

APPENDIX E

CHECKLISTS AND GUIDES

Checklists

- A Checklist for Science Field Investigations
- Science Facility Safety Checklist

Guides

- Microscale Chemistry Guide
- A Guide to Common Poisonous Plants

A CHECKLIST FOR SCIENCE FIELD INVESTIGATIONS

General Preparations

- ☐ Has a representative from the site granted permission?
- ☐ Is the site accessible for physically challenged students?
- ☐ Has a date been established?
- ☐ Has an alternate date been established?
- ☐ Have sponsors been selected?
- ☐ Has the sponsor/student ratio been established?
- ☐ Have students been checked for eligibility and a discipline record?
- ☐ Are there other requirements that the site requests?
- ☐ Are admission fees required?
- ☐ Are there bathrooms and an area to eat meals at the site?
- ☐ Is it necessary for students to bring their own food?
- ☐ Will copies of the Permission Forms and a student list be left with an administrator?
- ☐ Will the Emergency Medical Forms be taken with the teacher?
- ☐ Is there a portable phone for emergency use?
- ☐ Are emergency procedures in place for handling an injured student or sponsor?
- ☐ Has the school district approval been received?
- ☐ Is it necessary to have a meeting with parents?

Purpose of the Investigation

- ☐ Have objectives (TEKS) for the investigation been determined?
- ☐ Does the field investigation integrate with other subjects?
- ☐ Do students have sufficient background knowledge to be successful?
- ☐ Are activities planned so students will be actively engaged in learning?
- ☐ If students miss other classes, have their teachers been notified?

Transportation Requirements

- ☐ Will school district or public transportation be used?
- ☐ Is it necessary to raise money to pay for transportation?
- ☐ Has transportation information been given to parents?
- ☐ Are transportation permission field trip forms required by the school district?
- ☐ Is additional insurance required by the school district for field trips?
- ☐ Have arrangements been made if a vehicle breaks down?

Student Preparations

- ☐ Have students been notified of the type of clothing and shoes to wear?
- ☐ Has an information letter been sent to parents?
- ☐ Have medical forms, parental consent forms, etc. been given to students?
- ☐ Have deadlines for returning the forms been set?
- ☐ Have student behavior expectations been established?

MICROSCALE CHEMISTRY GUIDE

A pilot study, conducted by the Tyler Junior College chemistry department (the site of the South Central Regional Microscale Chemistry Center, SCR MCC), involved using a microscale technique in place of the macroscale procedure for determining boiling points which had been in their laboratory manual for a number of years. Due to the large number of students in the program (approximately 200/semester), the original experiment, which called for 5 milliliters of both a known and unknown (to the student) organic liquid, generated almost 2 liters of organic waste. The semester that the microscale technique was used, less than 50 milliliters total of organic waste was collected. The experimental accuracy appeared to be at least as good if not better than the previous macroscale procedure.

To illustrate the advantages of using the microscale technique, a boiling point investigation is included paralleling the original macroscale procedure previously used with a microscale procedure.

EQUIPMENT REQUIREMENTS

Using Hot Plates as Heat Source		Using Bunsen Burners as Heat Source	
Equipment	Quantity	Equipment	Quantity
Thermometer	24	Iron ring	24
Ring stand	24	Wire gauze	24
Test tube clamp	24	Bunsen burner	24
Stirring rod	24	Rubber tubing (2')	24
Capillary tube	24	Strikers	24
Hot plate	24	(these materials not needed if using hot plates)	
Test tube	24		
Beaker	24		

COMPARISON OF APPROXIMATE COST

Materials	Quantity	Cost	Materials	Quantity	Cost
16 x 150 mm test tube	24	\$0.55	6 x 50 mm test tube	24	\$0.04
400 mL beaker	24	\$3.95	50 mL beaker	24	\$3.03
Subtotal		\$90.00	Subtotal		\$68.60

SAFETY ADVANTAGES

The microscale setup uses approximately 25 mL of water in the hot water bath where the macroscale requires approximately 250 mL of hot water. This reduces the danger of burns from hot water bath spills. Air quality is greatly improved because of the reduction in organic chemicals being vaporized. This should be important to the teacher who is exposed to chemicals during each laboratory period.

In addition, the time required to heat 25 mL to the correct temperature takes approximately 1/10 the time required to heat 250 mL of water to the same temperature.

CHEMICAL QUANTITY AND COST COMPARISON

Macroscale Technique			Microscale Technique		
Materials	Quantity	Cost	Materials	Quantity	Cost
Acetone (known)	120 mL	\$0.55	Acetone (known)	5.0 mL	\$0.16
Methanol	25 mL	0.35	Methanol	1.0 mL	0.04
Isopropanol	25 mL	1.25	Isopropanol	1.0 mL	0.02
t-Butanol	25 mL	0.34	t-Butanol	1.0 mL	0.05
Ethanol	25 mL	1.00	Ethanol	1.0 mL	0.02
Acetone	25 mL	1.00	Acetone	1.0 mL	0.04
Total	245 mL	\$8.94	Total	10 mL	\$0.29

A GUIDE TO COMMON POISONOUS PLANTS

Common Name	Scientific Name	Poisonous Plant Part
Milkweed, Broadleaf	<i>Aesclepias latifolia</i>	sap and young shoots
Milkweed, Antelope Horn	<i>Aesclepias asperula</i>	sap and young shoots
Century Plant	<i>Agave</i> spp.	sap—any part of plant
Ragweed	<i>Ambrosia artemisiifolia</i>	leaves and pollen
Trumpet Creeper	<i>Campsis radians</i>	leaves and flowers
Virgin's Bower	<i>Clematis virginiana</i>	leaves
Water Hemlock	<i>Circuta maculata</i>	roots and young plants
Bull Nettle	<i>Cnidoscolus stimulosus</i>	stinging hairs
Texas Bull Nettle	<i>Cnidoscolus texanus</i>	stinging hairs
Lady's Slipper Orchid	<i>Cypripedium</i> spp.	leaves
Jimsonweed	<i>Datura stramonium</i>	leaves and flowers
Wild Carrot	<i>Dacus carota</i>	leaves
Larkspur	<i>Delphinium ajacis</i>	leaves and seeds
Horsetail	<i>Equisetum</i> spp.	all parts
Daisy Fleabane	<i>Erigeron canadensis</i>	leaves
Spurge	<i>Euphorbia</i> spp.	milky juice
Wild Poinsettia	<i>Euphorbia heterophylla</i>	milky juice
Yellow Jessamine	<i>Glesmium sempervirens</i>	leaves and stems
Ginko	<i>Ginko biloba</i>	seeds
Western Stinging Nettle	<i>Hesperocnide</i> spp.	stinging hairs
St. John's Wort	<i>Hypericum perforatum</i>	leaves
Juniper	<i>Juniperus virginiana</i>	leaves
Osage Orange	<i>Malcura pomifera</i>	milky juice
Red Mulberry	<i>Morus rubra</i>	leaves, stem

Common Name	Scientific Name	Poisonous Plant Part
Oleander	<i>Nerium oleander</i>	leaves
Redbird-cactus	<i>Pedilantus tithymaloides</i>	sap
Mayapple	<i>Podophyllum peltatum</i>	roots
Primrose	<i>Primula</i> spp.	all parts
Buttercup	<i>Ranunculus</i> spp.	leaves
Dock	<i>Rumex</i> spp.	leaves
Mexican Flame Vine	<i>Senecio confusus</i>	all parts
Poison Oak	<i>Toxicodendron quercrifolia</i>	leaves
Poison Ivy	<i>Toxicodendron radicans</i>	leaves
Poison Sumac	<i>Toxicodendron vernix</i>	all parts
Clover, Alsike	<i>Trifolium hybridum</i>	leaves
Chinese Tallow	<i>Sapium sebiferum</i>	leaves and berries
Cardinal Flower	<i>Lovelia cardinalis</i>	all parts
Carolina Horsenettle	<i>Solanum carolinense</i>	all parts
Silver Nightshade	<i>Solanum eleagnifolium</i>	all parts
Elderberry	<i>Sambucus canadensis</i>	all green parts
Mescal Bean	<i>Sophora secundiflora</i>	all parts
Mistletoe	<i>Phoradendron serotinum</i>	all parts
Oak	<i>Quercus</i> spp.	young shoots and acorns
Peyote	<i>Lophophora williamsii</i>	cactus tops
Pokeweed	<i>Phytolacca americana</i>	all parts
White Snakeroot	<i>Eupatorium rugosium</i>	all parts
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	all parts
Yaupon Holly	<i>Ilex vomitoria</i>	berries

SCIENCE FACILITY SAFETY CHECKLIST

The science facilities in your school should be checked annually to ensure a safe learning environment for you and your students. A copy of the Science Facility Safety Checklist should be filed with the building principal and district science coordinator so that appropriate action can be taken to correct any problem.

Notification should be made in writing if a hazard is identified that could jeopardize the safety of an individual.

COMMUNICATIONS

	√	√	√
Communication System	K-5	6-8	9-12
• Intercom system available			
• Telephone accessible and nearby			
• General fire alarm system functioning for entire building			
• Fire-drill instructions posted in each room			
• Emergency lights available in rooms without exterior windows			

PERSONAL PROTECTION

	√	√	√
Emergency Showers	K-5	6-8	9-12
• Shower (ADA compliant) present in chemistry laboratory rooms			
• Shower unobstructed			
• Valve handle functional			
• Floor drain present			
Eye/Face Wash Stations			
• Available in all laboratory rooms (5% ADA-compliant)			
• Stations marked clearly with a sign			
• Provides simultaneous tepid (60–90°F) water treatment to both eyes			
• Stations flushed for five minutes each week			
Protective Clothing			
• Laboratory aprons or coats available for each student			
• Gloves (acid resistant and heat resistant) available			
Safety Goggles			
• Approved ANSI safety goggles available for each student and teacher			
• Materials available for disinfecting goggles after their use			
• Face shields available when appropriate			
First Aid			
• Kits available in each laboratory room			
• Kits clearly marked and visible			
• Kits checked on a regular basis and supplies replenished			
• Located near a sink			

CHEMICAL STORAGE ROOM

	√	√	√
Combination BC Fire Extinguisher (flammable liquids & electrical)	K-5	6-8	9-12
• Extinguisher located in room where chemicals are stored			
• Fire extinguisher properly charged; checked quarterly; safety seal intact			
• Located near exit, clearly visible, and marked with a sign			
Class D Fire Extinguisher (flammable solids)			
• Extinguisher properly charged			
• Extinguisher in rooms using metals (sodium, potassium)			
Fire Blankets			
• Standard fireproof blanket in each chemical storage room			
• Blankets located at eye level, clearly visible, and marked with a sign			
Fire or Emergency Exits			
• Two emergency exits; visible sign marking exits			
• Emergency exits unobstructed and unlocked to traffic moving out of the room			
Other Fire Protection			
• Exit signs clearly visible			
• Emergency lights available in rooms without exterior windows			
• General fire-alarm system functioning for building			
• Fire-drill procedures posted in storage rooms			
• 4- to 9-liter container of dry sand or absorbant clay (cat litter)			
• Utility carts available to transport chemicals			
Ventilation			
• Six air changes per hour			

PREPARATION AND EQUIPMENT STORAGE ROOMS

	√	√	√
General Storage Requirements	K-5	6-8	9-12
• Combination BC extinguisher in preparatory rooms			
• Work surface of nonporous chemical-resistant materials			
• Large sink with hot water available			
• Emergency shower accessible			
• Materials Safety Data Sheets (MSDS) available			
• Room well lighted and clutter-free			
• Space to store chemicals			
• Chemical waste container and broken glass container available			
• Two emergency exits, with locks on doors			
• Smoke detectors present			
• Refrigerator marked "For Chemical Storage Only—No Food Allowed"			
• Adequate storage space (15 square feet per student)			
• Ventilation—six air changes per hour			

LABORATORY ROOM

	√	√	√
	K-5	6-8	9-12
Laboratory Work Stations			
• Number of students does not exceed the number of work stations			
• Work surfaces nonporous and chemical resistant			
• At least one work station that is ADA compliant			
Master Utility Controls			
• Natural gas shut-off valve present, labeled with room identification			
• Electrical shut-off valve present, labeled with room identification			
• Water shut-off valve present, labeled with room identification			
Fume Hood			
• Located in rooms where hazardous chemicals are used (ADA compliant)			
• Not used for storage			
• Correct air movement provided at hood face			
• Vented to outside above roof level away from vents			
• Located away from doors and windows			
Spill Control Kits			
• Chemical spill kits available			
• 4- to 9-liter container of dry sand or absorbent clay (cat litter)			
Sinks			
• One available for every 4 students (15" x 15" minimum size)			
• One equipped with hot water			
• 5% of sinks ADA compliant			
Ventilation			
• Forced floor to ceiling			
• Six air changes per hour			
• Emergency exhaust fan available			
General Safety Requirements			
• 40 square feet of space per student for elementary schools; 45 square feet of space per student for middle and high schools			
• Safety rules posted and visible			
• Space available for chemical storage			
• Material Safety Data Sheets (MSDS) readily accessible			
• Broken glass container present			
• Two emergency exits in laboratory rooms larger than 1000 square feet			
• Safety and exit signs posted and visible			
• Room not cluttered; movement in work area unobstructed			

LABORATORY ROOM

	√	√	√
Fire Protection	K-5	6-8	9-12
• Type ABC (dry chemical) fire extinguisher located by exit			
• Class D (flammable solids) available in rooms using metals			
• Extinguishers properly charged, checked quarterly, and marked with a sign			
• Fireproof blanket available, located at eye level, and marked with a sign			

ELECTRICAL SAFETY

	√	√	√
Electrical System	K-5	6-8	9-12
• Electrical outlets equipped with ground fault circuit interrupter (GFCI)			
• Sufficient electrical outlets to eliminate extension cords			
• Electrical outlets located away from water source (faucets, sinks)			
• Electrical system equipped with accessible circuit breaker box			
• Circuit breakers identified by area or item controlled			

This information represents an assessment of the school's science facilities and should serve as a guide for establishing a safe working and learning environment.

Teacher

Date