

THE WONDER OF CHEMISTRY EXPERIMENTS

Ira Remsen was a prominent American chemist during the nineteenth century. Below is an excerpt from F.H. Getman's article [The Life of Ira Remsen](#)* where Remsen himself recalls his first experience with chemistry and how it impacted his life.

While reading a textbook of chemistry I came upon the statement, "nitric acid acts upon copper." I was getting tired of reading such absurd stuff and I was determined to see what this meant. Copper was more or less familiar to me, for copper cents were in use. I had seen a bottle marked nitric acid on a table in the doctor's office where I was then "doing time." I did not know its peculiarities, but the spirit of adventure was upon me. Having nitric acid and copper, I had only to learn what "act upon" meant. The statement "nitric acid acts upon copper" would be something more than mere words. All was still. In the interest of knowledge I was even willing to sacrifice one of the few copper coins in my possession. I put one of them on the table, opened the bottle marked nitric acid, poured some of the liquid on the copper and prepared to make an observation. But what was this wonderful thing which I beheld? The cent was already changed and it was no small change either. A green-blue liquid foamed and fumed over the cent and over the table. The air in the neighborhood of the performance became colored dark red. A great colored cloud arose. This was disagreeable and suffocating. How should I stop this? I tried to get rid of the objectionable mess by picking it up and throwing it out the window. I learned another fact. Nitric acid not only acts upon copper, but it acts upon fingers. The pain led to another unpremeditated experiment. I drew my fingers across my trousers and another fact was discovered. Nitric acid acts upon trousers. Taking everything into consideration, that was the most impressive experiment and relatively probably the most costly experiment I have ever performed... It was a revelation to me. It resulted in a desire on my part to learn more about that remarkable kind of action. Plainly, the only way to learn about it was to see the results. To experiment, to work in a laboratory.



While we do not expect CHEM 100 to be a "life-changing" experience, we do hope that you will enjoy the act of discovery, which is the very essence of science. Only in a science course can you form ideas, test them, make observations, and then reform your ideas and opinions based upon your experience. We hope you enjoy the semester!

*From [The Life of Ira Remsen](#), published by the [Journal of Chemical Education](#), of the Division of Chemical Education Inc., of the American Chemical Society.

Practice

SAFE

CHEMISTRY

A. Rules Governing Personal Safety

You may be dismissed permanently from the class for violating any of the following rules:

1. **NO eating, drinking or smoking in the laboratory.** Chemicals could accidentally be ingested with food or drink. In addition to promoting many kinds of cancer, smoking is hazardous because many chemicals are flammable. **DO NOT BRING ANY FOOD, BEVERAGES, OR CONTAINERS INTO LAB.**



2. Perform only authorized experiments.



3. **Use appropriate lab dress.** Clothing that provides complete leg coverage (such as jeans or long skirts) is required. **ABSOLUTELY no shorts, mini-skirts, or halter-tops will be allowed in lab!** It is recommended that you wear old clothing to lab. Corrosive chemicals can damage clothes and some chemicals can leave permanent stains. Wear shoes that provide complete foot coverage to protect your feet from both spilled chemicals and broken glassware. **No sandals will be allowed.** **NOTE:** Should you come to lab inappropriately dressed, you will be dismissed from lab to change into appropriate attire.

4. **Eye goggles that completely cover the eyes MUST BE WORN AT ALL TIMES IN THE LABORATORY WHILE DOING AN EXPERIMENT** to comply with the following Missouri state law and to guard against potential eye injury:



SENATE BILL NO. 519
78th GENERAL ASSEMBLY
RSMo: Sections 170.005, .007 & .009

AN ACT

Requiring all students and teachers to wear approved eye protective devices when participating in certain vocational, industrial arts and chemical-physical courses of instruction.

Be it enacted by the General Assembly of the State of Missouri, as follows:

Section 1. *Every student, teacher and visitor is required to wear an industrial quality eye protective device when participating in or observing any of the following courses in schools, colleges, universities or other educational institutions:*

- (1) Vocational, technical, industrial arts, chemical, or chemical-physical shops or laboratories involving exposure to the following: hot molten metals, or other molten materials; gas or electric arc welding, or other forms of welding processes; repair or servicing of any vehicle; caustic or explosive materials;*
- (2) Chemical, physical, or combined chemical-physical laboratories involving caustic or explosive materials, hot liquids or solids, injurious radiations or other hazards not enumerated.*

Section 2. *As used in this act, "Industrial Quality Eye Protective Devices" means devices meeting the standards of the American National Standard Practice for Occupational and Educational Eye and Face Protection, Z 87.1 – 1989, and subsequent revisions thereof, approved by the American National Standards Institute, Inc.*

Section 3. *The state board of education and the coordinating board for higher education shall prepare and circulate to each public and private educational institution in this state instructions and recommendations for implementing the eye safety provisions of this act.*

This law benefits you directly despite its inconvenience. **You are responsible for obtaining a pair of goggles.**

B. Recommended Guidelines for Personal Safety

1. **Keep your lab area and equipment CLEAN.** By eliminating unnecessary clutter, accidents can be prevented. Your lab area includes your sink. Do not throw paper products or other solids in the sink. Proper disposal containers are available. **Some instructors take away points for uncleanliness.** Dirt or chemical residues in the equipment may interfere with your experimental reactions and make lab interpretation more difficult (if not impossible!). Chemicals often corrode metal equipment. Keeping the lab clean and safe is EVERYONE'S responsibility!
2. **Avoid rubbing your eyes while in lab.** You may accidentally transfer chemicals to your eyes and cause damage to them. (Eyesight is precious and damage is often permanent.) When goggles get foggy and/or your eyes need attention, wash your hands well before going out into the hall to take care of the problem.
3. **Secure (tie back) long hair.** Hair can catch fire, get caught in equipment, or be damaged by chemicals if not secured.

4. **Avoid direct contact with the reagent chemicals.** Contact may adversely affect your skin and experimental results. Many chemicals will burn or irritate skin. If you spill a chemical on your skin, flush it with water immediately and then wash with soap and water. Treat all chemicals as potentially dangerous. Gloves are provided and are located on the center bench.



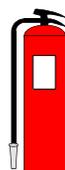
5. **Wash your hands before leaving lab.** Certain chemicals do not burn or stain the instant they come in contact with your skin, but they may after they have been there for a while. If you are a caregiver (moms, dads, and babysitters), you may inadvertently transfer chemical residues to your children by neglecting to thoroughly wash your hands. The possibility also exists for contaminating other things you come in contact with after you leave lab (such as your belongings, food and drink, etc.).

C. In the Case of an Accident

In the case of an accident or emergency, the following points of discussion may completely escape your recollection. Most people when surprised or frightened display a reaction noticeable to those around them. This is good! Just as promoting safety and preventing accidents is everyone's business, so is the patching up of any disaster. Keep alert so that if a problem arises you can properly respond to it. Please help whenever possible. In the case of an accident or emergency, consider the following.

**Safety is NO
ACCIDENT!**

1. Immediately indicate the need for help whether you are the victim or the observer. A gasp, scream, or shout is appropriate. If you are a bystander, notify the instructor, laboratory assistant or stockroom personnel of the accident or emergency.
2. In order to deal with eye injury, chemical spills or fire, know the location and use of: the eyewash, safety shower, the fire extinguishers, the fire blanket and first aid kit.



3. If a corrosive chemical gets on your skin, clothing or in your eyes, immediately wash the affected area with large quantities of water. Use the eyewash or safety shower if the situation calls for it. Remove clothing if necessary in the case of either a spill or fire.
4. If you spill a chemical, clean it up as directed by your instructor, lab assistant or stockroom personnel. If it is a spill that might endanger your neighbors, alert them to the problem.

5. Small-contained fires can be extinguished by covering them with a beaker or even a wet paper towel. For an open fire, use the fire extinguisher. Be sure to point it at the base of the flame.
6. Clean up broken glassware immediately (not with your hands!). Obtain the broom and dustpan (located on the center bench) for the job. Place the broken glassware in the container provided - NOT the garbage can!
7. No matter how small the injury or accident, please notify your instructor. An accident report must be filed for all injuries sustained in the laboratory.
8. If additional medical attention is necessary, the following procedure will be used: Report to your instructor who will accompany you to the Science Division Office. Someone will then escort you to the Student Health Clinic or the local emergency room. The student is financially responsible for any medical expenses, which may result from a laboratory accident. An accident report will be filled out.

D. Good Laboratory Practices

1. Treat all lab equipment as sacred. Some equipment is quite expensive and delicate (e.g., the balances), and often critical in obtaining easily interpreted results. Consult the techniques section or the common laboratory techniques section of the manual.
2. Read the reagent bottle twice before using the chemical from it to promote safety and to avoid errors which may require repeating the experiment.
3. Always clean glassware before and after using it. The glassware is shared among many students.
4. Never heat a closed system. Excess pressure builds up that could easily cause an explosion.
5. When heating a test tube, point the open end toward an unoccupied area, preferably at a wall. The same applies for stoppered test tubes.
6. Add reagents slowly and carefully. Pour concentrated solutions into water or less concentrated (dilute) solutions in order to avoid violent, uncontrolled reactions. For example, when acid and water are mixed, pour the acid into the water.
7. When determining the odor of chemicals, smell them indirectly by waving your hand over the top of the container and fanning the odor toward your nose.
8. Perform reactions with smelly, noxious, or dangerous chemicals in a fume hood.
9. Proper laboratory technique demands that you do not leave the laboratory without cleaning it. As a general rule, the lab should look as good if not better than when you walked in. This includes:
 - Glassware and totes
 - Your work area
 - Straightening chemicals
 - Balances
 - Putting paper towels and other refuse in the garbage can

