Escambia County
PUBLIC SCHOOLS

Chemical Hygiene & Laboratory Safety Guide

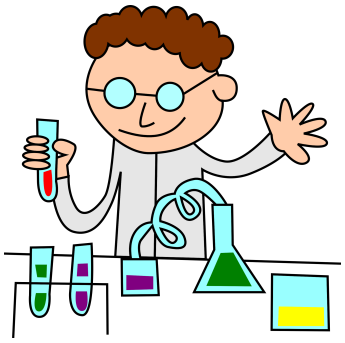

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TABLE OF CONTENTS

PART I: LABORATORY CHEMICALS

Anyone handling or working near hazardous chemicals in Escambia County School District's middle and high schools science laboratories is required to follow this guide, specifies work practices, standard operating procedures, control methods, use of personal protective equipment and any special precautions necessary while working with hazardous substances in a school laboratory setting. This document is intended to strengthen teachers' knowledge of safety concerns so that they can model safety practices for their students to emulate.

A. General Principles for working with laboratory chemicals

The recommended general principles or objectives to ensure student and teacher protection from laboratory chemicals are to:

1. Minimize all chemical exposures through prescribed "general" precautions for laboratory chemicals rather than outlining specific guidelines for particular chemicals and biological agents, while eye and skin contact should be avoided at all costs.
2. Avoid underestimation of risk through the assumption that all substances of unknown toxicity are toxic.
3. Provide adequate ventilation by use of fume hood and other precautionary devices.
4. Institute a chemical hygiene program as a regular and continuing effort.
5. Observe OSHA's Permissible Exposure Limits (PEL's) and Threshold Limit Values (TLV's) as outlined by the American Conference of Governmental Industrial Hygienists.

Over and above the OSHA requirements, the Escambia County School District general principle mandates for working with laboratory chemicals require staff to:

1. Classify and store chemicals in a compatible manner.
2. Properly label and dispose of hazardous materials/wastes.
3. Inventory chemicals annually.
4. Provide and maintain adequate up-to-date safety equipment.
5. Respond in a timely, responsible manner to report safety concerns.

B. Responsibilities of school personnel

Overall, the responsibility for chemical hygiene rests at all levels of staff within the school system, however, the superintendent and upper level administrators hold the ultimate responsibility to provide continuing support for school chemical hygiene. Physically, the Escambia County School District Science Specialist is responsible to work with principals, department chairs, and science teachers with regards to chemical hygiene in school laboratories. The Science Specialist is also responsible to implement the appropriate chemical hygiene policies and practices in order to monitor purchases, use and disposal of chemicals used in the laboratory as well has the authority to conduct all formal laboratory audits.

The school principal/site administrator is responsible for: providing continuing support by ensuring the requirements of this guide are followed; and training all appropriate staff in laboratory safety protocols found in this guide. The Science Department Chair is directly responsible for all chemical hygiene concerns in school science laboratories. The Science Specialist will maintain a list of all Science Department Chairs who will be responsible for: procurements, usage and disposal of chemicals used in school laboratory programs and will have the authority to conduct and document all informal laboratory audits.

The **Science Specialist** is required to:

- ☐ Ensure students and staff know and follow the Escambia County School District's Safety Guide.
- ☐ Verify all chemical stockrooms/storerooms are adequate and well ventilated.
- ☐ Assure the appropriate protective equipment is available and in working order.
- ☐ Determine the required levels of protective apparel and equipment (refer to http://www.fldoe.org/edfacil/sref.asp).
- ☐ Conduct routine housekeeping inspections with an emergency equipment checklist.
- ☐ Maintain documents/records of all routine inspections and condition of the emergency equipment.
- ☐ Document in writing all identified facility or equipment problems to Maintenance Services and the Principal promptly.
- ☐ Provide access to reference material to include all Safety Data Sheets (SDSs).
- ☐ Ensure that an annual inventory of laboratory chemicals is completed or updated.
- ☐ Train teachers and students in the proper use of all assigned emergency safety devices and equipment to include: eyewashes, emergency showers, fire extinguishers, fire blankets, spill kits, first aid kits, emergency shut offs, etc.
- ☐ Review the curriculum experiments for adequacy and appropriateness.
- ☐ Train all science teachers prior to the introduction of new chemicals, new procedures, new experiments, substantially modified procedures and experiments, or unique new equipment(s).
- ☐ Provide a list of all staff members trained in First Aid and CPR to science teachers.

The **laboratory supervisor or in other words the science teacher, if not the Science Department Chair** is responsible for laboratory oversight to:

- ☐ Plan and conduct activities according to this guide.
- ☐ Ensure students are knowledgeable with the policies and practices in this guide.
- ☐ Impose use of the appropriate protective apparel and equipment in the laboratory.
- ☐ Weekly activation of eye wash.
- ☐ Ensure scale of work is suitable to the physical facilities available.
- ☐ Report all facility and equipment problems immediately to Maintenance Services, the Chemical Hygiene Officer and the Principal.

Lastly, it is the **science teacher's** responsibility to hold the students accountable for following the proper safety procedures while handling laboratory chemicals in the classroom setting. To achieve this goal, the following objectives are recommended to assure student safety:

- ☐ Have students and parents read and sign a safety agreement at the beginning of the school year.
- ☐ Post location diagrams of safety equipment and emergency telephone numbers.

- ☐ Demonstrate proper use of all the safety/emergency equipment in each laboratory including safety showers, eye washes, eye/face washes, eyewashes/drench hose and drench hose units as well as fire extinguishers, fire blankets and exhaust switches.
- ☐ Review the specific safety procedures for each lab activity on the day of the activity.
- ☐ Impose consequences for safety policy violations.

Lesson Plans

In the classroom, science teachers are required to incorporate health and safety as an integral part of their instruction. Ultimately, it is the teacher's responsibility to make certain that proper safety considerations have been made and that the appropriate precautions have been taken. These safety features should be reflected in the documented lesson plans.

Teachers should ask themselves the following questions before conducting every laboratory experiment:

- ➢ What are the risks associated with this activity?
- ➢ What are its worst possible outcomes?
- ➢ What do I need to do to be prepared if these outcomes should occur?
- ➢ What practices, equipment and facilities would reduce risks?
- ➢ How can I relate these hazards to dangers that my students face in their everyday lives?

C. Laboratory safety equipment

Emergency Exhaust System is required in every science room with a manual switch to turn on the emergency exhaust system that is clearly labeled with a permanent sign.

Goggles and Goggle Sanitizing Cabinet is required by the State of Florida for students required to use personal eye protection in accordance with the American National Standard Institute (ANSI) Z87.1-2003 standards for use, durability, and cleaning. Science Teachers and students must wear goggles, when appropriate. Chemistry students, teachers and visitors to chemistry labs must wear ANSI Z87 or Z87.1 type G or H - SPLASH PROOF eye protection. Appropriate chemical resistant, sanitized or cleaned indirectly vented chemical splash goggles can be purchased through your school's science supply budget. Contact lenses should not be worn in the laboratory; however, if contact lenses are unavoidable, the use of non-vented chemical splash goggles is required. Goggles must be sanitized between uses by a goggle sanitizing cabinet or a soap and water solution.

Eyewash & Shower Stations are required to be located by signs posted in the lab identifying the unit. Eyewash and shower stations are required for every science room, laboratory or shop where students handle materials or chemicals that are potentially dangerous to human tissue. All students should be instructed in the use of the eyewash and shower stations. All safety equipment should not be blocked by debris, be in proper working condition and clearly labeled with instructions for use. Electrical outlets within six (6) feet of any water supply must be Ground Fault Circuit Interrupter (GFCI).

Lab Aprons must be non-absorbent, chemical-resistant and provided for each student during lab activities where there is a danger of spillage or splattering of chemicals or hot liquids.

Fire Blanket is to be mounted on a wall or placed in a cabinet no more than five (5) feet from the floor, be visible and readily accessible. If placed in a cabinet, the cabinet must be clearly labeled "Fire Blanket."

Fire Extinguisher policy requires, at minimum, 1-ABC fire extinguisher mounted no more than five (5) feet from the floor, visible and readily accessible near exit doors. The extinguisher cannot be more than 50 feet from any laboratory stations and cannot be blocked by storage or furniture. The science teacher should inspect the condition of the fire extinguishers at least weekly (in the green) and notify Maintenance Services if the extinguisher appears to be leaking, damaged, or discharged. Extinguishers should be recertified annually or in accordance with the type of fire extinguisher. Provide proper instruction on the use of a fire extinguisher to the class prior to the first laboratory exercise at the beginning of each school year.

First Aid Kits should be purchased by each school and be made available within the science department with their location clearly marked. The instructor should take inventory of the kit on a regular basis. The instructor should be aware of the proper use of the contents of the first-aid kit.

Fume Hood is used to prevent exposure to toxic, irritating, or noxious chemical vapors and gases as a source of positive ventilation and shut down when the emergency fan is turned on. It must be kept clean and contain minimal storage. Chemistry classrooms must have fume hoods **in working order** and vented through the roof.

Shut off Switches for gas and electrical shut off are required to be clearly labeled and located in a non-lockable place accessible within 15 feet of the instructor's station to allow cut off of services. Valves must shut completely with one quarter (1/4) turn.

D. Chemical Procurement, Distribution & Storage

Before a substance is ordered and received, information on proper handling, storage and disposal should be known. No school in the state of Florida shall accept gifts of chemicals from individuals, government installations, corporations, companies, or any other source without the specific authorization of the appropriate District Science Specialist. Preferably all substances should be received in a central location. If a chemical is received without a manufacturer's label--do not accept it! No container should be accepted without an adequate identification label. No container is to be accepted without a label exhibiting the:

- ➢ Identity of the hazardous chemical;
- ➢ Appropriate hazard warnings; and
- ➢ Manufacturer's name and address (information source).

By law, it is the manufacturer's responsibility to label containers appropriately. Make this information available to all staff involved in shipping, receiving, storage and distribution.

The table below is an extensive list of chemicals prohibited by Escambia County Public Schools. For these chemicals, the risk of use exceeds educational utility.

ECPS Prohibited Chemicals

Chemical Name	Hazards
Acetamide	Carcinogen. P-Listed Extremely Hazardous
Acetic Anhydride	Explosive potential, corrosive
Acetyl Chloride	Corrosive, dangerous fire risk,reacts violently with
Acrylamide	Toxic by absorption, suspected carcinogen
Acrylonitrile	Flammable, poison
Adipoyl Chloride	Corrosive; absorbs through skin, lachrymator
Aluminum Chloride, anhydrous	Water reactive, corrosive
Ammonia, gas	Corrosive lachrymator
Ammonium Bichromate	May explode on contact with organics, suspected
Ammonium Bifluoride	Reacts with water, forms Hydrofluoric Acid
Ammonium Chromate	Oxidizer, poison; may explode when heated
Ammonium Dichromate	Reactive, may cause fire and explosion
Ammonium Nitrate	Powerful oxidizer, reactive
Ammonium Perchlorate	Explosive; highly reactive
Ammonium Sulfide	Poison, Corrosive, Reacts with Water & Acids
Aniline	Carcinogen, toxic, absorbs through skin
Aniline Hydrochloride	Poison
Antimony Oxide	Health and contact hazard
Antimony Powder	Flammable as dust, health hazard
Antimony Trichloride	Corrosive; emits hydrogen chloride gas if moistened
Arsenic compounds	Poison, carcinogen
Asbestos, Friable	Inhalation Health Hazard, Carcinogen
Azide Compounds	Explosive in contact with metals, extremely reactive,
Barium Chromate	Poison
Barium Peroxide	Fire and explosion risk with organic materials, oxidizer,

Benzene	Flammable, carcinogen
Benzoyl Peroxide	Organic peroxide, flammable, oxidizer
Beryllium and its compounds	Poison. Dust is P-listed & highly toxic. Carcinogen
Bromine	Corrosive, oxidizer, volatile liquid
Butyric Acid	Corrosive; intense stench
Cadmium compounds	Toxic heavy metal, carcinogen
Cadmium sulfide	Highly toxic, carcinogen
Calcium Carbide	Flammable. Reaction with water.
Calcium Fluoride (Fluorspar)	Teratogen. Emits toxic fumes when heated
Carbon Disulfide	Flammable, toxic, P-Listed Extremely Hazardous
Carbon Tetrachloride	Toxic, carcinogen
Chloral Hydrate	Hypnotic drug. Controlled substance
Chlorine	Poison gas. Corrosive.
Chlorobenzene	Explosive limits 1.8% to 9.6%, toxic inhalation and
Chloroform	Carcinogen. If old forms deadly Phosgene gas.
Chlorosulfonic Acid	Toxic a/k/a Sulfuric Chlorohydrin
Chromic Acid	Strong oxidizer. Poison
Chromium Trioxide	Oxidizer, Poison
Collodion	Flammable. Explosive when dry. Nitrocellulose
Cuprous Cyanide	Toxic
Cyanogen Bromide	Poison, strong irritant to skin and eyes
Cyclohexene	Flammable, peroxide former
Dichlorobenzene	Toxic
Dichloroethane	Flammable. Toxic.
Dinitro Phenol	Explosive. "Bomb Squad"
Dinitrophenyl Hydrazine	Severe explosion and fire risk
Dioxane	Flammable, peroxide former
Ether, Anhydrous	Flammable, peroxide former

Ether, Ethyl	Flammable, peroxide former
Ether, Isopropyl	Flammable, peroxide former
Ethidium Bromide	Potent Mutagen
Ethyl Ether	Flammable, peroxide former
Ethyl Nitrate	Explosive. "Bomb Squad"
Ethylene Dichloride	Toxic, contact hazard, dangerous fire risk, explosive in
Ethyleneimine	Flammable. Toxic. P -listed
Ferrous Sulfide	Spontaneously ignites with air if wet
Formaldehyde (Formalin)	Toxic, carcinogen, sensitizer
Gunpowder	Explosive
Hexamethylenediamine	Corrosive; absorbs through skin, lachrymator
Hexanediamine, 1-6	Corrosive; absorbs through skin, lachrymator
Hydrazine	Flammable Absorbs thru skin Carcinogen. Corrosive
Hydriodic Acid	Corrosive. Toxic
Hydrobromic Acid	Corrosive. Poison
Hydrofluoric Acid	Corrosive, poisonous
Hydrogen	Flammable
Hydrogen Peroxide, >29%	Powerful oxidizer, corrosive to skin
Hydrogen Sulfide, gas	Poison. Stench
Immersion Oil (old)	May contain 10-30% PCBs such as Arochlor 1260.
Isopropyl Ether	Flammable, Highest-risk peroxide former
Lead compounds	Highly toxic
Lead Nitrate	Toxic heavy metal. Oxidizer
Lithium Aluminum Hydride	Flammable. Reacts with air, water and organics
Lithium Metal	Reacts with water, nitrogen in air
Magnesium, powder	Flammable
Mercaptoethanol	Flammable. Corrosive. Intense stench
Mercury compounds	Poisonous heavy metal

Mercury Thermometers	Toxic heavy metal, corrosive
Mercury, liquid	Toxic heavy metal, carcinogen
Methyl Ethyl Ketone	Flammable, dangerous fire risk, toxic
Methyl Iodide (Iodomethane)	May be a narcotic; Carcinogen. Lachrymator.
Methyl Isocyanate	Flammable, dangerous fire risk, toxic
Methyl Isopropyl Ketone	Toxic
Methyl Methacrylate	Flammable. Vapor causes explosive mix with air
Methylene Chloride	Toxic, carcinogen, narcotic
Naphthylamine, a-	Combustible, Toxic. Carcinogen.
Nickel Oxide	Flammable as dust. Toxic, carcinogen
Nicotine	Poison. P-Listed Extremely Hazardous
Nitrilotriacetic Acid	Corrosive
Nitrobenzene	Highly toxic
Nitrocellulose	Flammable. Explosive. Call ETSI
Nitrogen, liquid	burn hazard
Nitrogen Triiodide	Explosive. "Bomb Squad"
Nitroglycerin	Explosive. "Bomb Squad"
Osmium Tetraoxide (Osmic Acid)	Highly toxic. P-Listed Extremely Hazardous.
Pentachlorophenol	Extremely toxic
Perchloric Acid	Powerful oxidizer, reactive
Phenol	Poison
Phosphorus Pentasulfide	Water Reactive. Toxic. Incompatible with Air &
Phosphorus Pentoxide	Oxidizer, toxic
Phosphorus, Red	Flammable solid
Phosphorus, Yellow or White	Air reactive. Poison.
Picric Acid, Trinitrophenol	Explosive when dry
Potassium Chlorate	Powerful oxidizer, reactive
Potassium Chromate	Oxidizer. Toxic

Potassium Cyanide	Poison. P-Listed Extremely Hazardous
Potassium Dichromate	Powerful oxidizer, carcinogen
Potassium Perchlorate	Powerful oxidizer. Reactivity hazard
Potassium Sulfide	Flammable. May ignite spontaneously.
Potassium, metal	Water reactive, peroxide former (orange fog/crystals)
Pyridine	Flammable. Toxic. Vapor forms explosive mix with air
Radioactive Materials	Radioactive
Sebacoyl Chloride	Corrosive fumes. Lachrymator
Selenium	Toxic.
Silver compounds	Toxic
Silver Cyanide	Extremely toxic
Silver Oxide	Poison
Sodium Arsenate	Toxic. Carcinogen.
Sodium Arsenite	Toxic. Carcinogen.
Sodium Azide	Poison, explosive reaction with metals. P-Listed
Sodium Borohydride	Flammable Solid. Water Reactive
Sodium Chlorate	Powerful Oxidizer
Sodium Chromate	Oxidizer
Sodium Cyanide	Poison. P-Listed Extremely Hazardous
Sodium Dichromate	Reactive, may cause fire and explosion
Sodium Fluoride (Bifluoride)	Highly toxic by ingestion or inhalation; strong skin
Sodium Fluoroacetate	Tox-X Deadly poison!
Sodium metal lump	Water reactive, ignites spontaneously in dry hot air,
Sodium Peroxide	Water reactive; may cause fire & explosion
Sodium Sulfide	Fire and explosion risk
Sodium, metal, small chips	Water reactive, corrosive
Strontium	Flammable. Store under naphtha. Reacts with water.
Strontium Nitrate	Oxidizer. May explode when heated or shocked.

Testosterone HCl	Controlled substance
Tetrahydrofuran	Flammable, peroxide former
Thermite	Flammable solid
Thioacetamide	Toxic. Carcinogen. Combustible.
Thionyl Chloride	Corrosive.
Thiourea	Carcinogen
Titanium Trichloride	Flammable. Fire risk.
Toluene	Flammable, dangerous fire risk, toxic
Triethylamine	Flammable. Toxic. Irritant.
Trinitrobenzene	Explosive. "Bomb Squad"
Trinitrophenol	Explosive. "Bomb Squad"
Trinitrotoluene	Explosive. "Bomb Squad"
Uranium/Uranyl Compounds	Radioactive
Wood's Metal	Poison.
Xylene	Flammable, toxic

The Escambia County School District acquisition policy requires that chemicals for lab work or demonstrations be ordered at the school level with District Science Specialist approval. Acquiring chemicals through other means, including self-purchase by instructors or donations is strictly prohibited. Highly toxic chemicals of any nature are prohibited from use in schools.

Purchase the minimum amount of chemicals necessary for short-term use and distribution. If possible, purchase chemicals in class-size quantities only. Plan for the use of no more than one or two years' worth of chemicals. The maximum size container in which to order all liquid reagents (acids, bases and solvents) is one pint (500 mL). The maximum size container in which to order all solid reagents is one pound (500 g). Do not stockpile chemicals; it is expensive and can be hazardous. Preferably, all hazardous chemicals should be received in a central location within the school and inspected by the department chair or.

The following guidelines must be followed when receiving and/or handling chemicals for the Escambia County School District:

- ☐ Never open a reagent package until the label has been read and completely understood;
- ☐ Mark all incoming chemicals with the date received and initials of person receiving the chemicals;

- ☐ Clearly label all chemical storage areas with labels or placards on front of access doors to warn occupants and emergency response personnel such as fire fighters or paramedics;
- ☐ Properly store flammable liquids in small quantities in containers; and
- ☐ Add the newly accepted chemical to the existing chemical inventory list.

E. Personal Protective Equipment (PPE)

PPE is defined as the use of specialized clothing and equipment designed to be worn by laboratory workers to protect them from direct exposure from health and safety hazards. Examples of these accessories are: safety goggles, gloves, lab aprons and proper footwear. Always avoid skin contact by using gloves and long sleeves when appropriate. Wash hands and arms after working with hazardous chemicals.

The recommended PPE for a particular chemical is found on its respective SDS. Keep in mind that PPE protects you from a hazard but does not remove the hazard from the work area. PPE should not be used as a substitute for good lab practices.

F. Housekeeping, Storage, Maintenance & Inspections

Laboratory floors should be cleaned regularly. Formal housekeeping and chemical hygiene inspections should be held at least semiannually by the department chair. Access to exits, emergency equipment and utility controls should never be blocked. All laboratory work areas should be cleaned and counters wiped, glassware washed and put away, and students' hands washed before leaving the classroom.

With regard to laboratory chemical storage, the amounts permitted should be as small as practical. Chemical storage on bench tops is not allowed and storage in fume hoods should be very minimal. Chemical exposure to heat or direct sunlight should be avoided. Storerooms should be segregated into well identified areas that are adequately ventilated.

Chemicals whose containers have been opened should be in unbreakable secondary containers. Stockrooms/storerooms should not be used for preparation or repackaging. When chemicals are hand carried, the container should be placed in an outside container/ bucket or carried with both hands while having one hand on the bottom of the container.

Stored chemicals should be examined at minimum annually, for replacement, deterioration and container integrity. Periodic inventories should be conducted by the school-based CHO. Maintenance Services should be contacted to determine proper disposal of the unneeded items. Storerooms holding hazardous chemicals should be under the control of the Science Teacher or Chemical Hygiene Officer and secured from entry to students and other building occupants.

Ideally, one chemical/biological storage room under the supervision of a qualified person is advisable. The recommendation is 6 room air changes per hour. The storage room should have adequate security (only a few people should have a key or door code). Safety features for the facility should include:

- ➢ Accessibility of approved fire extinguishers;
- ➢ Working emergency shower and eye/face wash;
- ➢ Forced ventilation from floor to ceiling with exhaust above roof level;
- ➢ Impervious shelving with half-inch lip, secured to wall with the top shelf below eye level;
- ➢ Explosion proof lighting, heat and smoke detectors and good illumination; and
- ➢ Spill Kit items (Appendix C) and other clean-up materials.

Chemical Storage

Remember that a chemical is yours from its cradle to its grave. Once purchased, you own that chemical and must dispose of it properly when finished. Even if a disposal company is hired, the ultimate responsibility for the chemicals is still yours. Keep accurate records of the amount of all chemical product on hand; this inventory should be updated at least annually.

- ☐ Store chemicals in compatible families. **Do not store chemicals alphabetically!** (Storage pattern available on Flinn website, CDC Lab Safety Guide, and Stanford System (med.stanford.edu)).
- ☐ Whenever possible, avoid storing any chemicals on the floor.
- ☐ Shelves should be of wood construction and firmly secured to walls by the use of fixed wooden supports. Do not use metal, adjustable clips.
- ☐ Provide anti-roll lips on shelves whenever possible.
- ☐ Store flammables in a dedicated flammable cabinet. See the National Fire Protection Association (NFPA) template for reactivity coding. Acetone should not be stored in the refrigerator. It is denser than water and will flow downwards towards the compressor which is an ignition source.
- ☐ Store metals and hydrides away from any water.
- ☐ Store ammonium nitrate away from other chemicals.
- ☐ Chemicals prone to instability should be dated and disposed of after use.
- ☐ Do not use the fume hood as a storage area.
- ☐ Label all chemicals with the date of receipt.
- ☐ Store all compressed gases separately.
- ☐ All chemical storage areas should be locked and clearly designated off limits to everyone except authorized personnel.
- ☐ All chemical storage areas should be well ventilated (at least 6 air changes per hour).
- ☐ Do not store chemicals in your classroom. Keep them locked in the chemical storage room.
- ☐ Chemicals should be accessible to students during actual laboratory exercises only.
- ☐ Know the hazards associated with all the chemicals used in class experiments.
- ☐ Do not repackage chemicals into smaller containers unless the new containers are chemically secure, appropriately dated and labeled.
- ☐ Isolate nitric acid within the acid storage cabinet by enclosing it in a high density polypropylene container because it not only is an acid but also an oxidizer.

Signs and Labels

Signs and labels should be posted on:

- ➢ Exits;
- ➢ Chemical storage areas;
- ➢ Areas approved for food and beverage consumption only;
- ➢ Use signs to identify the location of eyewash stations, safety showers, fire extinguishers, fire blankets, other safety and first aid kits;
- ➢ Warnings for areas or equipment where special or unusual hazards exist;
- ➢ Labels identifying contents of containers, including waste receptacles; and
- ➢ Emergency telephone numbers of emergency responders, Department of Protection Services and the District Science Specialist.

Place signs conspicuously in the laboratory and on refrigerators to warn occupants that:

- ➢ No food or drink is permitted in the refrigerator;
- ➢ No food or drink is permitted in the laboratory; and
- ➢ Hands must be washed before leaving the lab.

Original manufacturer's labels, by law, must be on all incoming chemicals under OSHA's Hazard Communication Standard. A SDS must be promptly reviewed and readily available in hard copy for all hazardous chemicals in storage. Laboratory users must be provided a copy of all SDSs within 15 days upon request. A copy of each SDS must be stored outside the chemical storage room and in the school's main office. An up-to-date chemical inventory list must be sent to the science district office. Stock solutions and reagents must be labeled with the name of the contents, their hazards, and the preparation date. Unlabeled containers with unknown contents must be handled as hazardous waste. Disposal of unknown chemicals is very expensive.

G. Spills & Accidents

A spill control policy should be developed and include considerations for prevention, containment, cleanup and reporting for all releases and spills occurring in laboratories. The spill policy should include a one-page emergency plan to outline immediate response requirements. Proactive practice drills should be conducted so all students are familiar with the spill control and any accompanying emergency plan. There should be an alarm system to alert building occupants in all parts of the school. All accidents or near accidents should be reported to the Principal so they can be analyzed in the future, so any similar situation can be avoided. In the event of a spill or release, the emergency circumstances should be communicated immediately to all personnel in the surrounding area and Main Office. At that time, all spill procedures should be implemented with regards to: evacuation, ventilation requirements, medical care, spill response and reporting.

Be prepared for accidents. Assure that at least 2 people are present at all times when working with hazardous chemicals. Breakable containers should be stored in chemical resistant trays so in the event of a release the secondary containment can be placed under the fume hood. If a major spill occurs outside the hood, evacuate the area and assure that cleanup personnel wear appropriate protective equipment.

Chemical spills and leaks can occur in any laboratory. In order to minimize injury to health, property, and fire, the supplies listed below must be on hand to deal with minor spills.

- *Five (5) gallon plastic bucket with lid*
- *Absorbents such as sand and vermiculite*
- *Mix sand with neutralizing agents such as Sodium Carbonate or Bicarbonate*
- *Plastic bags of different sizes (4 each)*
- *Universal absorbent pads, 16 x 20 (4 each)*
- *Rubber gloves (2 pair)*
- *Splash goggles (1 each)*
- *Lab apron (1 each)*
- *Paper towels*
- *Broom and dust pan*
- *Sponges*

The instructions on the MSDS for spill cleanup should be followed.

GENERAL PROCEDURES FOR USING SPILL KIT:

1. *Mix 256 ounces of absorbent sand with 26 ounces of sodium carbonate (10:1) in 5 gallon bucket*
2. *Use Personal Protective Equipment (PPE), minimally use gloves, goggles and apron.*
3. *Ask for assistance--The Plant Manager/Head Custodian is available for urgent response*
4. *Double bag all hazardous waste and label the bag with the chemical name(s) of the waste.*
5. *For disposal, please call Plant Manager/Head Custodian and the Health & Safety Office.*

Without risking personal safety, the clean-up of a minor spill utilizing these supplies is allowed if wearing appropriate protective clothing. However, any major spill will require professional remediation.

If a spill of a hazardous chemical occurs:

- ➢ Evacuate classroom immediately;
- ➢ Affected skin or clothing should go immediately under eye wash/shower/drenching unit.
- ➢ Avoid breathing the vapor if it is a liquid spill and turn on emergency exhaust.
- ➢ Notify an administrator & Chemical Hygiene Officer as soon as possible regarding the incident.
- ➢ Notify the school nurse of any injuries.
- ➢ Follow the SDS instructions for clean-up procedures.
- ➢ Follow the general procedures above for cleaning up the spill.
- ➢ Deny access to the area until cleanup has been completed.

LABORATORY HAZARDS & EMERGENCY ACTIONS

***IN ALL CASES* of injury, hazardous spill, material damage, etc.:**

1. FOLLOW EMERGENCY PROCEDURES FOUND BELOW
2. AS NEEDED, NOTIFY THE FRONT OFFICE AND PRINCIPAL FOR ASSISTANCE
3. BE PREPARED TO ACT: ***Know the location and how to use the evacuation routes, eye wash, emergency shower, fire blanket, fire extinguisher, fume hood, exhaust systems, shutoffs, etc.***

EQUIPMENT OR ROOM FIRE

- Evacuate students
- Activate (pull) nearest Fire Alarm Pull Station
- Turn off gas master shutoffs
- Turn off gas master shutoffs
- Call front office or directly call 911
- Close doors and windows
- Close flammable and acid lockers
- Unplug all appliances and equipment

BODY FIRE

- Evacuate, if necessary
- Activate (pull) nearest Fire Alarm Pull Station
- Use a fire blanket (drop & roll)
- Immediately flush with cool water
- Call 911
- Call nurse's office

FAINTING

- Immediately move person to fresh air
- If due to a chemical, evacuate students and activate the emergency exhaust fan
- Keep the head lower than the rest of the body
- Keep warm and/or cover with blanket
- Call nurse's office
- If breathing or heart stops, apply CPR/artificial resuscitation while you send someone to call 911

BODY BURNS

- Follow MSDS emergency and first aid procedures
- Send student to the nurse's office with an escort

TOXIC EXPOSURES / POISONING

- Call 911 and/or poison control
- Follow MSDS emergency and first aid procedures
- Call front office/nurse
- Identify substance
- Give MSDS to emergency personnel

CHEMICAL SPILLS ON BODY

- Follow MSDS emergency/first aid procedures
- Call 911
- Identify substance
- Remove clothing or contacts as needed
- Call front office/nurse
- Give MSDS to emergency personnel

MINOR CUTS

- Follow MSDS emergency and first aid procedures
- Follow universal precautions
- Allow to bleed briefly
- Wash with soap and water
- Apply antiseptic and sterile bandage

FLOOR OR COUNTER SPILL

- Follow MSDS emergency and first aid procedures
- Activate emergency exhaust fan
- Evacuate if PEL exceeded or chemical an irritant
- Clear students from the spill area if necessary
- Follow **SPILL KIT** (**Appendix C**) procedures
- Contact Maintenance/Head Custodian for disposal

EYE INJURY

- Follow MSDS emergency and first aid
- Flush eye with water for at least 15 minutes using emergency eye wash
- Remove contacts, if necessary
- Do not rub eye
- Call front office/nurse

AFTER THE EMERGENCY

- Cleanup and prepare for the next emergency
- File a Student Accident/Incident Report or a worker's comp Report of Injury
- Get statement from witnesses
- Repeat safety training

H. Waste Disposal

The aim of a waste disposal program is to assure minimal harm to humans or the environment from the disposal of waste laboratory chemicals and their by-products left from curriculum experiments. The program is required to specify how waste is to be collected, segregated, stored and transported. Transportation from the school must be in accordance

with Department of Transportation regulations or lab-packed with licensed and insured Hazardous Waste Transporters.

During the planning stage of a school experiment, assure that each laboratory operation includes waste disposal procedures. Deposit chemical waste in appropriately labeled containers.

Disposal at a school site:
The only disposal "treatment" permitted in the district is the neutralization of small quantities of acids and bases or materials that meet the following criteria:

- ➢ They are liquids and readily water soluble (at least 3%)
- ➢ They are easily biodegradable or amenable to treatment by the wastewater treatment process.
- ➢ They are simple salt solutions of low toxicity inorganic substances.
- ➢ They have a pH between 5.5 and 9.5.

Indiscriminate disposal of laboratory chemicals by pouring waste chemicals down the drain or adding them to mixed refuse for landfill burial is unacceptable.

Pickup of Materials for Disposal:

1. Most chemicals should be boxed (compatible families) for removal. Each box will be tagged with its contents. The box(es) must remain in the chemical storage room or designated area.
2. Box flammable liquids separately. Each box will be tagged with its contents. The Request for Hazardous Waste Disposal form should be used to request disposal.
3. Out-dated diethyl ether (ethyl ether) should not be handled. If you have a container of outdated ether, have your administrator contact the district science department immediately.
4. All unlabeled, outdated, prohibited and/or potentially hazardous chemicals or those chemicals in excess of the maximum storage quantity must be boxed (compatible families) for disposal.
5. Do not handle any compromised containers. These containers should be identified on the Request for Hazardous Waste disposal form to be picked-up by maintenance.

Other items, including used batteries, halogen bulbs (containing mercury), old thermometers (containing mercury) or other materials identified as hazardous may be boxed for removal and stored in the chemical storage area.

PART II: NON-CHEMICAL HAZARDS

A. Microwave Ovens - Recommendations

1. Microwave ovens should not be available to students during regular classroom time.

2. When using it for a teacher demonstration, follow all lab procedures and be sure to only place proper and appropriate materials in the machine (no metal).

B. Model Rocketry – Statutes and recommendations

1. Model rockets may only be constructed from lightweight materials such as wood, paper, plastic, or without any metal used as structural parts.

2. Model rocket motors consisting of ammonium perchlorate composite propellant, black powder, or other similar low explosives; may contain no more than 62.5 grams propellant weight; and be designed as a single use motor.

3. No model rocket may be launched within five miles of the boundary of any airport, or within 1500 feet of any person or property that is not associated with the school board.

4. A maximum of 1,500 grams of propellant may be stored within the school storage facility. All rocket propellants must be stored in the flammable storage cabinet within the chemical storage rooms. Rocket engines may not be stored in the classroom.

5. Launch systems must be remotely controlled from a safe distance and electrically operated.

6. Launch systems must contain a launching switch that will return to the off position when released.

7. Launch systems must have a removable safety lock or removable key.

8. All persons must remain at least 30 feet away from any model rocket when igniting engines.

9. Only electrical igniters may be used. These must ignite the rocket engine within one second of actuation of the launching switch.

10. Model rockets may not carry live animals or payloads that are intended to be flammable or explosive.

11. Rockets must be launched outdoors in a cleared area, free of trees, power lines and buildings.

12. The following launch safety specifications must be met for all school based model rockets:

a. Rockets must be launched from a rod or other device that provides rigid guidance until the rocket has reached a speed adequate to ensure a safe flight path.

b. To prevent accidental eye injury, the launch rod must be above eye level or be capped when approached.

c. The launch rod must be capped when disassembled and never stored in an upright position.

d. The launch device must have a jet deflector to prevent the engine exhaust from hitting the ground directly.

e. The area around the launch device must be cleared of brown grass, dry weeds and other easy to burn materials.

f. An ABC type fire extinguisher must be within close proximity to the launch site.

g. All launches must be supervised by an ECSD employee/teacher.

13. No one may approach a model rocket on a launcher until the safety has been removed or the battery has been disconnected. If a misfire occurs, one full minute should be allotted before approaching the launcher.

14. Model rockets must not be launched so their flight path will carry them against targets. The launch device must be pointed within 30 degrees of vertical. Model rocket engines must never be used to propel any device horizontally.

15. A recovery system must be used in model rockets that will return them safely to the ground so that they may be flown again. Only flame-resistant recovery wadding should be used in the recovery system. No attempt should be made to recover rockets entangled in power lines.

C. Animals in the Classroom: Care, Handling, Precautions and Dissections.

Live animals on the premises of public and private elementary, middle, and high schools shall be housed and cared for in a humane and safe manner. Animals shall not remain on the premises of any school during periods when such school is not in session, unless adequate care is provided for such animals

Recommended Animals for Classroom Use:

Some animals may be allowed in the science classroom. However, all animals represent a high level of safety concern since their behavior is often unpredictable. Additionally, many animals carry pathogens or allergens that may impact the student population. These considerations must be addressed prior to any animal being placed in the student area. For this reason, it is recommended that both parent and principal permission are required before an animal may be placed in the classroom.

It is further recommended that animals in the classroom must be tied directly to the curriculum. For example, fish in a marine science lab have a direct connection to the content. Students will participate in the development and maintenance of the aquarium, and the content is enhanced by the placement of these tanks in the classroom. However, a hamster in a physical science class has no direct instructional relationship and is not appropriate for this classroom. In the elementary setting, these same guidelines apply. A hamster in an elementary classroom is only appropriate if instruction is enhanced by its placement in the classroom. Students can learn a great deal about animal behavior, nourishment, life patterns and environmental considerations by observing animals.

Due to the threat of Salmonella, all reptiles should have a veterinary certificate on file declaring these animals' safe and pathogen free. Snakes, turtles and iguanas may require a veterinary certificate prior to their placement in a student area. Stray animals (birds, frogs, turtles, snakes, etc.) should be forbidden unless proper veterinary documentation is obtained.

Additionally, **Pets are NEVER to be brought to school** (for show-and-tell or any reason). These are not controlled situations and open students to dangerous animal interactions.

If you wish to provide animal access to your students, you should meet these five requirements.

1. Parent permission is obtained for all students who may come in contact with or be in the same location as the animal(s).

2. Curriculum is tied directly to the animal(s).

3. Principal permission is obtained. The principal has the right to deny animal placement in any classroom.

4. Safety contracts are on file for each student, and student/animal interaction is addressed in each safety contract.

5. Animals are healthy and those animals that may carry pathogens have been declared pathogen free by a veterinary examination.

Recommended Guidelines for Animal Care and Handling

The care and well-being of animals studied in the classroom should be of major importance to the science teacher and student. The science teacher is ultimately responsible for all animals kept in the classroom. Students may participate in maintaining a schedule for feeding animals, cleaning their cages, supplying water and maintaining appropriate temperature. The teacher must supervise all student involvement. Due to the concern for allergies, parent permission is strongly recommended.

Before using animals, teachers should establish guidelines to avoid any intentional or unintentional abuse, mistreatment or neglect of animals and to promote humane care and proper animal husbandry practices. Whenever animals are to be used in science activities with students, it is imperative that care be exercised to protect both the animals and the students. If animals are to be kept at any time in the room in cages, be certain that adequately sized and clean cages are provided to all animals. Keep cages locked and in safe, comfortable settings.

Animals can stimulate and enhance learning and should be used safely in the laboratory/classroom. Because increased activity and sudden movements can make animals feel threatened, ALL student contact with animals should be highly organized and supervised. Teachers should keep the following precautions in mind to ensure an enjoyable and comfortable experience for their students.

1. Inquire beforehand about student allergies associated with animals.

2. Animals must be hardy and able to thrive in captivity.

3. Animals must have natural habitats that can be easily replicated.

4. Incompatible animals may never be housed in the same cage.

5. Animal quarters must be kept clean, protected from the elements, and have enough space for normal activity.

6. The quantity and type of food must meet the animal's nutritional requirements.

7. Temperature, lighting and other environmental features must be appropriate for the type of animal being housed.

8. Precautions must be taken to prevent unauthorized students from harassing or injuring the animal or themselves.

9. Careful monitoring of the animal's health is required and a licensed veterinarian, if it becomes necessary, must carry out euthanasia.

10. Students must be thoroughly instructed in the care and handling of animals before access to any animal is permitted. Safety contracts must outline these instructions.

11. Students must wear heavy cotton work gloves when handling animals that may bite and students must wash their hands after handling animals.

12. Never allow students to tease animals or touch animals to their mouths.

13. Animals must be handled in the manner and extent indigenous to the species.

14. Students must report all bites or scratches to the teacher.

15. Provisions must be made for animal care over weekends and holidays.

16. After the study of animals is completed, they should be returned unharmed to their natural environment or if purchased, to a pet store.

17. Wounded or stray animals must not be brought to the school.

18. Snakes that feed on other animals must not be fed in the presence of children.

19. Never dispose of fecal matter in sinks or with commonly used equipment.

20. Fish tanks must be constructed of a shatterproof/tempered glass. Plate glass tanks may not be used as fish tanks.

21. Fish tanks must not be placed in locations that compromise electrical safety. Filters, hoses and water outlets must not be located near electrical outlets unless the outlet is rated Ground Fault Interrupt (GFI). The OSHA standard suggests keeping all water/tanks at a distance of 3 feet or more from a non-GFI electrical outlet.

22. Poisonous fish, insects or animals are all forbidden, and aggressive carnivorous fish (Piranha, etc.) are forbidden.

23. The principal of a school has the right to add additional restrictions and provisions for animal care and handling.

When collecting aquatic species, instructors should attend Aquatic Species collection Workshops Sponsored by the Florida Marine Science Educators Association and the Florida Fish and Wildlife Conservation Commission (http://fmsea.org/events/ascw/).

Experiments on Animals

1. Lower orders of life and invertebrates may be used in scientific experiments.

2. Non-mammalian vertebrates, excluding birds, may be used in biological experiments, provided that physiological harm does not result from such experiments.

3. Observational studies of animals in the wild or in zoological parks, gardens, or aquaria, or of pets, fish, domestic animals, or livestock may be conducted.

4. Studies of vertebrate animal cells, such as red blood cells or other tissue cells, plasma or serum, or anatomical specimens, such as organs, tissues, or skeletons, **purchased or acquired from biological supply houses or research facilities** or from wholesale or retail establishments that supply carcasses or parts of food animals may be conducted.

D. Animal Dissection

1. No surgery or dissection shall be performed on any living mammalian vertebrate or bird.
2. Dissection may be performed on non-living mammals or birds secured from a recognized source of such specimens and under supervision of qualified instructors. Students **may be excused** upon written request of a parent.
3. Alternative instructional activities will be provided **at all levels** for those students who refuse or are unable to participate in dissection labs.
4. Only preserved specimens obtained from an approved commercial vendor may be used for dissection. **Purchasing animals (chicken, fish, squid, etc.) or animal parts (hearts, eyeballs, etc.) from a grocery store for the purpose of dissection is prohibited.**
5. Non-living animals should be stored in biologically-safe liquids such as Carosafe.
6. Formalin and formaldehyde are considered hazardous waste and should not be discarded down the drain or put in the trash. It is permissible to bag a dried specimen and put it in the trash.
7. Safety goggles must be worn by all students involved in dissection.
8. All equipment and lab surfaces must be disinfected, and students should be cautioned against touching their faces with contaminated gloves.
9. When using scissors, cut away from the body whenever possible. Scalpels should be used for incision only; scissors are the tool of choice.
10. The hands should be washed thoroughly with soap and water, especially under the fingernails, at the end of the laboratory period.

Dissection Curriculum:

1. Teachers using dissection as a method of instruction should be able to state sound educational goals and objectives for the dissection. As with all lessons, **every dissection should be accompanied by a lesson plan listing the Next Generation Sunshine State Standards benchmarks that are covered in the lesson.**

2. Appropriate pre-dissection discussion and instruction, dissection directions and guidance, and post dissection activities should be planned and implemented for each lab. Teachers should be prepared to discuss the structural significance of the species being studied in relation to humans and other organisms.

3. No animal dissections of any kind should be done in grades K-5.

E. Plants in the Classroom

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

Recommendations:

Plant Selection: It is important to realize that plants may carry allergens and are, in some cases, poisonous. For this reason, parent permission is required prior to plants being placed in the classroom. Parents must always be aware of the types of plants or animals

their children may come in contact with throughout their educational day. In all cases, poisonous plants are forbidden.

Utilize the following recommended policy guidelines for proper selection, care, handling and use of plants in the laboratory.

1. Inquire beforehand about student allergies associated with plants. Parent permission is required.
2. Never use poisonous or allergy-causing plants in the classroom.
3. Never burn plants that might contain allergy-causing oils, e.g., poison ivy or peanuts.
4. Make a clear distinction between edible and non-edible plants.
5. Never allow plants to be tasted.
6. Have students use gloves while handling plants and wash hands afterwards.
7. Alcohol should be substituted for chloroform in chlorophyll extractions.

Butterfly gardens: It is recommended that schools are aware that some plants used in a butterfly garden can be toxic to humans. For example, the milky sap of the milkweed plant can be dangerous if contact is made with the eye. The sap can also cause irritation on the skin. It is recommended that if there is a question on the safety of the species of plants being considered for the garden, that council is sought with a local agricultural agency.

F. Field Trip Safety Considerations

In many science curriculum areas, field trips play an important part in enhancing or augmenting textbook information. The science teacher should be aware of possible safety hazards and precautions to be taken when taking students on a field trip. The following list emphasizes several pre-field trip considerations.

Recommendations:

1. Follow all school and district guidelines for permission slips, supervision and student to adult ratio.

2. If plants are to be encountered, ascertain if any student is allergic to a particular type of species.

3. If the possibility of insect bites is likely, determine if any may be allergic.

4. Determine if any student is limited in his/her physical activity and make appropriate preparations.

5. If the field trip involves outdoor exploration, indicate appropriate clothing, sun protection, foul weather gear and insect protection. For marine science trips, refer to the “Field Trip, Sporting Trip, & School Activity Trip Guide” at http://escambiaschools.org/.

6. Carry a first aid kit and any appropriate safety equipment for hazardous procedures (i.e. goggles for chipping rocks).

7. Warn students about hazards including eating wild fruits or drinking water from lakes or ponds, putting their hands into any unexposed areas; that is, under bushes, in holes, under rocks or logs.

8. Instruct students to report to a designated emergency location if any difficulty arises and establish a buddy system so that students are never alone. Take attendance periodically.

G. Prohibited and Dangerous Practices: Risk Exceeds Educational Utility

1. Students may not draw or analyze human blood, urine or other body fluids, because of the possibility of AIDS.

2. Students may not scrape cheek cells for microscopic analysis because of the possibility of infection or AIDS.

3. Students may not heat glassware that is not designed for extreme temperatures since it may shatter.

4. Students may not use alcohol burners or propane tanks because of their high flammability. Gas burners and hot plates are the only allowed sources of heat.

5. Students may not use PTC (phenylthiocarbamide) taste paper because it is a rodenticide and not approved by the Federal Drug Administration (FDA) for human consumption. *NOTE: PTC is on the prohibited chemical list as per FLDOE.*

6. Students may not look directly at burning magnesium metal since the bright light may damage the eyes.

7. Students may not stare directly into a laser beam because of the possible retinal damage that might occur.

Laboratory Safety Contract

Name: _____ Period: _____

PREPARE FOR LABORATORY WORK:

- Study laboratory procedures prior to class
- Never perform unauthorized experiments
- Keep your lab bench organized and free of apparel, books and other clutter
- Know how to use the emergency shower, eye wash, fire blanket, and first aid kit

DRESS APPROPRIATELY FOR LABORATORY WORK:

- Always tie back long hair
- No loose or baggy clothing
- Roll up loose sleeves as they tend to get in the way
- No open-toed shoes or sandals
- Wear lab coats during all laboratory sessions
- Wear safety goggles during all laboratory sessions except for pre-lab discuss
- Wear gloves when using chemicals that irritate or can be absorbed through the skin

AVOID CONTACT WITH CHEMICALS:

- Never taste or "sniff" chemicals
- Never draw materials in a pipette with your mouth
- Point the opening away from people, when heating substances in a test tube
- Never carry dangerous chemicals or hot equipment near other people

AVOID HAZARDS:

- Keep combustibles away from open flames
- Use caution when handling hot glassware.
- When diluting acid, always add acid slowly to water (A&W)--never water to acid.
- Only teachers should insert glass tubing through stoppers
- Turn off burners when not in use
- Do not bend or cut glass unless appropriately instructed by teacher
- Keep caps on reagent bottles and never switch caps with other containers

CLEAN UP:

- Consult with the teacher for proper disposal of chemicals
- Wash hands thoroughly following experiments
- Leave laboratory bench clean and neat

IN CASE OF AN ACCIDENT:

- Report all accidents and spills to the teacher immediately
- Place broken glass in designated containers using gloves to clean up glass shards
- Wash all acids and bases or other chemicals from your skin immediately with copious amounts of water
- If chemicals get in your eyes, wash them for at least 15 minutes with laboratory eye wash

I, _____, agree to: (a) Follow the teachers instructions, (b) protect my eyes, face, hands and body during laboratory, (c) conduct myself in a responsible manner at all times in the laboratory, and (d) abide by all of the safety regulations specified above.

Signature _____ Date _____

Parent's (Guardian's) Signature _____ Date _____