American Chemical Society

ACS Chemistry for Life™

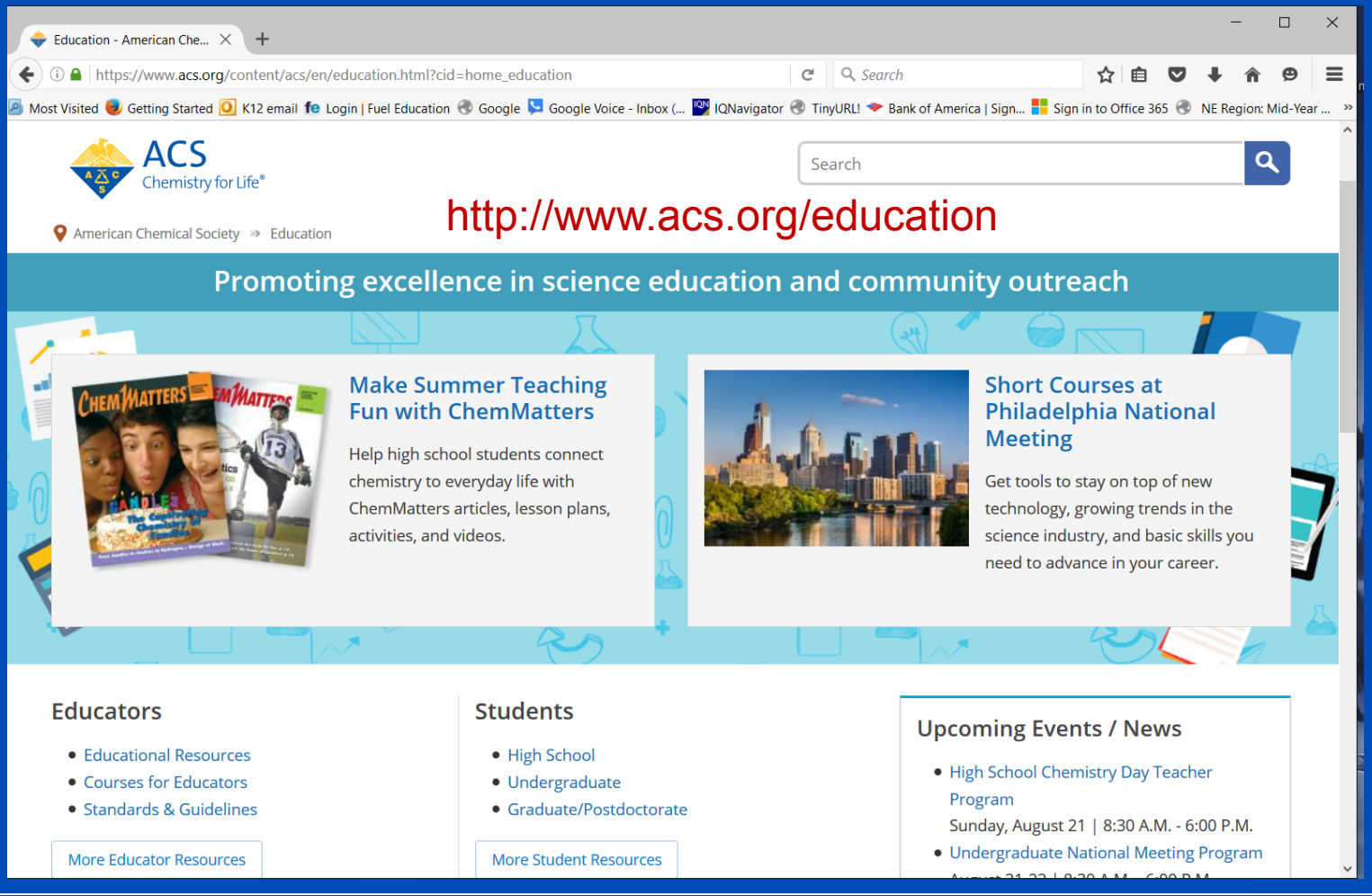
# Challenges and opportunities affecting safety in the K-12 classroom

CHAS: Chemical Safety in the K-12 Classroom

Tuesday, August 23, 2016

**Diane Krone**
**Chair, Society Committee on Education (SOCED)**

# THE OPPORTUNITY



# The Safety Challenges

- School Administration
- Student Attitudes
- Teacher Safety Training

# Safety Challenge: School Administration

Large class size

More students than lab stations

Half the class works at desk while half the class works in lab

English class in science lab?

# Opportunity

http://www.acs.org/hsguidelines

### Pathways to Learning

What BIG IDEAS should be investigated in a high school curriculum? How do you promote scientific literacy in accordance with National Science Education Standards? What teaching strategies and technologies engage students of diverse backgrounds best? This section explores these issues and more!

### Classroom & Laboratory

The preparation room, storage closet, and the laboratory are all components of the high school chemistry class. Learn about our recommendations for properly storing chemicals, adequate safety, and class size.

### Preparation and Responsibilities

Find out how you can develop professionally, collaborate with members of the greater scientific community, and help students connect what they have learned in the classroom to the world around them.

# Opportunity

## Workstations

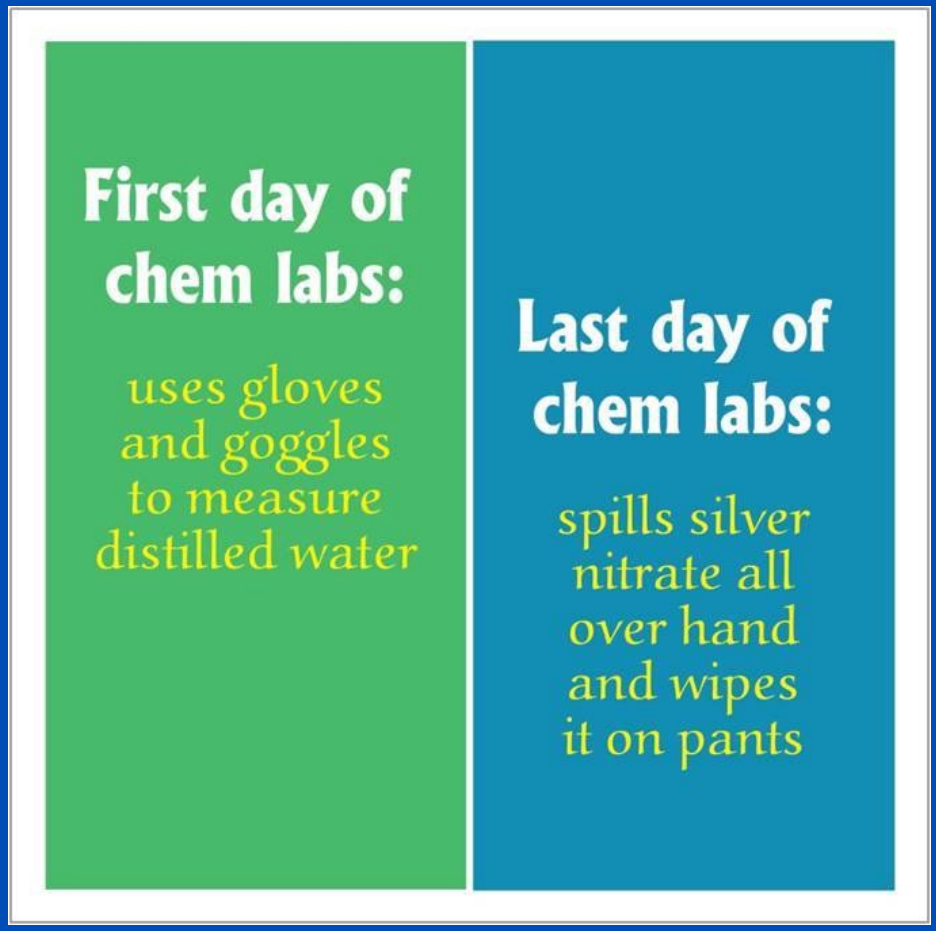
Each laboratory should contain a fully equipped teacher station suitable for demonstrations and lab work. Student workstations should be arranged throughout the remaining work area. The chemistry laboratory may contain moveable lab stations or fixed lab stations. The latter allows for a more productive use of time because the facility is always available. To ensure student safety with adequate supervision, the ACS and the National Science Teachers Association (NSTA) recommend a maximum of 24 students per classroom based on 60 square feet per student. The NSTA has produced a position statement on the liability of science educators for laboratory safety (NSTA, 2007).

## Spacing

The square footage per pupil must meet state regulations. Different state mandates may require additional square footage. Space may also be based on building and fire safety codes, appropriate supervision, and the special needs of students. Additional areas should include a safety station and a station for students with disabilities. The arrangement of furniture must allow for adequate flexibility and supervision. For safety reasons, stools should not be in the walkways during laboratory investigations.

# Safety Challenge: Student Attitudes


# Student Attitudes



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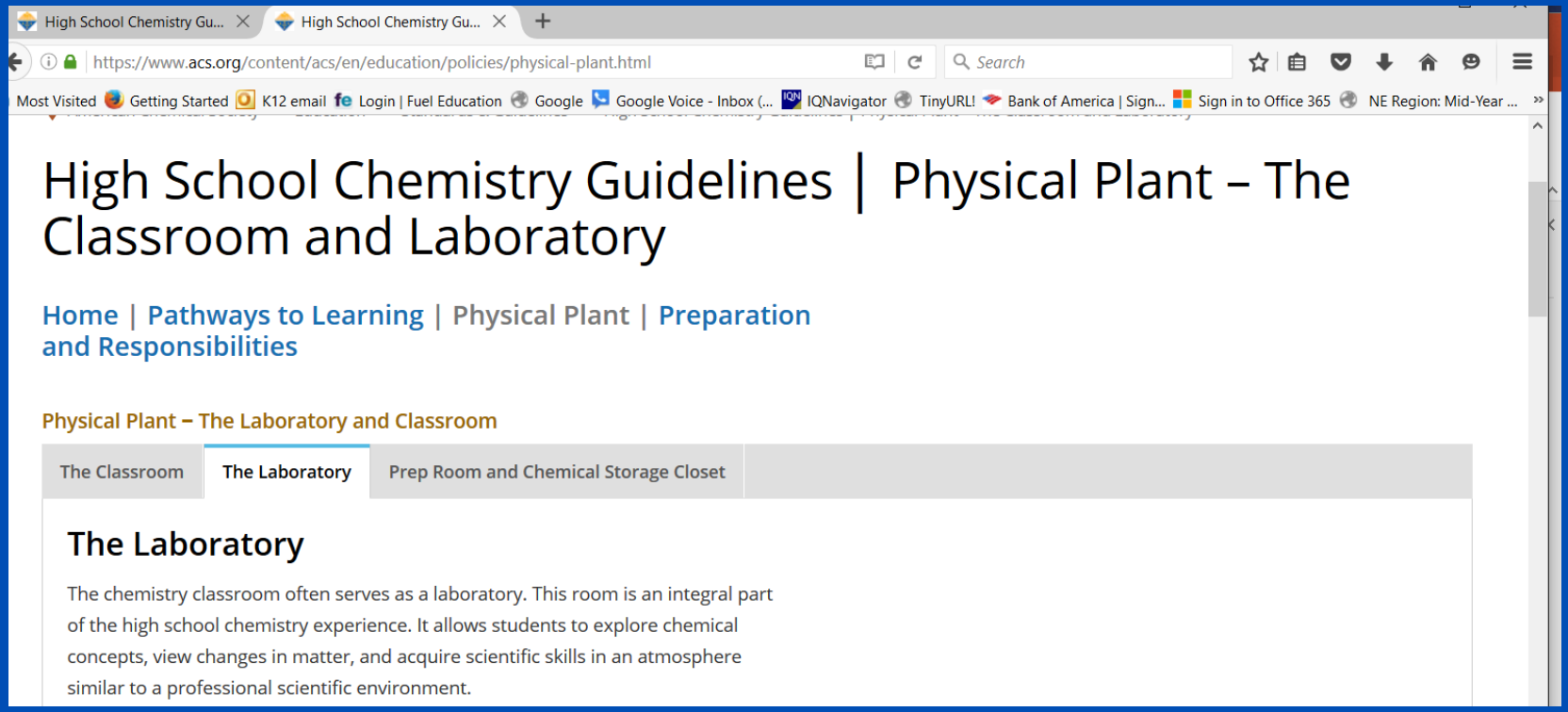

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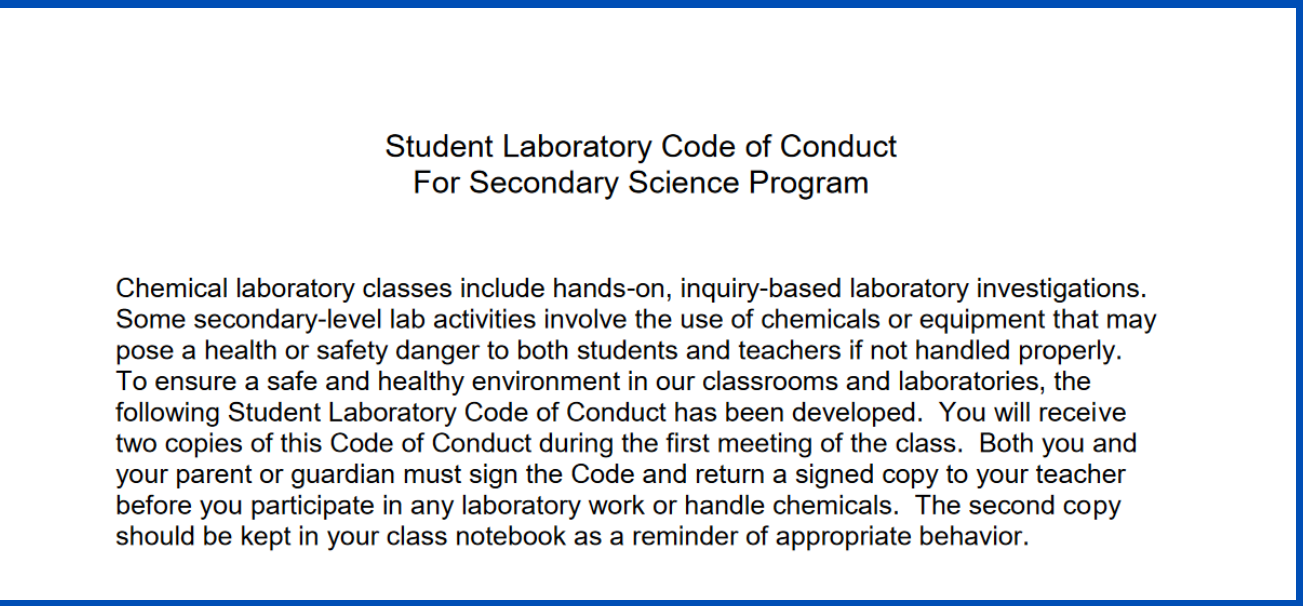


Student Laboratory Code of Conduct
For Secondary Science Program

Chemical laboratory classes include hands-on, inquiry-based laboratory investigations. Some secondary-level lab activities involve the use of chemicals or equipment that may pose a health or safety danger to both students and teachers if not handled properly. To ensure a safe and healthy environment in our classrooms and laboratories, the following Student Laboratory Code of Conduct has been developed. You will receive two copies of this Code of Conduct during the first meeting of the class. Both you and your parent or guardian must sign the Code and return a signed copy to your teacher before you participate in any laboratory work or handle chemicals. The second copy should be kept in your class notebook as a reminder of appropriate behavior.

# Opportunity

RESPONSE TO VIOLATIONS OF THE
STUDENT LABORATORY CODE OF CONDUCT

1st Offense: Verbal reprimand from the teacher, with a written record of the violation maintained. The teacher will review the rule with the student. If this is a serious violation which may have caused harm to human health or the environment, the parent or guardian will also be notified.

2nd Offense: The student will be suspended from laboratory work immediately and sent to the appropriate grade level administrative office, with a disciplinary referral from the teacher. Written notification will be sent to the parent or guardian, with information specifying the consequences should a third offense occur. The student will not be permitted to return to laboratory work for one week, with alternative work assignment(s) to be provided in a supervised setting as determined by the building administration.

3rd Offense: The student will be suspended from laboratory work immediately and sent to the appropriate grade level administrative office, with a disciplinary referral from the teacher. Written notification will be sent to the parent or guardian, and a mandatory conference will be scheduled with the parents, teacher and building administrator. Depending on the result of that conference, the student may be suspended from laboratory operations for the remainder of the school year. If this occurs, the student will be assigned alternative work assignment(s) to be provided in a supervised

# Opportunity

**STUDENT AGREEMENT**

I, _____ (student's name), have read and understand the Student Laboratory Safety Code of Conduct set forth above. I realize that I must obey these rules to ensure my own safety and that of my fellow students and teachers. I will cooperate to the fullest extent with my teachers and fellow students to maintain a safe working environment in the laboratory. I am aware that violations of this safety code will result in disciplinary action as specified in the Code.

_____ _____
Student Name Date

Note to Parents:

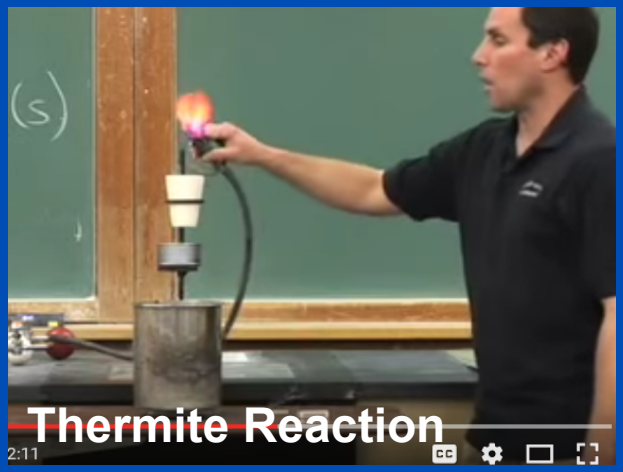
We believe you should be informed regarding our school's efforts to create and maintain a safe science classroom & laboratory environment. Safety awareness involves the cooperation of parents, students, and teachers. Please read the Student Science Laboratory Code of Conduct which details the safety concerns and expected student behaviors in the laboratory. *No student will be permitted to perform laboratory activities unless both student and at least one parent or guardian signs the Code and returns a signed copy to the teacher.* Your signature below indicates that you have read this Code of Conduct, are aware of the measures taken to ensure the safety of your son or daughter in the science laboratory, and will encourage your son or daughter to uphold the agreement to follow these rules and procedures.

_____ _____
Parent/Guardian Date

# The Opportunity

# Safety Challenge: Teacher Training





# Safety Challenge: Teacher Training

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Two high school kids burned in lab accident – New York

High school chemistry lab fire prompts warnings for science teachers - Virginia

Lab Accident Horror Stories

Teacher Fired For Role In Lab Accident That Burned Students

# Opportunity

## How To Make Chemistry Classroom Demonstrations And Experiments Safer

Fires that injure students prompt calls for safety assessments of demonstrations or experiments, plus teacher training

By Jyllian Kemsley November 23, 2015

# Opportunities

**FREE RESOURCES FOR TEACHERS**

National Fire Protection Association: "**Standard 45**"

National Research Council: "**Prudent Practices in the Laboratory**"

American Chemical Society: "**Chemical Safety in the Classroom**"

American Chemical Society: "**Safety Data Sheets**: **Information that Could Save Your Life"**

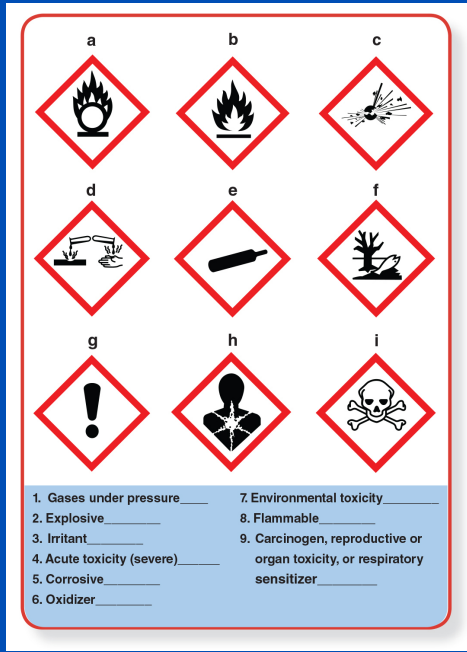
Flinn Scientific: **Videos**

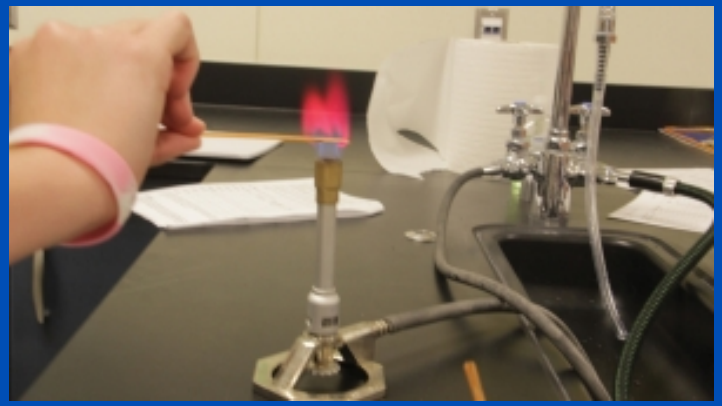
American Association of Chemistry Teachers: **Webinar on Creating a Culture of Safety in the Science Classroom**

# Opportunity

ChemMatters Online

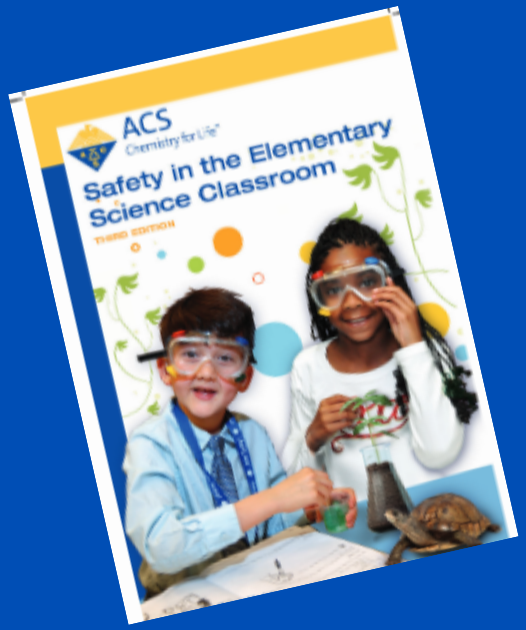
## Safety Data Sheets: Information that Could Save Your Life

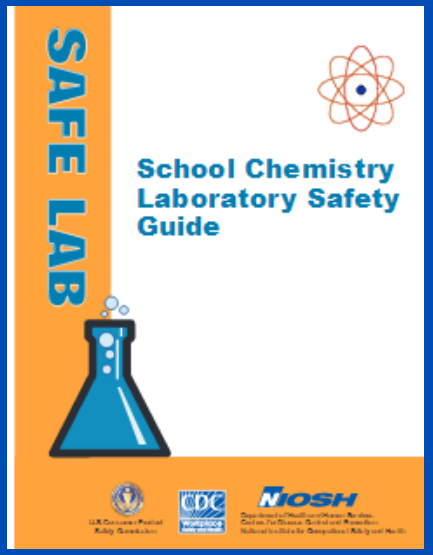


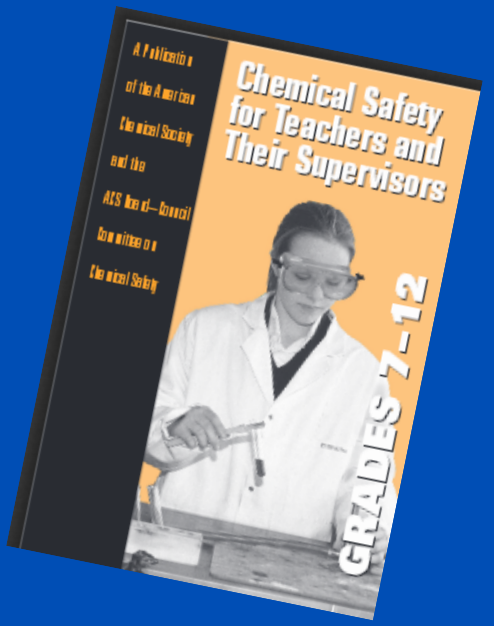



When conducting a flame test, soaking wooden splints in salt solutions and then placing the splints in a Bunsen burner is considered a safer alternative than working directly with flammable liquids, such as methanol, which is not recommended anymore.

# Opportunity



# Opportunity

# Opportunity

## 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 | **Inorganic #10** Arsenic, Phosphorous, Phosphorous Pentoxide, Sulfur | **Inorganic #7** Arsenates, Cyanates, Cyanides **STORE AWAY FROM WATER** |
| Do not store chemicals on the floor | **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** |

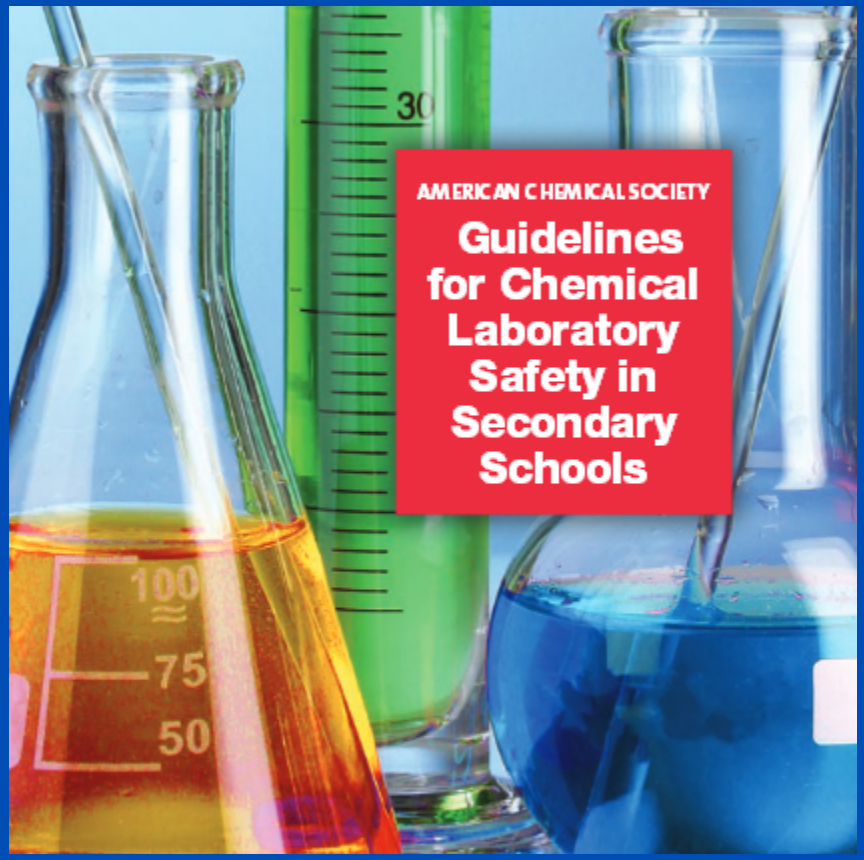
# Opportunity

## RAMPing up safety education: The time is now

By Bettyann Howson, Chair, ACS Committee on Chemical Safety

**Effective safety education must become an integral part of chemistry curricula at all levels.**

# Opportunity



# Opportunity

Rather than being grouped around specific topics such as flammables and corrosives, they are organized around the concept of RAMP, an acronym for the four principles of safety:

- **Recognize** the hazard.
- **Assess** the risk.
- **Minimize** the risk.
- **Prepare** for emergencies.

# Oportunity

The guidelines also include student learning outcomes that clearly state the:

- knowledge
- skills
- attitudes
- competencies

# Opportunity

## http://www.acs.org/safety

Recent Releases

- Guidelines for Chemical Laboratory Safety in Academic Institutions
- Guidelines for Chemical Laboratory Safety in Secondary Schools
- Hazard Assessment in Research Laboratories
- Safety Alert – Tornado Experiment
- Safety Alert! — Rainbow Demonstration
- Rainbow Demonstration, C&EN Comment, CCS Chair
- New and Improved — Flame Tests Demonstration

# Opportunity:
# Free HS Resources

ACS Chemistry for Life™

## A collection of teaching resources you can trust.

Teach the big ideas about energy in your high school chemistry classroom! Exercises, lab investigations, videos and demos focus on the fundamentals of chemical, mechanical, nuclear and gravitational energy.

**What is Energy?**

*Energy types and how we experience them in practice and study*



**How Do We Use Energy?**

*The energy in chemical & physical processes and everyday life*

**How Can Energy Change?**

*Energy conservation, transfer, exothermic and endothermic*

**What Theories Explain Energy?**

*Thermodynamics—the theory of energy; enthalpy and entropy*

# Opportunity

## Middle School Teaching Resources

### Science Teaching Guide (Grades 6-8)

middleschoolchemistry.com

- Lesson plans, classroom activities, and background science information!
- Activity sheets and related reading!
- Video demonstrations and molecular model animations!

# Opportunity

## Adventures in Chemistry

Explore chemistry with our new resource for kids—Adventures in Chemistry. The website, acs.org/kids, captures the interest and imagination of pre-Kindergarten and elementary students through interactive activities divided into four sections: Experiments, Secret Science of Stuff, Games, and Science ABCs. Students are able to explore both online and offline with real materials to build a strong foundation in chemistry.

# Opportunity

**Connect with other teachers to make your environment a safer place!**

# Opportunities

## Thank you
## and
## stay safe!

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