

Lab Safety Training



What are some hazards in Labs?

- Chemical
- Fire
- Mechanical
- Biological



Chemical Hazards

Types:

- Compressed Gas

- cylinders of compressed gas are under intense pressure

- Corrosivity

- strong acids and bases can cause visible destruction of living tissue at the site of contact.

- Flammability

- both solid and liquid chemicals can serve as fuel sources to support a fire

- Reactivity

- many substances will react violently if allowed contact with air, water or other chemicals. Friction, shock, light or heat can be enough to trigger some reactions

A chemical hazard is any substance that can cause harm, primarily to people

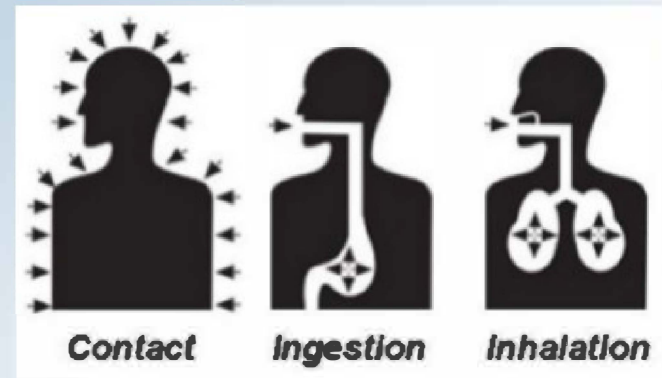
Chemical Hazards: Health Hazards

- Irritants
 - cause reversible inflammation of skin, eyes, or nasal passages
- Sensitizers
 - cause allergic reaction after repeated exposures. Individual sensitivities vary.
- Carcinogens
 - alter DNA or cause cells with altered DNA to multiply
- Systemic Toxins
 - typically target a specific organ or system (liver, kidney, blood, nervous system, reproductive system, etc.).

Exposure

- Exposures occur via 4 routes
 - Inhalation
 - Dermal absorption
 - Ingestion
 - Injection
- Exposures can always be controlled or eliminated by:
 - understanding the properties of the chemicals in use
 - utilizing protective equipment
 - and substituting less-hazardous chemicals into processes

Working with or around hazardous chemicals does not necessarily mean that a person's health will be effected. The link between hazardous chemicals and adverse health effects lies in exposure.



OSHA: Hazard Communication

What is OSHA?

With the Occupational Safety and Health Act of 1970, Congress created the Occupational Safety and Health Administration (OSHA) to ensure safe and healthful working conditions for workers by setting and enforcing standards and by providing training, outreach, education and assistance.

What is Hazard Communication?

When information on chemical hazards is provided to employees by:

- Information and Training
- Labeling
- Warnings
- Safety Data Sheets
- Inventories

Where it applies:

Used for any chemical in the workplace where employees may be exposed under normal routine conditions of use or in a foreseeable emergency so that appropriate measures can be taken to avoid exposure.

SAFETY DATA SHEET

Hydrogen Sulfide

Section 1. Identification

GHS product identifier : Hydrogen Sulfide
Chemical name : hydrogen sulphide
Other means of identification : Hydrogen sulfide; Hydrogen sulfide (H₂S); Sulfuretted hydrogen; Sewer gas; Hydrosulfuric acid; Dihydrogen sulfide
Product use : Synthetic/Analytical chemistry.
Synonym : Hydrogen sulfide; Hydrogen sulfide (H₂S); Sulfuretted hydrogen; Sewer gas; Hydrosulfuric acid; Dihydrogen sulfide
SDS # : 001029
Supplier's details :

Emergency telephone number (with hours of operation) :

Section 2. Hazards Identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas
ACUTE TOXICITY (inhalation) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3
AQUATIC HAZARD (ACUTE) - Category 1

GHS label elements

Hazard pictograms : 

Signal word : Danger

Hazard statements : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure.
May cause frostbite.
Fatal if inhaled.
Extended exposure to gas may cause respiratory irritation.
Very toxic to aquatic life.

Precautionary statements

Safety Data Sheet (SDS)

- Chemical specific
- Included in every shipment of hazardous chemicals
- Required to be in every work location where chemicals exist
- Created by chemical manufacturers
- NOT all created equal

You have a right to information about every chemical in your workplace, and the format created to convey this information is the Safety Data Sheet.

SDS

Format

What is it?

- Blue Print for what the chemical is
- No standard format (GHS 16 Part)
- Everything you need to know

1. Identification
2. Hazard(s) identification
3. Composition/info. on ingredients
4. First-aid measures
5. Fire-fighting measures
6. Accidental release measures
7. Handling and Storage
8. Exposure controls/personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information

Old:

HAZARDOUS MATERIALS CLASSIFICATION

HEALTH HAZARD

4 — Deadly
3 — Extreme danger
2 — Hazardous
1 — Slightly hazardous
0 — Normal material

FIRE HAZARD

Flash Points
4 — Below 73° F
3 — Below 100° F
2 — Below 200° F
1 — Above 200° F
0 — Will not burn

3 **2** **1**

W

SPECIFIC HAZARD

Oxidizer
Acid
Alkali
Corrosive
Use NO WATER
Radiation Hazard

OX
ACID
ALK
COR
W
☢

REACTIVITY

4 — May detonate
3 — Shock and heat may detonate
2 — Violent chemical change
1 — Unstable if heated
0 — Stable

Labeling

New


EPICHLOROHYDRIN ①

UN No. 2023
CAS No. 106-89-8

② **DANGER**

④ Flammable liquid and vapor. Toxic if swallowed. Toxic in contact with skin. Causes severe skin burns and eye damage. May cause an allergic skin reaction. May cause cancer.

⑤ Do not breathe dust/fume/gas/mist/vapors/spray. Wear protective gloves/protective clothing/eye protection.



Fill Weight: 18.52 lbs. Lot Number: A0323111323
Gross Weight: 20 lbs Fill Date: 1/15/2012
Expiration Date: 1/15/2018

⑥ JACKSON CHEMICAL COMPANY - City of Industry, Los Angeles, California, USA (800)-444-456-8989

Numbering System

	<i>RED</i>	BLUE	YELLOW
0	Will Not Burn	Normal Material	Stable
1	Flash Point >200°F	Slightly Hazardous	Not stable if heated
2	Flash Point >100°F <200°F	Hazardous	Violent Chemical change
3	Flash Point >73°F < 100°F	Extremely Hazardous	May detonate with Heat or Shock
4	Flash Point <73°F	Deadly	May detonate

Health Hazards



- Acute toxic
- Skin corrosion or irritation



- serious eye damage or irritation
- respiratory or skin sensitization



- mutagen, carcinogen, reproductive toxin
- specific target organ toxicity



- aspiration hazard

Physical Hazards



- Flammable



- Explosive
- Oxidizer
- Self-reactive
- Self-heating



- Organic Peroxide
- Gas under pressure



Label

2  **1** Sulfuric Acid **2** 

3 Danger! May be harmful if swallowed. Causes sever skin burns and eye **4** damage. Fatal if inhaled. Harmful to aquatic life.

Do not breathe dust/fume/gas/mist/vapors/spray. Wear protective gloves/protective clothing/eye protection/face protection. Wear respiratory protection.

5 **IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.**

In case of fire Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

See Material Safety Data Sheet for further details regarding safe use of this product.

6 Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA Telephone : +18003255832

1 Product Identifier

2 Pictograms

3 Signal word, "Danger!"

4 Hazard Statements

5 Precautionary Statements

6 Supplier Information

ECSU Chemical Hygiene Plan (CHP)

- Contains information and procedures that laboratory personnel can use to protect themselves from the chemicals they work with
- First place to look for answers to questions you might have regarding chemical or laboratory issues

Topics include:

- Glove selection
- Emergency Response
- Chemical compatibility
- Waste Management
- Standard Operating Procedures (SOPs)

Safety Equipment:

Personal Protective Equipment (PPE) (Last line of Defense)

Gloves

- No single glove material is appropriate for all chemicals
- Choose glove with lowest permeability to the chemical you are using
- Consult CHP as a guide



Eye Protection

- If chemicals or infectious agents could be splashed into your face, protect your eyes with glasses, goggles, or a face shield



Clothing

- minimize areas of exposed skin



Eye/Face Protection

What can happen:

"A researcher at Emory University's primate center has died after contracting herpes B from a monkey, the center announced Thursday."

What can happen:

"Applying siding with an air powered staple gun, the staple hit a metal plate behind the siding, ricocheted back, and one leg of the staple penetrated the safety glasses' lens."

Required when working with liquids, flying particles, radiant light, or corrosives



Common Eye/Face Injuries:

- **IMPACT:** Chipping, grinding machining, masonry work, woodworking, sawing, drilling, chiseling, powered fastening, riveting, and sanding.
- **HEAT:** Furnace operations, pouring, casting, hot dipping, welding, chemicals
- **LIGHT AND/OR RADIATION:** Electric arc welding, gas welding, gas cutting, and soldering.
- **NUISANCE:** Irritating mists, dusts.

Goggles

Vented?
Not vented?



Gloves



Skin Hazards

- Irritants
 - Acute (one time, local, reversible)
 - Chronic (extended period of time)
- Skin Sensitizers
 - allergens (poison ivy, latex)
- Others?
 - laceration, abrasion, burns, blisters



"A tiny drop of mercury shattered lives and science by claiming a brilliant researcher, loving wife and mother"

Clothing



S.O.P. (Standard Operating Procedures)

- No Eating
- No Drinking
- No Shorts
- No opened toed shoes

Lab Coats

When Required?
What do they do?

Safety Equipment:

Safety Shower and Eyewash



Ask yourself:

- Do I know where they are located
- Do I know how they work?
- Do I know that they work?
- Are they accessible?



Safety Equipment:

Chemical Fume Hood

Factors that affect airflow:

- Sash Height
- Drafts
- Bulky objects inside

- Airflow into the hood prevents chemicals inside from migrating out into your breathing zone
- If air velocity into the hood is impeded or slowed, the hood's ability to capture chemicals is compromised



Safety Equipment:

Biological Safety Cabinet



- Filtered, not ducted
- Removes particulates, NOT vapors
- Sash height still important

Safety Equipment:

Laminar Flow Hood

- any potentially infectious aerosol that is created will lead to exposure of the operator and the environment
- horizontal-flow clean-air bench used for cell cultures can expose the researcher to aerosols of allergenic or infectious materials.
- vertical-flow clean-air bench also blows air out

Provides product protection only and must not be used when working with any form of biohazard or chemical hazard



Biohazardous Waste

Red Biohazard Bags

Contain solid, non-sharp, biologically contaminated waste that has not been decontaminated prior to removal from the lab. Removed by custodians.



Red Plastic Sharps Containers

Red (hard plastic) sharps containers contain needles, syringes, razor blades, scalpel blades, etc. Removed by custodians.



- Red Biohazard Tissue Waste
- Orange Autoclavable Waste
- Sharps Waste
- Red Biohazard Box for all other Waste

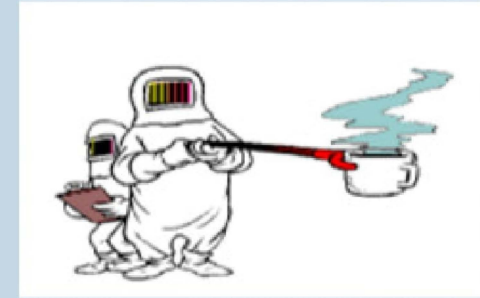
Chemical Spills



1. Identify the chemical



2. Assess your ability to safely contain and clean up the spill:



I CAN safely clean it up



3. Notify coworkers and secure the area



4. Use spill kit to contain and clean up the spill
(MSDS helps)

I CANNOT safely clean it up



3. Notify coworkers and vacate/secure the area

Hazardous Waste

"Characteristic" Hazardous Waste

- The four hazardous characteristics:
 - Ignitability
 - Corrosivity
 - Reactivity
 - Toxicity



Definition:

- A "Solid Waste" which displays a "hazardous characteristic" or is specifically "listed" as hazardous waste
- Solid Waste is any "discarded" material that is not excluded from the definition of hazardous waste
- Discarded Material is material that is "abandoned," "recycled" or inherently "waste-like"

Hazardous Waste

This list includes many of the common toxic wastes, see 40 CFR § 261.24:

Characteristic Waste Determination

Arsenic	5.0 ppm	D004
Barium	100 ppm	D005
Benzene	.5 ppm	D018
Cadmium	1.0 ppm	D006
Chromium	5.0 ppm	D007
Lead	5.0 ppm	D008
Mercury	.2 ppm	D009
MEK	200 ppm	D035
Selenium	1.0 ppm	D010
Silver	5.0 ppm	D011
Tetrachloroethylene	.7 ppm	D039
Trichloroethylene	.5 ppm	D040
Vinyl Chloride	.2 ppm	D043

- Generators may determine whether a waste displays a hazardous characteristic by:
 - Analyzing the waste using specified EPA test methods, or equivalent methods; or
 - Applying knowledge of the composition of the waste and the process generating it
- Characteristic hazardous waste which is not listed and no longer exhibits any characteristic is not hazardous

Satellite Storage

Long-term Storage

- G06
- Clock Starts from the day it enters
- Date is required
- Weekly Inspection

- material **MUST** be LABELLED
- must have the words "Hazardous Waste"
- Name of the material
- Characteristic identifier
- **DATE IS NOT REQUIRED UNTIL CONTAINER IS FULL**

HAZARDOUS WASTE

Waste Name:

PAINT THINNER

Hazards associated with this waste:
(Please check all that apply)

Ignitable XXX

Toxic _____

Corrosive _____

Reactive _____

Generated By: PAINT DEPARTMENT

Note: Once this container is filled, contact Eric Germain at 55103

Fire Safety

Fire Rules:

- **Never fight a fire if you don't know what is burning**
- If you don't know what is burning, you don't know what type of extinguisher to use.
- Even if you have an ABC extinguisher, there may be something in the fire which is going to explode or produce highly toxic smoke..



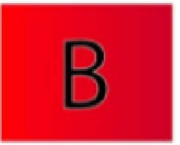







Station Bar, RI
(97 people killed)

“Human nature being what it is, they tried to go out the same way they came in and were trapped”



Types of Fires:

Fires are classified by the type of FUEL they burn:

		Ordinary Combustibles	Wood, Paper, Cloth, Etc.
		Flammable Liquids	Grease, Oil, Paint, Solvents
		Live Electrical Equipment	Electrical Panel, Motor, Wiring, Etc.
		Combustible Metal	Magnesium, Aluminum, Etc.
		Commercial Cooking Equipment	Cooking Oils, Animal Fats, Vegetable Oils

Using a Fire Extinguisher

P.A.S.S

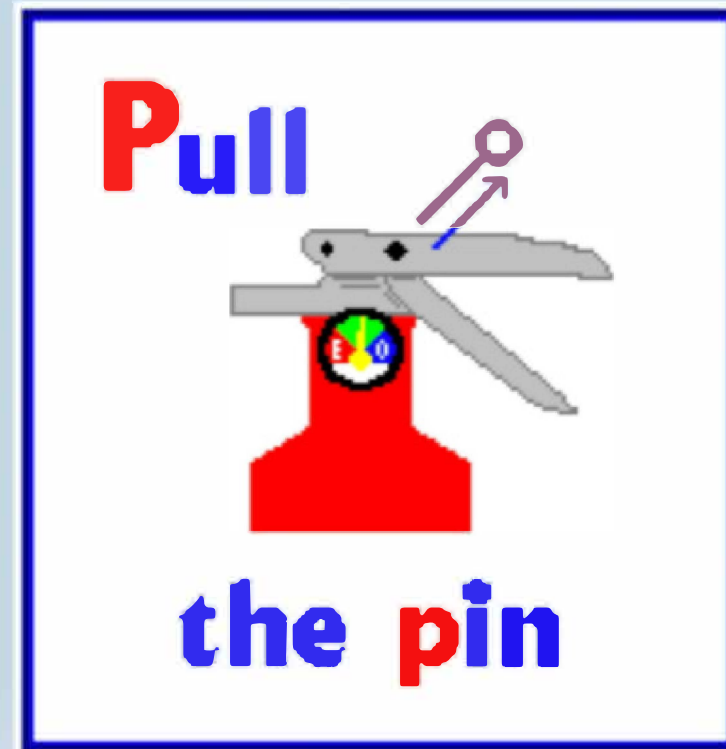
- Pull
- Aim
- Squeeze
- Sweep



1. Pull

Pull the Pin

- This will allow you to discharge the extinguisher.



2. Aim

Aim at the base of the fire

- If you aim at the flames, the extinguishing agent will fly right through and do no good. You want to hit the fuel.



3. Squeeze

Squeeze the top handle or lever

- This depresses a button that releases the pressurized extinguishing agent in the extinguisher



4. Sweep

Sweep from side to side

- Do this until the fire is completely out



Lab Safety Quiz