The Lost Art of Lab Packing
March 23, 2022

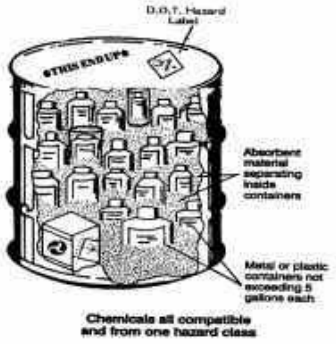
24th California Unified Program Annual Training Conference

March 22, 23, 24, 29, 30, 31 - 2022

OUTLINE

- Introduction
- Safety
- Regulatory Infrastructure
- Field Chemistry
- Supplies
- Lab Packing Recommendations
- Exercises
- Peripheral Operations
- Project Review
- Summary

Introduction



What is lab packing?

- Lab packing (*the verb*) is the process of packing relatively small chemical items (e.g., 5.3 gallons or less), which are designated for disposal, into the same outer packaging.
- DOT-regulated lab packed items must have the same primary DOT hazard class .
- Lab pack items must also be chemically compatible.

Introduction

- **A lab pack (*the noun*) is simply an outer packaging holding relatively small, chemically-compatible waste items; all of which share the same primary DOT-hazard class (where applicable).**

Introduction

- There are nine DOT hazard classes, we will primarily focus on those hazard classes and divisions that are eligible for the lab pack exception

Introduction

- Contrary to what the name indicates, lab packing operations are not limited to laboratory settings.
- Chemicals can be "lab packed" at…
  - Auto repair facilities
  - Hospitals
  - Household hazardous waste collection facilities (HHW)
  - Manufacturing facilities
  - Public works facilities
  - Refineries… etc… in addition to Research and Development facilities and in academia.

Introduction

- **Notwithstanding the key safety, technical, and regulatory aspects related to this topic (all of which will be covered in this presentation), one point must be communicated without equivocation:**

Introduction

- LAB PACKING IS FUN!!!!







CALIFORNIA CUPA FORUM

HISTORICAL INFORMATION:

- I joined LLNL in **1993** as a lab pack operations technologist.
- I began supervising the operation by **1996**
- I was promoted to managerial status in **1998** (as the lab pack operations team leader)

HISTORICAL INFORMATION:

- I joined the LLNL Permits and Regulatory Affairs Group (PRAG) in **2001**. (*PRAG serves as onsite EH&S consultants*).
- I retired from LLNL in **2006**.

FIRST POLL QUESTION:

- **When was the last time that I participated in a "hands on" lab packing operation, outside of a classroom?**

FIRST POLL QUESTION ANSWERS:

- In **1997**, just before the promotion?
- In **1998**, just before joining PRAG?
- In **2006**, just before retiring?
- In July of **2020**? or
- In July of **2022**?

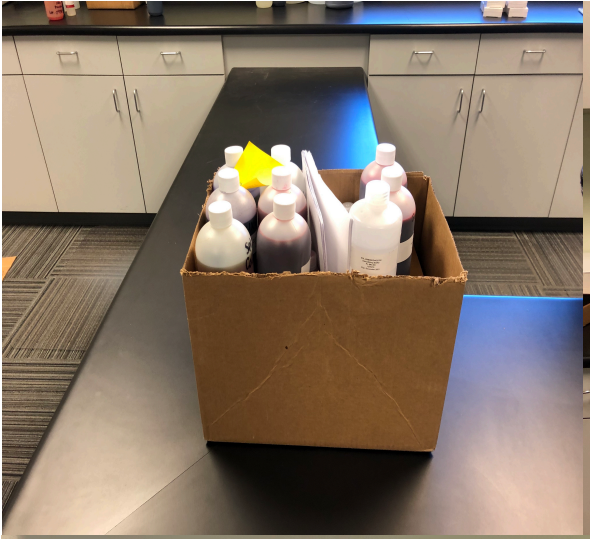

A → H
I → 2

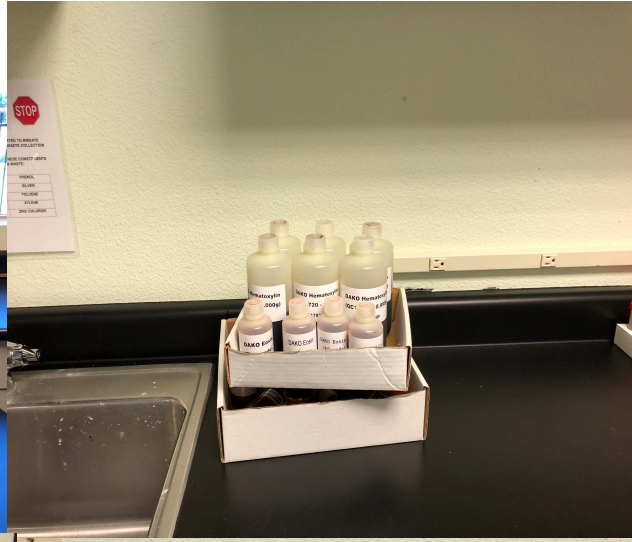

SPECTRUM
P0188 500 ML
Polyethylene Glycol 300
N.F.
PEG-6
P0131 500 G
Polyethylene Glycol 8000
(PEG-150)
U.S.P./N.F.
P0140 500 G
Polyvinyl-pyrrolidone
SIGMA-ALDRICH
POTASSIUM CARBONATE
SP1583
Pyridine
S0180 125 GM
Sodium Lauryl Sulfate
(Sodium Monododecyl Sulfate)
U.S.P./N.F.
S1456 500 G
Sodium Sulfate
Salt Cake
Anhydrous, Technical
CHEMICAL MFG
M590 500 ML
Mineral Oil
U.S.P.
ZINC CHLORIDE
REAGENT GRADE
REF SUCHZCL
DIANAL ACRYLIC RESIN
REF SUCHRES
Ammonium Sulfide Solution /100ml
ITEM#: SPA2226
UN1987
FLAMMABLE


SPECTRUM
A1093
500 G
Aluminum Hydroxide
Powder
Reagent
CAS 21645-51-2
Aluminum hydroxide and the sulfates Maintenance project
ALUMINUM SULFATE
SPECTRUM
BR110
100 ML
Brij® 35
SPECTRUM
Hydantoin
25 G
DUDLEY CORPORATION
Product Hematoxylin Certified
Net Weight
SAMPLE FOR EVALUATION ONLY
METHYL RED, 0.1%
Aqueous
J.T.Baker
Nuclear Fast Red
SPECTRUM
M1023
Magnesium Bromide
SIGMA
P-3130
n-PROPYL GALLATE

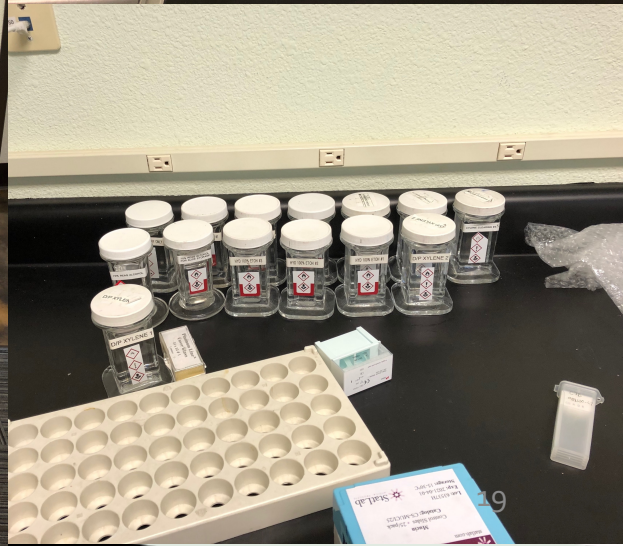

PHOSPHOMOLYBDIC PHOSPHOTUNGSTIC ACID
REF AHP0557
PHOSPHOMOLYBDIC PHOSPHOTUNGSTIC ACID
REF AHP0557
B*5 FIXATIVE
REF FXB5ZGAL

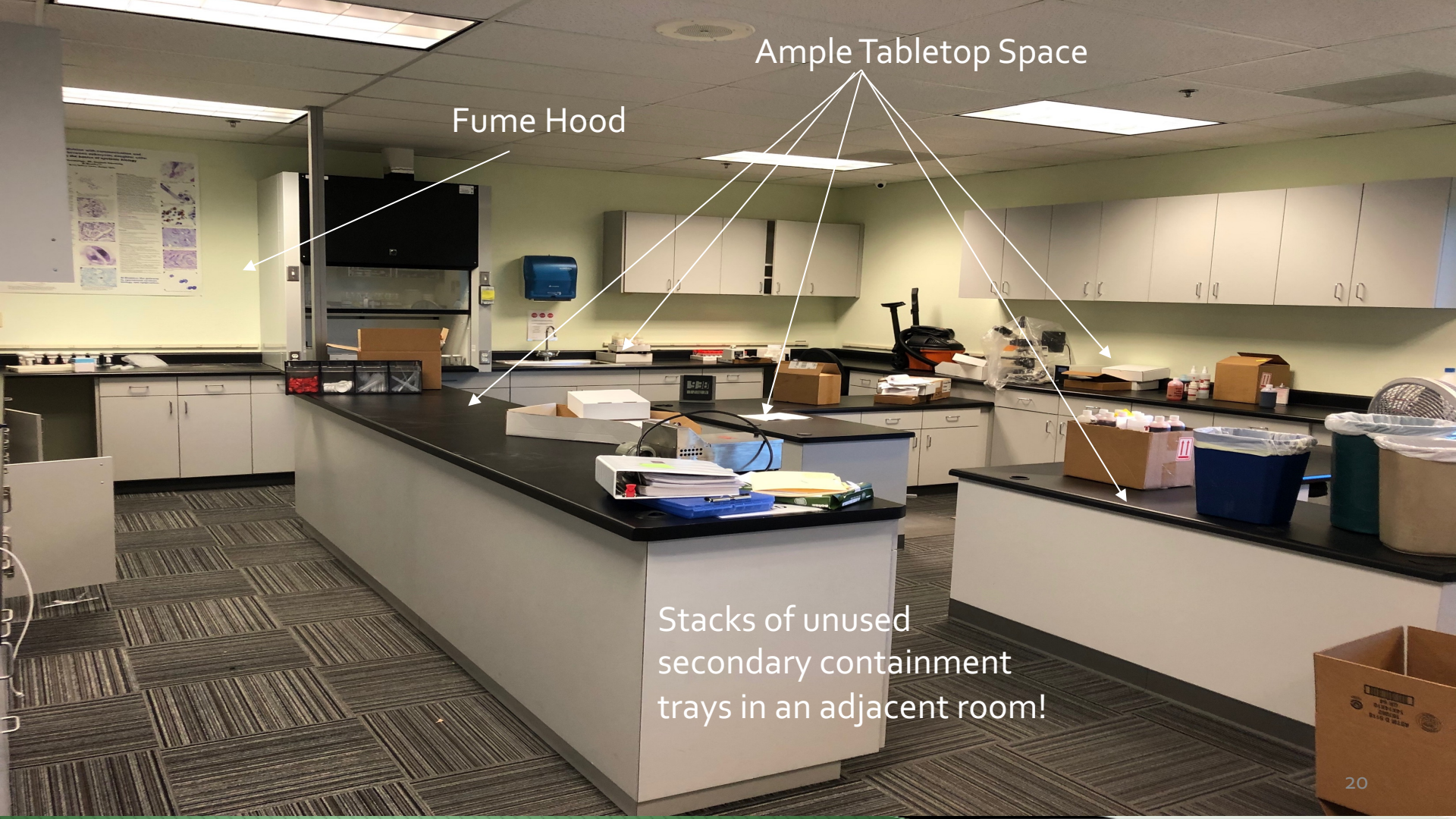

TRANSCEND
TRANSCEND




STOP

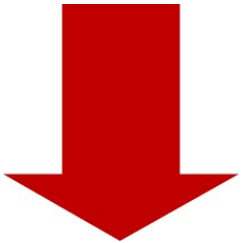

CAUTION!




Ample Tabletop Space
Fume Hood
Stacks of unused secondary containment trays in an adjacent room!

Introduction

MORE TO COME ON THIS PROJECT LATER IN THE PRESENTATION



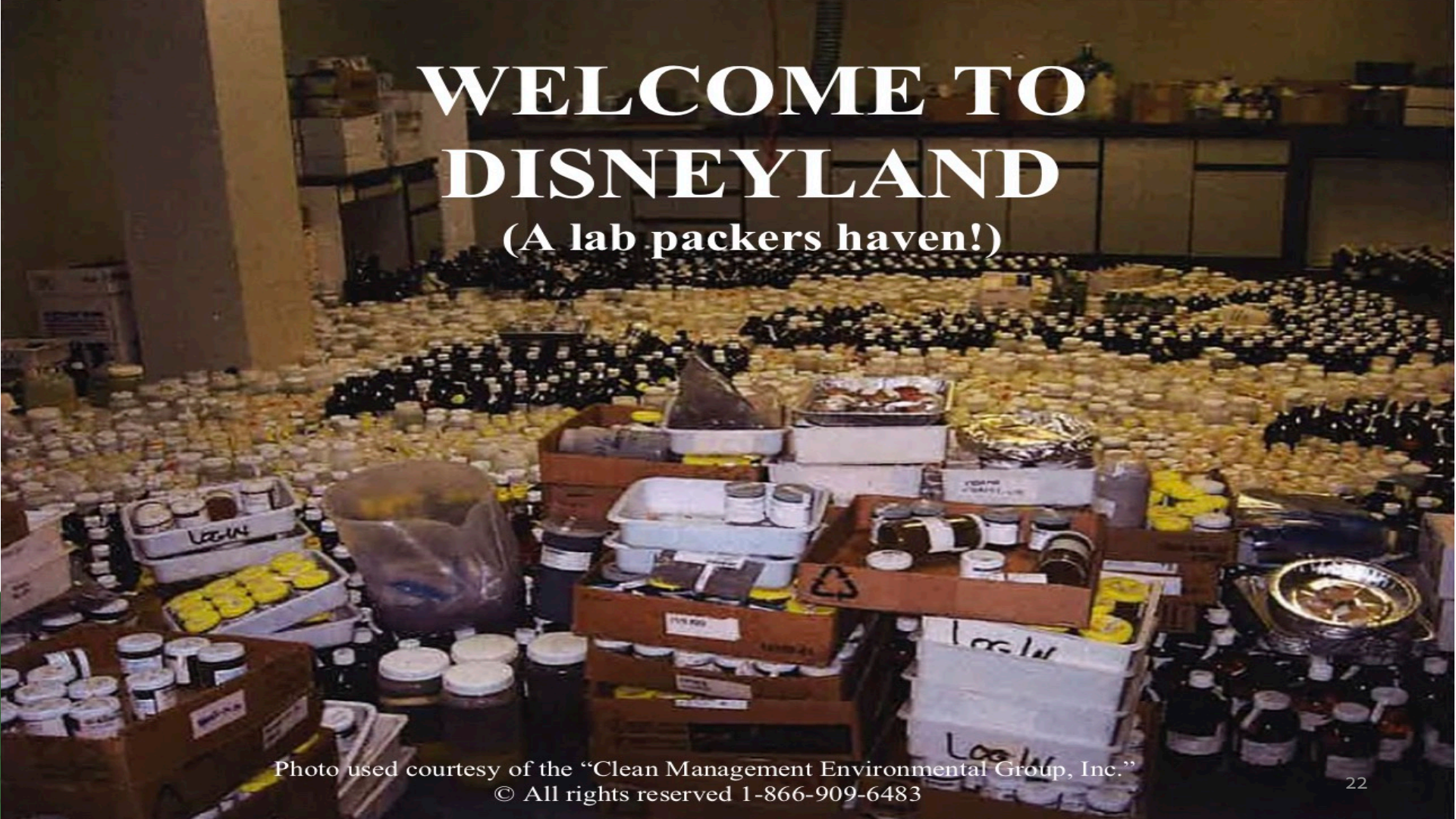


Photo used courtesy of the "Clean Management Environmental Group, Inc."

SAFETY

- Chemical Hazards
- Physical Hazards
- Hazard Controls
  - Engineering
  - Administrative
    - SOPs
    - Training
  - PPE

SAFETY

Chemical Hazards

Lab packing, by definition, involves handling a variety of chemicals, the extent to which depends greatly on where the work is done and the size of the operation.

SAFETY

Chemical Hazards:
If you are at a refinery, you may encounter….

- Acids,
- Bases,
- Catalyst
- Fuels
- Fuel additives
- Lubricants
- Petroleum distillates

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Chemical Hazards:
If you are at an autobody or auto repair shop, you may encounter…

- Aerosols
- Coolants
- Electrolyte
- Epoxies
- Lubricants
- Paints
- Thinners

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Chemical Hazards:
If you are at medical facility, you may encounter…

- **Non-RCRA pharmaceuticals**
- **RCRA pharmaceuticals**
- **Radiologic pharmaceuticals**
- **Biohazardous wastes**

NOTE: These items represent the types of hazards that may be encountered, not necessarily materials designated for lab packing.

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Chemical Hazards:

If you are at an R & D facility or a University, the list is unending….

- Air & water reactive substances
- Carcinogens, mutagens, teratogens
- Corrosive materials
- Explosives
- Gas lecture bottles
- Oxidizing agents
- Organic peroxides
- Poisons
- Self reactive
- Sensitizers

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Chemical Hazards:

The chemical hazards posed will be unique to the type of chemical handled….

CAUTION: **Multiple hazard is the rule** (*rather than the exception*)!!!!

Health Hazard	Flame	Exclamation Mark
• Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	• Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	• Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non Mandatory)
Gas Cylinder	**Corrosion**	**Exploding Bomb**
• Gases under Pressure	• Skin Corrosion/ burns • Eye Damage • Corrosive to Metals	• Explosives • Self-Reactives • Organic Peroxides
Flame over Circle	**Environment *(Non Mandatory)**	**Skull and Crossbones**
• Oxidizers	• Aquatic Toxicity	• Acute Toxicity (fatal or toxic)

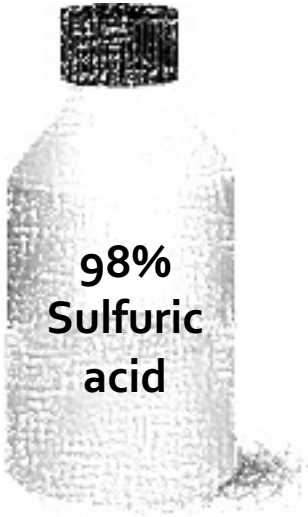
SAFETY

Chemical Hazards:

EXAMPLE:

Concentrated sulfuric acid exhibits all of the following hazardous properties:

- **Corrosive**
- **Water reactive**
- **Oxidizing**
- **The mists of which are carcinogenic**



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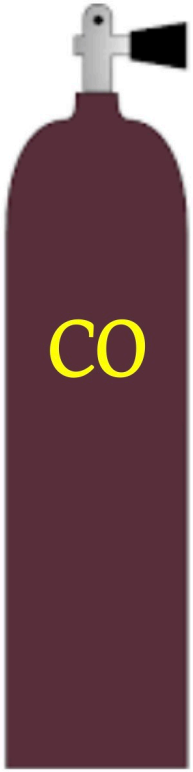
Chemical Hazards:

EXAMPLE:

Carbon monoxide exhibits all of the following hazardous properties:

- **Chemical asphyxiant**
- **Flammable gas**
- **Teratogenic**



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Chemical Hazards:

EXAMPLE:

1,4-Dioxane exhibits all of the following hazardou properties:

- **Flammable**
- **Mutagen**
- **Peroxide former**

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Chemical Hazards:

EXAMPLE:

Sodium azide exhibits all of the following hazardous properties:

- **Poisonous (DOT 6.1 PG II)**
- **Mutagen**
- **Explosive when heated or contaminated**

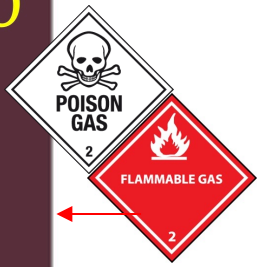
SAFETY

Chemical Hazards:

Class 8

Class 3

Div. 2.3, (2.1)



It is important to note that the multiple hazards exhibited by these materials are not direct indicators of how they will be classified for shipment.

Div. 6.1

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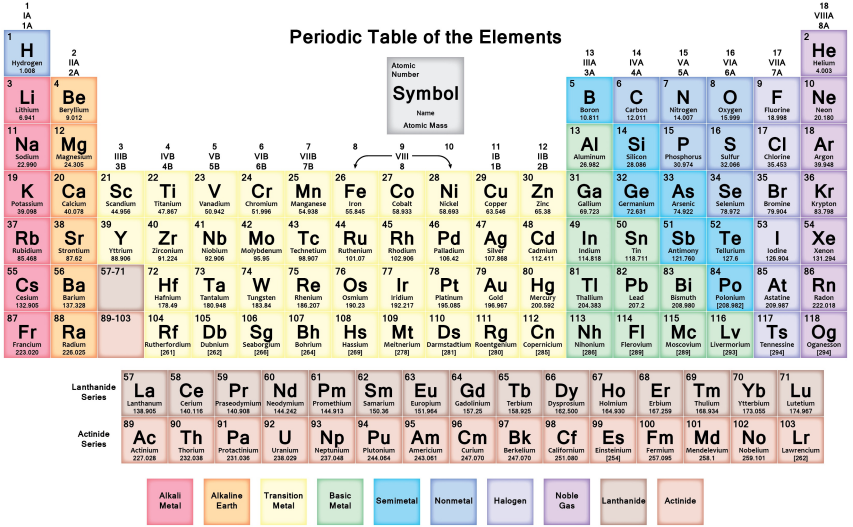
Chemical Hazards:

It can also be beneficial to associate nomenclature with hazards exhibited by the specified chemical families



Calcium carbide	4.3	UN1402	I	4.3	B55, B56, IB4, IP1, N34, T9, TP7, TP33	None	211	242	Forbidden	15 kg	B	52
Calcium cyanamide *with more than 0.1 percent of calcium carbide*	4.3	UN1403	III	4.3	A1, A19, IB8, IP4, T1, TP33	151	213	241	25 kg	100 kg	A	52
Calcium hydride	4.3	UN1404	I	4.3	A19, N40	None	211	242	Forbidden	15 kg	E	52
Calcium manganese silicon	4.3	UN2844	III	4.3	A1, A19, IB8, IP4, T1, TP33	151	213	241	25 kg	100 kg	A	52, 85, 103
Calcium phosphide	4.3	UN1360	I	4.3, 6.1	A8, A19, N40	None	211	242	Forbidden	15 kg	E	40, 52, 85
Calcium silicide	4.3	UN1405	II	4.3	A19, IB7, IP2, T3, TP33	151	212	241	15 kg	50 kg	B	52, 85, 103
Cells, containing sodium	4.3	UN3292	II	4.3		189	189	189	25 kg gross	No limit	A	
Cerium, *turnings or gritty powder*	4.3	UN3078	II	4.3	A1, IB7, IP2, T3, TP33	151	212	242	15 kg	50 kg	E	52
Cesium *or* Caesium	4.3	UN1407	I	4.3	A7, A19, IB4, IP1, N34, N40	None	211	242	Forbidden	15 kg	D	52
Chlorosilanes, water-reactive, flammable, corrosive, n.o.s	4.3	UN2988	I	4.3, 3, 8	A2, T14, TP2, TP7, TP13	None	201	244	Forbidden	1 L	D	21, 28, 40, 49, 100
Ethyldichlorosilane	4.3	UN1183	I	4.3, 8, 3	A2, A3, A7, N34, T14, TP2, TP7, TP13	None	201	244	Forbidden	1 L	D	21, 28, 40, 49, 100

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Chemical Hazards:

Oxidizing agents exacerbate fires and cause fires when in contact with organic material.

Oxidizers also react with reducing agents (e.g., metal powders, cyanides, sulfides, sulfites).

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Chemical Hazards:

Examples of oxidizing agents include but are not limited to the following:

- Bromates
- Bromites
- Chlorates
- Chlorites
- Chromates
- Chromites
- Nitrates
- Nitrites
- Perborates
- Perchlorates
- Periodates
- Permanganates
- Peroxides
- Persulfates

SAFETY

Chemical Hazards:

Examples of oxidizing acids include but are not limited to the following:

- Bromine
- Chromic acid
- Chromium trioxide
- Iodic acid
- Nitric acid
- Perchloric acid
- Potassium and sodium dichromate

SAFETY

Chemical Hazards:

Chemicals such as methyl ethyl ketone peroxide or dibutyl peroxide are organic peroxides and are shipped inhibited for stability

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Chemical Hazards:

- Other chemicals, themselves, are not organic peroxides, but can form organic peroxide crystals.
- Uninhibited organic peroxides are heat, shock, and friction sensitive.
- These materials can detonate from performing an action as simple as removing a bottle cap.

SAFETY

Chemical Hazards:

Examples of peroxide forming (a.k.a. peroxidizable) materials include, but are not limited to…

- **Ethers** *(light and medium molecular weight)*
- **Potassium metal**
- **Potassium and sodium amide**
- **Tetrafluoroethylene**
- **Cumene**
- **Cyclohexene**
- **1,4-Dioxane**
- **Tetrahydrofuran**

SAFETY

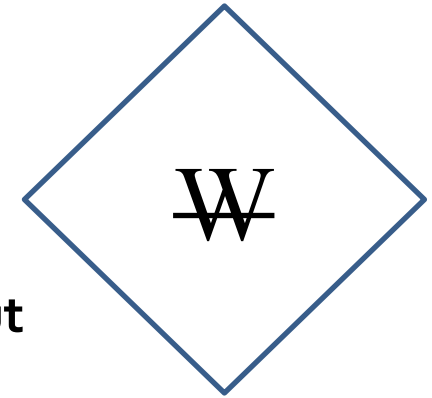
Chemical Hazards:

There are chemicals that dangerously polymerize when heated or otherwise initiated. Examples of polymerizable materials include, but are not limited to…

- Acrylic acid
- Ethyl acrylate
- Methyl methacrylate
- Styrene
- Vinyl acetate
- Vinyl chloride
- Vinyl pyridine

SAFETY

Chemical Hazards:

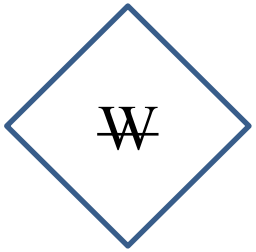


The term "anhydrous" denotes substances without water; thus, adding water typically produces an exothermic reaction.

Similarly, the term "anhydride" applies to substances with only one molecule of water; adding water can also result in the generation of heat.

SAFETY

Chemical Hazards:



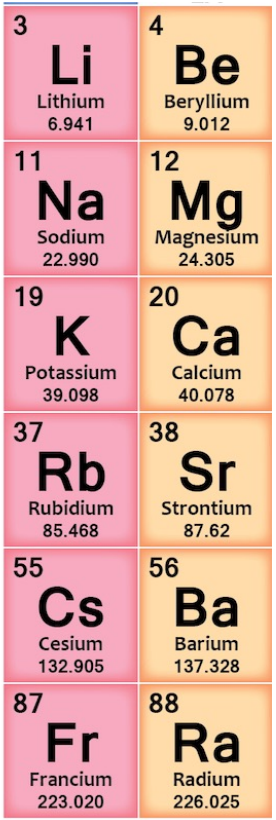
EXAMPLES:

- **Aluminum chloride, anhydrous**
- **Ferric chloride, anhydrous**
- **Sodium sulfide, anhydrous (*liberates H_2S gas*)**
- **Acetic anhydride and**
- **Phosphoric anhydride (*also known as phosphorus pentoxide*)**

SAFETY

Chemical Hazards:

Alkali and alkaline earth metals and their hydrides react violently with water.



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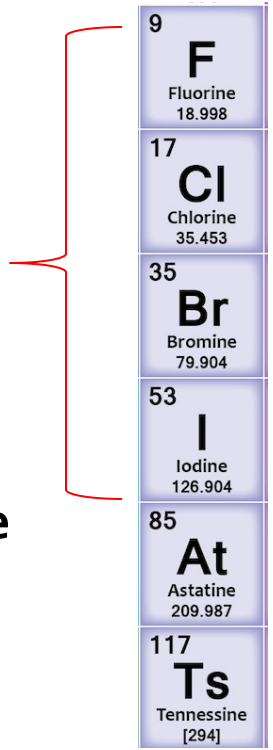
Chemical Hazards:

Many multi-halogenated inorganic compounds react violently with water and are acidic, such as…

- Antimony trichloride
- Bismuth pentafluoride
- Boron trichloride
- Phosphorus pentachloride
- Phosphorus tribromide
- Titanium tetrachloride



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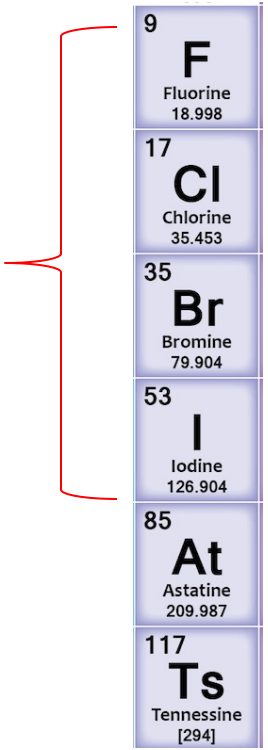
Chemical Hazards:

Many alkyl, aryl, and other "-yl" halides are fuming water reactive acids, such as…

- Acetyl bromide
- Acetyl chloride
- Benzoyl chloride
- Phosphoryl chloride
- Sulfonyl fluoride
- Thionyl chloride



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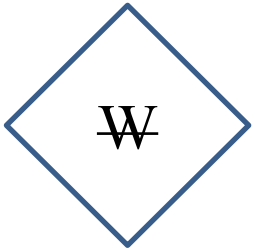
Chemical Hazards:



Other water reactive groups include…

- **Amides**
- **Carbides (like calcium carbide)**
- **Isocyanates**
- **Phosphides**
- **Silane, silyl, siloxane compounds (many organo- chlorosilanes, like dimethyl chlorosilane, are acidic, flammable, and water reactive)**

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Chemical Hazards:

Lastly, concentrated mineral acids (and some bases), in general, react energetically with water… as one pseudo-poet, yet very wise person, once wrote…

"DO AS YOU OUGHTA, ADD ACID TO  **."**

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Chemical Hazards:

While some multi-nitro organo compounds are dyes and/or mutagens, many are explosive. Examples of explosive materials include, but are not limited to…

- **HMX** (cyclotetramethylene-tetranitramine)
- **Nitrosoguanidine**
- **Pentaerythritol tetranitrate** (PETN)
- **Picric acid** (Trinitrophenol)
- **RDX** (1,3,5-Trinitro-1,3,5-triazine)
- **Tetranitromethane**
- **TNT** (Trinitrotoluene)

NOTE: Metal azides and metal fulminates are also explosive.

SAFETY: (Chemical Hazards)

UNKNOWNS

SAFETY

Chemical Hazards (Incompatibles):

Acids	Synonyms/ Notes	Bases	Synonyms/ Notes
Aluminum chloride	Contained in antiperspirants; the anhydrous form reacts violently with water	**Ammonia**	Ammonium hydroxide
Battery acid	Sulfuric acid; “Oil of Vitriol”	**Baking soda**	Sodium bicarbonate
Hydrochloric acid	Muriatic acid	**Potassium carbonate**	Potash
Hydrofluoric acid	Contained in glass etch; called the “bone-seeking” acid; also reacts with vermiculite & other silica-based products	**Caustic soda**	Sodium hydroxide
Iron chloride	Also called ferric or ferrous chloride	**Lime**	Calcium oxide
Nitric acid	An oxidizing acid	**Potassium hydroxide**	Caustic potash
Phosphoric acid	Contained in colas (in low concentration)	**Sodium meta-silicate**	Contained in driveway cleaners
Tin chloride	Also called stannic or stannous chloride	**TSP**	Trisodium phosphate, Phosphoric acid trisodium salt

Oxidizers	Examples	Organics	Examples
Bromates **Bromites** **Chlorates** **Chlorites** **Chromates** **Chromites** **Nitrates** **Nitrites** **Perborates** **Perchlorates** **Periodates** **Permanganates** **Peroxides** **Persulfates**	Ammonium nitrate (fertilizer); Hydrogen peroxide (≥8%); Pool Disinfectants (e.g., calcium hypochlorite or sodium dichloroisocyanurate)	**Carbon-containing substances that exhibit carbons unique binding property.** ***(More on this later)***	Acetone, Aerosols Alcohols, Cardboard, Fuels, Herbicides, Motor oil, Paints, Pesticides, Rice hulls Roundup, Sawdust, Solvents Surfactants

Inorganic Oxidizing Acids	Synonyms/ Notes	Organic acids	Synonyms/ Notes
Bromine	Also toxic by inhalation	**Acetic acid**	Vinegar
Chromic acid	Contained in some inks, ceramic glazes, paints, and laboratory glass cleaners (i.e. “Chromerge”)	**Acetylsalicylic acid**	Aspirin
Chromium trioxide	“ “	**Benzoic acid**	Food preservative
Iodic acid	Lab reagent, used in some pharmaceuticals	**Formic acid**	Contained in fumigants and insecticides
Nitric acid	Lab reagent	**Oxalic acid**	Contained in some radiator cleaners
Perchloric acid	Lab reagent; used in electro-polishing and explosive manufacturing	**Propionic acid**	Mold inhibitor; wood chip preservative
Potassium dichromate	Also extremely toxic on contact with skin and by ingestion.	**Stearic acid**	Contained in soaps

Acids	Cyanides
Acids	Sulfides
Aqueous materials*	Water Reactives (e.g., hydrides, anhydrides, and anhydrous; -yl chlorides; sodium, potassium, and lithium metals)
Oxidizers	Reducing agents (e.g., metal powders, sulfites, sulfides, cyanides….)
Part A epoxies**	Part B epoxies

Some chemicals within the same hazard category are incompatible

SAFETY: Chemical Hazards

Lab packers must also be aware of MATERIALS with which chemicals react:

Examples include:

- **Ammonia with copper, brass, zinc, and galvanized metals.**
- **Hydrofluoric acid: Glass, all silica-bearing materials**
- **Hydrogen peroxide: Aluminum fittings**
- **Oxidizers: (including concentrated sulfuric acid) with rubber.**
- **Water reactives: Vermiculite**

Chemical Hazards Exercise

Which chemical is incompatible with the others?

- Calcium nitrate
- Potassium nitrate
- Ammonium nitrate
- Sodium nitrite
- Potassium bromate

There are three incompatible chemicals in this drum…. Which are they?

- Oil of Vitriol
- Sulfuric acid
- Phosphoric acid, trisodium salt (TSP)
- Phosphoric acid
- Sodium sulfide
- Hydrochloric acid
- Muriatic acid
- 40% Ferric chloride solution
- Hydrocyanic acid, sodium salt (sodium cyanide)

Which chemical is found in frozen pizza?

- Tetrachlorodibenzo dioxin (TCDD)
- Sodium nitrite
- Thionyl chloride
- Phenol (crystalline)
- Potassium arsenate (for bacterial control)

Are these two oxidizing pool disinfectants compatible? If so, why…, and if not, why not?

- Calcium hypochlorite (CaOCl)
- Sodium dichloroisocyanurate ($C_3Cl_2N_3NaO_3$)

SAFETY: Chemical Hazards

Resources for Determining Compatibility

- **SDSs** (*Please befriend "Sections 2, 10, & 14," hazards, reactivity, and transportation, respectively*)
- **NIOSH Pocket Guide to Chemical Hazards**

https://www.cdc.gov/niosh/npg/npgsyn-a.html#

- **CAMEO**

https://www.epa.gov/cameo

SAFETY: Chemical Hazards

Resources for Determining Compatibility (cont.)

- **Chemical Reactivity Worksheet**

https://www.aiche.org/ccps/resources/chemical-reactivity-worksheet

- **Wiser database**

https://wiser.nlm.nih.gov/

SAFETY: Chemical Hazards

Resources for Determining Compatibility (cont.)

- Brethericks Handbook of Reactive Chemical Hazards
- Farms Chemical Handbook
- Hawley's Condensed Chemical Dictionary
- Merck Index
- SAX Dangerous Properties of Industrial Substances

10-MINUTE BREAK TIME!

SAFETY

Physical Hazards

In addition to chemical hazards, lab packing poses a range of physical hazards to guard against, including, but not limited to the following:

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Physical Hazards (cont.)

- Communication limitations (when respirators are worn)
- Drum handling (including pinch hazards posed by rigid metal drum rings)
- Lifting

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Physical Hazards (cont.)

- Loading and unloading containers and supplies
- Sharps (broken glass, sharp edges)
- The unique hazards posed by the work environment.

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Hazard Controls

Engineering:

- Ventilation systems
- Fume hoods (stationary and portable)
- Glovebags (can be used for remote handling small items)

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Hazard Controls (cont.)

Administrative:

- A comprehensive standard operating procedure (SOP), which incorporates the specific expertise and resources offered by your business.

SAFETY

Hazard Controls (cont.)

Administrative:

- **Training commensurate with the operation**
  (NOTE: all "asterisked" entries are required)
  - **Respiratory protection*** (if respirators will be worn)
  - **Incidental or emergency* spill response training** *(the latter will require "HAZMAT TECH" training under the HAZWOPER Standard.)*

SAFETY

Hazard Controls (cont.)

Administrative:

- Trained to the comprehensive SOP
- DOT Hazmat Employee training*
- Hazardous waste management*
- Either some college chemistry or field chemistry training obtained formerly or on-the-job

SAFETY

Hazard Controls (cont.)

NOTE:
Training is an integral component of in ensuring worker safety…and the California Labor Code (6400-6407) requires that employer provide and maintain a safe and healthful work environment for his or her staff.

SAFETY

Hazard Controls (cont.)

NOTE:
Additionally, HAZWOPER training can be useful, but is not required unless the work being performed at an uncontrolled hazardous waste, at a TSDF (where Section "P" applies), or when responding to a chemical emergency (where Section "Q" applies).

SAFETY

Hazard Controls (cont.)

PPE:

Lab pack typically involves wearing Level D and Level C PPE; the latter is worn when bulking or opening primary and outer containers.

It is recommended that the Level D ensemble include a disposal suit (e.g., a Tyvek or sleeve apron)

SAFETY

Hazard Controls (cont.)

PPE:

Thin nitrile gloves are typically worn for dexterity. It is recommended that you wear, at least, two pair.

Three pairs of thin nitrile gloves are better, however:

- **One inner; one intermediate (taped to the sleeve); and one outer un-taped, to allow for "onion-peeling."**

SAFETY

Hazard Controls (cont.)

Other considerations:

- Unobstructed, accessible eyewash and/or shower
- Strategically-staged fire extinguishers (of appropriate type) for trained technicians
- First aid supplies
- Designated medical facility
- A well-rehearsed emergency response plan

- Examples of PPE include:

Regulatory Infrastructure

- **EPA Exceptions**
- **DOT Exceptions**
- **TSDF Acceptance criteria** *(as this relates to permit restrictions)*

EPA Exceptions:

§ 66268.42. Treatment Standards Expressed As Specified Technologies

(1) the lab packs comply with the applicable provisions of section 66264.316 and section 66265.316;
(2) the lab pack does not contain any of the wastes listed in Appendix IV to chapter 18;

EPA Exceptions:

§ 66268.42. Treatment Standards Expressed As Specified Technologies (cont.)

(3) the lab packs are incinerated in accordance with the requirements of article 15, chapter 14 or article 15, chapter 15 and;

(4) any incinerator residues from lab packs containing D004, D005, D006, D007, D008, D010, and D011 are treated in compliance with the applicable treatment standards specified for such wastes in article 4, chapter 18.

EPA Exceptions:

MUST BE STABILIZED

- D004 = arsenic
- D005 = barium
- D006 = cadmium
- D007 = chromium (VI)
- D008 = lead
- D010 = selenium
- D011 = silver

EPA Exceptions:

Appendix IV. to Chapter 18

Wastes Excluded From Lab Packs Under the Alternative Treatment Standards of Section 66268.42(c)

Hazardous waste with the following EPA Hazardous Waste Codes may not be placed in lab packs **under alternative lab pack treatment standards** of section 66268.42(c), D009, F019, K003, K004, K005, K006, K062, K071, K100, K106, P010, P011, P012, P076, P078, U134, U151.

EPA Exceptions:

RESTRICTED WASTES

- D009 = mercury
- F019 = wastewater treatment sludges from the chemical conversion coating of aluminum
- K003 = wastewater treatment sludge from the production of molybdate orange pigments
- K004 = wastewater treatment sludge from the production of zinc yellow pigments

EPA Exceptions:

RESTRICTED WASTES

- K005 = wastewater treatment sludge from the production of chrome green pigments
- K006 = wastewater treatment sludge from the production of chrome oxide pigments (anhydrous and hydrated)
- K062 = Spent pickle liquor generated by steel finishing operations at facilities within the iron and steel industry

EPA Exceptions: RESTRICTED WASTES

- K071 = Brine purification muds from the mercury cell process in chlorine production, where separately pre-purified brine is not used
- K100 = Waste leaching solution from acid leaching of emission control dust/sludge from secondary lead smelting
- K106 = Wastewater treatment sludge from the mercury cell process in chlorine production

EPA Exceptions:

RESTRICTED WASTES

- P010 = arsenic acid
- P011 = arsenic oxide (a.k.a. arsenic pentoxide)
- P012 = arsenic trioxide
- P076 = nitric oxide
- P078 = nitrogen dioxide
- U134 = hydrofluoric acid (and hydrogen fluoride)
- U151 = mercury

DOT Exceptions

49 CFR 173 12

Lab packs.

(b)…Waste materials classed as Class or Division 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 8, or 9 are excepted from the specification packaging requirements …for combination packagings if packaged in accordance with this paragraph (b) and transported for disposal or recovery by highway, rail or cargo vessel.

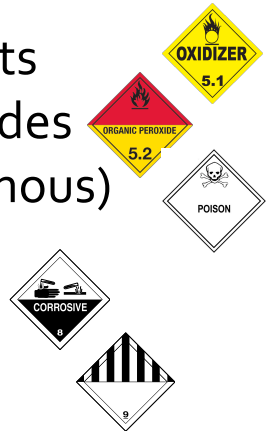
DOT Exceptions

49 CFR 173 12

Hazard Classes that are eligible for the lab packing exception

- Class 3 = flammable liquids
- Div 4.1 = flammable solids
- Div 4.2 = spontaneously combustible materials,
- Div 4.3 = water reactive materials

- Div 5.1 = oxidizing agents
- Div 5.2 = organic peroxides
- Div 6.1 = toxic (or poisonous) materials
- Class 8 = corrosives
- Class 9 = miscellaneous



DOT Exceptions

49 CFR 173 12

Lab packs.

In addition, a generic description from the § 172.101 Hazardous Materials Table may be used in place of specific chemical names, when two or more chemically compatible waste materials in the same hazard class are packaged in the same outside packaging.

DOT Exceptions

49 CFR 173 12

Lab packs.

The requirements for the inclusion of technical names for n.o.s. descriptions on shipping papers and package markings do not apply … except that packages containing materials meeting the definition of a hazardous substance* must be described and marked as required ….

**NOTE: The reference to hazardous substances pertains to "reportable quantities" (RQ)*

DOT Exceptions 49 CFR 173 12

Combination packaging requirements:

The inner packagings must be either…

- glass, not exceeding 4 L (1 gallon) rated capacity, or
- metal or plastic, not exceeding 20 L (5.3 gallons) rated capacity.

NOTE: a combination packaging is a non-bulk configuration that consists of an outer packaging and inner items.

DOT Exceptions 49 CFR 173 12

- Inner packagings containing liquid must be surrounded by a chemically compatible absorbent material in sufficient quantity to absorb **the total liquid contents.**

DOT Exceptions

Outer packaging.

EACH OUTER PACKAGING MAY ONLY CONTAIN ONE CLASS OF WASTE MATERIAL.

DOT Exceptions

Outer packaging.

The following outer packagings are authorized…

(except that Division 4.2 Packing Group I materials must be packaged using UN standard steel or plastic drums tested and marked to the Packing Group I performance level for liquids or solids; and bromine pentafluoride and bromine trifluoride may not be packaged using UN 4G fiberboard boxes):

DOT Exceptions

Outer packaging.

- A UN 1A2, UN 1B2 or UN 1N2 metal drum,
- a UN 1D plywood drum,
- a UN 1G fiber drum, or
- a UN 1H2 plastic drum, tested and **marked to at least the Packing Group III performance level** for liquids or solids;

DOT Exceptions

Outer packaging.

- At a minimum, a double-walled UN 4G fiberboard box made out of 500-pound burst-strength fiberboard **fitted with a polyethylene liner at least 3 mils (0.003 inches) thick** *(and when filled during testing to 95 percent capacity with a solid material)*, successfully passes the tests …to at least the Packing Group II performance level for liquids or solids

DOT Exceptions

Outer packaging.

- A UN 11G fiberboard intermediate bulk container (IBC) or a UN 11HH2 composite IBC**, fitted with a polyethylene liner at least 6 mils** (0.006 inches) thick, that successfully passes the tests …**to at least the Packing Group II** performance level for liquids or solids;

DOT Exceptions

Outer packaging.

THE GROSS WEIGHT OF EACH COMPLETED COMBINATION PACKAGE MAY NOT EXCEED 205 KG (452 LBS).

DOT Exceptions

PROHIBITED MATERIALS.

- Materials that are poisonous-by-inhalation
- A temperature controlled material *(unless it complies with § 173.21(f)(1))**
- A Division 6.1, Packing Group I material,
- Chloric acid, and
- Oleum (fuming sulfuric acid).

**NOTE: 173.21(f)(1) addresses self-accelerated decomposition and polymerizable temperatures (SADT & SAPT) requirements.*

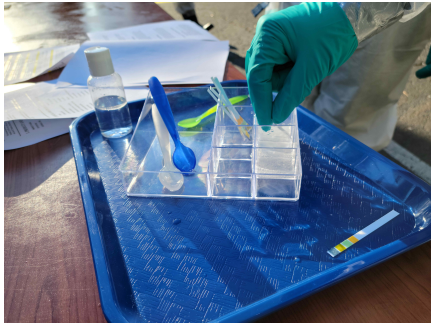
TSDF Acceptance Criteria

- A treatment, storage, and disposal facility (TSDF) may have requirements that are more stringent than what is specified in regulation.
- This may be due to permit constraints or TSDF operational preference.

TSDF Acceptance Criteria

- Notwithstanding, to ensure that waste is accepted by the designated facility, compliance is required.

Field Chemistry



A field chemist identifies the hazardous properties and assigns the material to an appropriate DOT hazard class.

Bear in mind, not all waste materials will meet a DOT hazard class definition.

Field Chemistry

An aqueous solution with a "pH of 2" makes a material a RCRA corrosive liquid, but does not necessarily translate to the material meeting the definition of a "DOT Class 8…."

Neither does seeing the word "nitrate" always means that the waste is oxidizing.

Field Chemistry

A field chemist must also be able to review constituents and make determinations based on concentrations, functional groups, and field-test confirmations.

Field Chemistry

A field chemist, by using available normality and molarity should be able to calculate the concentration of a given substance in a waste matrix.

Field Chemistry

For example, a 1L bottle of 3M nitric acid is added to a bottle of deionized water, making ~ 4L of solution.

Field Chemistry

The nitric acid formula is HNO_3. It's molecular weight is 63.01g/mol.

A 1M solution of nitric acid = 6.301%

Therefore, a 3M solution equates to 18.903%.

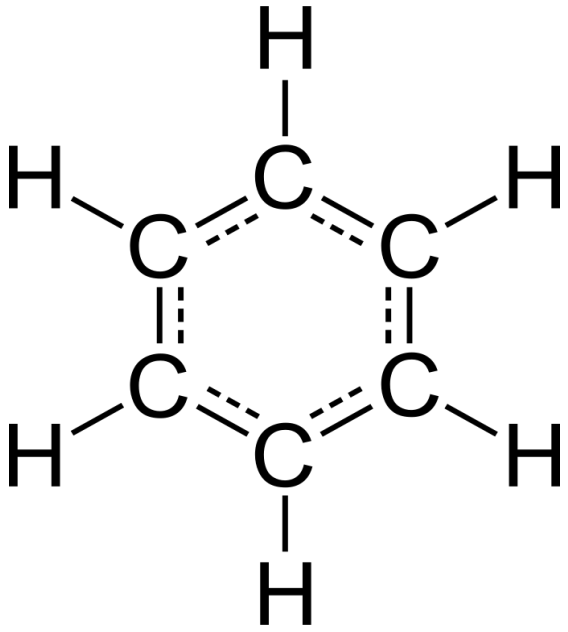
Field Chemistry

18.903% of 1000mL (1L) = 189.03 mL

189.03 mL of nitric acid dissolved in enough water to fill a 4L bottle amounts to 4.72575% or 4.73% HNO_3

Field Chemistry

A field chemist should know that all substances that do not contain carbon are "inorganic"… and that organic chemistry is the study of carbon-containing substances that exhibit carbon's unique binding properties.



Organic & Inorganic Chemistry (Definitions)

- Chemicals that do not contain carbon are ALWAYS inorganic.
- Chemicals that contain carbon (with few exception) are organic.

Examples of inorganic carbon-containing substances include oxides of carbon (e.g., carbon monoxide & carbon dioxide); metallic cyanides (e.g., sodium, potassium, silver, & gold cyanides); sodium carbonate, & carbon disulfide.

Organic & Inorganic Chemistry (Definitions)

The symbol for carbon is C… as in CH_4 or C_6H_6

The following symbols do NOT represent carbon:

- Ca = Calcium
- Cd = Cadmium
- Ce = Cesium
- Cf = Californium
- Cl = Chlorine
- Co = Cobalt
- Cr = Chromium
- Cs = Cesium
- Cu = Copper

Chemical Hazards Exercise

Two of the following chemicals are inorganic

- Methyl ethyl ketone $CH_3COCH_2CH_3$
- Benzene C_6H_6
- Calcium hypochlorite CaOCl
- Acetone $(CH_3)_2CO$
- Oil of Vitriol H_2SO_4
- Sodium acetate $NaCH_3CO_2$

Field Chemistry

Occasionally it may become necessary to perform an "acute toxicity estimate" (ATE) to determine whether a waste meets DOT's (or the State's) definition of toxicity

Field Chemistry

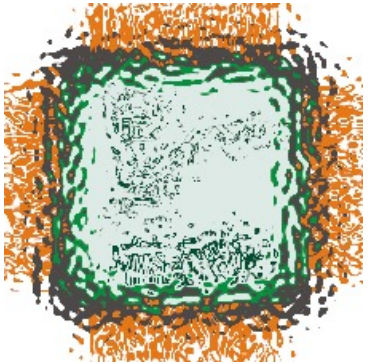
$$\text{Calculated oral or dermal } LD_{50} = \frac{100\%}{\sum_{x=1}^{n} \frac{\%A_x}{TA_x}}$$

Where $\%A_x$ is the weight percent of each component in the waste mixture and $[FNT]A_X$ is the acute oral or dermal LD_{50} or the acute oral LD_{LO} of each component.

Field Chemistry

A mixture contains 7% of Chemical "A," which has an oral LD50 of 229 mg/kg;
13% of Chemical "B," which has an LD50 of 1153 mg/kg; and
29% of Chemical "C," which has an LD50 of 109 mg/kg

Field Chemistry



$$\frac{100}{\frac{7}{229} + \frac{13}{1153} + \frac{29}{109}} = \frac{100}{0.307897664} = 324.8 \text{ mg/kg}$$

CONCLUSION: The waste is **California** toxic (with an oral toxicity LD_{50} threshold of **<2500** mg/kg but not **DOT** toxic, the latter having an oral LD_{50} threshold of **≤ 300** mg/kg

Supplies

In addition to required PPE and containers of appropriate types and sizes, the following items will be needed:

- Drum liners
- Drum closure tools (and instructions)
- A variety of polyethylene bag sizes (for bagging smaller chemicals)
- HDPE "Mayonnaise" jars (for "multi-packing" small compatible vials)

Supplies

- Parafilm wrap
- Blank labels (hazardous waste and small plain white adhesive labels)
- Chemical reference material
- Vermiculite, diatomaceous earth, and polypropylene pulp
- Scoops, pipettes
- Absorbent pads, dust pan and fox tail broom
  (The tools used to lab pack can also be used to clean a small spill)

Supplies

- Secondary containment trays
- "Bermed" carts
- Drum dollies
- pH paper, LEL meter, DI water, squirt bottles, potassium iodide paper and HCl for oxidizer tests….
- Placards
- Hazard Class labels
- Orientation arrows
- **Duct tape**

Supplies

- List of emergency and non-emergency contacts
- Mean(s) of internal and external communication…..

Lab Packing Recommendations

- For unused chemicals, first check section 14 of the manufacturer's SDS for hazard classification guidance.
- If you agree with the classification, manage the waste accordingly; if you do not, call the manufacturer.
- The 49 CFR 172.101 HAZMAT Table is also a good reference for cclassifying unused chemicals.

Lab Packing Recommendations

- When lab packing, 70% of the chemicals typically take 30% of the time to properly characterize and classify.

- (It is the remaining 30% of the chemicals will takes most of the time.)

Lab Packing Recommendations

- Either focus on the "lower lying" fruit at the onset, to achieve measured progress and the problematic items last, or
- Assign someone to work on the difficult items, while the rest of the team addresses the 70%.

Lab Packing Recommendations

- Generate and maintain an inventory of the content of each container.
- Whenever possible, get an inventory of the chemicals to-be-packed in advance from your client.
- Enter the chemicals onto an excel spreadsheet
- Classify… then sort….

Chemical Name	CAS	Manufacturer	Amount	Unit of Measure	Primary Hazard	Subsidiary Hazard	Tertiary Hazard	Comments
(-)-Riboflavin	83-88-5	Sigma-Aldrich	25	G				organic material; keep separate from oxidizing agents
1-(2-Hydroxyethyl)piperazine	103-76-4	Sigma-Aldrich	100	G	skin and eye irritant			incompatible with oxidizers, acids, copper, and chlorinated solvents
1-Decanol	112-30-1	Alfa Aesar	2500	mL	combustible	skin and eye irritant		possible Marpol marine pollutant; incompatible with oxidizers
1-Decanol	112-30-1	Alfa Aesar	2500	mL	combustible	skin and eye irritant		possible Marpol marine pollutant; incompatible with oxidizers
1-Decanol	112-30-1	TCI America	500	mL	combustible	skin and eye irritant		possible Marpol marine pollutant; incompatible with oxidizers
1-Ethylpiperazine	5308-25-8	Sigma-Aldrich	50	ML	flammable	skin and eye irritant		incompatible with oxidizing agents
1-Methyl-2-Pyrrolidinone	872-50-4	Sigma-Aldrich	100	ML	combustible	possible teratogen	skin and eye irritant	incompatible with oxidizing and reducing agents and acids
1-Methylpiperazine	109-01-3	Sigma-Aldrich	100	G	corrosive	flammable	toxic	incompatible with oxidizers and acids
1-Methylpiperazine	109-01-3	Sigma-Aldrich	100	G	corrosive	flammable	toxic	incompatible with oxidizers and acids
1-Naphthaleneacetic acid	86-87-3	Sigma-Aldrich	100	G	causes serious eye damage	skin irritant		incompatible with oxidizers and bases
1-Pentanol	71-41-0	Alfa Aesar	500	ML	flammable	skin irritant		incompatible with oxidizing agents
1,1,1,3,3,3, Hexafluoro-2 propanol	920-66-1	Acros Organics	50	ML	corrosive	toxic		acids, bases, finely divided powders, and oxidizing agents
1,10-Phenanthroline	66-71-7	Sigma-Aldrich	2.5	G	toxic			incompatible with oxidizing agents
1,2,3,4-Butanetetracarboxylic Acid	1703-58-8	Sigma-Aldrich	100	G	eye irritant			incompatible with oxidizing agents
1,3,5-Benzenetricarbonyl trichloride	4422-95-1	Sigma-Aldrich	25	G	corrosive	reacts with water		incompatible with oxidizing agents and bases
1,4-Butanediol Diglycidyl Ether	2425-79-8	Sigma-Aldrich	50	G	skin irritant			incompatible with acids, bases, oxidizers, and halides
1,4-Dimethylpiperazine	106-58-1	Sigma-Aldrich	100	G	flammable	corrosive		incompatible with acids and oxidizing agents
1,4-Dioxane	123-91-1	Sigma-Aldrich	1	L	flammable	peroxide former		incompatible with oxidizing agents, reducing agents, halides, and trimethyl aluminum
1,10-Phenanthroline	66-71-7	Sigma-Aldrich	2.5	G	toxic			incompatible with oxidizing agents
2-Butanol	78-92-2	Rigaku	250	ML	flammable			
2-Butanone (MEK)	78-93-3	Sigma-Aldrich	500	ML	flammable			

Chemical Name	CAS	Manufacturer	Amount	Unit of Measure	Primary Hazard	Subsidiary Hazard	Tertiary Hazard	Comments
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1-Methyl-2-Pyrrolidinone	872-50-4	Sigma-Aldrich	100	ML	combustible	possible teratogen	skin and eye irritant	incompatible with oxidizing and reducing agents and acids
1-Decanol	112-30-1	Alfa Aesar	2500	mL	combustible	skin and eye irritant		possible Marpol marine pollutant; incompatible with oxidizers
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1,3,5-Benzenetricarbonyl trichloride	4422-95-1	Sigma-Aldrich	25	G	corrosive	reacts with water		incompatible with oxidizing agents and bases
1,1,1,3,3,3, Hexafluoro-2 propanol	920-66-1	Acros Organics	50	ML	corrosive	toxic		acids, bases, finely divided powders, and oxidizing agents
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1,4-Dimethylpiperazine	106-58-1	Sigma-Aldrich	100	G	flammable	corrosive		incompatible with acids and oxidizing agents
1,4-Dioxane	123-91-1	Sigma-Aldrich	1	L	flammable	peroxide former		incompatible with oxidizing agents, reducing agents, halides, and trimethyl aluminum
1-Ethylpiperazine	5308-25-8	Sigma-Aldrich	50	ML	flammable	skin and eye irritant		incompatible with oxidizing agents
1-Pentanol	71-41-0	Alfa Aesar	500	ML	flammable	skin irritant		incompatible with oxidizing agents
2-Butanol	78-92-2	Rigaku	250	ML	flammable			
2-Butanone (MEK)	78-93-3	Sigma-Aldrich	500	ML	flammable			
1-(2-Hydroxyethyl)piperazine	103-76-4	Sigma-Aldrich	100	G	skin and eye irritant			incompatible with oxidizers, acids, copper, and chlorinated solvents
1,4-Butanediol Diglycidyl Ether	2425-79-8	Sigma-Aldrich	50	G	skin irritant			incompatible with acids, bases, oxidizers, and halides

Lab Packing Recommendations

- Survey new work areas for peripheral hazards.
- Establish an organized work zone.
- "Gross" segregation can be achieved by doing by doing the following:

Lab Packing Recommendations

- Separate liquids from solids.
- Separate obvious incompatibles within these groups (e.g., acids from bases).
- Separate organics from inorganics.
- Create groups based upon chemical families.
- Fine tune the segregation.

Lab Packing Recommendations

- Be careful when packing non-RCRA waste streams: a liquid with a pH of 2.3 and a liquid with a pH of 12.0 are both non-RCRA, but they should not be packed together.
- They can be packed in an appropriate "acid" or "base" drum, provided that the drums do not contain highly concentrated acids and bases.

Lab Packing Recommendations

- Have containers for debris wastestream (e.g., one for RCRA and another for non-RCRA debris).
- Ensure that empty containers that previously held acute and/or and extremely hazardous waste are managed properly.

Lab Packing Recommendations

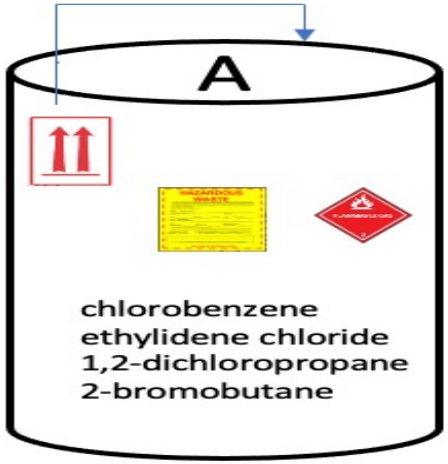
- Do not use "special permits" (SP) that were not issued to your company unless the permit language allows it, and the permit is still in effect.
- Some SPs get adopted into law (e.g., the one that was used to pack aerosols into cubic-yard boxes)

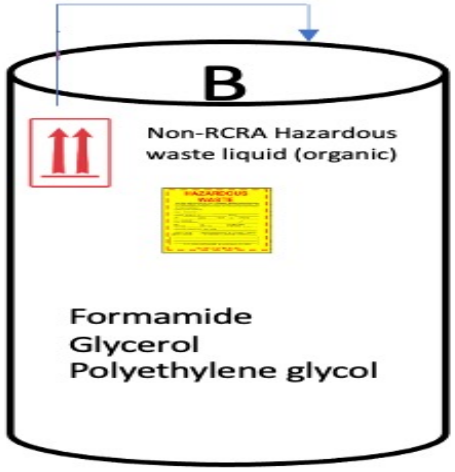
Lab Packing Recommendations

- Please be advised that SP14712, allowing enamel paint to-be-packed into cubic yard boxes, which was owned by Clean Earth, Inc., has expired. *(Unless renewed, this SP is no longer valid and should not be used.)*
- Some chemicals may be "controlled substances," for which additional controls will be imposed by the Drug Enforcement Agency.

10-MINUTE BREAK TIME!

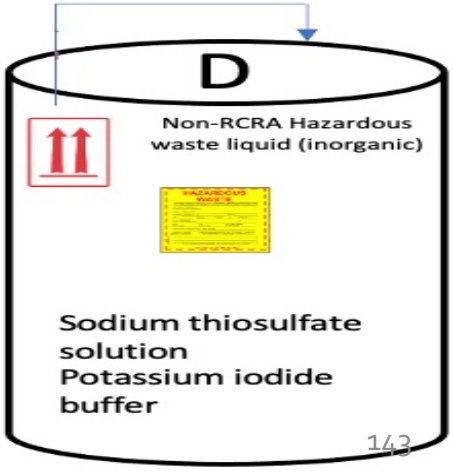
(Lab Pack Tabletops Following Break)

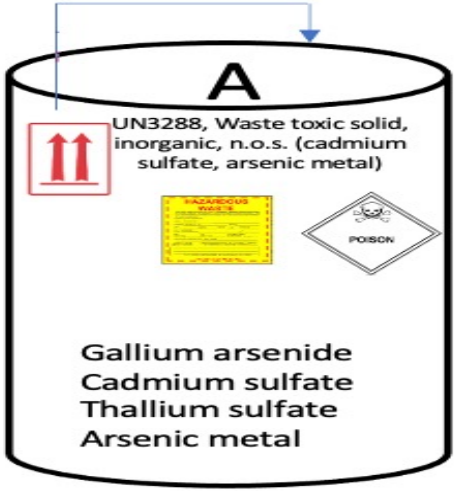


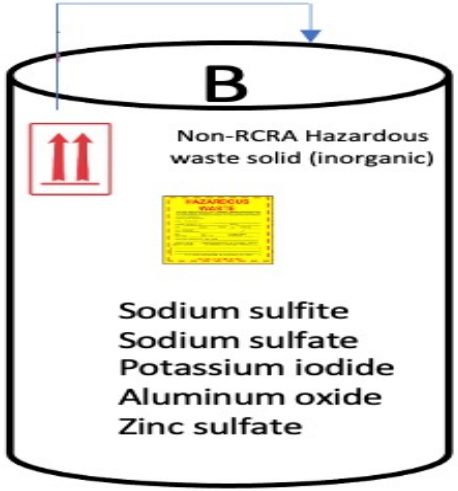


Chemical:
N' N'-Dimethylformamide
Physical form: liquid
Chemical formula:
C_3H_7NO
Flashpoint: 135°F
Boiling point: 307°F
Oral LD_{50}: 3010 mg/kg
Instability: Reacts with oxidizing agents and halogens.

INTO WHICH DRUM SHOULD THIS CHEMICAL BE PACKED?

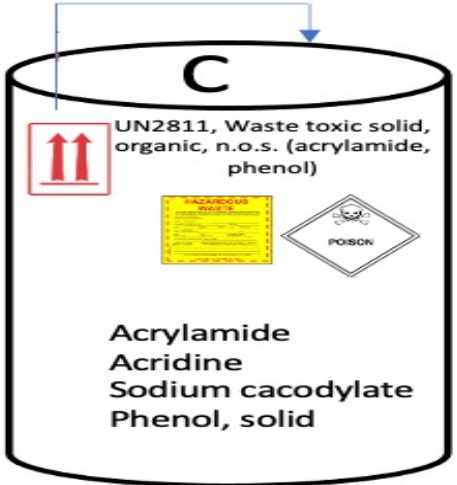


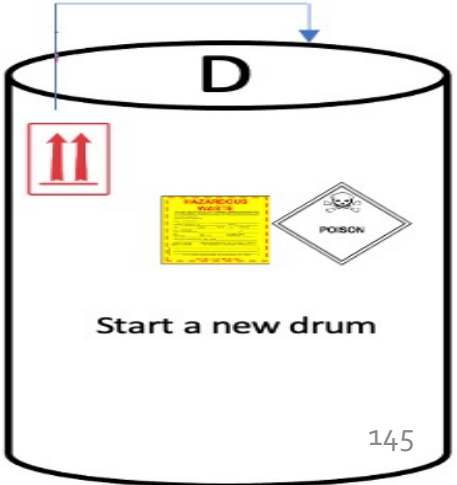


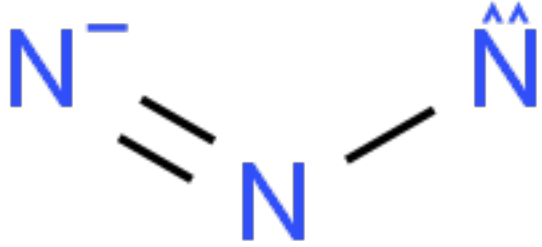


Chemical:
Arsenic pentoxide
Physical form: solid
EPA Code: P011
Chemical formula: As_2O_5
Oral LD_{50}: 8 mg/kg
Instability: Reacts with oxidizing agents and acid.

INTO WHICH DRUM SHOULD THIS CHEMICAL BE PACKED?

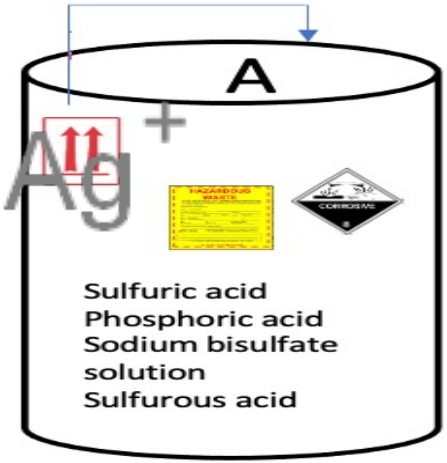


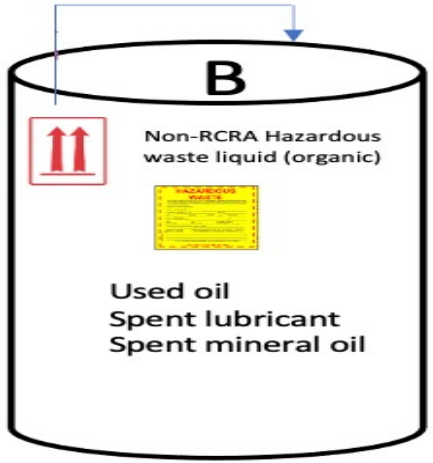


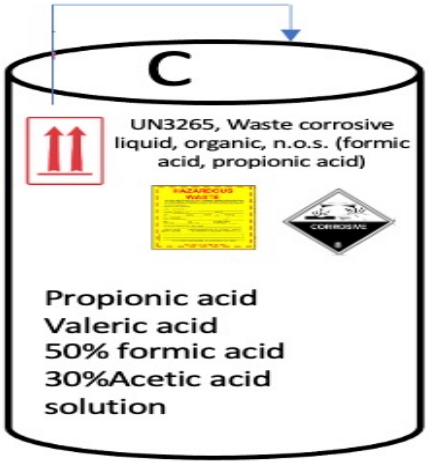


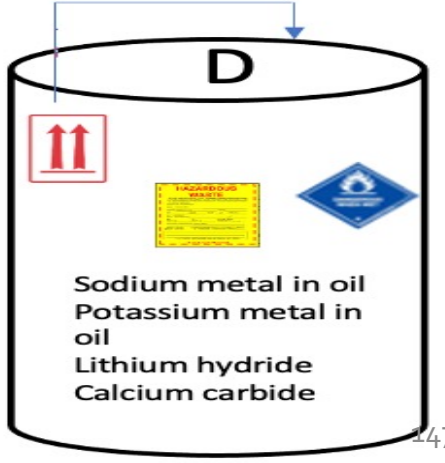
Chemical:
Oil of Vitriol
Physical form: liquid
Chemical formula:
H_2SO_4
Oral LD_{50}: 2140 mg/kg
Instability: Reacts with bases, organics, and water.

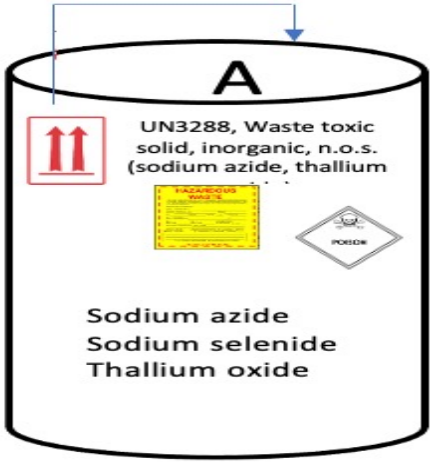
INTO WHICH DRUM SHOULD THIS CHEMICAL BE PACKED?

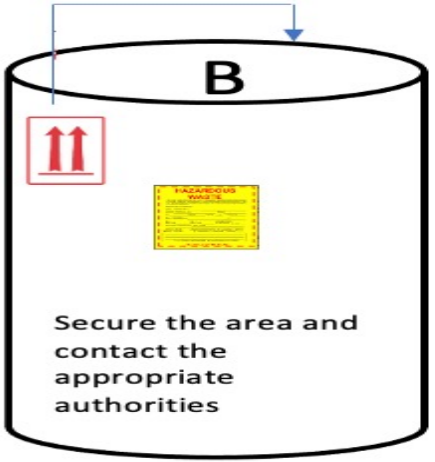


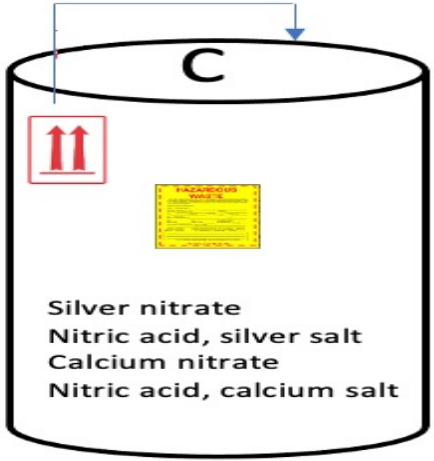


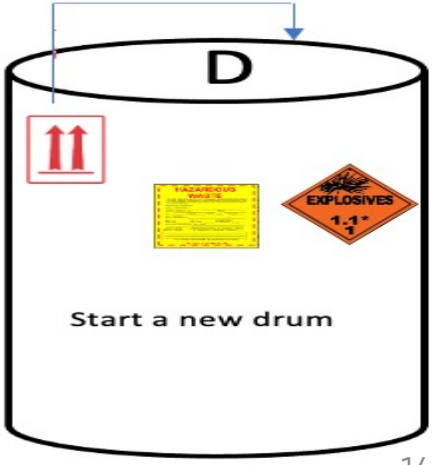












Chemical:
Silver azide
Physical form: solid
Chemical formula: AgN_3
Instability: Avoid shock, friction, or heat. Do not handle when dry. Reacts with oxidizing agents.

INTO WHICH DRUM SHOULD THIS CHEMICAL BE PACKED?

Faded Orange Label

Silver azide (CAS No. 13863-88-2) SDS

- CAS No: 13863-88-2
- Molecular Weight: 149.8883
- Molecular Formula: AgN_3

Names and IdentifiersPropertiesSafety and HandlingComputational chemical data

SDS

SAFETY DATA SHEETS

According to Globally Harmonized System of Classification and Labelling of Chemicals (GHS) - Sixth revised edition

Version: 1.0
Creation Date: Aug 19, 2017
Revision Date: Aug 19, 2017

1.Identification

1.1GHS Product identifier

Product name Silver(1+) azide

1.2Other means of identification

Product number -

Other names acrylic acid,silver (I)-compound

1.3Recommended use of the chemical and restrictions on use

Identified uses For industry use only.

Uses advised against no data available

1.4Supplier's details

Company

Address

Telephone

Fax

1.5Emergency phone number

Emergency phone number -

Service hours Monday to Friday, 9am-5pm (Standard time zone: UTC/GMT +8 hours).

2.Hazard identification

2.1Classification of the substance or mixture

Explosives, Unstable explosive

2.2GHS label elements, including precautionary statements

Pictogram(s)

Signal word	Danger
Hazard statement(s)	H200 Unstable explosive
Precautionary statement(s)	
Prevention	P201 Obtain special instructions before use.
	P250 Do not subject to grinding/shock/friction/….
	P280 Wear protective gloves/protective clothing/eye protection/face protection.
Response	P370+P372+P380+P373 In case of fire: Explosion risk. Evacuate area. DO NOT fight fire when fire reaches explosives.
Storage	P401 Store in accordance with…
Disposal	P501 Dispose of contents/container to ...

2.3Other hazards which do not result in classification

none

3.Composition/information on ingredients

3.1Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
Silver(1+) azide	Silver(1+) azide	13863-88-2	none	100%

6.Accidental release measures

6.1Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3Methods and materials for containment and cleaning up

Pick up and arrange disposal. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7.Handling and storage

7.1Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Avoid exposure - obtain special instructions before use.Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2Conditions for safe storage, including any incompatibilities

Store in cool place. Keep container tightly closed in a dry and well-ventilated place.

accordance with applicable laws and good laboratory practices. Wash and dry hands. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Respiratory protection

Wear dust mask when handling large quantities.

Thermal hazards

no data available

9.Physical and chemical properties

Physical state	no data available
Colour	no data available
Odour	no data available
Melting point/ freezing point	251oC
Boiling point or initial boiling point and boiling range	no data available
Flammability	no data available
Lower and upper explosion limit / flammability limit	no data available
Flash point	no data available
Auto-ignition temperature	no data available
Decomposition temperature	no data available
pH	no data available
Kinematic viscosity	no data available
Solubility	no data available
Partition coefficient n-octanol/water (log value)	no data available
Vapour pressure	no data available
Density and/or relative density	no data available
Relative vapour density	no data available
Particle characteristics	no data available

10.Stability and reactivity

10.1Reactivity
no data available

10.2Chemical stability
Stable under recommended storage conditions.

10.3Possibility of hazardous reactions
no data available

10.4Conditions to avoid
no data available

10.5Incompatible materials
no data available

10.6Hazardous decomposition products
no data available

11.Toxicological information

14.Transport information

14.1UN Number

ADR/RID: no data available IMDG: no data available IATA: no data available

14.2UN Proper Shipping Name

ADR/RID: no data available
IMDG: no data available
IATA: no data available

14.3Transport hazard class(es)

ADR/RID: no data available IMDG: no data available IATA: no data available

14.4Packing group, if applicable

ADR/RID: no data available IMDG: no data available IATA: no data available

14.5Environmental hazards

ADR/RID: no IMDG: no IATA: no

14.6Special precautions for user

no data available

14.7Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

no data available

Excerpt from DOT 49 CFR 172.101 Hazmat Table

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or Division	Identification Numbers	PG	Label Codes	Special provisions (§ 172.102)	(8)	
							Packaging (§ 173.***)	
							Exceptions	Non-bulk
						TP33		
	Silver azide (dry)	Forbidden						
	Silver chlorite (dry)	Forbidden						
	Silver cyanide	6.1	UN1684	II	6.1	IB8, IP2, IP4, T3, TP33	153	212

Glyoxal, 40%

SECTION 1: Identification of the substance/mixture and of the supplier

Product name: Glyoxal, 40%

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number:

Recommended uses of the product and restrictions on use:

Manufacturer Details:

SECTION 11: Toxicological information

Acute Toxicity:		
Oral:	107-22-2	LD50-rat: 200mg/kg
Inhalation:	107-22-2	LC50 rat: 2410mg/m3/4hr
Chronic Toxicity: No additional information.		
Corrosion Irritation: No additional information.		
Sensitization:		No additional information.
Single Target Organ (STOT):		No additional information.
Numerical Measures:		No additional information.
Carcinogenicity:		No additional information.
Mutagenicity:		No additional information.
Reproductive Toxicity:		No additional information.

SECTION 14: Transport information

UN-Number:

Not Regulated.

UN proper shipping name:

Not Regulated.

Transport hazard class(es): None
Packing group: Not Regulated
Environmental hazard: None
Transport in bulk: Not Applicable
Special precautions for user: None

A

Sodium azide
Sodium selenide
Thallium oxide

Chemical: Diethyldichlorosilane
Physical form: liquid
Chemical formula: $C_2H_6Cl_2Si$
Hazard Classes 8, (3)
Instability: Reacts with bases, oxidizers, and water.

INTO WHICH DRUM SHOULD THIS CHEMICAL BE PACKED?

B

Hazard Classes 3, (8)

UN2924, Waste flammable liquids, corrosive, n.o.s. (trimethylchlorosilane, propionyl chloride)

Trimethylchlorosilane
Propionyl chloride
Ethyltrichlorosilane
Dimethyldichlorosilane

C

Silver nitrate
Nitric acid, silver salt
Calcium nitrate
Nitric acid, calcium salt

D

Start a new drum

Peripheral Operations

Lab pack operations are typically supported by other activities such as…

- Bulking
- Hazard Categorization Tests (HAZCAT)
- Packing hazard classes and divisions, which are not eligible for lab packing exceptions, pursuant to other exceptions or to applicable regulations (e.g. aerosols and "poison inhalation hazards" (PIH).

Peripheral Operations

Lab pack operations are typically supported by other activities (cont.)

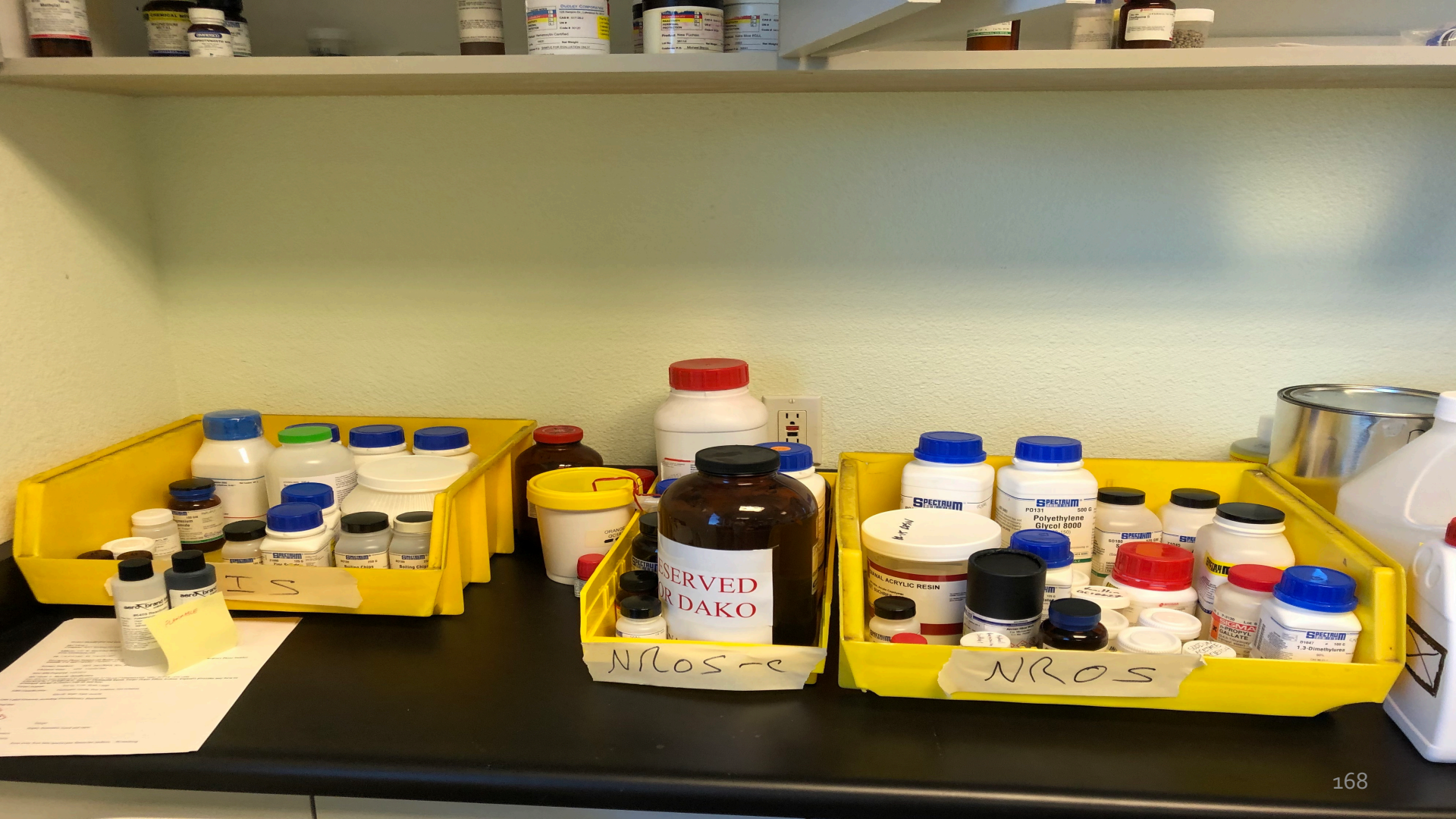
- Shipment prep activities *(e.g., oil immersions, water immersions, adding inhibitors to ethers… all of which require the acquisition of an emergency treatment permit from DTSC. Allow at least 5-to-10 business days for approval.)*

CALIFORNIA CUPA FORUM

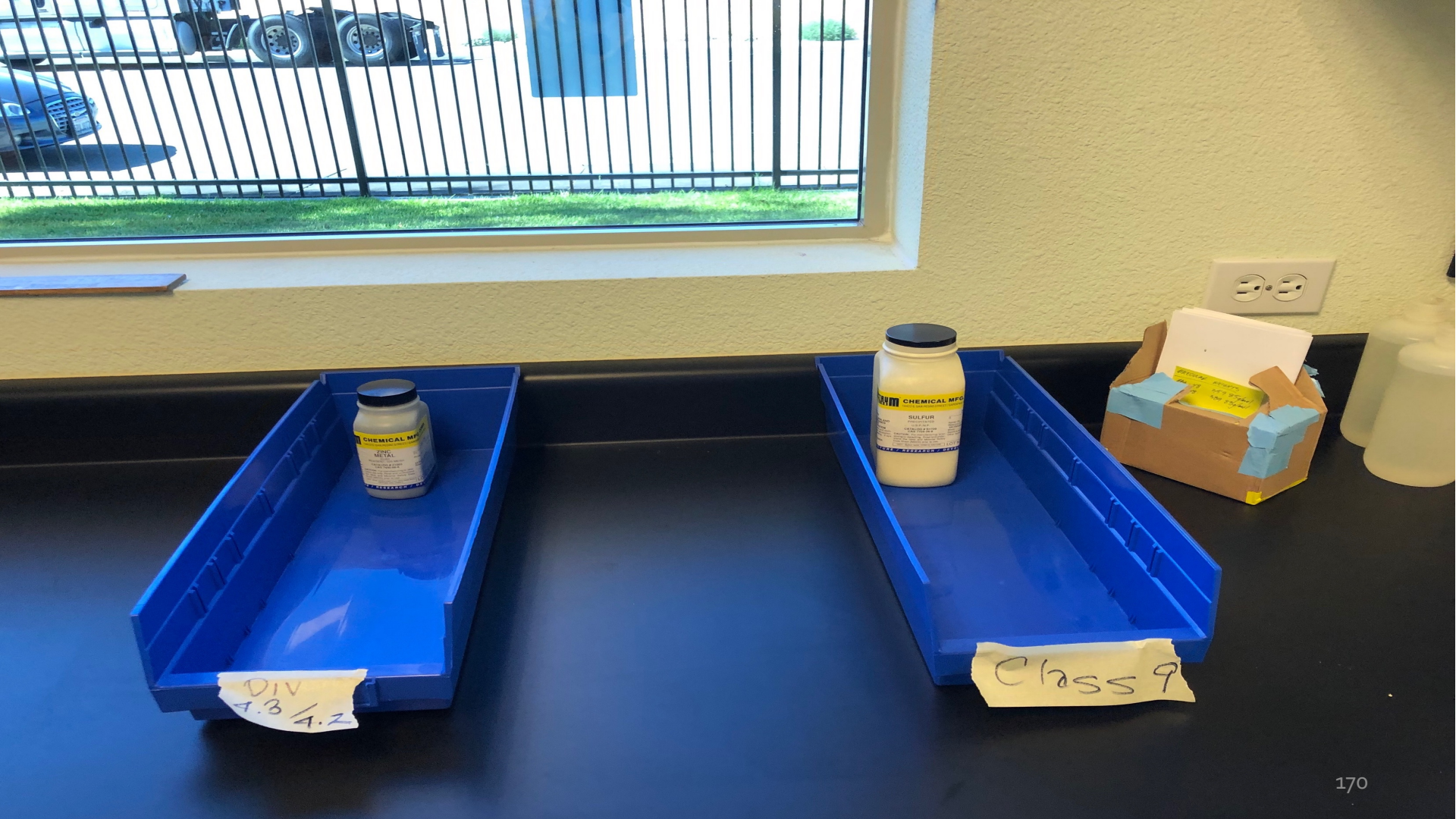
24th California Unified Program Annual Training Conference

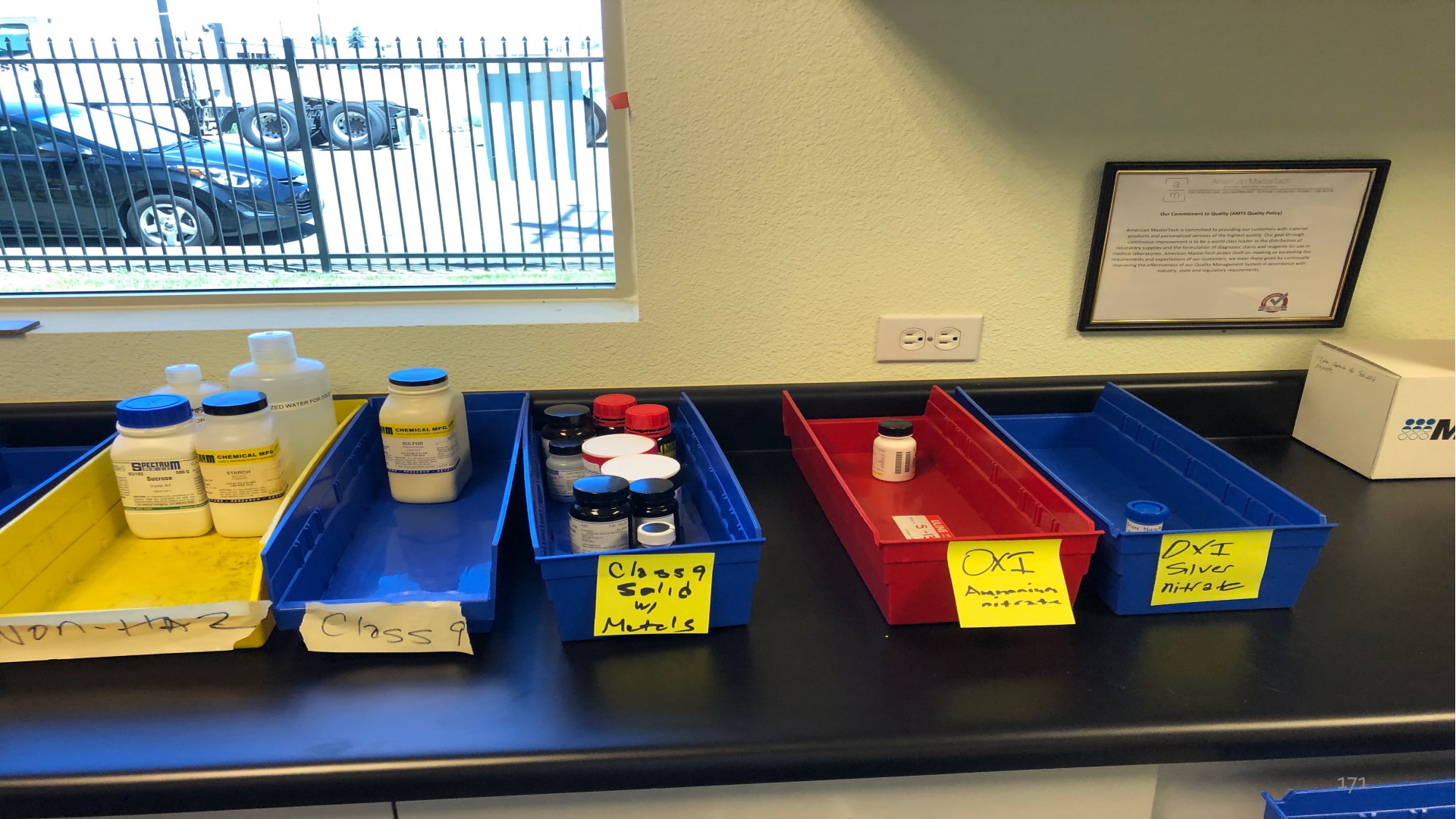
March 22, 23, 24, 29, 30, 31 - 2022


CAOL
CAI2
CAIL


Polyethylene
Glycol 8000
NROS-e
NROS


TSO
NROL
Caffeine
Sucrose
Mineral Oil


CHEMICAL MFG
ZINC METAL
CHEMICAL MFG
SULFUR
DIV 4.3 / 4.2
Class 9


Our Commitment to Quality (AMTS Quality Policy)
SPECTRUM
Sucrose
CHEMICAL MFG
STARCH
CHEMICAL MFG
SULFUR
Class 9
Class 9
Solid
w/
Metals
OXI
OXI
Silver
Nitrate

FLO

FLO

FLO

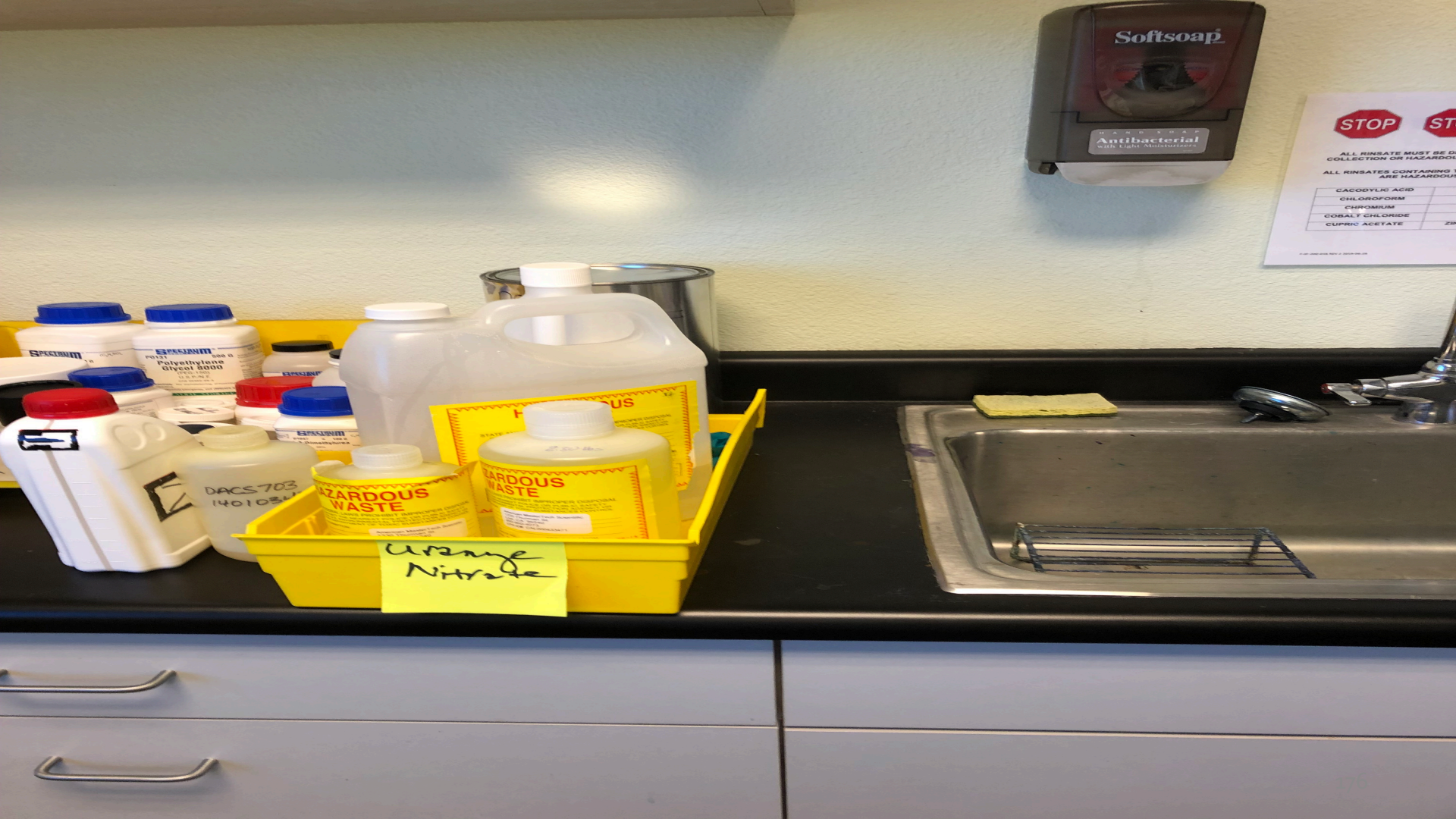
FLO

FLO


FLT
FLA


4.2
TSI-Serr
TSO
TSI
NCIS
-CN


MEISSNER
NROL
NROL


Softsoap
Antibacterial
STOP
Polyethylene Glycol 8000
HAZARDOUS WASTE
Uranyl Nitrate

Earl,

Pick-up, packaging, and disposal quote for the low level radioactive waste described below:

Solid Uranium Nitrate- estimated 500 grams, plus ziplock 14 grams @ $12.00/gram $6,168.00

3 liters 99% aqueous, 1% U Nitrate solution-as mixed waste to NSSI, Houston, Texas $3,000.00 or

3 liters 99% aqueous, 1% U nitrate solution-as rad only, generator certified non haz $1,000.00

Packaging-2 drums @ $100.00 each $ 200.00

Sales tax 8.25% $ 16.50

SW Compact export permit-only required if U nitrate/aqueous solution is non haz $ 500.00

Pick up fee $ 600.00

Total estimate $8,484.50 or $9,984.00

SUMMARY

- Introduction
- Safety
- Regulatory Infrastructure
- Field Chemistry
- Supplies
- Lab Packing Recommendations
- Exercises
- Peripheral Operations
- Project Review

In closing….

- LAB PACKING IS FUN!!!!







Any Questions?

Final Slide – Include your name, agency, email, phone