1. WHAT IS NOT A WASTE MATERIAL?

1.1. Any materials that can not be reused, or is spent and that must be disposed of. Material that is still "good" or "reusable" is not waste. Material that can be redistributed to other KSU Labs or areas is not waste.

2. WHAT IS A HAZARDOUS WASTE?

2.1. A Hazardous Waste is a waste material that meets one or more of the following definitions or is otherwise dangerous to human safety and/or the environment:

2.2. **FLAMMABLE / IGNITABLE:** Any material having a flashpoint of less than 140 degrees Fahrenheit/60 degrees Celsius. This will include most non-halogenated solvents. Water soluble solvents such as ethanol and acetone are also covered by this regulation if the flashpoint of the material or the mixture is below 140 degrees Fahrenheit/60 degrees Celsius. Any material which by its nature is considered to be a flammable solid such as Sodium Metal, Solid Naphthalene, and Nitrocellulose.

2.3. **TOXIC:** Any material which by nature of its active ingredients is considered to be a poison, carcinogen, mutagen or other reproductive hazard, or is capable of causing harm to the environment.

2.4. **CORROSIVE:** Any material having a pH of less than 2 or more than 12.5 must be treated as hazardous waste and cannot be disposed of in the sanitary sewer without first being neutralized, provided it has no other dangerous properties such as toxicity.

2.5. **REACTIVE:** Any material that is unstable, explosive, water or air reactive, strong oxidizer, organic peroxide, cyanide and sulfide bearing materials that release toxic gases in contact with acid.

2.6. **BIOHAZARDOUS:** Human or Animal tissue or fluids that are contaminated or may be contaminated with pathogenic organisms and/or toxic chemicals. Tissue or fluids that have been thoroughly sterilized by autoclaving, chemical sterilization or other methods are not considered to be biohazardous waste, but may still need special disposal.

2.7. **LISTED WASTE**: Waste that is listed on the non-specific sources (F-list), the specific sources (K-list), the certain discarded products list (U-list) or the acutely hazardous discarded products (P-list).

3. LABELING OF WASTE CONTAINERS

3.1. **All** hazardous waste containers must have a label that states **"HAZARDOUS WASTE,"** and the specific names of the wastes. Do not use abbreviations or chemical formulas.

4. PROPER CONTAINERS

4.1. Generally the best containers for hazardous waste are the ones that the materials originally came in. Other containers, such as 5 gallon jugs are acceptable as long as the containers and any residue left inside are compatible with the waste material. All containers must have tight-fitting lids, no corks or ground glass stoppers. Parafilm is not a substitute for a tight fitting lid.

4.2. When not actually pouring waste into or out of the container the top must be securely fastened. You cannot leave a funnel sitting in the container. The only exception to this is for processes such as HPLC that runs and adds waste to the container continuously. When the HPLC process is not running the top must be on the container.

5. **STORAGE AND COMPATIBILITY**

5.1. At no time should there be more than 55 gallons of waste allowed to accumulate in any area prior to pickup. At no time should there be waste stored over drains or in the sinks. Waste must be stored in a secure place, where it is always under the control of lab personnel. Waste stored outside the lab must be stored in the immediate vicinity of the laboratory or work area, kept behind lock and key, inspected, and kept in a clean location. Waste should not be stored with "good" chemicals. You must store only compatible wastes together in same containers as waste chemicals are accumulated.

6. The examples below are for **incompatible wastes:**

6.1. ELEMENTAL METALS/HYDRIDES AND ACIDS/ALCOHOLS
CYANIDES AND ACIDS
SULFIDES AND ACIDS
OXIDIZERS AND FLAMMABLE
ACIDS AND BASES
ACIDS AND FLAMMABLE
ACIDS AND CHLORINE COMPOUNDS
AMINES AND CHLORINE COMPOUNDS
WATER OR AIR REACTIVES AND ANYTHING
PHENOL AND FORMALDEHYDE

6.2. This list is not all inclusive if in doubt do not mix! You should always consult the Material Safety Data Sheet (MSDS) or other chemical information sources for compatibility information. Halogenated (chlorinated) and mercuric waste chemicals should be kept separate from non-halogenated wastes. Acid waste must be kept separate from basic waste.

7. **DISPOSAL OF CHEMICALS**

7.1. Waste generated from labs in Smith, SRL and Williams Halls are to be stored in the Waste Storage room located off of the Williams Hall loading dock for pick up. Waste generated in labs located in Cunningham Hall are to be stored in the Waste Storage Room in Cunningham A basement. Wastes form the LCM Building are to be kept in the generating lab until picked up by the waste hauler. Call Jim Dunlap, ext. 2333 when you have a full container of waste to arrange for pick up.

8. **SAFETY**

8.1. When handling hazardous waste take extreme care to ensure personal safety and to prevent spills and accidents. Small spills of known materials should be immediately taken care of by personnel in the labs or work areas. If the spill involves a hazardous waste the debris and clean up materials will be a hazardous waste also.

9. **For large spills** the Department Chemical Hygiene Officer, Department Safety Officer and the Manager, Laboratory Safety (Tom Bialke, 4996) should be called.

9.1. If the spill occurs after hours/weekends/holiday, call 911 from any campus phone.

9.2. If the spill or release involves a dangerous or potentially dangerous material then evacuate the immediate area, shut all doors and window if possible, and call 911 from any campus phone. You should stay on the line until told to hang up by the KSU Dispatcher. Persons involved with the problem should remain in the area at a safe distance away to provide information on the materials involved and procedures going on in the area.

10. **HAZARDOUS WASTE MINIMIZATION**

10.1. Federal and State law requires that all generators who create hazardous waste come up with strategies to cut both the volume and toxicity of their wastes. Strategies to minimize the waste that your area generates are:

10.2. **Substitution** - replacing toxic or other hazardous materials used in processes with less or non-hazardous substances. This is the best way to minimize your hazardous waste responsibilities. Example: using alconox instead of sulfuric/chromic acid glass cleaners.

10.3. **Micro Chemistry** - using minute quantities and small scale chemistry instead of large amounts of chemicals in laboratory experiments.

10.4. **Redistilling** - reclaiming solvents for reuse by a distilling process in the laboratory. This also is a great way to cut costs as you cut the cost of replacement solvents drastically.

10.5. **Recycling/Redistribution** - chemicals that are unused or unopened can often be redistributed to other labs or work areas for reuse saving both disposal costs and new product costs for someone else.

10.6. **Laboratory Destruction** - Some chemicals can be neutralized or made exempt from hazardous waste regulations by treatment or alteration in the laboratory. This **must** be done as part of the experiment and **must** be done according to published, recognized methods. An example of lab destruction would be neutralizing of strong acids or bases with a buffering solution as part of an experiment that required or created such materials.

10.7. **Sink Disposal** - Chemicals **NEVER** should be put down the drain because of safety concerns and the problems the chemical may cause at the City of Kent waste water treatment plant. If you have a chemical that you think can be safely disposed of down the drain, call Tom Bialke, 4996 to obtain authorization.

11. Revision History

Rev #	Date	Reason For Change	Approval
2	March 13, 2014		

Laboratory Waste Disposal

Table of Contents

Introduction

Kent State University is dedicated to the maintenance of a safe, healthy and productive workplace environment. As part of our commitment to environmental health and safety, we strive to ensure that our students, faculty and staff meet or exceed state and federal regulations concerning hazardous wastes, laboratory management and worker safety.

Proper storage and disposal of laboratory waste is a key element of this commitment. If you generate or handle wastes, it is incumbent upon you to follow the established guidelines concerning the proper disposal of hazardous waste. To ensure compliance with these rules, both the University and EPA perform surprise inspections of our laboratory facilities on a routine basis. Violations can result in substantial fines (up to $12,000 or more), or even the closing of the laboratory.

The purpose of this document is to assist you in proper handling and disposal of hazardous chemical waste. If at any time you are unsure how to deal with wastes, immediately consult your supervisor, the KSU Assistant Director for Health and Safety (ext 2-3111 or the Manager of Laboratory Safety (ext 2-4996).

The 5 Most Common (Deadly and EPA-Fineable) Errors In Waste Handling

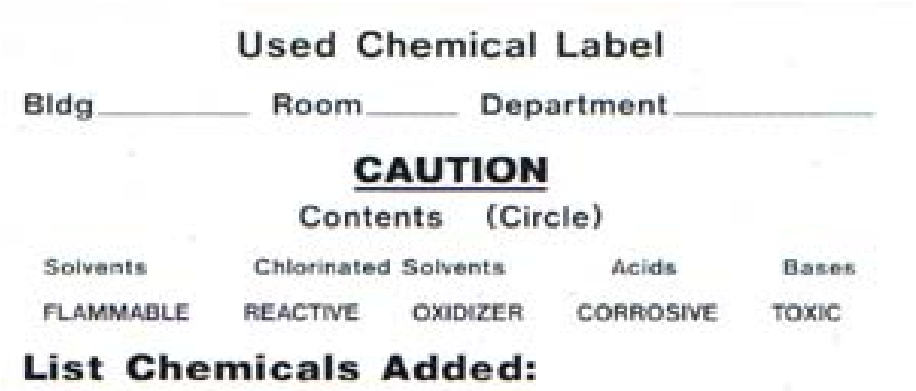
Even experienced laboratory workers have a tendency to become lax or complacent in the laboratory when they are "just cleaning up". Unfortunately, "just cleaning up" involves hazardous chemicals, and if these are improperly segregated or disposed of the results can have tragic circumstances. Most serious laboratory accidents occur during cleanup, when one's attention is more focused on going home or out to eat rather than on the potential hazard at hand.

Proper management of hazardous waste does not need to be an all-consuming task, but it does take discipline, vigilance and common sense. Listed here are 5 of the most common mistakes in hazardous waste handling in the laboratory. Print this list out and make sure that none of these are occurring in your laboratory!

1. **Improper Labeling of Waste**

   Typical examples include:

   a. Failing to label a waste bottle. If the contents of the bottle are not listed, the next person to use the bottle could accidentally combine incompatible chemicals, causing a fire and explosion. **ALL** bottles of chemical waste must held in the laboratory must have a Department Used Chemical Container Label:



b. and when placed in the appropriate Waste Storage Area designated for your laboratory place the a Hazardous Waste label over the USED CHEMICAL LABEL name and date it:

c. Storing waste in the waste storage area lacking the words "Hazardous Waste". Only these **exact** words must be used. "Organic Waste", "Xylene Waste" etc. is unacceptable. If something is not really waste, do not put the word "waste" on the bottle. Label it "used" etc.

d. Scratching out the former contents of the bottle and writing "Waste" on the bottle. You must remove or totally deface the old label so there is no confusion over the contents. "Waste" is an unacceptable term to the EPA or OSHA -- the words "Hazardous Waste" must appear on the bottle. And (as in a), always put a red Hazardous Waste sticker on the bottle.

2. **Improper Segregation of Waste**

Typical examples include:

a. Mixing incompatible chemicals in a waste container. For example, nitric acid and ethanol can form an explosive mixture

b. Storing acids and bases in the same cabinet. Leaking containers or a spill could cause a violent reaction, which would release large quantities of toxic gases.

c. Storing acids and organic waste in the same cabinet. In the event of accidental mixing, a catastrophic fire or explosion could result.

3. **Improper Storage of Waste**

   Typical examples include:

   a. Storage of waste in a fume hood where reactions are being carried out. If your reaction gets out of control, the waste bottle could explode and lead to a catastrophic fire or mixing of incompatible chemicals. **Always remove waste bottles from hoods where reactions are being performed**.

   b. Using metal cans for waste. Even near neutral pH, solids and liquids can easily corrode through metal cans in a surprisingly short period of time. Use only glass or polyethylene containers for waste.

   c. Storing flammable waste containers on a bench or floor. Store your waste containers in a cabinet, preferably an explosion-resistant solvent cabinet.

   d. Storing waste bottles in or near a sink or floor drain. This could allow toxic chemicals to enter the sewer, incurring the wrath of the EPA.

   e. Not placing the waste container in a drip pan or other type of secondary container.

4. **Failure to Cap Waste Bottles**

   Typical examples include:

   a. Leaving the cap off an organic waste bottle. The only time a cap should be off a waste bottle is when you are actually putting waste into it. If you are afraid of a pressure buildup in the bottle, simply cap it loosely.

   b. Leaving a funnel in the waste bottle. This is unacceptable. A funnel can too easily be moved to an adjacent (incompatible) waste bottle and result in a fire or explosion. When you are done with it, cap it!

5. **Accumulation of Excessive Waste**

   Ideally, you should have **no more than ONE** bottle of each kind of waste in your laboratory. If the organic waste bottle is full, take it to the appropriate Waste Storage Room for your laboratory.

How To Segregate Waste In The Laboratory

Proper segregation of laboratory waste is essential to good chemical hygiene and a safe workplace environment. Many researchers often tend to put all of their wastes into the same cabinet or fume hood. Doing so can have disastrous results!

The guidelines for temporary storage of chemical wastes in the laboratory are really no different than those that you use for the storage of your usual lab chemicals. The most important rule is to make sure that any chemicals or wastes that stored together are compatible with each other!

Therefore, proper segregation of wastes involves making sure that wastes within a bottle are compatible, but it also means that you **should NEVER store the following types of wastes near each other**:

- Acids and bases.
- Organics and acids.
- Cyanide, sulfide or arsenic compounds and acids.
- Alkali or alkali earth metals, alkyllithiums etc. and aqueous waste.
- Powdered or reactive metals and combustible materials.
- Mercury or silver and ammonium containing compounds.
- This list is not comprehensive.

If a bottle broke in a waste storage area where incompatibles were present, the results could be disastrous. Remember: incompatible bottles of wastes should be stored in separate cabinets, or in separate secondary containers and preferably as far apart as possible!

Self-Auditing Checklist For Hazardous Waste Generators

ALL hazardous waste containers must comply with **ALL** of the following requirements at **ALL TIMES**. If any item on this list is not checked, you are in violation of State and Federal EPA regulations.

1. ☐ Is the container sound? (No cracks, rust or deterioration permitted).
2. ☐ Is the container compatible with the waste? (No metal cans, in particular).
3. ☐ Are the contents of the container compatible with each other?
4. ☐ Is the container properly labeled before being put in waste storage area, including the words **Hazardous Waste** and a date?
5. ☐ Are the contents of the container clearly listed?
6. ☐ Is container closed with a properly fitting cap? (Do not leave funnels in the mouth!)
7. ☐ Is the waste container located in the lab (not in a hallway or storeroom)?
8. ☐ Is there less than 55 gallons of waste in the laboratory?
9. ☐ Is the waste located away from floor drains or sinks?
10. ☐ If the container is full, it is being taken to the waste storage room for disposal.

WASTE CONTAINERS MUST BE CAPPED AT ALL TIMES

Taking Waste to the Waste Storage Room

1. When your waste in the waste storage room. Make sure that:
    - **ALL** waste containers have a proper "HAZARDOUS WASTE" label with start date.
    - ALL contents are listed.
    - The bottle or jar has a cap that fits tightly.
    - There are no old or extraneous labels on the container.
    - If liquid, there is at least 1" of room at the top of the container.
    - The outside of the bottle is clean and dry.
    - Incompatible wastes (ex. acids and organics) are not mixed.
    - Halogenated wastes are separate from "regular" organic wastes whenever possible (it is much more expensive to get rid of halogenated waste)!
    - The pH is known and listed on the disposal tag.
    - Follow Department procedures for notification and delivery of waste containers.
    - Departments that do not have provisions for Waste Storage are to contact Jim Dunlap, 2-3111 to arrange for pick up of waste containers.

Chemical Incompatibilities

The following are examples of chemical incompatibilities. This list should not be considered complete and persons unsure as to the status of a particular chemical are advised to refer to more recent literature, the manufacturer, as well as MSDS databases..

Chemical	Incompatibilities
Acetic acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Acetone	Concentrated nitric and sulfuric acid mixtures
Alkali and alkaline earth metals (such as powdered aluminum or magnesium, calcium, lithium, sodium, potassium)	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury (in manometers, for example), chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, finely divided organic combustible materials
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Any reducing agent
Azides	Acids
Bromine	See chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents
Carbon tetrachloride	Sodium
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
Chromic acid and chromium	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Copper	Acetylene, hydrogen peroxide

Cumene hydroperoxide	Acids (organic or inorganic)
Cyanides	Acids
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Fluorine	All other chemicals
Hydrocarbons	(such as butane, propane, benzene) Fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrocyanic acid	Nitric acid, alkali
Hydrofluoric acid (anhydrous)	Ammonia (aqueous or anhydrous)
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane, combustible materials
Hydrogen sulfide	Fuming nitric acid, oxidizing gases
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Sulfuric acid
Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy metals
Nitrites	Acids
Nitroparaffins	Inorganic bases, amines
Oxalic acid	Silver, mercury
Oxygen	Oils, grease, hydrogen: flammable liquids, solids or gases
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorus (white)	Air, oxygen, alkalis, reducing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulfuric and other acids
Potassium perchlorate (see also chlorates)	Sulfuric and other acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
Selenides	Reducing agents

Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulfides	Acids
Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals, such as sodium, lithium)
Tellurides	Reducing agents
Matter	Antimatter