

Part 1 – Identification and Inventory of hazardous chemicals:

- Exercise “universal precaution” at all times.
- Chemicals prohibited from use in schools by OSHA and EPA should be purged appropriately.
- Labs will be conducted in a manner that prevents employee exposure to OSHA regulated substances in excess of permissible exposure limits (PELs). NC OSH has more strict PELs than OSHA.
- A complete chemical inventory will be maintained of all chemicals / locations / amounts / date received / shelf life.
- Other information should be included on the chemical inventory as deemed necessary by CMS or site specific CHO.
- All chemicals will be reviewed by the CMS Safety committee to determine “absolute need” in the science instructional program.
- A 1:1 correspondence of all chemicals on-hand and their Material Safety data Sheet (MSDS) must be maintained and made readily accessible upon request.
- The MSDSs for all chemicals will be reviewed by the Safety Committee to review associated hazards of “absolute need” chemicals.
- Chemicals requiring with a NFPA Health Hazard rating above 1 are banned from use.
- Chemicals requiring use of a respirator as personal protective equipment are banned from use.
- Laboratory chemicals must be properly labeled to identify any hazards associated with them for employee information and protection.
- Labels on incoming containers of hazardous chemicals must not be removed or defaced.
- Unlabeled chemicals MUST be disposed of promptly as determined by local/state/federal disposal procedures.
- When dispensing chemicals from one container to another, the new container MUST be properly labeled with the chemical name and hazards. All containers should be labeled in this manner.
- MSDSs should be referenced to determine details about chemicals.
- Laboratory areas that have special hazards (bio) (microwave ovens) should have warning signs
- NFPA diamonds should be affixed to the outside of buildings and storerooms that house chemicals with the highest hazard rating of any chemical within the storeroom.
(A Fire Department can legally refuse to fight a fire in a building that contains unknown chemicals.)
- Chemicals will be organized by the NIOSH/Flinn or Fisher System for secondary schools and the Fisher System for middle schools.
- Mercury, mercury compounds and mercury containing lab instruments (thermometers, barometers etc) will not be used. N.C. 1502 § G.S.
- Sometimes (usually for IB or AP science classes), chemicals will be required that are on an EPA hazard list – e.g. silver nitrate. In these cases a justification process should be in place to obtain needed chemicals.
- Household chemicals require an MSDS when brought into the school for use in the laboratory.

Part 2 – Minimization of exposure to employees:

- Use of laboratory is restricted to science teachers and students only.
- Personal protective equipment and instructions on proper use of this equipment will be provided to employees as appropriate.
- The storage, distribution and methods of handling hazardous chemicals will be conducted in a manner which minimizes the potential for accidents and incidents of employee/student exposure.
 - Work conducted in the lab and its scale must be appropriate to the facilities available.
- Special consideration of the quality of the ventilation system includes paying attention to the following characteristics
 - Adequate general system which ensures that laboratory air is continually and appropriately circulated includes the following:
 - well-ventilated and temperature controlled chemical storerooms
 - chemical storerooms should have a separate exhaust fan
 - science departments should have a separate ventilation system
 - quality and quantity of ventilation should be evaluated when installed or obtained and regularly monitored
 - ductless fume hoods **MUST** be available for middle or secondary schools – students and for demonstrations
 - when schools are considering remodeling, appropriate measures to correct ventilation issues in science classrooms and storerooms needs to be prioritized.
 - Adequate sinks and counter space
 - Proper storage for specific hazardous materials must take into consideration each of the following categories:
 - flammables
 - corrosives
 - poisons
 - acids.
 - Adequate and appropriate Emergency Equipment **MUST** include:
 - fire extinguishers
 - fire blankets
 - spill containment materials
 - a communication system
 - lighting
 - heat/smoke alarms
 - water/gas/electrical shut-offs.
 - Adequate and appropriate Safety Equipment **MUST** include:
 - eyewash stations
 - drench showers
 - eyewash/drench combination.
 - Proper disposal of chemical/biological waste

Part 2 – Minimization of exposure to employees (continued):

- Signage should be posted to:
 - show the location of safety showers, eyewash stations, fire protection equipment, eyewash/drench combination units
 - identify the type of waste that can be safely deposited in waste containers
 - remind employees and students that no consumption or storage of food or drink is allowed in the lab
 - remind employees and students food / chemicals / biological specimens are not to be stored together in a refrigerator
 - prohibit students from the chemical storeroom
 - mark exits and non-exits in a laboratory.
- Traffic patterns should be analyzed to minimize employees entering the chemical storeroom and to prohibit students from the chemical storage area.

Suggested Shelf Storage Pattern for Organics

<p>Organic #2 Alcohols, Amides, Amines, Imides, Imines, Glycols STORE FLAMMABLES IN A DEDICATED CABINET</p>	<p>Organic #8 Cresols, Phenol</p>
<p>Organic #3 Aldehydes, esters, hydrocarbons STORE FLAMMABLES IN A DEDICATED CABINET</p>	<p>Organic #6 Azides, Hydroperoxides, Peroxides</p>
<p>Organic #4 Ethers, Ethylene oxide, Halogenated Hydrocarbons, Ketenes, Ketones STORE FLAMMABLES IN A DEDICATED CABINET</p>	<p>Organic #1 Acids, Anhydrides, Peracids STORE CERTAIN ORGANIC ACIDS IN ACID CABINET</p>
<p>Organic #5 Epoxy compounds, Isocyanates</p>	<p>Miscellaneous</p>
<p>Organic #7 Nitriles, Polysulfides, Sulfides, Sulfoxides, etc.</p>	<p>Miscellaneous</p>

**POISON STORAGE
CABINET**
Toxic substances

**FLAMMABLE
STORAGE CABINET**
**FLAMMABLE
ORGANIC #2**
Alcohols, Glycols,
etc.

**FLAMMABLE
ORGANIC #3**
Hydrocarbons,
Esters, etc.

**FLAMMABLE
ORGANIC #4**

**Do not store
chemicals on
the floor**

Suggested Shelf Storage Pattern for Inorganics

**ACID STORAGE
CABINET
ACID
INORGANIC #9**

Acids, EXCEPT Nitric acid – Store Nitric acid away from other acids unless the cabinet provides a separate compartment for nitric acid storage

**Do not store
chemicals on
the floor**

Inorganic #10 Arsenic, Phosphorous, Phosphorous Pentoxide, Sulfur	Inorganic #7 Arsenates, Cyanates, Cyanides STORE AWAY FROM WATER
Inorganic #2 Halides, Halogens, Phosphates, Sulfates, Sulfites, Thiosulfates	Inorganic #5 Carbides, Nitrides, Phosphides, Selenides, Sulfides
Inorganic #3 Amides, Azides, Nitrates, Nitrites EXCEPT Ammonium nitrate - STORE AMMONIUM NITRATE AWAY FROM ALL OTHER SUBSTANCES	Inorganic #8 Borates, Chromates, Manganates, Permanganates
Inorganic #1 Hydrides, Metals STORE AWAY FROM WATER. STORE ANY FLAMMABLE SOLIDS IN DEDICATED CABINET	Inorganic #6 Chlorates, Chlorites, Hypochlorites, Hydrogen Peroxide, Perchlorates, Perchloric acid, Peroxides
Inorganic #4 Carbon, Carbonates, Hydroxides, Oxides, Silicates	Miscellaneous

©2006, Flinn Scientific, Inc. All Rights Reserved. Reproduction for one-time use with permission from Flinn Scientific, Inc., Batavia, Illinois, U.S.A. No part of this material may be reproduced or transmitted in any form or by any means, electronic or mechanical, including, but not limited to photocopy, recording, or any information storage and retrieval system, without permission in writing from Flinn Scientific, Inc.

HAZARDOUS CHEMICAL QUICK REFERENCE

It is imperative that science educators be prepared to deal with hazards associated with chemicals. Absolute need must be determined for each chemical on the school laboratory inventory list/database, all proper handling and storage procedures for chemicals must be strictly followed. Science Educators and students must be aware of the properties of chemicals before using them.

This document is not totally inclusive. It is a representative listing of hazardous chemicals.

ALWAYS REFERENCE MSDS.

EXPLOSIVES/FLAMMABLES

Not recommended for use or storage in schools.

_____ Benzoyl peroxide	_____ Perchloric acid	_____ Carbon disulfide
_____ Picric Acid	_____ Diisopropyl ether	_____ Formaldehyde
_____ Ethyl Ether		_____ Potassium metal

CARCINOGENS

Not recommended for use or storage in schools unless absolute need is determined and all proper handling and storage procedures are followed.

KNOWN CARCINOGENS AND PROBABLE CARCINOGENS

_____ 1,2-dibromo-c-chloropropane	_____ Benzene	_____ 1,3-butadiene
_____ Benzidine	_____ 2-acetylaminofluorene	_____ bis(chloromethyl) ether and its salt
_____ 3,3-dichlorobenzidine	_____ Cadmium	_____ Ethylenediamine
_____ Coke oven emissions	_____ 4-aminodiphenyl	_____ N-nitrosodimethylamine
_____ 4-diemthylaminoazobenzene	_____ Ethylene oxide	_____ Methyl chloromethyl ether
_____ Formaldehyde	_____ 4-nitrobipheyl	_____ alpha naphthylamine
_____ Acrylonitrile	_____ Inorganic arsenic	_____ Methyienedianiline
_____ Methylene chloride	_____ Asbestos	_____ B-propiolactone
_____ B-naphthylamine	_____ N-nitrosodimethylamine	
_____ Vinyl chloride		

ANIMAL CARCINOGENS OR MUTAGENS

Although information concerning human health hazard is incomplete, these chemicals must be handled only with great caution. Not recommended for use or storage in schools unless absolute need is determined and all proper handling and storage procedures are followed.

_____ Acetamide	_____ Indigo carmine	_____ Acrolein orange
_____ Lead II acetate	_____ Ammonium chromate	_____ Nickel (II) acetate
_____ Ammonium dichromate	_____ Osmium tetraoxide	_____ Ammonium bichromate
_____ Potassium chromate	_____ Aniline and salts	_____ Potassium permanganate
_____ Anthracene	_____ Pyrogallic acid	_____ Antimony oxide
_____ Silver nitrate	_____ Beryllium carbonate	_____ Sodium azide
_____ Cobalt powder	_____ Sodium dichromate dihydrate	_____ Colchicine
_____ Sodium nitrate	_____ 1,2-dichloroethane	_____ Sodium nitrite
_____ 1,4-dioxane	_____ Thioacetamide	_____ Formaldehyde
_____ Toluene	_____ Hydroquinone	_____ Urethane

REMOVE FROM SCHOOLS IF ALTERNATIVES CAN BE USED

These chemicals must be removed from the schools if alternatives can be used. For those that must be retained, amounts must be kept to a minimum. Evaluation included toxicity, carcinogenicity, teratogenicity, flammability, and explosive propensity.

<input type="checkbox"/> Acetamide	<input type="checkbox"/> Cyclohexane	<input type="checkbox"/> Methyl oleate
<input type="checkbox"/> Acid green	<input type="checkbox"/> Cyclohexene	<input type="checkbox"/> Nickel II carbonate
<input type="checkbox"/> Aluminum chloride	<input type="checkbox"/> Dichlorodophenol sodium salt	<input type="checkbox"/> Nickel II acetate
<input type="checkbox"/> Ammonium bichromate	<input type="checkbox"/> 2,4,-Dinitrophenol	<input type="checkbox"/> Paradichlorobenzene
<input type="checkbox"/> Ammonium oxalate	<input type="checkbox"/> Iron II sulfate	<input type="checkbox"/> Pentane
<input type="checkbox"/> Ammonium vanadate	<input type="checkbox"/> Formaldehyde	<input type="checkbox"/> Petroleum ether
<input type="checkbox"/> Antimony	<input type="checkbox"/> Formalin	<input type="checkbox"/> 1 - p h e n y l
<input type="checkbox"/> Antimony oxide	<input type="checkbox"/> Fuchsin	<input type="checkbox"/> 1-2-thiourea
<input type="checkbox"/> Antimony potassium tartrate	<input type="checkbox"/> Gasoline	<input type="checkbox"/> Phenylthiocarbamide
<input type="checkbox"/> Barium chloride	<input type="checkbox"/> Hematoxylin	<input type="checkbox"/> Potassium chlorate
<input type="checkbox"/> Barium oxalate	<input type="checkbox"/> Hydrogen sulfide	<input type="checkbox"/> Potassium chromate
<input type="checkbox"/> Benzene	<input type="checkbox"/> Hydroquinone	<input type="checkbox"/> Potassium periodate
<input type="checkbox"/> Beryllium carbonate	<input type="checkbox"/> Iso-amyl alcohol	<input type="checkbox"/> Potassium permanganate
<input type="checkbox"/> Bromine fluid	<input type="checkbox"/> Iso-butyl Alcohol	<input type="checkbox"/> Salol
<input type="checkbox"/> Bromine	<input type="checkbox"/> Iso-pentyl Alcohol	<input type="checkbox"/> Sodium Bromate
<input type="checkbox"/> Cadmium acetate	<input type="checkbox"/> Magnesium chlorate	<input type="checkbox"/> Sodium Chlorate
<input type="checkbox"/> Cadmium bromide	<input type="checkbox"/> Mercury II bichloride	<input type="checkbox"/> Sodium fluoride
<input type="checkbox"/> Cadmium carbonate	<input type="checkbox"/> Mercury II iodide	<input type="checkbox"/> Sodium oxalate
<input type="checkbox"/> Cadmium chloride	<input type="checkbox"/> Mercury II nitrate	<input type="checkbox"/> Sodium nitrate
<input type="checkbox"/> Cadmium, metal	<input type="checkbox"/> Mercury II oxide	<input type="checkbox"/> Sodium silicofluoride
<input type="checkbox"/> Cadmium sulfate	<input type="checkbox"/> Mercury II sulfide	<input type="checkbox"/> Sudan III
<input type="checkbox"/> Carmine	<input type="checkbox"/> Mercury II sulfate	<input type="checkbox"/> Sulfamethazine
<input type="checkbox"/> Catechol	<input type="checkbox"/> Mercury I chloride	<input type="checkbox"/> Toluene
<input type="checkbox"/> Chromic acid	<input type="checkbox"/> Mercury I nitrate	<input type="checkbox"/> Trichloroethylene
<input type="checkbox"/> Chromium acetate	<input type="checkbox"/> Mercury I oxide	<input type="checkbox"/> Urethane
<input type="checkbox"/> Cobalt, metal	<input type="checkbox"/> Methyl ethylketone	<input type="checkbox"/> Xylene
<input type="checkbox"/> Cobalt nitrate		

HIGHLY TOXIC SUBSTANCES

Not recommended for use or storage in schools unless absolute need is determined and all proper handling and storage procedures are followed. All necessary precautions must be taken to limit exposure to these highly toxic chemicals.

<input type="checkbox"/> Adrenaline	<input type="checkbox"/> Nicotine	<input type="checkbox"/> Barium hydroxide
<input type="checkbox"/> Osmium tetroxide	<input type="checkbox"/> Chlorine	<input type="checkbox"/> Phosphorous (white)
<input type="checkbox"/> Colchicine	<input type="checkbox"/> Phosphorous pentoxide	<input type="checkbox"/> Mercury
<input type="checkbox"/> Potassium cyanide	<input type="checkbox"/> Mercury II chloride	<input type="checkbox"/> Potassium
<input type="checkbox"/> Mercuric II iodide	<input type="checkbox"/> Silver cyanide	<input type="checkbox"/> Mercuriy II nitrate
<input type="checkbox"/> Sodium cyanide	<input type="checkbox"/> Mercuriy II Oxide	<input type="checkbox"/> Mercury II sulfate

CORROSIVE OR IRRITATING SUBSTANCES

Care must be taken to prevent contact with the skin, especially the eyes. All proper handling and storage procedures must be adhered to.

<input type="checkbox"/> Acetaldehyde	<input type="checkbox"/> Iodine (crystals)	<input type="checkbox"/> Acetic ACID
<input type="checkbox"/> Lead II carbonate	<input type="checkbox"/> Acetic anhydride	<input type="checkbox"/> Lithium
<input type="checkbox"/> Aluminum chloride	<input type="checkbox"/> Methyl ethyl ketone	<input type="checkbox"/> Ammonia
<input type="checkbox"/> Methyl methacrylate	<input type="checkbox"/> Ammonium dichromate	<input type="checkbox"/> Methyl salicylate
<input type="checkbox"/> Ammonium oxaiate	<input type="checkbox"/> Naphthalene	<input type="checkbox"/> Antimony pentachloride
<input type="checkbox"/> Nitric acid	<input type="checkbox"/> Antimony oxide	<input type="checkbox"/> Oxalic acid
<input type="checkbox"/> Antimony trichloride	<input type="checkbox"/> Phosphorous (white)	<input type="checkbox"/> Bismuth Trichloride
<input type="checkbox"/> Phosphorous pentoxide	<input type="checkbox"/> Bromine	<input type="checkbox"/> Phthalic Anhydride
<input type="checkbox"/> Calcium carbide	<input type="checkbox"/> Potassium Chromate	<input type="checkbox"/> Calcium Fluoride
<input type="checkbox"/> Potassium cyanide	<input type="checkbox"/> Calcium oxide	<input type="checkbox"/> Potassium Fluoride
<input type="checkbox"/> Catechol (pyrocatechol)	<input type="checkbox"/> Potassium metal	<input type="checkbox"/> Chlorine
<input type="checkbox"/> Potassium hydroxide	<input type="checkbox"/> Copper II bromide	<input type="checkbox"/> Potassium Permanganate
<input type="checkbox"/> Copper II chloride	<input type="checkbox"/> Sodium metal	<input type="checkbox"/> Copper II nitrate
<input type="checkbox"/> Sodium cyanide	<input type="checkbox"/> Copier II sulfate	<input type="checkbox"/> Sodium Ferrocyanide
<input type="checkbox"/> p-dichlorobenzene	<input type="checkbox"/> Sodium hydroxide	<input type="checkbox"/> Diethyl Phthalate
<input type="checkbox"/> Sodium sulfide	<input type="checkbox"/> Ethyl methacrylate	<input type="checkbox"/> Disodium Hexafluorosilicate
<input type="checkbox"/> Iron Hi chloride	<input type="checkbox"/> Tin IV chloride	<input type="checkbox"/> Hexachlorophen
<input type="checkbox"/> Sulfuric acid	<input type="checkbox"/> Hydrochloric acid	<input type="checkbox"/> Sulfuric Acid, fuming
<input type="checkbox"/> Hydrofluoric acid	<input type="checkbox"/> Titanium trichloride	<input type="checkbox"/> Hydrogen Peroxide (30%)
<input type="checkbox"/> Toluene	<input type="checkbox"/> Hydrogen sulfide	<input type="checkbox"/> Trichlorotrifluoroethane
<input type="checkbox"/> Hydroquinone	<input type="checkbox"/> Turpentine	

Table 2

NORTH CAROLINA SCHOOL BOARD OF EDUCATION POLICY

NC G.S. § 115C-105.47 "SAFE, ORDERLY & CARING SCHOOLS ASSESSMENT INVENTORY"



REQUIREMENTS CHECK LIST

Established policy and procedure to enable science teacher to advise the administration of conditions deemed unsafe and in need of correction

Annual updates on safety regulations and/or when a procedure or chemical is deemed unsafe.

MSDS accessible to teachers for all chemicals used

Prohibitions on the use of pathogens or procedures/ materials in any lab above Biosafety Level 1

Compliance with OSHA Right-to-Know legislation

Compliance with Bloodborne Pathogen Regulations

Compliance with Laboratory Standards—Chemical Hygiene Plan

Compliance with safety rules and guidelines established by the profession

Teachers who model and students that are taught to manipulate scientific equipment

Teachers who model and students that are taught to care for and handle live organisms

Teachers who model and students that are taught to perform laboratory procedures

Teachers who model and students that are taught to react if an accident occurs

Inventory of chemicals

Appropriate labeling of chemicals

Appropriate storage of chemicals

Appropriate procedures for disposal and a cleanup of biohazards

Appropriate procedures for disposal and cleanup of chemicals