



Chemical Storage and Waste Collection at CCSD

Presented by

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and

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Chemical Storage

Don't let this happen in your schools.



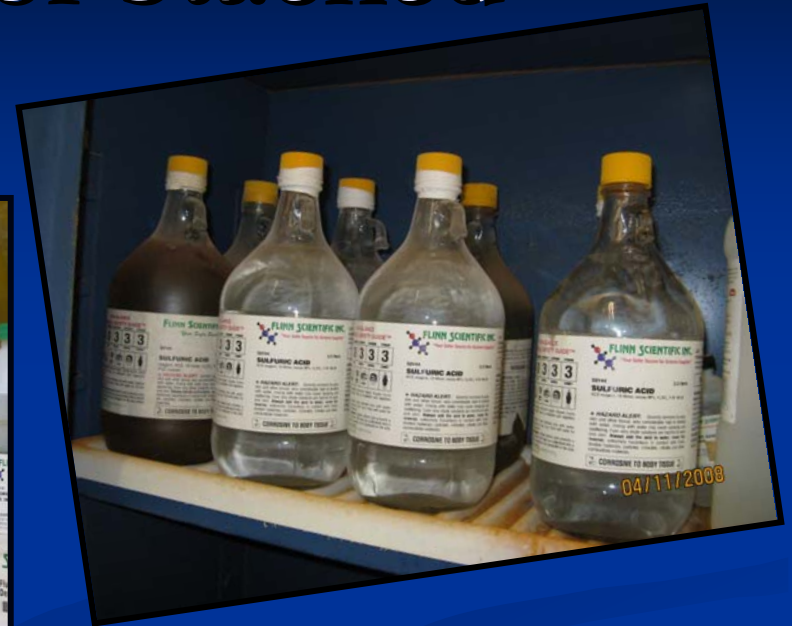
Chemical Mismanagement

- The EPA has identified several factors involved in the mismanagement of chemicals:
 - Chemicals in poor condition or expired
 - The overabundance of chemicals in storage or stacking of chemicals
 - Hazardous or potentially hazardous chemicals
 - Unknown chemicals or improperly labeled chemicals
 - Chemicals stored alphabetically or with incompatibles
 - Chemicals stored in inappropriate containers
 - Chemicals stored on deteriorating, unstable, or inappropriate shelves or cabinets

Chemicals in Poor Condition or Expired



Overabundance or Stacked



Appropriate Quantities

How much will they use in two years?

[UFC 80.301(n)]

■ Inorganics

- Solid inorganics: metal salts, elemental metals
 - 0.5-2kg depending on their need
- Liquid inorganics: Concentrated Acid and Base
 - 1 case=15 liters=six 2.5 liter bottles (Nitric Acid = 5 liters)

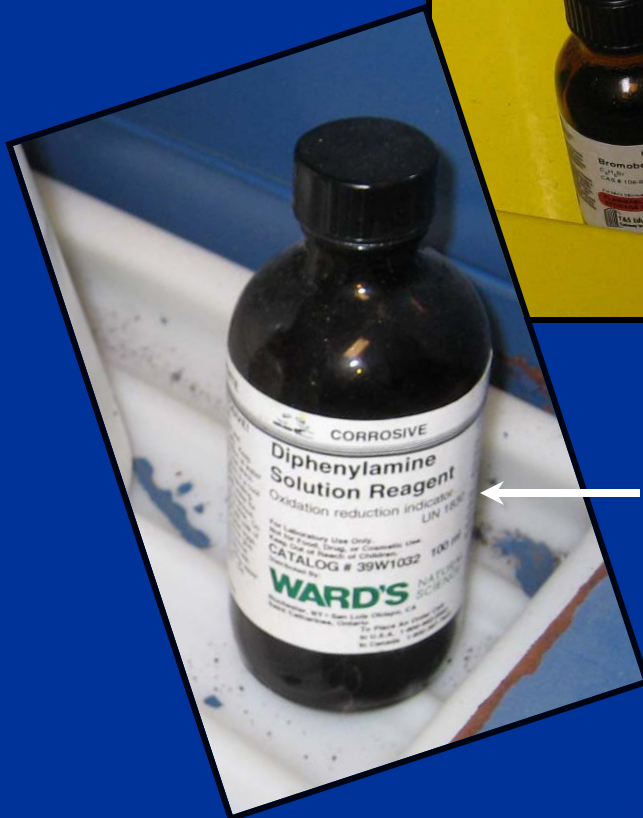
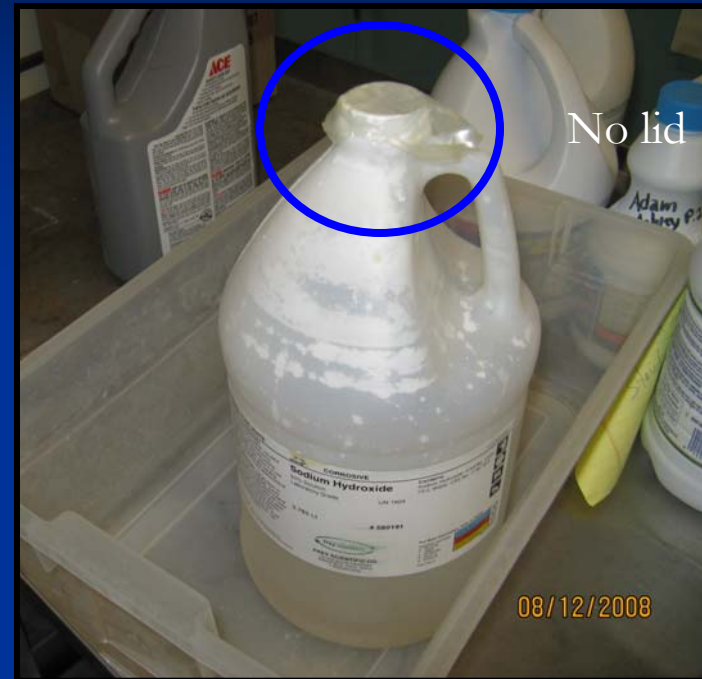
■ Organics

- Solid organics: any
 - Less than 1kg
- Liquid organics: solvents
 - Most solvents should be less than 1 liter
 - Some solvents no more than 8 liters (this is two large 4 liter amber bottles)

These are approximate quantities, dependent on your need.

Hazardous or Potentially Hazardous

Bromobenzene and Bromoform
These are Carcinogens



ROUTE OF EXPOSURE

Skin Contact: Causes skin irritation.

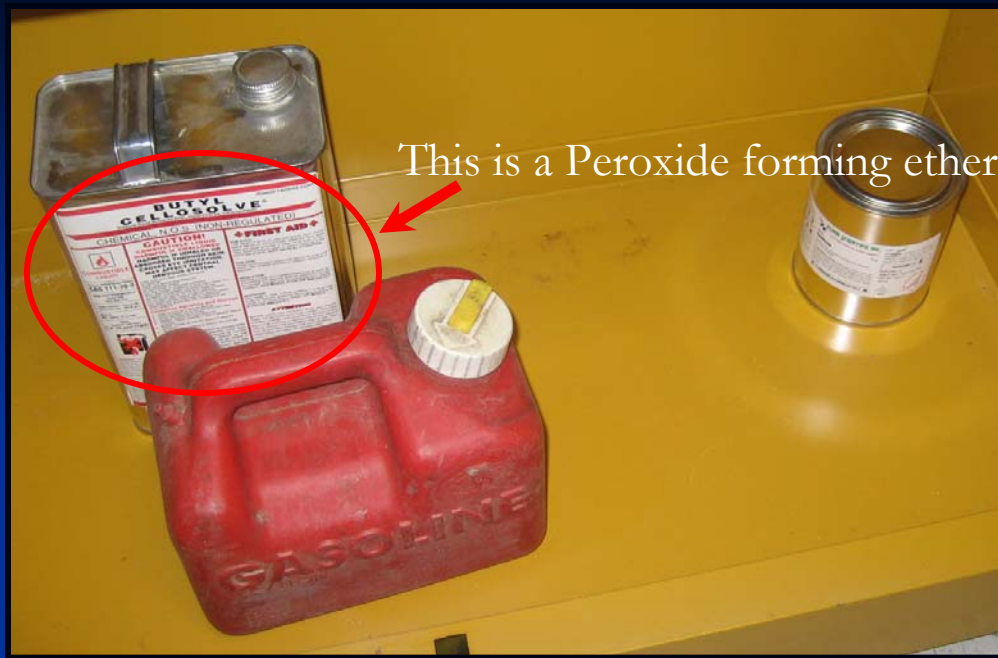
Skin Absorption: Toxic if absorbed through skin.

Eye Contact: Causes eye irritation.

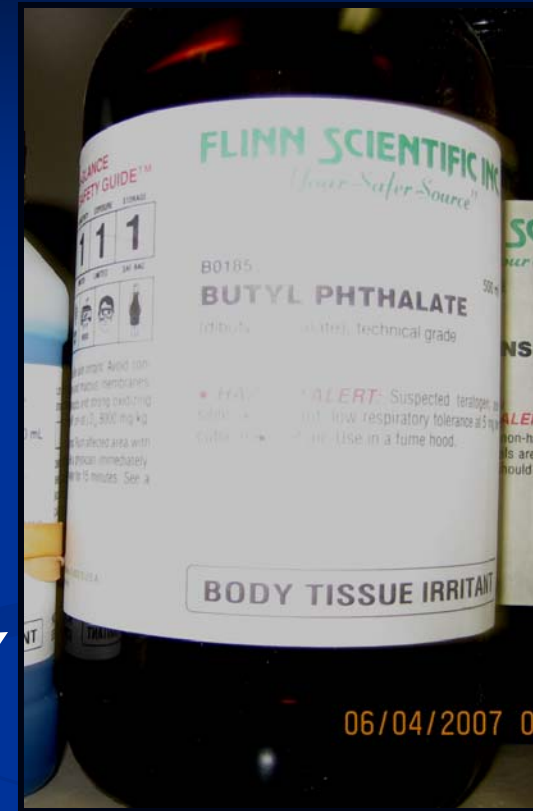
Inhalation: Toxic if inhaled. Material is irritating to mucous membranes and upper respiratory tract.

Ingestion: Toxic if swallowed.

Target Organs: Liver, kidneys, blood, bladder, heart and spleen

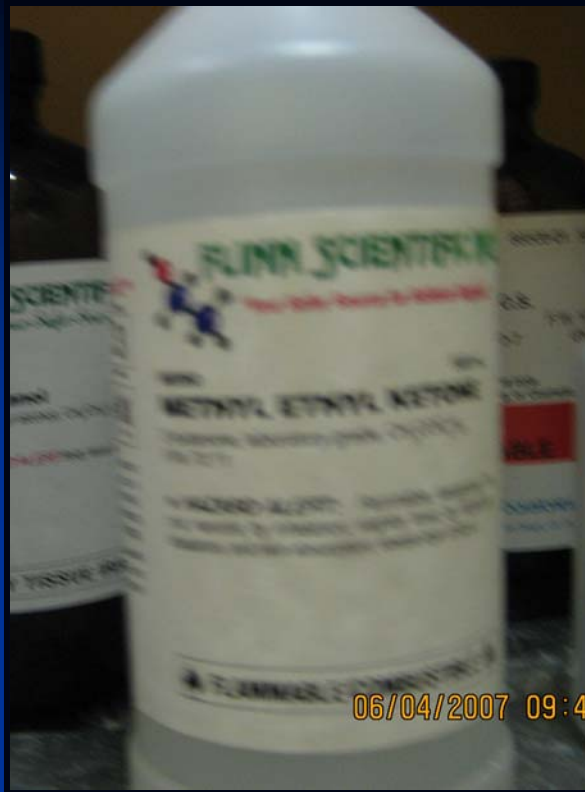


This is a Peroxide forming ether

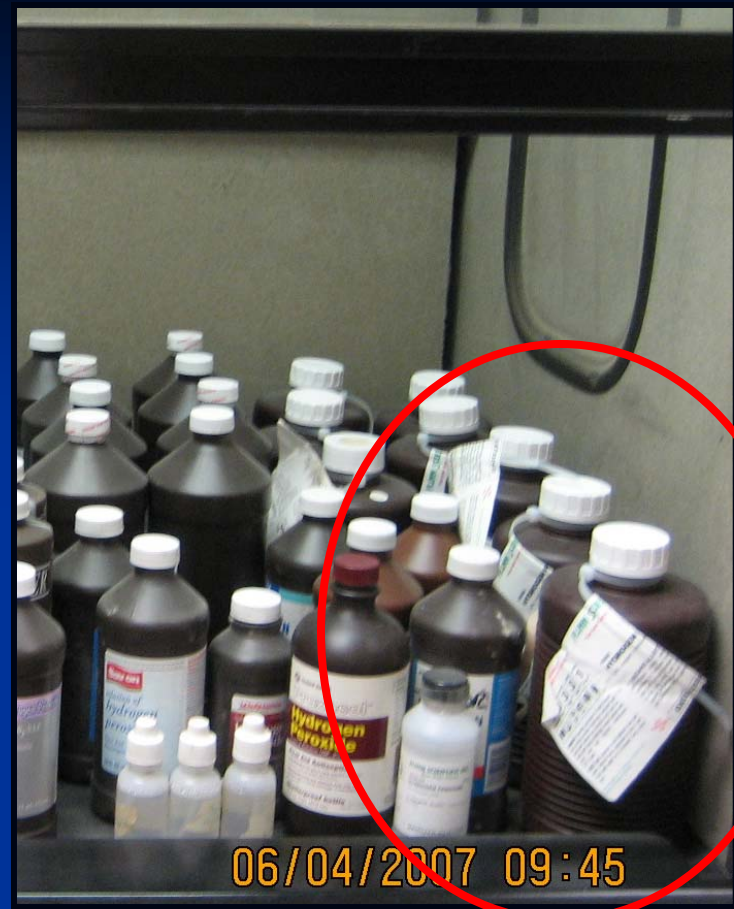


■ EMERGENCY OVERVIEW

- Toxic.
- May cause harm to the unborn child. Irritating to eyes, respiratory system and skin. Very toxic to aquatic organisms.
- Possible risk of impaired fertility.
- Target organ(s): Eyes. Kidneys.



- Methyl Ethyl Ketone
- It is unlawful to vend, sell, deliver or otherwise furnish poison to a person under 18 years of age. (NRS 454.030)

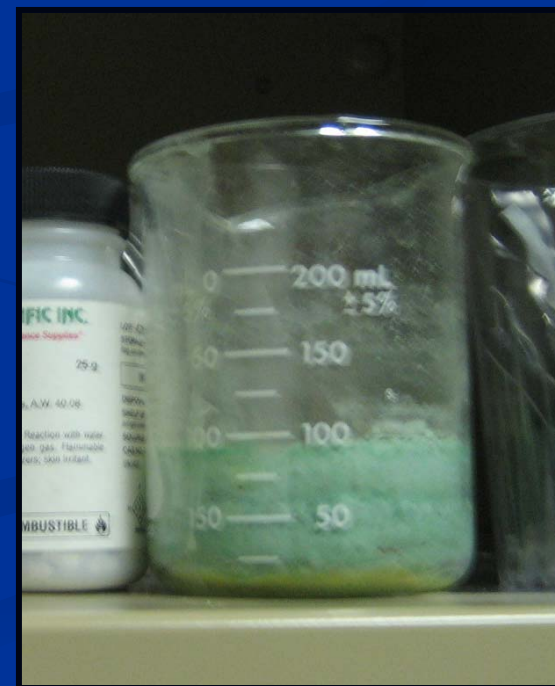
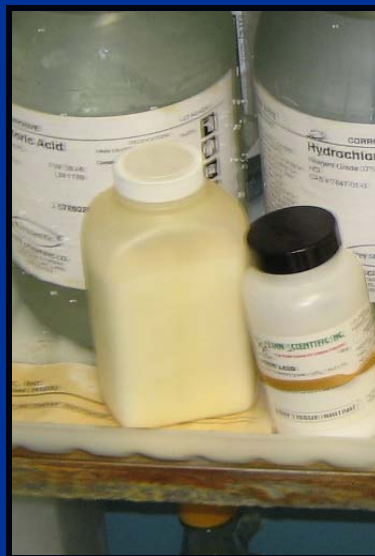


- This is 30% Hydrogen peroxide
 - H_2O_2 above 6% must be refrigerated in an explosion proof refrigerator

Hazardous Chemicals

- Some chemical dangers outweigh their educational value, careful consideration should be given before bringing them to your campus
- Avoid carcinogens and mutagens when possible
- State law prohibits certain poisonous chemicals for children under the age of 18 (MEK)
- If you are using ethers in you labs they require annual inspection to check for the growth of peroxides
 - Peroxide detection dip strips are available from most chemical companies
 - Bottles must be dated and initialed when inspected
 - If peroxides have formed contact your waste management for disposal
 - See guidelines provided

Unknown or Improperly Labeled



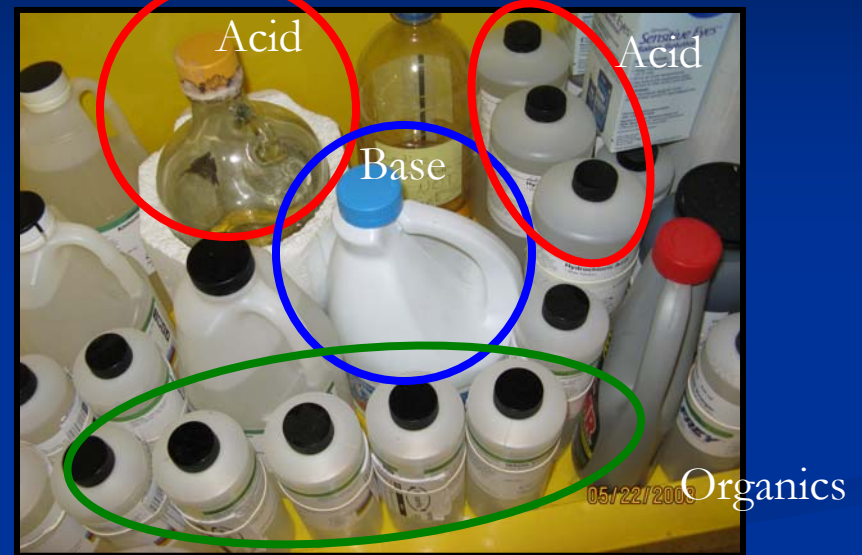
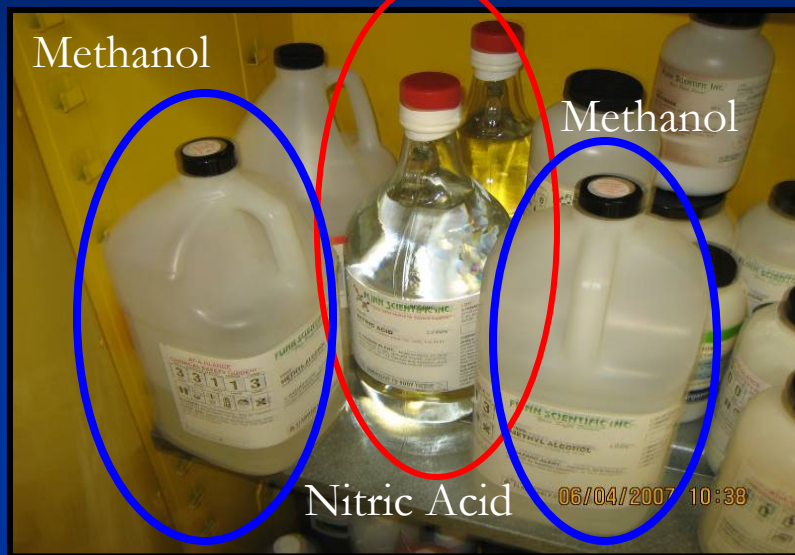
Labeling

Labels should contain the following information: (29 CFR 1910.1200)

- Commercially Packaged Chemicals
 - Chemical name – MSDS name
 - C.A.S. number
 - Manufacture name
 - Handling and hazard information
 - Date received, date opened, use by date
- Secondary Containers
 - Chemical name – MSDS name
 - C.A.S. number if available
 - Manufacture name or person who prepared the solution
 - Handling and hazard information
 - Concentration or purity
 - Date prepared, use by date

All labels should have a good adhesive back, be written in permanent marker, and be clear and visible. Old labels should be replaced.

Chemicals Stored Alphabetically or With Incompatibles



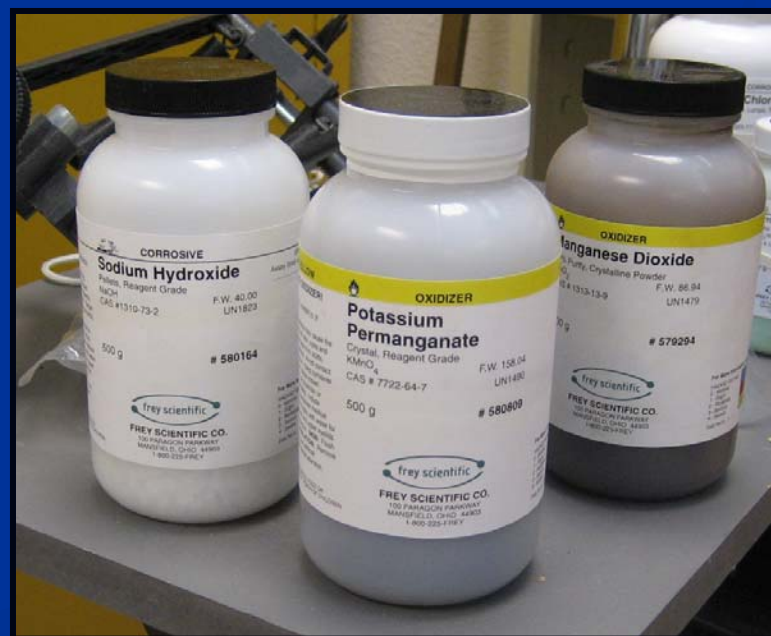


Aluminum Chloride, Anhydrous
CONDITIONS OF FLAMMABILITY
Water hydrolyzes material liberating acidic gas which in contact with metal surfaces can generate flammable and/or explosive hydrogen gas.

NOTE: Vinegar is 95% water. Also note that AlCl_3 is salting out of its container



Organics mixed with inorganic



Corrosives with oxidizers

Minimum Storage Requirements

- First sort chemicals into organic and inorganic by classes.
- Alphabetize chemicals within their classes or categories.
- Chemicals should never be stored on the floor.
- Special Notes:
 - Ammonium nitrate must be separated from all other chemicals.
 - Nitric Acid must be **ISOLATED** in an acid cabinet.
[UFC 80.301(a)]
 - Hydrogen Peroxide >6% must be refrigerated.
 - Flammable/Combustible liquids in excess of 10 gallons are stored in approved safety storage cabinets or safety cans.
[UFC 80.301(n), UFC 79.202(c), NFPA sect. 4-3.1, NFPA #30 sect. 45.4.2]
 - Concentrated acids and bases are isolated from each other and stored in approved storage cabinets. [UFC 80.301(a)]

Chemical Storage Patterns

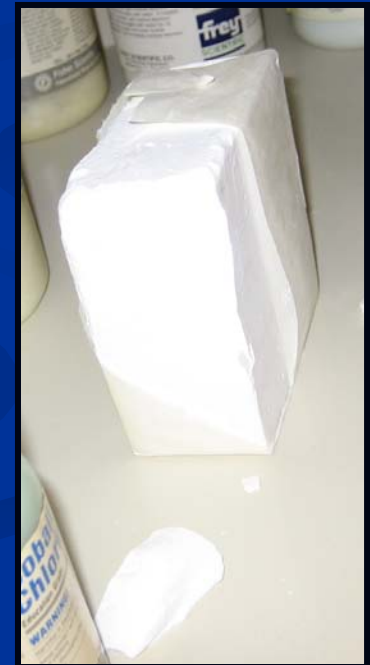
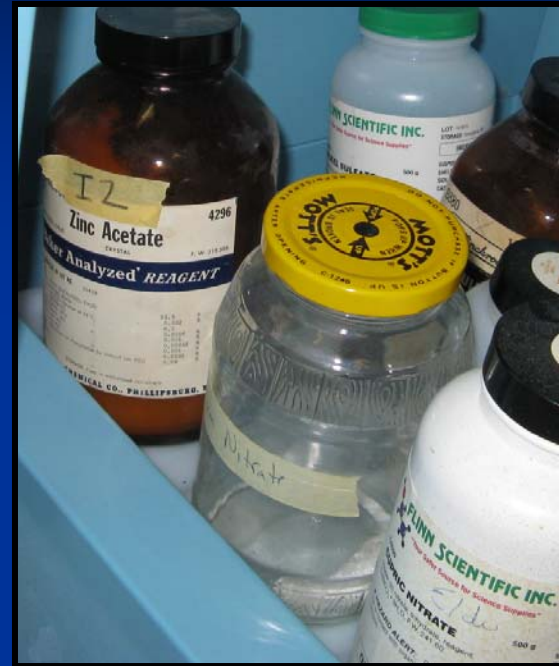
[UFC 80.301 (n)]

- Two helpful guides
 - Safe Lab – School Chemistry Laboratory Safety Guide
 - U.S. Consumer Product Safety Commission
 - Center for Disease Control and Prevention
 - National Institute for Occupational Safety and Health
 - Department of Health and Human Services

www.cdc.gov/niosh
 - FLINN Scientific

www.flinnsci.com

Inappropriate Containers



Inappropriate Storage Facilities



Additional Concerns

- Refrigerators
- Fume Hoods
- Safety Equipment
 - Eye washes and showers
 - Eye Protection
 - Fire extinguishers
- Lecture Bottle Storage
- General housekeeping
- Other

Refrigerators



- Never store food in a chemical storage area
- If you are storing Ethers or Hydrogen peroxide greater than 6%, it must be stored in an explosion proof refrigerator

Fume Hoods



Safety Equipment – Eye Washes and Showers

- Safety showers and eye wash stations should be activated weekly and inspected annually. (ANSI Z358.1-2004)
- Approved eyewash must be located within 10 sec. of storage area. [29 CFR 1910.151(c)]



Eye Protection

- Eye Protection must be worn at all times when chemicals are in use, if just one student is using chemicals in the lab then all of the students in the lab must wear eye protection
 - Goggles or Full Face Shields
 - Should be worn when using any chemical whose concentration is above 1 Molar.
 - Goggles must have shielded vent covers
 - Safety Glasses or Eye Shields
 - Can offer protection, however goggles are better.

Fire Extinguishers

- An ABC fire extinguisher must be available in any chemical storage area



Lecture Bottle and Compressed Gas Canister Storage



Compressed Gases

- Compressed gas cylinders, either empty or full, must be secured with at least one brace, however, two braces are best.
- Lecture bottles should be secured in a base or stored so that they can not fall or roll into danger.
- Gas canisters must be properly stored and in good condition. (OSHA 1910.110)
 - Oxidizing gases must be stored away from flammable gases by 20 feet or a 30 minute firewall that is 5 feet high.
 - Gases must be stored in cool, dry, well-ventilated area, away from incompatible materials and ignition sources.
 - Temperature of cylinders must stay between 50-125°F.
 - Store empty cylinders separately from full cylinders.

General Housekeeping



Chemical Hygiene Plan (CHP) and Chemical Inventories

- OSHA's *Occupational Exposure to Hazardous Chemicals in Laboratories Standard* (Title 29, Code of Federal Regulations, Part 1910.1450) mandates the requirement of a CHP
- Chemical Spill Control Policy
- Chemical inventories must be done on a regular bases (at least twice a year) and must be made available to CCSD administration and SNhD

Chemical Waste

Inorganic Waste

- Inorganic Waste to Collect
 - All metal salt waste except Sodium and Potassium
 - If you collect these make sure to label for them
 - Separating out Silver, Mercury and Lead waste will reduce the cost of disposal
 - Consider using a label like this one

CIRCLE ALL THAT APPLY

Aluminum	Barium	Bismuth
Cadmium	Calcium	Chromium
Cobalt	Copper	Iron
Lead	Lithium	Magnesium
Manganese	Mercury	Molybdenum
Nickel	Potassium	Silver
Sodium	Strontium	Tin
Zinc		

Organic Waste

- All Organic Waste must be collected
- Two Types
 - Non-halogenated Waste
 - Halogenated Waste
- When possible separate out the halogenated waste this will save on disposal cost
- The key is “Zero Discharge” of all waste

Reduction of Waste

- Processing Waste
 - Once collected it can not be processed
 - If processing is part of laboratory learning experience, some processing can take place, so add supplemental instruction for the students when appropriate
- Perform experiments in micro-scale
- Instruct students to rinse beakers and spot plates with wash bottles using only a small amount of water, so as not to add unnecessary water

Collection of Waste

- Bottles must have screw tops for waste collection
 - Old reagent bottles work well
 - Milk jugs can also work for inorganic waste
 - Gallon jugs can be purchased from chemical supply companies
 - Waste disposal carboys can be purchased from chemical supply companies, however you are unlikely to have them returned from your waste company

Collection of Waste Cont.

- Bottles need to have secondary containment
 - Buckets with flat bottoms work great
 - Halloween buckets used for candy work great and are cheap
- Use a funnel during lab but place the lid on the bottle at the end of lab
- Keep current waste bottle in hood
- Store filled bottles under one centralized hood
 - Keep bottles in secondary containment, bus tubs work great for this
 - Keep secure from students

Labeling of Waste

- Label should have the following information
 - Name of school and address
 - Generator Name – instructor and lab
 - Department
 - Building and Room Number
 - Accumulation Start Date – waste must be gone from your campus within one year of start date
 - Contents – list everything in the bottle
 - Physical State – Solid or Liquid
 - Hazardous Properties:
 - Toxic, Flammable, Reactive, Corrosive (provide pH), Other

Questions?

References and Additional Resources

- ANSI Z358.1 Compliance Checklist:2004
- *Chemical Handler's Manual : A Guide to Chemical Control Regulations.* U.S. Department of Justice: DEA. Jan 2004
- *Environmental Management Guide for Small Laboratories:* EPA. May 2000
- *FLINN Scientific Chemical and Biological Catalog Reference Manual.* 2007
- *Planning for Environmental Health and Safety Issues.* PowerPoint presentation: FEMA
- *School Chemistry Laboratory Safety Guide.* NIOSH. Oct. 2006