How to Store and Dispose of Chemical Lab Waste

1. For waste generated in lab experiments and chemical reactions:
    a. Before adding chemical solutions to a waste container, determine if the reagent chemicals and or the products are hazardous (refer to your inventory sheet or SDS for each chemical).
    b. Determine if the experiment is demonstrating a chemical change - are the products hazardous?
    c. In small quantities, certain non-hazardous chemical solutions that are simply dissolved in water can be rinsed down the drain (ex. Sugar water or salt water).
    d. If you are unsure, err on the side of safety and set aside as Hazardous Waste

2. Select and use appropriate compatible containers:
    a. Lab waste will **NO** longer be picked up if it is in **food or drink containers**. Mesa County Hazardous waste has informed us they will no longer accept lab waste in this manner.

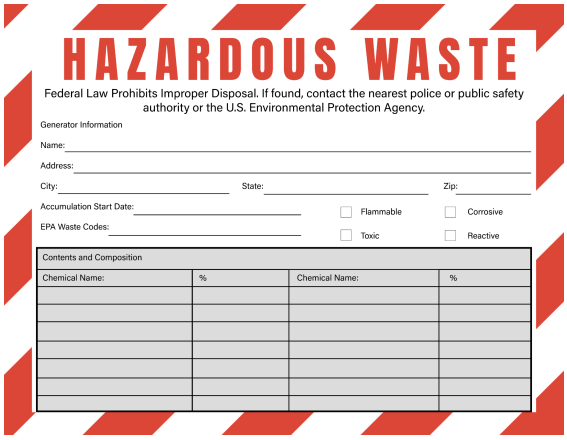
    b. Waste containers must be compatible with the types of chemicals that are being placed in them. Chemicals must not react with, weaken, or dissolve the container or lid. (ex. No corrosives in metal containers)
    c. Existing chemical containers that are <u>emptied and triple rinsed</u> can be reused as long as the original label is removed and replaced with the Haz Waste Label. Melissa (EHS) will provide Haz Waste Labels.

d. Containers must have screw caps or other secure closures. **NO** open beakers, parafilm or rubber stoppers.
e. Environmental Health and Safety has purchased some approved containers for collecting lab waste. Contact Melissa (EHS) when you need containers (**1 gallon, ½ gallon and 16 oz available**).

f. Never overfill the containers, or fill past the “neck” of the container. This will allow for expansion and prevent potential bulging or explosion.
g. DO NOT mix solids with liquids.
h. ONLY mix compatible wastes together. Please see the chemical compatibility information below.
i. Keep waste containers securely closed except when adding waste.

3. Designate a hazardous waste storage area:
    a. This should be inside your chemical storage area.
    b. Must be able to lock and keep unauthorized people out of the area.
    c. **NOT** inside a fume hood.
    d. **NOT** on the floor or near any drains.
    e. Keep waste containers in **secondary containment**, like a large bin or tupperware, to ensure any spilled waste is contained and to segregate incompatible chemicals.
    f. It's a good idea to label the designated area as your waste collection area.

4. Use an approved **Hazardous Waste Label:**
    a. Follow the below instructions for completing the hazardous waste label.
        i. Use a fine tip permanent marker to fill out the waste label
        ii. Use **FULL NAMES**, chemical formulas or abbreviations are not accepted.
        iii. List all components in the waste container, including water.
        iv. Indicate the percent concentration. You have the best knowledge of the contents of the container and an estimate by you is better than anyone else's guess. The percent must sum to 100%.
        v. Document on the label the date that the first chemicals were added to the container.


HAZARDOUS WASTE

Federal Law Prohibits Improper Disposal. If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.

Generator Information

Name:

Address:

City: State: Zip:

Accumulation Start Date: Flammable Corrosive

EPA Waste Codes: Toxic Reactive

Contents and Composition			
Chemical Name:	%	Chemical Name:	%

5. Collection and disposal:
    a. Containers with improper caps, leaks, outside contamination or improper labeling will not be accepted until problems have been corrected.
    b. Request a chemical waste pick by emailing Melissa directly once the container is full.

6. **DO NOT** illegally treat (treatment of waste requires a special permit) or dispose of any hazardous wastes, including:
    a. Disposal down any drain.
    b. Intentional evaporation in the fume hood.
    c. Disposal in the regular trash.
    d. Mixing to change its physical, chemical or biological characteristics to make it appear less hazardous. (ex. Adding absorbent to a flammable liquid to make it “solid”).

7. How to Dispose of empty chemical containers
    a. Ensure the containers are really empty or “RCRA” empty
        i. Liquids:
        - When tipped in any direction, no liquid drains from the container
        - The walls of the container have no encrusted material on them

        ii. Solids or non pourable (powders, sludges, grease and thick resins):
        - Interior is scraped clean with no residual material

RCRA empty simply means that you can rinse out and dispose of or recycle the container. Before disposing of or recycling an "RCRA" empty container, triple rinse with water.

Chemical Compatibility Groups:

Refer to Safety Data Sheets (SDS) for specific incompatibilities

Many chemicals in your lab may react adversely when combined, whether during an experimental protocol, accidentally when spilled, or when waste mixtures are improperly consolidated for disposal. It's recommended that incompatible chemicals are stored in separate areas of your lab when feasible. It's impossible, of course, to cover all reaction hazards in this document, but here are some general suggestions.

Separate acids from

Bases (possible violent exothermic reaction)
Most metals (production of flammable hydrogen gas)
Cyanides (forms toxic and flammable hydrogen cyanide gas)
Sulfides (forms toxic and flammable hydrogen sulfide gas)
Azides (may form explosive hydrazoic acid)
Phosphides (may form toxic and flammable phosphene gas)
Oxidizers (may form toxic and/or explosive compounds)

Separate oxidizers from

Acids (may form toxic and/or explosive compounds) (For example: concentrated sulfuric acid mixed with chlorates or perchlorates forms explosive compounds)
Organic materials (especially when mixed with flammables, may ignite)
Metals (may form explosive compounds)
Reducing agents (for example: boranes, hydrides, sodium hydrosulfite, etc.)
Ammonia (anhydrous or aqueous)

Separate water-reactive chemicals from

Aqueous solutions and in many cases just the moisture in the air (for example: metal hydrides, alkali metals and certain metal dusts in moist air will form hydrogen gas and ignite; halosilanes and acid halides will react with water to form toxic acid gasses)

NOTE: For more clarification of these hazard goups and potential chemicals that you might have in these groups, refer to the INORGANICS and ORGANICS tables below.

Examples of potential D51 chemicals in different reactive groups:

**note this list does not encompass all possible chemicals in D51 inventory. The reactive group names are based on FLINN's Compatible family codes.*

INORGANICS

I1	Metals	● Lead, Zinc, Nickel, Magnesium, Silver, Tin
	Hydrides (H^-) (many are **strong reducers** and are air and water reactive)	● Water, Ammonia, Sodium borohydride, Aluminum hydride, Calcium hydride, Sodium hydride, Potassium hydride
I2	Acetates ($CH_3CO_2^-$)	● Aluminum acetate, Ammonium acetate, Amyl acetate, Barium acetate
	Halides (Binary compounds with halogen atoms F, Cl, Br or I)	● Sodium chloride, Potassium chloride, Potassium iodide, Lithium chloride, Copper (II) chloride, Silver chloride
	Sulfates (SO_4^{2-})	● Aluminum potassium sulfate, Magnesium sulfate, Copper (II) sulfate, Lithium sulfate, Potassium persulfate
	Sulfites (SO_3^{2-})	● Sodium bisulfite, Sodium metabisulfite, Sulfur dioxide
	Thiosulfates ($S_2O_3^{2-}$)	● Sodium thiosulfate
	Phosphates (PO_4^{3-})	● Ammonium phosphate, Sodium phosphate, Calcium phosphate
	Halogens (**oxidizers**)	● Fluorine, Bromine, Iodine ● Chlorine is PROHIBITED

	Oxalates ($C_2O_4^{2-}$)	● Ammonium oxalate, Silver oxalate
	Phthalates	● Esters of Phthalic acid ● Butyl decyl phthalate, Dimethyl phthalate
	Oleates	● Salts or esters of oleic acid ● Sodium oleate
I3	Amides	● Cesium amide WATER REACTIVE, Lithium amide
	Nitrates (NO_3^-) (except Ammonium Nitrate) Many are **strong oxidizers**	● Aluminum nitrate, Calcium nitrate, Ferric nitrate, Magnesium nitrate, Silver nitrate
	Nitrites (NO_2^-)	● Sodium nitrite
	Azides	● Azide compounds are all PROHIBITED
I4	Hydroxides (OH^-)	● Aluminum hydroxide, Sodium hydroxide, Magnesium hydroxide, Calcium hydroxide, Potassium hydroxide
	Oxides (O_2^-) - Base anhydrides Many are **oxidizers**	● Calcium oxide, Chromium oxide, Silver oxide, Magnesium oxide, Manganese oxide ● Barium oxide, Cadmium oxide, Ethylene oxide, Iron Oxide are PROHIBITED
	Silicates (anion contains silicon and oxygen)	● Quartz, Feldspar, Mica, Silica
	Carbonates (CO_3^{2-})	● Ammonium carbonate, Manganese carbonate, Calcium carbonate, Sodium carbonate
	Carbon	
I5	Sulfides (S_2^-)	● Ammonium sulfide, Potassium sulfide, Sodium sulfide, Zinc sulfide
	Selenides (compound	● Sodium selenide, Zinc selenide, Copper indium selenide, Lead selenide

	containing selenium Se)	
	Phosphides (P^{3-})	● Boron phosphide, Calcium phosphide, Cesium phosphide ● Magnesium aluminum phosphide, Potassium phosphide, and Sodium phosphide are PROHIBITED
	Carbides	● Barium carbide, Calcium carbide, Titanium carbide, Tungsten carbide
	Nitrides (N^{3-})	● Sodium nitride, Potassium nitride, Beryllium nitride ● Many nitrides are PROHIBITED
I6 *(Most of this reactive group are Strong **Oxidizers**)*	Chlorates (ClO_3^-)	● Potassium chlorate, Magnesium chlorate ● Many chlorates are PROHIBITED
	Bromates (BrO_3^-)	● Potassium bromate, Sodium bromate
	Iodates (IO_3^-)	● Potassium iodate, Sodium iodate
	Chlorites (ClO_2^-)	● Sodium chlorite is PROHIBITED
	Hypochlorites (ClO^-)	● Calcium hypochlorite, Sodium hypochlorite
	Perchlorates (ClO_4^-)	● Most perchlorates are PROHIBITED
	Perchloric Acid ($HClO_4$)	● PROHIBITED
	Peroxides (O-O)	● Metal peroxides are PROHIBITED ● Most peroxides are PROHIBITED
	Hydrogen Peroxide	● Hydrogen peroxide 30% or less ● Hydrogen peroxide >30% PROHIBITED
I7	Arsenates (AsO_4^{3-})	● Arsenic compounds are PROHIBITED
	Cyanates (OCN^-)	● Strontium cyanate, Cesium cyanate, Potassium cyanate, Sodium cyanate ● Silver Cyanate is PROHIBITED
	Cyanides	● Cyanides are PROHIBITED
I8	Borates (containing Boron and oxygen)	● Aluminum tetrahydroborate, Sodium tetrahydroxyborate, Sodium pentaborate ● Sodium perborate is PROHIBITED

	Chromates (CrO_4^{2-})($Cr_2O_7^{2-}$) **Strong Oxidizers**	● Chromates and dichromates ● Ammonium chromate, Ammonium dichromate, Potassium chromate, Sodium chromate, Sodium dichromate
	Manganates (MnO_4^{2-})	● Potassium manganate
	Permanganates (MnO_4^-) **Strong Oxidizers**	● Potassium permanganate ● Ammonium permanganate, Calcium permanganate, Sodium permanganate are PROHIBITED
	Molybdates (oxyanion with molybdenum)	● Ammonium molybdate, Sodium molybdate
	Vanadates (oxoanions of vanadium)	● Sodium orthovanadate
I9	Acids (except Nitric acid)	● Nitric acid is separated and stored by itself ● Sulfuric acid, Hydrochloric acid, Boric acid, Phosphoric acid, Hydroiodic acid, Chromic acid, Hydrobromic acid, ● Hydrofluoric acid and Perchloric acid are PROHIBITED
I10	Sulfur	● Reacts with most metal to form sulfides
	Phosphorus **(Water Reactive)**	● Yellow and White are PROHIBITED ● Red only 50g DEMO ONLY ● Highly reactive
	Arsenic	● Arsenic and arsenic compounds are PROHIBITED
	Phosphorus Pentoxide (P_4O_{10})	● Powerful desiccant and dehydrating agent
IM	Inorganic Miscellaneous	● Anything else that doesn't fit into the other inorganic reactive groups

ORGANICS

O1	Acids (generally weaker acids than inorganic acids)	● Acetic acid, Lactic acid, Citric acid, Oxalic acid, Phthalic Acid, Propionic acid, Benzoic acid ● Many of these acids can exhibit multiple hazards, like corrosivity and flammability. Refer to the SDS sheet for storage **some might need to be in*

		flammable cabinets vs acid cabinets ex. Acetic acid, Formic Acid and Propionic acid
	Amino Acids	● Alanine, Arginine, Asparagine, Aspartate, Cysteine, Glutamine, Glycine, Tryptophan etc.
	Anhydrides, (removal of water molecules from an acid)	● Acetic anhydride, Maleic anhydride ● Phthalic anhydride is PROHIBITED
	Peracids (Peroxy acid)	● Peracetic acid
O2	Alcohols (hydroxyl group -OH) Most are **highly flammable**	● Methyl alcohol, Ethyl alcohol, Isopropyl alcohol, Propyl alcohol, Octyl alcohol, Pentyl alcohol, Isoamyl alcohol, Polyvinyl alcohol
	Glycols or Diols (two hydroxyl groups)	● Ethylene glycol, Diglyme (Diethylene glycol dimethyl ether)
	Sugars	● Glucose (dextrose), fructose (levulose), galactose, sucrose, lactose, maltose
	Amines (derivatives of ammonia) **Bases**	● Diphenylamine, Hexamethylenediamine, Hydroxylamine hydrochloride, Triethanolamine
	Amides	● Acetamide, Acetanilide
	Imines (carbon and nitrogen double bond) C=N	● Dimethylglyoxime
	Imides	● Succinimide, Malemide, Phthalimide
O3 *(most of this reactive group are highly* ***flammable*** *and can form* ***explosive peroxides****)*	Hydrocarbons (**highly flammable)**	● Methane, Ethane, Propane, Butane, Hexane, Octane, Pentane, Toluene, Turpentine
	Esters (many are solvents and odorants) **highly flammable**	● Amyl acetate, Ethyl acetate, Methyl acetate, Ethyl salicylate, Isopropyl acetate ● Vinyl acetate is PROHIBITED
	Aldehydes	● Benzaldehyde, Vanillin, Cinnamaldehyde ● Glutaraldehyde is WATER REACTIVE ● Formaldehyde and Acetaldehyde are PROHIBITED
	Oils (hydrophobic hydrocarbons)	● Cooking oils ● Lubricants

	flammable and combustible	● Fuel oils - Petroleum/crude oil; gasoline, pentane, octane, kerosene, diesel, hexane
O4 *(most of this reactive group are highly **flammable** and can form **explosive peroxides**)*	Ethers **Highly flammable, most are PROHIBITED**	● Dimethyl ether, ● Diethyl ether, Diisopropyl ether, Tetrahydrofuran, Dioxane are PROHIBITED ● Vinyl Ethers are PROHIBITED
	Ketones **Highly flammable**	● Acetone, Methyl ethyl ketone (MEK), Methyl isobutyl ketone
	Halogenated hydrocarbons (solvents and refrigerants)	● Benzyl chloride, Methyl chloride, Bromobenzene, Chlorobenzene, Dichloromethane, Ethylene dichloride ● Carbon tetrachloride, Chloroform, Acetyl halides are PROHIBITED
O5 Flammable and Toxic	Epoxy Compounds	
	Isocyanates	● Diphenylmethane-4,4 Diisocyanate ● Methyl isocyanate (Bhopal disaster) is PROHIBITED
O6 *(most of this reactive group are PROHIBITED)*	Peroxides (O-O) (Powerful bleaching agents)	● Peroxy acids - Peroxy acetic or peracetic acid is HIGHLY CORROSIVE and FLAMMABLE ● Organic peroxides - Benzoyl peroxide is PROHIBITED
	Hydroperoxides	
O7	Sulfides	● Dimethylsulfide, Thianisole, Polyphenylene sulfide
	Polysulfides	● Lenthionine
	Sulfoxides	● Dimethyl sulfoxide DMSO, Methyl phenyl sulfoxide
	Nitriles −C≡N (many are **Flammable** solvents)	● Found it super glue, nitrile rubber, medical gloves ● Acetonitrile, Propionitrile, ● Acrylonitrile is PROHIBITED
O8 *(many in this group are PROHIBITED because they are Explosive)*	Phenols (-OH directly bonded to an aromatic hydrocarbon)	● Phenolphthalein, Bisphenol A (BPA) ● Phenol, Dinitrophenol, Picric acid (Trinitrophenol) are PROHIBITED
	Cresols	● m-Cresol (3-methylphenol), o-Cresol (2-methylphenol), p-Cresol (4-methylphenol)
O9 (some of these can be	Dyes)	● Safranin, Crystal violet, Methylene blue, Eosin Y, Congo Red, Alizarin yellow and red, Aniline black, Bromocresol purple, Bomothymol blue

RESTRICTED) *many can be flammable because they are mixed in solvent or alcohol		● Usually soluble in solvent
	Stains	● Wright's Stain (contains Mercury) ● Histological stains
	Indicators	● Universal indicator
OM	Organic Miscellaneous	● Anything else that doesn't fit into the other organic reactive groups

Melissa's Contact Information for Questions or to Request Containers:

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