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Managing Chemical Wastes in School Labs

REASON TO DISPOSE OF A CHEMICAL

1. *It is expired*. Many companies now print expiration or purchase dates on their chemicals. Fisher Scientific recommends disposal after five years.
2. *Its condition has degraded*. For example, if a hygroscopic chemical has taken on water, or a container was not sealed properly, disposal is recommended.
3. *You don't use/need it*. Keep track of the chemicals you use in demonstrations and labs and dispose of those no longer required.
4. *It carries hazards to your laboratory instruction that outweigh the benefits.*

CHEMICALS THAT CAN GO INTO THE TRASH

Certain chemicals can be thrown away in the trash or dumpster at school. It is recommended that only small amounts be disposed of at any one time (no more than 5 or 10 lbs.), and only in tightly sealed containers. When you throw away chemicals in a lab trashcan, always alert maintenance staff so they can avoid any accidents in handling them.

To be safely disposed of in regular trash, an item must be:

1. Nonradioactive
2. Nonbiological hazard
3. Neither flammable, reactive, corrosive, nor listed as hazardous waste per the Environmental Protection Agency (EPA)
4. Not a substance that may negatively affect human or environmental health
5. Not a carcinogen

Safety Data Sheets have sections for each of these concerns, so the information is not difficult to find. However, this is a time-consuming process, and you will likely find some chemicals that cannot go into the trash. What do you do with these? It is recommended to set them aside in boxes for hazmat pickup, but be careful: compatibility is an issue, even in disposal.

INCOMPATIBLE CHEMICALS

The following table is useful not only for storing chemicals safely, but also for placing chemicals in boxes or bins for disposal. As most high schools do not have frequent pickup of hazmat materials, old chemicals must sometimes be set aside for up to a year until pickup occurs. Consult this table to determine which chemicals may or may not be stored together. Download the full list of Incompatible Chemicals in PDF.

CHEMICALS THAT *CANNOT* GO DOWN THE DRAIN

There are several chemicals that absolutely SHOULD NOT go down the drain:

- Halogenated hydrocarbons (chlorofluorocarbons, chlorocarbons, etc.)
- Nitro compounds (nitroethane, nitrobenzene, etc.)
- Mercaptans, also known as thiols (methyl mercaptan/methanethiol, etc.)
- Flammables immiscible in water (hexane, toluene, etc.)
- Explosives (azides, fulminates, etc.)
- Water-soluble polymers (sodium polyacrylate, guar gum, casein, etc.)
- Water-reactive materials (lithium, sodium, and other alkali metals)
- Chemicals with a foul odor
- Toxic chemicals (carcinogens, mutagens, teratogens; indicated on SDS)
- Substances with a boiling point lower than 50 °C
- Insoluble solids, including hair, ash, sand, metal, or glass
- Oil or grease
- Mixture that includes any of the above substances

Many of these substances will require hazmat pickup. However, for those that can go down the sink, remember to use the laboratory sinks ONLY, and never a storm drain that goes directly to a water source without treatment. When flushing chemicals, be sure ALL of one chemical is gone from the sink before a second chemical is flushed. Run an excess of water after disposing the chemical, even up to 100 times the original volume of which you disposed. On any given day, only dispose of a few hundred grams or milliliters, and check with your maintenance staff before disposing larger amounts.

WHICH CHEMICALS ARE ACCEPTABLE FOR DRAIN DISPOSAL?

- Those that meet criteria for trash disposal
- Acids and bases with a pH between 5.5 and 10.5
- Combinations of the cations and anions listed to the right (unless they are strong acids or bases). **Please note**, if you have a compound that is not a pairing of a cation and anion on this list, it is NOT safe for drain disposal and should be disposed with hazmat pickup.

Cations	Anions
Al^{3+}	HCO_3^-
NH_4^+	HSO_3^-
Ca^{2+}	BrO_3^-
Cs^+	Br^-
H^+	CO_3^{2-}
Li^+	ClO_3^-
Mg^{2+}	Cl^-
K^+	OH^-
Na^+	IO_3^-
Sr^{2+}	I^-
Sn^{2+}	NO_3^-
Fe^{2+}/Fe^{3+}	NO_2^-
Ti^{3+}/Ti^{4+}	O^{2-}
Zr^{2+}	PO_4^{3-}
	SO_4^{2-}
	SO_3^{2-}
	BO_3^{3-}
	$B_4O_7^{2-}$
	OCN^-
	SCN^-

WHAT TO PURCHASE TO UPDATE STORAGE

Be certain your lab has dedicated cabinets for flammables and corrosives. If not, this is an important purchase. Along with your chemicals, be sure to order new bottles for lab use. Keep or purchase extra glass bottles with tight-fitting lids for solvent disposal. Something that is often forgotten is labels; purchase new labels to keep careful record of your chemicals and their wastes.

HELPFUL TIPS

- Contact a local college or university for assistance and possible hazmat pickup.
- After the AP exam, your AP students could find and look over the SDS for pertinent information.
- Do one shelf at a time.
- Inform maintenance staff of your disposal activities.
- Keep a list of incompatible chemicals in your storeroom and do a quick check each time you rearrange for disposal.

HELPFUL LINKS

EPA Hazardous Waste Management for School Laboratories and Classrooms

EPA Toolkit for Safe Chemical Management in K-12 Schools

EPA Regulations for Hazardous Waste Generated at Academic Laboratories

Managing Chemical Wastes in the High School Lab

In-Lab Disposal Options

Managing Laboratory Hazardous Waste