

# Chemistry Laboratory Safety and Guidelines

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# Goong-Ni Laboratory Building(E6-5)



4<sup>th</sup> floor Lab



5<sup>th</sup> floor lab



7<sup>th</sup> floor lab



Floor	Lab Name	Lab
4th	General Chemistry Lab (1)	402~404
4th	General Chemistry Lab (2)	406~408
5th	Physical/Analytical chemistry Lab	505~506
7th	General Chemistry Lab (3)	704~705



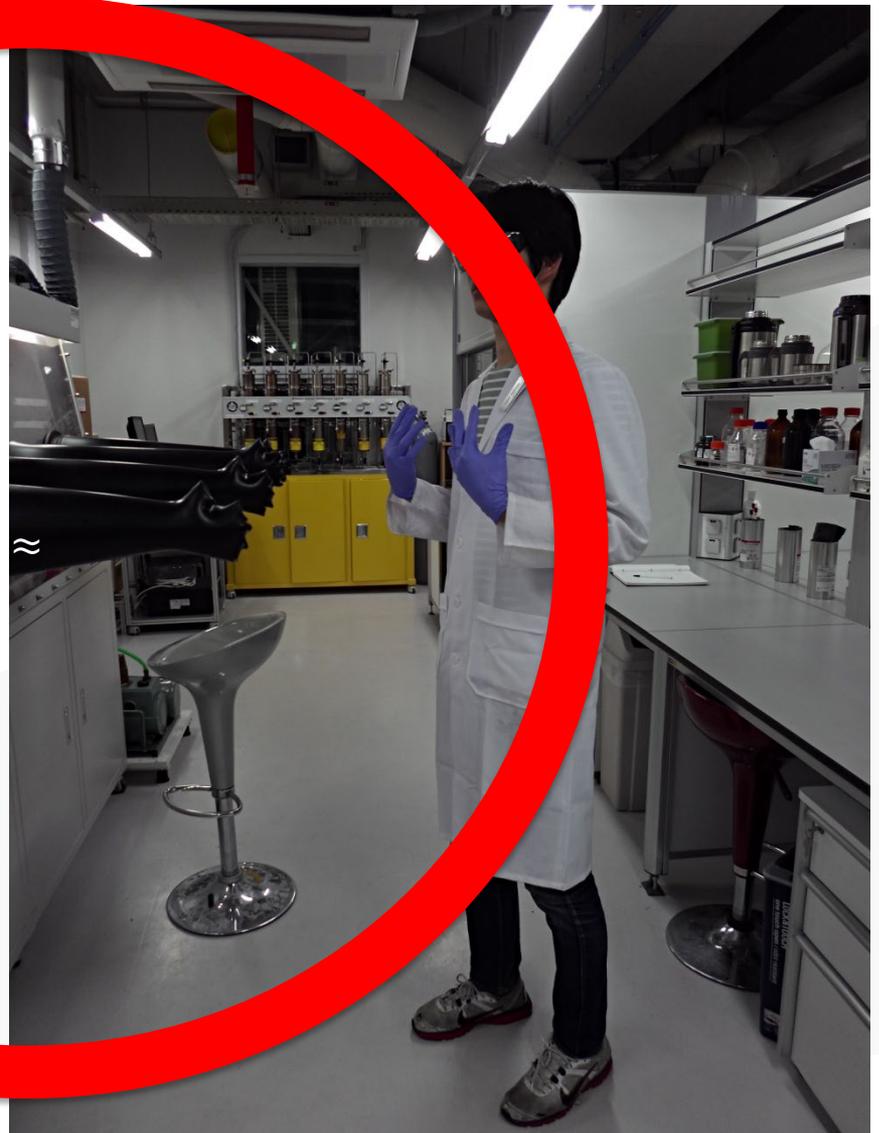
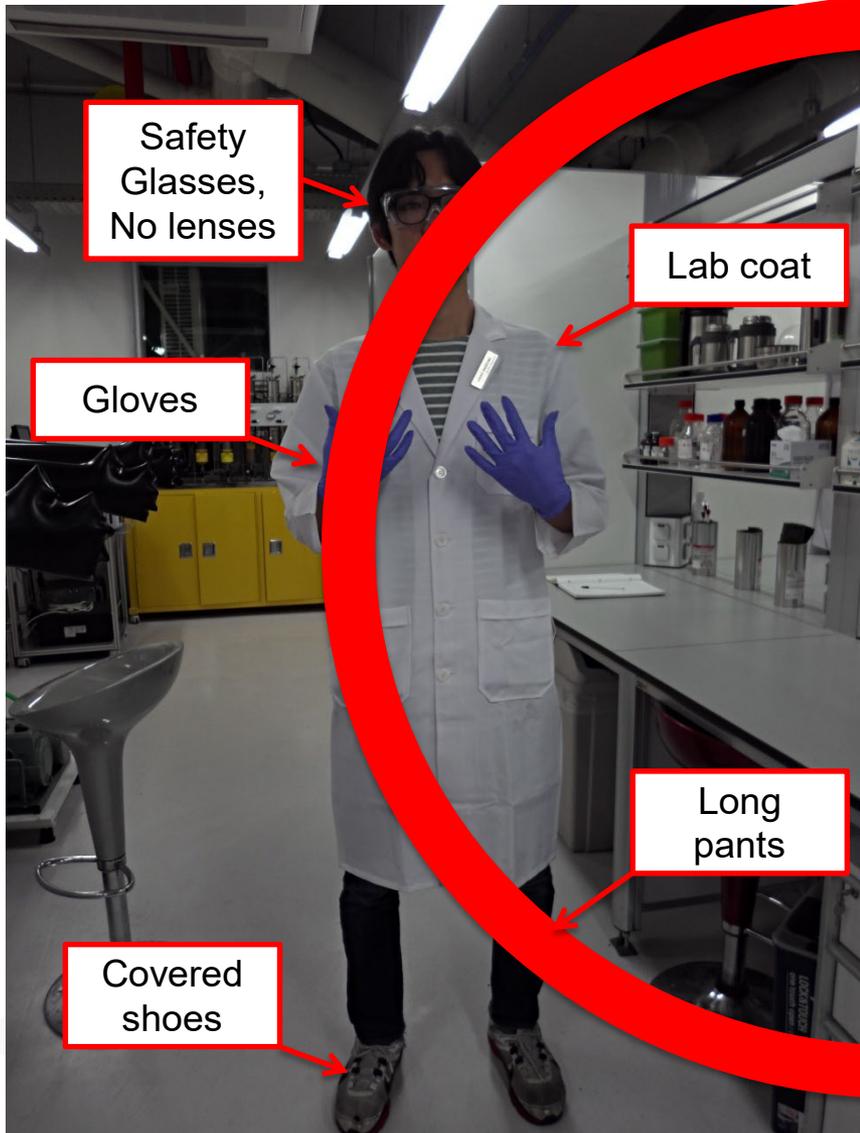
# Laboratory Safety and Guidelines: Self Protection

*Laboratory manual for Principles of General Chemistry, 10<sup>th</sup> Edition, J.A. Beran*

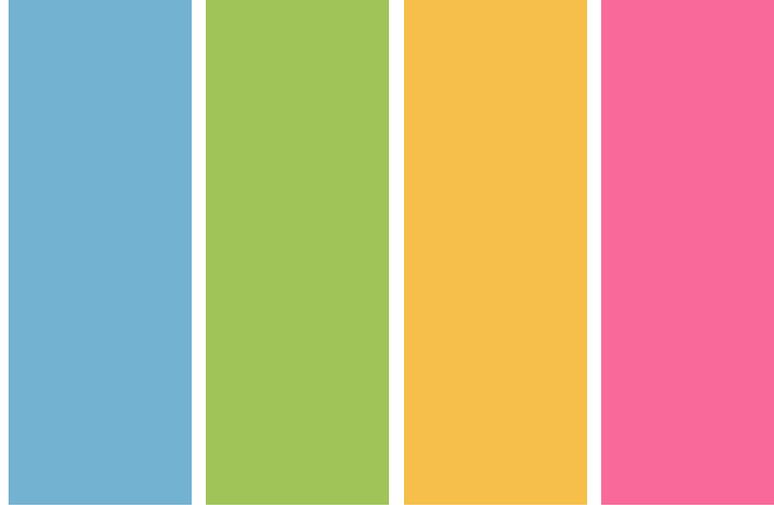
- Approved safety goggles or eye shields must be worn at all times guard against the laboratory accidents of others as well as your own. **Contact lenses should be replaced with prescription glasses.**
- *Shoes must be worn.* Wear only shoes that shed liquids. High-heeled shoes; open-toed shoes; sandals; shoe tops of canvas, leather, or fabric straps or other woven material are not permitted.
- *Clothing should be only nonsynthetic* (cotton).
- *Gloves are to be worn to protect the hand* when transferring corrosive liquids.
- *Jewelry should be removed.* Chemicals can cause a severe irritation if concentrated, under a ring, wristwatch, or bracelet; chemicals on fingers or gloves can cause irritation around earrings, necklaces, and so on.

# Personal Protective Equipment (PPE)





- Secure long hair and remove (or secure) neckties and scarves.
- Cosmetics, antibiotics, or moisturizers are not to be applied in the laboratory.
- **Be sure to read each technique and MSDS of chemicals carefully** before the laboratory session for completing a safe and successful experiment.
- **Wash you hands often during the laboratory**, but always wash your hands with soap and water before leaving the laboratory!



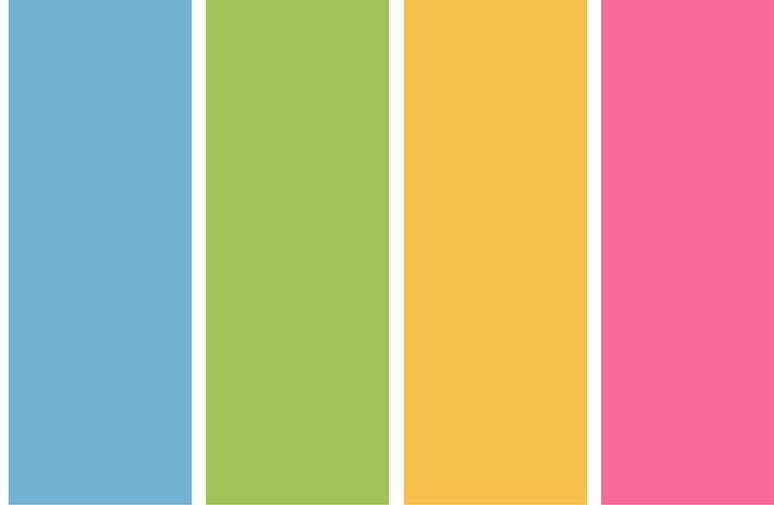
# Laboratory Safety and Guidelines: Laboratory Accident

- Locate the laboratory safety equipment such as eyewash fountains, safety showers, fire extinguishers, and fume hoods. Identify their locations.
- Report all accidents or injuries, even if considered minor, immediately to your TA or instructor.
- *If an accident occurs, do not panic! Alert you laboratory TA!*
- Whenever your skin (hands, arms, face, etc.) comes into contact with chemicals, quickly flush the affected area for several minutes with tap water followed by thorough washing with soap and water. Use the eyewash fountain to flush chemicals form the eyes and face. Get help immediately. Do not rub the affected area, especially the face or eyes, with your hand before washing.

- **Chemical spills over a large part of the body require immediate action.** Using the safety shower, flood the affected area for at least 5 minutes. Remove all contaminated clothing if necessary. Get medical attention as directed by you instructor.
- **In case of fire, discharge a fire extinguisher at the base of the flames and move it from one side to the other.** Do not discharge a fire extinguisher to be out of control, immediately evacuate the laboratory.
- **For abrasions or cuts, flush the affected area with water.** Any further treatment should be given only after consulting with the laboratory instructor.

- For burns, the affected area should be rubbed with ice, submerged in an ice-water bath, or placed under running water for several minutes to draw heat from the burned area. More serious burns require immediate medical attention. Consult with your laboratory instructor.
- **Treat chemical spills in the laboratory as follows:**
  - ✓ Alert your neighbors and the laboratory instructor
  - ✓ Clean up the spill as directed by the lab instructor
  - ✓ If the substance is volatile, flammable, or toxic, warn everyone of the accident

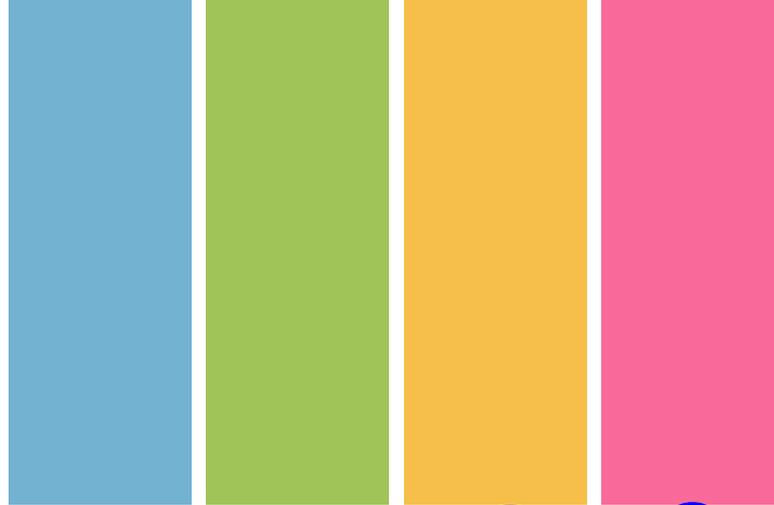
- Most all chemicals used in the experiments of this manual are considered “safe” but must be properly disposed after use for safety and environmental concerns. Improper disposal can result in serious laboratory accidents.



# Laboratory Safety and Guidelines: Laboratory Rules

- Smoking, drinking, eating, and chewing (including gum and tobacco) are not permitted at any time because chemicals may inadvertently enter the mouth or lungs. Your hands may be contaminated with an “unsafe” chemical.
- Do not work in the laboratory alone.
- Assemble your laboratory apparatus away from the edge of the lab bench to avoid accidents.
- Do not leave your experiment unattended during the laboratory period.
- Inquisitiveness and creativeness in the laboratory are encouraged. However, variations or alterations of the Experimental Procedure are forbidden without prior approval of the TA.

- **Maintain an orderly, clean laboratory bench.** Immediately clean up all chemical spills, paper scraps, and glassware.
- **Keep your bags free of any obstructions.** Do not place book bags, or items on the floor near any lab bench.
- **At the end of the laboratory period, completely clear the lab bench of equipment, clean it with a paper towel or wiper, and clean the sinks of all debris.** Also clean all glassware used in the experiment.
- **Be aware of your neighbors' activities:** You may be a victim of their mistakes. Advise them of improper techniques or unsafe practices.



# Laboratory Safety and Guidelines: Working in the Laboratory

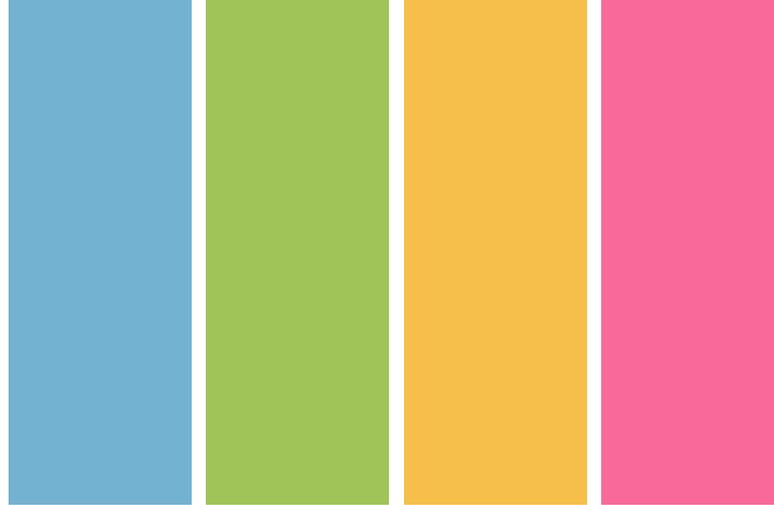
- Maintain a wholesome, professional attitude. Horseplay and other careless acts are prohibited.
- The operation of cell phones and other electronic “entertainment” equipment is strictly forbidden.
- Scientists learn much by discussion with one another. Likewise, you may profit by discussion with your TA or classmates-but not by copying from them.

- Prepare for each experiment. Review the Objectives and Introduction to determine the “chemistry” of the experiment, the chemical system, the stoichiometry of the reactions, the color changes to anticipate, and the calculations that will be required. A thorough knowledge of the experiment will make the laboratory experience more time efficient and scientifically more meaningful (and result in a better grade!).

- **Review the Experimental Procedure.**

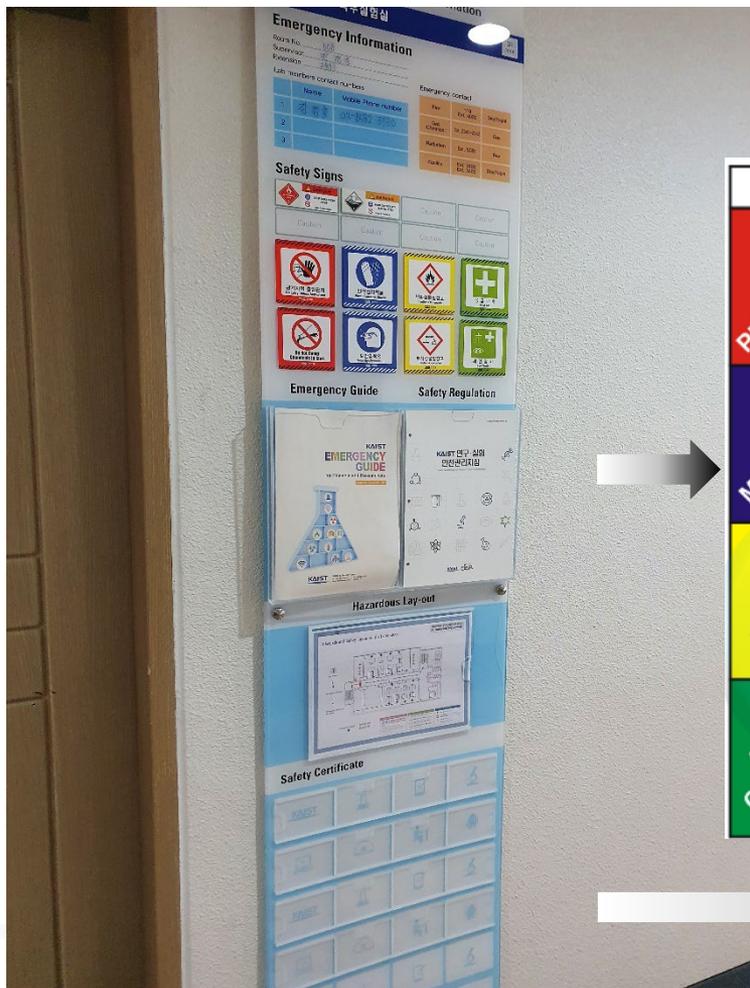
- ✓ Try to understand the purpose of each step
- ✓ Determine if any extra equipment is needed and be ready to obtain it all at once from the stockroom
- ✓ Determine what data are to be collected and how they are to be analyzed.
- ✓ Review the Laboratory Techniques and the Cautions, because they are important of conducting a safe and rewarding experiment.

- **Review the Report Sheet.** Complete any calculations required before data collection can begin during the laboratory period. Determine the data to be collected, the number of suggested trials, and the data analysis required (e.g., calculation, graphs).
- **Review the Laboratory Questions at the conclusion of the Report Sheet before and as you perform the experiment.** These questions are intended to enhance your understanding of the chemical principles on which the experiment is based.
- Above all, enjoy the laboratory experience. **Be prepared, observe, think, and anticipate during the course of the experiment.**



# Safety Symbol and Prohibition Sign Information

The hazardous materials presented in the laboratory may be used and stored, so be aware of them in advance and act in compliance with the established safety rules. Also, for the sake of safe activities in the laboratory, prohibited activities should be avoided.



	MEANING	SHAPE & COLOUR
<b>PROHIBITION</b>	<b>You must not.</b> <b>Do not do.</b> <b>Stop.</b>	 <b>RED</b> means <b>STOP</b>
<b>MANDATORY</b>	<b>You must do.</b> <b>Carry out the action given by the sign.</b>	 <b>BLUE</b> means <b>OBEY</b>
<b>WARNING</b>	<b>Caution.</b> <b>Risk of danger.</b> <b>Hazard ahead.</b>	 <b>YELLOW</b> means risk of <b>DANGER</b>
<b>SAFE CONDITION</b>	<b>The safe way.</b> <b>Where to go in an emergency</b>	 <b>GREEN</b> means <b>GO</b>

### Laboratory Safety Information

**O Hazard Warning Info**



General warning Broken glassware Corrosive materials Flammable materials Toxic materials

**O Prohibition Info**



Smoking & open flames forbidden No eating or drinking No mobile phones No access for unauthorized persons

**O Mandatory Safety Info**



Use personal protective equipment Eye protection must be worn Wear protective clothing Safety gloves must be worn Read the instructions

### Emergency Calls

Department	DEPARTMENT OF CHEMISTRY	
Staff	KANG, KYUNG HO	
	TA OFFICE	042-350-2893 (2893)
Phone (Ext.)	CHEMISTRY OFFICE	042-350-2802-6 (2802-6)
	CELL PHONE	010-8582-3730
	CAMPUS POLICE	042-350-4000 (4000)
	Business hours (Mon - Fri, 09:00-18:00)	
	Station hours (24 hours a day, 7 days a week)	

**Ext. 0119**  
**Ext. 4000**

## Warning Signs

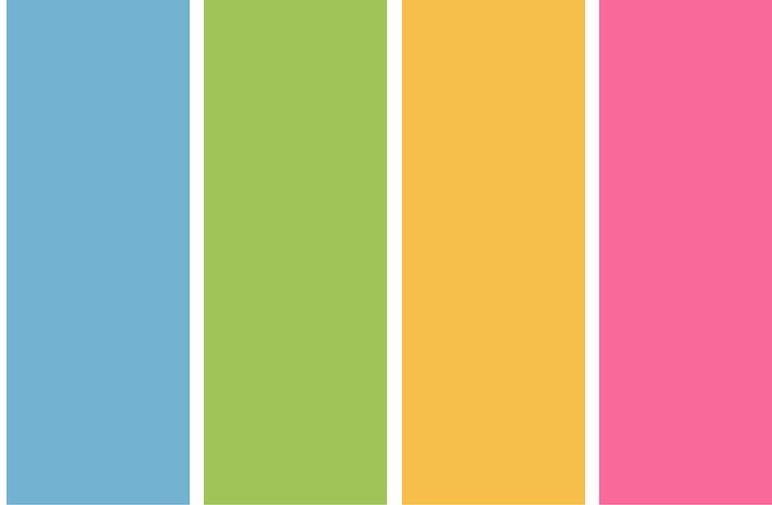


## Prohibition Signs



## Mandatory Action Signs





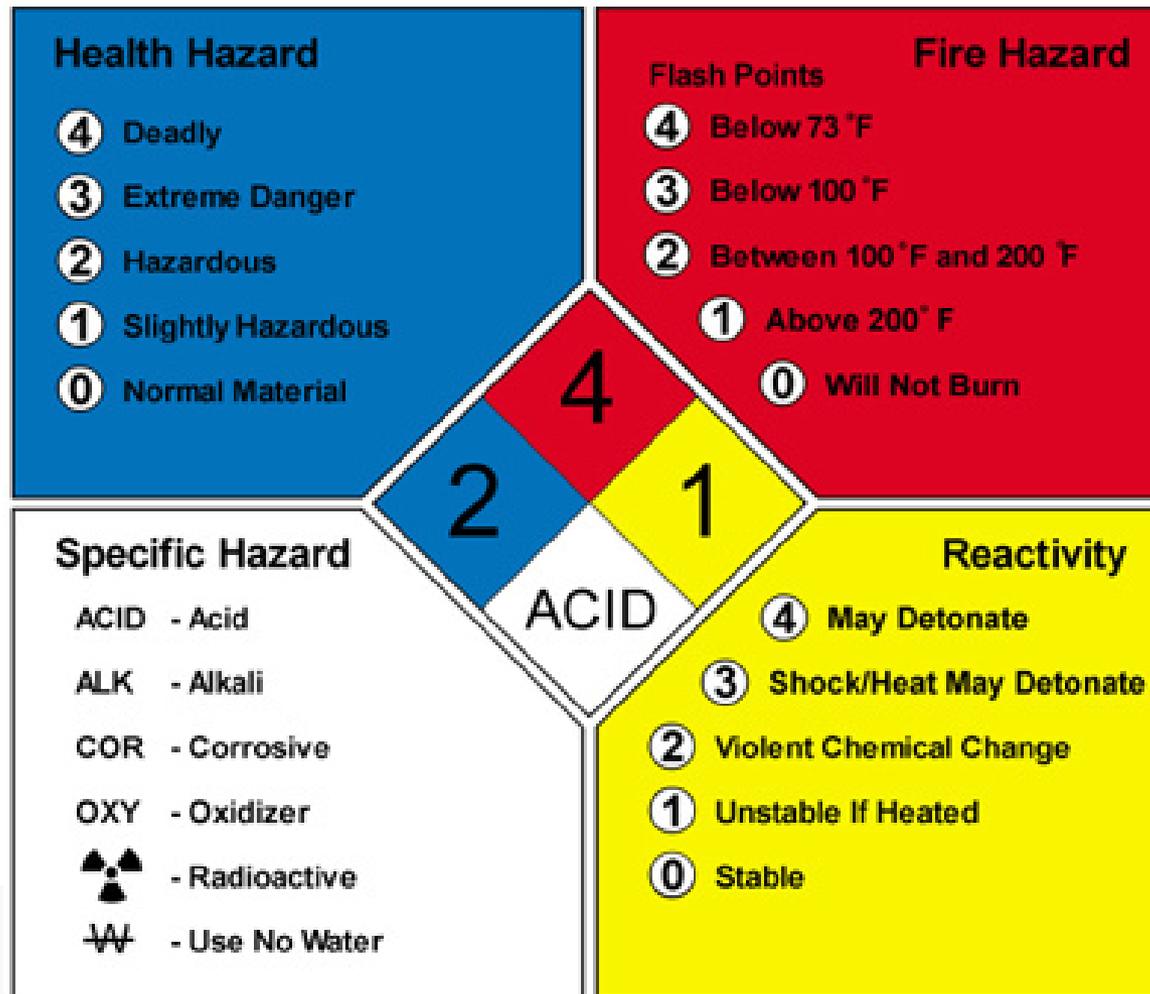
# Laboratory Technique; HANDLING CHEMICALS

- Read the label on a reagent bottle at least twice before removing any chemicals. The wrong chemical may lead to serious accident or “unexplainable” results in your experiment.
- Avoid using excessive amounts of reagents. Never dispense more than the experiments calls for. Do not return excess chemicals to the reagent bottle !
- Never touch, taste, or smell chemicals unless specifically directed to do so. Skin, nasal, and/or eye irritations may result. If inadvertent contact with a chemical does occur, wash the affected area immediately with copious amount of water.
- Properly dispose of chemicals

Chemicals are often labeled according to National Fire Protection Association (NFPA) standards that describe the four possible hazards of a chemical and a numerical rating from 0 to 4. The four hazards are **health hazard (blue)**, **fire hazard (red)**, **reactivity (yellow)**, and specific hazard (white).

If you wish to know more about the properties and hazards of the chemicals you will be working with in the laboratory, safety information about the chemicals in a bound collection of ***Material Safety Data Sheets (MSDS)***. The MSDS collection is also accessible on various Web sites.

- National fire protection association hazard labels (NFPA)



# MSDS (Material Safety and Data Sheet)

SIGMA-ALDRICH		sigma-aldrich.com
Material Safety Data Sheet		
Version 4.3 Revision Date 04/12/2011 Print Date 10/03/2011		
<b>1. PRODUCT AND COMPANY IDENTIFICATION</b>		
Product name	: Bis( <i>tert</i> -butylimino)bis(dimethylamino)tungsten(VI)	
Product Number	: 668885	
Brand	: Aldrich	
Supplier	: Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA	
Telephone	: +1 800-325-5832	
Fax	: +1 800-325-5052	
Emergency Phone # (For both supplier and manufacturer)	: (314) 776-6555	
Preparation Information	: Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956	
<b>2. HAZARDS IDENTIFICATION</b>		
<b>Emergency Overview</b>		
<b>OSHA Hazards</b> Flammable liquid, Water Reactive, Corrosive		
<b>GHS Classification</b> Flammable liquids (Category 2) Substances, which in contact with water, emit flammable gases (Category 1) Skin corrosion (Category 1B) Serious eye damage (Category 1)		
<b>GHS Label elements, including precautionary statements</b>		
Pictogram		
Signal word	Danger	
Hazard statement(s)	H225 Highly flammable liquid and vapour. H260 In contact with water releases flammable gases which may ignite spontaneously. H314 Causes severe skin burns and eye damage.	
Precautionary statement(s)	P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking. P223 Keep away from any possible contact with water, because of violent reaction and possible flash fire. P231 + P232 Handle under inert gas. Protect from moisture. P280 Wear protective gloves/ protective clothing/ eye protection/ face protection. P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P310 Immediately call a POISON CENTER or doctor/ physician. P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction. P422 Store contents under inert gas.	

## MSDS의 구성

### MSDS 구성정보

- |                    |                |
|--------------------|----------------|
| 1. 화학제품과 회사에 관한 정보 | 9. 물리화학적 특성    |
| 2. 유해 · 위험성        | 10. 안정성 및 반응성  |
| 3. 구성성분의 명칭 및 함유량  | 11. 독성에 관한 정보  |
| 4. 응급조치 요령         | 12. 환경에 미치는 영향 |
| 5. 폭발 · 화재 시 대처방법  | 13. 폐기 시 주의사항  |
| 6. 누출 사고 시 대처방법    | 14. 운송에 필요한 정보 |
| 7. 취급 및 저장방법       | 15. 법적 규제사항    |
| 8. 노출방지 및 개인보호구    | 16. 기타 참고사항    |

### 벤젠(CAS No. 71-43-2)

(산업안전보건법 제 41조에 의한 경고표시 예시)



#### 신호어

· 위험

#### 유해 · 위험 문구

- 고인화성 액체 및 증기
- 삼키면 유해함
- 피부에 자극을 일으킴
- 눈에 심한 자극을 일으킴
- 유전적인 결함을 일으킬 수 있음
- 임을 일으킬 수 있음
- 장기간 또는 반복노출 되면 신체 중 (중추신경계, 조혈계)에 손상을 일으킴
- 장기적인 영향에 의해 수생생물에 유해함

#### 예방조치 문구

- 예방**
- 열, 스파크, 화염, 고열로부터 멀리한다. - 금연
  - 이 제품을 사용할 때에는 먹거나, 마시거나 흡연하지 않는다.
  - 미스트, 증기, 스프레이를 흡입하지 않는다.
  - 보호장갑, 보호의, 보안경을 착용한다.
- 대응**
- 피부(또는 머리카락)에 묻으면 오염된 모든 의복은 벗거나 제거한다.
  - 피부를 물로 씻는다. / 샤워한다.
  - 눈에 묻으면 몇 분간 물로 조심해서 씻는다.
  - 가능한 콘택트렌즈를 제거한 후 계속 씻는다.
  - 입을 씻어낸다.
  - 토하게 하지 않는다.
- 저장**
- 환기가 잘 되는 곳에 보관하고 저온으로 유지한다.
  - 잠금장치가 있는 저장장소에 저장한다.
- 폐기**
- (관련 법규에 명시된 내용에 따라) 내용물 · 용기를 폐기한다.
- ※ 기타 자세한 사항은 물질안전보건자료(MSDS)를 참조한다.

Instructions for the safe use and potential hazards associated with a particular material or product. The MSDS should be available for reference in the area where the chemicals are being stored or in use

The UN Globally Harmonized System of Classification and Labeling of Chemicals (GHS) is an international system created by the UN to address the classification of chemicals by types of hazard and harmonize hazard communication elements, including labels and safety data sheets. It aims at providing a basis for harmonization of rules and regulations on chemicals at national, regional and worldwide level, an important factor also for trade facilitation.

## Physical Hazards

## Health Hazards

## Environmental Hazards

### Hazard Class

Explosives  
 Flammable gases  
 Flammable aerosols  
 Oxidizing gases  
 Gases under pressure  
 Flammable liquids  
 Flammable solids  
 Self-reactive substances  
 Pyrophoric solids  
 Pyrophoric liquids  
 Self-heating substances  
 Substances which in contact with water emit flammable gases  
 Oxidizing liquids  
 Oxidizing solids  
 Organic peroxides  
 Substances corrosive to metal

### Hazard Class

Acute toxicity  
 Skin corrosion  
 Skin irritation  
 Eye Effects  
 Sensitization (Skin or Eye)  
 Germ cell mutagenicity  
 Carcinogenicity  
 Reproductive toxicity  
 Target organ systemic toxicity: single and repeated exposure  
 Aspiration toxicity

### Hazard Class

Acute Aquatic Toxicity  
 Chronic Aquatic Toxicity



Flammable



Oxidizer



Explosive



Low Level Hazard



Corrosive



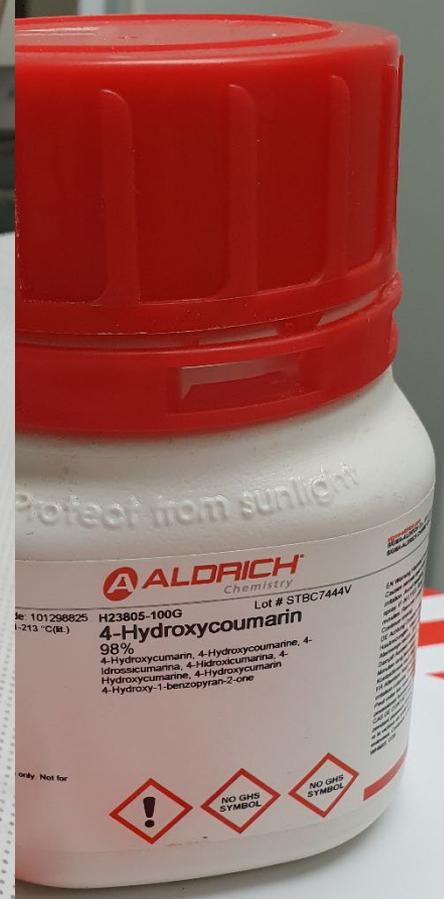
Severe Chronic Hazard



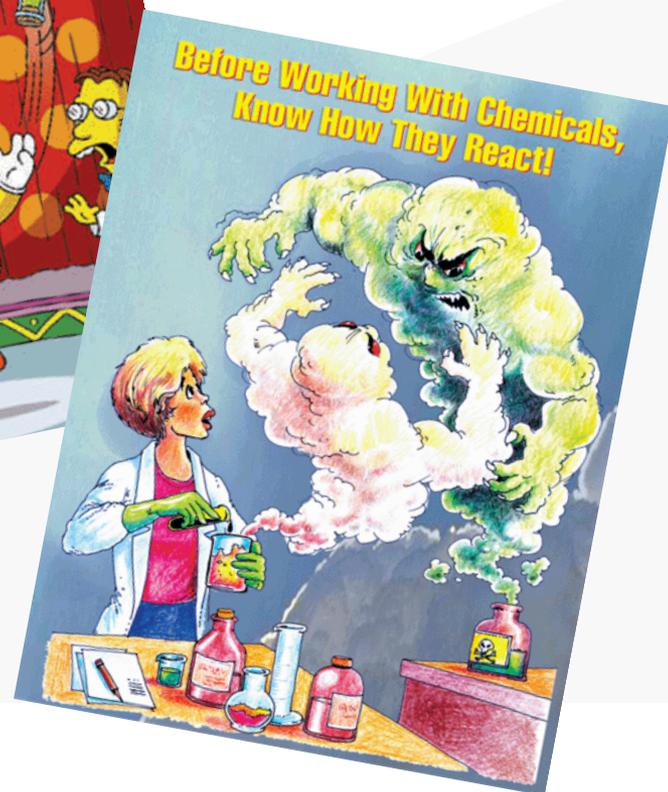
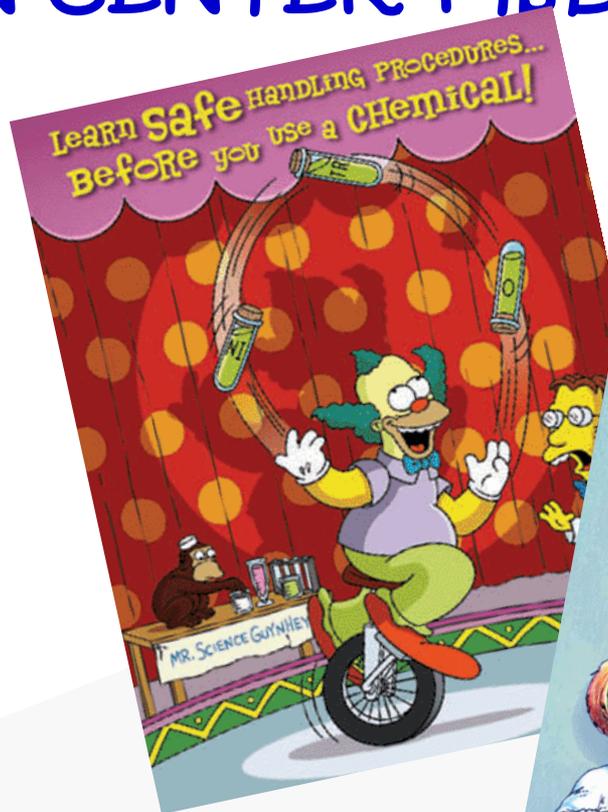
Poison

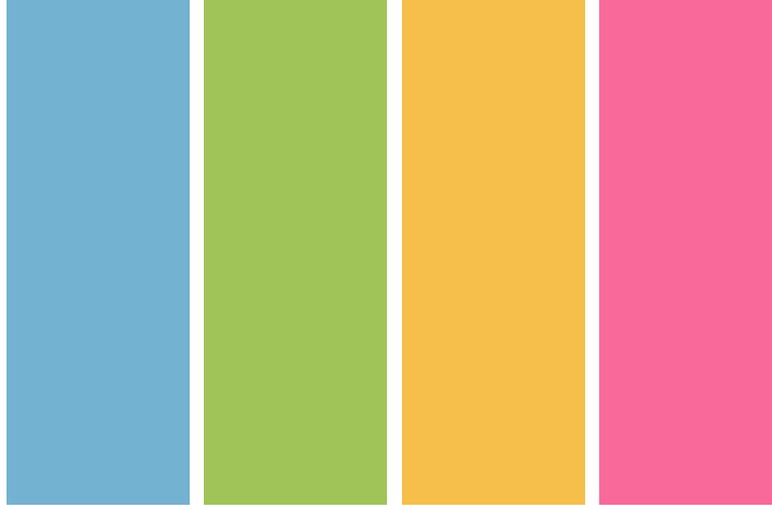


Environmental Hazard



# RIGHT TO KNOW: INFORMATION CENTER- MSDS

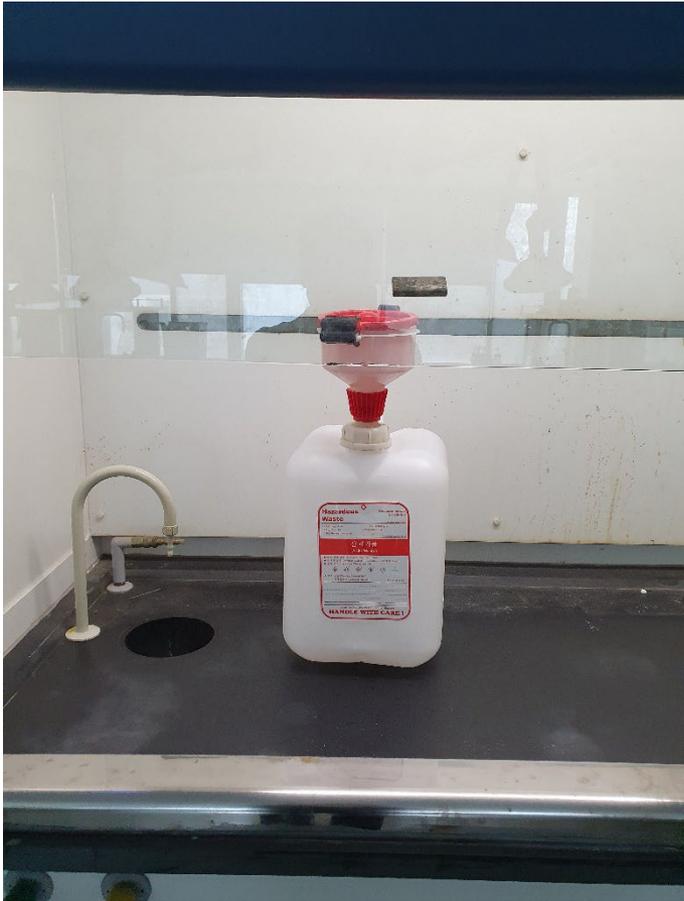




# Laboratory Technique; Disposing of chemicals

- Most all chemicals used in the experiments of this manual are considered “safe” but must be properly disposed after use for safety and environmental concerns.
  - ✓ Assume nothing (besides soap and water) is to be discarded in the sink.
  - ✓ Discard waste chemicals as directed by the TA. Read the label on the waste container at least twice before discarding the chemical. Careless that may result in improper mixing of waste chemicals can cause serious laboratory accidents.
- Information for the proper disposal of chemicals is also available from the MSDS collection or at various Web sites.

# Chemical Waste in chemical hood



Segregate waste by hazard class to prevent incompatible mixtures. Hazard class examples include: **flammable, oxidizer, acid, base, and toxic.** Liquid wastes generated in the laboratory should be disposed of for each labeled white container placed in the chemical hood.

# Chemical Waste Labeling



**CHEMICAL WASTE**  
비 할로겐계 유기용제  
(Non-Halogenated Organic Solvent)

폐기물 정보 (Waste Information)  
 ◦ 발생일자 (Date waste first generated)  
 YYYY - MM - DD

Chemical Name(s)	Volume (L)

◆ 주의사항 (Matters that require attention)

**위험정보 (Hazard Category)**

발생처 정보 (Generator Information)  
 학과/연구소 (Department):  
 오실 Room #:      전화번호 (Phone):  
 순번:      직위:

Wear Your Personal Protective Equipment!  
**Handle with Care!!** KAIST  
 For help call Safety & Security Team (1.2342)

**CHEMICAL WASTE**  
할로겐계 유기용제  
(Halogenated Organic Solvent)

폐기물 정보 (Waste Information)  
 ◦ 발생일자 (Date waste first generated)  
 YYYY - MM - DD

Chemical Name(s)	Volume (L)

◆ 주의사항 (Matters that require attention)

**위험정보 (Hazard Category)**

발생처 정보 (Generator Information)  
 학과/연구소 (Department):  
 오실 Room #:      전화번호 (Phone):  
 순번:      직위:

Wear Your Personal Protective Equipment!  
**Handle with Care!!** KAIST  
 For help call Safety & Security Team (1.2342)

**CHEMICAL WASTE**  
오일  
(Oil)

폐기물 정보 (Waste Information)  
 ◦ 발생일자 (Date waste first generated)  
 YYYY - MM - DD

Chemical Name(s)	Volume (L)

◆ 주의사항 (Matters that require attention)

**위험정보 (Hazard Category)**

발생처 정보 (Generator Information)  
 학과/연구소 (Department):  
 오실 Room #:      전화번호 (Phone):  
 순번:      직위:

Wear Your Personal Protective Equipment!  
**Handle with Care!!** KAIST  
 For help call Safety & Security Team (1.2342)

**CHEMICAL WASTE**  
무기물질  
(Inorganic Substance)

폐기물 정보 (Waste Information)  
 ◦ 발생일자 (Date waste first generated)  
 YYYY - MM - DD

Chemical Name(s)	Volume (L)

◆ 주의사항 (Matters that require attention)

**위험정보 (Hazard Category)**

발생처 정보 (Generator Information)  
 학과/연구소 (Department):  
 오실 Room #:      전화번호 (Phone):  
 순번:      직위:

Wear Your Personal Protective Equipment!  
**Handle with Care!!** KAIST  
 For help call Safety & Security Team (1.2342)

**CHEMICAL WASTE**  
폐 산  
(Acid)

폐기물 정보 (Waste Information)  
 ◦ 발생일자 (Date waste first generated)  
 YYYY - MM - DD

Chemical Name(s)	Volume (L)

◆ 주의사항 (Matters that require attention)

**위험정보 (Hazard Category)**

발생처 정보 (Generator Information)  
 학과/연구소 (Department):  
 오실 Room #:      전화번호 (Phone):  
 순번:      직위:

Wear Your Personal Protective Equipment!  
**Handle with Care!!** KAIST  
 For help call Safety & Security Team (1.2342)

**CHEMICAL WASTE**  
알카리  
(Alkali)

폐기물 정보 (Waste Information)  
 ◦ 발생일자 (Date waste first generated)  
 YYYY - MM - DD

Chemical Name(s)	Volume (L)

◆ 주의사항 (Matters that require attention)

**위험정보 (Hazard Category)**

발생처 정보 (Generator Information)  
 학과/연구소 (Department):  
 오실 Room #:      전화번호 (Phone):  
 순번:      직위:

Wear Your Personal Protective Equipment!  
**Handle with Care!!** KAIST  
 For help call Safety & Security Team (1.2342)

**CHEMICAL WASTE**  
폐 시약  
(Reagent)

폐기물 정보 (Waste Information)  
 ◦ 발생일자 (Date waste first generated)  
 YYYY - MM - DD

Chemical Name(s)	Volume (L)

◆ 주의사항 (Matters that require attention)

**위험정보 (Hazard Category)**

발생처 정보 (Generator Information)  
 학과/연구소 (Department):  
 오실 Room #:      전화번호 (Phone):  
 순번:      직위:

Wear Your Personal Protective Equipment!  
**Handle with Care!!** KAIST  
 For help call Safety & Security Team (1.2342)

**CHEMICAL WASTE**  
기타 폐기물  
(Etcetera Waste)

폐기물 정보 (Waste Information)  
 ◦ 발생일자 (Date waste first generated)  
 YYYY - MM - DD

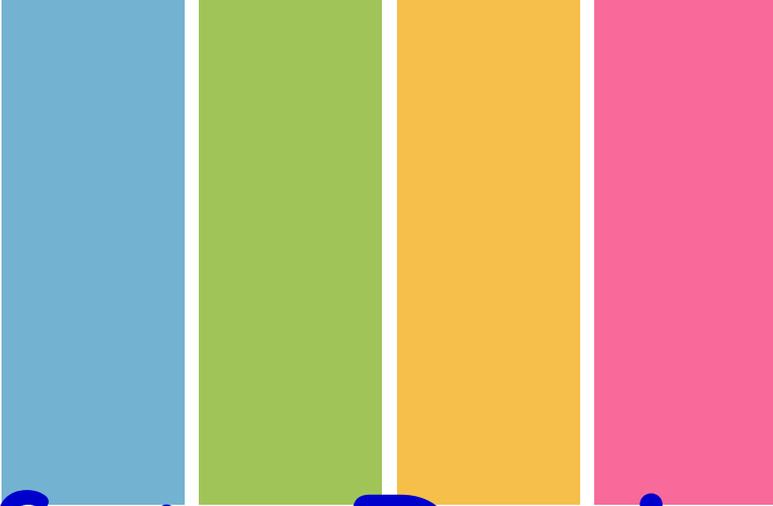
Chemical Name(s)	Volume (L)

◆ 주의사항 (Matters that require attention)

**위험정보 (Hazard Category)**

발생처 정보 (Generator Information)  
 학과/연구소 (Department):  
 오실 Room #:      전화번호 (Phone):  
 순번:      직위:

Wear Your Personal Protective Equipment!  
**Handle with Care!!** KAIST  
 For help call Safety & Security Team (1.2342)



# Safety Device & Equipment in the Laboratory

You must Know their locations and  
Learn how to use them!!

# Chemical Fume Hood



# Chamber on the bench



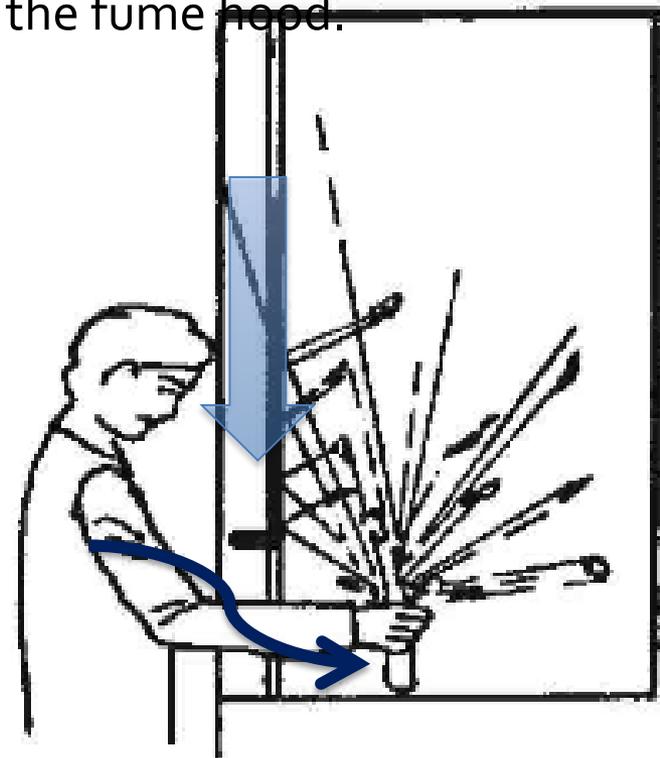
## Fume Hood Purpose and Importance

The laboratory chemical fume hood is the most common local exhaust ventilation system used in laboratories and is the primary method used to control inhalation exposures to hazardous substances. When used properly, fume hoods offer a significant degree of protection for the user. Understanding the limitations, the appropriate maintenance techniques, and overall design of the fume hood will ensure your safety while using hazardous materials. The purpose of a chemical fume hood is to prevent the release of hazardous substances into the general laboratory space by controlling and then exhausting hazardous and/or odorous chemicals. In the event of an accidental spill, the fume hood will contain the spilled chemicals and exhaust the fumes away from the user and laboratory zone.

- The window of the fume hood is must be **kept closed** as soon as the need of access to it is over.



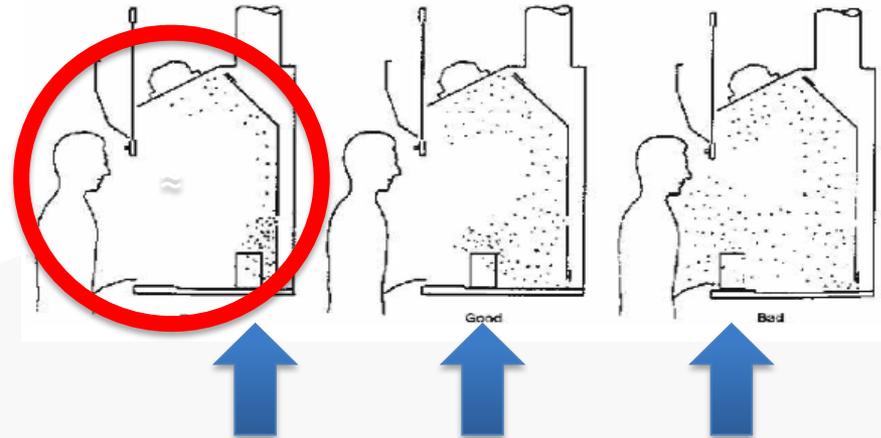
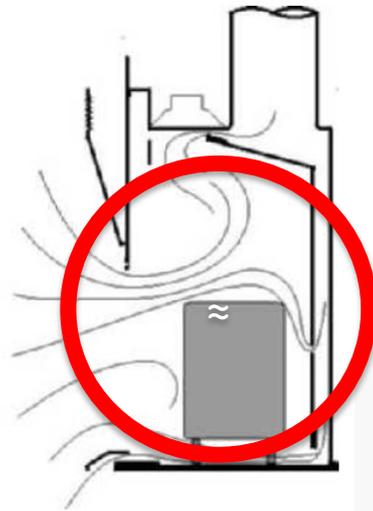
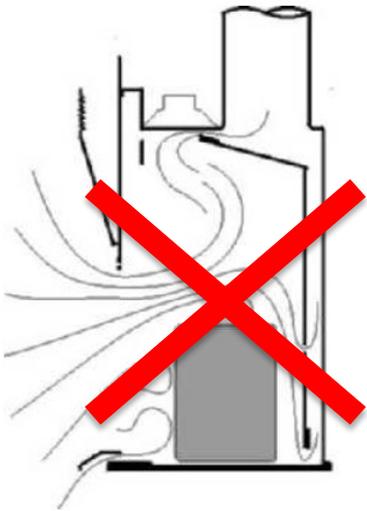
- Avoid the exposure by **not putting your body** except for hands and forearms into the fume hood.



**PROPER VIEWING  
SASH POSITION**

- Do not store chemicals or other materials.
- Make air space on all side if large bulky equipment are used.

- Place the chemicals on the right position.

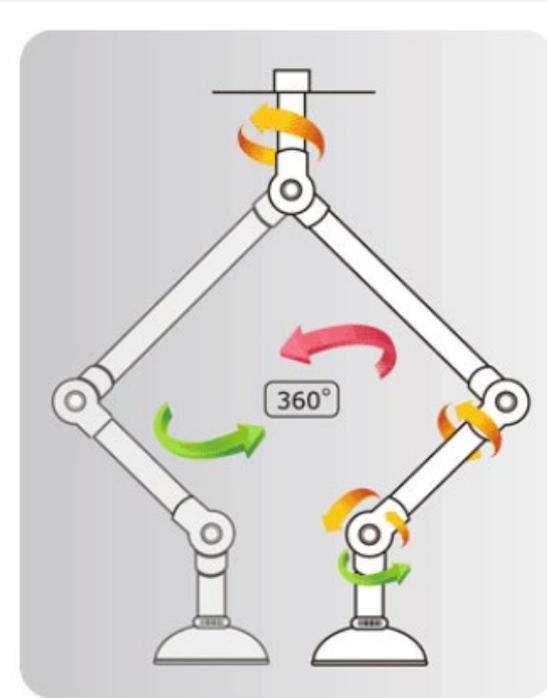


Images from [Kewaunee Fume Hoods](#)

Poor placement of large equipment

Good placement of large equipment

# Local Extractor Arm Hood



## Tips for using flexible extraction arms

For the best results, it is essential that all workers are familiar with a few good practices:

- Position the hood of the flexible fume extraction arm directly above the work area
- Position the hood as close to the work area as possible
- Reposition the extraction arm every time you change position
- Make sure you are not between the extraction hood and the source of the dust and fumes
- Check whether the hood visibly captures as much dangerous fumes and dust as possible

# Safety Shower & Eye shower



## First aid for skin or clothing



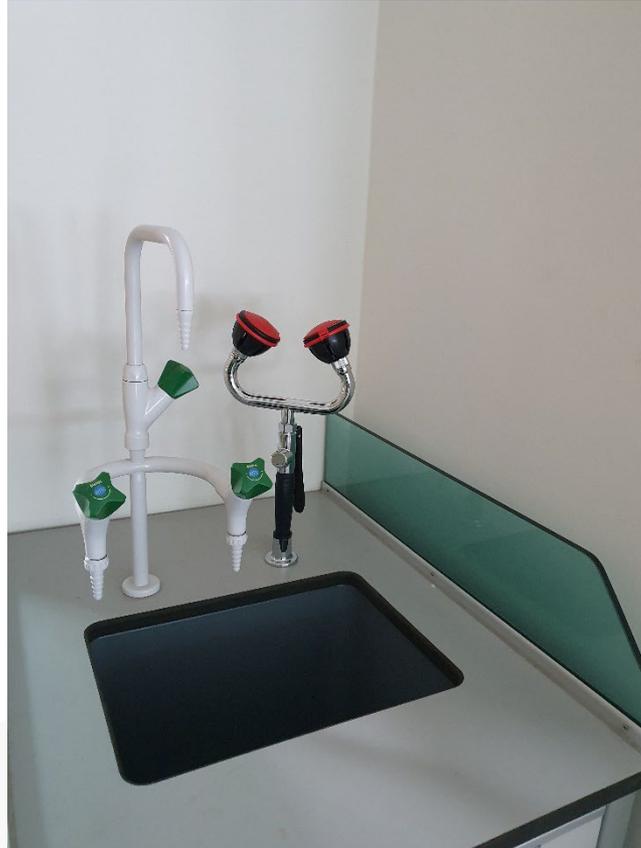
**Immediately,**  
Safety shower  
should be used at  
least 15 minutes.

Skin/  
Clothing



**Seconds count**  
Remove all  
contaminated  
clothing or jewelry.

- Know where safety showers and eye washers are located. Know how to use them. Consult your safety officer if needed.



# First aid for eyes

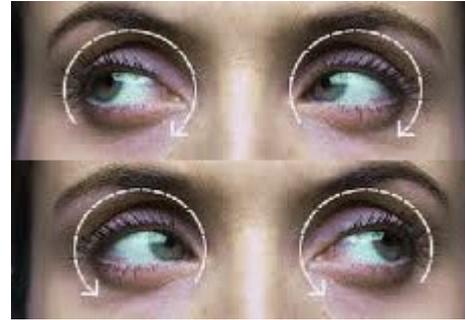


**Immediately,**  
Flush eyes with water at  
least 15 minutes.  
The eyes must be held  
open to wash

A hand free eyes wash  
fountain is desirable



Copyright © 2011 by American National Red Cross



## Eyeballs

must be rotated so all  
surface area is rinsed



**If** an eyewash is not  
available, pour water  
on the eye.



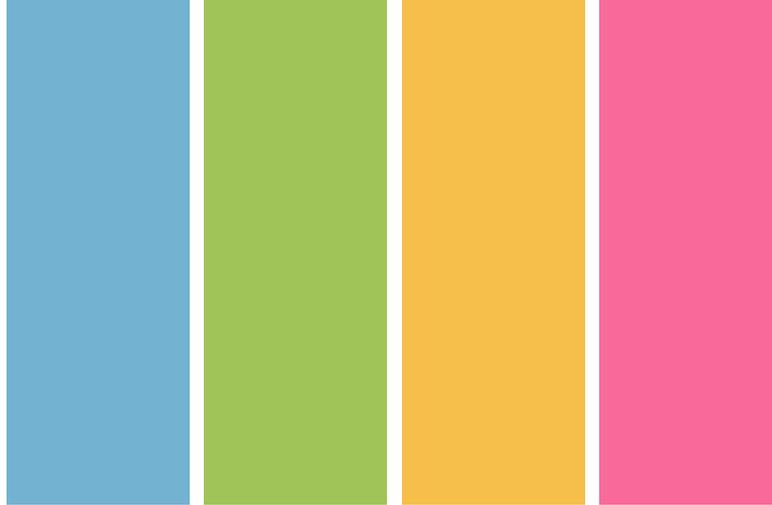
## Don't

Lose time removing  
contact lenses.  
remove contact  
lenses while rinsing.

# Emergency Fire Blanket



- For small fires, a **fire blanket** is a safety device which is useful in the lab.
- These blankets can put out smaller fires before they have a chance to get bigger.
- Useful for fires which can't be put out with water such as grease/oil fires and electrical fires.
- Never use water if you have a stove or pan catch fire – use a fire blanket instead of water.
- Even if someone's clothes catch fire, the fire blanket can be wrapped around them to put it out.



# Emergency Response Procedure

# Fire response

1. Assist any person in danger, if it can be accomplished without risk to yourself.
2. Activate the building fire alarm system and notify the fire department by dialing 119 (or safety team 0119).
3. After doing this, you may start using fire extinguisher to put it out.

<http://www.fireextinguishertraining.com/index.html>



- The type of fire



A



- **Class A:** Fires involving wood, paper, cloth, trash and other ordinary materials.

B



- **Class B:** Fires involving flammable liquids such as gasoline, thinners, oil-based paints and greases.

C



- **Class C:** Fires involving energized electrical equipment, where a nonconducting gaseous clean agent or smothering agent is needed. The most common type of extinguisher for this class is a carbon dioxide extinguisher.

D



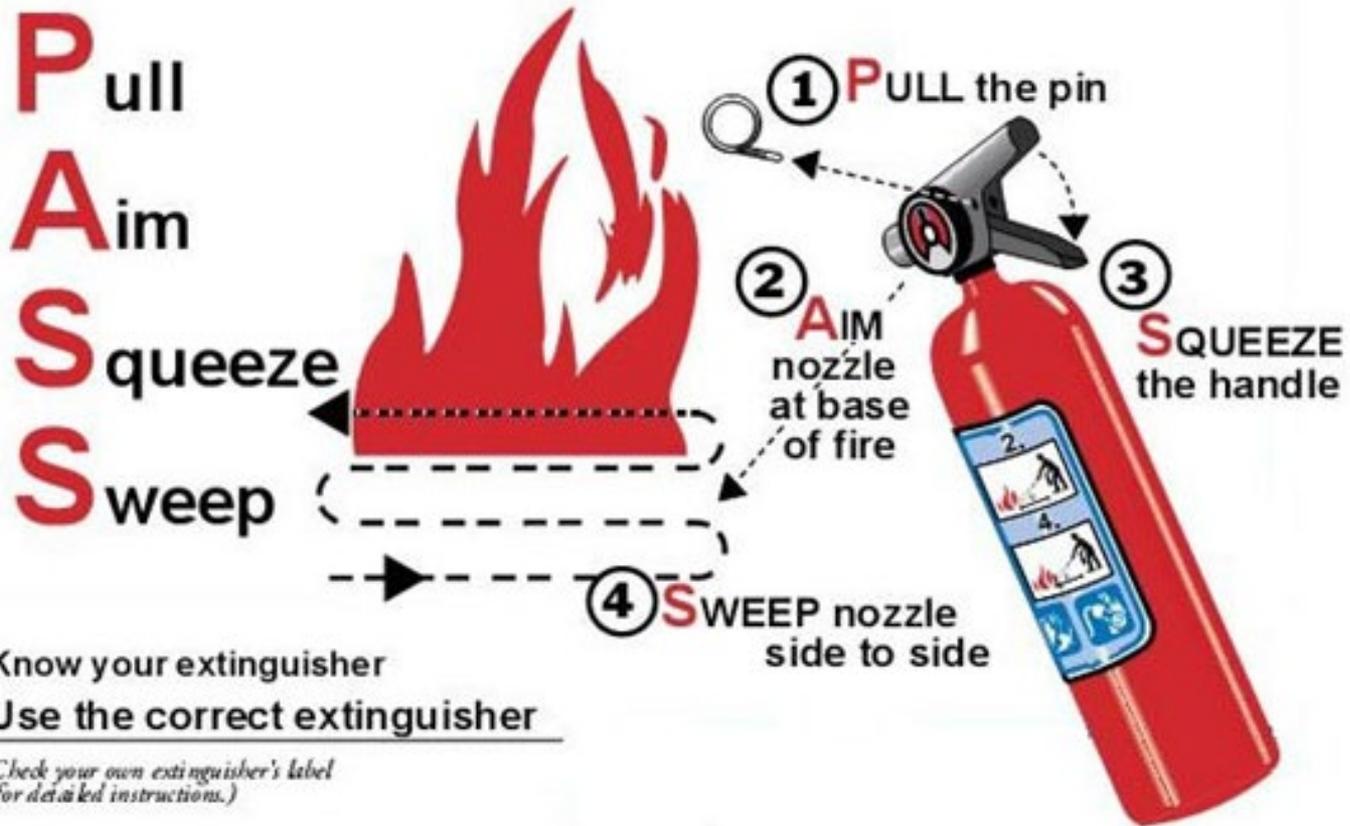
- **Class D:** Fires involving combustible metals such as magnesium, sodium, potassium, titanium, and aluminum. Special dry powder\* extinguishing agents are required for this class of fire, and must be tailored to the specific hazardous metal.

K



- **Class K:** Fires involving commercial cooking appliances with vegetable oils, animal oils, or fats at high temperatures. A wet potassium acetate, low pH-based agent is used for this class of fire.

## To operate an extinguisher:



# Cabinet and Response Carts for Safety Spill Control



In the event of a major spillage of corrosive or toxic material, the TA on duty must be informed at once. Do not attempt to clean up any major spillage before consulting the TA.

## Simple spills

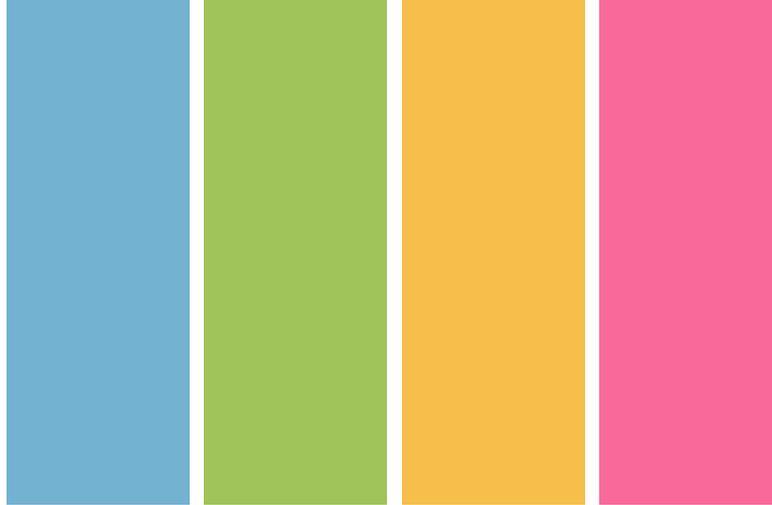


- Wear PPE (goggles, gloves, lab coat, etc.)
  - Absorb and sweep materials  
(Liquid: paper towel, Solid: dust pan)
  - Wet mop spill area
- Disposal (plastic bag & drum liner)

# Emergency Evacuation Routes



In case of an emergency during the class, you should evacuate using the emergency stairs instead of taking the elevator.



# Laboratory Waste Disposal

# Wastes in the lab

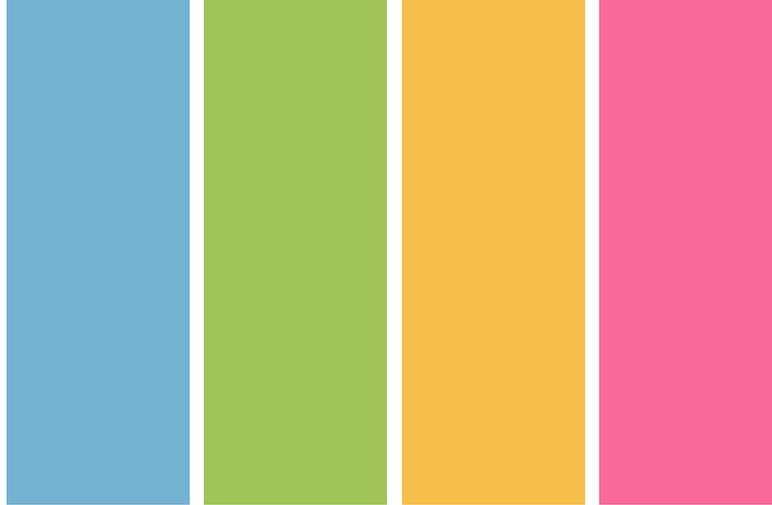


Please, dispose of used plastics, broken glasses, waste paper and sharp materials generated in the laboratory in their respective boxes.

# Nitrile glove waste



Used nitrile gloves should be disposed of in the designated bag as shown below.



KAIST

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24h-Emergency Call

**KAIST 24-HOUR EMERGENCY CALL**



**042-350**

**0119**

**KAIST 재난안전상황실**

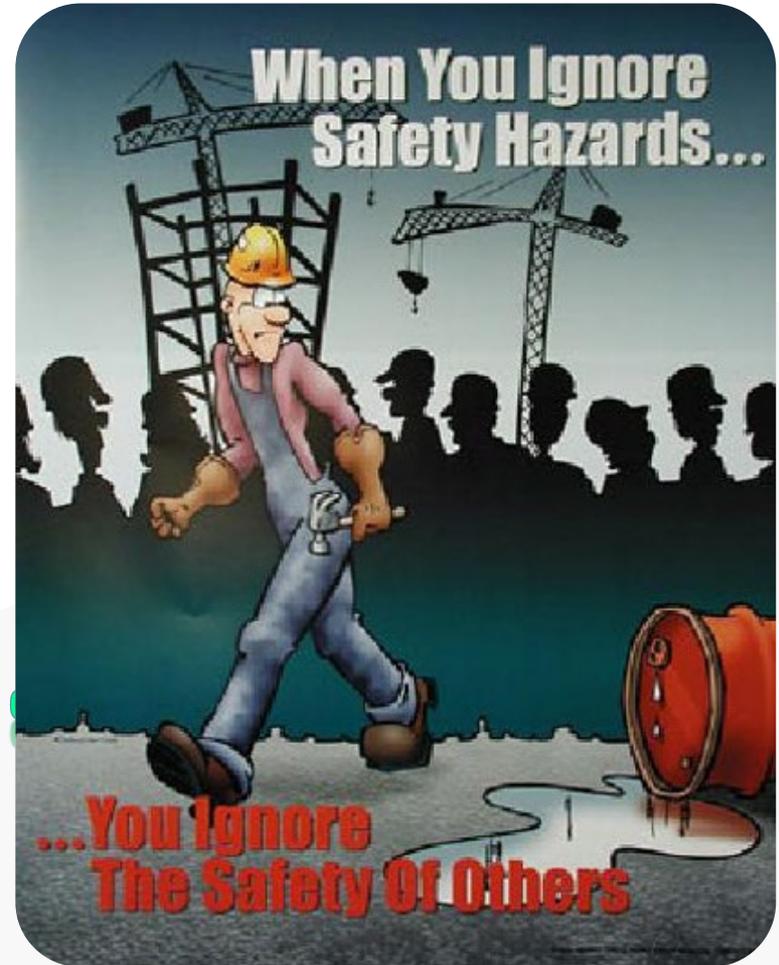
**KAIST EMERGENCY CONTROL OFFICE**



화재, 가스·화학약품 누출 등 응급상황, 각종 사건사고 신고  
0119 for Campus Police, Fire and all life threatening emergencies

**KAIST**

**SAFETY  
INVOLVES  
EVERYONE.**





**Your safety doesn't  
depend on LUCK!**

**It depends on YOU !**