Mercury in Science Laboratories and Classrooms

including Physics, Chemistry, Biology, General Science

The educational benefit of using mercury in the classroom is not worth the potential risk.

Items that contain mercury:

- bulk elemental mercury
- laboratory chemicals (e.g., mercury oxide, mercury chloride (Zenker's solution), mercury sulfate, mercury nitrate, mercury iodide)
- mercury laboratory thermometers, fever thermometers, sling psychrometers
- mercury barometers
- molecular motion demonstration devices with liquid mercury
- mercury switches

Mercury Laboratory Chemicals and Non-Mercury Alternatives

Mercury is a common chemical in school laboratories. Elemental mercury has been used to demonstrate the concept of density, and mercuric salts may be used in various experiments. Many people can remember seeing the mercury beads roll across the desk of the science lab out of a broken thermometer or even playing with mercury. People know better now. Mercury spills can cost schools tens of thousands of dollars to clean up. The educational benefit of using mercury in the classroom is not worth the potential risk of having the mercury on-site.

Non-mercury experiments can adequately demonstrate the concept of density. For example, "Discovering Density" (publisher: Lawrence Hall of Science, University of California at Berkeley) offers comprehensive information on five visual representations of the concept. A microscale, non-mercury density experiment is also offered in "40 Low-Risk, Low-Waste Chemistry Labs" (publisher: J. Weston Walsh, see http://www.cheminfonet.org). In addition, the "Ask Eric" website offers a non-mercury density experiment. (See http://www.askeric.org).

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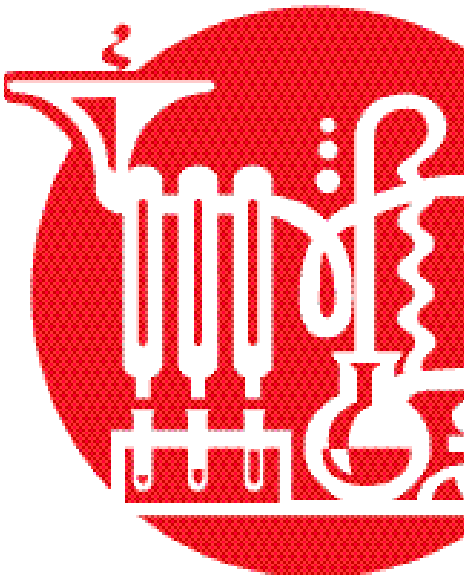


Chemical	Alternative
Mercury (II) Oxide	**Copper catalyst**
Mercury (II) Chloride	**Magnesium Chloride/Sulfuric Acid or Zinc Formalin, Freeze Drying**
Mercury (II) Sulfate	**Silver Nitrate/Potassium/Chromium (III) Sulfate**
Mercury Iodide	**Phenate method**
Mercury Nitrate - for corrosion of copper alloys or for antifungal use (mercurochrome)	**Ammonia/Copper Sulfate, Neosporin, Mycin**
Zenker's solution	**Zinc Formalin**

Direct replacements for mercuric salts also exist, depending on the experiment. The table above offers some alternatives found in the Wisconsin Department of Natural Resources *Mercury Sourcebook: Educational Institutions*. (See http://www.epa.gov/glnpo/p2.html).

Mercury Laboratory Thermometers and Non-Mercury Alternatives

Laboratory thermometers with the silver bulb contain between 1.5 and 3 grams of mercury and should not be thrown in the trash.

Non-mercury alcohol and mineral spirit-filled laboratory thermometers are effective for most applications and are available from laboratory supply vendors. These alternatives may cost slightly more or less than mercury laboratory thermometers depending on the accuracy required.

Preservatives

Mercury compounds were often used as preservatives in reagents, buffers, stains and saline solutions. The mercury compound may be listed as thimersol, merthiolate, or by specific mercury compound name. Take care not to purchase solutions containing a mercury preservative.

Mercury Manometers and Vacuum Gauges and Non-Mercury Alternatives

Manometers, barometers, vacuum gauges and U-tubes with a visible silver liquid contain mercury. Liquid mercury in the gauges responds to air pressure in a precise way that can be read on a calibrated scale.

Non-mercury alternatives are widely available. Electronic (digital) gauges and aneroid (e.g., Bourdon tube, diaphragm, piston or capsule) pressure gauges are available and effective for most applications.

Storing Unwanted Items

Unwanted mercury laboratory chemicals (including jars of elemental mercury) must be managed as hazardous waste, not universal waste, and must be disposed of according to federal and state hazardous waste regulations.

Unwanted thermometers and gauges and other devices that contain mercury can be managed as universal wastes. Universal wastes are a subcategory of hazardous waste, with streamlined handling requirements. None of these materials should be disposed of in the regular trash. Every school should have a protocol for handling and managing hazardous and universal wastes.

Until you arrange for proper disposal, save old or broken mercury laboratory thermometers and gauges in two sealed, non-breakable containers (e.g., two sealed,

plastic bags, one inside the other). Label the containers "Universal Waste - Mercury-Containing Devices" and indicate the date that they were stored. See the fact sheet "Establishing Hazardous and Universal Waste Collection Areas" for more infomation on storage requirements.

How to Handle a Mercury Spill

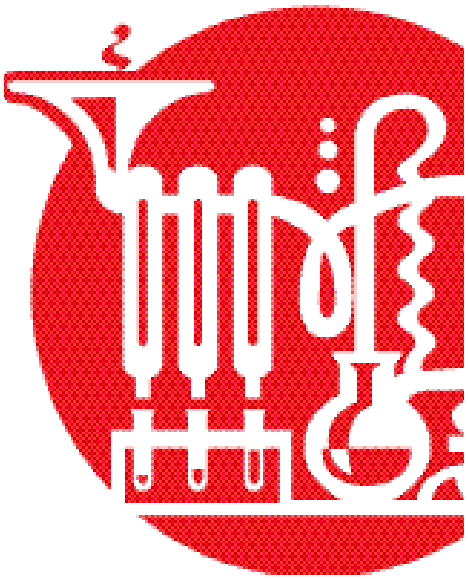
If a thermometer or gauge breaks and the spill is less than two tablespoons, you may be able to clean it up yourself. (Almost all thermometers contain less than this amount.) If you have a mercury spill kit and know how to use it, follow the instructions that come with the kit. Otherwise, follow these instructions:

- First ventilate the room to the outdoors and keep people and animals out of the area.
- Remove all jewelry from hands and wrists.
- Wear rubber gloves to avoid contact with the skin.
- Use an eyedropper or two pieces of stiff paper to scoop the mercury into an unbreakable container.
- Place all contaminated cleaning materials in two sealed, non-breakable containers (one inside the other).
- Remove contaminated carpeting and store with contaminated cleaning materials.
- Label the containers "Hazardous Waste - Mercury Spill Clean Up Materials" and indicate the date that they were stored. Store the containers in an appropriate location.
- Dispose of all contaminated materials as hazardous waste. (See the fact sheet "Establishing Hazardous and Universal Waste Collection Areas" for more information.)
- Replace the item with a non-mercury alternative.

If a spill is greater than two tablespoons, you should get professional spill response assistance. First, close off the area immediately. Call the Massachusetts DEP's Spill Response Center at 888-304-1133, or your local fire department. To reduce volatilization, turn down the temperature below 65 degrees Fahrenheit. Open windows and ventilate the area. Surround and contain the spill as much as possible. For a release to the environment of one pound (approximately two tablespoons) or more, reporting to the state's Spill Response Center is required.

NEVER use a vacuum cleaner or broom to clean up a mercury spill as this causes mercury to vaporize into the air, causing greater potential for health risks. **NEVER** pour mercury down the drain. Mercury is heavier than water and may get trapped in the plumbing system and continue to vaporize into the room, causing potential health risks.

For more information, contact the Massachusetts Mercury Hotline at 1-866-9MERCURY (1-866-963-7287).



Additional Information

The University of Wisconsin's Solid and Hazardous Waste Education Center has developed a website called "Mercury in Schools." (See http://www.mercury-k12.org).

Through their "Rehab the Lab" project, King County Washington's Local Hazardous Waste Management Program developed a collection of "Least Toxic Chemistry Labs." (See http://www.metrokc.gov/hazwaste/rehab).