Chemical Hygiene Plan for Science Labs

Rock Hill Schools (York 03)

ROCK HILL Schools
YORK COUNTY DISTRICT THREE

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Each school must update its individual Science **Lab Safety Plan Addendum** (Appendix F) annually, by September 1. A hardcopy, with all signatures, should be sent to the District's Science Instructional Specialist / Chemical Hygiene Officer by September 1 each year.

This document lists the Lab Safety procedures to be followed by all Science labs in Rock Hill Schools. Individual schools must indicate particular variations in their separate Lab Safety Plan Addendum.

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OSHA's Occupational Exposure to Hazardous Chemical in Laboratories standard (29 CFR 1910.1450), referred to as the Laboratory Standard, specifies the mandatory requirements of a Chemical Hygiene Plan (CHP) to protect laboratory workers from harm due to hazardous chemicals. THE CHP is a written program stating the policies, procedures and responsibilities that protect workers from the health hazards associated with the hazardous chemicals used in that particular workplace.

I. Standard Operating Procedures

The safety of our staff and students in Rock Hill Schools is of the highest importance. We encourage our teachers to conduct labs with students on a regular basis. At the same time, we strongly encourage teachers to consider the safety of the labs they conduct. Below are the guidelines for ALL middle and high school Science teachers and students.

- Annually, each of our teachers will watch two lab safety videos, and successfully complete the quiz through Safe Schools.
  1) Science Lab Safety
  2) Science Laboratory Chemical Spills

- Each student enrolled in Middle or High School Science will be shown the Rock Hill Schools Student Lab Safety video by their teacher. The video will be discussed and the students will each sign a lab safety pledge.

- When conducting labs, teachers and students will wear appropriate personal protective equipment (PPE) including aprons and goggles. Gloves may also be worn depending on the nature of the experiment.

- All chemicals to be used in Rock HIll Schools will be stored according to the **Flinn Chemical Storage Pattern**. (Appendix I)

- To determine and implement proper control measures, to reduce exposure to hazardous materials, teachers will review the SDS of any chemicals used for laboratory purposes and make decisions for the proper use of chemicals based upon the information in the SDS.

- Any chemicals are found to be mutagenic, teratogenic, or carcinogenic, will not be used in Rock Hill Schools.

- In Rock Hill Schools, no labs will be conducted that involve an open flame that is not fueled by a Bunsen burner, or larger than the flame of a tea candle. Teachers take special care to ensure that students maintain a proper distance, wear flame retardant aprons, and have flame distinguishing materials nearby.

- In Rock Hill Schools, Science teachers will be mindful of the labs and demonstrations they perform with household or easy-to-obtain materials. Students may attempt these labs or demonstrations at home where they could cause harm to themselves or someone else. When appropriate, teachers will use scientific names or chemical formulas as labels on containers, rather than using original source containers that students may recognize from home or common stores.

- Each semester, in August and January, Science teachers must complete and submit a Lab Safety Inventory (Appendix A). This signed document will be kept in their classroom and any issued reported to their school's Chemical Hygiene Officer.

- The door to each chemical storage area will bear a sign, Lab Safety Summary, (Appendix E) stating a summary of our Lab Safety procedures. Behind the sign will be the list of chemicals stored in that storage area AND a signed copy of the Lab Safety Summary (Appendix A).

- Under no circumstances will teachers in Rock Hill Schools give students chemicals or other laboratory supplies to use at home. All chemicals and Science laboratory supplies will be used under the direct supervision of a Science teacher.

- All chemicals ordered for use in Rock Hill Schools, will be ordered from **Flinn Scientific**.

- All preserved specimens for use in Rock Hill Schools, will be ordered from either **Flinn** (Appendix B) or **Carolina Biologicals** (Appendix C).

- Rock Hill Schools will adhere to the **NSTA Minimum Safety Practices and Regulations for Demonstrations, Experiments, and Workshops** (Appendix H).

- Any past and future **NSTA Safety Alerts** will be added to this Chemical Hygiene Plan to be adhered to by teachers in Rock Hill Schools.

II. Chemical Storage:

1. If possible, the number of locations in which chemicals are stored should be minimized. We also should minimize the need for teachers to travel with chemicals. If there are two science storage areas on the same floor of a building, consider storing all chemicals in one storage area instead of both. We do not, however, want teachers traveling between buildings or up and down stairwells with chemicals.

2. Any microwaves, refrigerators, coffee makers, etc. in the lab storage areas may only be used for lab use, not personal use. No food may be stored in the lab storage areas.

3. If the science storage area contains chemicals, no excess furnishings may also be stored there. Extra furnishings (tables, desks, etc.) may be moved to Operations through the submission of a work order.

4. A container for broken glass must be in each chemical storage area. The container must be labeled. At the end of each semester, a work order must be submitted for the removal of the broken glass. The lid should be snapped onto the container in order for the container to be emptied. The container will be returned.

5. Any gas cylinders stored in the lab storage area should be chained to the wall to prevent them from accidentally toppling over.

6. If equipped, a UV Safety Goggle Cleaner should be used to sanitize safety goggles following each use.

7. All chemicals, including "kitchen" chemicals that seem to pose no danger, must be stored in the lab storage area. SDS sheets exist even for kitchen chemicals, and they must be stored properly.

8. The Safety Data Sheet (SDS) for each chemical should be examined for proper storage. Our district will use Flinn as our primary source of SDS sheets. Please go to www.flinnsci.com and log in, then click the SDS tab. You will receive your school's login credentials from your CHO—Do not create a new account—an account for each MS and HS school has been created. For each SDS you pull, please click **Save to Your Library** ( ). You will also need to **Download PDF** to determine proper storage (outlined in green). See screenshot below.

9. If no SDS exists in the Flinn database, there are 2 other sources of SDS we may use. If you use a non-Flinn SDS you must **print** the SDS. You may have difficulty determining the category in which to store the material as we are using the Flinn storage system. If you have a question, please see your school's CHO.
OSHA: https://www.osha.gov/chemicaldata/
MSDS: http://www.msds.com/

10. Chemical Inventory: Each school that has a science laboratory program must maintain a complete inventory of ALL chemicals used in the science program. It is recommended that the chemicals be dated as they are received. This inventory must be kept maintained and posted on the exterior of the storage closet.

11. EVERY chemical must be labeled. If more than 4 fluid ounces, (118mL) the chemical must bear a manufacturer's label. If **unknown materials** are found, they should be set to the side and your school's CHO must be notified.

12. Each chemical storage area should have a set of labels for solutions mixed by the teacher. EVERY chemical container must have a label. A smudge-proof pen must be used for each label. When more labels are needed, please see your school's CHO.
13. No chemicals may be stored on the floor. The floor space must remain clear of hazards.

13. No chemicals may be stored above eye-level.

14. Check to ensure that all of the shelves in your chemical storage area are securely mounted. If shelves are loose, a work order should be submitted for repair.

15. As you organize your chemical storage area, if chemicals are found to be leaking from their container, solids that appear to be old, have discolored labels, crystallization around the lid, or other signs of age, please set the material to the side to be discarded. If you find chemicals that are expired or have a purchase date of more than 5-years ago, please set it aside to be discarded. If this is a material you need, please see your department chair to order a replacement.

16. *For the current and future safety of students and staff, in Rock Hill Schools we will not use or store any chemicals that are mutagenic, teratogenic, or carcinogenic. If any such chemicals in your storage area, please notify your school's CHO.

*Carcinogenic chemicals are associated with causing or promoting the growth of cancer cells. Common carcinogens include: **benzene, vinyl chloride, formaldehyde, dioxane, and acrylamide**.

*Mutagenic chemicals have a tendency to cause changes to DNA. Common mutagens include: **ethidium bromide, formaldehyde, dioxane, and nicotine**.

*Teratogenic chemicals have a tendency to disrupt the separation of chromosomes, which can lead to birth defects. Common teratogenic chemicals include: **ethanol, mercury compounds, lead compounds, phenol, carbon disulfide, toluene and xylene.**

17. For the current and future safety of our students and teachers, we will not store any chemicals of a molarity greater than 6M. If any such chemicals are found in our labs, they should be diluted to 6M and stored in bottles no larger than 4 fluid ounces (118mL) and a new label made for the container. If teachers are uncomfortable performing this procedure, the school's Chemical Hygiene Officer should be contacted.

18. Chemical storage areas should be locked at all times. Students should only be allowed in chemical storage areas when accompanied by the teacher.

Disposal of Lab Materials

1. To properly dispose of laboratory chemicals, each material's SDS will be consulted. At the conclusion of each semester, teachers will send a list (Appendix D) containing the name, approximate amount, and approximate size of the container (in Liters) will be sent to the school's CHO to be compiled and sent to the District's CHO. A disposal company will be consulted for removal.

2. Any dissection materials purchased will be from Flinn or Carolina Biologicals. The teacher (not the students) will place the discarded specimens into an opaque plastic bag to be sealed and placed with the school's general waste. The fluid used to preserve the specimens will be poured into a sink and flushed with water. (Appendix B, Appendix C)

Eye Safety

1. During Science lab experiments, teachers and students must wear goggles to protect their eyes. Goggles are provided by the school.

2. In the event a chemical splashes into a student or teacher's eyes, the eyes must be flushed with water from either the eyewash sink or eyewash kit.

3. Both the school's nurse and CHO should be contacted in the event any chemical enters a student or teacher's eye(s).

Skin Safety

1. During Science lab experiments, teachers and students should wear shoes that enclose the entire foot.

2. During Science lab experiments, teachers and students must wear lab aprons to protect skin and clothing. Aprons are provided by the school. Fire retardant aprons are recommended.

3. In the event a chemical comes in contact with a teacher or student's skin, the individual must immediately rinse with cold water. The use of soap is not recommended.

4. Both the school's nurse and CHO should be contacted in the event of a skin irritation.

Spills

1. In the event of a chemical spill, the teacher should consult the material's SDS regarding any hazards. Most chemicals may be contained with a spil agent and swept into a pile to be discarded.

2. Teachers may use their discretion as to whether students should leave the room while a spill is being contained. If students must leave the room during the containment of a spill, the school's CHO should be contacted.

In Case of Fire

1. Each Science lab classroom is equipped with an ABC fire extinguisher, and teachers have each been trained on how to use it, if necessary. Teachers are required to verify the fire extinguisher is FULL at the start of each semester.

2. Each Science lab classroom is equipped with a fire retardant blanket, and teachers have each been trained on how to use it, if necessary.

3. Some of our Science lab classrooms are equipped with a shower. Teachers are required to test this device at the start of each semester to ensure it is working.

4. Each of our Science lab classrooms has a fire escape route posted on the wall next to each exit.

5. Each of our Science teachers is aware of the location of the fire alarm pull station nearest his/her Science lab classroom.

6. As a part of our Lab Safety training for students, procedures, in case of fire are explained.

7. In the event of fire, the teachers have the option of attempting to put out the fire or evacuating immediately. If the teacher chooses to attempt to extinguish the flames, the students will be dismissed according to the evacuation route posted next to the exit. One student may be asked to pull the nearest fire alarm. As the classroom is evacuated, the door(s) will be closed to contain and flames or smoke.

8. The school's CHO should be contacted in the event of any unintentional fire in a Science lab.

Reporting of Incidents

In the event of an unusual occurrence in a Science lab, that could affect the immediate or future health of any students or the teacher, the following procedures must be employed.

1. As soon as reasonably possible, the teacher should send an email to 1) the school's Department Chair, 2) Chemical Hygiene Officer, and the 3) District Chemical Hygiene Officer (kmassey).

2. The email should contain the following information
   - date and time of incident
   - names of affected students
   - explanation of the incident
   - teacher's response to the incident

Teachers are asked to err on the side of caution. If the teacher is unsure if an incident should be reported, he or should should report it, just in case. Teachers should always send students to the school nurse to be evaluated if he or she is unsure.

(Appendix A)

Science Lab Safety Plan Addendum

Date	
Name of School	
School Address	
School Phone Number	
Name of Principal	
Science Department Chair	
Chemical Hygiene Officer (school administrator)	
Addendum Items After your review of the RHSD Lab Safety plan, please indicate any <u>additional</u> safety procedures, or <u>special considerations</u> for your school.	
☐ **Science teachers, room** Type each teacher's name and room number below. Check the box if chemicals are stored in that classroom or a storage room connected to the classroom.	**Signature:** Each teacher signifies agreement with the Rock Hill Schools Lab Safety Plan AND the school addendum.
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☐	

☐ **Science teachers, room** Type each teacher's name and room number below. Check the box if chemicals are stored in that classroom or a storage room connected to the classroom.	**Signature:** Each teacher signifies agreement with the Rock Hill Schools Lab Safety Plan AND the school addendum.
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Please send a hardcopy of this document, with all signatures to Kimberly G. Massey by October 1. Please retain the original for your school records. If new Science faculty are hired once this document has been submitted, please have the new teacher(s) sign and send a new copy to Mrs. Massey.

(Appendix B)

Science Teacher Lab Inventory

School	
Teacher	
Room/Lab Number	

	August _____			January _____		
ALL of the fume hoods are working.	Yes	No	N/A	Yes	No	N/A
The safety shower is working.	Yes	No	N/A	Yes	No	N/A
The fire extinguisher is full.	Yes	No	N/A	Yes	No	N/A
The eye-wash sink is working.	Yes	No	N/A	Yes	No	N/A
The gas ports for ALL bunsen burners are working.	Yes	No	N/A	Yes	No	N/A
The exit(s) from your classroom/lab are unobstructed. They should always be unlocked.	Yes	No	N/A	Yes	No	N/A
The lock on the chemical storage area works. The chemical storage area is locked.	Yes	No	N/A	Yes	No	N/A
You have access to enough flame resistant aprons that ALL students are able to wear one during lab.	Yes	No	N/A	Yes	No	N/A
You have access to enough goggles that ALL students are able to wear one during lab.	Yes	No	N/A	Yes	No	N/A
Outside your chemical storage door, is an up-to-date chemical inventory.	Yes	No	N/A	Yes	No	N/A
ALL chemicals in your chemical storage area have an SDS saved in the Flinn system.	Yes	No	N/A	Yes	No	N/A

Anything marked **No**, above, should be reported to your school's Chemical Hygiene Officer immediately.

August: Teacher Signature: _____ Date _____

January: Teacher Signature: _____ Date _____

Store this page behind your Lab Safety Summary posted on the Chemical Storage closet.

(Appendix C)

Lab Safety Summary

Rock Hill Schools (York 03)

For Students

- Students must watch the RHSD Lab Safety video and sign a Lab Safety Agreement.
- Students must follow the directions given by the teacher.
  -Measure correctly.
  -Only combine the chemicals stated in the directions.
  -Clean up as directed by the teacher.
- Students must wear their apron and goggles appropriately.
- Students should tie back long hair and wear closed-toe shoes during lab experiments.
- Students must alert the teacher of any spills, broken glass, or unintentional fires.
- Students should know the location and proper use of the fire extinguisher, fire blanket, safety shower, and eyewash station.

For Teachers

- Teachers must watch the Safe Schools Lab Safety videos and complete the quizzes.
- Teachers must clearly explain directions and expectations to students prior to each lab experience.
- Teachers must maintain an inventory of all chemicals and the proper SDS for each chemical stored in the Science lab storage area.
- Teachers must give students clear directions for lab experiments and maintain a safe atmosphere during such experiments.
- Teachers must keep the chemical storage area locked at all times.
- In the event of a spill, fire, or injury, the teacher should send an email to 1) the school's Department Chair, 2) Chemical Hygiene Officer, and the 3) District Chemical Hygiene Officer (kmassey). The email should contain the following information
  - date and time of incident
  - names of affected students
  - explanation of the incident
  - teacher's response to the incident

(Appendix D)

Science Lab Chemicals Requiring Outside Disposal

School _____ **Date** _____

Location (room number)	Chemical Name	Approximate Amount (optional units)	Approximate Size of Container (use L)

Please list everything at the school that requires outside disposal on this form.
Submit form to your school's CHO, who will submit to the District CHO annually by May 1.

(Appendix E)

Chemical Inventory List

Teacher Name _____ **Room Number** _____

Please keep your list of chemicals up-to-date.
It should be stored in the pouch behind the Lab Safety Summary.

Safety Data Sheet

Specimens in Carosafe®

CAROLINA®
www.carolina.com

Section 1 Product Description

Product Name:	Specimens in Carosafe®
Recommended Use:	Science education applications
Synonyms:	None Known
Distributor:	Carolina Biological Supply Company 2700 York Road, Burlington, NC 27215 1-800-227-1150
Chemical Information:	800-227-1150 (8am-5pm (ET) M-F)
Chemtrec:	800-424-9300 (Transportation Spill Response 24 hours)

Section 2 Hazard Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200;

DANGER

May cause cancer.

GHS Classification:
Carcinogenicity Category 1A, Skin Corrosion/Irritation Category 3, Acute Toxicity - Oral Category 5

Other Safety Precautions: IF exposed or concerned: Get medical advice/attention.

Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%
Water	7732-18-5	89
Propylene Glycol	57-55-6	10
2-Phenoxyethanol	122-99-6	0.67
2-Amino-2-Ethyl-1,3-Propanediol	115-70-8	0.33

Specimens will contain some residual formaldehyde. Cow and Sheep specimens will contain some residual phenol.

Section 4 First Aid Measures

Emergency and First Aid Procedures

Inhalation:	In case of accident by inhalation: remove casualty to fresh air and keep at rest.
Eyes:	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Skin Contact:	After contact with skin, wash immediately with plenty of water.
Ingestion:	If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

Section 5 Firefighting Procedures

Extinguishing Media:	Use dry chemical, CO2 or appropriate foam.
Fire Fighting Methods and Protection:	Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.
Fire and/or Explosion Hazards:	Fire or excessive heat may produce hazardous decomposition products.
Hazardous Combustion Products:	Carbon dioxide, Carbon monoxide

Section 6 Spill or Leak Procedures

Steps to Take in Case Material Is Released or Spilled: No health affects expected from the clean-up of this material if contact can be avoided. Follow personal protective equipment recommendations found in Section 8 of this (M)SDS Surfaces may become slippery after spillage.
Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

Section 7 Handling and Storage

Handling: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Avoid contact with skin and eyes. Do not breathe gas/fumes/vapor/spray.
Storage: Store locked up. Keep container tightly closed in a cool, well-ventilated place.
Storage Code: Green - general chemical storage

Section 8 Protection Information

	ACGIH		OSHA PEL	
Chemical Name	(TWA)	(STEL)	(TWA)	(STEL)
Propylene Glycol	N/A	N/A	N/A	N/A
2-Phenoxyethanol	N/A	N/A	N/A	N/A
2-Amino-2-Ethyl-1,3-Propanediol	N/A	N/A	N/A	N/A

Control Parameters

Engineering Measures: No exposure limits exist for the constituents of this product. Use local exhaust ventilation or other engineering controls to minimize exposures and maintain operator comfort.
Personal Protective Equipment (PPE): Lab coat, apron, eye wash, safety shower.
Respiratory Protection: No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 11. A respirator is not normally required.
Respirator Type(s): None required where adequate ventilation is provided. If airborne concentrations are above the applicable exposure limits, use NIOSH/MSHA approved respiratory protection.
Eye Protection: Wear appropriate eye protection when handling this product.
Skin Protection: Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.
Gloves: No information available

Section 9 Physical Data

Formula: See Section 3
Molecular Weight: No data available
Appearance: Colorless Preserved Specimen
Odor: Mild distinct sweet, pungent biological odor.
Odor Threshold: No data available
pH: 7
Melting Point: -60 C
Boiling Point: 100 C
Flash Point: > 200 C
Flammable Limits in Air: No data available

Vapor Pressure: No data available
Evaporation Rate (BuAc=1): No data available
Vapor Density (Air=1): No data available
Specific Gravity: >1
Solubility in Water: Soluble
Log Pow (calculated): No data available
Autoignition Temperature: No data available
Decomposition Temperature: No data available
Viscosity: No data available
Percent Volatile by Volume: No data available

Section 10 Reactivity Data

Reactivity: No data available
Chemical Stability: Stable under normal conditions.
Conditions to Avoid: None known.
Incompatible Materials: Metals, Strong oxidizing agents, Strong alkalies, Caustics (bases)

Hazardous Decomposition Products: Carbon oxides, Nitrogen containing gases
Hazardous Polymerization: Will not occur

Section 11 Toxicity Data

Routes of Entry Inhalation and ingestion.
Symptoms (Acute): Diarrhea, Nausea, Respiratory Irritation, Dermititis, Allergies
Delayed Effects: No data available

Acute Toxicity:

Chemical Name	CAS Number	Oral LD50	Dermal LD50	Inhalation LC50
Water	7732-18-5	Oral LD50 Rat 90000 mg/kg		
Propylene Glycol	57-55-6	Oral LD50 Dog 22000 mg/kg	Dermal LD50 Rabbit 20800 mg/kg	
2-Phenoxyethanol	122-99-6	Oral LD50 Rat 1260 mg/kg Oral LD50 Mouse 933 mg/kg	Dermal LD50 Rat 14422 mg/kg Dermal LD50 Rabbit 5 ml/kg	
2-Amino-2-Ethyl-1,3-Propanediol	115-70-8			

Carcinogenicity:

Chemical Name	CAS Number	IARC	NTP	OSHA
Propylene Glycol	57-55-6	Not listed	Not listed	Not listed
2-Phenoxyethanol	122-99-6	Not listed	Not listed	Not listed
2-Amino-2-Ethyl-1,3-Propanediol	115-70-8	Not listed	Not listed	Not listed

Chronic Effects:
Mutagenicity: No evidence of a mutagenic effect.
Teratogenicity: No evidence of a teratogenic effect (birth defect).
Sensitization: No evidence of a sensitization effect.
Reproductive: No evidence of negative reproductive effects.
Target Organ Effects:
Acute: No information available
Chronic: No information available

Section 12 Ecological Data

Overview: This material is not expected to be harmful to the ecology.
Mobility: This material is expected to have high mobility in soil. It absorbs weakly to most soil types.
Persistence: Biodegradation, Dissolved into water
Bioaccumulation: Bioconcentration is not expected to occur.
Degradability: Biodegrades at a moderate rate.
Other Adverse Effects: No data

Chemical Name	CAS Number	Eco Toxicity
Water	7732-18-5	No data available
Propylene Glycol	57-55-6	96 HR LC50 PIMEPHALES PROMELAS 710 MG/L 96 HR LC50 PIMEPHALES PROMELAS 51400 MG/L [STATIC] 96 HR LC50 ONCORHYNCHUS MYKISS 51600 MG/L [STATIC] 48 HR EC50 DAPHNIA MAGNA > 1000 MG/L [STATIC] 24 HR EC50 DAPHNIA MAGNA > 10000 MG/L 96 HR EC50 PSEUDOKIRCHNERIELLA SUBCAPITATA 19000 MG/L
2-Phenoxyethanol	122-99-6	96 HR LC50 PIMEPHALES PROMELAS 366 MG/L [STATIC] 48 HR EC50 DAPHNIA MAGNA > 500 MG/L 72 HR EC50 DESMODESMUS SUBSPICATUS > 500 MG/L
2-Amino-2-Ethyl-1,3-Propanediol	115-70-8	Not available

Safety Data Sheet

Section 13 Disposal Information

Disposal Methods: Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.

Waste Disposal Code(s): Not Determined

Section 14 Transport Information

Ground - DOT Proper Shipping Name:
Not regulated for transport by US DOT.

Air - IATA Proper Shipping Name:
Not regulated for air transport by IATA.

Section 15 Regulatory Information

TSCA Status: All components in this product are on the TSCA Inventory.

Chemical Name	CAS Number	§ 313 Name	§ 304 RQ	CERCLA RQ	§ 302 TPQ	CAA 112(2) TQ
Propylene Glycol	57-55-6	No	No	No	No	No
2-Phenoxyethanol	122-99-6	No	No	No	No	No
2-Amino-2-Ethyl-1,3-Propanediol	115-70-8	No	No	No	No	No

California Prop 65: WARNING: This product contains a chemical known to the state of California to cause cancer.

Section 16 Additional Information

Revised: 02/08/2017 **Replaces: 02/08/2017** **Printed: 02-16-2017**

The information provided in this (Material) Safety Data Sheet represents a compilation of data drawn directly from various sources available to us. Carolina Biological Supply makes no representation or guarantee as to the suitability of this information to a particular application of the substance covered in the (Material) Safety Data Sheet.

Glossary

ACGIH	American Conference of Governmental Industrial Hygienists	NTP	National Toxicology Program
CAS	Chemical Abstract Service Number	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
DOT	U.S. Department of Transportation	ppm	Parts per million
IARC	International Agency for Research on Cancer	RCRA	Resource Conservation and Recovery Act
N/A	Not Available	SARA	Superfund Amendments and Reauthorization Act
		TLV	Threshold Limit Value
		TSCA	Toxic Substances Control Act
		IDLH	Immediately dangerous to life and health

SAFETY DATA SHEET Appendix F

PRESERVED SPECIMEN HOLDING SOLUTION - CONCENTRATE

RANACO
www.ranaco.com

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Preserved Specimen Holding Solution - Concentrate
Recommended Use:	Science education applications
Synonyms:	Delta Sol
Manufacturer/Supplier:	Ranaco Corporation, 4345 E Irvington Road, Tucson, AZ 85714
General Information:	800-528-7023
Transportation Emergency Number:	800-424-9300 Chemtrec – 24 hours assistance

SECTION 2: HAZARD IDENTIFICATION

WARNING

Targeted organs:
Eyes, Skin, Respiratory Tract

GHS Classification:
Acute Toxicity, oral (Category 4)
Acute Toxicity, dermal (Category 4)
Skin Irritation (Category 2)
Eye irritation (Category 2B)
Acute toxicity, inhalation (Category 4)

Precautionary Statements:
Obtain special instructions before use.
Wear protective gloves and eye protection.
Do not eat, drink or smoke when using this product.
Wash hands thoroughly after handling.
IF ON SKIN: Wash with plenty of soap and water.
IF IN EYES: Rinse cautiously for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing.
IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF SWALLOWED: Immediately call a POISON CENTER or physician
IF exposed or concerned: Get medical advice/attention.
Store in a well- ventilated place. Keep container tightly closed.
Dispose of contents/container in accordance with local/regional/national regulations.

Hazard Statements:
Maybe harmful if swallowed.
May be harmful in contact with skin.
Causes eye irritation.
May cause respiratory irritation.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS #	%
Propylene Glycol	57-55-6	90%
Ethylene Glycol Monophenyl Ether	122-99-6	9%

SECTION 4: FIRST AID MEASURES

SKIN CONTACT: Wash affected area with soap and water. Seek medical attention if symptoms develop.
EYE CONTACT: Rinse cautiously for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing. Seek medical attention if irritation persists.
INHALATION: Remove to fresh air. Get medical treatment if symptoms persist.
INGESTION: Immediately call a POISON CENTER or physician. Only induce vomiting at the instruction of medical personnel. Never give anything by mouth to an unconscious person.
SIGNS AND SYMPTOMS OF EXPOSURE: Irritation of skin, eyes, respiratory tract.

SECTION 5: FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Use dry chemical, CO_2, water spray (fog) or alcohol foam.
FIRE FIGHTING METHODS AND PROTECTION: Firefighters should wear self-contained breathing apparatus and wear full protective equipment.
FIRE AND/OR EXPLOSION HAZARDS: During a fire, smoke generated can be irritating or toxic.
HAZARDOUS COMBUSTION PRODUCTS: Products of combustion include but are not limited to carbon monoxide and carbon dioxide.

SECTION 6: ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS: Avoid breathing vapors. Use gloves and eye protection to clean up spills.
EMERGENCY PROCEDURES: Ventilate area of spill. Eliminate all sources of ignition. Remove non-essential personnel.
ENVIRONMENTAL PRECAUTIONS: No special hazards. Follow applicable federal, state, provincial and local regulations regarding releases.
METHODS FOR CONTAINMENT AND CLEAN-UP: Absorb with liquid binding material and place in a sealed container. Dispose of waste in accordance with federal, state, provincial and local regulations.

SECTION 7: HANDLING AND STORAGE

PRECAUTIONS FOR SAFE HANDLING: Do not eat, drink or smoke when using this product. Avoid breathing vapors. Avoid direct skin or eye contact with liquids. Do not ingest. Wash hands with soap and water after use or handling of product.
CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES: Store at room temperature in a dry well ventilated area. Keep container tightly closed when not in use.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits:

Chemical Name	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
Ethylene Glycol Monophenyl Ether	Not available	Not available	Not available
	WEEL		
Propylene Glycol	TWA 10 mg/m^3 Aerosol	Not available	Not available

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility, a safety shower and fire extinguishing material. Personnel should wear safety glasses, goggles or face shield, apron and appropriate protective gloves. Use adequate ventilation to keep airborne concentrations low.

Respiratory Protection: None should be needed in normal handling and room temperatures. If use conditions generate fumes above the OSHA regulations, use of a NIOSH/MSHA approved respirator is required.

ACGIH: American Conference of Industrialist Hygienists, OSHA: U.S. Occupational Safety and Health Administration, NIOSH: U.S. National Institute for Occupational Safety and Health, PEL: Permissible Exposure Limit, TWA: Time Weighted Average, STEL: Short Term Exposure Limit, REL: Recommended Exposure Limit, WEEL: Workplace Environmental Exposure Limit

SECTION 9: PHYSICAL & CHEMICAL PROPERTIES

Appearance: Clear colorless liquid
Odor: Mild odor
Odor Threshold: Data not available
pH: Data not available
Melting/Freezing Point: Data not available
Boiling Point: Data not available
Flash Point: Data not available
Evaporation Rate (Water = 1) : >1
Flammability (solid/gas): Data not available
Explosion Limits: Lower/Upper: Data not available
Vapor Pressure (mmHg): Data not available
Vapor Density: Data not available
Relative Density (Specific Gravity): >1
Solubility(ies): Complete in water
Partition Coefficient: Data not available
Auto-ignition Temperature: Data not available
Decomposition Temperature: Data not available
Viscosity: Data not available
Molecular Formula: Mixture
Molecular Weight: Mixture

SECTION 10: STABILITY & REACTIVITY

Reactivity: None under normal conditions.
Chemical Stability: Stable
Conditions to Avoid: Excessive temperatures which cause evaporation.
Incompatible Materials: Avoid contact with strong acids, strong oxidizers, and strong bases.
Hazardous Polymerization: None under normal conditions.
Hazardous Decomposition Products: May include, but are not limited to carbon oxcides.

SECTION 11: TOXICOLOGICAL INFORMATION

Acute Toxicity: Preserved Specimen Holding Solution – Concentrate has not been tested as a mixture. Information about individual components is supplied.
Propylene Glycol – Ingestion-rat LD50: > 20,000 mg/kg; Skin absorption-rabbit LD50: > 20,000 mg/kg
Ethylene Glycol Monophenyl Ether- Oral-rat LD50: 1,840 mg/kg; Dermal-rabbit: >2,214 mg/kg

Chronic Effects: Data not available.
Skin Corrosion/Irritation:
May cause skin irritation.
Serious Eye Damage/Irritation:
May cause eye irritation.
Respiratory or Skin Sensitization:
Data not available.
Germ Cell Mutagencity:
Data not available.
Carcinogenicity: Data not available. Information about individual components is supplied.
No components of this mixture are classified as a carcinogen by the International Agency for Research on Cancer (IARC), National Toxicology Program (NTP) or OSHA.
Reproductive Toxicity: Data not available.
Specific Target Organ Toxicity – Single exposure: Data not available.
Specific Target Organ Toxicity– Repeated exposure: Data not available.
Aspiration Hazard: Data not available.

Potential Health Effects:

Inhalation: May cause respiratory irritation.

Ingestion: May be harmful if swallowed.

Skin: May cause skin irritation.

Eyes: May cause eye irritation.

Signs and Symptoms of Exposure:

The chemical, physical and toxicological properties have not been thoroughly investigated for this mixture. Specific data is not available. Exercise appropriate procedures to minimize hazards.

SECTION 12: ECOLOGICAL INFORMATION

Toxicity to fish: No data available.

Toxicity to daphnia and other aquatic invertebrates: No data available.

Toxicity to algae: No data available.

Persistence and degradability: No data available.

Bioaccumulative potential: No data available.

Mobility in soil: No data available.

PBT and vPvB assessment: No data available.

Other adverse effects: An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

SECTION 13: DISPOSAL CONSIDERATIONS

Dispose of contents/container in accordance with local/regional/national regulations.

SECTION 14: TRANSPORTATION INFORMATION (US DOT / CANADA TDG)

UN/NA Number: Not applicable

Shipping Name: Not regulated

Hazard Class: Not applicable

Packing Group: Not applicable

Reportable Quantity: No

Marine Pollutant: No

Exceptions: Not applicable

2012 ERG Guide#: Not applicable

SECTION 15: REGULATORY INFORMATION

Toxic Substances Control Act (TSCA): All components of this product are included on the TSCA inventory.

Component	TSCA	CERLCA (RQ)	RCRA CODE	DSL	NDSL	WHMIS CLASSIFICATION
Propylene Glycol	Listed	None	None	Listed	Not Listed	None
Ethylene Glycol Monophenyl Ether	Listed	None	None	Listed	Not Listed	B3

SECTION 16: OTHER INFORMATION

Date Prepared: April 16, 2015

RANACO disclaims all expressed or implied warranties of merchantability and fitness for a particular purpose, with respect to the product or information provided herein. All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, **RANACO** makes no representations as to its accuracy or sufficiency. Conditions of use are beyond **RANACO**'s control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling and disposal of the product or from the publication or use of, or reliance upon, information contained herein. This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process.

National Science Teachers Association

NSTA Minimum Safety Practices and Regulations for Demonstrations, Experiments, and Workshops

Science activities, including hands-on investigations, explorations, and demonstrations are essential for high-quality K–12 science instruction. Inherent in conducting science activities, however, is the potential for injury. The National Science Teachers Association (NSTA) sets forth the following minimum safety practices and regulations for all hands-on demonstrations, experiments, and workshops given at NSTA-sponsored events in rooms, other on-site locations, and on the floor of the NSTA exhibit hall.

The following materials and practices are not allowed:

- activities that put parts of the body in danger, such as placing dry ice in the mouth, dipping hands into liquid nitrogen, exposing the hands and face to microorganisms, walking on broken glass or hot coals with bare feet, or lying on a bed of nails;
- live ammunition, firearms, commercially available fireworks, and blasting caps;
- dangerous explosives, such as benzoyl peroxide, diethyl ether, perchloric acid, picric acid, and sodium azide;
- volatile toxic substances, such as benzene, carbon tetrachloride, and formaldehyde;
- activities that could result in the release of harmful quantities of noxious gases into the local air supply;
- plants with poisonous oils (e.g., poison ivy) or saps (e.g., oleander), and other plants known to be generally toxic to humans;
- use of human or animal blood/body fluids or other potentially infectious materials (OPIMs);
- demonstrations or experiments using live vertebrate animals*; and
- animals that are exploited for advertisement, commercial purposes, or sensationalism*.

*Note: Animals should only be used for observational purposes provided that they have been lawfully acquired, are housed in proper containers, and are handled in a humane way following the guidelines set forth in NSTA's position statement, *Responsible Use of Live Animals and Dissection in the Classroom* adopted in 2007. Any certification papers or vaccination documents will need to be made available upon request. In addition, animals should only be used for educational purposes.

Please adhere to the following professional practices for all hands-on demonstrations, experiments, and workshops:

DO emphasize and demonstrate appropriate safety precautions throughout the presentation or workshop.

DO comply with all local fire and safety rules and regulations.

DO wear appropriate personal protective equipment (i.e., eye protection, apron, ear protection, and similar protective gear) for all chemical demonstrations or when appropriate for other demonstrations.

- Safety glasses with side shields (ANSI/ISEA Z87.1 compliant) are to be used when dealing with solids (e.g., projectiles and glassware).
- Indirectly vented chemical splash goggles (ANSI/ISEA Z87.1 compliant) are to be used when dealing with hazardous liquids (e.g., acids, bases, alcohols).
- Splash goggles (ANSI/ISEA Z87.1 compliant) can also be used in lieu of safety glasses with solids.

DO provide a gravity-fed eyewash unit or other type of effective emergency eyewash device when hazardous chemicals are used. If in the exhibit hall, **DO** know the location of portable gravity-fed eyewash stations in case of a hazardous chemical splash incident.

DO provide personal protective equipment such as eye protection, aprons, and safety equipment for participants who will be handling chemicals or hazardous substances or working with flames. Appropriate personal protective equipment must also be provided for audience members who are considered in the "danger zone" that would result from a splash or other means of contact.

DO arrange for proper shielding and protection for demonstrations that involve radioactive powders, liquids, or solutions. Only low-level radioactive sources should be used. **DO** check all state requirements regarding the amounts and kinds of allowable radioactive isotopes.

DO provide fire suppression equipment (such as fire extinguishers) with up-to-date inspection tags if flames or flammable materials are used. Presenter is required to provide up-to-date extinguisher training certificate prior to workshop safety compliance approval.

DO use a safety barrier when physical, biological, and chemical hazards exist. For example, provide a machine guard when motor-driven discs are revolved at moderate or high speeds and move participants to a safer distance from the rotating disc.

DO provide appropriate non-latex gloves and shields when working with hazardous chemicals and biohazards, cryogenic materials, hot materials, radioactive substances, vacuums, or electromagnetic radiation, and when presenting animals for observation.

DO review emergency evacuation information with attendees at the beginning of the presentation/demonstration/activity and maintain a clear egress during the demonstration or workshop.

DO use only Ground Fault Interrupter (GFI) or Ground Fault Circuit Interrupter (GFCI) protected electrical receptacles when working with liquids or other potential electrical hazards to prevent accidental shock.

DO distribute handouts that will give participants detailed instructions about the procedure, safety precautions, hazards, and disposal for each demonstration and workshop.

DO recruit assistants for demonstrations and provide them with proper instructions beforehand.

DO ask participants and audience members to cover their ears when a loud controlled explosion is anticipated, and alert them at the beginning of the program about the presence or production of allergenic materials, such as chemical emissions, strobe lights, microwaves, "theater" smoke, lycopodium powder, or live animals.

DO follow proper procedures for working with pressurized gases and when heating all forms of matter.

DO provide service dogs that are present with similar personal protective equipment, appropriate to their size and proximity to the ground. Lasers and similar electromagnetic radiation sources should not be directed downward toward a service dog.

DO confer with owners of service animals to make them aware of what will take place during a demonstration so that the animal can be protected and both the presenter and participant will know what to expect from the animal.

DO NOT direct lasers into eyes of an observer or from a reflected surface into the eye.

DO NOT taste or encourage participants to taste any non-food substances.

DO NOT dump or dispose of any hazardous liquid, solid, organic, or recyclable waste in building facilities that contain programming for NSTA conferences and meetings (restrooms, sinks, toilets, water fountains, etc.)

NSTA Provides the Following Professional Practices to Help You Prepare for Your Hands-on Demonstration, Experiment or Workshop:

DO practice all procedures prior to presenting them to an audience or having participants try them.

DO conduct a safety assessment involving a hazards analysis, risks assessment, and appropriate safety actions. This includes researching and understanding the properties, chemical reactions, and dangers involved in all demonstrations and reviewing Safety Data Sheets (SDS) for ALL chemicals prior to using them. Plan to use correct handling and disposal procedures for all chemicals and biohazards used.

DO make arrangements to have a fire extinguisher available whenever the slightest possibility of fire exists. Safety codes require training for use of portable fire extinguishers. Certificate of extinguisher training should be provided as part of the safety compliance approval.

DO secure sanitized personal protective equipment (i.e., eye protection, hand protection, apron, ear protection, and similar protective gear) for all presenters and participants when a demonstration involves the use of biological, chemical, or physical hazards. Personal protective equipment should be worn by participants and presenters during the set-up of the activity, hands-on demonstration or experiment, and take down of the activity.

DO prepare handouts for demonstrations that give participants detailed instructions about the procedures, safety precautions, hazards, and disposal methods. Safety Data Sheets for chemicals and biohazards should be made available upon request at all times at the site.

DO ensure that prudent safety practices are shown in all photographs, slides, and videotapes. Do not remove goggles and other personal protective equipment for aesthetic considerations.

DO limit quantities of hazardous materials to the quantity required for the demonstration or experiment, and only those quantities that can be adequately handled by the available ventilation system.

DO make arrangements to provide your own fume hood if using nitrogen dioxide, sulfur dioxide, or hydrogen sulfide.

DO inspect glassware and equipment to ensure it is not broken or damaged. If glassware is to be heated, Pyrex™ or similar product should be used. Properly dispose of broken glassware.

DO thoroughly check motor-driven discs that will be revolved at moderate or high speeds. Make sure the disc is sturdy, that it contains no parts that may come free, and that the safety nut is securely fastened.

DO make arrangements to use a safety shield and/or eye protection for all individuals in the room for demonstrations that launch projectiles or if there is the slightest possibility of an unsafe explosion.

DO ensure that any lasers used are helium-neon lasers with a maximum output power rating not exceeding 1.0 milliwatts.

DO label all hazardous chemicals used in presentations and activities in accordance with OSHA's newly revised (March 2012) Hazard Communication Standard 29 CFR 1910.1200 relative to the *Globally Harmonized System of Classification and Labeling of Chemicals* (GHS).

DO have an appropriate storage container for waste and make proper arrangements in advance to dispose of any hazardous liquid, solid, organic, or recyclable waste to ensure it is disposed of offsite.

DO NOT plan activities that allow direct viewing of the Sun or of infrared or ultraviolet sources.

DO receive advance permission from NSTA to use a small unmanned aircraft system (UAS) such as drones, radio controlled aircraft, etc.

DO obtain in advance state and/or local permits needed for the firing of model rockets. Activities involving the firing of rockets must follow Federal Aviation Agency (FAA) regulations, state and local rules and regulations, and the National Association of Rocketry's (NAR) Solid Propellant Model Rocketry Safety Code. Two informative online resources, include the Federal Aviation Administration (FAA) and Alaska Drones, developed by Alaska's Unmanned Aircraft Systems Legislative Task Force (UASLTF).

Outdoor flight: Outdoor flight is governed by the FAA. In addition, NSTA is required to get permission from local safety compliance authorities. Basic criteria includes—but is not limited to—the following for outdoor flight operators:

- Be at least 18 years old.
- Meet all operator and aircraft requirements and obligations applicable to the aircraft and its specific use as required by the FAA.
- Maintain documentation that certifies that the operator has been trained in the proper and safe use of applicable aircraft.

Indoor Flight: Indoor flight is defined as flight occurring inside an enclosed space where the enclosure can be reasonably expected to prevent the flying platform from exiting the enclosure while in flight. While indoor flight is not governed by the FAA, NSTA must seek permission from the local safety compliance authorities. NSTA provides the following safety guidelines for indoor flight operators:

- Ensure that unmanned aircraft is tethered.
- Attach blade guards, if possible.
- Use only nano, micro, or mini drones for indoor flight.
- Ensure that observers, participants or obstacles (furniture, light fixtures, wiring, etc.) are not in the flight path.
- Conduct a preflight inspection in accordance with any guidelines applicable to the aircraft and its specific use as specified by the FAA. At a minimum, conduct a visual inspection of the aircraft and a function test of all controls prior to takeoff.
- Conduct a review of safety procedures with observers prior to flight.
- Conduct only one unmanned aircraft operation at one time.

SUGGESTED SEQUENCE OF STEPS TO MORE SAFELY ORGANIZE YOUR SCHOOL'S CHEMICAL STORES AREA

Take an inventory of all the chemicals in your school. You will never know the extent of your problem until you know exactly what you have. Record the inventory. You may want to consider the purchase of the FLINN CHEMICAL INVENTORY SYSTEM to facilitate this task.

Decide what products you will need for the next year (at best, two years). Ruthlessly rid yourselves of the remainder of the accumulated materials.

Reorganize the remaining products into their compatible chemical families (see our Suggested Chemical Storage Pattern on page 1075). The actual sequence of compatible families on your shelves is not critical. What is important is to keep the compatible families separate and to keep the organic and inorganic families as far apart as possible. The Suggested Shelf Storage Pattern shown on pages 1075–1076 is only one suggested sequence you can use. If shelf space is a problem, you are permitted to place more than one compatible family on a shelf. Make sure you either have a physical divider or leave a 3" space between each family.

Hundreds of teachers who have reorganized their shelves, using these patterns, tell us products are easier to find versus the alphabetical system previously used. When you reorganize, you may need some estimate of the percentage of shelf space each family might occupy. If yours is a "typical" high school, the following profile may be a helpful guide:

Inorganic Families

Families	Percentage of Shelf Space Occupied
Acids (Inorganic 9)	Store away from all other items. Store in a dedicated acid cabinet. Store nitric acid away from all other materials.
Metals, etc. (Inorganic 1)	Less than 5%
Halides, Sulfates, Phosphates, Acetates, etc. (Inorganic 2)	Could be 35–40% of available space. This is usually the largest family.
Nitrates, etc. (Inorganic 3)	Approximately 8–10%
Hydroxides, Oxides, etc. (Inorganic 4)	Approximately 10%

Families	Percentage of Shelf Space Occupied
Sulfides, etc. (Inorganic 5)	Less than 1%
Chlorates, Perchlorates, etc. (Inorganic 6)	5+%
Arsenates, etc. (Inorganic 7)	Less than 1%
Borates, Chromates, etc. (Inorganic 8)	Less than 1%
Sulfur, Phosphorus, etc. (Inorganic 10)	Approximately 3%

And Organic Families

Organic acids (Organic 1) will probably occupy about 5+% of your organic shelf space except for acetic acid which should be stored with the inorganic acids (hydrochloric, etc.) in a dedicated acid cabinet. Keep acetic acid *away* from nitric acid. If your school is "typical," the remainder of your organic materials may occupy about 15–20% of your total shelf space. You should store all flammable organics in a dedicated flammables cabinet.

And Other Materials

There may be some very large space consumers in 2-kilogram (5-lb.) containers; i.e., calcium chloride, calcium hydroxide, etc. Certainly you may wish to extend family storage in a separate location for such large volumes of large packages.

Congratulations! You have now reorganized your chemical stores facility to:

- store compatible products together
- separate acids into dedicated storage
- separate flammables into dedicated storage
- lock up all poisons
- record all inventory
- rid yourselves of excess materials

YOU NOW HAVE A SAFER FACILITY

SUGGESTED CHEMICAL STORAGE PATTERN

Storage of laboratory chemicals presents an ongoing safety hazard for school science departments. There are many chemicals that are incompatible with each other. The common method of storing these products in alphabetical order sometimes results in incompatible neighbors. For example, storing strong oxidizing materials next to organic chemicals can present a hazard.

A possible solution is to separate chemicals into their organic and inorganic families and then to further divide the materials into related and compatible families. Below is a list of compatible families. On the next page you will find this family arrangement pictured as shelf areas in your chemical stores area. The pictured shelf arrangement will easily enable you to rearrange your inventory into a safer and more compatible environment.

Inorganic

1. Metals, Hydrides
2. Acetates, Halides, Iodides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens, Oxalates, Phthalates, Oleates
3. Amides, Nitrates (except Ammonium Nitrate), Nitrites, Azides
4. Hydroxides, Oxides, Silicates, Carbonates, Carbon
5. Sulfides, Selenides, Phosphides, Carbides, Nitrides
6. Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide
7. Arsenates, Cyanides, Cyanates
8. Borates, Chromates, Manganates, Permanganates, Molybdates, Vanadates
9. Acids (except Nitric) (Nitric Acid is isolated and stored by itself.)
10. Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide
11. Inorganic miscellaneous

Organic

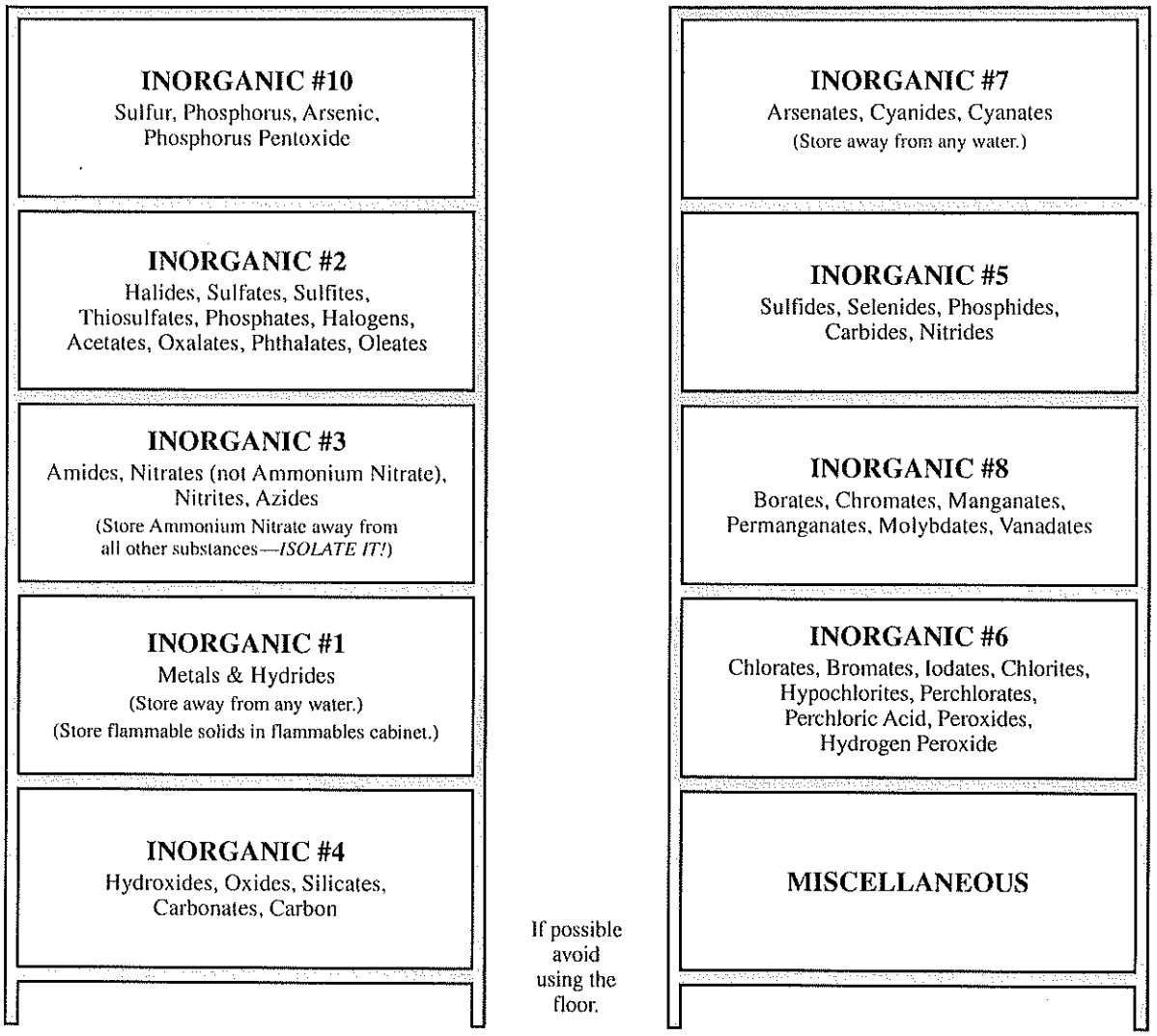
1. Acids, Amino Acids, Anhydrides, Peracids
2. Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides
3. Hydrocarbons, Esters, Aldehydes, Oils
4. Ethers, Ketones, Ketenes, Halogenated Hydrocarbons, Ethylene Oxide
5. Epoxy Compounds, Isocyanates
6. Peroxides, Hydroperoxides, Azides
7. Sulfides, Polysulfides, Sulfoxides, Nitriles
8. Phenols, Cresols
9. Dyes, Stains, Indicators
10. Organic miscellaneous

NOTE: If you store volatile materials (ether, hydrocarbons, etc.) in a refrigerator, the refrigerator must be explosion-proof. The thermostat switch or light switch in a standard refrigerator may spark and set off the volatile fumes inside and thus cause an explosion.

This list is not complete and is intended only to cover the materials possibly found in an average school situation. This is not the only method of arranging these materials and is only offered as a suggestion.

See the next three pages for detailed inventory and storage steps you might follow to vastly improve the safety profile of your chemical storage.

SUGGESTED SHELF STORAGE PATTERN—INORGANIC



If possible avoid using the floor.

Storage Suggestions

1. Avoid storing chemicals on the floor (even temporarily).
2. No top shelf chemical storage.
3. No chemicals stored above eye level.
4. Shelf assemblies are firmly secured to walls. Avoid island shelf assemblies.
5. Provide anti-roll-off lips on all shelves.
6. Ideally, shelving assemblies would be of wood construction.
7. Avoid adjustable metal shelf supports and clips. Better to use fixed, wooden supports.
8. Store acids in a dedicated acid cabinet. Store nitric acid in the same cabinet **only** if isolated from other acids. Store both inorganic and some organic acids in the acid cabinet.
9. Store flammables in a dedicated flammables cabinet.
10. Store severe poisons in a dedicated poisons cabinet.

OTHER STORAGE SUGGESTIONS ARE CONTAINED THROUGHOUT THIS CATALOG/REFERENCE MANUAL.

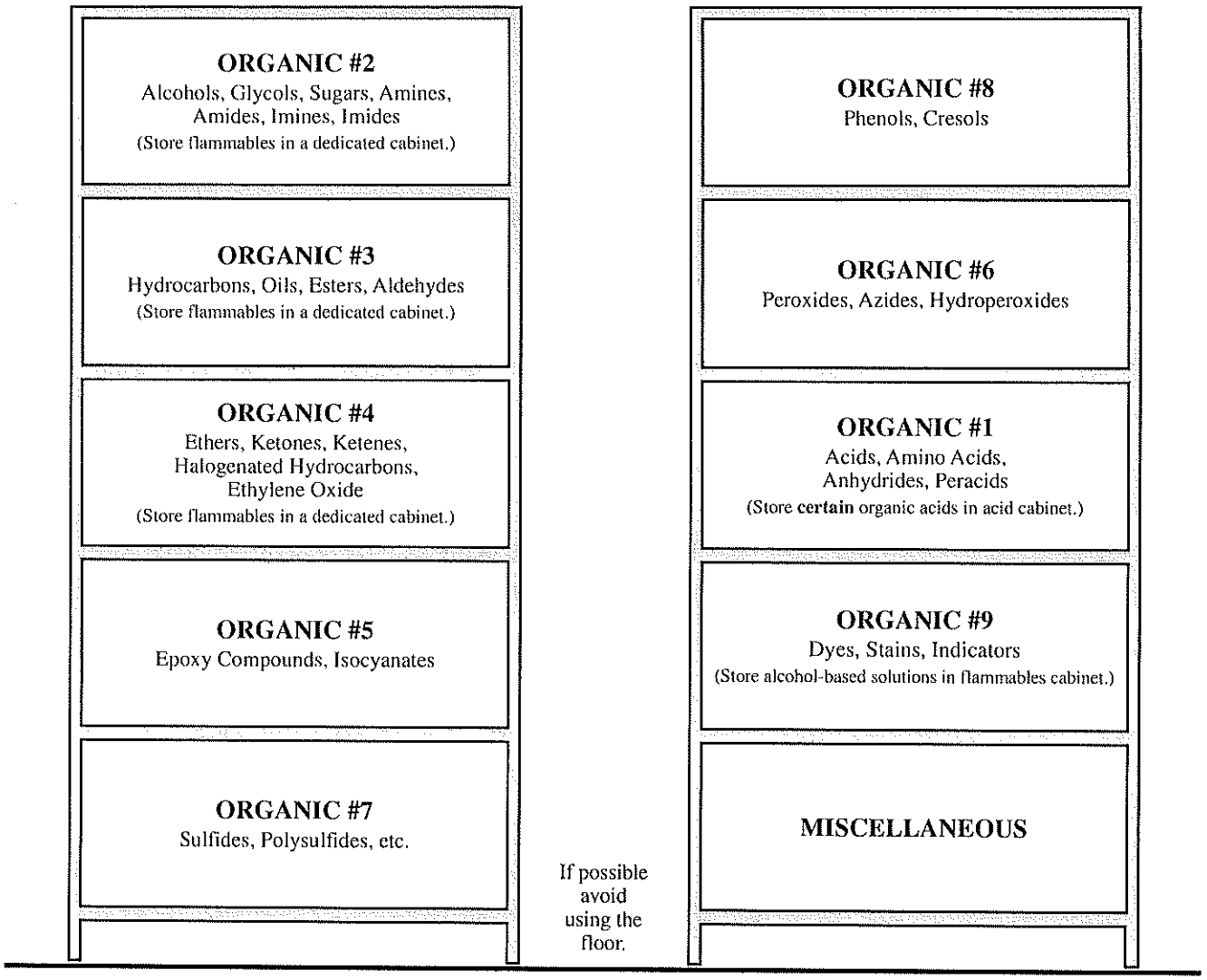
INORGANIC #9

Acids, except Nitric

(Acids are best stored in dedicated cabinets.)

Store nitric acid away from other acids unless your acid cabinet provides a separate compartment for nitric acid.

SUGGESTED SHELF STORAGE PATTERN—ORGANIC



ORGANIC #2
Alcohols, Glycols, etc.

ORGANIC #3
Hydrocarbons, etc.

ORGANIC #4
Ethers, Ketones, etc.

ORGANIC #9
Alcohol-based Indicators, etc.

Store severe poisons in locked Poisons Cabinet.

Maximize Storage Space

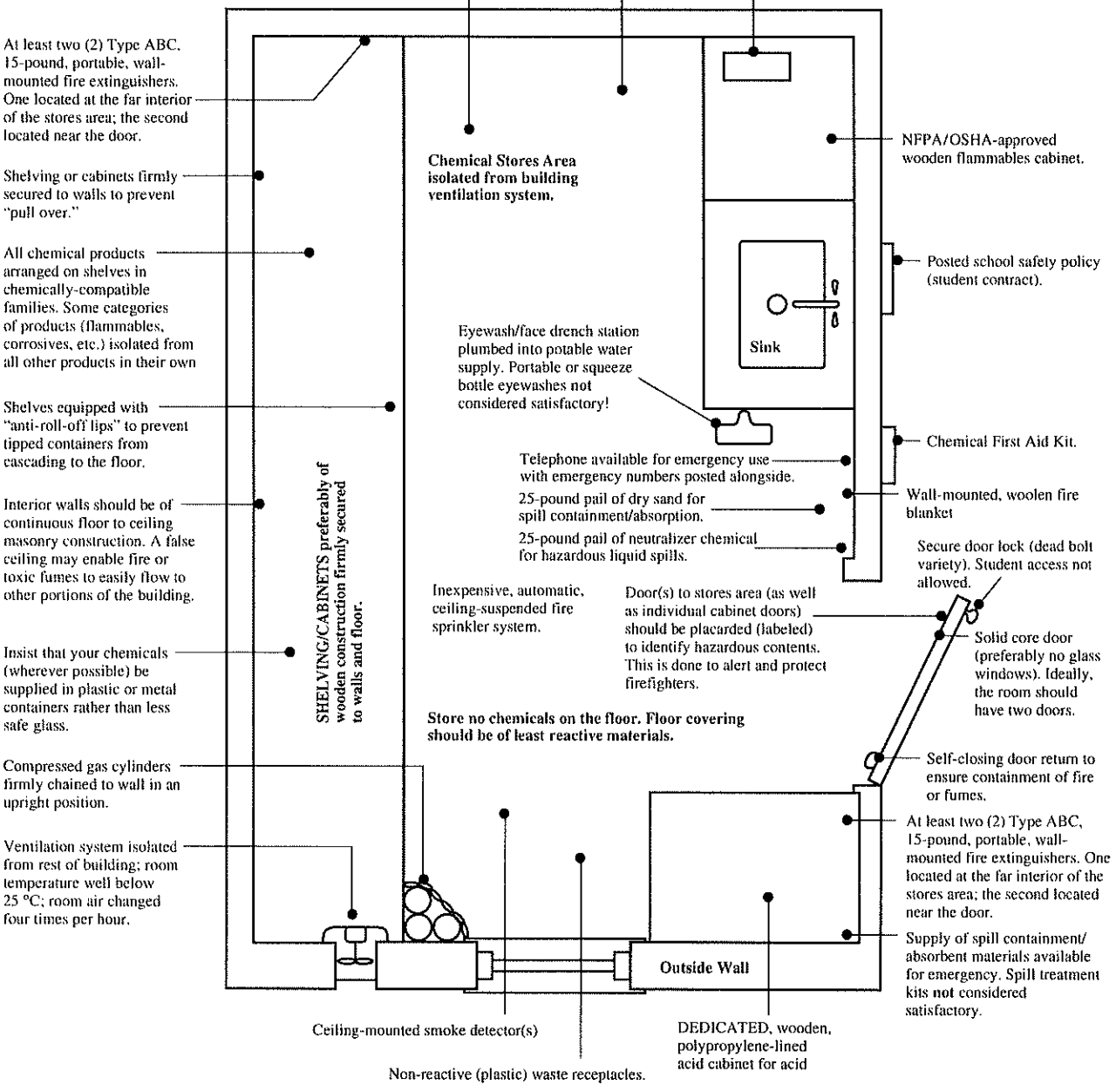
If shelf space is a problem, you are permitted to place more than one compatible chemical family on a shelf. Make sure you either have a physical divider or leave a 3" space between each family. This will maximize your tight shelf space while keeping each compatible chemical family separate from one another.

See page 1074 for complete instructions on organizing your chemical stores area.

MODEL CHEMICAL STORES AREA

Please compare your facility to this model.

- **Never store chemicals in a fume hood.**
- **No chemicals routinely stored in classrooms.**
- **VARIOUS SCIENCE DEPARTMENTS (chemistry, biology) should store their chemicals in one dedicated area.**



Scale 1/2" = 1'-0"