K–12 Science Safety Manual

Developed by the
Innovative Teaching and Learning Unit
Instructional Design and Professional Learning Division
K–12 Science Department

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The *Clark County School District K–12 Science Safety Manual* is a coordinated effort by a team of teachers, administrators, with input from the Southern Nevada Health District.

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INTRODUCTION

The purpose of the *Clark County School District K–12 Science Safety Manual* is to promote safety awareness and encourage safe work practices in all science classrooms. This manual will provide guidelines to follow in promoting safe practices in science classrooms and laboratories. Although these guidelines are applicable to all research, teaching, and academic laboratories, the science classroom may require more specialized rules that apply to specific materials, equipment, and activities.

The *Clark County School District K–12 Science Safety Manual* has been prepared to help science teachers and administrators understand and avoid circumstances in which accidents might occur in the science laboratories or on field trips and outdoor education experiences. The suggestions contained in this manual are generally agreed upon as standard procedures within the K–12 educational community. However, no manual can completely describe the actions for ensuring safety under all conditions and in all situations. Therefore, the contributors cannot be responsible for errors in the manual or for any consequences arising from the use of the information published herein.

IMPORTANCE OF SAFETY

Laboratory activities and demonstrations represent an essential part of effective science instruction. Students more fully understand concepts related to science when they participate in or observe learning activities involving laboratory experiments and demonstrations.

Although many science activities present potential hazards, a carefully planned and conducted laboratory science instructional program can greatly reduce the likelihood of accidents. When students strictly adhere to standard safety precautions, they are less likely to be harmed. Knowing about possible hazards and taking precautions are the basis for creating a safe learning environment. Teachers should conduct all laboratory activities or demonstrations prior to classroom implementation to determine potential hazards.

The National Science Teachers Association (NSTA) promotes extensive use of inquiry laboratory investigations and field trips in science instruction and urges that school districts and teachers share the responsibility for establishing safety standards and ensuring compliance. A safe science laboratory experience is a shared endeavor.

The laboratory science instructional program should be carefully planned and conducted to ensure maximum safety conditions for all personnel. Teachers who have particular concerns about safety conditions related to facilities, equipment, supplies, curriculum, and classroom occupant load should notify the site administrator.

SAFETY IS A SHARED RESPONSIBILITY

Safety is a shared responsibility. A safe laboratory program requires participation and collaboration by administrators, teachers, students, and parents.

A. Administrator Responsibilities

1. Provide safety items and materials for the department.

2. Ensure that a restricted chemical form is signed by the department coordinator and administrator and kept on file at their site.

3. Understand the importance of the CHIMERA chemical inventory database which is the mandatory system for inventorying chemicals.

4. Ensure that all accidents are properly investigated and that, following each investigation, appropriate revisions in safety practices are made as necessary to correct conditions that may have contributed to the accident and to reduce the chances of recurrence.

B. Teacher Responsibilities

1. Exercise sound judgment in planning for and conducting student laboratory investigations.
    A. Set a good example by observing and modeling all safety rules, wearing proper protective equipment, and being enthusiastic about safety.

    B. Know the properties and hazards associated with each chemical/material used in a laboratory activity before the students carry out the procedure.

    C. Read and understand the information on Safety Data Sheets (SDS) relating to chemicals or other hazardous materials that will be used in the laboratory.

    D. Perform a trial laboratory experiment if the investigation has not been conducted before.

    E. Ensure that all safety equipment is present in the laboratory and in good working condition.

    F. Provide eye protection and other necessary personal protective equipment for students and instruct students in the use of such equipment.

    G. Ensure that all containers are properly labeled.

    H. Ensure that laboratory investigations are not left for substitute teachers.

2. Provide student instruction in safe laboratory procedures in the classroom.
    A. Provide comprehensive safety instruction for all students. Such instruction should include the location of all classroom safety equipment and safety procedures in a science classroom.

    B. Have students sign a safety rules agreement.

    C. Instruct students in the use of safety goggles and other appropriate personal protective equipment.

    D. Before each laboratory experiment, instruct students about the hazards associated with each laboratory chemical and activity.

    E. Monitor the laboratory room or field site. Work with students to correct any procedure or behavior that is not safe.

3. Provide appropriate supervision for all classroom instruction. Give special attention to laboratory activities.
    A. Make sure that all safety rules are obeyed.

    B. Maintain accountability for laboratory chemicals and materials before, during and after classroom activities.

    C. Promptly clean up or direct the clean-up of spilled materials.

    D. Instruct students how to dispose of waste. Use separate, designated containers (not the wastebasket) for the following:
        - Matches, litmus paper, wooden splints, toothpicks, etc.
        - Broken and waste glass
        - Rags, paper towels, or other absorbent materials used in the cleanup of flammable solids or liquids
        - Hazardous/toxic liquids and solids

4. Maintain a written record of the following:
    A. Students and parents were notified of safe laboratory practices as outlined in the Safety Rules Agreement.

    B. All students received instruction in safe laboratory practices.

C. Students Responsibilities

1. Obey all safety rules and regulations. Sign a safety rules agreement.

2. Know the location of the emergency shower, eyewash and face wash station, fire blanket, fire extinguisher, fire alarm box, and exits. Know how to properly use them.

3. Be familiar with the properties and hazards of the laboratory chemicals in use.

4. Never remove chemicals, other laboratory materials, or equipment from the science room.

5. Clean the work area immediately after use.

6. Report all accidents and injuries to the teacher immediately, no matter how minor, including reporting any burn, scratch, cut, or corrosive liquid on skin or clothing.

7. Inform the teacher immediately of any equipment not working properly.

8. Wear appropriate eye protection, as directed by the instructor, whenever working in the laboratory. Safety goggles MUST be worn during hazardous activities involving caustic/corrosive chemicals, heating of liquids, and other activities that may injure the eyes.

9. Never taste anything or touch chemicals with the hands, unless specifically instructed to do so.

10. Test for odor of chemicals only by waving your hand above the container and sniffing cautiously from a distance (called wafting).

11. Eating or drinking in the laboratory or from laboratory equipment is not permitted.

12. When heating material in a test tube, do not look into the tube or point it in the direction of any person during the process.

13. Never pour reagents back into bottles, exchange stoppers of bottles, or lay stoppers on the table.

14. Keep hands away from face, eyes, and clothes while using solutions, specimens, equipment, or materials in the laboratory. Wash hands as necessary and wash thoroughly at the conclusion of the laboratory period.

15. Roll long sleeves above the wrist. Long, hanging necklaces, bulky jewelry, and excessive and bulky clothing should not be worn in the laboratory.

16. Wear closed toe shoes during laboratory experiences. Sandals are not allowed.

17. Light gas burners only as instructed by the teacher. Be certain no volatile materials (such as alcohol or acetone) are being used nearby. Use extreme caution.

18. Use a fire blanket to extinguish any flame on a person (stop, drop, and roll.)

19. Place books, purses, and such items in the designated storage area. Take only laboratory manuals and notebooks into the working area.

20. Dispose of laboratory waste as instructed by the teacher. Use separate, designated containers (not the wastebasket) for the following:
    - Matches, litmus paper, wooden splints, toothpicks, etc.
    - Broken and waste glass
    - Rags, paper towels, or other absorbent materials used in the cleanup of flammable solids or liquids
    - Hazardous/toxic liquids and solids

D. Parents/Guardians Responsibilities

1. Read and discuss safety rules with your child.

2. Sign the Safety Rules Agreement indicating that you have read and understand the rules.

3. Parents/guardians and other visitors are welcome in the science laboratories, just as they are in other classrooms. School procedures for visitors should be followed. Guests should wear protective goggles and follow the same safety procedures expected of students. Parents are encouraged to support the school science program and to reinforce the curricular objectives of the course through family activities, museum visits, and field trips.

GENERAL INFORMATION

SAFETY AND LOSS CONTROL

Become familiar with CCSD Regulation 7310. The Clark County School District recognizes that a safety program for students and employees is necessary to accomplish its public education mission. It is recognized that loss control management is needed to reduce property damage, bodily injury, environmental pollution, and legal actions. Safety and loss control is a shared responsibility. Clark County School District employees and students must work together at all levels to maintain a safe work and educational environment.

RISK MANAGEMENT

Laws and regulations place direct responsibility on teachers, administrators, and school board members for the safety of students in school, including in science classrooms. Therefore, it is important to plan preventive steps that will protect students and teachers, minimize or alleviate accidents, and reduce both individual and district liabilities.

Such steps include effective safety instruction, careful supervision of all activities, and proper maintenance of laboratory and classroom equipment. Courts examine the circumstances and conduct of the responsible individuals to ascertain whether their conduct, actions, judgment, and behavior were reasonable and prudent under the given circumstances. Through an analysis of the actions taken by the school district, the school, and the individual, the court determines the degree of responsibility that can be attributed to the parties involved.

Posting safety guidelines and procedures is a recommended practice for science classrooms. Specific safety instruction and testing are highly recommended as an integral part of every science classroom procedure. This handbook includes suggested safety procedures and a student safety test that may be used in the teaching of various scientific disciplines. The science teacher should continually remind students of both general and specific hazards before the performance of laboratory activities in which any element of danger might exist.

If a textbook or laboratory manual specifies a dangerous procedure, which neither the students nor the instructor can safely carry out, then the teacher must ensure that the procedure is not performed, but replaced with a safe one. Students should not be allowed unsupervised access to potentially dangerous materials or equipment and should be under continual supervision in all laboratory situations. Monitoring or supervising a laboratory setup during passing periods is an essential practice.

The checklists included in this manual will also help ensure that the safety features of the classroom/laboratories, preparation areas, and storerooms are present and in proper working condition. These checklists were designed to assist department chairs and administrative staff in evaluating the effectiveness of facilities and established procedures regarding accident prevention. They are not intended as a purchasing standard.

SAFETY PRACTICES COMMON TO ALL SCIENCE LABORATORIES AND CLASSROOMS

- Laboratories and storage rooms should always be locked when not in use. Students are not permitted in science storage or prep rooms.

- Chemical cabinets should remain locked at all times.

- The custodial staff should be alerted to general hazards that may be encountered in science areas and to special situations that arise.

- There should be no use of explosive, volatile, or flammable materials in any containers that would create a potential for ignition and/or explosion. Small quantities of such materials may be used in glass test tubes and beakers where such use is part of an appropriate laboratory exercise.

CLASSROOM MAINTENANCE

Keep laboratory classroom floors dry at all times. Immediately attend to spills of chemicals/water, and notify lab participants of potential slipping hazards. Free and clear access to all safety equipment should be maintained. Keep paperwork, displays, posters, etc. away from the experiment area.

If experiments are to be continued unattended overnight, place a note next to the experimental apparatus indicating the chemicals involved, your name, and a number where you can be reached in case of an emergency.

GIFTS

Please reference CCSD Regulation 3241 regarding acceptance of gifts. Gifts of scientific equipment and supplies should be carefully inspected before being accepted by individual school sites. If the donation is out-dated, dangerous, or not useful for the classroom, do not accept it. **Chemicals, in any form, should never be accepted.** It is strongly suggested that schools do not accept donations of equipment from universities or lab-based businesses because of possible exposure to radioactive materials.

PROHIBITED PRACTICES

The following procedures are strictly prohibited in the Clark County School District:

1. Drawing or analyzing human blood, urine, or other body fluids.

2. Scraping cheek cells for microscopic analysis of epithelial cells because of the possibility of bloodborne pathogen transmission and infection.

3. Heating glassware that is not labeled Kimax or Pyrex since it may shatter.

4. Using mercury and/or any mercury compound including the use of mercury thermometers.

5. Ordering animals preserved in formaldehyde or formalin.

6. Purchasing or using hypodermic needles.

7. Demonstrating a thermite reaction since the heat produced is difficult to control and using magnesium is hazardous.

8. Staring directly into a laser beam because of the possible retinal damage that might occur.

9. Using latex gloves if an allergy to latex is present. Utilize a “latex free” alternative.

EMERGENCY INFORMATION

EMERGENCY PROCEDURES (GENERAL)

In the event of an emergency, contact the school office immediately and follow all school procedures. A variety of emergency response departments can then be alerted to the situation.

Do not cover windows of laboratory classroom doors, except for special experimental requirements. This allows staff to notice if anyone is in need of emergency assistance.

Be familiar with the location and use of the following safety devices:

- Safety shower
- Fire blanket
- Eye wash station
- Fire alarm
- Call button
- First aid kit
- Fume hood
- Spill cleanup kit
- Fire extinguisher

FIRST AID

Under normal circumstances, the school nurse or FASA (First Aid Safety Assistant) will direct the treatment of any illnesses, injuries, or other health problems of students. In the case of any emergency, school procedures should be followed. It is important to get qualified help as soon as possible. Measures should be taken to reduce any anxiety or fear that the injured student or other students may experience. A written accident report must be given to the school site administrator when any such incident occurs.

- **DO** be cool, calm, and collected.
- **DO** follow the school's emergency procedures.
- **DO** make a prompt, complete, and accurate written report of the incident.
- **DO** send a copy of the SDS to the health office if injury is caused by contact with a chemical.
- **DO NOT** diagnose.
- **DO NOT** give medical advice.
- **DO NOT** treat injuries that happened at home.
- **DO NOT** move the person.
- **DO NOT** try to arouse an unconscious person.

CARDIOPULMONARY RESUSCITATION (CPR)

This procedure must be administered **only** by someone trained and certified according to the standards of the American National Red Cross or the American Heart Association.

CHEMICAL BURNS

If hazardous chemicals should come into contact with the skin or eyes, follow the first aid procedures below. Do not become a victim; wear gloves and safety goggles to protect yourself when assisting someone covered in chemical(s). **Direct a student to notify the office while you are attending to the victim.** Send an SDS to the health office with the student.

Skin

- Remove victim's clothes; don't let modesty stand in the way. Remove victim's shoes as chemicals may collect in the shoes.
- Rinse the area with large quantities of water for at least 15 minutes (sink, shower or hose).

Eyes

- Open eyelids forcibly to ensure effective washing behind the eyelid.
- Wash from the nose out to the ear. This will avoid washing chemicals back into the eye or into an unaffected eye.
- Flood eyes and eyelids with water/eye solution for a minimum of 15 minutes.

CHEMICAL INGESTION

Call the office IMMEDIATELY. Try to identify what the victim has ingested. Have this information available for emergency personnel. SDS information should be made available when applicable.

CHEMICAL INHALATION

- Evacuate the area and move the victim into fresh air.
- Notify the office.

USE OF A FIRE BLANKET

A fire blanket is used in the event of fire involving clothing. If a student's clothing catches fire, the student should not run. He or she should stop, drop, and roll on the ground immediately while another person brings the fire blanket. Then the burn victim should roll up in the blanket to smother the flames. The blanket should be held closed at the neck to force the flames away from the head and hair while the student is rolling up in the blanket. Water, if available, may be used with the fire blanket to extinguish the flames. **DO NOT use a fire extinguisher on a person because serious chemical reactions or frostbite (with the use of a CO_2 extinguisher) may result from such use. Direct a student to notify the office while you are attending to the victim. A fire blanket should be located in every science classroom and in every science prep room.**

FIRE PREVENTION

Instructors need to be aware of ignition sources in the laboratory area. This includes open flames, heat, electrical equipment, or other sources of sparks. Flammable reagents should be purchased in the smallest quantities possible. Many substances and types of chemical reactions involved in science programs present potential fire hazards.

The teacher must anticipate the causes of fires and be ready to act swiftly in the event that a fire should occur despite preventative measures taken. In the event of a fire, teachers should follow the school fire evacuation plan.

Storage

- Incompatible reagents should not be stored together.
- Flammable supplies must be stored in appropriate safety cabinets and/or safety cans.
- Flammable liquids are not to be stored in standard refrigerators; an explosion-proof refrigerator should be used.

Electricity

- All electrical outlets should be grounded and should accommodate a three pronged plug.
- Instructors should make certain that all electrical cords are in good condition.

Open Flame Use

- When an open flame is used in the classroom, caution students to stay well away from that flame.
- Never reach across the flame area.
- Bunsen burners and open flames from tea light and/or birthday candles may be used in the course of classroom and laboratory exercises for purposes of instruction when conducted under the supervision of a science instructor. A fire blanket and a fire extinguisher should be present in the room any time an open flame is present.
- **Sterno cans are strictly prohibited!**

In Case of Fire

- In the event of a classroom fire, the teacher should conduct a fast, orderly evacuation of the room following the site evacuation plan. The fire should be reported immediately, and control measures taken if the fire is localized and not presenting imminent danger.
- Both teacher and students should know the location of the nearest fire alarm, fire blankets, and extinguisher.
- In the event that hair or clothing becomes ignited, douse with water.
- A fire blanket can be used to smother the flaming area if water is not available in sufficient quantity.
- In an electrical fire, pull the plug if this can be done without sustaining a burn (cord might be hot) or becoming part of the circuit. Do not use water. It is a conductor of electrical current.

The most common causes of fires in science laboratory activities are:

- Failure to understand the nature and potential hazards of the supplies equipment being used;
- Careless handling of supplies or equipment; and
- Failure to follow directions and lab procedures.

EARTHQUAKE PREPAREDNESS

The Las Vegas Valley has risk of experiencing a moderate size earthquake. Although Clark County schools are structurally built to withstand an earthquake of magnitude 7.0, the shaking would cause a tremendous amount of glass breakage and other types of damage within the classroom.

The following preventive measures are recommended:

- Toxic chemicals should be stored on low shelves and in chemical-proof containers.
- Chemicals cannot be stacked on top of each other.
- The school must keep an annual inventory of what is in the storeroom and in each individual chemical cabinet using CHIMERA.
- Emergency procedures should be documented and posted at every school.
- Disaster drills should be conducted according to District guidelines.

Science preparation areas that are properly managed and have good storage practices can ride out strong earthquakes. Shelving that is secured to the wall and has a retaining lip on the front edge can prevent items from falling off during the lateral motion of an earthquake. Cabinets should have doors that can be latched so that the ground motion does not cause the doors to swing open, emptying the contents into the classroom. Battery-operated emergency lights should clearly illuminate chemical storage areas. These earthquake safety measures should augment the school's general emergency/ disaster plans.

Teachers are encouraged to use the checklist on page 10 to help identify common nonstructural earthquake hazards that can be reduced or eliminated at little or no cost. These hazards include equipment, furnishings and fixtures in the classroom that must be securely mounted or restrained in the event of ground motion. A special check of all hazardous/toxic material storage should be made. In the event of an earthquake, breakage of containers containing dangerous material can release gases and other toxic material into the school environment. After identifying the nonstructural hazards in the classroom, laboratory, stockroom, and preparation room, the school administration will determine the most effective method to mitigate those risks.

TEACHER CHECKLIST FOR EARTHQUAKE PREPAREDNESS		
YES	**NO**	Are freestanding cabinets, lockers, bookcases, cupboards, storage racks, and wall shelves secured to a structural support?
YES	**NO**	Do tall industrial storage racks have adequate bracing?
YES	**NO**	Are racks that are significantly taller than they are wide connected to the concrete slab by large anchor bolts?
YES	**NO**	Is the television monitor securely fastened either to a securely fastened platform or to a cart with a low center of gravity and lockable wheels?
YES	**NO**	Do desktop computers have secured monitors?
YES	**NO**	Are heavy or sharp wall decorations securely mounted (with closed eye hooks, for example)?
YES	**NO**	Are heavy objects stored above head level restrained or relocated?
YES	**NO**	Is specialized heavy laboratory equipment (e.g., an autoclave) on a countertop secured to protect it against sliding off and falling?
YES	**NO**	Are fire extinguishers securely mounted?
YES	**NO**	Are cabinets equipped with heavy-duty latches (magnetic catches can pop open too easily)?
YES	**NO**	Are display cases or aquariums protected against overturning or sliding off tables?
YES	**NO**	Are emergency battery-operated lights protected from falling off shelf supports?
YES	**NO**	Are hanging plants, movie screens, or displays fastened with closed eye hooks and positioned so that they would not hit a window if they were to swing?
YES	**NO**	Have inventories been made of hazardous chemicals so that someone can check the chemicals after an earthquake?
YES	**NO**	Are compressed gas cylinders tightly secured with a nylon strap or strong chain near the top and near the bottom or stored on a rack designed to restrain cylinders?
YES	**NO**	Are laboratory chemicals on shelves restrained by a wire, lip, or other barrier?
YES	**NO**	Have chemicals been stored by compatible groups to reduce the likelihood of their mixing and causing reactions?
YES	**NO**	Have chemicals been stored in plastic or other unbreakable storage containers?
YES	**NO**	Have the windows in the classroom/laboratory or stockroom been equipped with safety glass or covered with protective film?

SAFETY ON FIELD TRIPS

Field trips afford unique learning opportunities, but often include hazards not encountered in the classroom laboratory. Field trips should be carefully planned and should include provisions for transportation, protection against on-site hazards, and supervision.

The teacher should visit the site beforehand to assess the hazards so that they can be considered in the pre-trip orientation and in communications with parents or guardians. Permission slips should be completed and signed by parents or guardians. Please check with school site administration regarding proper procedures for completing all required paperwork and possible site-specific requirements.

SUPERVISION

The nature of the field trip activity and the environment will dictate supervision needs. Pre-, during, and post- activities should be assigned and planned in advance. Check with your site administrator and the field trip site contact to determine the appropriate adult/student ratio.

A first-aid kit is required whenever a group takes a trip away from school. If the field trip is conducted in an area known to be infested by poisonous animals, precautions should be taken. Students should be informed of appropriate kinds of clothing to wear on a particular field trip. Students should be instructed to wash their hands and faces with a strong soap immediately after any exposure to hazards, such as poisonous plants. Special precautions should be taken when trips are conducted on or near deep water. When trips are conducted in areas in which participants are likely to come into contact with animals or organisms that spread diseases, such as the Hanta virus and Lyme disease, other precautions must be followed.

The Hanta virus is spread by rodents and is found around and in primitive, abandoned, or seasonally used buildings in Nevada and other southwestern states. The virus is often inhaled with dust in which saliva, urine, or feces from rodents have intermingled. Students and teachers should not touch or collect owl pellets because of the possible consumption by the owls or infected rodents. Consult your county environmental health department for decontamination procedures if there is a chance of coming in contact with infected rodents.

Lyme disease is more prevalent in mountainous regions and temperate climate zones. The spirochete which causes the infection is injected during the bite of certain ticks and may also be transmitted to other mammals (including pets) and birds. Students should take special precautions, such as wearing protective clothing and checking their clothes and body frequently for ticks. Students should shower as soon as they return home and carefully check for ticks again at that time.

FIELD TRIP TIPS

- **Carry water** – 1 gallon/person/day. In the heat, soda is not a suitable replacement for water. Drinks such as sports drinks are good because they replenish minerals and carbohydrates.
- **Keep cool** –Cooling bands soaked in water and spray bottles with fans attached can keep a person cool by evaporation of the moisture.
- **Protection from the sun** – Students should be advised to wear protective clothing, including long pants, long sleeves, close-toed shoes, sunglasses, and hats. Students should be advised to wear sunscreen.
- **Protection from insects** – Protective clothing is necessary. Wear gloves and shoes, especially when working in the dirt or around plants. Insect repellants can help, but citrus-scented ones will attract bees. Please note: the most effective insect repellant products contain the highest percentage of DEET.
    - **Biting or stinging ants:** Get away, brush them off, remove clothing as necessary, and treat bites with a cold and soothing ointment. If the possibility exists that these might be imported fire ants, it is important to get a sample of them and submit it to the Department of Agriculture.
    - **Bees:** Stay away from beehives. Getting closer than 75 feet may cause a reaction from the Africanized honey bee.

  Note: The stings of both imported fire ants and Africanized honey bees can cause a small percentage of people to go into anaphylactic shock. If this happens, seek medical attention immediately.
- **Protection from Cacti** - Be careful when walking or hiking near cacti. If contact occurs remove clothing as soon as practical; remove small thorns if possible. Thorns from cholla and ocotillo are considered puncture wounds, and should only be removed by medical personnel.
- **Dealing with allergies** – There are many things in the desert that can cause allergic reactions such as dust, pollen, and pollutants. Be aware of students with allergies.
- **Communication methods** – Cell phones are helpful, but in isolated places, they are only as good as the batteries and the availability of coverage. Two-way radios are also invaluable. If needed, carry GPS units.
- **Do not overexert** – Frequent, short rest periods conserve energy and allow everyone to keep going in the heat.
- **Be careful around hazards** - Take great care of using chemicals in the heat. Keep them away from power equipment. Be careful when handling equipment and tools that have been placed in the sun; they can be extremely hot.
- **Heat exhaustion:** Symptoms of heat exhaustion may include feeling clammy, weak and nauseous. Keep calm, stay in the shade, offer fluids, and seek medical attention.
- **Being stranded:** Students should never be allowed to explore alone. Be certain that the field trip destination, leaving and arrival times, and routes are clearly communicated to the administration. If stranded, it is best to stay by the vehicle and wait for help to arrive.

- **Injury:** A first aid kit should be carried with the group. Stabilize the victim and get help.
- **Snake bites:** Constrict the extremity, keep calm, and get help.

It is always a good idea to consult additional resources specific to the field trip environment.

BITES BY SNAKES, SPIDERS, INSECTS, AND MAMMALS

Spider Bites

1. Apply a cold application to the wound site.
2. Refer a student with black-widow spider bites to the nurse for medical attention. Generally, the bites are not considered to be medically urgent unless the school nurse alerts the teacher that the student has had an allergic reaction.

Bee Stings

1. Observe the person for an allergic reaction while carrying out steps two through five described below. Some of the signs to look for would be:
   - breathing difficulties
   - dry, hacking cough
   - swelling and itching about the eyes
   - sense of constriction in the throat or chest
   - massive rash
   - sneezing and wheezing
   - sense of uneasiness

   These symptoms usually occur within minutes, and victims experiencing such symptoms should be seen by a physician right away. Occasionally, the reactions are delayed.
2. Remove the stinger as soon as possible by scraping it with a fingernail or the blunt edge of a knife or a plastic card. To avoid releasing more venom, do not squeeze the end of the stinger by pulling it out.
3. Wash the area of the sting well with soap and water.
4. Place an ice pack on the sting. Do not put ice directly on the skin. Use an ice bag or wrap ice in a cloth.
5. Seek medical evaluation if the swelling becomes severe. Observe for infection, as bacteria are associated with any bite or sting.

Mammal Bites

There is danger of infection and rabies from the bites of all warm-blooded animals. Students should be advised not to approach strange dogs or other animals, especially a familiar pet that is acting peculiarly. Bats and skunks that are active in daytime must be considered rabid. First-aid treatment consists of washing and flushing out the wounds thoroughly with strong soap and warm water or detergent solution as quickly as possible. Continue the washing for at least 10 minutes. Call 911. The value of the washing procedure is greatest when performed during the first hour or two. Catch the animal, if it is deemed safe to do so, and obtain information on the animal. Then call the local animal control agency.

POISONOUS PLANTS

While plants produce the oxygen necessary for animal life, provide us with food, and beautify our surroundings, some produce very toxic substances. Teachers should familiarize themselves thoroughly with any plants they plan to use in the classroom.

Teachers should be prepared to caution students regarding the hazards of poisonous plants. Special attention should be given to poisonous plants or plants with poisonous parts. These include plants that are part of the school landscaping, part of a classroom unit of study, and/or may be encountered during planned field trips. Since not all plants have been thoroughly researched for their toxicity, common sense rules would be:

- **NEVER** place any plant part in the mouth.
- **NEVER** rub any sap or fruit juice into the skin or on an open wound.
- **NEVER** inhale or expose skin or eyes to the smoke of any burning plant or plant part.
- **NEVER** pick strange wildflowers or unknown cultivated plants.
- **NEVER** eat food after handling plants without first washing hands thoroughly.

Any part of a plant may be relatively toxic, even to the point of fatality, depending on the weight of the person and the amount of the plant ingested. Many seeds are coated with hormones, fungicides and insecticides. Some of these coatings may cause allergic responses. Some may be deadly when inhaled to any degree or accidentally ingested. Teachers purchasing seeds from dealers for experiments should investigate the presence of any such coating or sprays and ask the dealer if the seeds have been chemically coated.

The following list of plants was supplied by the University of Nevada Reno Cooperative Extension and should not be taken as "all inclusive." If plants are used in the classroom and their toxicity is unknown, contact the UNLV Cooperative Extension Master Gardner Program at (702) 257-5555.

Poisonous Plants

Common Household Plants:
Diffenbachia – leaves and stems
Philodendron – leaves and stems

Common Yard Plants:
Amarylis – bulb
Belladonna
Carolina Jessamine – all parts
Castor Bean – all parts
Chinaberry – seeds, bark and flowers
Common Privet – berries
Delphinium – leaves
English Ivy – leaves and berries
Elderberry – wood and bark
Fire Thorn
Holly berries
Jerusalem Cherry – fruits
Lantana – green berries are toxic
Oleander – all parts
Peach – leaves (hydrocyanic acid)
Poinsettia – primarily leaves
Pyrocantha
Texas Mountain Laurel (Mescal bean) – seeds

Other Common Plants:
Bittersweet – berries, juice
Black Nightshade – juice, leave
Bleeding Heart – leaves, tubers
Burning Bush – leaves
Columbine – berry
Dogwood – fruit
Dumb Cane - all parts
Foxglove – leaves
Golden Chain – leaves, seeds
Horse Chestnut – leaves, nuts
Hydrangea – leaves
Impatiens – stem, leaves

Iris – underground stem
Lily-of-the-Valley – all parts
Lupine – leaves, pods, seeds
May apple – roots
Milkweed – leaves, stems
Mistletoe-Berries
Mock Orange – fruit
Monkshood – all parts
Narcissus – bulb
Pinks – seeds
Potato – seeds, sprouts
Rhubarb – leaves
Sacred Datura (Western Jimson-Weed or Thorn Apple) – stem, leaves
Wild Black Cherry - leaves
Yew – leaves, bark, seeds

Plants that are Irritants (causing a rash):

Ailanthus – leaves
Milkweed – milky sap
Nettle – leaves
Poinsettia – milky sap
Primrose – leaves, stems
Rubber Plant – milky sap
Thistle – leaves
Trumpet Vine – flowers

Contact Poisons:
Poison Ivy – all parts
Poison Oak – all parts
Poison Sumac – oil from leaves

Here are some good sources of information:

Desert Survival Handbook
Poisonous Dwellers of the Desert

GENERAL LABORATORY SAFETY

LABORATORY CLASS SIZE

Teachers are encouraged to work with their administrators to identify and alleviate potential hazards due to overcrowding and limitations in facilities. The objective should be to guarantee the safest possible environment in which to conduct experiments without reducing the number or quality of activity-based science lessons. When making decisions about class size with administrators, the following factors should be considered:

- The space required for each student to perform experiments safely.
- The safety features present in the design of the facilities or space.
- The level of maturity and safety knowledge students bring to the science laboratory.
- The nature and degree of hazards that may be encountered with the activity.

LABORATORY SAFETY AWARENESS

Everyone working in and around the science classroom should be alert to unsafe conditions and actions. The teacher should call attention to hazardous situations and address corrections. This should include student behavior during labs. Mature and responsible student behavior must be maintained during any laboratory experiment or demonstration.

All laboratory equipment should be in proper working condition. All safety equipment should be regularly inspected to make sure that it is working properly. Proper notification should be made to correct non-functioning laboratory equipment. All storage areas should be properly labeled. Chemicals should be stored in accordance with guidelines established in the Chemical Hygiene Plan, and Safety Data Sheets (SDS) should be current. The date of receipt should be identified. No unmarked containers should be in the classroom or storage area. A separate refrigerator should be maintained for laboratory experiments or supplies. **No food should be stored with laboratory materials.**

The instructor should be familiar with the appropriate measures to be followed when someone in the lab is working with or exposed to the following:

- Corrosive chemicals
- Radioactive materials
- Compressed gases
- Toxic chemicals
- Reactive chemicals
- Flammable substances

PERSONAL SAFETY FOR TEACHERS AND STUDENTS

Respiratory and Body Protection

- Fume hoods should be used whenever appropriate.
- Laboratory coat/apron should be worn in the laboratory classroom.
- Gloves should be worn as needed.
- Eye protection should meet all state and federal standards.
- Safety goggles should be worn at all times in the laboratory classroom.
- Face shields should be used in conjunction with goggles when deemed necessary by the teacher.
- Goggles or safety glasses devices should be stored in an easily accessible germicidal or ultraviolet storage cabinet for sterilization when not in use.
- Safety shields should be used for group protection from splash and impact during all demonstrations. Teacher and students should also wear goggles during such experiments.

Potential Eye Hazards: Eye protective devices should be provided for participants and observers during, but not limited to, the following situations:

- Operation of power tools
- Operation of centripetal devices
- Projectile and collision demonstrations
- Handling of elastic material under stress; (e.g., springs, wires, rubber)
- Working with or igniting explosive or implosive devices or substances
- Working with hot, molten metals
- Hammering, chipping, or grinding of rocks, minerals, and metals
- Cutting, heating or breaking glass
- Pouring, pumping, or dispensing corrosive substances
- During dissection
- Heating or electrolysis of chemicals
- Generation of toxic or potentially explosive gases
- Mixing chemicals that react violently
- Preserving and staining of biological specimens
- Cleaning and sterilizing with irritating or corrosive substances, including ammonia, detergents, or solvents

Personal Hygiene

- Wash hands after any laboratory activity.
- Never use the mouth to pipette chemicals.
- Avoid having long hair, loose sleeves/cuffs, rings, bracelets, etc., in close proximity to open flames or operating machinery with moving parts.
- Keep exposed skin covered. Shorts, skirts, or open-toed shoes should not be worn in the laboratory classroom.

ELEMENTARY SCIENCE SAFETY

Elementary school teachers should become familiar with appropriate sections of this manual. All science teachers should facilitate only labs and activities that come from current, up-to-date curriculum guides, adopted textbooks, or FOSS kits. Never demonstrate or allow students to use a procedure that you have not performed in advance.

Elementary school activities provide an essential opportunity for students to learn about safety. While it may be tempting to relax safety rules when the danger appears minimal, keep in mind that students are creating safe habits that will be needed as they progress through their science education. The following guidelines will ensure a safe science learning environment.

1. Encourage appropriate safe behavior during laboratory activities.

2. Warn children that eating candy and chewing gum are not permitted during laboratory activities.

3. Instruct children in the proper use of safety equipment.

4. Warn children to not touch their face, mouth, ears, eyes, or nose while working with chemicals, plants, or animals.

5. Always wash hands with soap and warm water after handling, chemicals, plants, or animals.

6. Instruct children to notify the teacher of any allergies (i.e. food, latex, animals, peanuts).

7. Children should be taught to clean-up and put away equipment and supplies at the end of the laboratory activities.

8. When handling pointed scissors, children should be reminded that scissors are sharp and may cause injury.

9. The teacher should tape the ends of all sharp glass objects (mirrors, lenses, glass tubes, etc.).

10. Keep sharp instruments (knives, scissors, needles, razor blades or glass objects) in a locked drawer.

11. Children should be instructed never to use rubber bands as sling shots.

12. Children should be instructed never to place sharp, metallic objects in electrical outlets.

13. Do not allow children to handle pumps and aquarium filters without proper instruction and supervision.

14. Children like to explore and experiment. It is important to keep all chemicals in a locked area.

15. The teacher should label all chemicals with the date of purchase so that old chemicals can be disposed.

16. Remind students that many household chemicals are dangerous and should be handled with care in the classroom and at home. Household chemicals should never be mixed together unless an adult is present.

17. Children should be taught correct emergency procedures: how to evacuate the room in case of fire, what to do if a chemical is spilled, and the procedure to follow in case a child is injured. These procedures should be practiced on a regular basis.

18. Only provide the exact amount of chemicals needed for an experiment.

19. Show children how to "smell" a chemical. The wafting technique is utilized. Hold the container at arm's length in front of the face. Wave one hand over the open end of the tube toward the face, letting some fumes reach the nose.

20. Most of the chemicals used at the elementary level can be disposed of properly by diluting them with plenty of water and pouring the resulting solution down the drain. Consult the chemical vendor for additional information.

BIOLOGICAL SCIENCE SAFETY

ANIMALS IN THE CLASSROOM

These guidelines were written by the CCSD Risk and Environmental Services Department and our found in Appendix H. For further information call (702) 799-6496.

BACTERIA OR FUNGI

Although pathogenic (disease-causing) bacteria should not be cultured, all bacteria and fungi must be handled as though they were pathogenic. Pure cultures of nonpathogenic microorganisms must be used in experiments. When water or soil is used as a source, it should be collected from areas unlikely to be contaminated by human pathogens and free of sewage and animal waste.

If agar plates are inoculated with soil or plant material or exposed to air, there is a strong possibility that some disease-causing molds, fungi, and bacteria (Histoplasmosis, Coccidiodes (Valley Fever), or Anthrax bacteria, etc.) will grow in nutrient agar. People with weakened immune systems are at a high risk for infections from inhaled fungal spores. Therefore, culture plates should not be inoculated with soil unless the plates remain sealed and are sterilized before disposal. Soil contaminated with bird or bat droppings, from archaeological sites, land around old buildings, and animal burrows should be avoided.

Collecting wild mushrooms is not encouraged. You can purchase these items from a store if available. Many parts of wild mushrooms and toadstools may contain poison.

Wire loops used for transferring bacterial cultures should be flamed until the entire wire is red-hot before and after each transfer. Loops must be allowed to cool before insertion into liquid cultures to avoid aerosol generation of the bacteria.
To sterilize plates before cleaning or disposal, follow these steps:

Using an autoclave:

- Autoclave the unopened plates. Steaming under pressure of 15 pounds per square inch for 15-20 minutes kills the majority of microbes.
- If you are trying to sterilize large volumes of soil samples, continue as follows:
    - Wait one day for resistant spores to begin growing
    - Sterilize a second time
    - Wait one day
    - Sterilize a third time

Alternate method:

- Prepare a 10% bleach solution (dilute 1 part household bleach with 9 parts water). Pour bleach solution into each Petri dish to cover the agar for 24 hours. This method may also be used to sterilize pipettes, forceps, or other contaminated materials.

These precautions are intended for laboratory activities involving any bacteria or fungi, including pathogenic strains. However, even normally nonpathogenic microorganisms can cause disease if they enter the body accidentally, especially if the immune system is suppressed. The practice of maximum precautions may provide valuable experience for students who may encounter pathogenic organisms later in their academic or professional careers.

BLOODBORNE PATHOGENS

Bloodborne pathogens are bacteria, viruses, and parasites found in human blood and other body fluids such as urine. They can infect and cause disease in humans. The two pathogens recently receiving the greatest attention are the Hepatitis B virus (HBV) and Human Immunodeficiency Virus (HIV). Other pathogens that can also be of concern cause herpes, meningitis, tuberculosis, Epstein-Barr syndrome, Lyme disease, malaria, and syphilis, to name a few.

THE USE OF HUMAN BLOOD OR BLOOD PRODUCTS IS STRICTLY PROHIBITED!

SCIENCE TEACHERS MUST SECURE A SAFE ALTERNATIVE TO LABORATORY ACTIVITIES THAT INVOLVE HUMAN BLOOD FOR BLOOD TYPING.

CHLORPHYLL & PIGMENT EXTRACTION

An immersion-type electric heater or water bath heated by an electric hot plate should be used, not an open-flame heated water bath. Flames should be kept away from solvents or vapors. If a solvent ignites in a beaker, cover the beaker with a glass plate. If the burning solvent spills on a table, use either a carbon dioxide fire extinguisher or fire blanket.

DISSECTION

This policy is in accordance with the National Science Teachers Association, 2013. 6–12: Teachers using dissection as a method of instruction should be able to state sound educational goals and objectives for the dissection. Appropriate pre-dissection discussion and instruction, dissection directions and guidance, and post dissection activities should be planned and implemented for each lab. Teachers should be prepared to discuss the structural significance of the species being studied in relation to humans and other organisms. As with all instruction, the use of animal dissection in the curriculum should be well-planned, and educationally sound and aligned with CCSD standards-based curriculum for the course being taught.

Students should be instructed in safe use of dissection instruments as well as safety during cleaning these instruments. Adequate ventilation should be provided whenever preservative fumes are present. **Safety goggles and gloves must be worn during dissection**.

Students have the right to refrain from participating in dissection activities according to regulation 6144. A note from his or her parent/guardian should substantiate a student's

objection. The teacher must then provide an alternative educational project of comparable time and effort or excuse the student from dissection.

All preserved specimens and remaining fluid must be disposed of properly. PLACE ALL DISSECTED SPECIMENS INTO THE SUPPLIED DRUM. (NO scalpels, paper towels or other foreign matter may be placed in the container.) REPLACE THE LID AND SECURE IT WITH THE RING BOLT! POUR ALL LIQUIDS BACK INTO AN ORIGINAL CONTAINER. Call (702) 799-0990 when the container is full and/or for a replacement container.

CLARK COUNTY SCHOOL DISTRICT REGULATION

R-6144

EXEMPTIONS FROM COURSE REQUIREMENTS

I. The State Department regulations specify that students may be excused from physical education for the following reasons:

   A. Non-enrollment for physical reasons as certified by physician's statement.

   B. Non-enrollment for religious reasons as certified by written statement.

   C. Those students enrolled in R.O.T.C. are granted exemption.

II. Those students presenting parental statements relative to excusing students from specific units of instruction on the human reproductive system, related communicable diseases, and sexual responsibilities in any class may be excused.

III. Those students who present a signed parental statement requesting that the student be excused from the dissection of preserved specimens shall be excused and assigned an alternative activity.

Legal Reference:	NRS Chapter 389 Courses of Study, Section 065 AGO dated September 22, 1955
Cross Reference:	Regulation 6121
Review Responsibility:	Instructional Design and Professional Learning Division
Adopted:	[6156: 7/12/63]
Revised:	(8/13/81; 8/16/82)
Pol Gov. Rev:	6/28/01
Revised:	(4/11/02; 3/26/15)

EPITHELIAL TISSUE STUDY

Scraping cheek cells for microscopic analysis of epithelial cells because of the possibility of bloodborne pathogen transmission and infection is strictly prohibited.

INSECT KILLING JARS

Students should be familiar with the best ways to collect and preserve insects for projects or study in the classroom. Two methods may be used. A safe killing jar can be made using a clean large jar with a screw type lid. Place a facial tissue in the bottom to absorb the killing liquid - ethyl alcohol - **(not carbon tetrachloride or potassium cyanide)**. Add the killing liquid to the bottom of the jar – usually about six drops – then place a clean tissue on top of the tissue containing the killing liquid. The jar must be labeled as follows:

INSECT KILLING JAR
DANGER: FLAMMABLE LIQUID!

To recharge the jar, remove the top tissue and add a few more drops of ethyl alcohol. Add a clean tissue on top.

An alternate method uses Plaster of Paris:

Place 1 inch of fresh Plaster of Paris in the bottom of a glass jar. Let the Plaster of Paris harden for 24 hours. At least 12 hours before using, pour in enough ethyl alcohol to cover the plaster. Let stand 20 minutes and pour off excess. Enough ethyl alcohol will be absorbed to last a week if jar is kept covered. Cover Plaster of Paris with a tissue during use. Label the jar with information noted above.

MICROSCOPES AND HAND LENSES

Students with eye infections must not use school microscopes or hand lenses. Between classes, eyepieces must be cleaned with an alcohol-based lens cleaner.

OWL PELLETS

The Hantavirus is spread by rodents and is found around and in primitive, abandoned, or seasonally used buildings in Nevada and other southwestern states. The virus is often inhaled with dust in which saliva, urine, or feces from rodents have intermingled. Special decontamination measures should be taken when students come into contact with owl pellets because of the possible consumption by the owls of infected rodents. Purchase owl pellets from a reputable dealer who will certify they have been decontaminated. Do not collect them on your own.

EARTH AND SPACE SCIENCE SAFETY

AEROSPACE

Airplanes

Paper airplanes are used to learn about the principles of flight. Their sharp noses can cause damage if flown into an eye. Students must launch their airplanes in a single direction away from other students. All students should wear eye protection.

ASTRONOMY

Lasers

Educational scientific supply houses sell both Class II and Class III (a & b) lasers for school use. Students should not be allowed to operate any lasers above Class I. Keep the room well illuminated when using lasers. The pupils of the eyes will dilate if the amount of light in the room is low. This will increase the chances of damage from the laser beam. More information on lasers can be found in the PHYSICS SAFETY SECTION.

Spectroscopic Analysis Using Flame Tests

The most common chemicals used when performing nichrome wire flame tests are recognized as toxic, and adequate precautions should be taken to ensure good ventilation of the experimental area. In poorly ventilated or confined laboratories, flame tests should be performed in a fume hood.

When large numbers of students are performing flame tests, the potential exists for individual acute toxicity exposure or instructor chronic toxicity exposure. The general nature of an unknown compound should be ascertained before performing a flame test. Students should never ingest the chemicals.

When performing flame tests, the nichrome wire or paper clip that is used should be held in a well-insulated holder or long-handled pliers. The wire and holding device should be placed on an insulated mat and allowed to cool thoroughly before handling.

Goggles should be worn. An overloaded wire causes splattering and material can fall into the burner jest, causing blockage. Unknown chemicals should not be placed in the flame.

It is recommended that teachers use spectrum tubes to show the properties of spectrum analysis. These spectrum tubes are safe and can be used in any classroom setting. Care should be used when changing tubes as they can get hot when used for a few minutes. These spectrum tubes and power supplies can be purchased from many science supply companies.

Viewing the Sun

Light from the sun, even during eclipses of the sun, is harmful when viewed directly. Whenever students are observing the daytime sky, they must be clearly instructed not to look at the sun directly or through lenses, even momentarily. The danger of retinal burn comes from the invisible infrared rays which penetrate light filters and instantaneously damage eyes.

Students should not sight objects close to the sun, which would increase risk of accidental viewing of the sun. Dark glasses; smoked glass, exposed photographic film, and welder's goggles are insufficient protection against the rays of light from the sun. Watching an eclipse on television is the safest way to vie an eclipse of the sun. Images of the sun, projected onto a piece of paper through a pinhole or a convex lens can be safely viewed. Filters, designed specifically for viewing the sun can be used.

PHYSICAL GEOLOGY

ROCKS AND MINERALS

Acid Tests

Most chemical experiments with naturally occurring minerals involve the application of dilute hydrochloric acid to the specimen (most often to identify calcium carbonate, marble, and limestone). Dilute hydrochloric acid is not particularly dangerous, but students should learn to treat it with the respect deserved by all acids. Students should always wear protective goggles when using acids in rock or mineral identification. Acid should be rinsed from the specimen before it is handled or returned to its container. Dilute hydrochloric acid is not very corrosive, but students should be warned to avoid contact with skin or clothing and to guard against splashes into the eyes. After handling rocks or minerals, students should was their hands. Water should never be added to the acid.

When dilute hydrochloric acid is applied to mineral specimens, gases often result. Due to the varied composition of the minerals, it is not always possible to predict which gases will be involved. Therefore, such experiments should be performed in well-ventilated areas or in the fume hood. Gases should not be smelled directly.

Cleavage/Fracture Tests

The wearing of safety goggles is essential when breaking rocks or mineral samples with a hammer. Students should be made aware of the dangers from flying particles from a work group other than their own. When breaking rocks, care should be taken to ensure that other students are not within range of flying particles. Rocks should be held firmly with long-handled pliers to avoid injury of the fingers and prevent movement. Students should not handle or be exposed to asbestos-bearing minerals such as tremolite and chrysolite.

Crystallization

Some texts suggest observing the process of crystallization by examining the evaporating edge of an aqueous solution or the cooling edge of a pool of molten chemical on a glass slide with a microscope. If solutions are used, be aware of the toxicity of the substances used and take adequate precautions. If a molten chemical is used, care should be taken to avoid burns.

Hardness Tests

Students must always be properly instructed on the proper technique used to determine hardness of a mineral. When scratching one mineral sample against another, care should be taken not to cut or gouge fingers and hands. Sharp, angular specimens should be handled with gloves. If testing hardness b scratching a glass plate, students should not hold the glass plate in the palm of their hands. The glass plate should be placed on a flat surface and

scratched away from the body. Goggles should be worn in case the glass breaks and splinters or a piece of the mineral chips away.

Ultraviolet Light Used for Viewing Fluorescent Minerals

Any radiation with a wavelength shorter than 250nm should be considered dangerous. This includes the ultraviolet light (black light) used in some mineralogy laboratories. Never remove the protective shield in front of a UV source. Safety glasses with UV-absorbing lenses should be provided.

EROSION/DEPOSITION

Diatomaceous Earth

Due to the possible inhalation of dust, use of diatomaceous earth should be avoided. Diatomaceous earth contains amorphous diatomaceous silica and crystalline silica. Breathing crystalline silica over a prolonged period of time can cause silicosis. Crystalline silica has been classified as a probable human carcinogen and therefore should be properly disposed of by using the chemical removal procedures.

Stream Table

Stream tables can have electric motors attached in order to pump water. Precautions should be taken to avoid spillage of water onto the electrical contacts. All electrical equipment should be regularly inspected for frayed power cords or damage to the housing.

Water

When collecting water samples from natural water sources there should be close supervision. Water that is stagnant or contains sewage effluent or industrial effluent should not be sampled.

EARTHQUAKES AND VOLCANOES

Volcanoes

Some experiments suggest using ammonium dichromate which dramatically simulates the effects of a volcano. This experiment should never be performed in the classroom. Ammonium dichromate is strictly prohibited.

METEOROLOGY

Air Pressure

Air under pressure can cause explosions or make objects or parts of objects move suddenly and violently. Containers that are to be pressurized or evacuated must be able to withstand the differences in pressure without violently shattering. Glass containers should not be subjected to differences in air pressure unless they were designed for such purposes. Students should always wear protective goggles when performing air pressure experiments.

Magdeburg Hemispheres are often used to demonstrate the force exerted on a surface by air pressure. When attempting to pull apart the hemispheres, students should be reminded of Newton's First Law. If they are braced and pulling hard and the hemisphere gives way, they could go flying into objects behind them. Do not release the vacuum inside the hemispheres while students are pulling on them.

Barometers and Thermometers
Mercury barometers and thermometers are strictly prohibited. Use aneroid barometers to explain air pressure readings.

Sling Psychrometers
Sling phychrometers are used to measure relative humidity. It is highly recommended that sling psychrometers only be done as teacher demonstrations. It is far safer for students to wet gauze and place it on a digital thermometer. Use a small fan to blow air across the gauze and the temperature will readily drop.

CHEMISTRY SCIENCE SAFETY

The following bullet points provide general chemistry science safety guidelines.

- Give proper instructions and caution students on the use of polyethylene squeeze bottles and the risk of dropping bottles, especially if the bottles contain flammable liquids. In such cases, bottles should not be used near open flames.
- Exercise care so that any hose connections between burners and gas outlets are protected from pinching or from being pulled away from the outlet.
- Never use fume hoods for storage of books, supplies, or chemicals.
- Use the stationary or portable fume hood when potentially hazardous vapors or gaseous substances are used or produced in a laboratory investigation.
- Preserve dry ice for short periods of time by wrapping the ice in several layers of newspaper to insulate it and reduce the rate of sublimation. The use of vermiculite, Styrofoam beads, or other particulate insulating material and a styrofoam chest will further extend the preservation of dry ice. Dry ice should be handled with great care to avoid contact with the skin and eyes. Gloves or tongs should be used when handling dry ice.
- Handle glass wool and steel wool carefully to avoid getting splinters in the skin or eyes.
- Never add water to concentrated acids. To dilute acids, add the concentrated acid in small quantities to the water, stirring constantly. Use heat-resistant glassware for this procedure.
- Tabletops should be protected from extreme heat by using insulation under burners or heated objects.
- Each science teacher should be prepared to act deliberately and intelligently in the event of a classroom fire.
- Approved eye-protective devices should be used by all persons performing science activities involving hazards to the eyes. This includes the use of liquids, heat, and glassware. All persons in proximity must be similarly equipped.
- Laboratory aprons and rubber or plastic gloves should be available and should be worn whenever hazards exist that could damage clothing, injure someone, or irritate skin.

Glass Tubing: For inserting glass tubing into a rubber stopper or tubing, observe the following precautions:

- Never attempt to insert glass tubing that has a jagged edge. Fire-polish the edge, if possible. Otherwise, bevel the edge with a file or emery cloth. Re-cut the tubing if necessary.
- Always aim the glass tubing away from the palm of the hand that holds the stopper or rubber tubing.
- Use water, soap solution, glycerin, or petroleum jelly as a lubricant, and gently press the tube into the hole with a twisting motion. Wash glycerin from rubber stoppers to prevent them from becoming brittle.
- Always hold glass tubing as close as possible to the part that is entering the rubber stopper.
- Cork borers should only be used with cork stoppers. They will not cut rubber.
- Lessen the chances of injury from broken tubing by wrapping a cloth around the hand or around the tubing at the point of contact with the hand.
- Do not grasp a thistle tube by the bowl when inserting the thistle tube into a rubber stopper. Grasp only the tubing, as closely as possible to where the glass tubing enters the stopper. Use plastic thistle tubes whenever possible.

CHEMICAL HEALTH HAZARDS
MANY CHEMICALS ARE PROHIBITED OR RESTRICTED; PLEASE CHECK APPENDICES F AND G BEFORE ORDERING OR USING ANY CHEMICAL IN THE CLASSROOM.

Chemical substances can enter the bloodstream, in three ways: ingestion, absorption, or inhalation. The following are examples of some classes of chemical substances and their effects on the body:

Acids: Acetic, chromic, hydrochloric, nitric, sulfuric, and carbolic (phenolic) acids cause severe burns and tissue damage.

Alcohols: These irritate mucous membranes. Methanol induces blindness through ingestion or prolonged inhalation.

Aldehydes and ketones: Inhalation, absorption, or ingestion of these substances irritates tissues and produces a narcotic effect.

Alkalies: Sodium and potassium hydroxides and ammonium hydroxide cause severe tissue burns (especially destructive to eye tissue) and bronchial spasms.

Asphyxiants: Carbon monoxide, carbon dioxide, and cyanide, and cyanogens compounds reduce the oxygen-carrying capacity of the blood, stop oxidation in tissues through destruction of enzymes, and displace atmospheric oxygen.

Carbon monoxide: Prolonged exposure renders the hemoglobin of red blood cells ineffective for the transport of oxygen. May lead to death.

Compounds of sulfur, phosphorus, nitrogen: Corrode the skin and destroy respiratory tissues.

Cyanides: Absorption, inhalation, or ingestion of cyanides produces toxic effects.

Cyanide compounds should not be used in high school laboratories since they generate hydrogen cyanide when dissolved in water. Hydrogen cyanide gas is extremely toxic.
Esters: Exposure causes tissue poisoning and irritation.
Ethers: Inhalation produces a powerful narcotic effect.
Halogens: Corrosive and highly irritating to tissues.
Hydrocarbons: Inhalation causes irritation and tissue destruction. *Prolonged exposure is very dangerous*. Chlorinated varieties form toxic phosgene gas when burned.
Irritants: Ammonia, phosphoric halides, hydrogen chloride, chlorine, bromine, and hydrogen sulfide damage respiratory tissues and skin.
Metal fumes: The fumes of mercury and zinc poison tissues, cause nausea and fever, even death. *Always use a fume hood.*

ESTABLISHING SAFE CHEMICAL STORAGE AREAS IN SCIENCE

CHEMICAL INVENTORY MANAGEMENT AND ELECTRONIC REPORTING APPLICATION (CHIMERA)

The Clark County School District uses CHIMERA to track all science chemical and consumable items at each secondary school site. Each site is provided CHIMERA access for two administrators and two designated science teachers. Each secondary school site is responsible for adding and deleting chemicals throughout the year and creating an accurate yearly inventory. A separate CHIMERA manual is made available to designated teachers and administrators.

Each school site must:

- Designate an administrator and a member of the science department to review, update, and ensure compliance with the CCSD's adopted procedures for laboratory safety.
- Examine all science chemical storage areas carefully for safety on a regular basis (at a minimum of once a month).
- Dispose of chemicals whose shelf life has been exceeded, and chemicals no longer being used by completing the Environmental Services, Hazardous Material Chemical/ Waste Collection form and faxing to Environmental Services at (702) 799-0990.
- Complete an annual inventory of all hazardous materials according to procedures of the CCSD Hazard Communication Plan.
- Ensure that alphabetized copies of Safety Data Sheets (SDS) for every chemical are kept in a binder in the science prep area and an additional binder be kept in the designated administrator's office. SDS sheets will have specific labeling that gives the name, hazard, and first aid procedures in case of exposure.

The result of planning and implementation should be a chemical storage area that has the following characteristics:

- The area is clean and orderly.
- A telephone is readily available.
- Emergency procedures are up-to-date and posted.
- A fully-stocked first-aid kit is available.
- Safety equipment and supplies (goggles, aprons, face shields, a fire blanket, fire extinguisher, eyewash, spill kit, and fume hood) are available **and functional**.

- There are no chemicals on the prohibited list present.
- Only necessary chemicals are available for use.

- Chemicals on hand will be consumed within the next year (except for items with an unlimited shelf-life, such as iron filings).
- Chemicals are arranged for storage in compatible groups.
- Chemicals are properly labeled and stored in appropriate containers. Adequate spacing between containers ensures proper air circulation and safe retrieval of chemicals.
- There is a continuous up-to-date inventory of all chemicals, including quantity, location, and date of purchase, shelf life, and projected disposal date.
- No chemicals or specimen pails are stored on the floor.
- Shelves or cabinets are secured firmly to the walls (except acid or locked metal flammable cabinets).
- No student is permitted in the storage area.
- Spill lips/barriers are in place on storage shelves.
- The storeroom door is self-closing and locks automatically.
- There is adequate ventilation and air is isolated from the rest of the building.
- Compressed gas cylinders are upright and secured with a metal chain to the wall, with caps in place. Flammable gases are separated from oxidizing gases.
- There are one or more non-reactive waste receptacles made of plastic or crockery.

POTENTIALLY HAZARDOUS CHEMICALS

Prohibited chemicals pose an inherent, immediate and potentially life threatening risk, injury or impairment due to toxicity or other chemical properties to the students, staff or other occupants of the school. These chemicals are prohibited from use and/or storage at the school and the school is prohibited from purchasing or accepting donations of such chemicals.

Restricted chemicals are restricted by use, and/or quantities. If restricted chemicals are present at the school, each chemical is addressed in the school's written emergency plan. The majority of restricted chemicals need a fume hood and should only be used at high schools.

Prohibited chemicals cannot be ordered under any circumstance. Restricted chemicals must have a written rationale, including the purpose of usage (name of teacher, course taught, and the demonstration to be conducted). See the form on page 87. The department coordinator must meet with the site administrator for approval with verifying signature. These forms must be kept on file with the SDS binders. A fillable PDF is available on InterAct at Ed link>Instructional Design and Professional Learning>IDPL Science>Science Safety and Equipment Repair.

Appendices F and G contain lists of Prohibited Chemicals and Restricted Chemicals. In addition, science teachers are advised to make careful decisions about the acquisition and use of laboratory chemicals. If an especially hazardous chemical is deemed essential to a program, the responsibility to ensure safe storage and use must be assumed the designated site administrator and a member of the science department. When in doubt, school staff should

contact appropriate District staff (see Appendix A for Technical Safety Assistance Contact Information).

WASTE COLLECTION
Minimize chemical waste by limiting the quantity of material purchased and used. Segregate and prepare chemical waste for collection in accordance with the procedures outlined by the CCSD Risk and Environmental Services Department. This includes depositing all waste in designated containers, labeling containers by identifying the type of hazardous waste material, and notifying Hazardous Materials whenever waste chemicals need to be removed. (See Appendix A for Technical Safety Assistance Contact Information and Appendix E for waste collection and disposal).

PHYSICS SCIENCE SAFETY

The considerations in this section are not intended to be all inclusive. Specific experiments and demonstrations presented in the physics curricula vary depending upon the equipment available and the expertise and confidence of the teacher.

ELECTRICITY

The use of electricity can present a serious hazard in the classroom or laboratory. Electrical devices used in the laboratory or classroom should only be those listed by the Underwriters Laboratory (UL), or equivalent, for 110-volt outlet application or those listed for use with a low voltage direct current furnished by batteries. Electrical devices should not be used or placed near any source of water or in an area subject to wetting from any source. Exercise special care in the placement and use of aquariums, particularly when using a 110- volt light source. Teachers should caution students that any projects submitted must meet the specifications noted or they will not be accepted.

Some guidelines for safety in the use of electrical equipment are as follows:

- Use only those 110-volt devices included in the list by Underwriters Laboratory or equivalent.
- Use 6-volt or 12-volt direct current for all possible applications.
- Operate electrical devices with dry hands and in a dry location. Make certain the floor is dry. Do not stand on metal or any other conducting surface when using electrical devices.
- Ground fault circuit interrupters (GFCIs) should be on electrical outlets near sinks.
- Ensure that power equipment or devices are double-insulated or safely grounded (three-prong plug).
- Use extension cords with extreme caution and never allow them to lie across areas of foot traffic. Be certain multiple-outlet bars have fuse protection or some other circuit breaker.
- Ask the building engineer for the location of the master electrical cut-off switch.
- Use low voltage DC for studying simple circuits.
- The teacher should check all student circuits before the power is connected.

- Never touch electrical circuit components with the power on. Only insulated tools should be used to make checks.
- In wiring an electrical circuit, make the live plug-in or the switch connection the last act in assembling and the first act in disassembling the circuit. This practice is applicable to all portable electrical apparatus. All alternating current (AC) circuits above 12 volts should be shielded to avoid direct contact.
- When using an electrical current, use only one hand at a time to avoid bringing both hands in contact with live sections of the circuit.
- Batteries should be checked for leakage and stored separately from electrical appliances.
- If an electrical current is used near a metal object, the object should be permanently insulated to prevent contact. Care should be taken to ensure that live wires do not contact grounded metal objects.
- During the charging of a student-made wet storage cell, keep students away from the fine spray that develops. It is harmful when inhaled, and is an eye and skin irritant.
- Carefully handle a storage battery. In spite of its low voltage, a high current can be drawn from it on a short circuit.
- Switches should be labeled for "on" and "off" positions.
- Proper grounding of equipment should be checked by the teacher before use.
- Any equipment with frayed cords or any other visible defects should not be used.
- Installation and repair to electrical equipment should be done by a trained repairman. Check with the administrator for the appropriate procedures for getting equipment repaired.
- Plugs should always be plugged in and pulled out using the plug, not the wire.
- Use properly grounded (three-prong, one constant ground) service outlets.
- Care should be taken not to spill liquids near electrical outlets. Spills should be cleaned up immediately.
- All potentiometers should be checked by the teacher before use in circuits by students.
- If fire does occur with a live electrical apparatus, pull the plug. Then use a Class C dry chemical CO_2 fire extinguisher.

ELECTRICAL APPARATUS

BATTERIES

A battery is an unregulated source of current capable of producing large currents when resistance is low. When short-circuited, connecting wires can become very hot, raising the risk of burns. Chemical leakage from batteries is a potential hazard, especially in the case of wet cells that contain caustic chemicals such as sulfuric acid.

CAPACITORS

Capacitors are used to store electric charge. They may remain charged for long periods after power is turned off, and they therefore pose a serious shock/burn hazard. Before working on any circuit containing a capacitor, make sure that it is discharged by shorting its terminals with an insulated wire or screwdriver. Oil-filled capacitors may sometimes recharge

themselves and should be kept shorted when not in use. Oil from older capacitors may be contaminated with dangerous PCBs. When installing electrolytic-type capacitors in a circuit, proper polarity rules must be followed (negative to negative and positive to positive). Improper connection can result in an explosion. Be on the lookout for capacitors in any apparatus with high voltage components such as oscilloscopes, TV sets, lasers, computers, and power supplies. Electrostatic generators and Leyden Jars are also capacitors and can be a source of unexpected shock.

ELECTROSTATIC GENERATORS

Electrostatic generators used in demonstrations of static electricity produce high voltages (about 10^5 volts) with very low currents. The danger of these generators depends on their size and capacity to produce enough current to be dangerous. In many cases the shock from such devices is very quick and not harmful.

In general, experiments that use human subjects to demonstrate the effect of electrical shock should not be attempted due to the large variation in physical and physiological factors. Leyden jars -- which can be charged with electrostatic generators -- are especially dangerous because of their capacity to store a charge for long periods of time. An accidental discharge through a person can be avoided by properly shorting the devices after use.

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

- **Fuses/Circuit Breakers.** Replace blown equipment fuses with fuses of the same amperage. Replace fuses with the equipment unplugged. Failure to use the correct fuse can cause damage to equipment and overheating. Frequent blowing of circuit fuses or tripping of circuit breakers usually indicates that the circuit is overloaded or a short exists. Circuit breakers and fuses that are tripped or blown should be turned on or replaced only after the cause of the short or overload is removed from the circuit.

- **Grounding.** Use grounded 3-prong plugs when available. If the outlet is 2-prong, use an adapter and secure the ground wire to the cover-plate screw on the outlet. Grounding is particularly important for the light sources used with ripple tanks since these lights are suspended above the water in the tanks. Any apparatus with a metallic case or exposed metal parts should be checked to make sure that the case is grounded. Such ungrounded appliances should be retrofitted with a ground wire and three-pronged plug. The use of ground-fault interrupters should be considered.

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

ELECTRICAL HAZARDS

BODY RESISTANCE

Students must be warned of the high death potential present even when the voltage is low. The severity of an electrical shock depends primarily on the amount of current to which a person is exposed. Since the current is related to the resistance and voltage, these two factors, as well as the part of the body involved and the duration of the contact, determine the extent of injuries to the victim. If the skin is wet or the surface broken, the resistance drops off rapidly, permitting the current to flow readily through the bloodstream and body tissues.

BURNS

Many electrical devices become quite hot while in use. In addition, "shorted" dry cells and batteries can produce very high temperatures. Students should never grasp a recently operated device or wiring without first checking for excess heat.

CURRENT-RESISTANCE RELATIONSHIP

Ohm's law indicates that the amount of current in *amperes* flowing in a circuit varies directly with the electrical potential applied in *volts* (V) and varies inversely with the resistance (R) in *ohms*: I = V/R

Thus, one can calculate the expected current in a given situation.

Example: Let R for a damp hand = 1,000 ohms. If an electrical potential of 110 volts is applied across the hand, the current would be:

$$I = \frac{110 \text{ Volts}}{1{,}000 \text{ ohms}} = 0.11 \text{ A or } 110 \text{ mA}$$

ENERGY EXPERIMENTS

- Ring stands should be secured with a C-clamp.
- Springs should not exceed their elastic limits.
- When viewing the pointer on a fixed scale, goggles should be worn.
- Sufficient space must be allowed during activities involving collisions.

LASERS

Before using lasers in demonstrations or in research, orient all students to the potential hazards. In general, school demonstration lasers emit visible light; therefore, students and teachers face hazards typical of visible and infrared light.

Lasers are valuable in demonstrations and laboratory experiments in school. Most school lasers are relatively low-powered, with a light emission of less than a thousandth of a watt. These lasers should not be confused with the powerful lasers intended for burning, cutting,

and drilling. However, science teachers should be aware of the inherent dangers in the operation of lasers.
The greatest danger in the use of lasers is the accidental penetration of the laser beam into the eye. Relatively low-powered beams may burn the retinal area, producing a blind spot. If the retinal area irradiated is the macula, its fovea (area of extremely fine vision), or the optic nerve, severe permanent visual damage may result.

The effects on the skin are those of burns. Lighter skin with little melanin pigment is affected to a lesser degree, but skin with high melanin content (overall or in spots, such as moles) may be burned severely. Conversely, lighter skin does not protect deeper-lying tissue from visible and near infrared irradiation damage as well as darker skin does. Exposure to ultraviolet irradiation may result in "sunburn," and, possibly, skin cancer in susceptible individuals.

Even though the power of a laser may be low, the beam should be treated with caution and common sense. Many laser hazards may be avoided by implementing the following measures:
Do not allow direct viewing of the beam. Instruct students not to look directly into the laser beam or its bright reflections, just as they should not look directly at the sun or at arc lamps.
Do not place any portion of the body in the path of the beam. These practices become increasingly important as the power of the laser device's output increases. Good work practices, developed early, will benefit an individual later when working with more hazardous lasers.
Know the location of the beam's path and keep it clear of extraneous objects. All optical components should be fixed in position with relation to the laser before the beam is propagated to ensure that the beam's path does not change in an uncontrolled manner. Objects with mirror-like finishes (e.g., plumbing fixtures, personal jewelry, and tools) reflect laser beams in unexpected directions. Such surfaces should be removed from the vicinity of the beam's path. Demonstration equipment, such as support rods, bench surfaces, and adjustment tools, should be painted or treated to produce a dull, non-reflective surface.
Block the beam when it is not needed. The mechanical beam stop should be opened to allow beam emission only when necessary for measurements or observations. It should always be closed when an optical element is being inserted into the beam's path or is being relocated.
Terminate laser beams. Block off the beam at a point beyond the farthest point of interest. All laser beams should be terminated in a non-reflective, light-absorbing material. For higher power lasers (>0.5 W), the material should be nonflammable.
Demonstrations should be prepared and tested by the instructor when no one else is present. All unwanted reflections should always be determined, eliminated or blocked.
Deflect the beam in a vertical plane in complex demonstrations. In normal experimental situations, the laser beam's path should be kept in a horizontal plane at a level below or above the eye level of the teacher and observers. Complex demonstrations involving reflection or refraction should be conducted with the beam's deflection angles contained in a vertical plane to reduce the possibility of directing a stray reflection into the audience. The laser display system should be contained in a box that is open on the side(s) but closed on the ends, top, and bottom. If the beam must travel a long distance, keep it close to the ground or overhead so that it does not cross walkways at eye level.

Affix expanding lenses rigidly to the laser. When the laser is used to illuminate large surfaces, such as in the viewing of holograms, beam expanding (diverging) lenses should be fixed rigidly to the laser.
The laser should be equipped with a key switch in the primary power circuit, rather than with the more commonly used toggle switch. Key switches are available from electronic supply stores for a relatively small charge. An additional switch that requires constant pressure is desirable. Although installing a key switch is desirable, a retrofit may void the manufacturer's warranty. It is advisable to have an electrical technician perform this operation.
Do not leave an operable laser accessible and unattended. The key should be removed and placed in a secure location to prevent unauthorized use of the laser and possible injurious exposures. For the same reason, when experiments or demonstrations take place in areas that might permit access to the beam by individuals not under the control of the teacher, a responsible person should be assigned to stop the beam's emission if such access to the beam appears imminent.
Reduce the optical power of the laser. The optical power used should be reduced to the minimum necessary to accomplish the objective of the experiment or demonstration. Neutral density filters or colored plastic can be used effectively to reduce radiated optical power.
Keep the area well lighted at all times. Good lighting tends to keep the pupil of the eye relatively contracted and reduces the amount of light that might impinge upon the retina accidentally when the laser system is in use.
Provide and use adequate eye-protective devices. Protecting the eyes with shatter-resistant goggles is essential when using some types of laser systems, but no one kind of goggle offers protection from all wavelengths.
Shield the pump source. Flashlamps or arc lamps are used to transmit energy into the laser material of solid-state lasers. The high-intensity light generated by these lamps should not be viewed directly. The broadband white light emitted is not completely blocked by laser-protection eyewear. Enclosure of the lamp in an opaque housing is essential.
Never permit eye exposure to either direct or reflected laser light. Target must be made of non-reflecting material. Beams should not be set at eye level. Students should not move about the room during the activity. Prisms should be set up before class to avoid unexpected reflections.
An adequate laser for high school use is the .5 milliwatt Helium-Neon laser.

LIGHT

- Sharp mirrors should be taped. Jagged-edged and chipped mirrors should be discarded.
- The use of lenses and prisms in direct sunlight should be supervised.
- Caution should be exercised in the use of ultraviolet light sources that can cause severe sunburn or damage to the retina. Proper instructions, labels, and protective gear should be provided.
- Wave motion, when studied with light, generally includes the use of large coil springs or rubber hoses. Do not exceed the elastic limit of the coils or release the hose unexpectedly.
- Ripple tanks should be set up to assure the stability of the high intensity light, motor, and electrical source.

- When simulating Young's experiment, caution should be taken when handling the delicate slides and single-edged razor blades.
- The spectrum tube power supply should be checked prior to classroom use. Students should make sure that the power supply is unplugged when inserting spectrum tubes.
- Teachers should be aware that some students may have physiological or psychological reactions to the effects of a strobe light (e.g. epilepsy).

MECHANICAL HAZARDS

EXPOSED BELTS

Exposed belts and pulleys must be covered with a shield. This prevents the hazard of broken belts, and of fingers or clothing being caught between belts and pulleys.

FALLING MASSES

Heavy masses may be used in experiments involving Atwood's machine, free fall, Newton's laws, and momentum. Warning should be given to students to prevent hands and feet from being caught between a moving heavy mass and floor or table surfaces.

HIGH-SPEED ROTATION

Rotators are sometimes used to demonstrate centripetal force, circular motion, and sound phenomena. Any device attached to a rotator should be fastened securely and checked for tightness frequently. Loose clothing and long hair should be kept away from moving parts, and observers should not be in the plane of rotation. Safety goggles should be used in student laboratories investigating centripetal force.

MAGNETS

Large permanent magnets and electromagnets may attract opposite poles or steel objects with unanticipated force. Students should be warned of the potential risk of pinching their hands between object and the magnet. In addition, exposed terminals on electromagnets should be insulated to prevent electric shock hazards.

PROJECTILES

In demonstrating the flight of any projectile, students should be kept clear of the path and impact area. The teacher should always pre-test the projectile to determine the path it will follow and its range as well as the amount of variability to be expected. Sharp-pointed objects should not be used as projectiles. Safety goggles should be used.

SPRINGS

Stretched or compressed springs contain mechanical potential energy. A stretched spring, unexpectedly released, can pinch fingers. A compressed spring, when suddenly released, can send an object at high velocity toward an observer. Care should be taken to avoid unexpected release of the spring's energy when working with dynamics carts, spring-type simple harmonic oscillators, and springs used in wave demonstrations.

VACUUM AND PRESSURE HAZARDS

VACUUMS

- **Suitable Containers.** Many popular physics demonstrations utilize a small vacuum pump to evacuate a chamber such as a bell jar, a coin-feather tube, or a collapsing metal can. Under no circumstances should a standard thin-walled, flat-bottom jar be evacuated because of the likelihood of implosion. If students are to be allowed to pump out a well-designed chamber, make sure it is firmly mounted so it cannot tip over and implode when under vacuum. Any large evacuated chamber should be equipped with a screen shield to help provide protection following an implosion. Such implosions can result from long-term stresses in glass or may result from thermal effects if heating occurs without opportunity to expand. On small chambers where a screen is inconvenient or undesirable, the walls should be wrapped with tape to reduce the flying glass following an implosion. When bell jars are used in demonstrations, remind students that they are specifically designed to withstand atmospheric pressure, and that one should never pump on a conventional container. Full face shields should be worn whenever working with a system which could conceivably implode or explode.

- **Tubes and Implosions.** Vacuum tubes, especially large ones, present a safety hazard if the tube breaks. Flying glass and electrodes can travel great distances when a tube implodes. This is a particular danger when tubes such as a cathode ray tube, a TV picture tube, or a Crookes tube are used in a demonstration or experiment that removes them from a protective housing. Under these conditions, safety goggles or shields must be worn by all observers. When an inoperable tube is to be discarded, it should be covered with a heavy canvas cloth and broken by striking the rear of the tube with a hammer. The broken tube should then be carefully disposed of.

- **Vacuum Pumps.** Vacuum pumps equipped with belts and pulleys must have the belt and pulley system shielded to prevent clothing and hands from getting caught. This shield should also prevent injury from broken belts striking nearby observers. Students should be warned to be careful of the hot motor and other parts after operation.

PRESSURES

- **Compressed Air.** Students in laboratories equipped with compressed air at lab stations or lecture tables should be warned of the danger of blowing dust or other debris into the eyes accidentally with compressed air. High pressure air directed at glassware for drying purposes can provide enough force to knock containers from the hands. The flow of air should be adjusted first to prevent this hazard.

- **Gas Bottles.** One of the most common items to be found in any science laboratory is a container of compressed gas. The pressures in gas containers may vary from atmospheric pressure to 10,000 psi, with most tanks essentially designed as shipping containers (with a minimum weight and wall thickness). A container of gas should not be kept around if the gas and its characteristics are unknown. Any gas cylinder should be anchored to the wall or mounted in a well-designed holder. When a gas cylinder tips over and is damaged, it can become a high powered, massive rocket capable of going through many walls and people. Large tanks URL 66 should be carefully moved in a wheeled cart with a tie-down chain safety cap in place, and should never be pulled by the threaded cap or rolled on the floor.).

  Almost all cylinders have internal pressures greatly exceeding what is needed for an experimental apparatus. Small laboratory lecture bottles may be controlled with a needle valve as long as they are not discharging into a system allowing pressure to build up to bottle pressure. Large cylinders should be controlled by a single or double stage regulator of a suitable pressure range. When a regulator is being used, the main cylinder valve should still be closed each time an experiment is shut down since regulators are not made to be reliable shut-off valves.
  If compressed gas is used as a propellant, students should remain clear of the gas exhaust and propelled objects.

- **Generating Gases.** A pressure relief safety valve of some type should be an integral part of any system constructed to generate gas or steam.

HEAT AND CRYOGENIC HAZARDS

HEAT

Heating Procedure

Often it is necessary to heat liquids and solids in physics experiments and demonstrations. It is safer to use water baths and hot plates than to heat directly with open flames such as with Bunsen burners. Below are guidelines for heating and handling hot objects.

- Any glass apparatus that is to be heated should be made of Pyrex® brand or Kimax® brand. It must be free of chips and cracks.
- Gas burners should be kept away from the body at all times. The pressure of the gas should be adjusted to allow proper ignition. Too high a pressure tends to blow the flame out. Do not allow gas to accumulate if ignition is delayed for any reason.
- Never heat a closed container if there is no means of pressure relief.
- Many substances, especially glass, remain hot for a long time after they are removed from the heat source. Always check objects by bringing the back of the hand near them before attempting to pick them up without tongs, hot pads, or gloves.
- Never set hot glassware on cold surfaces or in any other way change its temperature suddenly, because uneven contraction may cause breakage.

Steam
Live steam is generated in experiments to determine coefficients of thermal expansion and the heat of vaporization of water. Potential hazards can be avoided by following a few simple guidelines.

- Produce steam only in a container with a direct open line to the atmosphere.
- Instruct students that steam has a very high heat capacity and is invisible (the visible "vapor" is already condensed droplets). Caution them not to aim steam outlets at their own skin or at other students.
- Production of steam under pressures higher than atmospheric pressure should be limited to teacher demonstrations. The teacher should take necessary precautions associated with the higher temperatures of this steam and the explosion hazards.

Thermometers
Thermometers present several possible hazards. Following the guidelines below will minimize the hazards.

- Use alcohol thermometers in place of prohibited mercury thermometers.
- Consider the range of temperatures to be measured when choosing a thermometer. If heated beyond its capacity, a thermometer may break.
- Mount a thermometer in a safety rubber stopper whenever possible. When using other types of stoppers, use a lubricant on the glass or a split stopper. If necessary to free the thermometer from the stopper, split the stopper with a single-edge razor blade. Teachers should ensure that students use the thermometer in such a way that the equipment does not become unstable.

Burns
A common cause of student injury is a burn from recently heated glassware. To avoid such burns, check the glassware by bringing the back of the hand close before attempting to pick it up. In case of an accidental burn, administer first aid and send the student to the health office.

CHEMICAL HAZARDS

Carbon Dioxide
The use of dry ice in cryogenic experiments must be accompanied by precautions against production of an oxygen-deficient atmosphere. Carbon dioxide, which is more dense than air, easily collects in a non-ventilated area.

Carbon Monoxide
Do not allow carbon monoxide from incomplete combustion to collect in a closed area. Always conduct demonstrations using small internal combustion engines under a vented hood or outdoors.

Flammables

Do not use flammable substances near an open flame unless the purpose is to demonstrate flammability. Many flammables produce toxic fumes and should be burned only under a vented hood. Large containers of flammable liquids should be opened, and liquids transferred, in a room free from open flames, preferably, under a fume hood.

RADIATION HAZARDS

Infrared Radiation

Caution students that, beyond a limited exposure, infrared waves (heat waves) entering the eye can cause burns to the cells of the retina. Infrared lamps and the sun are concentrated sources of these waves.

- Follow manufacturer's instructions when using any infrared lamp.
- The sun should never be viewed directly, especially at times when its visible light is partially obscured. (The visible light triggers the body's natural defenses of avoidance and pupil constriction.) Lenses and sunglasses do not offer protection from this radiation. Safe viewing of the sun can be done by projecting an image of it through a very small hole onto a white piece of paper about one-half meter behind the hole.

Microwaves

A microwave apparatus is often used to demonstrate various wave behaviors of electromagnetic radiation. Microwave devices designed for high school use have sufficiently low power to be free of radiation hazards when the manufacturer's instructions are followed. Microwave ovens that are in good working order and used properly do not pose any safety hazard in a classroom. Follow these guidelines:

- Check the apparatus for radiation leakage before use if there are any doubts about its safety.
- Inspect ovens periodically to ensure they are clean and the door, hinges, vision screen, seals, and locks are secure and working properly.
- Do not place metal objects in the heating cavity.
- Do not permit students to stand close to an oven during operation.

Radioactive Materials

The details in this section are intended for the use of radioactive materials for class demonstrations only with the use of a Geiger counter or cloud chamber. Needles or button type radioactive sources are the only items that can be used in the school setting. No other use of radioactive materials is allowed at the school site. The use of radioactive isotopes in Nevada is regulated by the U.S. Nuclear Regulatory Commission and by laws and regulations of the State of Nevada. Science teachers in secondary schools who intend to use radioactive materials must become familiar with Nevada State regulations. It is of utmost importance that exposure of students, teacher, or other school personnel to any radioactive substance be minimized.

All orders for radioactive materials must be approved before purchase by the Clark County School District Hazardous Environmental Services Department (see Appendix A for contact information).

Upon receipt of radioactive materials, the teacher should:

- Inspect the package carefully for any breakage.
- Monitor the packing materials for any possible radioactive contamination. If evidence of any contamination exists, the appropriate district staff member or other appropriate agency must be notified immediately.

Each container must be labeled with the following information:

- That the package contains a radioactive substance.
- The chemical name of the material and its mass number.
- The date received and the name of the person responsible.
- The quantity of radioactive material (in Microcuries) and the latest date of measurement.

Radioisotopes

Radioisotopes produce biological injury (cell damage) resulting from their ionizing properties. Gamma rays and beta particles are hazardous both inside and outside the body. Alpha particles cannot penetrate skin and are not hazardous if kept outside the body. The use of license-exempt quantities especially sealed sources will create minimum hazard because of the small amount of radiation present. Safe handling requires these protective measures:

- *Time*. Minimize contact time with samples.
- *Distance*. Use tongs, forceps, etc., to avoid direct contact.
- *Shielding*. Use shielding appropriate for the radiations encountered.
- *Storage*. Store radioactive materials so that people are not in frequent close proximity to them and they are not damaged accidentally.

Ultraviolet Radiation

Ultraviolet light can be absorbed in the outer layers of the eye, producing an inflammation known as conjunctivitis. The effect usually appears several hours after exposure and, unless the exposure is severe, will disappear within several days. Sources of harmful ultraviolet light likely to be encountered in physics include mercury vapor lamps, electrical arcs (e.g., the carbon arc lamp), incandescent ultraviolet lamps, and the sun.

- Plastic or glass sheets which transmit poorly in the ultraviolet region offer good protection for the viewer of these sources.
- Use black paper with caution because, while it absorbs well in the visible range, it may be highly reflective in the ultraviolet range.
- The sun should never be observed directly.
- Incandescent ultraviolet lamps present a minimal danger from their ultraviolet emissions, as the energy of this radiation is very low. These bulbs, however, get extremely hot when in use and must be given plenty of time to cool before handling.

Visible Light (including Lasers)

Intense sources of visible light are usually not hazardous due to the inability of the human eye to remain focused on an intense source. Infrared and ultraviolet radiation sometimes present along with visible light provides a greater hazard.

X-ray Radiation

X-rays may be produced in any situation in which high-speed electrons strike a target. These conditions may exist in evacuated tubes where the accelerating voltages are in the range of 10,000 volts or more. Crookes tubes and other cold cathode discharge tubes are potential sources of X-rays in the classroom. (Spectrum tubes used to observe spectra of elements and compounds are not a source of X-rays if the tubes are in good condition because the enclosed gases prevent electrons from achieving high enough energies.) To minimize possible X-ray exposure, three rules should be observed by teachers and students:

- Minimize the voltages used to operate vacuum tubes.
- Maximize the distance between the tube and the observers.
- Minimize the time during which the tube is operated. If any tube or apparatus is suspected of emitting X-rays, it should be checked for dangerous amounts of radiation. Commercial companies listed in the yellow pages should be able to provide this service.

MODEL ROCKET LAUNCHINGS ON SCHOOL SITES

Only factory prepared, solid engine propellant should be used and only as recommended by manufacturers. Direct supervision is needed.

- All rocket launchings must be approved by the site administrator.
- Only authorized classes or clubs should engage in this kind of activity on school sites and only with permission from the site administration.
- All rocketry equipment should be stored in appropriate and locked flammable cabinets. They cannot be stored with incompatible chemicals.
- The length of the rocket must not measure fewer than 10 inches (25 cm).
- The rocket must not weigh more than 1500 grams (53 ounces).
- Only commercially-produced class D or smaller engines are to be used.
- The minimum size of the launch site for class D engines should extend to a radius of 250 feet from the firing position. Details for each engine size can be found at www.nar.org.
- No fire hazard may be posed by the launch. No dry vegetation or forest areas may be within the launch radius.
- No buildings, other structures, roads, or high-voltage electrical lines may be within the launch radius. The firing area should be at the center of the launch radius.
- No rockets should be launched if the wind is blowing more than 15 miles per hour.
- Students must not attempt to recover their rockets from power lines, trees, roofs, or other dangerous places.
- Teachers should caution their students about the danger of experimenting with rockets and missiles.

MOTION AND FORCES

- Teachers should make sure that stationary devices are secured with a clamp.
- Spring-loaded carts and heavy masses should be used only as directed.
- Centripetal force labs should be conducted only with protective goggles.
- If glass rods are used, they should be fire polished and wrapped in tape. Additional space may be needed to assure the spinning mass does not hit anything.

Instructions should caution students never to walk into the path of the spinning masses. The teacher should check to make sure the mass being used by each group is securely fastened.

- The building and testing of **model bridges** warrants some precautionary measures. Protective goggles should be worn by everyone when breaking bridges. Caution students about the potential hazards of the container of masses.
- Never view **solar eclipses** directly; always use an indirect method.
- Observe caution in the use of all **rotating apparatus**, such as the whirling table or Savart's Wheel. Be certain the safety nut is securely fastened at all times. The apparatus should revolve at moderate speeds only.

NATURAL GAS AND HEATING METHODS

- **The use of mercury thermometers is prohibited!**
- Locate master gas valve cut-off and leave master control "off" when valve is not in use.
- Closed containers should never be heated.
- Use proper technique to insert a thermometer into a rubber stopper to prevent lacerations.
- Bunsen burners and rubber hoses should be periodically checked for leaks.
- Fire retardant pads and gloves should be used when handling hot materials.
- Only Pyrex or heat-resistant glassware should be used when heating liquids.
- Do not leave gas jets open.
- A fire blanket and an appropriate fire extinguisher should be available in the vicinity.
- Never leave a heating object unattended.

PRESSURE

When using a **bell jar and vacuum pump** to show the effects of reduced air pressure on materials, examine the equipment before use. If any cracks or chips are found in the bell jar the items cannot be used and must be disposed of properly. **The use of a safety shield and protective eyewear is required for teachers and students.**

When using a **pressure cooker** to demonstrate the variation of boiling points under pressure, be sure to examine the safety valve on the cooker before use to make sure it is in working order. Do not exceed 20 pounds per square inch (137.8 kPa).

SOUND

When studying resonance, the vibrating **tuning forks** must not touch the top of the glass tube because of the danger of shattering the tube. Placing tape on the rim of the tube will reduce chipping. In the production of sound, **levels of 110 decibels** or higher can cause hearing damage. Use caution with resonance rods (singing rods) when using for prolonged periods of time.

APPENDIX A TECHNICAL SAFETY ASSISTANCE

RESPONSE SECTION	PHONE	TOPIC/SERVICE AREA
Career & Technical Education	(702) 799-8462	Shop Safety (Auto, Mechanic, Wood, etc.)
Equipment Repair	(702) 855-6680	Fire Extinguisher
Facilities and Equipment Safety Inspection	(702) 799-6496	Equipment Safety
		Inspections, Playgrounds and Schools
Grounds/Landscaping	(702) 799-8310	Bee Swarms/Hives on School Grounds
Risk Management: Environmental Services, Hazardous Materials	(702) 799-0990	Chemical Spills
		Chemical Disposal
		EPA, Federal and State
		Inspections, EPA
		Safety Data Sheet (SDS)
Health Services	(702) 799-7443	Student Health
	(702) 799-0767	Bloodborne Pathogens
Building Department/Inspection Services	(702)799-7605	Fire Code Compliance
		Fire Prevention
		Inspection, Fire
		Inspection, Building
K–12 Science, Health, and Physical Education	(702) 799-2348	K–12 Science Safety Manual
Risk Management	(702) 799-6496	Accidents, General
		Accidents, Vehicle
		Injuries, Employees and Students
		Insurance, Liability
		Workers Compensation
Environmental Services	(702)799-0985	Asbestos Management
		Indoor Air Quality
		Materials Analysis
		Shelter-in-Place
		Accidents, General
		Hazard Analysis, Safety
		Inspections, OSHA
		Occupational Safety
		Safety Equipment
		Safety Training
		Videos, Safety
School Police	(702) 799-5411	Security – School

APPENDIX B SAFETY SAFETY SURVEY

School:_____
Teacher:_____
Room Number: _____

Individual Classroom Safety Items
Circle (F) functional, (NF) nonfunctional or (NP) for not present.

Eye wash station
-Portable
F NF NP
-Permanent (plumbed)
F NF NP

Shower
-Drain located below shower
F NF NP
-Monthly schedule for flushing and testing of eyewash and showers.
F NF NP

Goggle Station/Sterilizer
1 pair of chemical splash proof goggles per student in class
F NF NP

Fume Hood (in rooms where chemistry is taught)
F NF NP

Hot Hands (used to pick up hot objects)
F NF NP

Lab Aprons
F NF NP

Glass only can
F NF NP

-Dust pan and broom for sharp objects
F NF NP

First Aid supplies
-Band aids
-Access to ice (for burns)
-Rubber gloves (Universal Precaution)
-4 x 4 gauze
-Disinfectant/antiseptic

Fire extinguisher
F NF NP

Fire blanket
F NF NP

Sinks
-Student stations
-Teacher demonstration station
-Portable
F NF NP

Chemical resistant lab tables
F NF NP
-Chemical resistant lab counters
F NF NP
-CCSD Accident Report Forms
F NF NP
-Student safety contract
F NF NP

Department Level Safety Items Please mark all of the items that are located in your department prep/common area.

Chemical storage cabinets
-Acid/base/corrosion resistant
-Flammable
-Locked Cabinets

Shelves or Cabinets bolted to framing/Structural Support

Locked Chemical Storage area (Restricted Student Access)

Ventilation of chemical storage area.
F NF NP

Safety Shield (Polycarbonate shield)
F NF NP

Explosion Proof Refrigerator
F NF NP

Spill Control Station
F NF NP

Autoclave
F NF NP

Step Ladder or Step Stool
F NF NP

Emergency Lighting
F NF NP

SDS Files (Science Department copy, Main Office or Administration)
F NF NP

APPENDIX C
LAB INSPECTION CHECKLIST

School Name: _____
Conducted By: _____
Date of Inspection:_____
Room Number: _____

I. Laboratory Work Practices

	Yes/No	Comments
✓ Food and beverages are not stored in the laboratory areas, refrigerators or in glassware that is also used for laboratory operations.	Yes/No	
✓ Pipetting is performed by mechanical means.	Yes/No	
✓ Laboratory surfaces are cleaned; disinfected or decontaminated after work is performed.	Yes/No	
✓ Hoods are not being used for storage.	Yes/No	

II. Housekeeping

	Yes/No	Comments
✓ Laboratory and storage areas uncluttered and orderly (including bench tops).	Yes/No	
✓ Aisles & exits are free from obstruction.	Yes/No	
✓ Work surfaces are protected from contamination.	Yes/No	
✓ Electrical cords are in good condition and are UL listed.	Yes/No	
✓ Tools and equipment are in good repair and electrically grounded.	Yes/No	
✓ Tops of cabinets and shelves are free from stored items.	Yes/No	
✓ Heavy objects are confined to lower shelves.	Yes/No	
✓ Glassware is free from cracks, chips, sharp edges and other defects.	Yes/No	
✓ Broken glass containers are available and in use.	Yes/No	

III. Personal Protective Equipment

	Yes/No	Comments
✓ Protective gloves are available and matched to hazards involved.	Yes/No	
✓ Eye protection is available and in use in all laboratories.	Yes/No	
✓ Lab coats or other protective garments are available and in use.	Yes/No	
✓ Lab coats are only worn in the laboratory and are removed before entering offices, lunchrooms, rest rooms, conference rooms and other non-laboratory general use areas. (This includes disposable protective clothing).	Yes/No	

IV. Hazard Communication

	Yes/No	Comments
✓ Primary & secondary chemical containers are labeled with identity, appropriate hazard warnings, and expiration dates.	Yes/No	
✓ Signs on storage areas (e.g. refrigerators) and laboratories are consistent with hazards within.	Yes/No	
✓ SDS binders are available for chemicals used and stored in area.	Yes/No	
✓ Employees know the location of the SDS binders for their work area.	Yes/No	

V. Chemical Storage

	Yes/No	Comments
✓ Incompatible materials are segregated.	Yes/No	
✓ Corrosives and flammables are stored below eye level.	Yes/No	
✓ Hazardous materials used/stored in the laboratory are limited to small quantities.	Yes/No	
✓ Unnecessary, unused, or outdated materials are removed from laboratories and chemical storage areas.	Yes/No	
✓ Safety carriers are available and in use while transporting chemicals.	Yes/No	
✓ All lab carts have side-rails.	Yes/No	
✓ All containers are properly labeled.	Yes/No	

VII. Compressed Gas Cylinders

	Yes/No	Comments
✓ Gas cylinders are properly chained/secured.	Yes/No	
✓ Cylinder caps are in place when cylinders are not in use or being moved.	Yes/No	
✓ Gas cylinders are transported on a cart with chains.	Yes/No	
✓ Gas cylinders are stored away from excessive heat.	Yes/No	
✓ Fuel gas cylinders are at least 20 feet away from oxygen cylinders.	Yes/No	
✓ Gas cylinders are properly marked as to their contents.	Yes/No	
✓ Full and empty cylinders are stored separately.	Yes/No	
✓ Empty gas cylinders are labeled “EMPTY”.	Yes/No	
✓ Gas lines, piping, manifold, etc. are labeled with the identity of their contents.	Yes/No	
✓ Hoses, tubing and regulators are in good working condition.	Yes/No	

VI. Flammable Liquids Storage & Handling

	Yes/No	Comments
✓ Flammable liquids are stored and used away from ignition sources.	Yes/No	
✓ Bulk quantities of flammable liquids are stored in approved storage cabinets.	Yes/No	
✓ Flammable liquid storage cabinets are properly labeled.	Yes/No	
✓ Flammable liquid storage cabinets close properly.	Yes/No	
✓ Flammables stored on open shelves in glass or plastic containers are within permissible quantities.	Yes/No	
✓ Safety cans used to handle small quantities of flammable liquids are properly labeled.	Yes/No	
✓ Solvent waste cans are labeled properly.	Yes/No	
✓ Nothing is stored on top of flammable cabinets.	Yes/No	

VIII.Waste Handling: Hazardous, Non-Hazardous & Biological

	Yes/No	Comments
✓ No liquid waste is disposed of in the sinks or the sewer.	Yes/No	
✓ Hazardous wastes are not accumulated for longer than one month in the laboratory.	Yes/No	
✓ Waste streams are separated as necessary: ex. Solid vs. liquid, hazardous vs. non-hazardous, halogenated vs. non-halogenated, etc.	Yes/No	
✓ Waste containers are appropriately tagged before placing in waste room.	Yes/No	
✓ Containers of hazardous waste are labeled properly with the date and name of person discarding waste.	Yes/No	
✓ **Biological waste** is appropriately marked with a biohazard symbol.	Yes/No	
✓ Syringes and other sharp waste are disposed of into a sharps container and placed directly into biohazard waste container.	Yes/No	
✓ Waste material is not allowed to accumulate on the floors, in corners or under shelves/tables in laboratories.	Yes/No	
✓ **Radioactive waste** is properly marked with radiation symbol.	Yes/No	

IX. Means of Egress and Emergency Exits

	Yes/No	Comments
✓ Exits are clearly marked.	Yes/No	
✓ Exits are free from obstruction.	Yes/No	
✓ All fire doors are self-closing.	Yes/No	
✓ All fire doors are kept closed.	Yes/No	
✓ Fire alarms are provided.	Yes/No	
✓ Telephones are labeled with emergency numbers.	Yes/No	
✓ Emergency evacuation routes are clearly posted.	Yes/No	
✓ Emergency evacuation routes are posted in common hallways.	Yes/No	
✓ Emergency exit lights are working and clear of obstruction.	Yes/No	

X. Other Labeling & Posting

	Yes/No	Comments
✓ Warning signs and labels are present whenever required (e.g. carcinogen, mutagen) where chemicals are stored.	Yes/No	
✓ Biohazard symbols are posted on access doors to biohazard laboratories and animal rooms and on potentially contaminated equipment.	Yes/No	

XI. Safety Equipment

	Yes/No	Comments
✓ Safety showers and eye wash stations are located within 75' of all laboratories.	Yes/No	
✓ Safety showers and eye wash stations are clearly labeled, and these areas are clear from obstruction.	Yes/No	
✓ All showers and eye wash stations are clean, covers are replaced and they in good working condition.	Yes/No	
✓ Fire extinguishers are available.	Yes/No	
✓ Fire extinguishers are checked monthly. Date of last check: _____	Yes/No	
✓ Fire detection devices, smoke alarms, sprinkler systems, lighted exit signs are in good working condition.	Yes/No	
✓ First-aid supplies are readily available and clearly visible.	Yes/No	
✓ Spill team list is clearly posted in laboratories.	Yes/No	

APPENDIX D
CHEMICAL STORAGE

CHEMICAL INVENTORY MANAGEMENT AND ELECTRONIC REPORTING APPLICATION (CHIMERA)

The Clark County School District uses CHIMERA to track all science chemical and consumable items at each secondary school site. Each site is provided CHIMERA access for two administrators and two designated science teachers. Each secondary school site is responsible for adding and deleting chemicals throughout the year and creating an accurate yearly inventory. A separate CHIMERA manual is made available to designated teachers and administrators.

CHEMICAL COMPATIBILITY CATEGORIES=

1. All **Metals.** Flammable solids should be stored in the flammables cabinet. Keep separate from oxidizers (including ammonium nitrate), halogens, organic compounds, and moisture.
2. **Oxidizers** . All except ammonium nitrate. Includes nitrates, nitrites, permanganates, chlorates, perchlorates, peroxides, and hydrogen peroxide 30 percent or greater. Keep separate from metals, acids, organic materials, and ammonium nitrate. Preferably, isolate oxidizers from the flammable liquids storage cabinet by a minimum of eight meters (25 feet) or by a one-hour fire wall.
3. **Ammonium nitrate.** Store in isolation from all other chemicals, especially acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, and finely divided organic combustible materials.
4. **Bases.** Strong bases—sodium hydroxide, potassium hydroxide, and other regulated bases—and ammonium hydroxide. Store in a dedicated corrosive chemical storage cabinet that has an interior constructed entirely of corrosion-resistant materials.
5. **Acids.** Inorganic (except nitric acid) and regulated organic acids. Store in a dedicated corrosive chemical storage cabinet that has an interior constructed entirely of corrosion-resistant materials.
6. **Nitric acid.** Must be stored separately from acetic acid. Store either in an isolated compartment in the acids cabinet or in special Styrofoam containers available for that purpose from vendors of chemicals. Fuming nitric acid should never be used.
7. **Flammables.** Store in a dedicated flammables storage cabinet painted with heat/flame-resistant paint. Preferably, isolate flammables from all oxidizers by a minimum of eight meters (25 feet) or by a one-hour fire wall.
8. **Poisons.** Use a lockable cabinet designated for poison only.
9. **Compressed gases.** Cylinders must be chained or strapped to the wall, with caps on tight. (a) Keep oxidizing gases remote from flammable liquids, metals, and flammable gases; (b) Keep flammable gases remote from oxidizers and oxidizing gases by a distance of eight meters (25 feet) or by a one-hour fire-wall.
10. **Low-hazard chemicals.** Many of the salts not otherwise specified (*not* the nitrates), weak bases, oxides, carbonates, sulfides, dyes, indicators, stains, noncorrosive organic acids, amino acids, sugars, and so forth. Store on open shelves that have earthquake barriers.

COMMON CHEMICAL STORAGE SYSTEM

Science teachers will utilize the chemical storage system as recommended by the Southern Nevada Health District (SNHD). This system is taken from the National Institute for Occupational Safety and Health (NIOSH) document entitled *School Chemistry Laboratory Safety Guide.* This guide can be downloaded from www.cdc.gov/nisoh.

A suggested arrangement of compatible chemical families on shelves in a chemical storage room is depicted here. However, the list of chemicals below does not mean that these chemicals should be used in a school laboratory. Please refer to the **Prohibited and Restricted Chemical List** found in Appendices F and G.

In addition, middle schools or junior high schools may have a limited number of chemicals and chemical cabinets. Therefore, some chemicals can safely be stored on the same shelf as delineated in the following pages if families are separated by a piece of wood or plastic.

To begin organizing chemical cabinets sort chemicals into organic and inorganic classes. Next, separate into the following compatible families:

Inorganics	**Organics**
1. Metals, Hydrides	1. Acids, Anhydrides, Peracids
2. Halides, Halogens, Phosphates, Sulfates, Sulfites, Thiosulfates	2. Alcohols, Amides, Amines, Glycols, Imides, Imines
3. Amides, Azides*, Nitrates* (except Ammonium Nitrate), Nitrites*, Nitric acid	3. Aldehydes, Esters, Hydrocarbons
4. Carbon, Carbonates, Hydroxides, Oxides, Silicates	4. Ethers*, Ethylene oxide, Halogenated Hydrocarbons, Ketenes, Ketones
5. Carbides, Nitrides, Phosphides, Selenides, Sulfides	5. Epoxy Compounds, Isocyanates
6. Chlorates, Chlorites, Hydrogen Peroxide*, Hypochlorites, Perchlorates*, Perchloric Acid*, Peroxides	6. Azides*, Hydroperoxides, Peroxides
7. Arsenates, Cyanates, Cyanides	7. Nitriles, Polysulfides, Sulfides, Sulfoxides
8. Borates, Chromates, Manganates, Permanganates	8. Cresols, Phenols
9. Acids (except Nitric Acid)	
10. Arsenic, Phosphorous*, Phosphorous Pentoxide*, Sulfur	

***Chemicals deserving special attention because of their potential instability.**

CHEMICAL LABELING

Chemicals located in chemical storage areas, chemical cabinets, and classrooms must utilize a consistent label format. Each chemical must include the following:

- Full Chemical Name
- Chemical Formula
- Concentration
- Quality or Grade (Reagent, Lab, etc.)
- Date Purchased
- Expiration Date
- Shelf Life
- Disposal Reference
- Hazard Information, Including NFPA Coding (National Fire Protection Association labeling system that rates the hazards of a chemical during a fire to include health, flammability, and reactivity hazard)
- Warning and First Aid Information
- Storage Location and Code (cabinet and shelf location)
- CAS Number (number assigned by the Chemical Abstract Service (CAS) to a chemical or a group of similar chemicals)

SUGGESTED SHELF STORAGE PATTERN — HIGH SCHOOL

(See the *Flinn Scientific Catalog/Reference Manual* for detailed storage information)

CABINET 1
SHELF 1: Inorganic #10 Pentoxide, Sulfur
SHELF 2: Inorganic #2 Halides, Halogens, Phosphates, Sulfates, Sulfites, Thiosulfates
SHELF 3: Inorganic #3 Amides, Azides, Nitrates, Nitrites EXCEPT Ammonium Nitrate -STORE AMMONIUM NITRATE AWAY FROM ALL OTHER SUBSTANCES
SHELF 4: Inorganic #1 Hydrides, Metals STORE AWAY FROM WATER. STORE ANY FLAMMABLE SOLIDS IN DEDICATED CABINET
SHELF 5: Inorganic #4 Carbon, Carbonates, Hydroxides, Oxides, Silicates

CABINET 2
SHELF 1: Inorganic #7 Arsenates, Cyanates, Cyanides STORE AWAY FROM WATER
SHELF 2: Inorganic #5 Carbides, Nitrides, Phosphides, Selenides, Sulfides
SHELF 3: Inorganic #8 Borates, Chromates, Manganates, Permanganates
SHELF 4: Inorganic #6 Chlorates, Chlorites, Hypochlorites, Hydrogen Peroxide, Perchlorates, Perchloric Acid, Peroxides
SHELF 5: Miscellaneous

SUGGESTED SHELF STORAGE PATTERN — HIGH SCHOOL

(See the *Flinn Scientific Catalog/Reference Manual* for detailed storage information)

CABINET 3
SHELF 1: Organic #2 Alcohols, Amides, Amines, Imides, Imines, Glycols STORE FLAMMABLES IN A DEDICATED CABINET
SHELF 2: Organic #3 Aldehydes, Esters, Hydrocarbons STORE FLAMMABLES IN A DEDICATED CABINET
SHELF 3: Organic #4 Ethers, Ethylene Oxide, Halogenated Hydrocarbons, Ketenes, Ketones STORE FLAMMABLES IN A DEDICATED CABINET
SHELF 4: Organic #5 Epoxy Compounds, Isocyanates
SHELF 5: Organic #7 Nitriles, Polysulfides, Sulfides, Sulfoxides

CABINET 4
SHELF 1: Organic #8 Cresols, Phenol
SHELF 2: Organic #6 Azides, Hydroperoxides, Peroxides
SHELF 3: Organic #1 Acids, Anhydrides, Peracids STORE CERTAIN ORGANIC ACIDS IN ACID CABINET
SHELF 4: Miscellaneous
SHELF 5: Miscellaneous

SUGGESTED SHELF STORAGE PATTERN — HIGH SCHOOL

(See the *Flinn Scientific Catalog/Reference Manual* for detailed storage information)

CABINET 5
SHELF 1: Inorganic #9 (Acids) **Acids, EXCEPT Nitric Acid –** Store Nitric Acid away from other acids unless the cabinet provides a separate compartment for Nitric Acid storage

CABINET 6
SHELF 1: Flammable Organic #2 Alcohols and Glycols
SHELF 2: Flammable Organic #3 Hydrocarbons and Esters
SHELF 3: Flammable Organic #4

CABINET 7
SHELF 1: Poison Storage

SUGGESTED SHELF STORAGE PATTERN — MIDDLE SCHOOL

(See the *Flinn Scientific Catalog/Reference Manual* for detailed storage information)
(see high school for names of compounds)

CABINET 1
SHELF 1: **Inorganic #3, #6, #7, #8**
SHELF 2: **Inorganic #2**
SHELF 3: **Inorganic #2, #10**
SHELF 4: **Inorganic #1, #5**
SHELF 5: **Inorganic #9**

CABINET 2
SHELF 1: **Inorganic #4**
SHELF 2: **Organic #9, #1**
SHELF 3: **Organic #2, #3, #4**
SHELF 4: **Organic #5, #6, #7, #8**
SHELF 5: **Organic and Inorganic Miscellaneous**

SUGGESTED SHELF STORAGE PATTERN — MIDDLE SCHOOL

(See the *Flinn Scientific Catalog/Reference Manual* for detailed storage information)
(see high school for names of compounds)

CABINET 3
SHELF 1: **Organic # 1** **Inorganic #9 (Acids)** **Acids, EXCEPT Nitric Acid –** Store Nitric Acid away from other acids unless the cabinet provides a separate compartment for Nitric Acid storage

CABINET 4
SHELF 1: Flammable Organic #2 Alcohols and Glycols
SHELF 2: Flammable Organic #3 Hydrocarbons and Esters
SHELF 3: Flammable Organic #4
SHELF 4: Flammable Organic #9

APPENDIX E
WASTE DISPOSAL

CHEMICAL WASTE DISPOSAL GUIDELINES

Potentially hazardous chemicals and all hazardous waste must be disposed of in accordance with Federal & State regulations and procedures established by CCSD Risk & Environmental Services Department. Your site may have additional procedures which you are required to follow. Contact your supervisor or Risk & Environmental Services Department before discarding any potentially hazardous chemical or waste.

The following guidelines will assist in waste disposal and collection:

- Disposal of chemicals by way of the sanitary sewer system is **prohibited**. The only exception to this is diluted acids and bases. These can be disposed of using **only** the black sinks in the science labs. Disposal of chemicals of any kind in any other sink or drain is **prohibited**.

- All staff members must be familiar with the location and composition of all used chemicals produced in the lab or worksite.

- All containers must remain closed except when actually adding to them. Open containers violate state and federal waste regulations.

- Used chemicals must not be placed or left for removal in hallways, offices or rooms. Chemicals must be kept only in approved storage areas.

The first priority of CCSD's Hazardous Waste Management Procedures for Schools is waste minimization. Whenever possible, chemical quantities should be minimized.

This is achieved by:

- Planning experiments to reduce types of used chemicals generated.

- Reducing the scale of experiments to limit the amount of used chemicals generated.

- Planning & purchasing chemicals only in the amounts necessary to complete the experiment.

Used Chemical Container Labeling

Leftover reagents and reaction products should be placed in marked containers at the end of each laboratory session. Broken glass should be placed in its own marked container.

Used chemicals shall be classified into the following categories:

- Flammable
- Organic Acid
- Reactive
- Base
- Water Reactive
- Toxic
- Air Reactive
- Oxidizer
- Inorganic Acid
- Other

Containers shall be labeled with the following information:

- Used-chemical category
- Complete name of chemical(s) in the container
- Approximate percentage of each chemical (if mixed)
- PH
- Date prepared
- Name of teacher & room number

Used chemicals will be maintained in their containers and secured in an approved storage area until such time that they are either reused in a laboratory procedure or reclassified as waste for disposal. Chemicals stored in each facility shall be inventoried annually at a minimum utilizing the Chimera system.

CHEMICAL & HAZARDOUS WASTE DISPOSAL PROCEDURES

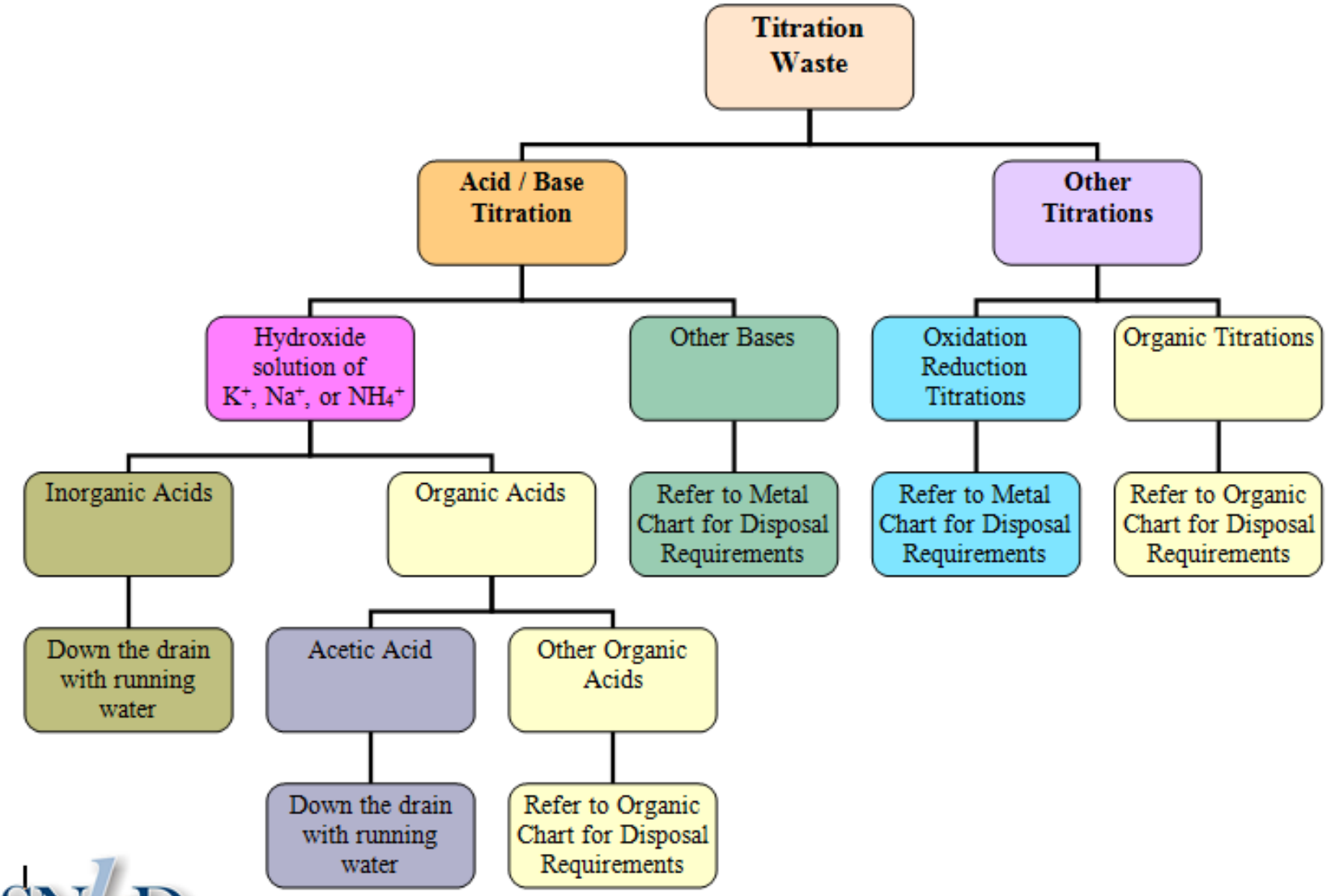
All Chemical and Hazardous Waste Disposal **must** be coordinated through the Clark County School District, Risk & Environmental Services - Hazardous Materials Section. Additional information is available on the Interact Desktop, under District Link, under the Environmental Services conference.

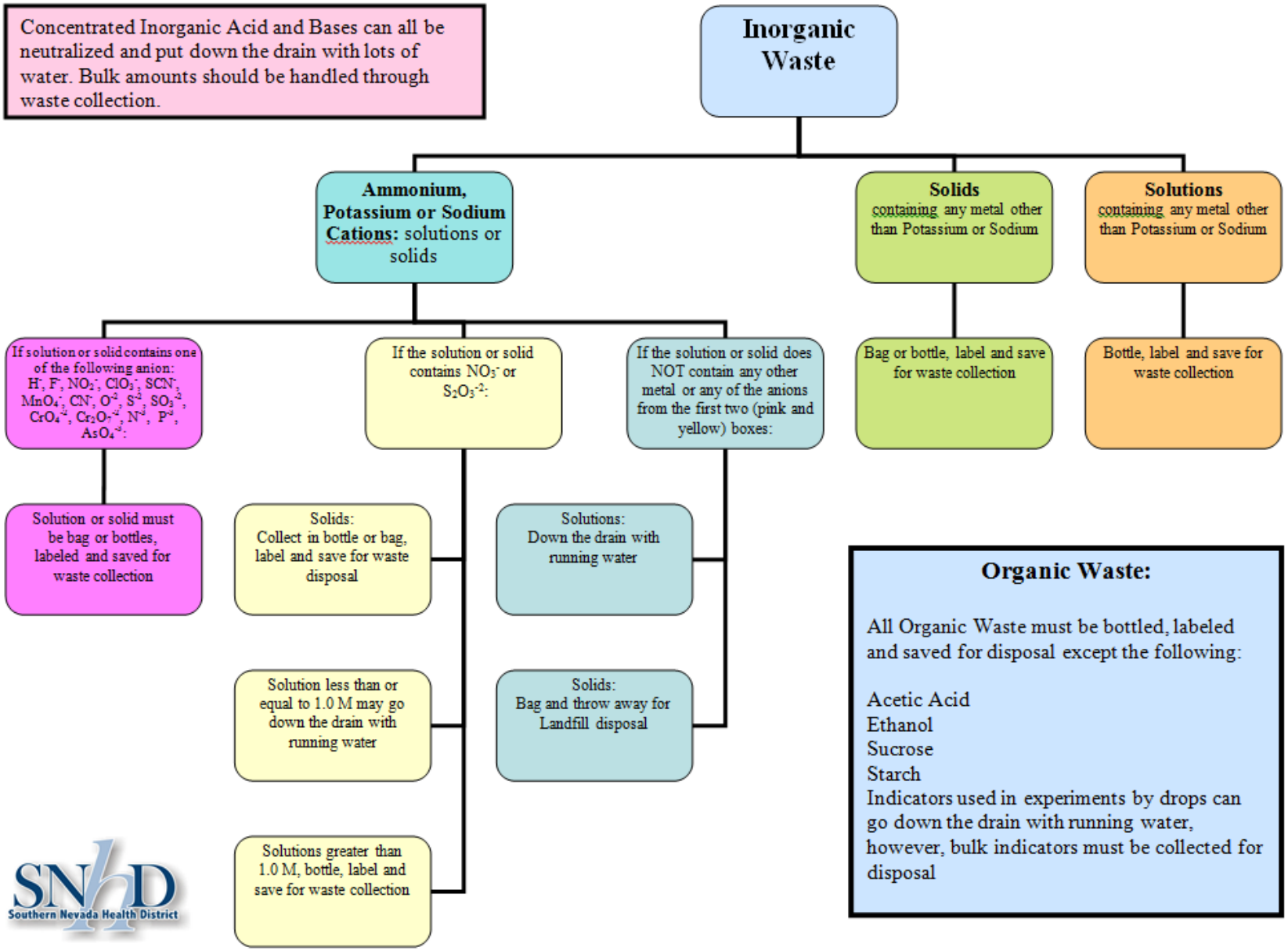
If new, old, unused, or used chemicals are no longer needed, Risk & Environmental Services will pick them up. To schedule a pickup, please utilize the following link;

http://riskmanagement.ccsd.net/pickitup

(For additional Contact Information please see “Appendix A” Technical Safety Assistance).

The flowcharts provided in this section were developed by the Southern Nevada Health District as a resource for secondary science teachers regarding waste disposal.


Titration Waste
Acid / Base Titration
Other Titrations
Hydroxide solution of K^+, Na^+, or NH_4^+
Other Bases
Oxidation Reduction Titrations
Organic Titrations
Inorganic Acids
Organic Acids
Refer to Metal Chart for Disposal Requirements
Refer to Metal Chart for Disposal Requirements
Refer to Organic Chart for Disposal Requirements
Down the drain with running water
Acetic Acid
Other Organic Acids
Down the drain with running water
Refer to Organic Chart for Disposal Requirements


Concentrated Inorganic Acid and Bases can all be neutralized and put down the drain with lots of water. Bulk amounts should be handled through waste collection.
Inorganic Waste
Ammonium, Potassium or Sodium Cations: solutions or solids
Solids containing any metal other than Potassium or Sodium
Solutions containing any metal other than Potassium or Sodium
If solution or solid contains one of the following anion: H-, F-, NO2-, ClO3-, SCN-, MnO4-, CN-, O-2, S-2, SO3-2, CrO4-2, Cr2O7-2, N-3, P-3, AsO4-3:
If the solution or solid contains NO3- or S2O3-2:
If the solution or solid does NOT contain any other metal or any of the anions from the first two (pink and yellow) boxes:
Bag or bottle, label and save for waste collection
Bottle, label and save for waste collection
Solution or solid must be bag or bottles, labeled and saved for waste collection
Solids: Collect in bottle or bag, label and save for waste disposal
Solutions: Down the drain with running water
Solution less than or equal to 1.0 M may go down the drain with running water
Solids: Bag and throw away for Landfill disposal
Solutions greater than 1.0 M, bottle, label and save for waste collection
Organic Waste:
All Organic Waste must be bottled, labeled and saved for disposal except the following:
Acetic Acid
Ethanol
Sucrose
Starch
Indicators used in experiments by drops can go down the drain with running water, however, bulk indicators must be collected for disposal
SNHD
Southern Nevada Health District

APPENDIX F
PROHIBITED CHEMICALS

CHEMICAL NAME	REASON FOR PROHIBITING
Acetaldehyde Suspected carcinogen, highly flammable	Carcinogen, highly flammable
Acrylamide (and pre-poured gels)	Possible neurotoxin and carcinogen
Acrylonitrile	OSHA listed carcinogen; flammable
Adrenaline	Highly toxic
4-Aminodiphenyl	OSHA listed carcinogen
2-Acetylaminofluorene	OSHA listed carcinogen
Aluminum Chloride, Anhydrous (Hydrate Salts Are Allowed)	Water reactive; corrosive
Ammonium Chromate	OSHA known human carcinogen
Ammonium Dichromate	May decompose to chromium (III),known human carcinogen
Ammonium Perchlorate	Explosive
Ammonium Sulfide	Contact with acids or acid fumes may liberate flammable and poisonous hydrogen sulfide gas, strong skin and mucous irritant
Antimony and all compounds	Animal carcinogen, corrosive, irritating
Aniline; Aniline Hydrochloride	Combustible; may be fatal if inhaled, ingested, or absorbed through the skin, confirmed animal carcinogen
Anthracene	Irritant; may cause an allergic skin reaction
Arsenic and any of its compounds	Poison; known human carcinogens, highly toxic
Asbestos in any form	OSHA known human carcinogen
Ascarite II	Corrosive; may be fatal if ingested
Azides, heavy metal salts	Primary high explosive detonable when heated or shaken
Barium Oxalate	Highly toxic
Barium Peroxide	Fire and explosion risk
Benzene	OSHA known human carcinogen; flammable
Benzidine	OSHA listed carcinogen
Benzoyl Peroxide	Flammable; can spontaneously explode

CHEMICAL NAME	REASON FOR PROHIBITING
Benzaldehyde	DEA Schedule I precursor for the production of amphetamine and P2P which is used to produce methamphetamine
Benzyl Chloride	DEA Schedule I precursor for the production of methamphetamine
Beryllium and all compounds	Poison, Dust is highly toxic
Bouin's Solution	25% Formaldehyde, suspected carcinogen
Butyric Acid	Corrosive, intense stench
Cadmium	Positive animal carcinogen, teratogen and mutagen; known human carcinogen, toxic if inhaled or swallowed
Cadmium Chloride	Known human carcinogen
Cadmium Nitrate	Known human carcinogen, highly toxic, flammable
Cadmium Oxide	Poison
Cadmium Powder	Poison
Cadmium Salts	Poison
Cadmium Sulfate	Highly toxic, positive animal carcinogen, bio-accumulative in all organisms major ingredient is picric acid
Calcium Cyanide	May be fatal if inhaled or ingested
Carbon Disulfide	Flammable; acute central nervous system toxicity
Carbon Tetrachloride	Nephrotoxin and hepatotoxin, suspect human carcinogen (OSHA says known carcinogen), absorbs through skin
Chloretone	Regulated as a drug in may state; highly addictive, toxic
Chloral Hydrate	Controlled barbiturate
Chlorine	Oxidizer; corrosive; may be fatal if inhaled
Chlorobenzene	Explosive limits 1.8% to 9.6%, toxic inhalation
Chloroform	Suspected human carcinogen, may cause cardia- arrhythmias
bis-Chloromethyl Ether	OSHA and ACGIH listed carcinogen
Chloropromazine	Controlled substance
Chromium Trioxide	Highly toxic, corrosive and carcinogenic
Cobalt Powder	Carcinogen
Colchicine	Highly toxic, 2/100 gram potentially fatal; mutagen
Cyanide (Group I)	Reactive
Collodion	Contains 70% ethyl ether
Diazomethane	Suspected carcinogen
Dichloroacetylene	Suspected carcinogen

CHEMICAL NAME	REASON FOR PROHIBITING
1.2-Dibromo-3-Chloropropane	OSHA listed larcinogen
3,3-Dichlorobenzidine	OSHA listed carcinogen
1,2 Dichloroethane (aka Ethylene Dichloride)	Peroxide former, fatalities have occurred
Dichloropropene	Suspected carcinogen, absorbs through skin
Diisopropyl Ether	Explosive
4,4-Dimethylaminoazobenzene	OSHA listed carcinogen
Dimethylamine; Dimethylaniline	Acute toxins
1,1-Dimethylhydrazine (aka UDMH)	Suspected carcinogen
2,4 Dinitrophenol	Irritant, cellular metabolic poison
Dinitrotoluene	Suspected carcinogen, absorbs through skin, highly explosive
1,4 Dioxane	Known carcinogen, may explode, high fire risk, absorbs through skin
Divinyl Acetylene	Peroxide former fatalities have occurred
Ephedrine	DEA Schedule I precursor used in the production of methamphetamine
Epinephrine	Can be fatal
Estrone	Known carcinogen
Ethidium Bromide	Mutagen
Ether, Anhydrous	Flammable, peroxide former
Ethyl Acetate	Fire and explosion risk, toxic by inhalation and skin absorption
Ethylamide	DEA Schedule I precursor used in the production of methamphetamine
Ethylene Dibromide	Known carcinogen, absorbs through skin
Ethylenediamine	OSHA listed carcinogen, explosive
Ethylene Dichloride (dichloroethane)	Animal carcinogen
Ethylene Oxide	OSHA listed carcinogen
Ethyl Bromide	Suspected carcinogen, absorbs through skin, inhalation hazard
Ethyl Ether (Diethyl Ether)	Highly flammable, explosive with age
Explosives and Ammunition; Gunpowder	Explosive
Fisher-Fresh Concentrate	Contains formaldehyde, a suspected human carcinogen and known animal carcinogen
Formaldehyde	Known animal carcinogen and OSHA listed human carcinogen; poison; may cause allergen reaction
Formalin	Possible human carcinogen
Formic Acid	Explosion hazard upon aging
Gasoline	Reactive
Glazes with Lead and Cadmium	Toxic, suspected carcinogens

CHEMICAL NAME	REASON FOR PROHIBITING
Gunpowder	Explosive
Hexachlorophene	May be fatal if inhaled, ingested, or absorbed through the skin; possible teratogen
Hydrazine (anhydrous)	Flammable, acute toxin, suspected human carcinogen
Hydrobromic Acid	Corrosive; may be fatal if inhaled or ingested
Hydrocyanic Acid	Extremely Toxic
Hydrofluoric Acid	Corrosive; may be fatal if inhaled or ingested; can cause severe burns
Hydrogen	Flammable
Hydrogen Sulfide	Corrosive, as deadly as cyanide gas
Hydroquinone	Animal carcinogen, corrosive, irritating
Hydriodic Acid	Corrosive; may be fatal if inhaled or ingested
Isopropyl Ether	Peroxide former, fatalities have occurred
Isosafrole	DEA Schedule I precursor
Lead (II) Arsenate	High toxicity; known human carcinogen and teratogen
Lead Carbonate	May be fatal if inhaled or ingested; neurotoxin
Lindane	Suspected carcinogen, absorbs through skin
Lithium Metal	Combustible; water reactive
Magnesium Metal or Powder (RIBBON IS ALLOWED)	May ignite spontaneously on contact with water or damp materials
Mercury and all its compounds	Corrosive; may be fatal if inhaled or ingested
Methylamine and other primary amines	DEA Schedule I precursor used in production of methamphetamine
Methylchloromethyl Ether	OSHA listed carcinogen
Methyl Ethyl Ketone	Irritant; flammable, inhalation hazard includes birth defects
Methylhydrazine (Mono or Di)	Explosive, used in rocket fuel
Methyl Iodide	May be fatal if inhaled or ingested, or absorbed through the skin; carcinogen
Methyl Methacrylate	Flammable; explosive
Methyl Orange Solid (INDICATOR SOLUTION ARE ALLOWED)	Possible mutagen
Methyl Red Solid (INDICATOR SOLUTION ARE ALLOWED)	Possible mutagen
2-Methoxy Ethanol	Possible teratogen, absorbed through skin
Million's Reagent	Contains 11% mercury
Nickel Carbonyl	Known human carcinogen

CHEMICAL NAME	REASON FOR PROHIBITING
Nickel Metal	Known human carcinogen; mutagen
Nickel Oxide	Known human carcinogen; mutagen
Nickel Powder	Acute toxin
Nicotine	May be fatal if inhaled or ingested, or absorbed through the skin
Nitro or Nitros (Any chemical with nitro or nitros in name)	Flammable, explosive
Fuming Nitric Acid (CONCENTRATED, NON-FUMING ACID IS ALLOWED)	Known human carcinogen; mutagen
Nitro Compounds (di or tri)	Explosion Hazard
4-Nitrobiphenyl	OSHA listed carcinogen
Nitroglycerine	Explosion hazard
1-Naphthylomine & Salts	Known human carcinogen
2-Naphthylomine & Salts	Known human carcinogen
alpha-Naphthylamine	OSHA listed carcinogen
beta-Naphthylamine	OSHA listed carcinogen
N-Nitrosodimethylamine	OSHA listed carcinogen
Organo-Peroxides including Benzoyl Peroxide	Explosion hazard
Organo-Phosphorus	Highly explosive and toxic gases
Oleum (32 Molar Sulfuric Acid, fuming Sulfuric Acid)	Extremely corrosive, causes severe burns
Osmium Tetroxide	May be fatal if inhaled or ingested
Paris Green	May be fatal if inhaled or ingested, or absorbed through the skin; known human carcinogen
Perchloric Acid	Dangerously explosive, corrosive
Phenol	Combustible; corrosive; may be fatal if inhaled or ingested, or absorbed through the skin
Phenylhydrazine	Suspected carcinogen, absorbs through skin
Phenylhydrazine Hydrochloride	Suspected carcinogen
Phosphorous (Red, White, or Yellow)	Extremely reactive, very toxic when burned, can cause very serious skin burns
Phosphorous Pentachloride	Reactive in water, source of hydrogen chloride and chlorine gas
Phosphorous Pentoxide	Water reactive; corrosive
Phthalic, Anhydride	Combustible; finely dispersed particles form explosive mixture in air; corrosive
Picric Acid	Extremely reactive; may be explosive
Piperdine	DEA Schedule I precursor
Piperonal	DEA Schedule I precursor
Potassium Amide	Peroxide former, fatalities have occurred
Potassium Cyanide	Extremely poisonous
Potassium Metal	Flammable, water reactive, peroxide former

CHEMICAL NAME	REASON FOR PROHIBITING
Potassium Oxalate	Corrosive; may be fatal if ingested, fatalities have occurred
Potassium Sulfide	Spontaneously combustible; explosive in dust or powder form
Progesterone	Known human carcinogen
Propionic Anhydride	DEA Schedule I precursor
beta-Propiolactone	OSHA listed carcinogen
Pyridine	Flammable; possible mutagen
Pyrogallol	Poison, fatal dose (adult) is t grams, may be absorbed through the skin
Radioactive Materials	Carcinogenic, teratogenic
Safrole	DEA Schedule I precursor
Selenium	Sever irritant
Silver Cyanide	May be fatal if inhaled or ingested, or absorbed through the skin
Silver Oxide	Oxidizer
Sodium Amide	Peroxide former, fatalities have occurred
Sodium Arsenate	May be fatal if inhaled or ingested; known human carcinogen
Sodium Arsenite	Suspected carcinogen, acute toxin, deadly poison
Sodium Azide	Explosive when heated; May be fatal if ingested, or absorbed through the skin
Sodium Chromate	Oxidizer; corrosive; known human carcinogen
Sodium Cyanide	Poison
Sodium Dichromate	Oxidizer; corrosive; may be fatal if ingested; known human carcinogen
Sodium Nitrite	Oxidizer
Sodium Perchlorate	Explosive
Sodium Peroxide	Serious explosion, fire risk
Sodium Sulfide	Corrosive; may be fatal if inhaled or ingested
Sodium Thiocyanide	Contact with acid liberates very toxic gas
Stannic Chloride, Anhydrous	Corrosive; hydrochloric acid liberated upon contact with moisture and heat
Stearic Acid	May form combustible dust in the air
Strychnine	Highly toxic
Strontium	Water reactive
Strontium Nitrate	Oxidizer
Sudan II & IV Solids (SOLUTIONS ARE ALLOWED)	Irritant; toxic properties have not been thoroughly evaluated
(Fuming) Sulfuric Acid (CONCENTRATED, NON-FUMING ACID IS ALLOWED)	Corrosive; may be fatal if ingested
Tannic Acid	Irritant
alpha-Terpineol	Tumorigenic effects in animals

CHEMICAL NAME	REASON FOR PROHIBITING
Tetrabromoethane	May be fatal if inhaled or ingested, or absorbed through the skin
Testosterone; Testosterone Propionate	Positive animal carcinogen, suspect human carcinogen, may affect reproductive system
Tetrahydrofuran	Explosive if improperly stored
Thioacetimide	Reasonably anticipated human carcinogen
Thiourea	Reasonably anticipated human carcinogen
2,4,6-Trinitrotoluene	Explosive, possible carcinogen
Titanium Trichloride	Water reactive; corrosive
Titanium Tetrachloride	Water reactive; corrosive; may be fatal if inhaled
o-Tolidine	Suspected carcinogen, absorbs through skin
o-Toluidine	Reasonably anticipated human carcinogen; mutagen
Toluene	Flammable, toxic
o-Toluidine Blue	Suspected carcinogen, absorbs through skin
p-Toluidine	Suspected carcinogen, absorbs through skin
2,4,6 - trinitrotoluene	Explosive, possible carcinogen
Trichlororacetic Acid	Animal mutagen
1,1,1-Trichloroethane	Reproductive and mutagenic effects in animals
1,1,2-Trichloroethane	Suspected carcinogen, absorbs through skin
Trichloroethylene	Positive animal carcinogen, suspected human carcinogen
Triethylamine	Flammable, toxic, irritant
Urathane	Combustible; reasonably anticipated human carcinogen
Uranium	Radioactive
Uranyl Acetate	Radioactive
Uranyl Nitrate	Radioactive
Vinyl Bromide	Suspected carcinogen
Vinyl Chloride	OSHA listed carcinogen
Wood's Metal	May be fatal if inhaled or ingested; known human carcinogen
Xylene	Flammable, toxic
Zinc Chromates	Known human carcinogen (ACGIH)

The most recent chemicals added to the prohibited list appear in red.

APPENDIX G
RESTRICTED CHEMICALS

CHEMICAL NAME	REASON FOR RESTRICTION
Acetaldehyde	Suspected carcinogen, highly flammable
Acetamide	Suspected animal carcinogen
Acrylamide	Suspected carcinogen, absorbs through skin
AITCH-TU-ESS Cartridges (HIGH SCHOOL ONLY)	Generates explosive and toxic gas
Aldrin	Suspected carcinogen, absorbs through skin
Allyl Chloride	Suspected carcinogen
Aluminum Chloride, Anhydrous (Hydrate Salts Are Allowed)	Water reactive; corrosive
Ammonium Bichromate	Oxidizer, corrosive, known human carcinogen
Ammonium Nitrate	AP/IB CHEMISTRY ONLY: Explosive if heated under confinement
Ammonium Oxalate	May be fatal if inhaled or ingested
Ammonium Vanadate	May be fatal if inhaled or ingested
Anisidine (o-, p-isomers)	Suspected carcinogen
Barium Chloride	Severely toxic; 0.8 gram fatal dose
Barium Hydroxide	Highly toxic, neurotoxin
Barium Nitrate	Poison, strong oxidant, highly toxic to eyes
Benzone (Phenylbutazone)	Irritant
Benzo(a)pyrene	Suspected carcinogen
Bromine	Poison, powerful oxidizer
Bromoform	Toxic by inhalation, unsuspected carcinogen
iso-Butanol	Suspected carcinogen, highly flammable
sec-Butanol	May form explosive hydroperoxides
tert-Butanol	Suspected carcinogen and mutagen, highly flammable
1,3-Butadiene	Suspected carcinogen
Caffeine	Very toxic, 1 grain may be life threatening
Calcium Carbide	Flammable, reacts with water
Calcium Chromate	Suspected carcinogen
Calcium Fluoride	Mutagenic effects in animals, poison, toxic to humans
Calcium Oxide	Corrosive, irritating
Carbol Fuchsin	Suspect animal carcinogen and mutagen
Carmine	Irritant; burning may produce carbon monoxide
Catechol	Corrosive
Chlordane	Suspected carcinogen, absorbs through skin
Chlorinated Camphene	Suspected carcinogen, absorbs through skin
B-Chloroprene	Suspected carcinogen, absorbs through skin
Chromic Sulfuric Acid	Positive animal and human carcinogen
Chromium	Known human carcinogen as dust or fume
Chromium Acetate	Irritant

CHEMICAL NAME	REASON FOR PROHIBITING
Chromium (III) Chloride	Suspected carcinogen
Chromium(III) Nitrate	Known human carcinogen
Chromium (III) Oxide	Known Human carcinogen
Chromium (VI) Oxide	Suspected carcinogen
Chromium(III) Potassium Sulfate	Suspected carcinogen
Chrysene	Suspected carcinogen
Cobalt	Suspected carcinogen
Cobalt Nitrate	Oxidizer; irritant
Cresols	AB/IB BIOLOGY ONLY: Dermal toxicity
Crotonaldehyde	Suspected carcinogen
Crystal Violet Solution	AP/IB CHEMISTRY ONLY: Contains known animal carcinogens and poisons
Cyclohexane	AP/IB CHEMISTRY ONLY: Flammable
Cyclohexanol	AP/IB CHEMISTRY ONLY: May form explosive peroxides as it ages
Cyclohexene	May form explosive peroxides, toxic by inhalation
p-Dichlorobenzene	AP/IB CHEMISTRY ONLY: Combustible, known human carcinogen
1,2-Dichloroethane	Suspected human carcinogen, animal mutagen
Dichloroindophenol Sodium	Irritant
Dieldrin	Suspected carcinogen, absorbs through skin
Diglycidyl Ether (DGE)	Suspected carcinogen
Dimethyl Sulfate	Suspected carcinogen, absorbs through skin
Epichlorohydrin	Suspected carcinogen, absorbs through skin
Ethyl Bromide	Suspected carcinogen, absorbs through skin, inhalation hazard
Ethylene Glycol	Animal mutagen, narcotic and nephrotoxin
Ethylenediamine Tetra-acetic Acid	Animal mutagen
FAA Solution	Contains formaldehyde and 90% alcohol, poison
Ferrous Sulfate	Irritant
Fuchsin	Irritant
Hematoxylin	Suspected carcinogen
Heptachlor	Suspected carcinogen, absorbs through skin
Hexachlorobutadiene	Suspected carcinogen, absorbs through skin
Hexachloroethane	Suspected carcinogen
Hexamethyl phosphoramide	Suspected carcinogen, absorbs through skin
Hydrogen Peroxide (30%)	HIGH SCHOOL ONLY: Fire and explosion risk, severely corrosive
Iodine Crystals	AP/IB CHEMISTRY ONLY: May react violently, vapor highly toxic
Indigo Carmine	Animal carcinogen
Isoamyl Alcohol	Irritant; combustible liquid and vapor
Isobutyl Alcohol	Flammable
Lead(II) Acetate	Suspected animal carcinogen
Lead (VI) Chromate	May be fatal if inhaled or ingested, known human carcinogen
Lead and Lead Compounds	Poison, cumulative neurotoxin
Lithium Nitrate	Oxidizer
Magnesium Chlorate	Irritant
Magnesium Ribbon	Irritant

CHEMICAL NAME	REASON FOR PROHIBITING
Manganous Nitrate	Explosion hazard in dry form
Methanol	AP/IB CHEMISTRY ONLY: absorbs through skin, flammable
Methyl Bromide	Suspected carcinogen, absorbs through skin
Methyl Chloride	Suspected carcinogen, absorbs through skin
Methyl Oleate	Toxic
Methylene Chloride	Possible carcinogen, may be absorbed through skin
4,4'-Methylene bis(2-chloroaniline)	Suspected carcinogen, absorbs through skin
4,4'-Methylene Dianiline	Suspected carcinogen, absorbs through skin
Naphthalene	Corrosive, irritating
Nessler's Reagent Solution	Poison, neurotoxin, and nephrotoxin
Nickel Carbonate	Reasonably anticipated human carcinogen
Nickel(II) Chloride	Suspected animal carcinogen
Nickel Compounds	Fumes may cause increase risk of lung cancer, many nickel compound are animal mutagens and carcinogens (also Nickel(ous) compounds)
Nickel(II) Nitrate	Suspected animal carcinogen
Nickelous Acetate	Reasonably anticipated human carcinogen
Ninhydrin	Irritant poison, biologically active
Oxalic Acid	Neurotoxin and nephrotoxin, poison
Paraformaldehyde	Mutagen, possible animal carcinogen
Pentane	Irritant; flammable
Petroleum Ether	Flammable
o-Phenylenediamine	Suspected carcinogen
1-Phenyl-2-Thiourea	May be fatal if inhaled or ingested
Polyvinyl Alcohol	Suspected animal carcinogen
Potassium Bromate	Animal mutagen
Potassium Chlorate	Extremely explosive if slightly contaminated
Potassium Chromate	Possible human carcinogen
Potassium Dichromate	Possible human carcinogen
Potassium Ferricyanide	Decomposed to ferrocyanide upon ingestion
Potassium Nitrite	Animal mutagen and teratogen
Potassium Permanganate	Animal mutagen
Potassium Periodate	Oxidizer
Propane Sultone	Suspected carcinogen
Propylene Dichloride	Suspected carcinogen
Propylene Diamine	Suspected carcinogen, absorbs through skin
Propylene Oxide	Suspected carcinogen; extremely flammable; harmful by inhalation and ingestion.
Resorcinol	Neurotoxin
Rhodamine B	Moderately toxic, positive animal carcinogen, suspected human carcinogen, avoid all skin contact
Salol (Phenyl Salicylate)	Irritant
Saponin	Destroys red blood cells, toxic by ingestion
Silver Acetate	Severely toxic by inhalation and ingestion
Silver Nitrate (HIGH SCHOOL ONLY)	Oxidizer; corrosive; may be fatal if ingested
Sodium Bisulfite	Animal Mutagen

CHEMICAL NAME	REASON FOR PROHIBITING
Sodium Borate	Animal mutagen, poisoning affects kidneys
Sodium Bromate	Oxidizer
Sodium Chlorate	Clothing contaminated with chlorates are extremely flammable
Sodium Fluoride	Animal mutagen
Sodium Metal (Lump/Piece)	Water Reactive
Sodium Nitrate	Oxidizer; irritant
Sodium Oxalate	Poison; fatal dose < 5 grams, nephrotoxin and neurotoxin
Sodium Silicofluoride	Toxic
Sodium Salicylate	Animal mutagen and reproductive effects
Strontium Chromate	suspected carcinogen
Sudan III or Sudan IV (SOLUTIONS ONLY)	Decomposes to oxides of nitrogen
Sulfamethazine	Irritant
Thermite	AP/IB CHEMISTRY ONLY: Explosive
Thymol	Tumororigenic, reproductive, and mutagenic effects in animals
Toluene	Nephrotoxin and hepatotoxin; mutagenic effects in animals
Toluene -2,4-diisocyanate	Suspected carcinogen, sensitizer (allergen)
Triethanolamine	Suspected carcinogen
Urethane (Ethyl Carbamate)	Alleged carcinogen
Vinyl Cyclohexene dioxide	Suspected carcinogen
Wright's Stain Solution	Neurotoxin
Zinc Acetate	Reproductive and mutagenic animal effects
Zinc Chloride	Reproductive and tumorigenic effects in animals
Zinc Oxide	Animal mutagen
Zinc Sulfate	Animal mutagen

The most recent chemicals added to the restricted list appear in red.

APPENDIX H
ANIMALS IN THE CLASSROOM
(Written by the CCSD Risk and Environmental Services Department)

GUIDELINES FOR BRINGING ANIMALS INTO THE CLASSROOM

The presence of animals in schools provides many opportunities for addressing academic standards and supporting the social/emotional growth of students. Animals are part of our natural environment and can be used effectively as teaching aids. The positive benefits of the human-animal bond are well established.

The presence of animals in schools may also pose a safety or health risk for some when they are exposed to allergens that activate allergy and/or asthma symptoms. Others may be afraid of animals and feel emotionally unsafe in their presence. The purpose of this policy is to allow animals in the classroom while providing for the health and safety of school staff, students, and animals. Animals will be removed from the classroom and/or the school when this cannot be achieved. Animals may be brought into schools and classrooms for a variety of purposes. Each of the purposes is listed below, along with required procedures to ensure the health and safety of staff, students and animals.

Animals Used In Educational Presentations

Animals may be brought into schools by an animal handler for one day or less for presentations to the whole school, several classrooms, or a single classroom. The animal handler must have extensive knowledge and experience with the animal and experience providing educational demonstrations on a regular basis. The animal handler must show that all animals are free from disease and will have to supply CCSD with a proof of liability insurance.

Procedures for Educational Presentations with Animals

1. Before bringing an animal into the school or a classroom, staff must provide the principal with information about how the animal will support the academic program or the social emotional development of students.
2. The staff member bringing the animal into the school must obtain the written approval of the principal.
3. Before granting permission, the principal shall be satisfied that all requirements listed below have been met.
    - Information that documents the animal is healthy and appropriate for classroom use shall be made available for parent/guardian review. Such documentation shall include:
        a) A signed statement of health from an organization (e.g., Humane Society) or veterinarian that states at the time of the examination the animal is free of external and internal parasites or disease, and has proof of current, necessary vaccinations, **and**
        b) Verification that the animal's temperament is conducive to being around children.

- Students who require modifications due to animal fears or allergies or whose parents do not want them to participate in the activities with animals will be provided alternative activities that address the same concepts.

4. Upon approval by the principal, all parents/guardians of students will be provided with a letter.
   - The letter must contain the following, at a minimum:
     a) Information about any health concerns that could result from the animal's presence.
     b) A paragraph that encourages parents to report to the principal any observable symptoms or concerns their child may exhibit in the presence of the animal.
   - All letters must be translated to meet the language needs of non-English speaking parents either in writing or through oral translation. **Written consent from parent/guardian is not required.**

Animals Not Handled by Children

Cold blooded animals that will not be handled by children may be brought into the classrooms or school for observation and discussion for up to one semester. For example, an aquarium may be placed in the Library Media Center or in a classroom.

Procedures for Cold Blooded Animals Not Handled by Children

1. Before bringing a cold blooded animal into the school or classroom, staff must provide the principal with information about how the animal will support the academic program or the social emotional development of students.
2. The staff member bringing the animal into the school must obtain the written approval of the principal.
   a) Before granting permission, the principal shall be satisfied that all requirements listed below have been met.
   b) Once granted, this approval may be rescinded or revoked by the principal if the policy and procedures are not followed.
   c) Written approval of the principal is valid for a maximum of one semester, at which time the staff member may re-submit the request for an extension of an additional semester.

3. Information that documents the animal is healthy and appropriate for classroom use shall be made available for parent/guardian review. Such documentation shall include:

   a) A signed statement of health from an organization (e.g., Humane Society) or veterinarian that states at the time of the examination the animal is free of external and internal parasites or disease, and has proof of current, necessary vaccinations, **and**
   b) Verification that the animal's temperament is conducive to being around children.

Classroom Animals

Animals may be present in a classroom for up to one semester (there is no limit on the number of extensions) when their presence supports instructional purposes and/or the social emotional development of students. In these situations, students may experience daily, direct contact with the animal.

Procedures for Classroom Animals

Before bringing an animal into the school or a classroom, staff must provide the principal the following:

1. Information about how the animal will support the academic program or the social emotional development of students.
2. The letter that will be sent to parents/guardians of students who will be exposed to the animal.
    a) All letters must be translated to meet the language needs of non-English speaking parents either in writing or through oral translation.
    b) The letter must contain the type and number of animals that will be present,
    c) The CCSD academic standards, and/or the social/emotional objectives that the animal's presence will support,
    d) The length of time the animal will be present,
    e) The animal's location and type of enclosure,
    f) Information about any health concerns that could result from the animal's presence,
    g) A paragraph that encourages parents to report to the principal any observable symptoms or concerns their child may exhibit in the presence of the animal.

3. **Written parent consent must be obtained in response to the letter.**
    a) If a parent requests that modifications be made for a student who, for example, has allergies or is afraid of animals, the teacher may develop an alternative plan for each such student that does not interfere with or adversely affect the education of the child. (The plan shall also be approved by the parent and principal). Animals will be removed from the classroom and/or the school when the health and safety of the child cannot be achieved.
    b) Information that documents the animal is healthy and appropriate for classroom use shall be made available for parent/guardian review. Such documentation shall include:
        I. A signed statement of health from an organization (e.g., the Humane Society or veterinarian that ensures that the animal is free of external and internal parasites or disease, and has proof of current, necessary vaccinations, **and**
        II. Verification that the animal's temperament is conducive to being around children.
    c) Staff bringing the animal to school must also provide instruction for students in the proper care and handling of the animal.

I. Students may only care for or handle animals under the supervision of a staff member.
II. Instruction should include a plan of action should a student, staff member, or animal be in danger.
III. Instruction should include a plan of action to ensure that animals are not abused, mistreated or neglected.

d) Identify the area in which the animal will be housed.
I. Free roaming animals are not permitted in the classroom or on the school premises.

e) Provide an appropriate plan and be responsible for cleaning the area in which the animal is housed, as well as the proper disposal of animal waste.
I. Students shall not be allowed to handle or clean up any form of animal waste (feces, urine, blood, soiled bedding, etc.). When staff are disposing of animal waste and/or cleaning up, the following procedures must be followed:
- Dispose animal wastes where children cannot come into contact with it, such as in a plastic bag or a container with a well fitted lid or via the sewage system for feces.
- Wear disposable gloves and wash hands after glove removal.
- Clean cages, surfaces, and sinks using disinfecting guidelines.

f) Ensure that animals are not allowed in the vicinity of sinks where children wash their hands, in any area where food is prepared, or stored, or in areas used for storage of food utensils or dishes.

4. Because of the potential risk for salmonella infection, the following additional procedures should be used for reptiles and amphibians:
a) Reptiles and amphibians are not appropriate for classrooms with children under age five or in classrooms with students whose immune systems are compromised.
b) Reptiles should never be allowed to roam freely outside of their cage or enclosure. If they are removed for a limited period, any hard surface touched by the reptile must be cleaned and disinfected using CCSD approved cleaning solution prior to allowing students in the area.
c) After any direct contact with reptiles, amphibians, or their enclosures, students must immediately wash hands with warm soapy water for at least 15 seconds or use antibacterial hand sanitizer with 60% - 70% alcohol content.
d) Reptiles must never be near sinks or counters that may be used for food preparation.
5. The staff member bringing the animal into the school must obtain the written approval of the principal or principal designee.
a) Before granting permission, the principal shall be satisfied that all requirements listed above have been met.
b) Once granted, this approval may be rescinded or revoked by the principal if the policies and procedures are not followed.

c) Written approval is valid for a maximum of one semester, at which time the teacher may re-submit the request for an extension of up to one semester. There is no limit on the number of extensions.

Animals Excluded from School or Classroom Use by the Policy

- Because poisonous, venomous animals are dangerous if mishandled, they are not appropriate in school settings and are not permitted on school premises under this policy.
- A family pet is prohibited on school premises unless the family pet meets the requirements set forth in this policy and procedures.

Animals Exempt From Compliance with the Policy

The following animals are exempt from compliance with this policy:

- Trained and certified (service) animals which support individual students and/or adults with disabilities.
- Animals or invertebrates for the specific use with the grades K–12 science curriculum. The use of animals in the high school biological sciences program must meet the standards approved by the National Science Teacher's Association, the National Biology Teacher's Association and the Institute for Laboratory Animal Research.
- Preserved specimens for dissection are excluded.

Additional Requirements

1. **Transportation**

   - Animals may not be transported to and/or from school on yellow school buses or via any other transportation provided by the School District.

2. **Communication**

   - The principal will inform parents and staff about the policy and include it in the parent handbook, yearly.

3. **Conditions Requiring Animals To Be Immediately Removed From School Premises**

   a) If a student or staff member has an allergic reaction or other health problem because of the presence of an animal, the animal must be immediately removed from the classroom/work space of the affected individual, and removed from the school grounds until the situation is resolved.
   b) If an animal is aggressive, the animal must be immediately isolated and removed from the school grounds by the District.
   c) If a student, staff member or anyone else on school premises is injured by an animal:

i. the animal shall be isolated immediately,
ii. a health office visit report will be completed if the injury requires treatment outside the classroom and the principal shall be notified,
iii. appropriate medical care shall be provided to the person who has been injured, and
iv. the principal or designee shall notify the owner of the animal of the injury, and request that the animal be removed from the school grounds until the situation is resolved.

d) If an animal consistently has a powerful unpleasant odor that cannot be resolved, the animal will be removed.
e) If an animal disrupts the classroom learning environment (e.g., shrieking of a bird), the animal will be removed.
f) If an animal exhibits any signs of illness and/or distress, the animal will be immediately isolated and removed from the school grounds.
g) If there is an outstanding air quality complaint that has been filed under the District's indoor air quality procedure, no animals, except service animals, shall be present on school premises.
h) If problems are resolved through modifications or adaptations in how the animal is managed, the animal may be returned to the classroom with the written consent of the principal or principal designee.

No Animal Training by School Employees

Training animals while in pay status as an employee of the District is prohibited. This provision shall not be construed to restrict an employee from training an animal while such employee is not working for the District.

Appeal Process

Teachers may appeal the decision of the principal to allow an animal to be present in the school with the appropriate Assistant Chief. The appeal must be in writing and filed within ten days of the denial.

Review Responsibility	Instruction Unit	Risk Management
Main Line Phone Number	(702) 799-5475	(702) 799-6496
Date of Revision	10/31/2013	

APPENDIX I
SAFETY CONTRACTS AND EXAMS

It is suggested that all students and parents sign a safety contract. It is strongly encouraged that all students complete and pass a science exam before they are allowed to partake in science laboratory experiments. This exam may be teacher or department created.

For comprehensive science safety contracts or safety exams in English or Spanish go to http://www.flinnsci.com/teacher-resources/safety/safety-contracts-and-safety-exams.aspx. You may reproduce these exams as needed for classroom instruction on safety.

APPENDIX J
SAFETY RESOURCE WEBSITES

For a wealth of additional science safety information, please reference the following websites:

American Chemical Society
www.acs.org

Centers for Disease Control and Prevention/The National Institute for Occupational Safety and Health (NIOSH)
http://www.cdc.gov/niosh/

First Aid
http://www.mayoclinic.com/health/FirstAidIndex/FirstAidIndex

Flinn Scientific Safety
http://www.flinnsci.com/Sections/Safety/safety.asp

National Association of Biology Teachers
www.nabt.org

National Science Teachers Association
http://www.nsta.org/

Society for Science and the Public (International Science and Engineering Fair Guidelines)
https://www.societyforscience.org/intel-international-science-and-engineering-fair

Southern Nevada Health District
http://www.southernnevadahealthdistrict.org/

United States Department of Labor Occupational Safety and Health Administration (OSHA)
http://www.osha.gov/

RESTRICTED CHEMICAL REQUEST FORM

Restricted chemicals are restricted by use, and/or quantities. Appendix G of the Instructional Design and Professional Learning *K–12 Science Safety Manual* contains a list of restricted chemicals. If restricted chemicals are present at a school, each chemical is addressed in the school's written emergency plan. Many restricted chemicals need a fume hood and should only be used at high schools. Science teachers are advised to make careful decisions about the acquisition and use of laboratory chemicals. If an especially hazardous chemical is deemed essential to a laboratory activity or demonstration, the responsibility to ensure safe storage and use must be assumed by the designated teacher using the chemical and a designated site administrator. When in doubt, contact the appropriate staff from the Instructional Design and Professional Learning Division Science Department.

Date: _____ School: _____

Course Name: _____

Name of the chemical: _____

Quantity on hand: _____

Quantity needing ordered: _____

Name of the lab activity: _____

Purpose of lab activity: _____
_____
_____

A copy of the laboratory activity utilizing this chemical must be stapled to this form.

Identify the proper storage location of the chemical: _____
_____
_____

Teacher Signature: _____

Department Coordinator Signature: _____

Administrator Signature (to verify approval to purchase this chemical):
_____

PLACE A SIGNED COPY IN THE SDS BINDER IN SCIENCE PREP AREA AND A COPY IN THE SDS BINDER IN THE DESIGNATED ADMINISTRATOR'S OFFICE

Secondary Science Teacher
Safety Manual Acknowledgement
Signature Form

I have read and understand the content, policies, and procedures outlined in the *Clark County School District K–12 Science Safety Manual* and I understand my responsibility as a secondary science teacher.

I understand that all science classrooms and instruction must comply with these safety policies and procedures. I understand that no laboratory activity will be performed without proper facilities, personal protective equipment, safety instruction for students, and the appropriate SDS available in case of emergency.

Name (please print)

_____

School Name/Location Number (please print)

_____

Signature _____

Date_____

To be kept on file with the science department coordinator and renewed yearly.