



Deer Valley Unified School District

CHEMICAL HYGIENE PLAN

April 2014

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I. Glossary

A) Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
CAS	Chemical Abstracts Service
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CHP	Chemical Hygiene Plan
CHO	Chemical Hygiene Officer
DOT	Department of Transportation
DVUSD	Deer Valley Unified School District #97
EPA	Environmental Protection Agency
GHS	Globally Harmonized System of Classification and Labeling of Chemicals
HCS	Hazard Communication Standard
HEPA	High Efficiency Particulate Air
IDLH	Immediately Dangerous to Life and Health
SDS	Material Safety Data Sheets
NEC	National Electrical Code
NFPA	National Fire Protection Association
NIH	National Institutes of Health
NIOSH	National Institute of Occupational Safety and Health
NRC	National Research Council
NTP	National Toxicology Program
OEL	Occupational Exposure Limit
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Level
PPE	Personal Protective Equipment
SDS	Safety Data Sheets
SOP	Standard Operating Procedures
TLV	Threshold Limit Value
TWA	Time Weighted Average
WHO	World Health Organization

B) Definitions

Acute Exposure - Short durations of exposure to high concentrations of hazardous materials.

Allergen - A chemical substance that induces an immediate or delayed adverse reaction by the immune system.

Asphyxiant - A substance that can cause suffocation.

Chemical Hygiene Officer - An employee at the local school level (building) who is qualified, through training, education, and experience, to oversee the implementation of and subsequent reviews of the school Chemical Hygiene Plan, per OSHA 29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*.

Carcinogen - A substance that causes the development of cancerous growths in humans or is considered capable of causing cancer in humans. A substance is considered a carcinogen if:

- 1) It has been evaluated by the International Agency for Research on Cancer (IARC) and has been found to be a carcinogen or potential carcinogen;
- 2) It is listed in the National Toxicology Program's (NTP) *Annual Report on Carcinogens* as a carcinogen or potential carcinogen;
- 3) It is an OSHA-regulated carcinogen;
- 4) One study has been published which positively identifies the substance as a carcinogen.

Chemical Abstracts Service (CAS) Registration Number - A unique number that is assigned to a chemical as a means to identify the material.

Chemical Hygiene Plan - A written plan that is designed to protect laboratory workers from occupational exposure to hazardous chemicals, per OSHA 29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*.

Chronic Exposure - Continuous exposure over a long period of time to low concentrations of hazardous materials in the work place.

Chronic Toxicity - Adverse health effects that can be a result of long-term exposure to hazardous materials.

Combustible Material - A substance (solid, liquid, or gas) that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.

Corrosive Material - A substance that can cause visible destruction of or irreversible alteration on physical contact with living tissue.

Embryotoxin - A material that is harmful to a developing embryo at a concentration that does not have adverse effects on the pregnant female.



Explosive Material - A material that will exhibit a rapid chemical change when subjected to a suitable ignition source (i.e., detonation, heat, friction, or impact).

Flammable - A term commonly used to describe a gas, solid, vapor, or liquid that easily ignites and rapidly burns.

Flash Point - The lowest temperature at which a flammable liquid produces sufficient vapor to form a readily ignitable mixture with air, either at its surface or in a container.

Hazardous Chemical - A chemical for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles. Acute or chronic health effects may occur in exposed persons.

Hazard Warning - A label on a chemical container that includes text and/or symbols to convey the hazards of the material.

High Efficiency Particulate Air (HEPA) filter - An air filter that has a 99.97% removal efficiency for all particles greater than 0.3 micrometre from the air that passes through.

Immediately Dangerous to Life and Health (IDLH) - Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided.

Incompatible Materials - Materials which, when mixed, could result in the formation of toxic gases or hazardous conditions (i.e., an explosion).

Irritant - A substance that produces an inflammatory effect on contact with living tissue.

LC₅₀ (50% lethal concentration) - The concentration of a chemical in air or of a chemical in water which causes the death of 50% (one-half) of a group of test animals.

LD₅₀ (50% lethal dosage) - The amount of a chemical, given all at once, which causes the death of 50% (one half) of a group of test animals.

Material Safety Data Sheet - A document containing information about a material, as referenced by OSHA 29 CFR, Part 1910.1200. MSDS is used interchangeably with SDS.

Mutagen - A material that produces genetic mutations in chromosomal DNA.

Oxidizing Agent - A substance that may react violently upon contact with reducing materials.

Nonflammable - A material that is not easily ignited; a DOT hazard class for compressed gases that are not classed as flammable gases.



Permissible Exposure Limit (PEL) - The maximum acceptable concentration of a chemical in the work place air. Commonly used exposure limits include TLV-TWA (Threshold Limit Value-Time Weighted Average), STEL (Short-Term Exposure Limit), and C (Ceiling Value).

Personal Protective Equipment (PPE) - Protective equipment (i.e., gloves, safety goggles, laboratory coat or apron, respirators) that is worn by laboratory workers to protect them from direct exposure to hazardous materials.

Physical Hazard - A substance that is a hazard of physical origin (i.e., a burn): A material that is flammable, explosive, water reactive, pyrophoric, or unstable; a combustible liquid, a compressed gas, an organic peroxide, or an oxidizer.

Poison - A substance that may injure or kill an organism, even in relatively low doses.

Pyrophoric Material - Any liquid or solid which will ignite spontaneously in air below 54°C (130°F).

Reactive Material - An explosive material, organic peroxide, pressure-generating material, or water-reactive material that vigorously polymerizes, decomposes, condenses, or becomes self-reactive when subjected to pressure, shock, or temperature changes.

Safety Data Sheet - OSHA's adoption of GHS via HazCom 2012 mandates the use of a single GHS format for safety data sheets, a format which features 16 sections in a strict ordering. A SDS is a MSDS.

Select Carcinogen - Defined in OSHA 29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*, as a substance that:

- 1) Is regulated by OSHA as a carcinogen;
- 2) Is listed by the NTP as "known to be carcinogen";
- 3) Is listed on IARC lists as Group 1, "carcinogenic to humans"; or
- 4) Is included on the IARC lists as Group 2A or 2B, "reasonably anticipated to be carcinogen", because it causes statistically significant tumor incidence in animals according to the criteria that are listed in Section 2, Paragraph b.

Stench - Material that emits an extremely offensive odor.

Teratogen - A substance that causes growth abnormalities in embryos.

Threshold Limit Value - The ACGIH term that is used to express the maximum airborne concentration of a substance to which most workers can be exposed during a normal 8-hour workday or normal 40-hour work week with no adverse health effects.

TLV-Ceiling Limit - The exposure concentration of an airborne substance that must not be exceeded at any time.



TLV-Short Term Exposure Limit (STEL) - The maximum concentration of an airborne substance for a continuous exposure period of 15 minutes, with the following guidelines:

- 1) There will be a maximum of four 15-minute periods per day.
- 2) There will be at least 60 minutes between exposure periods.
- 3) The daily TLV-TWA will not be exceeded.

TLV-Time Weighted Average - The ACGIH term that is used to express the maximum allowable time weighted average concentration of an airborne substance for a normal 8-hour work day or 40-hour work week.

Toxic Material - A poisonous substance which has the ability to cause adverse health effects upon exposure.

II. Introduction

Purpose: The Chemical Hygiene Plan has been developed to provide employees of Deer Valley Unified School District #97 with information necessary to safely work in the school science laboratory.

Access: All components of the Chemical Hygiene Plan will be available to all employees as follows:

1. Each school will have copies of the Chemical Hygiene Plan, the school chemical inventory, and the Safety Data Sheets in the following locations.
 - Principal's office
 - Maintenance office
 - Nurse's office
 - Science department and/or chemical storage area.
2. All employees will be given access to a copy of the Chemical Hygiene Plan through a link on the Deer Valley Unified School District #97 Curriculum, Instruction and Assessment Science portal page at <https://portal.dvusd.org/>. Additionally, the Chemical Hygiene Plan and Safety Data Sheets will be given to the maintenance foreman and kept in a location known and accessible to all maintenance workers.
3. Records of previous exposure or medical records related to hazardous chemicals in the laboratory (if any) will be available from the Human Resources office.

Revisions: All components of the Chemical Hygiene Plan will be reviewed annually and necessary revisions will be made and disseminated.

Compliance: An annual evaluation of compliance to the OSHA Laboratory Standards and an inspection of the science chemical storage areas of each school will be conducted by a qualified person designated by the principal. A written report will be completed noting any conditions not in compliance with the OSHA Hazardous Chemicals in Laboratories Standards, CDC/NIOSH School Chemistry Laboratory Safety Guide, and the Chemical Hygiene Plan for Science Departments of Deer Valley Unified School District #97. Problems indicated by the inspection will be noted and corrective measures will be taken in a timely manner with the cooperation and at the expense of the school. A copy of the inspection report and any notations will be kept by the school Chemical Hygiene Officer(s) and the School Administration and may be viewed by other employees of the school upon request.

III. Chemical Hygiene Responsibilities

A) Administration

1. The administration is ultimately responsible for the implementation, enforcement, and support of the Chemical Hygiene Plan and safety program.
2. Assumes responsibility for the laboratory use of hazardous chemicals and appoints one or more Chemical Hygiene Officer(s) (CHO) for each unit. Provides the Chemical Hygiene Officers with the support necessary to implement and maintain their Chemical Hygiene Programs.
3. Ensures that the district and schools remains in compliance with the Chemical Hygiene Plan and safety program.
4. Provides budgetary arrangements to ensure the health and safety of the employees, students, and visitors in the school.

B) Student Supervision – Safety and Liability

The number of occupants allowed in the laboratory must be set at a safe level based on building and fire safety codes, size and design of the laboratory teaching facility, chemical/physical/biological hazards, and students' needs (NSTA 2000; Roy 2006). Science classes should have no more than 24 students to allow for adequate supervision during science activities, even if the occupancy load limit might accommodate more (NSTA 2004). It is equally important to ensure adequate workspace for each student. NSTA recommends 60 sq. ft. for each secondary student and 45 sq. ft. for each elementary student in a laboratory/classroom setting (Motz et al. 2007). Research data show that accidents rise dramatically as class enrollments exceed 24 students or when inadequate individual workspace is provided (West et al. 2005).

C) General Rules for Employees

All employees involved in the science laboratory environment or teaching a science lesson involving chemicals must read and adhere to the provisions of the Science Safety Guidelines for Teachers, the DVUSD Chemical Hygiene Plan and model the same correct, safe behaviors expected of students in the Science Safety Rules and Procedures Agreement.

No teacher or other employee should attempt a laboratory experiment unless they are appropriately trained in that science discipline, are fully aware of possible hazards, and are willing to follow all procedures necessary for a safe laboratory experience. No experiment is justified if the safety of an employee or student is in doubt.

In addition, employees should:

1. Maintain records of the amounts of chemicals on hand, amounts used, and the names of employees involved.

2. Minimize all chemical exposure.
3. Not underestimate chemical hazards.
4. Know and understand the hazards of each chemical reactant and each of the products of chemical experiments as stated in the SDS, lab direction, etc.
5. Know how to properly store all chemicals. If there is a question, the Chemical Hygiene Officer for the school/building should be consulted.
6. Wear appropriate eye protection at all times. Chemical splash goggles must be worn anytime chemicals, glassware, or heat are used in the laboratory.
7. Use protective safety equipment to reduce potential exposure, e.g., gloves, respirators, fume hood, etc., especially when working with carcinogens, reproductive toxins, and substances with a high degree of acute toxicity. (See Appendix G) A safety shield or fume hood must be used for hazardous demonstrations.
8. Never perform a first-time chemical demonstration in front of students. Always perform first-time demonstrations in front of other instructors to evaluate the safety of the demonstration.
9. Know the locations for all personal safety and emergency equipment such as eye wash, shower, fire extinguisher, and spill control materials.
10. Know appropriate emergency procedures, waste disposal, spill cleanup, evacuation routes, and fire emergency notification.
11. Only teachers/staff may handle concentrated materials requiring mixing or dilution. (The mixing and dilution should occur in the fume hood.)
12. Exercise great care in moving chemicals from room to room. Use trays or carts with raised edges for moving glassware and chemicals.
13. Wash hands thoroughly after handling any chemicals or materials.

C) Chemical Hygiene Officer (CHO)

Role: Chemical Hygiene Officers have the duty and responsibility of monitoring the Chemical Hygiene Plan at their respective schools/buildings. A Chemical Hygiene Officer will be appointed at each school, or high school science building, on an annual basis by the principal.

Duties will include:

1. Being familiar with all aspects of the Chemical Hygiene Plan, especially chemical storage and safety provisions in the science area.

2. Being a contact person for disseminating information involving chemical safety to employees of the school. This will include an annual in-service for employees (See Section IX - Employee Training).
3. Being a resource for employees at the school on matters involving the use of chemicals in the science laboratory.
4. Inspecting safety equipment at the beginning of each semester and cooperating with the annual inspection of laboratories and chemical storage areas. See Section III – Compliance and Section VIII – Facilities and Safety Equipment of Science Laboratories.
5. Reporting any observed conditions involving chemicals that pose risks to health and safety to the school principal and any other persons deemed necessary.
6. Monitoring science chemical inventories and updating the school chemical inventory list when necessary.
7. Making requests to the Plant Foreman for disposal of unwanted chemicals from the science area. A request for disposal of unwanted chemicals includes the name of the chemical, if known, and the quantity of the chemical. Requests for disposal of chemicals should be sent to the Plant Foreman by December 10th and May 10th of each school year.
8. Review chemical purchase orders to indicate no prohibited chemicals are being ordered.

While the appointment of a Chemical Hygiene Officer is intended to enhance safety for employees, it does not lessen the responsibility of any employee to learn and practice safe procedures for working and teaching in a school science laboratory.

D) Teachers

The following minimum guidelines must be read and observed by all teachers, K-12, who teach science. These guidelines are part of the Chemical Hygiene Plan and are reviewed annually.

General Guidelines:

1. It is the teacher's responsibility to know any hazards that might be associated with a laboratory experiment or demonstration and to take steps to protect themselves and their students against such hazards. Only demonstrate experiments and/or have students perform experiments that are very familiar to you. If there is any doubt about the safety of an experiment, wait until you can find someone who can answer your questions before proceeding.
2. Students must be under the active supervision of a teacher during any science experiment. Teachers are never to leave the room while students are engaged in a laboratory exercise or when chemicals or equipment are in use in the room.



3. Teachers must be familiar with all safety equipment and emergency procedures. Safety equipment (safety goggles, aprons, etc.) appropriate to the laboratory experiment must be provided. The teaching environment should be appropriate for the science activities performed. The teaching environment includes features such as room size, adequate ventilation, the presence of fire extinguishers, eye wash fountains, etc. Student maturity and behavior should be taken into consideration when selecting laboratory exercises.
4. Students must be instructed in safety rules before lab activities. The “Deer Valley Unified School District #97 Science Safety Rules and Procedures Agreement” is required for high school students enrolled in any science course.
5. Students must be instructed in procedures for leaving the science room under emergency conditions.

E) Students

1. Provide classroom teacher with pertinent medical conditions and records related to laboratory participation.
2. Read, share with parent/guardian, and sign safety contract.
3. Read, understand, and follow all safety rules and regulations that apply to the laboratory.
4. Promote good housekeeping practices in the laboratory.
5. Notify the teacher of any hazardous conditions or unsafe work practices in the laboratory.
6. Use personal protective equipment as appropriate for each procedure that involves hazardous chemicals.
7. Dress appropriately for laboratory.
8. Immediately report any injury to the teacher.

F) Employee Training

New and current employees who will be working in the science laboratory and chemical storage area must submit written proof of certification from the appropriate level approved chemical safety course (high school or middle school). Additionally, the Chemical Hygiene Officer will provide an orientation about the Chemical Hygiene Plan to employees who will be working in the science laboratory and chemical storage areas. Employees hired after this orientation must be presented the same information before they begin work in the science laboratory.

The orientation will include the following:

1. Distribution of the written Chemical Hygiene Plan for Science Departments of Deer Valley Unified School District #97 to each science teacher and each maintenance/custodial department.



If these employees have copies already, any changes or updates of information will be provided.

2. Locations of the chemical inventory and Safety Data Sheets. Copies of SDS should be in a location within the Science Department that is known by and accessible to all teachers who use these materials.
3. Procedure for reporting accidents. Use the “Incident Report” form (Appendix D) to report an accident.
4. Procedure for reporting unsafe conditions to school administrator. (Appendix E)
5. Procedure for medical treatment involving chemical exposure. Remember one source of information for medical treatment is found on Safety Data Sheets.
6. Procedure for acquiring and disposing of chemicals. The school’s Chemical Hygiene Officer should send a request for disposal of unwanted chemicals including the name of the chemical, if known, and the quantity of the chemical to the Plant Foreman by December 10th and May 10th of each school year. The Chemical Hygiene Officer(s) must give approval in writing for the acquisition of any chemicals in high schools.
7. Instruction on how to read the Safety Data Sheets to obtain appropriate hazard information.
8. A reminder of the list of chemicals prohibited in the school science laboratory. (See Appendix C and D in the CDC/NIOSH School Laboratory Safety Guide <http://www.cdc.gov/niosh/docs/2007-107/>)
9. Instruction on emergency procedures in the event of fire, chemical spills, or injury.

Additional employee training should be regularly included in Science Department meetings and/or other in-service meetings.

December 1, 2013 Training Requirements for the Revised Hazard Communication Standard

OSHA Training Requirements Fact Sheet (<http://www.osha.gov/dsg/hazcom/index.html>)

OSHA revised its Hazard Communication Standard (HCS) to align with the United Nations’ Globally Harmonized System of Classification and Labeling of Chemicals (GHS) and published it in the Federal Register in March 2012 (77 FR 17574). Two significant changes contained in the revised standard require the use of new labeling elements and a standardized format for Safety Data Sheets (SDS), formerly known as, Material Safety Data Sheets (MSDS). The new label elements and SDS requirements will improve worker understanding of the hazards associated with the chemicals in their workplace. To help companies comply with the revised standard, OSHA is phasing in the specific requirements over several years (December 1, 2013 to June 1, 2016)

The first compliance date of the revised HCS is December 1, 2013. By that time employers must have trained their workers on the new label elements and the SDS format. This training is needed

early in the transition process since workers are already beginning to see the new labels and SDS on the chemicals in their workplace. To ensure employees have the information they need to better protect themselves from chemical hazards in the workplace during the transition period, it is critical that employees understand the new label and SDS formats. The following list contains the minimum required topics for the training that must be completed by December 1, 2013.

➤ Training on label elements must include information on:

- Type of information the employee would expect to see on the new labels, including the

- ✓ **Product identifier:** how the hazardous chemical is identified. This can be (but is not limited to) the chemical name, code number or batch number. The manufacturer, importer or distributor can decide the appropriate product identifier. The same product identifier must be both on the label and in Section 1 of the SDS (Identification).
- ✓ **Signal word:** used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. There are only two signal words, “Danger and “Warning.” Within a specific hazard class, “Danger” is used for the more severe hazards and “Warning” is used for the less severe hazards. There will only be one signal word on the label no matter how many hazards a chemical may have. If one of the hazards warrants a “Danger” signal word and another warrants the signal word “Warning,” then only “Danger” should appear on the label.
- ✓ **Pictogram:** OSHA’s required pictograms must be in the shape of a square set at a point and include a black hazard symbol on a white background with a red frame sufficiently wide enough to be clearly visible. A square red frame set at a point without a hazard symbol is not a pictogram and is not permitted on the label. OSHA has designated eight pictograms under this standard for application to a hazard category.
- ✓ **Hazard statement(s):** describe the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard. For example: “Causes damage to kidneys through prolonged or repeated exposure when absorbed through the skin.” All of the applicable hazard statements must appear on the label. Hazard statements may be combined where appropriate to reduce redundancies and improve readability. The hazard statements are specific to the hazard classification categories, and chemical users should always see the same statement for the same hazards, no matter what the chemical is or who produces it.
- ✓ **Precautionary statement(s):** means a phrase that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical or improper storage or handling.
- ✓ **Name, address and phone number of the chemical manufacturer, distributor, or importer**

- How an employee might use the labels in the workplace. For example,
 - ✓ Explain how information on the label can be used to ensure proper storage of hazardous chemicals.
 - ✓ Explain how the information on the label might be used to quickly locate information on first aid when needed by employees or emergency personnel.
- General understanding of how the elements work together on a label. For example,
 - ✓ Explain that where a chemical has multiple hazards, different pictograms are used to identify the various hazards. The employee should expect to see the appropriate pictogram for the corresponding hazard class.
 - ✓ Explain that when there are similar precautionary statements, the one providing the most protective information will be included on the label.
- Training on the format of the SDS must include information on:
 - Standardized 16-section format, including the type of information found in the various sections
 - ✓ For example, the employee should be instructed that with the new format, Section 8 (Exposure Controls/Personal Protection) will always contain information about exposure limits, engineering controls and ways to protect yourself, including personal protective equipment.
 - How the information on the label is related to the SDS
 - ✓ For example, explain that the precautionary statements would be the same on the label and on the SDS.

OSHA's Hazard Communication website (<http://www.osha.gov/dsg/hazcom/index.html>) has the following QuickCards and OSHA Briefs to assist employers with the required training.

- Label QuickCard ([English/Spanish](#))
- Pictogram QuickCard ([English/Spanish](#))
- Safety Data Sheet QuickCard ([English](#)) ([Spanish](#))
- [Safety Data Sheet OSHA Brief](#)
- Label/Pictogram OSHA Brief (to come)

IV. General Protocols for Laboratory Work Involving Chemicals

A) Fundamental Principles to Avoid Exposure to Hazardous Chemicals

1. The number of occupants allowed in the laboratory must be set at a safe level based on building and fire safety codes, size and design of the laboratory teaching facility, chemical/physical/biological hazards, and students' needs (NSTA 2000; Roy 2006). Science classes should have no more than 24 students to allow for adequate supervision during science activities, even if the occupancy load limit might accommodate more (NSTA 2004). It is equally important to ensure adequate workspace for each student. NSTA recommends 60 sq. ft. for each secondary student and 45 sq. ft. for each elementary student in a laboratory/classroom setting (Motz et al. 2007). Research data show that accidents rise dramatically as class enrollments exceed 24 students or when inadequate individual workspace is provided (West et al. 2005).
2. Thoroughly review all proposed laboratory procedures to determine the potential health and safety hazards before beginning work in the laboratory. Refer to the SDS for guidance on chemical storage, handling, and disposal.
3. Avoid ingestion, injection, inhalation, eye contact, and skin contact with hazardous materials.
4. Observe the PEL (Permissible Exposure Limit) and TLV (Threshold Limit Value) of each hazardous material in the laboratory. These limits are listed on the SDS.
5. The choice of chemicals to be used in the laboratory shall be appropriate to the facilities, age level of the students, and shall not exceed the capacity of the exhaust system.
6. Do not smell or taste chemicals. When instructed to smell a chemical, gently waft the vapors toward your nose. Do not directly inhale the vapors.
7. Vent apparatuses which may discharge chemicals (vacuum pumps, distillation columns, etc) into local exhaust or hoods.
8. Inspect gloves and glove boxes before use.
9. Always wash exposed areas of skin after chemical usage and before exiting the laboratory.
10. Never wear gloves or lab coats outside of the laboratory or into areas where food is stored and consumed.
11. Eating, smoking, using smoke-less tobacco products, drinking, chewing gum, or applying cosmetics in areas where laboratory chemicals are present is prohibited.
12. Food, beverages, and cosmetics are not to be stored in chemical storage areas or refrigerators.
13. Do not use glassware or utensils used for laboratory work for any other purpose (i.e., drinking beverages in a beaker).



14. Laboratory workers should wash laboratory apparel separately from personal clothing.
15. Keep chemical containers closed when not in use. All containers with either mixed or discarded chemicals must be clearly labeled with contents as well as the date.

B) General Safety Rules for Teachers and Students

Chemical Guidelines:

Teachers who engage in laboratory activities involving chemicals need to consult the Chemical Hygiene Plan for more specific rules and procedures designed to protect them as employees of Deer Valley Unified School District #97.

1. Do not acquire or store any chemicals unless they support the Arizona Science Standards, Advanced Placement (AP), or International Baccalaureate (IB) science curriculum and are on the district approved list of chemicals.
2. Purchase or receive chemicals only from reliable sources such as science supply companies. Do not accept donations from other sources, private or public.
3. Avoid stockpiling chemicals in order to prevent problems with storage space, deterioration, magnitude of accidental spills, etc.
4. Purchase orders/requisitions for chemicals must specify that a SDS is required.
5. All approved chemicals must be stored in a locked storage room. Students must not have access unless directly supervised by a teacher.
6. Adequate ventilation is essential. Most elementary school classrooms, or classrooms not equipped as a science lab, do not have adequate ventilation for experiments involving volatile substances.
7. Chemical splash goggles must be worn during all chemical experiments. If students are observing a chemistry demonstration, a protective safety shield is needed in addition to the safety goggles.

Equipment Guidelines:

1. Do not operate and do not allow a student to operate any piece of equipment that is not thoroughly familiar to you. Be sure that you have thoroughly explained the operation procedures to the student.
2. Teachers and students must wear eye protection when heating glassware, using chemicals, or performing experiments that could generate flying objects. In addition, a safety shield should be used during demonstrations that pose these hazards.

3. Instruct students in the proper use of flames or heating elements before use in an experiment. Use alcohol burners with caution. Do not allow students to fill burners; fill in well-ventilated areas. Never fill when flames are in use; never keep stock containers of alcohol or other flammables in a room where flames are in use. Never transport a lit alcohol burner.
4. Never allow a student to focus direct sunlight through a microscope. Magnifying glasses can also cause eye damage if a student looks through them at the sun.
5. Thermometers, barometers, or other devices containing mercury are not to be present - ever.
6. Inspect all electrical cords before use. Keep areas around electrical cord, outlets, and equipment dry.

Biological Guidelines:

1. No lab exercises involving the collecting of or use of blood are to be performed. Blood experiments are to be done with commercially available blood substitutes and microscopy of human blood is to be done with commercially prepared slides, and not fresh smears.
2. The deliberate culture of microorganisms should be done only if the teacher is familiar with safe culture procedures. No cultures are to be made using known pathogens. Human and animal body fluids, including saliva, are not to be cultured.
3. Students and teachers should wash their hands thoroughly after handling chemicals and biological specimens.

Live Animals in the Classroom:

1. Animals are permitted at school only with prior approval of the principal.
2. Teachers should,
 - Educate themselves about the safe and responsible use of animals in the classroom.
 - Seek information from reputable sources and familiarize themselves with Arizona laws and regulations.
 - Become knowledgeable about the acquisition and care of animals appropriate to the species under study so that both students and the animals stay safe and healthy during all activities.
 - Follow local, state, and national laws, policies, and regulations when live organisms, particularly native species, are included in the classroom.
 - Integrate live animals into the science program based on sound curriculum and pedagogical decisions.

- Develop activities that promote observation and comparison skills that instill in students an appreciation for the value of life and the importance of caring for animals responsibly.
 - Instruct students on safety precautions for handling live organisms and establish a plan for addressing such issues as allergies and fear of animals.
 - Develop and implement a plan for future care or disposition of animals at the conclusion of the study as well as during school breaks and summer vacations.
 - Espouse the importance of not conducting experimental procedures on animals if such procedures are likely to cause pain, induce nutritional deficiencies, or expose animals to parasites, hazardous/toxic chemicals, or radiation.
 - Shelter animals when the classroom is being cleaned with chemical cleaners, sprayed with pesticides, and during other times when potentially harmful chemicals are being used.
 - Refrain from releasing animals into a non-indigenous environment.
3. Care and common sense should be used in collecting and handling live insects and other invertebrates.
 4. Vertebrate animals should be kept in the classroom only if they can be treated humanely and their handling monitored by the teacher. Animals capable of inflicting bites should be displayed only, not handled. No experimentation that causes pain, malnutrition, thirst, or other stress to an animal is permissible.
 5. Students are not encouraged to bring pets from home. If a student brings an animal to school, it should support instruction based on the curriculum and be with the prior knowledge and approval of the teacher and the principal. Proper care and safe display of the animal must be provided.
 6. Students and teachers should wash their hands thoroughly after handling chemicals, plants and/or animals.

C) Personal Protective Equipment (PPE)

1. Personal protective equipment must be available and compatible with the degree of potential chemical hazard. Always review new procedures and refer to the SDS to determine the degree of PPE that is required for each chemical that will be used in the laboratory. All photographs that are taken in a laboratory setting must depict laboratory workers who are wearing proper personal protective equipment (i.e., chemical splash goggles, gloves, and laboratory coat or apron). Notify the Administration and/or the

Chemical Hygiene Officer when photographs of the laboratory are scheduled to be taken for publication purposes.

2. Wear chemical splash goggles that conform to ANSI Z87.1-2003, *Occupational and Educational Personal Eye and Face Protection Devices*, at all times (and over eyeglasses) when working in the laboratory.
3. A face shield (in addition to chemical splash goggles) shall be used when there exists a possibility of explosion or implosion, and only to be used by the teachers.
4. Protective safety glasses with UV-absorbing lenses shall be worn when working with radiation of wavelengths shorter than 250 nm.
5. Gloves that are appropriate to the degree of hazard (according to the SDS) must be worn at all times. Inspect gloves for defects before wearing. Remove gloves before handling pens, notebooks, doorknobs, computer keyboards, and telephones. Remove gloves before exiting the laboratory.
6. Lab coats or aprons must be worn appropriate to the degree of hazard.

D) Personal Apparel

1. Wear clothing that provides protection from chemical spills in the laboratory (i.e., clothing that sufficiently covers the upper and lower body such as long pants, long skirt, and the equivalent of a t-shirt or short sleeve blouse).
2. Wear shoes at all times in the laboratory. Do not wear perforated, open-toed, open-backed, or high-heeled shoes or sandals.
3. Shorts and short skirts are inappropriate apparel for the laboratory.
4. Jewelry (i.e., rings, bracelets, necklaces, and watches) should not be worn in the laboratory. Chemicals can seep under the jewelry and cause injuries to the skin. Jewelry can become caught in machinery and can conduct electricity. Chemicals can ruin jewelry and change its composition.
5. Hair longer than shoulder length and loose sleeves must be confined (tied back) in the laboratory.

E) General Housekeeping Practices in the Laboratory

1. Formal housekeeping and chemical hygiene inspections will be conducted at a regular interval by the CHO.

2. Access to exits, emergency equipment, and utilities must never be blocked. Coats, bags, and other personal items must be stored in the proper area, not on the bench tops or in the aisle ways.
3. Properly label chemicals and equipment for use and storage. Repair or replace any damaged labels immediately. Secondary containers must be labeled with the chemical name, common name (if available), chemical formula, manufacturer's name, hazard class, and any other special warnings.
4. The floors shall be cleaned on a regular basis. Promptly wipe up all liquid spills and ice on the floor.
5. Keep work areas clean and uncluttered. Bench tops and hoods should remain clear of broken glass, spilled chemicals, and paper litter.
6. Chemical hazards shall be maintained at least two inches from the edge of the bench tops.
7. Hallways, stairways, and fume hoods shall not be used as storage areas.
8. Do not conduct unattended experiments without the authorization and prior approval of the CHO.
9. Do not store materials or chemicals on the floor.
10. Do not block the sink drains. Place rubber matting in the bottom of the sinks to prevent breakage of glassware and avoid injuries.
11. Wear appropriate gloves to clean glassware. Do not pile up dirty glassware in the laboratory. Wash glassware carefully. Dirty water can mask glassware fragments.
12. Handle and store laboratory glassware with care. Promptly discard cracked or chipped glassware.
13. Cleanup work areas at the end of the operation or day.
14. Properly dispose of broken glass and sharps (i.e., needles and razor blades). If broken glassware is contaminated with a hazardous substance, the glassware must be treated as a hazardous substance.
15. To avoid accidents, drawers and cabinets must be kept closed.
16. Properly dispose of all waste chemicals. Never pour waste chemicals down the drains.

F) Signs and Labels

1. Emergency signs shall be posted on all laboratory and prep room doors. The signs must contain the names and telephone numbers of all emergency contact personnel.
2. Emergency evacuation routes must be posted and clearly marked.
3. Label all secondary containers, including waste receptacles, with the contents (chemical name, common name, chemical formula), manufacturer's name, appropriate warnings, and hazard class.
4. Have designated location(s) for safety shower, eyewash, fire extinguisher, first-aid station, fire blanket, and emergency telephone. Label all safety equipment.
5. Post warning signs for areas of special or unusual hazards.

G) Laboratory Equipment

1. Only trained individuals shall maintain electrical equipment. Properly ground all electrical equipment. Report any electrical failure or suspicious heating of equipment to the supervisor immediately. Periodically inspect electrical equipment. Ensure quick access to electrical equipment shut-offs in the event of an emergency. Ensure that all electrical hand tools are double insulated or grounded.
2. Microwave-assisted reactions that involve flammable liquids and other hazardous materials must be conducted in laboratory-grade microwave ovens that possess all required safety features and control systems. To avoid fires, explosions, personal injury, and facility damage, **domestic-grade microwave ovens shall not be used** to heat flammable liquids.
3. Centrifuges should be anchored securely to the bench top. Close the lid before operating and remain with the centrifuge until full operating speed is attained. If vibration occurs, stop the centrifuge and check the counter-balance load. Periodically clean the buckets and rotors to avoid contamination.
4. Securely lock down all balances to avoid theft.
5. Take extra precautions when using Dewar flasks; shield or wrap them with tape to contain implosions.
6. Use laboratory equipment for the intended purpose only.
7. Periodically clean and examine all laboratory equipment.
8. Do not block walkways or aisles with extension cords. Periodically inspect extension cords for visible defects.

9. When using lasers, always wear appropriate eye protection and do not look directly at the source of the beam. Do not aim the laser by sighting along the beam. Keep the laser beam at or below chest height. Reflective materials should not be allowed near the beam. Hang warning signs when lasers are in use.
10. When using UV lamps, wear appropriate eye protection, as described in the operating procedures for the instrument. Cover exposed skin.

H) Environmental Monitoring

1. Regular employee exposure monitoring shall be provided upon request.
2. Regular monitoring for airborne substances may be appropriate when testing a new ventilation system or when redesigning laboratory hoods.
3. Regular monitoring may be appropriate if a hazardous substance is stored in the laboratory or if the substance is used routinely (three times a week or more.)

I) Medical Monitoring Program

In compliance with OSHA 29 CFR 1920.20, employee records will be maintained for the length of employment plus 30 years. The employee will be monitored:

- * If the employee develops signs and symptoms of exposure associated with a hazardous chemical.
- * When exposure monitoring routinely exceeds the action level for an OSHA regulated substance.
- * In the event of a spill, leak, explosion, or other occurrence resulting in the likelihood of exposure.

J) Record Maintenance

1. Chemical Inventories for the school laboratories must be posted within the laboratory storage area, filed with the CHO, filed in the Principal's office, Maintenance office, Nurses' office, and provided to the responding Fire Department.
2. Accident records will be written and submitted to the CHO and Administration.
3. Inventory and usage for High Risk substances will be maintained by the CHO and kept in a specified location.
4. The institution will retain medical monitoring records and personnel training records.
5. The CHO will retain an up-to-date copy of the chemical inventory, the CHP, and SDS. SDS copies must be retained for 30 years.

K) Unattended Operations

1. Obtain permission from the CHO prior to conducting any unattended operations.
2. Leave lights on and post a sign on the door announcing an unattended operation.
3. Return periodically to check on the unattended operation.
4. Provide for the containment of toxic substances in the event of equipment or utility failure.
5. Water hoses must be securely fastened to faucets and apparatus to avoid floods.
6. The laboratory door should be posted with emergency contact names and telephone numbers.

L) Use of Chemical Fume Hoods

Fume hoods are an important feature in any laboratory using hazardous chemicals. Fume hoods provide a location for the dispensing and use of hazardous chemicals that are likely to form a vapor or aerosol that could be inhaled by the user of the chemical or others in the laboratory. Fume hoods are not designed for room ventilation. Fume hoods are only designed to ventilate the activity taking place in the fume hood itself and to prevent the release of hazardous chemicals into the general laboratory environment.

A fume hood should NEVER be used as storage space for chemicals or other items. Doing so not only decreases the efficiency of the hood, but also creates an unsafe situation for the user(s) of the hood. When items are stored in the hood they will prevent proper airflow, which decreases the hood's efficiency. Additionally, items stored in the hood force the users to perform their tasks closer to the front of the hood, which increases the possibility that the products or fumes from their activity will enter the general laboratory environment.

1. See the Chemical Guide located behind the front panel to verify the chemical(s) being used are compatible with the fume hood filters.
2. Do not use open flames inside the hood.
3. Ensure pre-filters are installed prior to use. Change the pre-filters quarterly.
4. Use care when installing filter cells, units are heavy.
5. Exhausted carbon filters will have absorbed vapors from chemicals used in the hood and therefore are chemical waste.
6. Users need to be familiar with the operating procedures for the hood.

7. The Chemistry Lab ventilation system must be operating while using the hood.
8. Abnormal odors may indicate that the hood filters may need to be changed.
9. The hood is not intended for highly toxic vapors, unknown reactions, hazardous particulates or experiments generating high levels of contaminants.
10. Minimize the quantity of the chemical(s) used in the hood.
11. Adjust the sash position to the 100 fpm1 setting for chemicals with a Time-Weighted Average (TWA) below 50 ppm.
12. Leave blower on for at least 1 minute after work in the enclosure has been completed.
13. If a chemical is spilled inside the fume hood, leave the blower running until all traces of the chemical have been removed.
14. Make sure the filter cells are installed prior to using the hood.
15. If the fume hood blower fails during use, terminate the experiment and evacuate the lab.
16. Contact the manufacturer for assistance with the fume hood or filter selection.

V) Chemical Management

A) Chemical Procurement

No chemicals should be purchased or used in science laboratory exercises unless they support the Arizona Science Standards, Advanced Placement (AP), International Baccalaureate (IB) science curriculum, and are published in an appropriate laboratory manual with complete instructions.

Chemicals are to be purchased from commercial chemical suppliers. The only exceptions are those chemicals listed in Appendix A. **Under no circumstances** are chemicals to be accepted as gifts or otherwise acquired from private individuals, manufacturing companies, government agencies, etc. The teacher should be familiar with any exercise involving chemicals and follow safe procedures for use and storage of those chemicals.

The quantity of chemicals stored should not be excessive. Quantities should be limited to amounts no greater than what will be consumed over two academic years.

The following list of chemicals was prepared using data from the Flinn Chemical Catalog/Reference Manual. Evaluation of these chemicals involved reactivity, toxicity, carcinogenic potential, explosiveness, and flammability. This brief list should be compared to the chemical inventory. Those chemicals preceded by an asterisk (*) should not be purchased, used, or stored. If those with an asterisk (*) are already present at the school/labs, a plan for their proper disposal should be made and carried out. The other chemicals listed should be used or stored only with appropriate cautions. The SDS should be read before using these or any other chemicals. The Flinn Chemical Catalog/Reference Manual is a good source of information on potential hazards.

Hazards indicated: C = positive or suspected carcinogen

T = moderately to extremely toxic

R = highly reactive and/or corrosive

F or E = potentially flammable or explosive

This list is subject to periodic review and updating. Inquiries on the status of any chemical may be directed to the Chemical Hygiene Officer, Science Department Chair, or Administration.



Acetamide – C	*Arsenic – T	*Cadmium chloride – C
Acetic acid (glacial) – T, F, R	*Arsenic chloride – T	Cadmium nitrate – C, T, F
Acetic acid – R	*Arsenic pentoxide – T	Cadmium sulfate – C, T
*Acetic anhydride – F, R, T	*Arsenic trioxide –C, T	*Calcium carbide – F
Acetone – F, T	*Asbestos – C	*Calcium cyanide – T
Acetyl chloride – F	*Arcarite – C	*Carbon disulfide – F, E
Acrylonitrile – C	*Barium chloride (crystals) - T	*Carbon tetrachloride – T
dl-Adrenalin – T	Barium oxalate – T	*Catechol (pyrocatechol) – T
*Aluminum chloride (anhydrous) – R, T	Barium peroxide – T, F (High School Only, Demo Supply)	*Chlorine, chlorine water – T (High School Only & fresh supply only)
*Ammonium bichromate – T, E, F	*Benzene – C, T, F	*Chloral hydrate – T
Ammonium chromate – T	*Benzidine – T	*Chloretone (chlorobutanol) – T
Ammonium dichromate – T, E, F	*Benzoin – C, T	*Chloroform – C, T
Ammonium hydroxide (14M) – T	Benzoyl chloride – T, R	Chlorpromazine – T
Ammonium hydroxide (6M) - T	*Benzoyl peroxide – T, E, R	*Chromium – C, T
Ammonium nitrate (crystals) – T, E	*Beryllium carbonate – T	*Chromium (powder) – C
Ammonium vanadate (ammonium metavanadate) – T	Biuret solution – R	*Chromium oxide – C
*Aniline – T, C	*Bromine – T, F	Chromium potassium sulfate - T
*Aniline hydrochloride – T	*Bromine water – T (High School Only & fresh supply only)	*Chromium trioxide (chromic acid) – C, T
*Anthracene – C	*Cadmium – C, T	Cobalt – T
Antimony – T	All Cadmium compounds – T	Cobalt chloride – T
Antimony pentachloride – R	Cadmium bromide – T	*Colchicine – C, T
Antimony trichloride - T	Cadmium carbonate – T	Cyclohexane – F, T (for high school only)



*Cyclohexene – F, T, E	Hydrogen gas – F	*Millon’s reagent solution – T
*Cyclohexanol – F, T	Hydrogen peroxide (over 6% for high school only) – T, R	Nickel(ous) Ammonium sulfate crystals – T
Dichlorobenzene – T	Hydrogen sulfide – T	Nickel carbonate – C
*Dimethylaniline – T	Hydroquinone – T	Nickel(ous) chloride – T, C
*Dichloroethane (ethylene dichloride) – C	Iodine crystals – T, R (High School Only, Demo Supply)	Nickel(ous) nitrate – T, C
*2,4-Dinitrophenol – T, E	Isobutyl alcohol – F, T	Nickel oxide – C
*Diisopropyl ether – E	Isopentyl alcohol – F, T Isopropyl alcohol – F	Nickel(ous) sulfate – T, C
Dioxane – C	Lactic acid – R	Nicotine – T
Ethyl alcohol – F, T	All Lead compounds – T	Nitric acid – R
*Ethylene dichloride (Dichloroethane – C, F, T)	*Lead acetate (flakes) – T, C	Osmium tetroxide – T
Ethylene oxide – T, F Ether (ethyl ether) – F, E	*Lead arsenate – C, T	Oxygen tanks – F
Ferrous sulfate – T	Lithium – F, R (max. qty. – 1 yr. demo supply)	Para-dichlorobenze (1,4 Dichlorabenzene) – T
*Formaldehyde (37% solution) – T, C	Lithium nitrate crystals – E, R (max. qty. – 1 yr. demo supply)	*Paris green – T
Formalin (10% formaldehyde) – T	Magnesium – F	Pentane – F
*Formic acid – R	Magnesium chlorate – T	*Perchloric acid – R, E
*Gasoline – F, E	Magnesium perchlorate – R *Mercury (and all compounds) - T	Perchloroethylene – C, T
*Gunpowder – E	Methyl alcohol – F, T Methyl ethyl ketone – F	*Petroleum ether – F *Phenol (Crystals or 88% solution) – C, T
*Hexachlorophene – T		1-Phenyl-2Thiourea – T
*Hydrobromic acid – T		Phenylthiocarbamide powder -T
Hydrochloric acid – R	Methyl iodide – C	
*Hydrofluoric acid – T	Methyl methacrylate – T, F	*Phosphorous, red or white – F

*Phosphorous pentoxide – F, R	Soda lime – R	*Sulfuric acid (fuming) – T, R
*Picric acid - E	Sodium metal – F, R (max. qty. – 1 yr. demo supply)	Sulfuric acid – R, T
Potassium metal – E, R (max. qty. – 1 yr. demo supply)	*Sodium arsenate – T, C	Tannic acid – C, T
*Potassium cyanide – T	*Sodium arsenite – T, C	Tetrabromoethane – T
*Potassium chlorate – T, E	*Sodium azide – T, E	Thioacetamide – C, T
Potassium chromate – C, T	Sodium chlorate – F	Thiourea (thiocarbamide) – C
Potassium dichromate – R, T, C	Sodium chromate – T, C	*Toluene – T, F
Potassium ferricyanide – T	*Sodium cyanide – T	Toluidine – C
Potassium hydroxide (solid) – T, R	Sodium dichromate – T, C	Trichloroethylene – C, T
Potassium nitrate – F, E	Sodium fluoride – T	Uranyl acetate – C
Potassium nitrite (crystals) – F, E	Sodium hydroxide solutions – R (purchase of pre-mixed solution recommended)	Uranyl nitrate – C, F, E
Potassium periodate – R	Sodium hydroxide – R	Urethane – C
Potassium permanganate – T, F	Sodium nitrate – R, E, T	Vinylite – C
*Potassium sulfide – F,	Sodium nitrate (granular) – T, F, E (for AP/IB Chemistry only)	Winkler's solution #2 – R
T Propionic acid – F	Sodium nitrite – C, T, E	Wood's metal – T
n-Propyl alcohol – F	Sodium sulfide – T, F	Xylene – F, T
Pyridine – T, E	*Sodium peroxide – E	Zinc nitrate (flakes) – T, F
Pyrogallol (Pyrogallic acid) – T	Sodium thiocyanate – T	
Sebacoyl chloride/hexane solution – F	Stannic chloride – R, T	
Silver acetate – T	*Strontium – F	
*Silver cyanide – T	Strontium nitrate – F	
Silver nitrate – T, R	Sudan IV – C	

Chemicals Purchased from Local Community Suppliers

The chemicals listed below may be purchased from local community suppliers, such as grocery stores. All other chemicals are to be purchase from commercial chemical suppliers. Every chemical, including ones purchased from a local community supplier, require a SDS.

- | | | |
|---|--|--|
| <input type="checkbox"/> Antacids | <input type="checkbox"/> Epsom salt | <input type="checkbox"/> Rubbing alcohol |
| <input type="checkbox"/> Aluminum | <input type="checkbox"/> Flour | <input type="checkbox"/> Salt |
| <input type="checkbox"/> Aluminum foil | <input type="checkbox"/> Food coloring | <input type="checkbox"/> Shampoo/
conditioner |
| <input type="checkbox"/> Ammonia | <input type="checkbox"/> Gelatin | <input type="checkbox"/> Steel |
| <input type="checkbox"/> Aspirin | <input type="checkbox"/> Hydrogen
peroxide 3% | <input type="checkbox"/> Sugar |
| <input type="checkbox"/> Baking soda | <input type="checkbox"/> Honey | <input type="checkbox"/> Tea bags |
| <input type="checkbox"/> Baking powder | <input type="checkbox"/> Iron | <input type="checkbox"/> Fabric dyes |
| <input type="checkbox"/> Bleach | <input type="checkbox"/> Liquid bluing | <input type="checkbox"/> Tylenol® |
| <input type="checkbox"/> Chalk – for lab
experiments | <input type="checkbox"/> Nail polish
remover | <input type="checkbox"/> Vegetable oil |
| <input type="checkbox"/> Corn syrup | <input type="checkbox"/> Pancake syrup | <input type="checkbox"/> Vinegar |
| <input type="checkbox"/> Copper | <input type="checkbox"/> Plastic wrap | <input type="checkbox"/> Windex® |
| <input type="checkbox"/> Corn starch | <input type="checkbox"/> Rock salt | <input type="checkbox"/> Woolite® |
| <input type="checkbox"/> Dish detergent | | <input type="checkbox"/> Zinc |

Procedure for adding chemicals to the list of chemicals that may be purchased from local community suppliers

The Chemical Hygiene Officer may give a temporary approval for the purchase of a chemical not listed above for the current school year.

1. The Chemical Hygiene Officer will notify the Principal and Science Department Chair (if high school or middle school), and the district science curriculum specialist this temporary approval.
2. The district science curriculum specialist will notify all other Chemical Hygiene Officers of this temporary approval.
3. At the beginning of each school year the Chemical Hygiene Officers will meet and review all chemicals that have received temporary approval during the previous school year and decide whether to add the chemicals to approved list of chemicals from local community suppliers.

B) Chemical Storage Rules and Procedures

No chemicals should be purchased or used in science laboratory exercises unless they meet the following three conditions.

- (a) Their use supports the Arizona State Science Standards, Advanced Placement (AP) Science Curriculum or International Baccalaureate (IB) Science Curriculum.
- (b) Use of the chemicals is published in an appropriate laboratory manual with complete instructions.
- (c) They are supported by the Centers for Disease Control and Prevention (CDC) and National Institute for Occupational Safety and Health (NIOSH) School Chemistry Laboratory Safety Guide.

Chemicals are to be purchased from commercial chemical suppliers except for those chemicals listed on page 31 that may be purchased from local community suppliers. **Under no circumstances** are chemicals to be accepted as gifts or otherwise acquired from private individuals, manufacturing companies, government agencies, etc. The teacher should be familiar with any exercise involving chemicals and follow safe procedures for use and storage of those chemicals.

The quantity of chemicals stored should not be excessive. It is recommended that quantities be limited to amounts no greater than what will be consumed over two academic years. Refer to the CDC/NIOSH Guidelines for specifications on shelf life and storage directions.

1. An updated inventory of all chemicals, their quantities, and storage location must be kept in the Principal's office, Maintenance office, Nurses' office, and chemical storage area.
2. All chemicals, including solutions made, must be clearly labeled. In addition to the contents and concentration, the date of purchase or mixing should be written on the label. **No unlabeled chemicals** are to be stored.
3. All chemicals should be stored in chemically compatible families. Refer to the CDC/NIOSH for information about compatible families.
4. Store chemicals in a separate, locked, dedicated storeroom. If chemicals are used in the classroom for lab exercises, they must be returned to the proper storage location at the end of the period unless needed in the next subsequent period.
5. Only authorized personnel are allowed in the chemical storage area. Students, including teacher assistants (TAs), are NEVER authorized.
6. Store the minimum amount of chemicals needed and avoid bulk purchases. Smaller containers, though generally more expensive, promote freshness, maintain quality, reduce the likelihood of contamination, and lessen severity of spills.

7. To reduce the potential for overexposure to more hazardous materials consider purchasing ready-to-use products that require no mixing or dilution of concentrated ingredients when appropriate.
8. Store corrosives in appropriate corrosives cabinets.
9. No flammable materials should be stored outside of an approved flammables storage cabinet unless in safety cans.
10. Store flammables away from all sources of ignition.
11. Never store flammables in refrigerators unless the refrigerator is explosion proof.
12. Avoid storing hazardous chemicals on shelves above eye level.
13. The storage area and cabinets should be clearly labeled to identify the hazardous nature of the products stored within.
14. Chemicals should not be stored on the floor except in approved shipping containers.
15. Storage areas should be well ventilated.
16. Chemical exposure to heat or direct sunlight should be avoided.
17. Reduce the accumulation of waste by disposing of chemicals as soon as possible after use. This will eliminate the complications associated with the disposal of large quantities.
18. Metal and glass containers of flammable liquids are limited to a maximum size of one gallon. Approved safety cans are limited to a maximum size of two gallons.
19. Compressed gas cylinders must be stored with the cylinder valve closed, safety cap installed if provided, away from heat, and adequately secured to prevent damage caused by rolling or falling. Acetylene and liquefied gas cylinders are stored in the upright position.
20. Employees conducting an inventory or inspection of a chemical storage area must wear splash goggles and lab coats. If chemical containers are being rearranged, employees are not to work alone.
21. Drawers and cabinets at each laboratory station need to be checked and cleaned after each lab exercise.
22. NO food, drink, cosmetics or any objects for human consumption should be found or used the chemical storage areas without the express approval of the CHO.

C) Specific Rules and Guidelines for Chemical Safety

Student Supervision – Safety and Liability

The number of occupants allowed in the laboratory must be set at a safe level based on building and fire safety codes, size and design of the laboratory teaching facility, chemical/physical/biological hazards, and students' needs (NSTA 2000; Roy 2006). Science classes should have no more than 24 students to allow for adequate supervision during science activities, even if the occupancy load limit might accommodate more (NSTA 2004). It is equally important to ensure adequate workspace for each student. NSTA recommends 60 sq. ft. for each secondary student and 45 sq. ft. for each elementary student in a laboratory/classroom setting (Motz et al. 2007). Research data show that accidents rise dramatically as class enrollments exceed 24 students or when inadequate individual workspace is provided (West et al. 2005).

OSHA Quick Card Hazardous Communication Safety Data Sheets (SDSs)

The Hazard Communication Standard (HCS) requires chemical manufacturers, distributors, or importers to provide Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets or MSDS) to communicate the hazards of hazardous chemical products. As of June 1, 2015, the HCS will require new SDSs to be in a uniform format, and include the section numbers, the headings, and associated information under the headings below:

Section 1, Identification includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

Section 2, Hazard(s) identification includes all hazards regarding the chemical; required label elements.

Section 3, Composition/information on ingredients includes information on chemical ingredients; trade secret claims.

Section 4, First-aid measures includes important symptoms/effects, acute, delayed; required treatment.

Section 5, Fire-fighting measures lists suitable extinguishing techniques, equipment; chemical hazards from fire.

Section 6, Accidental release measures lists emergency procedures; protective equipment; proper methods of containment and cleanup.

Section 7, Handling and storage lists precautions for safe handling and storage, including incompatibilities.

Section 8, Exposure controls/personal protection lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).



Section 9, Physical and chemical properties lists the chemical's characteristics.

Section 10, Stability and reactivity lists chemical stability and possibility of hazardous reactions.

Section 11, Toxicological information includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.

Section 12, Ecological information*

Section 13, Disposal considerations*

Section 14, Transport information*

Section 15, Regulatory information*

Section 16, Other information, includes the date of preparation or last revision.

***Note:** Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15 (29 CFR 1910.1200(g)(2)).

Employers must ensure that SDSs are readily accessible to employees.

See Appendix D of 29 CFR 1910.1200 for a detailed description of SDS contents.

Every chemical on campus is required to have a Safety Data Sheet.

D) Chemical Handling

The rules and guidelines below are designed to avoid a number of hazardous situations. However, it must be realized that some employees, such as chemistry teachers, may be exposed to chemicals on a daily basis for a long period of time. These employees should be especially aware of the toxicological information on the Safety Data Sheets for chemicals they frequently use.

1. Never perform unauthorized laboratory experiments. Perform chemical experiments from a published procedure with an understanding of possible hazards. Deviation from authorized lab experiments requires approval from the Department Chair, Chemical Hygiene Officer, and site Principal.
2. Inspect all protective safety equipment before use. If defective, do not use.
3. Have appropriate types and sizes of fire extinguishers. Tri-class ABC is appropriate for laboratories. Carbon dioxide fire extinguishers are inappropriate for laboratories. A Class D fire extinguisher or clean dry sand should be available when working with flammable solids. Fire extinguishers should be inspected every six months.
4. Do not block fire exits. Keep all aisles clear.
5. Post emergency telephone numbers in the chemical storage area. Have a telephone, intercom, or other means of emergency communication in the laboratory. In the event of a chemical



spill/explosion, evacuate the lab, call 911, and notify nurse and principal.

6. Clean up spills immediately and thoroughly. Follow approved spill cleanup procedures; spills should only be cleaned up by approved personnel.
7. The use or storage of mercury or mercury compounds is prohibited. Spills involving mercury need special care by Hazardous Materials specialists and the Fire Department. Call 911 immediately should any amount of mercury is spilled. School staff is not to dispose of any mercury.
 - a. Thermometers, barometers, or other devices containing mercury are not to be used. Although slightly less accurate, non-mercury thermometers remove a serious safety hazard and a troublesome clean up procedure. The use of electronic substitutes, such as probeware, is recommended.
 - b. To dispose of mercury-containing devices, call the Plant Foreman.
8. Neutralizing chemicals, such as a spill kit, dry sand, kitty litter, and other spill control materials, should be supplied by each school and readily available in each science lab and chemical storeroom.
9. Chemical Disposal/Waste Plan (Note: Follow SDS for proper disposal)
 - a. With regards to the periodic disposal of unwanted chemicals by a licensed disposal company, the quantity limits on stored chemicals, and the restrictions on purchasing, the disposal cost of hazardous reagents should be minimized. The Chemical Hygiene Officer will be in charge of requesting disposal of all hazardous reagents.
 - b. All unknown chemicals will be considered hazardous.
 - c. In general, the small quantities (test tube amounts) of chemical waste generated by the science laboratory pose no problem for water treatment plants. Flush with adequate amounts of water to protect plumbing. If this information is not on the SDS, ask your supplier, and provide a record of your request and the supplier's reply to the Chemical Hygiene Officer.
 - d. It is suggested that specimens be ordered in packaging that uses the minimum amount of preservative. Non-formaldehyde preservatives are preferred.
 - e. Preserved dissection specimens should be disposed of through a medical waste company or through supplier.
 - f. The school's Chemical Hygiene Officer should send a request for disposal of unwanted chemicals to the Plant Foreman by December 10th and May 10th of each school year.
 - g. The Chemical Hygiene Officer must give approval in writing for the acquisition of any

chemicals in schools.

10. Work and floor surfaces should be cleaned regularly and kept free of clutter.
11. Do not use chipped, etched, or cracked glassware. Glassware that is chipped or scratched presents a serious breakage hazard when heated or handled. Dispose of glassware in an approved container. Notify maintenance to empty container as needed.
12. Eye protection must be worn. Chemical splash goggles must meet ANSI Z87.1 Standard. Wear face shields when dealing with corrosive liquids, (i.e., full strength acids and bases).
13. Eyewashes and safety showers must be maintained clear (free from obstruction) and operable. Monthly testing by maintenance personnel is highly recommended.
14. Wear gloves that offer protection for all hazards you may find in the lab.
15. Always wear a lab coat or a chemical-resistant apron when dealing with corrosive chemicals.
16. Do not pipet by mouth. Always use a pipet bulb or other appropriate suction device.
17. Wash hands thoroughly after any chemical exposure or before leaving the laboratory.
18. Never smell chemicals directly; always waft the odors to your nose using your hand.
19. Foodstuffs should not be present or eaten in a room with toxic materials.
20. Do not apply cosmetics in areas where laboratory chemicals are present.
21. Read all labels carefully; the names of many chemicals look alike at first glance.
22. **No unlabeled products** should be stored anywhere in the science facility.
23. Handle toxic, corrosive, flammable, and noxious chemicals under a fume hood.
24. Do not expose flammable liquids to open flame, sparks, heat, or any source of ignition.
25. At least every semester inspect all shelf clips in your acid cabinet to check for possible corrosion. Corroded shelf clips can lead to a shelf collapsing and causing dangerous spills.
26. Use a safety shield when igniting flammable solids.
27. Use extreme caution when handling finely divided (dust-like) material. Finely divided materials may form explosive mixtures with air and also make inhalation of toxic materials more likely.
28. Discourage the use of contact lenses in areas where chemicals are used or stored. If contacts must be worn, wear non-vented goggles.

29. All accidents or near accidents (close calls) should be carefully analyzed with the results distributed to all who might benefit. Send the information to the Chemical Hygiene Officer, Science Department Chair, Principal, School Nurse, and Plant Foreman, for distribution.
30. In the event of an injury or exposure to a hazardous chemical, the person shall be referred to the nurse as soon as possible. Fill out an accident report describing the event in detail before leaving campus for the school day. Accident report forms are obtainable from the school principal.
31. Develop and practice Laboratory emergency plans (fire, spills, power failure, etc.) with your students.

Chemical-Specific Safety Procedures Reproductive Toxins

1. Reproductive toxins should be handled only in a fume hood, using appropriate protective apparel (especially suitable gloves) to prevent skin contact.
2. Reproductive toxins should be properly labeled and stored in well-ventilated areas in unbreakable secondary containers, if possible.
3. Notify supervisor/instructor of all incidents of exposure or spills.

High Acute Toxicity Chemicals: (Supplemental rules to be followed in addition to those mentioned above)

1. Use and store these chemicals in areas of restricted access that are posted with special warning signs. These areas should include a fume hood with a face velocity of at least 80 feet per minute (fpm)¹ or other containment device for procedures that may generate aerosols or vapors containing the substance.
2. Use gloves, long sleeves and other protective apparel as needed to avoid skin contact. Always wash hands after working with these chemicals.
3. Maintain records of the amounts of these materials on hand, amounts used, and the names of staff members involved.
4. Assure that at least two people are present at all times if a compound in use is highly toxic or of unknown toxicity.
5. Be prepared for accidents and spills. Store breakable containers in chemically resistant trays. Cover work and storage surfaces with removable, absorbent, plastic-backed paper.
6. If a major spill occurs outside of the fume hood, evacuate the area and call for professional assistance. Do not try to clean up a major spill on your own.
7. Thoroughly decontaminate or incinerate contaminated clothing or shoes. If possible, chemically

decontaminate by chemical conversion.

8. Store contaminated waste in closed, suitably labeled, secondary containers.

Select Carcinogens: (Further supplemental rules to be followed, in addition to all these previously mentioned.

1. Conduct all transfers and work with these substances in a designated area - a restricted access fume hood or portion of a lab designated for use of highly toxic substances, for which all people with access are aware of the substance being used and necessary precautions. The designated area should be conspicuously marked with warning and restricted access signs. Prepare a plan for use and disposal of these materials and obtain approval of the appropriate lab supervisor or instructor.
2. All containers of these substances should be properly labeled with identification and warning labels.
3. Store containers of these chemicals in ventilated, limited access areas in appropriately labeled, unbreakable, chemically resistant, secondary containers.
4. If using toxicologically significant quantities of a select carcinogen on a regular basis (three times a week or more), consult a physician concerning desirability of regular medical surveillance.
5. If the toxic substance is a dry powder, use a wet mop instead of dry sweeping.
6. Use chemical decontamination whenever possible; ensure that containers of contaminated waste (including washings from contaminated flasks) are transferred from the controlled area in secondary containers under the supervision of the instructor or laboratory supervisor.
7. Decontaminate any equipment, including glassware, in the fume hood before removing them from the controlled area. Decontaminate the controlled area before resuming normal work.
8. When leaving the controlled area, remove protective apparel and wash hands, forearms, face and neck.

Flammables: (Further supplemental rules to be followed, in addition to all these previously mentioned.

1. Never heat flammable liquids with an open flame or hot plate. Use a heating mantle, steam bath or hot water bath.
2. Never use or store flammable chemicals near any source of ignition spark or open flame.
3. Handle solvents in an exhaust hood or well-ventilated area.
4. Ground containers when transferring from one container to another if the potential for sparking exists.

5. Do not store large quantities of flammable reagents in the laboratory.
6. Store flammable liquids in appropriate safety cabinets and/or safety cans.

E) Chemical Inventory

1. Perform biannual checks and annual revisions of chemical inventories for each chemical storage area.
2. Include the following information in the chemical inventory records:
 - a. Chemical name
 - b. CAS number
 - c. Manufacturer
 - d. Owner
 - e. Room number
 - f. Location within the room
3. When performing a chemical inventory, be sure to:
 - a. Wear appropriate PPE
 - b. Use a chemical cart to manipulate and move chemicals around the room
 - c. Use an approved laboratory step stool
 - d. Have extra gloves on hand
 - e. Be familiar with the Emergency Action Plan
 - f. Implement a Work Stand Down, if necessary, to avoid accidents while performing a chemical inventory.

F) Transportation of Chemicals

1. If chemicals are to be hand-carried, the chemicals should be placed in a safety container or rubber bucket.
2. Avoid transporting chemicals in crowded areas between classes. If possible, transport chemicals in a freight-only elevator and do not allow other passengers.
3. Chemicals should be transported on chemical carts with attached side rails to contain the bottles. Chemical carts should have trays of single piece construction at least two inches deep to contain any spill that may occur. Gas cylinders require special carts. Do not carry carts over obstructions or up or down stairs.
4. To protect teachers and students, all planned demonstrations and chemistry magic shows that will be performed by chemistry teachers that are not a part of normal instructional activities must be pre-approved and authorized by the Administration and Chemical Hygiene Officer. Teachers who are interested in participating in such activities and plan to use school chemicals and apparatus must submit the following information, in writing at least two weeks in advance of the planned event, to the Administration and Chemical Hygiene Officer:

- *The location of the demonstration
- *The date of the event
- *The age of the intended audience
- *The number of persons who will attend the event
- *The degree of audience participation
- *The demonstrations that will be performed
- *A list of chemicals that will be transported to the demonstration site
(copy of DOT permit for transport of listed chemicals)
- *The personal protective equipment that will be worn and by whom

All chemicals that are transported to the demonstration site must be handled in a prudent manner, packaged appropriately, properly labeled, and transported back to the school for disposal via the chemical waste disposal system. Under no circumstances should any chemicals that originated at the school be left at the demonstration site or disposed of at the demonstration site.

Prior to the planned event, teachers should ensure that, in the event of an accident involving chemicals in their personal vehicles, they will be covered under their personal insurance policies. Many insurance policies forbid the transport of any chemicals from the workplace in personal vehicles.

G) Waste Disposal Program

1. Waste chemicals must be stored in separate screw cap containers and must be labeled in compliance with institutional regulations.
2. Waste containers shall be the minimum size that is required and shall contain one to two inches of headspace prior to collection.
3. Do not dispose of any chemical down the drain unless it meets the conditions stated in part 9c on page 36 or Flinn Catalog.
4. Contact the Chemical Hygiene Officer to obtain the departmental hazardous waste procedures and forms.
5. Contracted institutional personnel will collect hazardous waste at school's expense on a biannual basis.

VI. Facilities Management

A) Facilities and Safety Equipment for Science Laboratories

It is the school administrator's responsibility to provide and maintain safe laboratory facilities.

- Teachers must understand their responsibilities and duty of care.
- Teachers must be supervised and held accountable by school administration.
- Lack of training/leadership is more costly in the end.
- Create an environment of unity - teachers, students, and parents should work together to provide a safe classroom and laboratory environment.
- Mandate safety training.
- Mandate regular science safety meetings and keep copies of the sign-in sheets and notes on topics discussed.
- Duty to provide a safe environment include:
 - ✓ The number of occupants allowed in the laboratory must be set at a safe level based on building and fire safety codes, size and design of the laboratory teaching facility, chemical/physical/biological hazards, and students' needs (NSTA 2000; Roy 2006). Science classes should have no more than 24 students to allow for adequate supervision during science activities, even if the occupancy load limit might accommodate more (NSTA 2004). It is equally important to ensure adequate workspace for each student. NSTA recommends 60 sq. ft. for each secondary student and 45 sq. ft. for each elementary student in a laboratory/classroom setting (Motz et al. 2007). Research data show that accidents rise dramatically as class enrollments exceed 24 students or when inadequate individual workspace is provided (West et al. 2005).
 - ✓ All necessary Personal Protection Equipment (PPE) must be available in science laboratories at all times. PPE includes items such as goggles, gloves, and lab aprons.
 - ✓ Laboratories are equipped with safety equipment - safety blanket, eye wash, body drench, proper ventilation, chemical safety shield, ABC fire extinguishers, etc.
 - ✓ All equipment is in proper working condition before student use.
 - ✓ Chemical storerooms should always be locked.
 - ✓ Teachers and students must have a safe location to perform experiments that is equipped to handle chemicals.

- ✓ Long-term substitute teachers must be held to the same standards as permanent science teachers. **Short-term substitutes should never perform a lab using chemicals.** Long-term substitute teachers should not be allowed to perform labs with students unless they meet the following criteria,
 - Possess a science degree
 - Have appropriate laboratory skill level
 - Have approval from School Administration
 - Certified in an approved chemical safety course as stated on page 13 (section F)

For the safe operation of the Science Laboratory the following conditions are necessary where chemicals, open flames, heating of glassware, or release of fumes are involved.

1. An easily accessible fire blanket must be present where open flames are used.
2. Clean and functional splash goggles must be available.
3. Adequate laboratory ventilation must be provided when chemical fumes are liberated. Exhaust air must be vented externally to the building or otherwise purified. A rate of four to twelve air changes per hour is recommended. Refer to the operating procedure and manuals to ensure non-vented fume hoods are operating properly.
4. Fire extinguishers must be of the right type, Tri-class ABC, and they must always be properly inspected. A fire extinguisher must be located in each laboratory and chemical storage area.
5. Eyewash stations must be functional and flushed at least once a month. Eye wash bottles should be maintained according to the manufacturers' directions.
6. Fume hood must be functional. A level of 80-120 feet per minute (fpm¹) is recommended.
7. A safety shield must be available for demonstrations. This does not remove the responsibility for wearing safety goggles.
8. Full body showers are to be located in high school chemistry labs.
9. Running water should be available for hand washing in laboratories using preserved specimens or handling chemicals.

In no instance should a classroom not properly equipped be used for laboratory exercises involving chemicals, flames, or release of fumes. The Chemical Hygiene Officer must inspect all safety

equipment at the beginning of each semester and report deficiencies immediately. The Chemical Hygiene Officer must keep documentation of corrective actions taken.

B) Maintenance

Monitoring and changing the filters is the primary maintenance required with an exhaust fume hood. Under normal operations, the unit will require little routine maintenance. The following maintenance schedule is recommended:

Weekly

- Using an appropriate glass cleaner, clean the sash and sides. Wipe down the interior surfaces of the unit using a damp cloth.
- Clean the exterior surfaces of the unit, particularly the front and top to remove any accumulated dust.

Monthly

- Test the filter condition using a gas detector tube at intervals of 20% of the total estimated time. The exception to the 20% recommendation is formaldehyde or any carcinogen or suspected carcinogen. These hazardous chemicals must be checked at least every 10% of the total estimated time. Gas detector tubes for the specific chemicals that are being used in the enclosure can be obtained from your laboratory supply dealer.
- Check face velocity on the HEPA filtered models. Change HEPA filter when face velocity drops below 90 feet per minute.
- Replace filter when chemical breakthrough is indicated by odor, time, detector tube, vapor sensor or for some chemicals, analytical instrumentation.
- The Safety First Vapor Sensor does NOT eliminate the need to sample with detector tubes.
- See “Filter” section of manual.

Quarterly

- Change the pre-filters every three months or more frequently if dusty conditions exist.

Annually

- The fume hood ductwork is checked to make sure that it is in good condition and venting directly to the out-of-doors, away from building air intakes.
- Safety showers and eyewash stations will be inspected by the maintenance department at least yearly. Maintenance is to flush every eyewash and shower unit monthly until the water runs clear. The date and person performing the maintenance must be recorded and retained. The inspector will record his or her initials and date of inspection on a tag that is attached to the equipment.

- Fire extinguishers shall be inspected yearly. The inspector's initials and date of inspection should be recorded on the attached tag.

C) Ventilation

1. Laboratory procedures involving hazardous chemicals must not be started if there is a possibility that the ventilation system cannot handle the gas or vapor emissions from the procedure.
2. The laboratory ventilation should have a performance level of 10-20 room changes per hour.
3. There should be 2.5 linear feet of hood space for each worker who spends the majority of his or her time working with hazardous chemicals.
4. Laboratory air must not be recirculated.
5. Hood face velocity should be 60-120 linear feet per minute.

D) Laboratory Inspections

OSHA Lab Standard, Appendix A, Section D.4.b (*Housekeeping, Maintenance, and Inspections*) *“Inspections. Formal housekeeping and chemical hygiene inspections should be held at least quarterly for units which have frequent personnel changes and semiannually for others; informal inspections should be continual.”*

The goals of laboratory inspections include:

1. To ensure that the facilities provide a healthy, safe, and code-compliant environment in which to teach and learn.
2. To ensure that employees and students follow institutional chemical hygiene plans.
3. To ensure that all laboratory activities are conducted in a prudent manner to avoid employee and student exposure to hazardous chemicals.

When inspecting laboratories, laboratory inspectors shall report on the status of:

- ✓ Housekeeping
- ✓ Personal protective equipment (PPE)
- ✓ Chemical storage and waste
- ✓ Signs and labels
- ✓ Laboratory hoods
- ✓ Gas cylinder storage
- ✓ Emergency safety equipment
- ✓ Physical Plant issues

VII. Emergency Preparedness

A) Emergency Action Plan

A written emergency action plan shall be developed and communicated to all personnel in the unit. The plan shall include procedures for evacuation, ventilation failure, first-aid, and incident reporting. Clear and concise instructions (with contact names and telephone numbers) on what to do in the event of:

- ✓ Chemical spill
- ✓ Fire
- ✓ Medical emergency
- ✓ Suspicious package
- ✓ Suspected explosive device
- ✓ Chemical fume hood failure
- ✓ Unplanned power outage
- ✓ Flooding of a laboratory or chemical storeroom

B) Fire Alarm Policy

When a fire alarm sounds, you must evacuate the laboratory immediately via the nearest exit. Extinguish all flames and turn off all equipment, as appropriate, before exiting. Teachers must ensure the orderly and expeditious evacuation of the students from the classrooms and laboratories. School personnel who violate this fire alarm policy will be subject to citations and/or arrest by the responding city officials.

C) Accident Procedures

After each incident, the employee must complete an incident report and submit it to the CHO. Provide a copy of the appropriate SDS to the attending physician, as needed. **All medical procedures are to be conducted under the purview of the school nurse.**

Cuts: The person performing first aid must wear appropriate PPE. At the very least, this will include gloves and eye protection. If the injured person has experienced a minor cut, flush the wound with tepid running water to remove any possible chemical contaminants. If there is a cut on a gloved hand, remove the glove after thoroughly washing the affected area to avoid contamination of the cut with chemicals. Apply a bandage and advise the victim that he or she should report any signs of infection to a physician. If there is a possibility that the wound is contaminated by broken glass or chemicals, the victim should seek immediate medical attention. If the injured person has experienced a more serious injury (if sutures will be necessary) call 911 and apply sterile gauze pads to the wound. If necessary, apply direct pressure to the wound to stop the bleeding. Apply additional pads if the blood soaks through the first sterile pad. If bleeding continues, encourage the victim to lie down and elevate the wound area to a position above the victim's heart. If you are unable to stop the bleeding,



remain calm and carefully explain the situation to the dispatcher at 911. The dispatcher will advise you on further action.

Thermal Burns: Do not apply ointments or ice to the wound. For first-degree wounds, flush with copious amounts of tepid running water. Apply a moist dressing and bandage loosely. For second degree (with open blisters) and third degree burns, do not flush with water. Apply a dry dressing and bandage loosely. Immediately seek medical attention.

Chemical Burns: Immediately flush the area with tepid running water for 15 minutes. Remove any jewelry, contaminated clothing, and shoes. Place the victim in the safety shower, if necessary. **Do not apply ointments, baking soda, ice, or gauze coverings to the wound.** Seek immediate medical attention.

Eye Contact: Flush eyes with tepid water for 15 minutes and seek immediate medical attention.

Ingestion: DO NOT WASTE TIME. Call 911. Do not encourage vomiting except under the advice of a physician. **Call the National Poison Hotline immediately and consult the SDS for the appropriate action.**

NATIONAL POISON HOTLINE: 1-800-222-1222

Save all chemical containers and a small amount of vomitus, if possible, for analysis. Stay with the victim until emergency medical assistance arrives.

Unconsciousness: Call 911. If it is safe for you to enter the area, place the victim on his or her back and cover with a blanket. Do not attempt to remove the victim from the area unless there is an immediate danger. Clear the area of any chemical spill or broken glassware. If the victim begins to vomit, turn the head so that the stomach contents are not aspirated into the lungs.

Convulsions: Call 911. If it is safe for you to enter the area, remove anything that might cause harm to the victim. Clear the area of any chemical spills or broken glassware. If the victim begins to vomit, turn the head so that the stomach contents are not aspirated into the lungs. Try to protect the victim from further danger with as little interference as possible.

D) Emergency Safety Equipment

1. Fire extinguishers, appropriate to the highest level of hazard, will be made available in the laboratory and will be tested on a regular basis.
2. Eye wash stations will be made available, inspected and tested monthly.
3. Safety showers will be made available and tested monthly.
4. Fire blankets will be made available in the laboratory, as required. Fire blankets should only be used to exterminate a fire when other means are not available (water is the first source of dousing the flames). They are also useful to cover a shock victim and for warmth and modesty when treating a victim under a safety shower in the event of a chemical spill.

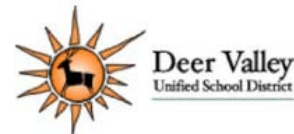
5. Access to fire alarms and telephones will be made available for emergency use.
6. Maintain clear pathways to fire extinguishers, eye wash stations, fire blankets, first-aid kits, and safety showers.

E) Chemical Spill Policy

1. A written spill and evacuation policy shall be established by the school and distributed to all personnel. The policy shall include sections on prevention, reporting, containment, and cleanup. In the event of a chemical spill, always consult the label and the SDS, and refer to the institutional Emergency Action Plan.
2. If the spill is flammable, toxic, or volatile, warn all laboratory occupants, immediately extinguish all flames, and turn off all spark-producing equipment.
 - If appropriate, according to the school spill policy, promptly clean up spills according to the directions on the SDS.
 - Use appropriate protective equipment and clothing.
 - Properly dispose of chemical waste.
3. All spills shall be reported immediately to Administration, Maintenance, Nurse, and Chemical Hygiene Officer.

VIII. References

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17. *Safety in Academic Chemistry Laboratories*; Volumes 1 and 2, American Chemical Society; Washington, D.C., 2003. http://membership.acs.org/c/ccs/pubs/SACL_Students.pdf
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IX. Appendices

Appendix A

Deer Valley Unified School District #97

Student Safety Contract

In order to ensure that science experiments are safe and positive learning experiences, students and their parents should read, discuss, and sign the science safety rules and procedures agreement. No student will be permitted to participate in laboratory work until the agreement is signed by a parent and student and returned to the teacher.

1. Act in a responsible manner at all times. Misconduct that endangers any student will not be tolerated.
2. Never work without adult supervision. Do not handle any materials until instructed by the teacher to do so.
3. Perform the experiments as directed. Do not do anything that is not part of an approved experimental procedure. Follow all instructions given by the teacher. Read the written procedures. If you do not understand a procedure or piece of equipment, ask the teacher.
4. Eating or drinking in the lab or experimental work area is forbidden.
5. Wear appropriate protective equipment. ANSI approved eye protection should be worn at all times in the lab. The only exception to wearing eye protection is when doing book work or board work, i.e., no chemical or physical hazards exist. A lab coat or apron should be worn when necessary. Keep hands away from face, eyes, and mouth while using chemicals or preserved specimens.
6. Learn the locations and operation of emergency equipment including eyewash fountains, safety showers, fire extinguishers, fire blankets, etc. Report all accidents, injuries, close calls, or unsafe conditions to your teacher.
7. Closed-toed shoes must be worn at all times; never go barefoot in the lab. Special care should be taken with floppy clothing. Tie back long hair to keep it away from flames and chemicals.
8. Never taste a chemical. Never pipette by mouth – always use a pipette bulb.
9. Check odors only if instructed to do so by gently wafting some of the vapor toward your nose with your hand.
10. Carry sharp objects with tip or sharp edge pointing downwards. Do not try to catch falling sharp objects.



11. Use caution when heating materials in the lab. Keep hands and face away from the mouth of a test tube or beaker being heated. Turn off burner or hot plate when you are finished – never leave an active heat source unattended.
12. Do not enter science prep rooms or storage areas unless under teacher supervision.
13. Never take chemicals, supplies, or equipment out of the laboratory without the knowledge and consent of the science teacher.
14. Clean your lab area; put away all equipment and reagents; wash your hands at the end of each work session. Report any damaged glassware or equipment to your teacher.
15. All personal items, backpack, bags, etc., are to remain safely stowed away. Personal items are not permitted on the lab tables.

Your Science Teacher may add additional safety instructions.

I, _____, have read, understand, and agree to follow these science safety rules and procedures. I agree to abide by any additional instructions, written or verbal, provided by my science teacher or adult supervisor.

Student Signature

Date

Parent Signature

Date

List any allergies or medical problems of which your teacher should be aware, including contact lenses.



Appendix B

Science Department Chemical Storage Inspection Checklist

This checklist describes the conditions for a science chemical storage area to be in compliance with the Chemical Hygiene Plan for Deer Valley Unified School District #97. Copies of this report and documentation of necessary corrective actions taken are to be kept by the Chemical Hygiene Officer, school Administration, and the Science Department Chair.

School _____ Storage Location _____

Inspection by _____ Date _____

Signature of Chemical Hygiene Officer _____

Date _____

Conditions within storage area

S = Satisfactory, C = Corrective action needed

_____ All chemicals are clearly labeled with all appropriate information.

_____ Chemicals are stored on secure shelving.

_____ Chemicals are spaced to allow safe storage and removal of chemicals.

_____ Stored quantities of hazardous chemicals do not exceed a two-year supply.

_____ The chemicals stored are only those required for science instruction.

_____ Labeled cabinets are used for storage of flammables and contact hazards.

_____ Storage area is free of defective containers.

_____ Hazardous chemicals are not stored above eye level.

_____ Locked doors secure access to the chemical storage area.

_____ A fire extinguisher is located in the chemical storage area.

_____ Materials are available for spill control and cleanup.

_____ Floor area is free from clutter and provides easy exit from storage room.

_____ None of the following are stored:

- Gasoline
- Mercury or mercury compounds
- Benzoyl peroxide
- Carbon disulfide
- Ether
- Picric acid
- Perchloric acid
- Arsenic powder, pentoxide, trichloride, or trioxide
- Asbestos
- Benzene or benzidine
- Chromium powder or chromium (IV) oxide
- Lead arsenate
- Sodium arsenate or sodium arsenite

_____ SDS sheets are available in a clearly marked location.

_____ Metal and glass containers of flammables are limited to one gallon in size.

_____ Glass bottles are limited to one gallon for any of the following chemicals:

- acetone
- amyl alcohol
- methyl ethyl ketone
- cyclohexane
- ethanol
- methanol

_____ Chemical storage area and laboratory has adequate ventilation.

_____ Operation of fume hood is adequate; 80 to 120 fpm¹ is recommended

Remarks: If more room is needed, please attach additional documents.

Appendix C

Chemical Hygiene Plan Checklist

This chemical hygiene plan checklist is for use in Deer Valley Unified School District #97 for annual inspections of science departments to ensure effectiveness and compliance with OSHA Standard 29 CFR 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories. Copies are to be kept by the Chemical Hygiene Officer, school Administration, and the Science Department.

School _____ Storage Area _____

Chemical Hygiene Officer _____

Date _____ Inspection by _____

S = Satisfactory, C = Corrective action needed

_____ Laboratory use of hazardous chemicals complies with OSHA Standard.

_____ Work is performed on laboratory scale.

_____ Employees are not exposed to substances requiring monitoring as defined by the OSHA Standard.

_____ There is a written Chemical Hygiene Plan as defined by OSHA Standard.

_____ The Chemical Hygiene Plan is capable of protecting employees from health hazards associated with chemicals in the laboratory.

_____ The Chemical Hygiene Plan is readily available to employees, employee representatives, and evaluators.

_____ The Chemical Hygiene Plan indicates specific measures to ensure employee protection in the laboratory including the following:

- a. Standard operating procedures relevant to safety and health to be used when working with hazardous chemicals are addressed.
- b. Circumstances that require prior approval are addressed.
- c. There is documentation of employee information and training at the time of employment and/or new assignment.
- d. Employees are given access to a copy of the Chemical Hygiene Plan.
- e. The Chemical Hygiene Plan is reviewed in detail with employees at least annually and any new provisions are explained.

_____ Only chemical processes that do not require use of respirators are used.

- _____ Employees are provided the opportunity to receive medical attention under the circumstances defined in the Standard.
- _____ Chemicals of unknown composition are assumed hazardous and covered in the Chemical Hygiene Plan.
- _____ Labels on incoming containers of hazardous chemicals are not removed or defaced.
- _____ The Chemical Hygiene Plan indicates particularly hazardous chemicals not allowed for laboratory use or storage.
- _____ Procedures for removal of unwanted or hazardous chemicals are explained.
- _____ The Chemical Hygiene Plan is reviewed and updated at least annually

Recommended Actions: (Attach any additional documents.)

Final DVUSD Disposition (how you intend to handle the incident, any next steps required, or likely outcomes)

Print Name of Person Submitting Report _____

Signature of Person Submitting Report _____

Date of Report _____ **Date Submitted to School Administrator** _____

(USE ADDITIONAL PAGES IF NEEDED)

NOTE: Immediately following the incident, notify the school's office by telephone. Incident report form must be completed and submitted to principal/school administrator within 48 hours of incident.

Appendix E
Unsafe Conditions Report Form

School _____

Location: (Classroom/Lab/Storeroom) _____

Description of Unsafe Conditions _____

Print Name of Person Submitting Report _____

Signature of Person Submitting Report _____

Date of Report _____ **Date Submitted to School Administrator** _____

(USE ADDITIONAL PAGES IF NEEDED)

Appendix F
Request for Chemical or Biological Waste Disposal

School _____

Location: (Classroom/Lab/Storeroom) _____

Description of Waste (include name of chemical and/or biological waste and quantity)

Print Name of Person Submitting Request _____

Signature of Person Submitting Request _____

Date of Request _____ **Date Submitted to Plant Manager** _____

(Copy to School Administrator)

(USE ADDITIONAL PAGES IF NEEDED)