Suggested Activities for Laboratory Safety for Middle / Secondary

1. Students develop their own set of safety icons. These symbols can be especially helpful for students with language barriers.
   a. Poison
   b. Explosive
   c. Extremely flammable
   d. Highly flammable
   e. Flammable
   f. Oxidizing
   g. Toxic
   h. Very toxic
   i. Harmful
   j. Irritant
   k. Mutagen
   l. Carcinogen
   m. Dangerous for the environment

2. Students develop their own safety rules for the Student Safety Contract.

3. Students make safety signs for Science Lab/Classroom pictorial. This can be especially helpful for students with language barriers.
   a. Goggles
   b. Shower
   c. Eyewash
   d. Fire extinguisher
   e. Fire blanket
   f. Exit
   g. Non-exit

4. Students learn to read a chemical label on commercially-purchased chemicals as well as household chemicals.

5. Students prepare worksheets using MSDSs of chemicals they will use in the science lab following Table 24., "Student Practice in Reading an MSDS," Pg 100, Science Laboratory Safety Manual, S&SCS.

6. Practice emergency procedures in the event of an accident occurring in the lab. Type these scenarios on notecards, one per card. When students are conducting lab, randomly give one of these cards to a student to read to the others. The students are to go into “Accident Mode!” What do we do? Develop: “A PLAN INSTEAD OF PANIC.”
Problem-Solving Scenarios for Laboratory Safety

a. Electrical short occurs using a hotplate. The cord starts burning.

b. Electrical short occurs using a hotplate. The cord starts burning and is laying in water. Sparks are being created, popping noises are being made. There are no GFIs.
Problem-Solving Scenarios for Laboratory Safety

c. While heating a test tube that contains a boiling liquid, the contents of the test tube explode out of the test tube into the face of a student walking by the lab table. Injured student has on an apron and chemical splash goggles. The teacher had given specific safety warnings about how to heat the test tube by moving it gently through the flame and the appropriate PPE for the lab. There is an eyewash in the laboratory.

d. A beaker containing about 100 mL 1 M HCl(aq) (hydrochloric acid) is knocked off the lab bench onto the floor. The acid splashes onto the leg and foot of a student wearing flip flops. The beaker is also broken. There is not a shower in the laboratory.
Problem-Solving Scenarios for Laboratory Safety

e. A beaker containing about 100 mL 1 M HCl(aq) (hydrochloric acid) is knocked off the lab bench onto the floor. The acid splashes onto the leg and foot of a student wearing flip flops. The beaker is also broken. There is a shower in the laboratory.

f. The teacher is conducting a flame test demonstration at the lecture desk. The metal salts are dissolved in methanol. Students are around the desk (without PPE) watching the teacher ignite the methanol to see the different colored flames of different metal ions. A flash fire occurs and the fire self extinguishes; however, two students receive burns on their arms.
Problem-Solving Scenarios for Laboratory Safety

g. A student leans over the flame of a burner. He/she has on a long sleeve shirt which catches on fire. Describe appropriate actions:

- Shower in the laboratory.
- No shower, only a fire blanket and water on lab stations.
- No shower, water, or fire blanket in the laboratory; however, fire extinguisher outside the laboratory.

h. A student splashes alcohol on his/her hands when it is poured down the sink drain.
Problem-Solving Scenarios for Laboratory Safety

i. A student goes into the chemical prep room to find a thermometer. He/she finds one that contains mercury. As the student is walking back to the lab table, he/she accidentally hits the thermometer bulb on the corner of the lab table. The mercury falls to the floor, breaking into hundreds of little balls. Students are fascinated with the liquid. They begin pushing the beads back together and then separating them again and again.

Problem-Solving Scenarios for Laboratory Safety

j. A student cuts his/her hand while accidentally breaking a beaker—not serious enough to have stitches; however, it is bleeding sufficiently. No blood vessels are cut.
Problem-Solving Scenarios for Laboratory Safety

k. A student starts to shake, feel faint; his/her skin feels cold and clammy. His/her vision is also blurred. The student is a known diabetic. There is no record of the student having such a reaction prior to this attack.

Problem-Solving Scenarios for Laboratory Safety

l. In a biology classroom there is a cage that contains a gerbil. One student starts poking at the gerbil with a pencil. Another student tries to get the student to stop antagonizing the animal. The student finally opens the cage and reaches in to get the gerbil. The gerbil bites the student on the hand. Students have been given rules regarding the handling and proper care of animals.
Problem-Solving Scenarios for Laboratory Safety

m. A student who wears contact lenses is wearing safety glasses in the laboratory while working with baking soda and vinegar. The reaction is rapid. The bubbles of carbon dioxide are forming quickly and some of the wet baking soda splashes into the student's eye.

n. Students are working in the laboratory when alcohol vapors ignite. A student attempting to smother the blaze knocks over the bottle of alcohol. The flames race across the laboratory table, down the side where the alcohol is dripping onto the floor.
   • What if there is a fire extinguisher nearby at the exit door of the laboratory?
   • What if there is no fire blanket and a fire extinguisher is available?
   • What if there is no fire blanket available and no fire extinguisher available?
Problem-Solving Scenarios for Laboratory Safety

oo. Ms. Jones takes her Environmental Science Class to a wooded area adjacent to the school to make measurements of temperature, relative humidity and rainfall accumulations at several different climate stations in the area. She has warned students to be observant and cautious when touching various kinds of plants, to watch their step, and not to swat at bees/wasps with their hands. A bee stings a student on his/her neck. Almost immediately, swelling appears to more than normal. The student appears to have some difficulty in breathing.

Problem-Solving Scenarios for Laboratory Safety

pp. A teacher is assigned to a non-science room to teach the chemistry portion of Physical Science by the school principal. The teacher indicated the problems inherent in conducting science inquiry in this classroom. The room does not have any safety equipment, gas or water. There is only one exit from the room. Students are conducting an experiment which requires heat. The teacher uses alcohol burners. About five minutes before the bell is to ring, the teacher instructs the students to clean up the lab table and refill the alcohol lamps from the gallon jug of alcohol. There is one burner still lit on a table when the student who is refilling his/her lamp spills alcohol on the table. The arm of one student is burned severely enough to have blisters.
Problem-Solving Scenarios for Laboratory Safety

q. In Earth Science, students were identifying rocks. A dilute solution of hydrochloric acid was used to determine if the rock contained a carbonate. Students were not wearing goggles or safety glasses. Two boys started squirting each other with the pipet containing the acid from the dropper bottles that were at each lab station. One student was hit in the eye with the acid solution. The teacher got the student to the eyewash station; however, when the paddle was pushed, only brown water came out.

r. On Friday in Biology class, students were observing plant cell structures under a microscope. All the students at the lab table developed conjunctivitis over the weekend.
Problem-Solving Scenarios for Laboratory Safety

In a middle school science class, students were wearing goggles with adjustable elastic bands. There was not a Goggle Sanitation Cabinet or water in the classroom where students were conducting the lab. The teacher typically took the goggles home every weekend and washed them in her dishwasher. Within a week, there was a head lice epidemic in this teacher’s science classes.
Suggested Activities for Laboratory Safety for Grades K-5

1. Students learn the vocabulary and develop their own set of safety icons. These symbols can be especially helpful for students with language barriers.
   a. Poison
   b. Explosive
   c. Flammable
   d. Toxic
   e. Harmful
   f. Irritant
   g. Allergen
   h. Sensitizer
   i. Dangerous or harmful for the environment

2. Students develop their own safety rules for the Student Safety Contract.

3. Students make pictorial safety signs for Science Lab / Classroom. Examples:
   a. Goggles
   b. Shower
   c. Eyewash
   d. Drench hose
   e. Fire extinguisher
   f. Exit
   g. Non-exit

4. Students should learn to read a chemical label. Use a household product that you use in your science activities: sugar, salt, vinegar, glue, or crayons.

5. Download MSDSs from Flinn Scientific: [www.flinnsci.com](http://www.flinnsci.com) for the household products. Go over information such as hazards, NFPA ratings, personal protective equipment that is needed. Talk about importance of never tasting any chemical even if it is sugar in a science laboratory setting.

6. Practice emergency procedures in the event of an accident occurring in the lab. Depending on the grade level of your student, cut the following Problem-Solving Scenarios for Laboratory Safety and place them on a 4 x 6 index card. Laminate them. Talk about “practice” with the students to avoid mass hysteria from erupting when you read one of the “accidents” to the students. Walk around the laboratory when students are working, have one of them draw a card, read it (or you may need to) to the class. Have them decide/practice what should be done if the “accident” were to really occur.
Problem-Solving Scenarios for Laboratory Safety

a. The teacher is heating water in a beaker on a hot plate. The cord has a crack in the rubber housing and an electrical short occurs. Sparks of fire are emitted; you can smell the rubber burning. What should you do? What if the cord is lying is water on the table? There is not a GFI (ground fault interrupter).

b. A glass beaker containing 150 mL vinegar is knocked off the lab table where students are working. The beaker breaks; vinegar and glass are on the table, floor and splashes also on the leg of a student who is wearing shorts and flip flops. What if this student were wearing long pants and tennis shoes? What if the beaker were plastic? There is not a shower in the classroom—but there is water? What if there is no water?
Problem-Solving Scenarios for Laboratory Safety

c. A student splashes rubbing alcohol on her hands as she is pouring it down the sink drain.

d. A student is wearing goggles and carrying a plastic beaker that contains some rubbing alcohol. Two boys are pushing / playing and accidentally jostles her arm; the alcohol splashes into her face, hair and goggles.
Problem-Solving Scenarios for Laboratory Safety

e. A student is wearing goggles and carrying a plastic beaker that contains some rubbing alcohol. Two boys are pushing / playing and accidentally jostles her arm; the alcohol splashes into her face, hair and eyes. There is not water in the classroom. What would you do if the same thing occurred and the student was not wearing goggles?

Problem-Solving Scenarios for Laboratory Safety

f. A student starts to shake, feels faint, his / her skin feels cold and clammy. His / her vision is also blurred. The student has diabetes. What do you do?
Problem-Solving Scenarios for Laboratory Safety

g. In the classroom, there is a cage that contains a gerbil. One of the students starts poking at the gerbil with a pencil. Another student tries to get the student to stop antagonizing the animal. This student opens the cage and reaches in to get the gerbil to prevent further abuse. The gerbil bites the student on the hand which bleeds. Students have been given rules regarding the handling and proper care of animals.

h. There is a pepper plant (not the garden variety) in the classroom window that has pretty red pods. One of the students picks a pepper and eats it on a dare from another student. When he starts to feel nauseous, he comes to you and confesses what has happened.
Problem-Solving Scenarios for Laboratory Safety

i. A teacher was using a candle as a heat source. She discarded the candle remains at the end of the experiment. A fire erupts in a trash can (contains paper) at the front of the room with a fairly good blaze. There is a fire extinguisher in the hall about 50 feet outside the door. Students might have some difficulty getting by the blazing trash can without being burned. There is only one exit door.

• What do you do if there is no water in the room?
• What if you have a fire blanket?
• What if you have a bucket of kitty litter? Or Sand?
• What if you have nothing?
• What if you have an extinguisher in the room?

Problem-Solving Scenarios for Laboratory Safety

j. There is a wooded area next to the elementary school. It is late spring and about 85 °F. You have taken your 26 students out to observe nature – plants, animals. You suddenly hear a student scream that a snake has been him? You observe 2 puncture wounds on the student’s leg. The students did not clearly see the snake-one says the snake was brownish; another says the snake had a pattern and reddish tan in color. You suspect it was a copperhead.
Problem-Solving Scenarios for Laboratory Safety

k. In an elementary level science class, students were wearing goggles with adjustable elastic straps. There was not a UV Goggle Sanitation Cabinet or water in the classroom where students were conducting the lab. The teacher typically took the goggles home every weekend and washed them in his/her dishwasher. Within a week, there was a head lice epidemic in this teacher’s class.

Problem-Solving Scenarios for Laboratory Safety

l. On a field trip with your students to a botanical garden in early fall, sweat bees and wasps are in the area. You warn the students to stay calm, move away gently and not to swat at them if one approaches. A student is stung on his arm and significant swelling occurs. He starts to have some breathing difficulty? What do you do? All you have is a cell phone and a few chaperones.
Appendix: Grades K-5 Activities for Laboratory Safety

Problem-Solving Scenarios for Laboratory Safety

m. On Friday, students were using hand lenses to observe the surface of rocks and crystals. Over the weekend, 18 of the 26 students developed conjunctivitis.

n. A teacher was using an alcohol lamp as a heat source for heating water (only cold water in the lab) for an experiment. The lamp was knocked over spilling alcohol on the table. The alcohol spilled across the table and onto the floor. The alcohol caught fire from the wick in the lamp. Fire spread across the table and down to the floor. A student’s blouse sleeve caught fire and blistered her arm before cold water was used to douse the burning sleeve. Fire extinguisher was outside the door of the classroom; however there was not a fire blanket available.
Problem-Solving Scenarios for Laboratory Safety

- A student is cut by a cracked beaker which broke during a science inquiry activity. Stitches are needed to close the wound and for proper healing.