

## CHEMICAL SAFETY



RADFORD UNIVERSITY  
Radford, VA  
August 2-6, 2009

Chemical demonstrations and workshops are important educational components of every ChemEd Conference. The ChemEd 2009 Committee will work with all presenters to ensure that these events are conducted in a safe and accessible venue. In order to do so, it is imperative that all participants follow the safety rules and guidelines listed within.

The following set of guidelines, rules, and policy statements were developed through discussion with previous Chem Ed hosts, BCCE hosts, the ACS Division of Chemical Education, Radford University (RU), and the ChemEd 2009 Committee.

Because of the increased security that characterizes transportation systems within the U.S., the ChemEd 2009 Committee recommends that participants DO NOT carry chemicals with them or in their luggage while traveling on airlines. Once permission is granted from the ChemEd 2009 Committee to perform a chemical demonstration, a form will be sent that explains how the chemicals will be dealt with at this conference.

Individuals attending this conference must understand that the storage of chemicals in automobiles parked on the RU campus or in the RU residence halls WILL NOT be permitted. Participants who bring chemicals with them must make prior arrangements with Dianne Clark, Chemical and Workshop Coordinator, [dclark@radford.edu](mailto:dclark@radford.edu), for proper storage of the chemicals within the Chemistry and Physics Department.

*Please note that no radioactive materials of any quantities are allowed on the Radford University campus.*

Because of the increase in cost of disposing of waste generated by chemical demonstrations and workshops, ChemEd reserves the right to say no to certain costly events. Please realize that there is only a limited amount in the ChemEd 2009 budget to cover the cost of waste disposal generated by these events. This conference reserves the right to charge demonstrators and workshops a disposal fee if necessary. If there is a fee, the amount will be determined after the abstracts have been submitted.

Individuals preparing, presenting, or involved in the clean-up of chemical demonstrations and/or workshops must be registered participants of the ChemEd 2009 Conference. All of these persons must wear appropriate safety equipment (safety goggles, gloves, lab coat, etc.). All presenters and participants in demonstrations and workshops should bring their own safety goggles. RU expects all waste generated to be collected in appropriately labeled waste containers.

ChemEd 2009 will not supply individuals with chemicals from the Department of Chemistry and Physics Laboratories. Chemicals and other needed supplies must be requested and approved by March 1, 2009.

Only neutral salts or neutralized acid-base demonstrations that have a measured pH between 6.1 and 8.5 can be disposed of in an expedient manner.

Any unused chemicals purchased for the intent of this conference and paid for by a presenter must have a designated plan for return after the conference has come to an end. Otherwise, all chemicals purchased by ChemEd 2009 for this conference will become the property of the RU's Chemistry and Physics Department at the completion of this conference. Please be aware that it is necessary for the Department to track all chemicals from the time they enter the building through the amounts that are used in any reactions.

**Complete List for Presenters Giving Workshops and Demonstrations**  
**for ChemEd 2009**

All demonstrations and workshops presented at the ChemEd 2009 Conference MUST have the following documents on file with Dianne Clark, Chemical and Workshop Coordinator, by March 1, 2009:

1. Prior approval from the General Chair, Program Chair, RU Safety Director, and Chemical and Workshop Coordinator
2. Abstract of the demonstration and workshop submitted and accepted
3. Submission of the *ChemEd 2009 Requirements for Presenters Giving Workshops and Demonstrations* Form
4. **A signed form** – ACS Division of Chemical Education Guidelines for Presenting Chemical Demonstrations and Activities. Your signature will indicate that you agree to these procedures and guidelines. This is found on **page 10** of this document.

## **Presentations and Activities at Scientifically Equipped Facilities**

Scientifically equipped facilities include:

- Science facilities at colleges, universities, secondary schools, and science museums;
- Research and manufacturing facilities; and
- Any other type of facility that has laboratories.

It is assumed that these facilities generally have:

- Extensive emergency equipment, including fire extinguishers;
- Chemical supplies;
- Adequate ventilation and air circulation;
- Disposal procedures for chemical waste; and
- Rules concerning personal safety of visitors and employees during community activities.

### **1. Secure pre-approval for use of the facilities.**

Secure pre-approval of all hands-on activities and demonstrations from the laboratory safety director or other management official. Make facility security/safety officers aware of the planned activity.

### **2. Prepare supplies in an appropriate area.**

Carry out demonstration and activity preparations in an area designed for working with chemicals. Put controls in place to ensure that the types and quantities of chemicals brought into the area are appropriate and kept to a minimum. Make certain that all chemicals are appropriately labeled including appropriate safety hazard warnings. Make MSDS available for all chemicals in the activity area.

### **3. Pretest demonstrations and activities.**

Pretest programs, if possible, in the area in which they are to be performed. The pre-testing will help identify potential safety hazards.

#### **4. Carefully review activities that produce loud noises.**

Consider moving these activities outside. If they are carried out inside, be certain to notify management and security. In all cases, alert the audience to expect a loud noise and to cover (protect) their ears.

#### **5. Identify issues related to chemical waste.**

Establish in advance the types of chemical waste that will be produced and the procedure for waste disposal. Be certain to follow the federal, state, and local regulations for waste disposal.

#### **6. For demonstrations, provide adequate shielding for the audience and the demonstrator.**

The safety of the audience is paramount. It must not be assumed that the members of the audience are protected by distance. Protection could be achieved by shielding the audience and by the demonstrator wearing chemical splash (cover) goggles (ANSI Z87.1) types G or H. Alternately, chemical splash (cover) goggles could be worn by all participants (demonstrator and audience). Have a goggle sanitation plan for goggles used by multiple persons. One possible method of sanitation is to immerse the goggles in diluted household laundry bleach (1 part bleach to 9 parts water), followed by thorough rinsing and drying. Know the location of the nearest eye wash fountain and safety shower and ensure in advance that the eyewash and safety shower are working properly. Discuss safety precautions with the audience as well as the locations of the nearest restrooms.

#### **7. If the activity is hands-on, provide adequate personal protective equipment for the participants, the leader(s), and any assistants.**

The safety of all persons involved is paramount. All participants, helpers, and presenters must wear eye protection in the form of chemical splash (cover) goggles (ANSI Z87.1) types G or H. Prepare and execute a goggle sanitation plan for goggles used by multiple persons. One possible method of sanitation is to immerse the goggles in diluted household laundry bleach (1 part bleach to 9 parts water), followed by thorough rinsing and drying. If the activity is likely to be messy, consider providing disposable laboratory aprons and gloves. If aprons are to be reused, be certain to label the front of the apron. Never reuse disposable gloves. Prior to the activity, discuss safety precautions with the audience as well as the locations of the nearest restrooms.

#### **8. Perform programs in areas with adequate ventilation.**

Make certain the facility being used for the activity or demonstration has adequate ventilation for the chemicals being used.

**9. Make plans in advance for adequate crowd control.**

Make advance plans and provide personnel to ensure that the audience size is maintained at a predetermined level for the activities. This includes control over the entrances to limit the number of persons admitted to the area. Make certain that the number of volunteers is appropriate for the activities and for the expected size of the audience. For

hands-on activities, it is very important to control the number of persons having access to the area of the activity.

**10. Plan exit routes.**

Make certain that there is easy access to and exit from the area of the demonstration or activity. Include an explanation of exit procedures and have adequate personnel to supervise evacuation in case of an emergency.

Be aware of all on-site fire regulations regarding audience size and emergency evacuations.

**11. Do not allow consumption of food or drink in the demonstration/activity area.**

**12. Have spill kits available that are appropriate for the chemicals to be used.**

**13. Ensure that fire protection is readily available in the immediate area.**

**14. Distribute handouts complete with safety recommendations.**

If the description of the activity is distributed, make sure that the procedure is well tested and details all safety related concerns. All ACS materials have undergone safety review and contain appropriate guidelines.

## **Guidelines for Hands-on Activities**

When hands-on activities are planned, regardless of the location, certain precautions must be taken to protect the participants and those directing and assisting with the activity. The protection is necessary regardless of the nature of the activity, even if the “safest of chemicals” are being used. These guidelines must be used in conjunction with one of the two facility guidelines.

**1. Pretest all planned activities to ensure that they work and to identify and eliminate any safety problems.**

**2. Select chemicals that carry a minimum of risk for use in hands-on activities.**

Keep in mind common allergies such as those to different varieties of nuts, latex, and sulfites.

**3. Explain the procedures clearly to ensure that all participants understand and agree to follow the procedures before beginning the activity.**

**4. Make provisions to ensure that adequate experienced help is available to carefully oversee the experimenters carrying out the hands-on activities.**

**5. Supervise participants.**

Do not allow unsupervised activity. Do not allow any extension of the planned activity unless approved by the presenters. Prior to starting any activity, discuss safety precautions with the audience as well as the locations of the nearest restrooms.

**6. All participants, helpers, and presenters must wear appropriate personal protective equipment.**

The safety of all persons involved is paramount. All participants, helpers, and presenters must wear eye protection in the form of chemical splash (cover) goggles (ANSI Z87.1) types G or H. Have a goggle sanitation plan for goggles used by multiple persons. One possible method of sanitation is to immerse the goggles in diluted household laundry bleach (1 part bleach to 9 parts water), followed by thorough rinsing and drying. If the activity is likely to be messy, consider providing disposable laboratory aprons and gloves. If aprons are to be reused, be certain to label the front of the apron. Never reuse disposable gloves.

**7. Make all participants aware of all safety precautions.**

Do not allow anyone to participate in any activity if they have missed procedural and safety instructions.

## **8. Exercise caution with flames.**

Never use alcohol burners in any type of activity. It is inappropriate to use a flame in a non-scientific facility. If burners are used in a laboratory setting, make certain that the experimenters are old enough to understand the use and dangers involved. Be careful of loose-fitting clothing, and make certain that long hair is tied back or otherwise prevented from hanging down when using burners. Caution must also be exercised when using hotplates. Never use a hotplate to heat flammable materials.

## **9. Carefully control activities using the sense of smell.**

Prepare in advance any activity that involves smelling any substances. Allow only safe, commercially available substances to be smelled. Additionally, these should be at minimal concentrations even if dilution is required. Teach participants about the dangers of smelling chemicals and instruct them in the proper technique—wafting a small amount of vapor from the container to the nose rather than placing the nose directly over the container. Use professional discretion in selecting substances for these types of activities being particularly aware of chemical sensitivities (allergies).

## **10. Do not perform activities that involve tasting.**

This guideline is consistent with the earlier guideline that prohibits the consumption of food or drink in the demonstration areas. In keeping with standard, safe chemical practice, chemists do not taste substances used in their activities.

## **11. Instruct all participants to wash their hands immediately upon completion of the activity and before leaving the facility in which the activity takes place.**



# Minimum Safety Guidelines for Chemical Demonstrations

## ACS Division of Chemical Education

### Chemical Demonstrators Must:

1. Know the properties of the chemicals and the chemical reactions involved in all demonstrations presented.
2. Comply with all local rules and regulations.
3. Wear appropriate eye protection for all chemical demonstrations.
4. Warn members of the audience to cover their ears whenever a loud noise is anticipated.
5. Plan the demonstration so that harmful quantities of noxious gases (e.g., NO<sub>2</sub>, SO<sub>2</sub>, H<sub>2</sub>S) do not enter the local air supply.
6. Provide safety shield protection wherever there is the slightest possibility that a container, its fragments or its contents could be propelled with sufficient force to cause personal injury.
7. Arrange to have a fire extinguisher at hand whenever the slightest possibility for fire exists.
8. Not taste or encourage spectators to taste any nonfood substance.
9. Not use demonstrations in which parts of the human body are placed in danger (such as placing dry ice in the mouth or dipping hands into liquid nitrogen).
10. Not use open containers of volatile, toxic substances (e.g., benzene, CCl<sub>4</sub>, CS<sub>2</sub>, formaldehyde) without adequate ventilation as provided by fume hoods.
11. Provide written procedure, hazard, and disposal information for each demonstration whenever the audience is encouraged to repeat the demonstration.
12. Arrange for appropriate waste containers for and subsequent disposal of materials harmful to the environment.

Revised 4/1/95

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Print name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Abstract Login ID: \_\_\_\_\_

This form must be submitted to Dianne Clark ([dclark@radford.edu](mailto:dclark@radford.edu), fax: 540-831-6615, Box 6949, Department of Chemistry and Physics, Radford University, Radford, VA, 24142) for anyone that will be using chemicals in a talk or a hands-on workshop. Failure to submit this form will result in the presenter being dropped from the program.