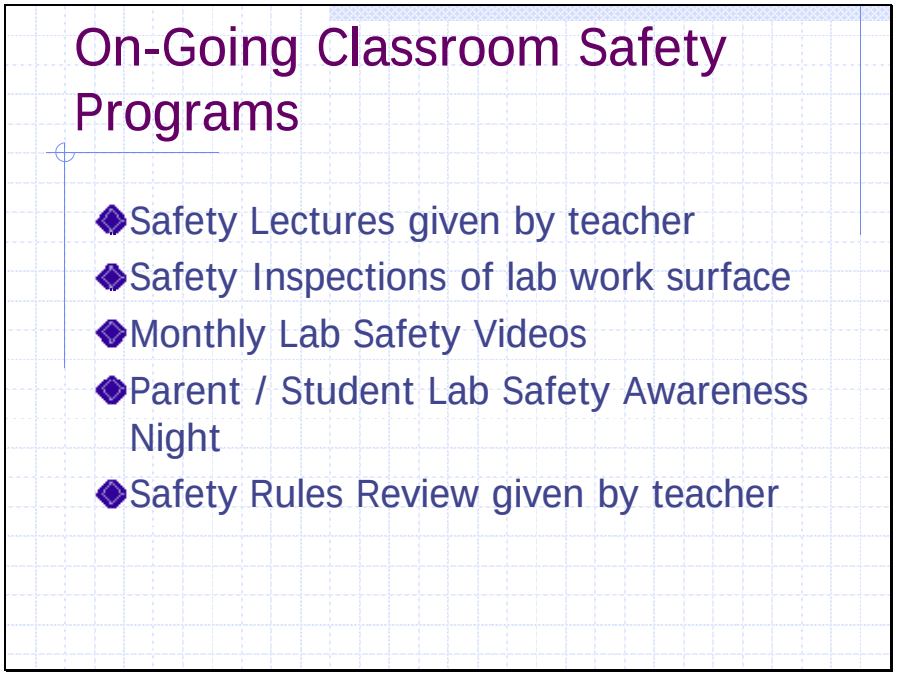
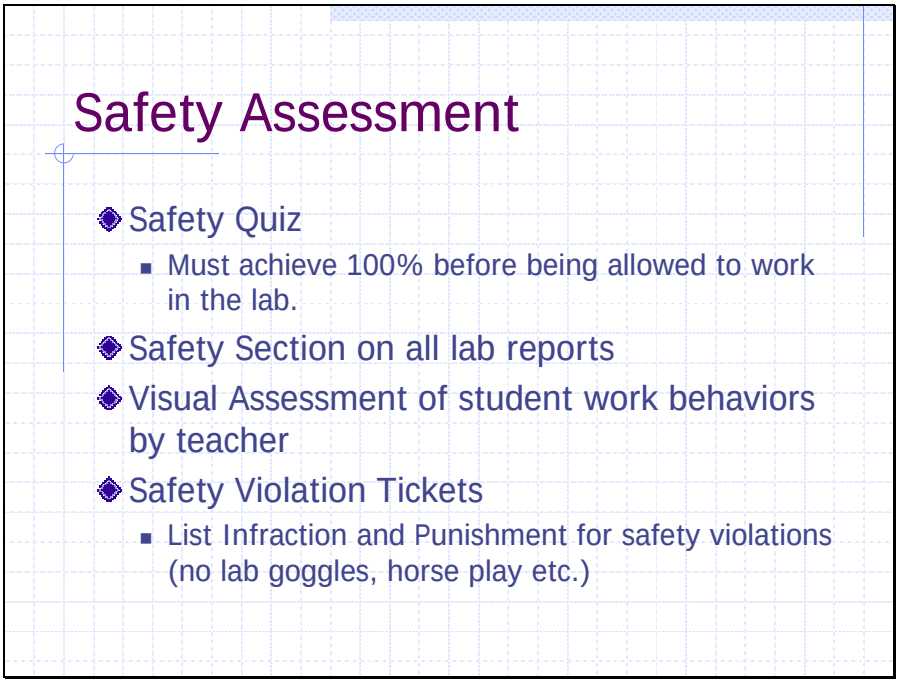

Walking & Working Surfaces
Clear aisles & walkways
Watch for wet floors around the sink
Keep lab work surface free of excess "stuff"
Clean up as you go as long as it can be done safely
Clean work area before leaving the laboratory

Notes:


On-Going Classroom Safety Programs
Safety Lectures given by teacher
Safety Inspections of lab work surface
Monthly Lab Safety Videos
Parent / Student Lab Safety Awareness Night
Safety Rules Review given by teacher

Notes:


Safety Assessment
Safety Quiz
Must achieve 100% before being allowed to work in the lab.
Safety Section on all lab reports
Visual Assessment of student work behaviors by teacher
Safety Violation Tickets
List Infraction and Punishment for safety violations (no lab goggles, horse play etc.)

Notes:

STUDENT LESSON 2

Objective: Students will be aware of science lab rules set forth and expectations by the teacher concerning laboratory safety. Students will become aware of the Safety and Environmental concerns and measures taken to ensure their personal safety in the classroom.

- Hand out the packet of safety contracts and first aid awareness information.
- Have each student read the "Laboratory Safety Contract" and "First Aid in the Laboratory sheets" silently to themselves.
- Go over each safety rule orally with students and make them aware of teacher expectations. Stress why each rule exists.
- Have students sign and date these papers and bring home for parent / guardian review and signature.

Teacher: _____

School Years: _____

Laboratory Safety Rules

The following rules have been set in order to ensure that students are working in a safe and healthy environment in the science classes that are taught at _____ School.

Please read and review these rules with a parent / guardian. When you have completed reading them, sign the form to assure the school that you have read and understand the safety rules for all science courses at _____ School.

In addition to signing this rule sheet, fill out the personal information section. This personal information will not be shared with anyone; it will be kept on file for use only in the event of an emergency.

1. Appropriate eye protection (safety glasses of chemical splash goggles), apron, and gloves must be worn by investigators (including visitors) while laboratory investigations are in progress.

2. Prepare for each laboratory lesson by listening to all directions, reviewing safety precautions, and reading all instructions before starting any investigation.

3. Be alert and aware of what is going on around you in the laboratory. Use caution when walking around the laboratory to prevent accidents.

4. **Never** leave an investigation unattended. If questions arise contact the teacher who will come and help solve the question or problem.

5. Do not wear long bulky clothing on lab days. It would be best if you wore cotton clothing. You may **not** wear open toed shoes. Remove any long, dangling, jewelry and any cloth wristbands or watch bands.

6. Laboratory manuals, laboratory notebooks, and associated laboratory equipment are the only items permitted in the laboratory area.

7. Food and drinks are not allowed in the laboratory.

8. **Never taste, or smell chemicals.**

9. All long hair should be tied back.

10. When using the burners, make sure that your head, hair and clothing are away from the burner. Only light burners when instructed to. Before leaving the room make sure that all burners are turned off.

11. Be familiar with all exits, fire drill procedures, and safety equipment.

12. Work area should be clean and organized at all times to prevent contamination and/or possible accident.

13. At the conclusion of each lab, place all equipment in the proper locations, clean work area, and wipe surfaces dry.

14. At the conclusion of each activity and when you are done cleaning up, make sure that your hands are thoroughly washed up to the elbows with soap and water.

15. Everyone should recognize and heed all safety symbols and cautions incorporated in the laboratory procedures.

16. All accidents and incidents should be reported to the teacher as soon as they occur, even if they are minor.

17. If you are not feeling well, inform the teacher immediately.

18. When communicating with fellow investigators while laboratory investigations are in progress, be sure to talk at a volume level that does not disturb others and allows you to hear the teacher in case he or she needs to make an announcement.

19. **Never work alone in the laboratory.** Activities and investigations may only be conducted when the teacher is present.

School Year: _____

LABORATORY SAFETY CONTRACT SHEET

The following rules have been set in order to ensure that I am working in a safe and healthy environment in the science classes that are taught at _____ _____ School. I have read and reviewed these guidelines with a parent / guardian. In addition to signing this guideline sheet, I have filled out the personal information section. I realize that this information will not be shared with anyone; it will be kept on file for use in an emergency.

I, _____ have read, understand, and agree to abide by the safety rules set forth above and agree to follow all other written and verbal instructions given in class.

_____ _____

Student Signature Date

Print Parent/ Guardian Name: _____

Signature of Parent/ Guardian: _____

Home Phone number: _____ Work Phone Number: _____

Student Health Information

Allergies: _____

_____

Medical or physical conditions: _____

_____

Do you wear contact lenses: _____

Teacher: _____
School Year: _____

FIRST AID IN THE LABORATORY

If an accident should occur in the laboratory, these are a few basic rules to follow that can be of immediate benefit.

1. Stay calm and don't panic.
2. Immediately report any accident or injury, no matter how minor, to the teacher.
3. If a chemical splashes in your eyes, wash them out at the eyewash with plenty of running water for at least 15 minutes, report the accident to the teacher, and then seek medical attention.
4. If a chemical contacts your skin, immediately wash the skin with water in the safety shower or sink. Remove all contaminated clothing and immediately report the accident to the teacher, who may then recommend further action.
5. If a fire occurs in the laboratory, immediately tell the teacher. Hit the gas shut off switch.
6. If your clothing is on fire, STOP, DROP, and ROLL to smother the fire. Then, cool the affected area(s) with cool water from a sink or safety shower.
7. If you burn your hand, place the hand under cool running water.
8. If your hand is cut, rinse the area, apply pressure, tell the teacher, and seek medical attention.

SAFETY EQUIPMENT

Eye and Face Wash Fountain: Fountains prevent and reduce injuries from chemicals splashing in the eye region of the face.

Safety Showers: Showers prevent and reduce injuries from chemicals that contact the skin. The showerhead will be used to flood contaminated skin with water and dilute materials that are potentially harmful.

Fire Blankets: Fire blankets have various uses: they can be used to provide warmth, act as a stretcher, act as a pillow, provide covering, or act as a shield to obstruct the view of someone undressing under the safety shower or to smother fires.

Fire Extinguishers: Extinguishers are used to put out fires. Be familiar with how a fire extinguisher is used, when and if it is to be used, and the operating instructions of fire extinguishers.

First Aid Kits: First aid kits are used to give immediate care to small injuries. Only the teacher or school nurse should administer treatment.

Lab Aprons: Aprons are used to protect the body and clothing from chemicals. Lab aprons should be cleaned once per week.

Lab Gloves: Appropriate gloves are used to protect your hands from laboratory safety hazards, i.e. chemical, physical and biological. Always wear appropriate gloves when handling hazardous chemicals.

Safety Goggles: Goggles protect your eyes from chemicals and small objects. Students will have a pair to wear while lab investigations are running. Goggles can be worn with prescription glasses and should be washed after each use. Goggles should be stored in a protective case to keep them clean.

Tongs: Tongs are used to protect the hands from hot glassware and burns.

Waste Containers: Appropriate waste containers are used for disposing laboratory waste properly. Plastic containers are used for trash. Puncture resistant containers are used for glass. Properly labeled and sealed glass jars are used for chemical waste. Metal containers are used for flammable waste.

Ventilation Hood: Ventilation hoods prevent the spreading of poisonous gases that evolve from an investigation and remove toxic fumes from the building.

School: _____

Address: _____

_____

_____

Attention: Parents/Guardians

Subject: **LABORATORY SAFETY AND FIRST AID CONTRACT**

Date: _____

Dear Parents/Guardians,

This year at _____ School we are trying to make our students and parents more aware of science laboratory safety and health issues. In class we have discussed what is expected of your son or daughter in the science laboratory in order to ensure a safe and healthy laboratory environment. I would like to ask you to review the "Laboratory Safety Regulations" and "First Aid in the Laboratory" enclosures. After reviewing the materials with your child, sign, date, and return the sheets to school. If these sheets are not returned, your son or daughter will be unable to participate in laboratory experiments / activities in science. Thank you for your anticipated cooperation. If you have any questions please do not hesitate to call me at the school.

Sincerely,

Science Teacher

STUDENT LESSON 3

Objectives: Students will identify first aid and safety equipment around the classroom. Students will create posters of science safety principles for easy recognition in the classroom. Students will become aware of the Safety and Environmental concerns and measures taken to ensure their personal safety in the classroom.

- Collect student "Laboratory Safety Contracts" that were signed last night for homework.
- Start off the class period making an analogy between the kitchen and a science laboratory.
- Assign lab groups and conduct the "Science Laboratory Safety Day" Lab.
- Prepare a summary of the laboratory exercise conducted today.

Chapter 4

Start off the class period making an analogy between the kitchen and a science laboratory. To show that the science laboratory is based on common sense and current experiences use a kitchen analogy. **Explain** that the primary objective for people using a kitchen is to prepare food to eat. The primary objective for a science laboratory is to investigate and make observations. Many comparisons can be made between the two workplaces.

Give some examples such as: kitchens have equipment such as ovens, dishwashers, toasters, microwaves, etc. that must be maintained and kept in good working order. Foods that are needed are bought and stored in the appropriate places; such as milk in the refrigerator, clean dishes in the cabinets, dirty dishes in the sink etc. People normally do not store cleaning products on the same shelves with their food, or their dirty dishes with the clean ones. Outdated food is disposed of in the garbage can. Tools are in safe places to avoid accidents. The kitchen is a place to prepare the food. When food preparation occurs, only the necessary items are taken out of their place and used. During preparation, a recipe is followed in order to reach a desired outcome (i.e. read the back of the box to make brownies). When the preparation is complete, tools are cleaned and restored to their proper place. These steps that are done almost automatically as are the procedures one follows in their kitchen. If the chef has a question, they usually ask someone near by or use a resource to find the answer. *The products being prepared and cooked are in essence the experiment and the outcome is a form of assessment.*

The same occurs in a science laboratory . . . **Ask** students: Can you tell me the steps we follow in the lab that relate to the steps used in the kitchen to cook something? What are the tools we use in the lab? Who is the chef? What is the recipe? What is the preparation and cooking of the food similar to in the lab? <u>But remember, we never eat or drink in the science laboratory.</u>

1. **Talk about the requirement of a separate lab notebook.**
   Students should be required to have a black and white composition book to write down experiments and important information.

2. **Assign lab groups and break up into groups.**
   Lab groups will have three students in them. Explain the importance of lab partners. Each student will have a specific job: material collector, procedure provider, and preparation/clean up person. Mention that although students are each given a specific job, everyone is expected to do the experiment together. The jobs are assigned so those groups work efficiently and manage their time properly, not so that each person only does his or her assigned job. Now students will sit with their groups and are given one of the seven following tasks:

   - ❑ Group 1: Using materials provided make a poster of the **<u>never</u>** to do in the lab, on a poster in **red** marker.
   - ❑ Group 2: Using materials provided make a poster of the always to do in the lab, on a poster in green marker.
   - ❑ Group 3: Cut & post lab safety symbols in appropriate spots around the room.
   - ❑ Group 4: Cut and post the first aid symbols in appropriate spots around the room, also post a list of the other teachers in the department's schedules in the room and a method to contact the nurse in case on an emergency.
   - ❑ Group 5: Conduct a lab "check list" to identify items in the lab that class members should be made aware of.
   - ❑ Group 6: List ways that the classroom could be improved to make the classroom safer.
   - ❑ Group 7: Place the Safety equipment labels around the room at the appropriate locations.
   - ❑ Group 8: Research on the Internet "Proper hand-washing techniques" and create a poster to go next to each of the sinks in the laboratory.

3. **Task Time and Regroup**. Give students fifteen minutes in order to complete task. Then have them regroup as a class in their seats. One person from each group will tell the whole class what they did and why they did it so that everyone in class is aware of the safety issues discussed.

4. **Homework and Summary:** Conduct a quick oral summary of the need for safety rules and guidelines.

* The teacher should keep a laboratory log that contains who was in attendance of the lab, the procedure, the chemicals used, and possible hazards. This log should be kept in a file with the signed "Laboratory Safety Rules" sheets. (A Laboratory Log is important because a science teacher should be able to recall student exposure to chemicals in case of an emergency.) This will also help in classroom organization as a science laboratory teacher.

GROUP 1:
LAB SAFETY LESSON INSTRUCTIONS

"NEVERS"

Task:

Create a poster using the handouts to make a list of things to "Never do in the lab." All "Nevers" should be in red and written clearly and neatly on poster board.

You have fifteen minutes to complete the above task.

Then select one person from your group to share with the whole class what you did and why you did it. We want everyone in class to be aware of the safety issues you discussed.

Supplies:

Two rulers, two wide tip red markers, one piece poster board, and one roll masking tape.

GROUP 2:
LAB SAFETY LESSON INSTRUCTIONS

Task:

Your job is to create a poster using the handouts to make a list of things to "Always do in the lab." All "Always" should be in green and written clearly and neatly on poster board.

You have fifteen minutes to complete the above task.

Then select one person from your group to share with the whole class what you did and why you did it. We want everyone in class to be aware of the safety issues you discussed.

Supplies:

Two rulers, two wide tip green markers, one piece poster board, and one roll masking tape.

GROUP 3:
LAB SAFETY LESSON INSTRUCTIONS

SAFETY SYMBOLS

Task:

Your job is to cut out safety symbols and post them on poster board squares. Place these squares around the room in the proper locations.

You have fifteen minutes to complete the above task.

Then select one person from your group to share with the whole class what you did and why you did it. We want everyone in class to be aware of the safety issues you discussed.

Supplies:

12 square pieces of poster board, one roll masking tape, and safety symbols.

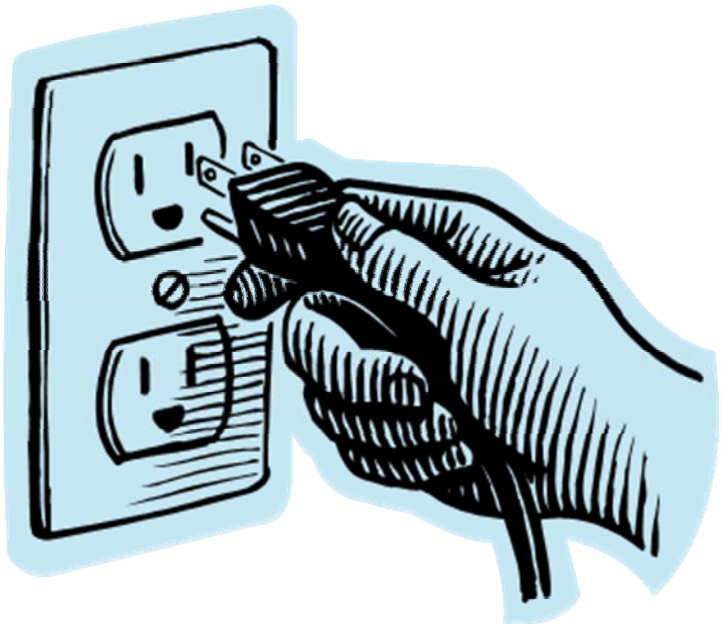
Clothing /Body Safety

- Gloves
- Aprons/Lab Coats
- Closed Toe Shoes
- No Bare Mid-drift or Shorts

Electrical Safety

Never plug or un-plug an apparatus unless instructed to do so.

Never insert anything into an electrical outlet



Explosion Safety

Always use a shield when there is the risk of explosion

Chemical Safety

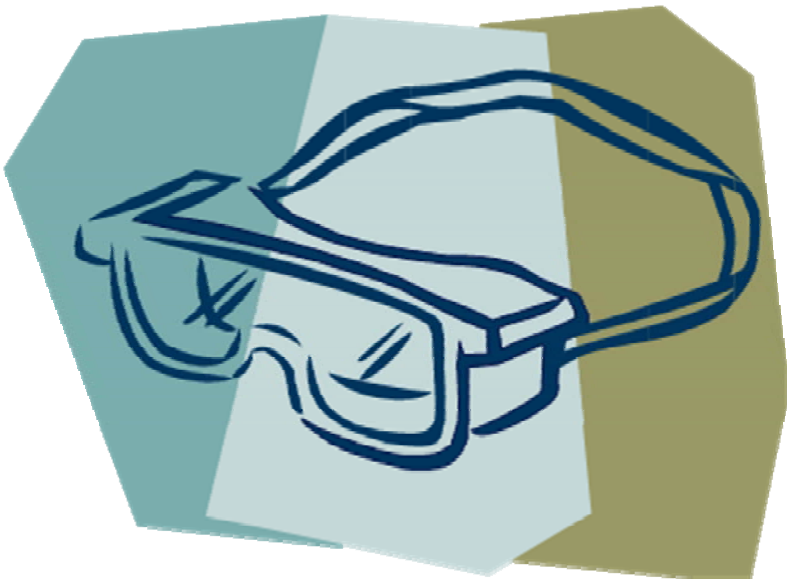
Always remember the basic safety rules for the handling of chemicals.

Plant Safety

- Toxic/Allergic Plant Exposure
- Pollen Exposure
- Flower Exposure
- Leaf Decay
- Fruit/Seed

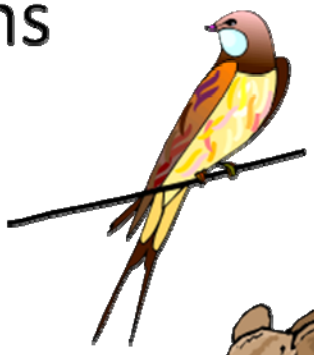
Eye and Face Safety

Only goggles offering both impact and indirect splash protection are to be worn.

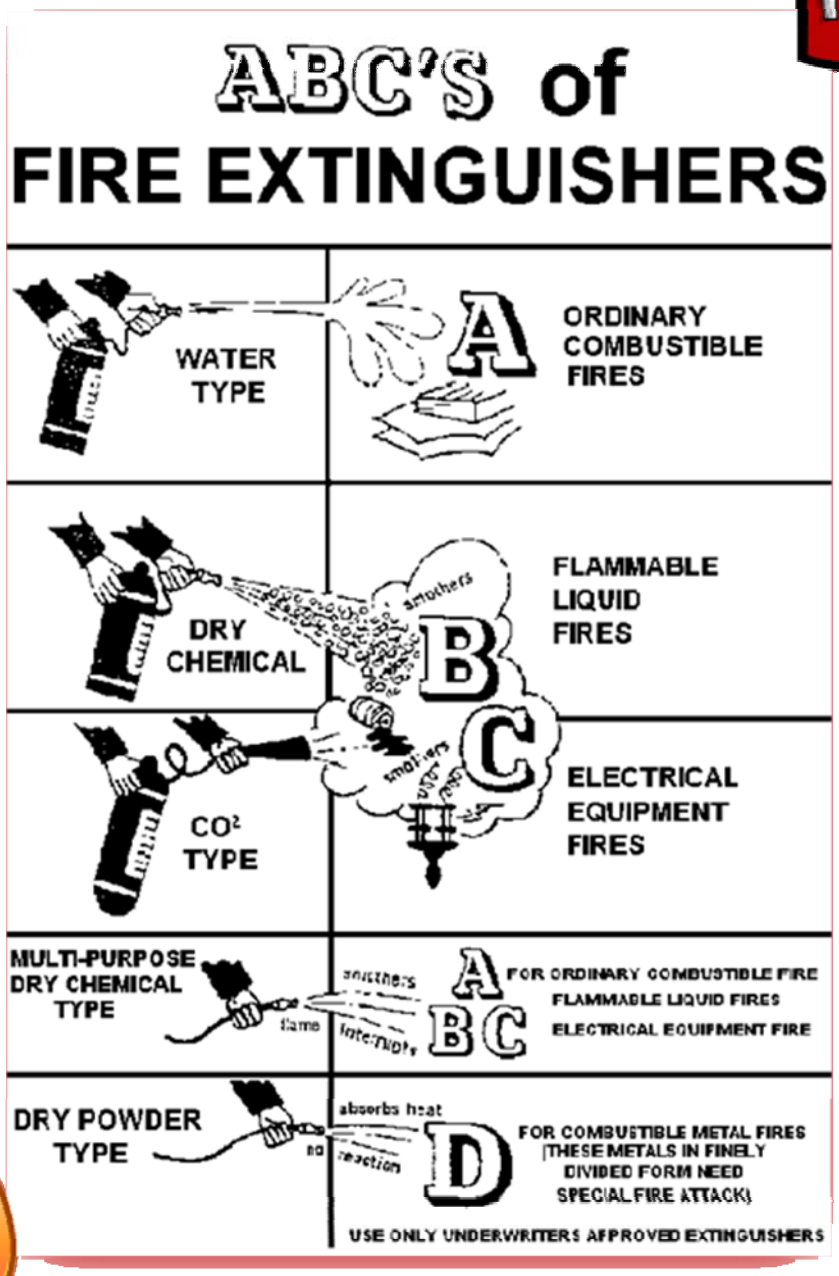


Animal Safety

- Amphibians
- Reptiles
- Mammals
- Birds
- Fish



Fire Safety

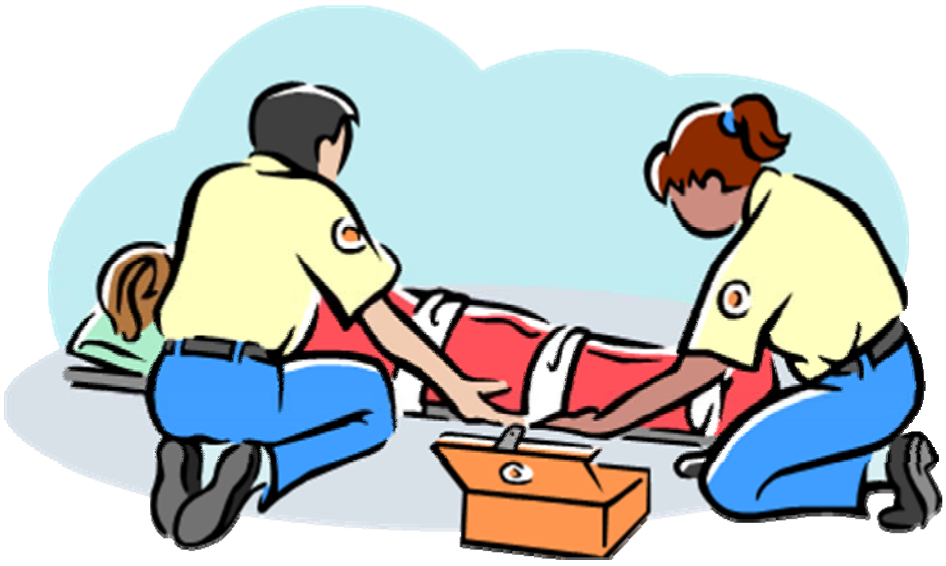

ABC's of
FIRE EXTINGUISHERS
WATER TYPE
A
ORDINARY COMBUSTIBLE FIRES
DRY CHEMICAL
smothers
B
FLAMMABLE LIQUID FIRES
CO² TYPE
smothers
C
ELECTRICAL EQUIPMENT FIRES
MULTI-PURPOSE DRY CHEMICAL TYPE
smothers
flame
interrupts
A
B C
FOR ORDINARY COMBUSTIBLE FIRE
FLAMMABLE LIQUID FIRES
ELECTRICAL EQUIPMENT FIRE
DRY POWDER TYPE
absorbs heat
no reaction
D
FOR COMBUSTIBLE METAL FIRES (THESE METALS IN FINELY DIVIDED FORM NEED SPECIAL FIRE ATTACK)
USE ONLY UNDERWRITERS APPROVED EXTINGUISHERS

Implosion Safety

Apparatus to be used under reduced pressure must be protected. Wrap with tape or toweling to reduce implosion risk.

First Aid Safety

Only those persons trained in first aid should offer treatment.



GROUP 4:
LAB SAFETY LESSON INSTRUCTIONS

FIRST AID

Task:

Your job is to place first aid symbols around the room in the proper locations. Place the first aid symbols in the following locations: eye and face wash fountain, safety shower, fire blanket, fire extinguishers, and first aid kits.

You have fifteen minutes to complete the above task.

Then select one person from your group to share with the whole class what you did and why you did it. We want everyone in class to be aware of the safety issues you discussed.

Supplies:

12 square pieces of poster board, one roll masking tape, safety symbols, glue stick, and scissor.

GROUP 5:
LAB SAFETY LESSON INSTRUCTIONS

LAB CHECK LIST

Task:

Your job is to go around the laboratory and locate any unsafe conditions found within the classroom. Use the checklist provided to complete the task.

You have fifteen minutes to complete the above task.

Then select one person from your group to share with the whole class what you did and why you did it. We want everyone in class to be aware of the safety issues you discussed.

Supplies:

Check list and pen or pencil.

SCIENCE LAB SAFETY CHECKLIST

Make an "x" under the appropriate heading . . .	**Yes**	**No**	**N/A**
1. Horizontal lab tables			
2. Even surface on top of lab tables			
3. Working sink at each lab table			
4. Rubber mats in bottom of each sink			
5. Phone/intercom system that works			
6. Emergency Phone numbers posted on/by phone			
7. List of other teachers' schedules posted			
8. Safety rules posted			
9. Safety posters			
10. Safety contracts signed			
11. Resource manuals accessible			
12. First aid equipment labeled and visible			
13. Master gas control labeled and visible			
14. Master water control labeled and visible			
15. Master electricity control labeled and visible			
16. First aid kit			
17. Ground fault circuit interrupters (GFCIs)			

Make an "x" under the appropriate heading . . .

	Yes	No	N/A
18. Fire Blanket			
19. Fire Extinguisher			
20. Eye wash station that works			
21. Safety shower that works			
22. Sand bucket to put out fires			
23. Smoke alarm			
24. Sprinkler system			
25. Ventilation hood that works			
26. Windows that open			
27. All working lights			
28. All working electrical sockets			
29. Chemicals properly stored			
30. Cabinets that doors close			
31. Shelves around room with a lip on them			
32. Clear aisles			
33. Ample room to work			
34. Grounded cords on equipment			

GROUP 6:
LAB SAFETY LESSON INSTRUCTIONS

SAFETY IMPROVEMENTS

Task:

Your job is to go around the laboratory and make a list of ways we could make the room safer and healthier, be sure to state why your group thinks we need to improve this area of the room.

You have fifteen minutes to complete the above task.

Then select one person from your group to share with the whole class what you did. We want everyone in class to be aware of the safety issues you discussed.

Supplies:

Improvements list and pen or pencil.

LABORATORY SAFETY IMPROVEMENT LIST

Things that need to be done to make our laboratory safer and healthier . . .

1. _____

Explanation: _____

_____

2. _____

Explanation: _____

_____

3. _____

Explanation: _____

_____

4. _____

Explanation: _____

_____

5. _____

Explanation: _____

_____

6. _____

Explanation: _____

_____

7. _____

Explanation: _____

_____

8. _____

Explanation: _____

_____

9. _____

Explanation: _____

_____

10. _____

Explanation: _____

_____

GROUP 7:
LAB SAFETY LESSON INSTRUCTIONS

SAFETY EQUIPMENT LABLES

Task:

Your job is to go around the laboratory and place safety equipment labels around the room in designated areas. Place the signs above the desired areas.

You have fifteen minutes to complete the above task.

Then select one person from your group to share with the whole class what you did and why you did it. We want everyone in class to be aware of the safety issues you discussed.

Supplies:

Safety Equipment Labels and masking tape.

EYE AND FACE WASH FOUNTAINS:

Fountains help to dilute and remove chemicals splashed in the face and/or eyes.

The eyes must be held open, the eyeballs constantly rolled, and water passed over the eyes and face for a minimum of 15 minutes.

Medical attention should be sought to insure eye health.

SAFETY SHOWERS:

Showers prevent and reduce injuries from chemicals that contact the skin. Showers flood contaminated skin with water and dilute materials that are potentially harmful.

All contaminated clothing must be removed immediately.

Medical attention should be sought immediately.

FIRE BLANKETS:

1. Keep people warm.
2. Act as a temporary stretcher.
3. Serve as a pillow.
4. Smother flaming equipment.
5. Provide modesty.
6. Help extinguish clothing while a person is doing “Stop, Drop, and Roll” to smother the fire.

If clothing is on fire, “Stop, Drop, and Roll” to smother the fire.

If hair is on fire, extinguish with hands, lab coat, towel or fire blanket.

Due to the “chimney effect” and heat containment, a person on fire should never be wrapped in a fire blanket.

FIRE EXTINGUISHERS:

Extinguishers are used to put out fires. Be familiar with how a fire extinguisher is used, when and if it is to be used and the operating instructions of fire extinguishers.

Fire extinguishers are to be used only by those persons trained in their use.

FIRST AID KITS:

First aid kits are used to give immediate care to small injuries.

Only the trained and certified teacher or school nurse should administer treatment.

LAB APRONS:

Aprons are used to protect body and clothing from chemicals.

Lab aprons should be cleaned once per week and immediately after a spill or splash on the apron.

LAB GLOVES:

Appropriate gloves are used to protect the hands from laboratory safety hazards, i.e., chemical, physical and biological.

Always wear appropriate gloves when handling hazardous chemicals. It is important to be certain that the glove material offers protection to the chemicals being handled.

Disposable gloves should not be reused.

SAFETY GOGGLES:

Goggles offering both impact and indirect splash protection (indirect ventilation) protect the eyes from chemicals and small objects.

Each student will have his or her own pair of goggles to wear in the laboratory.

Goggles can be worn with prescription glasses and should be washed after each use. Goggles should be stored in a protective case to keep them clean.

TONGS:

Tongs are used to protect the hands from hot glassware and burns.

The use of tongs should be practiced before actual use with hazardous materials.

WASTE CONTAINERS:

Appropriate waste containers are used for disposing of laboratory waste properly.

Plastic containers are used for trash. Puncture resistant containers are used for glass. Properly labeled and sealed glass jars are used for chemical waste. Appropriate containers are used for flammable waste.

VENTILATION (FUME) HOOD:

Ventilation (fume) hoods are designed to prevent exposure to hazardous vapors. They help to prevent the spreading of poisonous gases that evolve from an investigation.

The hazardous vapors are vented from the building through a properly working hood system. Hood must be checked on a regular basis to insure that they are working properly.

GROUP 8:
LAB SAFETY LESSON INSTRUCTIONS

PROPER HAND WASHING TECHNIQUE

Task 1:

Your job is to research on the Internet "Proper Hand-washing techniques," and create a poster using the information. Be sure to write clearly and neatly on the poster board.

You have fifteen minutes to complete the above task.

Then select one person from your group to share with the whole class what you did and why you did it. We want everyone in class to be aware of the safety issues you discussed.

Task 2:

Use the product 'glow germ' which is actually cornstarch with a luminescent substance that shines under UV light to teach fellow classmates the importance of proper hand washing techniques. Then ask your teacher to teach the class how germs can be transferred from surfaces and the importance of scrubbing your hands.

Supplies:

Task 1 Supplies: ruler, wide tip markers, one piece poster board, and one roll masking tape.

Task 2 Supplies: glow germ, UV light, glow germ directions.

STUDENT LESSON 4

Objective: Students will identify equipment used in the science classroom laboratory.

- Hand out an equipment list that students will be using in the course. (This is not included in this guide. Teachers will need to obtain this from the textbook series that is being used. The apparatus list will change depending upon the courses taught.)
- Identify and show examples of each piece of laboratory equipment that will be used in the school science laboratory.
- Explain how each piece of equipment is used.
- Review and highlight safety procedures in the classroom in preparation for the science safety quiz. (The equipment on the safety quiz are those that would be used in a basic life science / general science / chemistry laboratory or class.

STUDENT LESSON 5

Objective:
Students will recall safety rules and instruments used in the classroom science laboratory.

- Science Safety Quiz (The safety quiz was designed to be used after all of the lessons in this guide have been taught. Teachers may want to create a quiz that is personalized to their course and students in order to ensure student safety knowledge.)

  - The Quiz has a section called "Equipment Recognition." The master Quiz found in this guide does not have any pictures of equipment in it. It is the job of the teacher to select ten common pieces of equipment that will coordinate with the class being taught. Number these pieces of equipment and place them in an area of the classroom where all students can see them prior to handing out the quiz. Students will then write down in the respected blanks on the quiz the name of each piece of equipment.

  - The master Quiz does not come with an answer key. The teacher will have to draft an answer key that fits the classroom, course being taught, and pieces of common equipment selected.

Name: _____ Date: _____

Teacher: _____ Science

SCIENCE SAFETY QUIZ

Directions: The following questions are fill-in the blank. Place the best answer on the line next to the question / statement. You may use an answer more than once.

1. If there is an accident in the science lab, what is the first thing that you should do? _____
2. Which two pieces of emergency equipment are used to put out fires?
   1._____ 2._____
3. How many emergency exits are there in the science lab?
   _____
4. What is the piece of emergency protective equipment that protects your eyes called? _____
5. What types of shoes are required to be worn in the science lab?
   _____
6. List two methods of chemical and allergen exposure in the science lab.
   1._____ 2._____
7. There are two methods of exposure control in the science lab that allow for proper ventilation, name them.
   1._____ 2._____
8. What is the book called that contains safety precautions and recommendations for all the chemicals in the science lab?
   _____
9. What do the letters MSDS stand for?
   _____
10. List two safety labels that you can see in the science lab.
    1._____ 2._____

Directions: The following questions are equipment recognition questions. Place the name of the piece of equipment next to its picture. You will not use an answer more than once.

11. _____

12. _____

13. _____

14. _____

15. _____

16. _____

17. _____

18. _____

19. _____

20. _____

STUDENT LESSON 6

Objective: Students should be able to conduct a laboratory exercise safely and display a level of personal responsibility.

- Return Science safety quizzes to students and go over the correct answers.

- Conduct a simple introductory science laboratory exercise in order to observe students following science safety rules and guidelines. There are no introductory science laboratory exercises included in this guide because the intent is for the teacher to use a laboratory exercise that will introduce students to the science subject area which will be covered throughout the school year. Consult the individual textbook series that will be used during the course of study for individual introductory laboratory exercises for ideas.

Chapter 7

ABSTRACT

Project Description

This guide was designed to provide teachers and students with a sense of personal security and awareness in the science laboratory. The goal of this guide is to get students and teachers to reasonably foresee the consequences of what they are doing, about to do, or are not about to do, in order to generate a sense of personal safety and awareness in the science laboratory. The learning activities in this guide are lecture, "Hands-on," group work, and individual assessment.

Background

The guide provides a system of support for:

- The National Science Education Standards: Teaching Standard "D," Teaching Standard " E"
- The various state standards
- Teachers in getting their students to develop problem-solving, decision-making and inquiry skills; reflected by formulating usable questions and hypotheses, planning experiments, conducting systematic observations, interpreting and analyzing data, drawing conclusions, and communicating results.
- Students so that they can practice science in the classroom laboratory following guidelines and laws similar to those in the industrial laboratory workplace.

Grade/ Course/ Student Population

- The target grade levels for this guide are elementary and middle school however, the information provided is suitable for all levels of science grades K-12.
- Any courses in science could benefit from the lessons in this guide.

Materials:

- Computer with internet access, computer projector, overhead projector, or large monitor, rulers (2), colored markers (2 sets), poster boards (3), masking tape (3 rolls), Scissors (4), photocopies of: safety symbols (1), first aid symbols (2), pencils (2), photocopy laboratory activities, lab safety check list (1), safety improvement list (1), laboratory safety rules agreement and rules (As many as there are students), first aid in the science classroom (As many as there are students), safety violation tickets (20), safety quizzes (As many as there are students), glow germ product(1), UV light (1), and Student Apparatus List Worksheet (As many as there are students).

RESOURCES

Flinn, Larry, Flinn Scientific, Inc., Batavia, Illinois

Holt, Rinehart, and Winston, Modern Chemistry New York, New York.

Jarka, Marie, Retired Language Arts Educator, Holy Family School, Florham Park, New Jersey

Kirchmer, Leila, RN, Vernon, New Jersey

Kirchmer, Robert, (Biology / Chemistry / Physics Teacher) Vernon Township High School, Vernon, New Jersey

Latincsics, Dawn, CSP Senior Environmental Engineer: Schering-Plough Research Institute Lafayette, New Jersey

National Science Education Teaching Standards

Newell, Elizabeth, (Elizabethtown College Professor) Elizabethtown College, Elizabethtown, Pennsylvania

New Jersey Core Curriculum Content Standards in Science

Ryan, Kelly, Science Classroom Safety and the Law Flinn Scientific Inc, Batavia, Illinois, 2001.

The Laboratory Safety Institute, Natick, MA

West, Sandra, (Manuscript Reviewer) Professor of Biology, Texas State University, San-Marcos, Texas

SUPPORT RESOURCES

All support resources are available for purchase through The Laboratory Safety Institute: http://www.LabSafetyInstitute.org

- Inquiring Safely: A Guide for Middle School Teachers
- Investigating Safely: A Guide for High School Teachers
- Laboratory Safety Pocket Handbook
- NSTA Guide to School Science Facilities
- Safe at School
- Safety in School Science Labs
- School Science Laboratories Guide to Some Hazardous Substances
- Science Classroom Safety and the Law
- Safety in the secondary School classroom and Laboratory
- Working Safety with Chemicals in the laboratory 2nd ed. Student Guide
- ABC and D's of Portable Fire Extinguishers
- Avoiding Harmful Chemical Exposure in the Science Laboratory
- Chemical Safety Training
- Dangerous Elements
- Eye and Face Protection
- Fisher Scientific Hazardous Recognition Safety Program for School Science Labs
- Florida Department of Education-Safety in the School Science Laboratory
- Fumehoods - Facts and Fables
- General Laboratory Safety Practices
- Handling Glassware Safely

ABOUT THE AUTHOR

Erin Colfax, is a research explorer and science teacher in The Science Academy at Morristown High School in Morristown, NJ. As a teacher and explorer, she has spent the past several years conducting international research projects while traveling throughout the seven continents. In addition she has given numerous presentations for students, teachers, administrators, and community members on science safety in the classroom, science teaching practices, and scientific phenomenon she has observed during her world travels.

Mrs. Colfax has recived a plethora of grants from The New Jerse Center for Mathematics, The New Jersey Science Education Leadership Association, The National Education Association, On-Set Computers, Mt. Everest Mental, the K2 Group, GBC Corporation.

She has presented at the Weston Science Scholars Program at Montclair State University the Annual Convention for the National Council of Teachers of English, the New Jersey Science Teachers Convetion.

In addition Mrs. Colfax has been named Teacher of the Year from the NJCSTE, was a New Jersey Business / Industry / Science Education Consortium Scholar, was an Earthwatch “Live from the Field” fellow, and identified as an Up and Coming Female Legend.

Her research over the past several years has been published by The Laboratory Safety Institute, The New Jersey Education Association, Leading and Learning with Technology, and Equinox Publishing. Erin has a B.S. in science education from Elizabethtown College and an M.S. in Educational Technology from Ramapo College. She currently resides in Reiverdale, New Jersey with her husband, and continues to pursue science, education, and poetry.

She is the author of a March 2007 Publication in *Learning & Leading with Technology Journal* for a HSPA lesson utilizing the equation y=mx+b and temperature data from her 2005 Antarctica Expedition.

In addition she has mentored numerous students in conducting their own original research investigations that have competed at the New Jersey Academy of Junior Scientists, the Young Science Achievers, and the National Academy of Science.

About the Editor

Christina Dillard has extensive experience as an EH&S specialist and is a committed advocate for workplace safety and environmental protection. In addition to serving as the Assistant Director of the Laboratory Safety Institute (LSI), she is a faculty instructor and EH&S consultant providing safety training and services to laboratory professionals in industry and academia.

Christina's broad background in laboratory safety with education and experience in chemical, biological and radiological safety, hazardous waste disposal and emergency response has made her a huge asset to LSI. She recently revised LSI's Biosafety in the Lab and Lab Waste Management Programs, created an IACUC Community Representative handbook for the City of Cambridge and contributed to the Town of Grafton's Biological Emergency Response Plan.

She is regarded as an effective and entertaining presenter full or passion and enthusiasm. She regularly presents LSI's One, Two and Three-Day Lab Safety Short Courses, How to be More Effective Lab Chemical Hygiene Officer, Hazardous Waste Management and Biosafety in the Laboratory Seminars.

Prior to joining LSI she developed and managed the EH&S program for Antigenics, Inc., consulted for several Boston area biotechnology and medical device companies, organized a Biosafety Conference for Cambridge area IBC representatives and industry professionals, led the Massachusetts Recycling Coalition and analyzed the safety and emergency response efforts of California Conservation Corps crew members.

About The Laboratory Safety Institute

The Laboratory Safety Institute is a non-profit organization whose mission is to make health and safety an integral and important part of science education, work, and life. LSI provides training, consultations, publications, audio-visual materials, and responds to requests for information.

LSI was founded in 1978 as The Laboratory Safety Workshop by James A. Kaufman, Ph.D. His experience working for the Dow Chemical Company convinced him that schools and colleges were not doing enough to encourage health and safety. Studies by LSI and others have shown the accident rate at schools and colleges to be 100 to 1000 times that of Dow and DuPont.

Since 1978, LSI has trained over 65,000 science educators and scientists. LSI's brand of safety training is a unique blend of technical information, practical and inexpensive solutions, humor, and accounts of accidents drawn from a collection of over 5,000 examples.

LSI has produced two lab safety, training audio-visuals: "The One-Day Lab Safety Audio Course" (5.5 hours) and "The Two-day Lab Safety Video Short Course" (eight, 90-minute VHS Cassettes)

LSI publishes a newsletter: "Speaking of Safety".

LSI offers lectures, seminars, short courses, audit and inspections, and regulatory compliance and safety program development consultations throughout the world for academic, industrial, medical, and government laboratories.

LSI operates an Internet discussion list, LABSAFETY-L, and maintains an informative website (http://www.labsafetyinstitute.org)

LSI is supported by corporate sponsors, agencies, associations, generous individuals, its members. Members receive a newsletter subscription, use of the audio-visual lending library without rental fee, a 10% discount on most LSI publications, a 5% discount on training and consultation services, and use of the Toll Free, 24-hour Lab Safety Information Hotline.

The Journal of Chemical Education called The Laboratory Safety Institute "A national resource for safety conscious science teachers". If you would like to help support the efforts of The Laboratory Safety Institute: (1) Subscribe to "Speaking of Safety", (2) Become a member of LSI (partially tax deductible), and (3) Make a contribution (tax deductible).

Free copies of our “Laboratory Safety Guidelines”, Publications List, Audio-Visual Lending Library List, and Introduction to The Laboratory Safety Institute (containing seminar schedule and membership information) are available on request. For more information about LSI, contact: The Laboratory Safety Institute, 192 Worcester Road, Natick, MA 01760, 508-647-1900; Fax: 508-647-0062, Email: info@labsafetyinstitute.org.

www.LabSafetyInstitute.org

Description:

This guide was designed to provide teachers and students with a sense of personal security and awareness in the science laboratory. It is imperative that teachers not only orientate themselves about laboratory safety, but inform their students as well. The guide will provide the teacher with an array of activities to promote thinking and stimulate safety awareness among students. In addition, the knowledge contained in this guide will bring peace of mind to the teacher, school administration, students, and parents. Please feel free to modify any of the original text pieces to fit your school's personal science program. This guide correlates with the National Science Education Standards.

Erin Colfax, is a research explorer and science teacher in The Science Academy at Morristown High School in Morristown, NJ. As a teacher and explorer, she has spent the past several years conducting international research projects while traveling throughout the seven continents....

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