

# WINTHROP UNIVERSITY - SAFETY IN THE CHEMISTRY LABORATORY

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The Department of Chemistry, Physics, and Geology at Winthrop University makes every effort to provide a safe learning environment for the chemistry student. All laboratory experiments are checked for safety when performed according to the directions. STUDENTS ARE RESPONSIBLE FOR READING ALL SAFETY PRECAUTIONS FOR PERFORMING EACH EXPERIMENT BEFORE COMING TO LAB. Part of the educational program in chemistry is to learn how to handle potentially hazardous materials in a safe and efficient manner. As with any activity where there is the potential for a serious accident, the fundamental responsibility lies with the individual. The principle effort in conducting a safe laboratory program is thorough preparation and constant vigilance. WHENEVER THERE IS ANY DOUBT ABOUT THE SAFETY OF A PROCEDURE OR WHAT PRECAUTIONS SHOULD BE TAKEN, ASK YOUR INSTRUCTOR BEFORE BEGINNING THE EXPERIMENT.

The following rules will be strictly enforced. If you violate these rules, you will be asked to leave for the safety of the other students. You will not be allowed to return or complete the lab assignment at a later date.

## Personal Protective Equipment (PPE)

- You must always wear safety goggles while in lab. It is your responsibility to provide department approved safety goggles. Chemical splash goggles (NOT GLASSES) are required. Goggles must be worn by everyone, including those who wear eyeglasses or contact lenses. The bookstore sells the appropriate goggles.
- It is poor personal hygiene to share eye protection. Borrowing goggles is not an option.
- The American Chemical Society Committee on Chemical Safety has studied and reviewed the wearing of contact lenses in the laboratory. They recommend that contact lenses can be worn in most laboratory environments provided the same approved eye protection is worn as required of other workers in the lab. If you wear contact lenses in the lab, your instructor will give you a colored sticker to place on your goggles indicating that you are wearing contacts.
- Closed-toe shoes, preferably leather, that cover the entire foot are required for each lab. Open-toe shoes are not allowed. If you come to lab with the wrong shoes, you will have to leave.
- Avoid loose clothing that could become caught in equipment or easily knock over containers.
- Laboratory aprons are available in the general chemistry labs and must be worn while working in the laboratory.
- Tie back long hair, especially around flames and caustic chemicals.
- Gloves are available in lab when needed.

## General Safety Rules

- No eating, drinking, chewing gum or tobacco/vaping use in the laboratory. Also, be sure to wash your hands prior to leaving lab for the day.
- Cell phones, music players, ear buds/headphones are not allowed in lab. If you must answer your cell phone in lab, wash your hands and leave the lab before handling a phone.
- "Horseplay" and unauthorized experiments are strictly forbidden
- Learn the location of all safety equipment such as eyewash stations, safety showers, fire blankets, and fire exits before beginning work in the laboratory.
- Keep aisles and exits clear. There are areas designated for storing book bags. Do not store your book bag on the floor. You can store your personal belongings on a table in the computer room.
- Close your lab drawer after removing laboratory equipment.
- Return equipment and chemicals to the appropriate storage area when you are finished using them.
- Be sure to inspect glassware before using. Discard any glassware that is cracked, chipped, scratched or has any other obvious defect.
- Discard broken glassware in the broken glass container in the front of the lab.
- Burns are a common laboratory injury. Use caution when working with Bunsen burners, hot plates, hot glassware, etc.
- Do not insert glass tubing into a rubber stopper without advanced training. There is special equipment that should be used in order to minimize the risk of injury.

## Working with Chemicals

- Never leave an open flame or rapid reaction mixture unattended. In the event of a fire, turn off your Bunsen burner and exit the building.
- Always add acids to water never water to acids.
- Keep substances with irritating fumes under your fume hood at all times.
- Never use flammable substances around open flames. Use extreme caution when using flammable substances around other heat sources.
- Return caps and lids to all reagent bottles immediately after use. Don't assume the next person will do that for you. If you remove it, put it back.
- Never return reagents to stock bottles. This contaminates the stock and may cause a violent reaction.

- Dispose of unused or contaminated reagents in labeled containers as directed by the instructor. Do not put any chemicals down the drain unless otherwise directed by your instructor.
- Wash glassware before returning to your lab drawer. Glassware that is returned to the common area must be rinsed before returning the item.
- Use extreme caution when testing odors. Smell chemicals only when instructed to do so. Use proper technique when smelling chemicals. Waft odors towards your nose rather than sniffing directly.
- Never taste anything when in the lab.
- Never pipet by mouth. Always use a rubber bulb.

## **What to do in case of an accident**

- Never work alone in the laboratory.
- Report any accident to your instructor immediately.
- Practice good housekeeping; leave the lab cleaner than you found it. Clean up small chemical spills immediately. For larger spills, notify your instructor immediately.

If, for any reason, your instructor feels that your safety is in jeopardy or that you are jeopardizing the safety of others, you will be asked to leave the lab. You will not be allowed to return to make up missed work and you will receive a zero for that day's work. You will not be allowed to return to future labs until the situation is corrected.

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# Laboratory Etiquette

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- Other students use the workspace and equipment that you use in this laboratory. Always leave your workspace clean. Laboratory instructors can deduct penalty points for poor housekeeping. There are detergents for glassware, hand soap and paper towels available at each workstation.
  - In addition, much of the equipment is usually quite expensive. Treat the equipment with care. Balances are especially sensitive, expensive devices. Never weigh chemicals directly on the pan. Corrosive materials can damage the steel pan. Use a container such as a beaker or flask. Remove the container from the balance, add the chemical, and then replace the container on the balance. If you spill anything on the balance, please notify the instructor immediately.
  - If you find a piece of equipment that is not in good working order, notify your instructor immediately.
  - When working with "community reagents", take an appropriate size container to the front lab bench, and pour the appropriate amount of reagent into your container. Be sure to follow the correct procedures (see below) for obtaining chemicals from a stock bottle.
  - Never lay reagent bottle stoppers or caps on the lab bench. The entire reagent may become contaminated. In addition, the residue on the bench may be hazardous and linger for days or weeks. This could injure someone well after the fact. Hold the stopper in your other hand while you get the material out of the bottle. Replace stoppers immediately and completely.
  - Many chemicals have strong or toxic odors and should be used in a fume hood only. For example, acids and bases can be particularly hazardous. If you are not sure, be on the safe side and use your hood.
  - Cell phones and music players are inappropriate in lab.
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# Winthrop University - Safety in the Chemistry Laboratory

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## Accidents and Accident Prevention

There are many potential hazards that exist in the laboratory. The best way to deal with such hazards is to prevent accidents from happening. The following are some guidelines for dealing with and preventing the more common accidents. When in the laboratory, use common sense, pay attention to what you are doing, and be alert as to what is going on around you.

- For any type of incident, turn off all heat sources and notify your instructor immediately.
  - If you are attempting to assist someone, do not become a victim yourself. Wear safety goggles and gloves to prevent direct contact.
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## Accidents

### A. Chemical Exposure and/or Burns

#### 1. Chemicals on the Skin in Confined Areas

- Immediately flush the area with cool water for at least 15 minutes. Remove all jewelry to facilitate removal of any residual material.
- Have someone else notify your laboratory instructor.
- Seek medical attention
- If a delayed reaction is noted, report immediately for medical attention and explain carefully what chemicals were involved.

#### 2. Chemicals Spilled over a Large Area of the Body

- The person should immediately head to the nearest safety shower.
- Notify an instructor- Treat as a life threatening emergency. Call -911 or 323-3333.
- Once in the shower, rinse first, and then remove clothes taking care not to spread chemicals especially into the eyes.
- Wash head and remove clothing before removing goggles.
- Flush skin for 15 minutes, and seek immediate medical attention.
- If a fire blanket is available it can be used as a shower curtain for someone using the safety shower and then used to keep someone warm while waiting for emergency help to arrive.
- Avoid putting anything on the affected area; it may worsen the condition and cause irritation.
- Send SDS with the injured person

### 3. Chemicals in the Eyes

- **Prevention:** Always wear the appropriate splash goggle in lab.
- Get the victim to an eyewash station immediately, and rinse the eyes for at least 15 minutes.
- Eyelids have to be forcibly opened to ensure effective washing behind the eyelid.
- Remove contact lenses as soon as possible so that the eye can be thoroughly rinsed.
- Get medical attention immediately. All eye injuries must be treated at the Crawford Health Services.

### 4. Ingestion of Chemicals

- **Prevention:** Do not eat, drink, chew gum, use any type of cosmetic, hand cream, etc. while in lab. Do not use your cell phone, head phones, ear buds, etc. while in lab. Keep your hands away from your face and mouth and always wash hands before leaving the lab.
- Identify the chemical ingested
- Call -911 immediately

### B. Chemical Spills

- Turn off all sources of ignition.
- Notify individuals in the area of the spill.
- Notify your instructor immediately of the spill and the chemical that was spilled.
- If any injury is involved, and it can be done safely, attend to injured or contaminated persons, and remove them from exposure.
- Do not attempt to clean up the spill yourself. Your instructor will determine what needs to be done in order to clean up the spilled chemical.

### D. Fires

- If possible, turn off all sources of ignition.
- Notify everyone else in the laboratory.
- **Notify your instructor immediately and send someone to find another faculty or staff member.**
- If a person's clothing is on fire, help them drop to the floor and roll, or take them to a safety shower. A fire blanket can be used to help smother the flames, but do not wrap a person whose clothing is on fire in a fire blanket. Use a fire blanket to cover them once flames are extinguished.
- If the fire is spreading quickly or you are unsure as to what to do, evacuate the area and pull the fire alarm.
- Do not attempt to put the fire out yourself.

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### Prevention

## A. Accidents

- Use the appropriate personal protective equipment at all times while in the lab.
- Pay attention to your surroundings.
- Keep your workspace clean of clutter.
- Do not store any items on the floor of a laboratory, i.e. book bags. There are storage areas provided.
- Keep lab drawers closed.
- Keep the sinks clear of waste. No solids of any kind ever go into the sink.
- Do not work with chipped or broken glassware.
- There are specially marked containers for all broken glass. **Do not throw glass in a trashcan.**

## B. Fires

- The best way to handle fires is to prevent them.
  - The following is a list of some of the things you can do to help prevent fires from starting:
    - Keep your work area free of clutter
    - In case of any incident, always turn off any heat source you are using.
    - **Never leave a Bunsen burner unattended** and always turn off the gas when finished. Even if you plan on using the Bunsen burner again during the lab period, always turn the gas off after each use.
    - If the fire bell rings while you are working, **turn your Bunsen burner off** and exit the building calmly.
    - Never use an open flame to heat a flammable liquid.
  - When working with an open flame, keep your hair pulled back if it is long and watch that your clothing does not catch fire. Do not wear long, loose fitting clothing.
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## Safety Equipment



## Description

### Splash Goggles

- **Splash goggles are required in lab at all times. Put your goggles on when you enter the lab and leave them on until you exit the lab. Many splash incidents happen while cleaning up.**

### Eye Wash Station



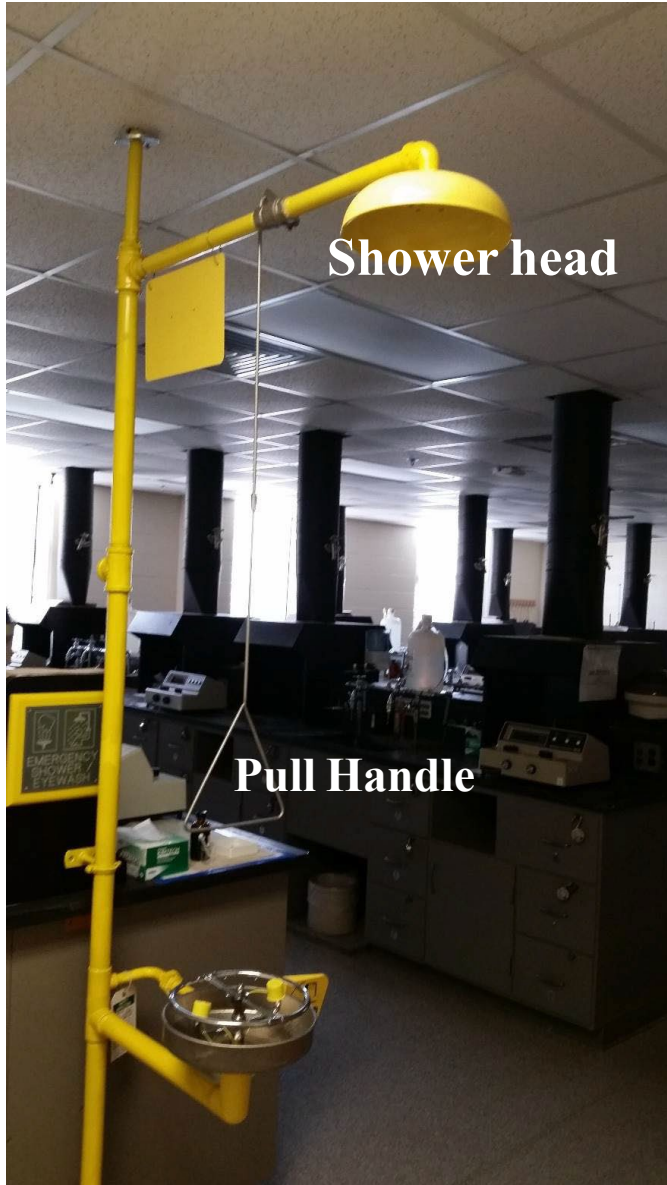
- **Prevention: Always wear the appropriate splash goggle in lab.**
- Get the victim to an eyewash station immediately, and rinse the eyes for at least 15 minutes.
- Eyelids have to be forcibly opened to ensure effective washing behind the eyelid.
- Remove contact lenses as soon as possible so that the eye can be thoroughly rinsed. Move eyes up and down and sideways to wash behind eyelids.
- Follow up with immediate medical attention.



## Safety Equipment

## Description

### Safety Shower



- **Prevention: Always wear the appropriate personal protective equipment until you leave the lab. Pay attention to what you are doing and those around you.**
- Notify an instructor- Treat as a life threatening emergency. Call -911 or 323-3333.
- Once in the shower, rinse first, and then remove clothes taking care not to spread chemicals especially into the eyes.
- Wash head and remove clothing before removing goggles. Cut garments off instead of pulling over the head.
- Flush skin for 15 minutes and seek immediate medical attention.
- If a fire blanket is available it can be used as a shower curtain for someone using the safety shower and then used to keep someone warm while waiting for emergency help to arrive.
- Send SDS with the injured person.

## Safety Equipment

## Description



### Fire Blanket

- **Prevention:**
  - Keep your work area free of clutter
  - In case of any incident, always turn off any heat source you are using.
  - **Never leave a Bunsen burner unattended** and always turn off the gas when finished. Even if you plan on using the Bunsen burner again during the lab period, always turn the gas off after each use.
  - If the fire bell rings while you are working, **turn your Bunsen burner off** and exit the building calmly.
  - Never use an open flame to heat a flammable liquid and pay attention to all ignition sources when using flammable chemicals.
  - When working with an open flame, keep your hair pulled back if it is long and watch that your clothing does not catch fire. Do not wear long, loose fitting clothing.
- A fire blanket can be used to suffocate a small. Fires grow quickly, so you must act fast. A fire blanket can also be used as a “shower curtain” if some has to use the safety shower.



### Fire Extinguisher

- A fire contained in a small vessel often can be suffocated, for example by placing a watch glass over its opening or using a fire blanket.
  - If the fire is too large to be suffocated quickly:
    - Activate the fire alarm and notify everyone around you. Use the stairs when evacuating the building. Do not use the elevator during the evacuation.
- A fire extinguisher can be used on a small fire. **However, you should never attempt to use a fire extinguisher unless you have been trained in its use.** Locate yourself between the fire and the exit. Always be sure you can escape.

## Safety Data Sheets (SDS)

A SDS for a particular chemical will include hazard information (physical, health and environmental hazards), protective measures, safety precautions for handling, storing and transporting the chemical.

We will focus mostly on Section 2- Hazard Identification

- In Section 2, the physical, health and environmental hazards of the substance are reported.
  - Uses the GHS (Globally Harmonized System of Classification and Labeling of Chemicals).
  - Uses a numbering system that rates the hazards of a chemical.
    - Category 1 hazard = high hazard
    - Category 4 hazard = less hazardous
  - Includes pictograms to represent hazards. Pictograms convey hazards through images.
  - Signal words help convey hazards through a simple word:
    - “Danger” is used for more severe hazards
    - “Warning” is used for less severe hazards

## SDS for ethanol.

### SIGMA-ALDRICH

[sigma-aldrich.com](http://sigma-aldrich.com)

### SAFETY DATA SHEET

Version 4.12

Revision Date 07/09/2015

Print Date 01/15/2016

This is a safety data sheet for ethanol

#### 1. PRODUCT AND COMPANY IDENTIFICATION

##### 1.1 Product identifiers

Product name : Ethyl alcohol, pure

Product Number : E7023

Brand : Sigma-Aldrich

Index-No. : 603-002-00-5

CAS-No. : 64-17-5

##### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

##### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

##### 1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

**SDS were originally created for emergency response personnel. However, there is good information in SDS's that laboratory workers can use.**

**We will focus mostly on Sections 2, 8 and 11 of the SDS.**

## Section 2

### 2. HAZARDS IDENTIFICATION

#### 2.1 Classification of the substance or mixture **GHS Classifications**

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225

Eye irritation (Category 2A), H319

For the full text of the H-Statements mentioned in this Section, see Section 19

#### 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

Highly flammable liquid and vapour.  
Causes serious eye irritation.

H225

H319

Precautionary statement(s)

Keep away from heat/sparks/open flames/hot surfaces. - No smoking.  
Keep container tightly closed.  
Ground/bond container and receiving equipment.  
Use explosion-proof electrical/ ventilating/ lighting/ equipment.  
Use only non-sparking tools.  
Take precautionary measures against static discharge.  
Wash skin thoroughly after handling.  
Wear protective gloves/ eye protection/ face protection.  
IF ON SKIN (or hair): Take off immediately all contaminated clothing.

P210

P233

P240

P241

P242

P243

P264

P280

P303 + P361 + P353

Ethanol is listed as a Category 2 flammable liquid. This means that it is easily ignited by a spark or open flame. Use in a chemical hood to reduce fumes in lab or keep away from any potential sparking system

Hazard and precautionary statements reinforce hazards and ways to reduce hazard and protect yourself.

Sigma-Aldrich - E7023

Signal word- indicating hazardous substance

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Category 2A eye irritant- Irritating to the eyes. Wear chemical splash goggles

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - 10,470 mg/kg

LC50 Inhalation - Rat - 4 h - 30,000 mg/l

LD50 Dermal - Rabbit - 15,800 mg/kg

No data available

#### Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 24 h  
(OECD Test Guideline 404)

#### Serious eye damage/eye irritation

Eyes - Rabbit

Result: Moderate eye irritation  
(OECD Test Guideline 405)

#### Respiratory or skin sensitisation

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

Carcinogenicity - Mouse - Oral

Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Liver: Tumors. Blood: Lymphomas including Hodgkin's disease.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Toxicology data help us determine how toxic a substance can be.

LC<sub>50</sub>- the conc. of a hazardous material in air that is expected to kill 50% of a group of test animals when given as a single respiratory exposure in a specific time period

LD50 is a single dose, other than inhalation, that causes death in 50% of an animal population from exposure to a hazardous substance

A one-time exposure to a chemical with any of the following data could result in severe illness or death. If using a chemical with any of the following values, make sure you do your homework and are well prepared.

LD<sub>50</sub> ≤ 50 mg/kg (oral)

LD<sub>50</sub> ≤ 200 mg/kg (skin contact)

LC<sub>50</sub> ≤ 200 ppm (inhalation)

## National Fire Protection Association (NFPA)- The NFPA Hazard Fire Diamond

Originally, the fire diamond was created to provide information for firefighting and emergency personnel, but their descriptions of the hazards of chemicals can be useful in the chemistry laboratory.

The fire diamond addresses health, flammability, reactivity, and related hazards presented by short-term exposure (fire, spill) of chemicals displayed in a diamond shaped image.

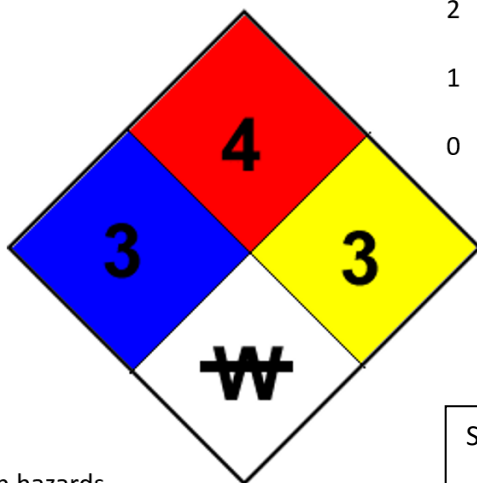
It does not apply to chronic exposure or non-emergency occupational exposure.

### Flammability- Red Diamond

- 4 Extremely flammable.
- 3 Flammable; ignites under normal temperatures
- 2 Ignites when moderately heated
- 1 Material is normally stable, but may ignite at high temperatures
- 0 Will not burn

### Reactivity- Yellow Diamond

- 4 Readily detonates or explodes
- 3 Shock or heat may detonate
- 2 Unstable; may undergo violent chemical change but does not detonate.
- 1 Normally stable, but can become unstable when heated
- 0 Normally stable



### Health- Blue Diamond

Addresses acute health hazards

- 4 Deadly; one time exposure could result in death.
- 3 Extreme Danger; Could cause serious injury
- 2 Hazardous; Could cause injury
- 1 Slightly Hazardous
- 0 No Hazard

### Special Hazard- White Diamond

Uses symbols to convey special hazards

~~W~~ No water. Material ready reacts with water.

OX- Material is an oxidizer

SA- Material is a simple asphyxiant gas