

# **Training Course: Chemical Safety Training for Research Students and Researchers**

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# Safety Health and Environmental Policy of Chulalongkorn University



## SHECU

S*ystematization*

H*abituation*

E*nforcement*

C*ountercheck*

U*nification*

1. To implement and develop the safety, occupational health and working environment management systems.
2. To provide relevant knowledges as well as raise awareness of safety, occupational health and working environment to the university at all levels: administrative boards, faculties, staff, students including third parties working for or dealing with the university.

# Safety Health and Environmental Policy of Chulalongkorn University



## SHECU

S*ystematization*

H*abituation*

E*nforcement*

C*ountercheck*

U*nification*

- 3.** To assure the works related to safety, occupational health and working environment in compliance with the laws, standards and regulations.
- 4.** To inspect and evaluate for development works related to safety, occupational health and working environment.
- 5.** To cooperate with the neighboring communities for improving the quality of environment, health and safety in their human life and properties.

# Center for Safety, Health and Environment of Chulalongkorn University (SHECU)

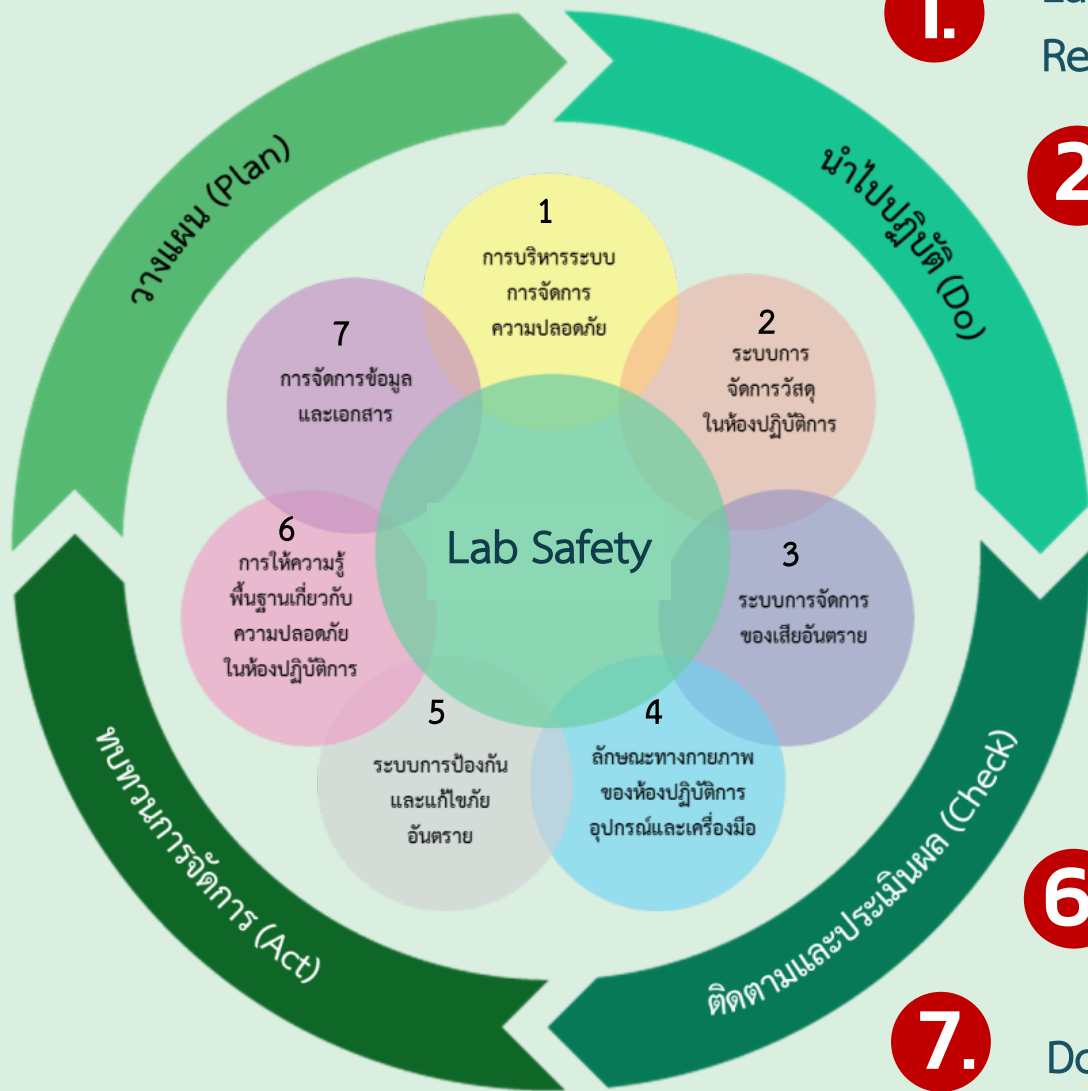


To provide responsive services and critical support need as well as educate community members to understand and make Chulalongkorn university a safe, healthy and environmentally responsible place to work and study.



To support CU's commitment to SHE performance beyond compliance.

**Our mission is "Zero Accident"**



1. Laboratory Safety Policy/ Management Roles and Responsibility
2. Chemical Inventory and Management
3. Waste Categorization and Management
4. Lab design, facilities and equipment
5. Emergency preparedness, response/ Risk Management
6. Education and Training
7. Document control system

# Chulalongkorn University Councils

Safety, Health and Environment (SHE)-Policy committees of CU

Center of Safety, Health and Environment of CU (SHECU)

SHE committees of CU

CU Institutional Biosafety Committees (CU-IBC)

CU Institutional Chemical Safety Committees

CU Institutional Radiology Safety Committees

CSR of SHE Knowledge Base's Committees

Curriculum Development Committees (Chemical Safety, BioSafety and Radiology Safety)

Institutional SHE committeses (e.g. Faculty of Medicine, Engineer, Dentistry, Pharmaceutical Science, Science)

# Training Courses



1. Basic Chemical Safety for Everyday Life
2. Chemical Safety Training in Teaching laboratories
3. Chemical Safety Training for Research students and Researchers
4. Chemical Safety Training for Laboratory Supervisors

“Proactive” safety  
is more efficient than “Reactive” safety

# General Best Practices (Proactive concept)



## 1. Information



### Chemicals:

- ✓ Symbol, Hazard Classification, Chemical Incompatibility
- ✓ Safety Data Sheets (SDS), Hazardous Waste Classification



### Tools (e.g. equipment, instrument) and Locations

- ✓ Instrument Manuals
- ✓ Location of emergency shower and eye wash station, Fire Extinguishers, First-Aid Kits

**2.** To perform a task within a process according to lab work instructions, precautionary and strictly.

**3.** To wear appropriated Laboratory clothing and PPE, correctly.

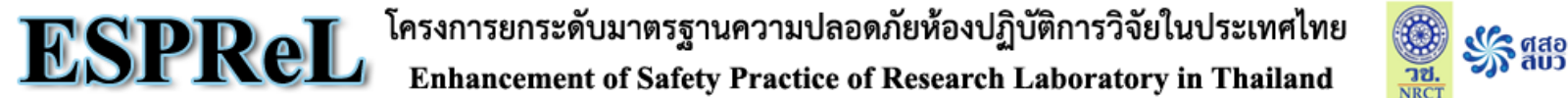


# General Best Practices (Proactive concept)



## 4. Risk Assessment

- ✓ ESPReL Checklist can be used to inspect and evaluate a safety level in the laboratory.



หน้าแรก	แนะนำโครงการ	ESPReL Checklist	ข้อมูลห้องปฏิบัติการ	คำอธิบายการกรอก Checklist	เอกสารเผยแพร่	ติดต่อ	ถาม-ตอบ
<b>ประกาศ!!</b> ด่วนโหนด เอกสารการประชุม วันที่ 2 มิถุนายน 2557 ได้ที่นี่							
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<http://esprel.labsafety.nrct.go.th>

## 5. Prepare for an emergency: emergency response and emergency preparedness

# Topics

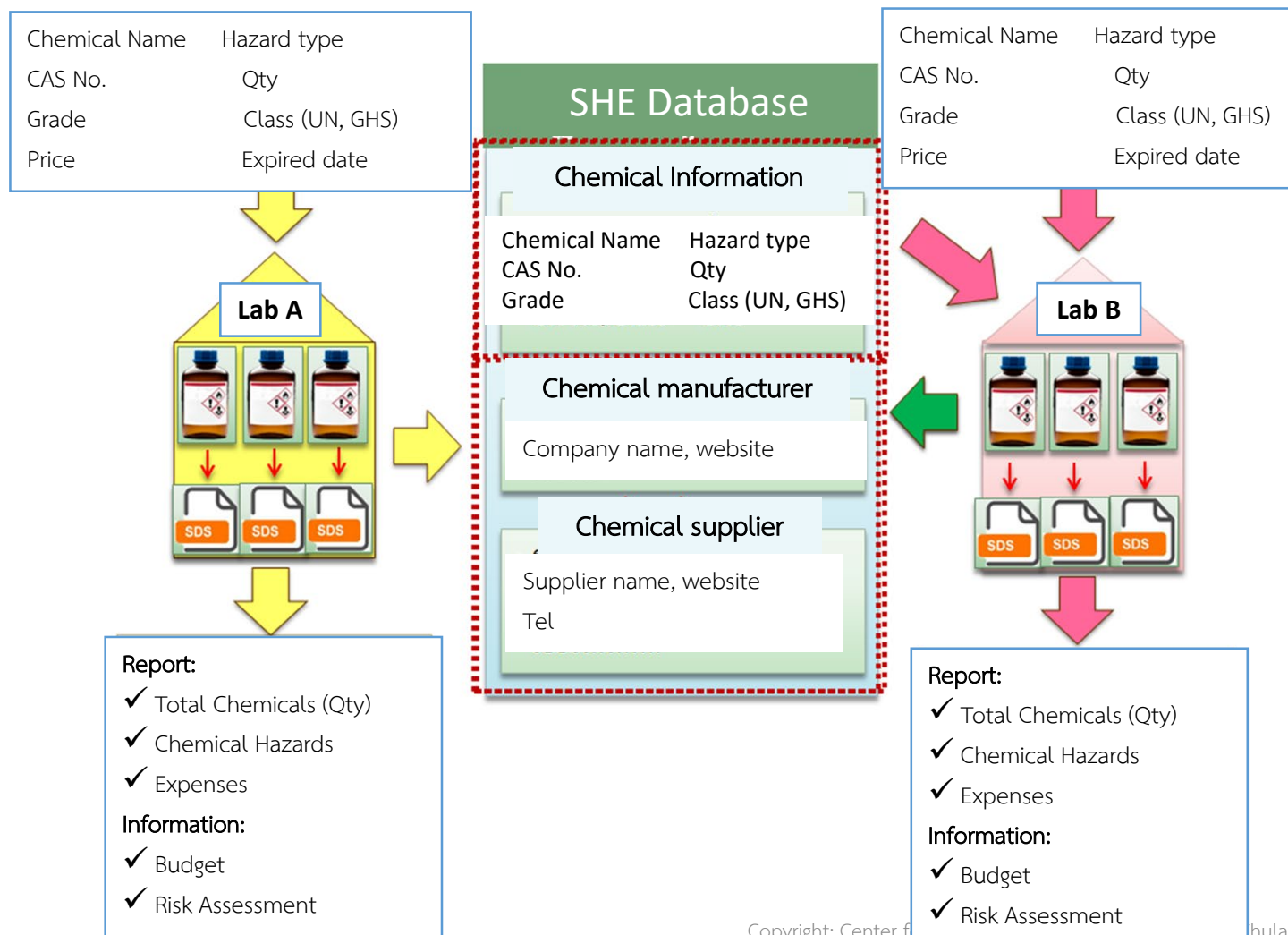


- 1.** Lab Safety Management
- 2.** Hazards in the Laboratory
- 3.** Risk assessment
- 4.** House Keeping in the Laboratory
- 5.** Engineering Controls
- 6.** Laboratory Best Practices
- 7.** Personal Protective Equipment
- 8.** Emergency Safety Equipment
- 9.** Systems of Classification of Chemicals
- 10.** Safety Data Sheets
- 11.** Chemical Handling and Practices
- 12.** Hazardous Waste Practices
- 13.** Chemicals Spill Response Procedure
- 14.** Chemicals Spill Response Procedure (in Large Qty)
- 15.** Emergency Fire Response procedure
- 16.** Incident reporting

# 1. Lab Safety Management



## 1.1 The university chemical inventory system (ChemTrack)



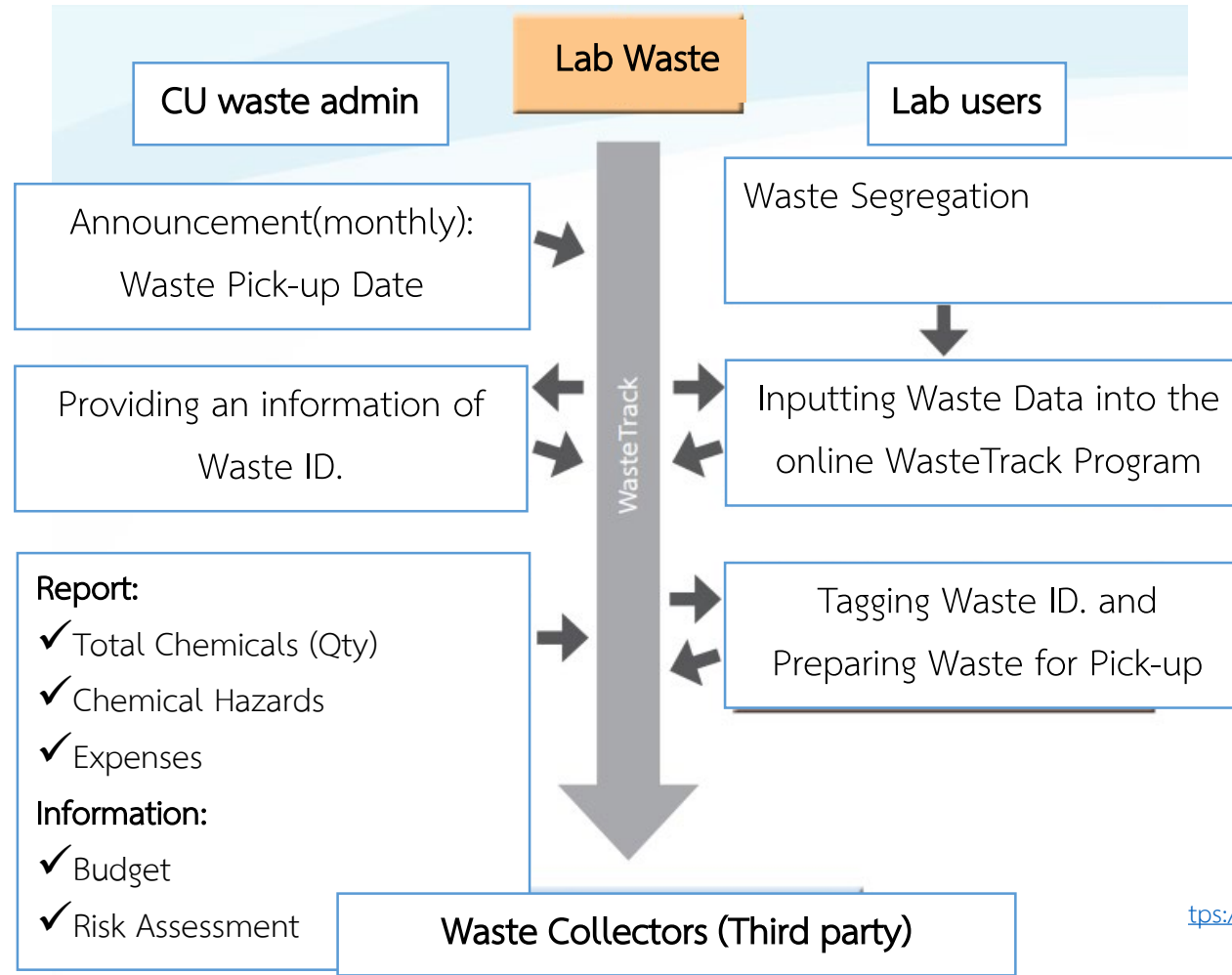
<https://www.shecu.chula.ac.th/home/content.asp?Cnt=134>



# 1. Lab Safety Management



## 1.2 The university chemical waste system (WasteTrack)

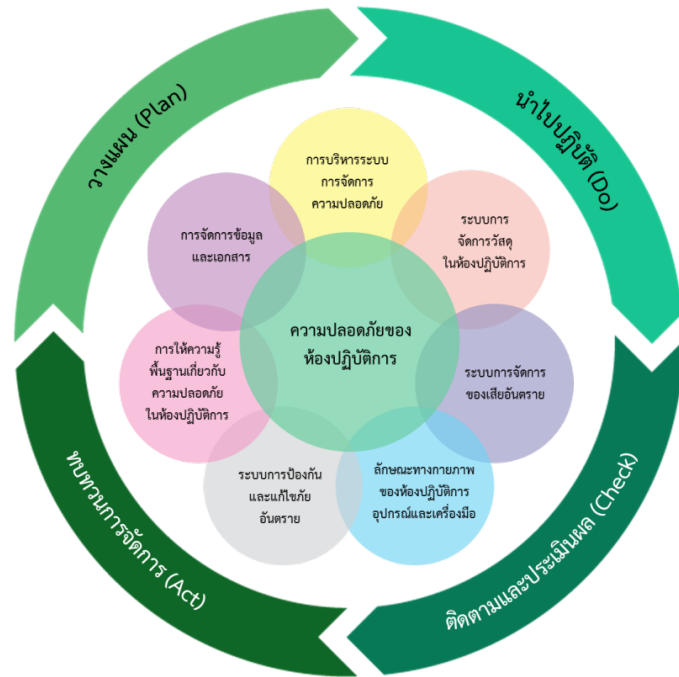


[tps://www.shecu.chula.ac.th/home/content.asp?Cnt=134](https://www.shecu.chula.ac.th/home/content.asp?Cnt=134)

# 1. Lab Safety Management



## 1.3 Lab Safety Inspection System



1. Laboratory Safety Policy/ Management Roles and Responsibility
2. Chemical Inventory and Management
3. Waste Categorization and Management
4. Lab design, facilities and equipment
5. Emergency preparedness, response/ Risk Management
6. Education and Training
7. Document control system



Inspecting lab safety by using ESPReL checklist at least once a year



Understanding your lab safety's strengths and weakness of lab component following to ESPReL checklist and using them for lab safety enhancement.

## 2. Hazards in the Laboratory



1.

### Chemical hazards

Corrosion

2.

### Physical hazards

Fire, Explosion,  
Electricity, Ergonomic  
Radiation

3.

### Biological hazards

Pathogens  
(e.g. Bacteria, Virus)

routes of entry  
chemicals



Contact



Ingestion



Inhalation

## 2. Hazards in the Laboratory



Hot Burn



Cold Burn



Cut



Explosion



Fire



Compressed Gases






### 3. Risk Assessment

**Hazard:** Identify the hazards

**Activity:** Identify critical processes

**Controls:** What protective measures are needed?

Here is the example of experiment involving high risk

-  Up-scale experiment
-  Using Water Reactive or Air Sensitive Chemicals
-  Using Strong Oxidizers or Explosive Chemicals
-  Using High Toxic Chemicals Performing Experiment
-  under High or Low pressure



Lab Risk assessment form

Lab in details ..... ชั้น ..... อาคาร .....

..... ผู้ทดลอง .....

หมายเลขโทรศัพท์ติดต่อในกรณีฉุกเฉิน .....

ประเภทของการทดลอง .....

ระดับความเสี่ยง ( ) ความเสี่ยงสูง ( ) ความเสี่ยงปานกลาง

Experiment in details

Chemical (Qty, Hazards) .....

Warning Sign .....

Risk assessment and Emergency Response .....

ลงชื่อ .....

ลงชื่อ .....

Researcher Sign

Advisor or Lab supervisor Sign



## 4. Housekeeping in the laboratory



- 1.** Exits/ aisles/ corridors, safety shower, safety eyewash station as well as any areas related to the safety zones are not blocked.
- 2.** The laboratory (e.g. room, equipment, chemicals) must be clean and tidy.
- 3.** Segregation and chemical storage according to the chemical management guidance and do not store chemicals into a lab hood, permanently.

# 5. Engineering Controls in the laboratory



Engineering controls are considered as the “first line of defense” in protecting workers.

## 5.1 Laboratory fume hood



### Recommendations

- ✓ Work at least 6 – 10 inches inside the hood.
- ✓ Sash at or below marked approval level.
- ✓ Never put your head inside the lab hood.
- ✓ Clean the contaminated area inside the hood and sash down over 1-2 inches after work.
- ✓ Do not store any chemicals inside the hood permanently.

# 5. Engineering Controls in the laboratory



## 5.2 ventilation and cooling system

- ✓ Used to circulate or ventilate air in closed laboratories.
- ✓ Used to control the condition of air (temperature and humidity).



ช่องลม



พัดลมระบายอากาศ



พัดลมเพดาน



เครื่องปรับอากาศ

## 6. Laboratory Best Practices.



- 1.** Everyone working in the chemical laboratory have to know and work by following the lab safety.
- 2.** Do not allow anyone working alone in the lab.
- 3.** Do not allow anyone working in the lab after regular working hour except it is notified to advisor or lab supervisors.
- 4.** No horseplay in the laboratory.
- 5.** Exits/ aisles/ corridors are not blocked.

## 6. Laboratory Best Practices.



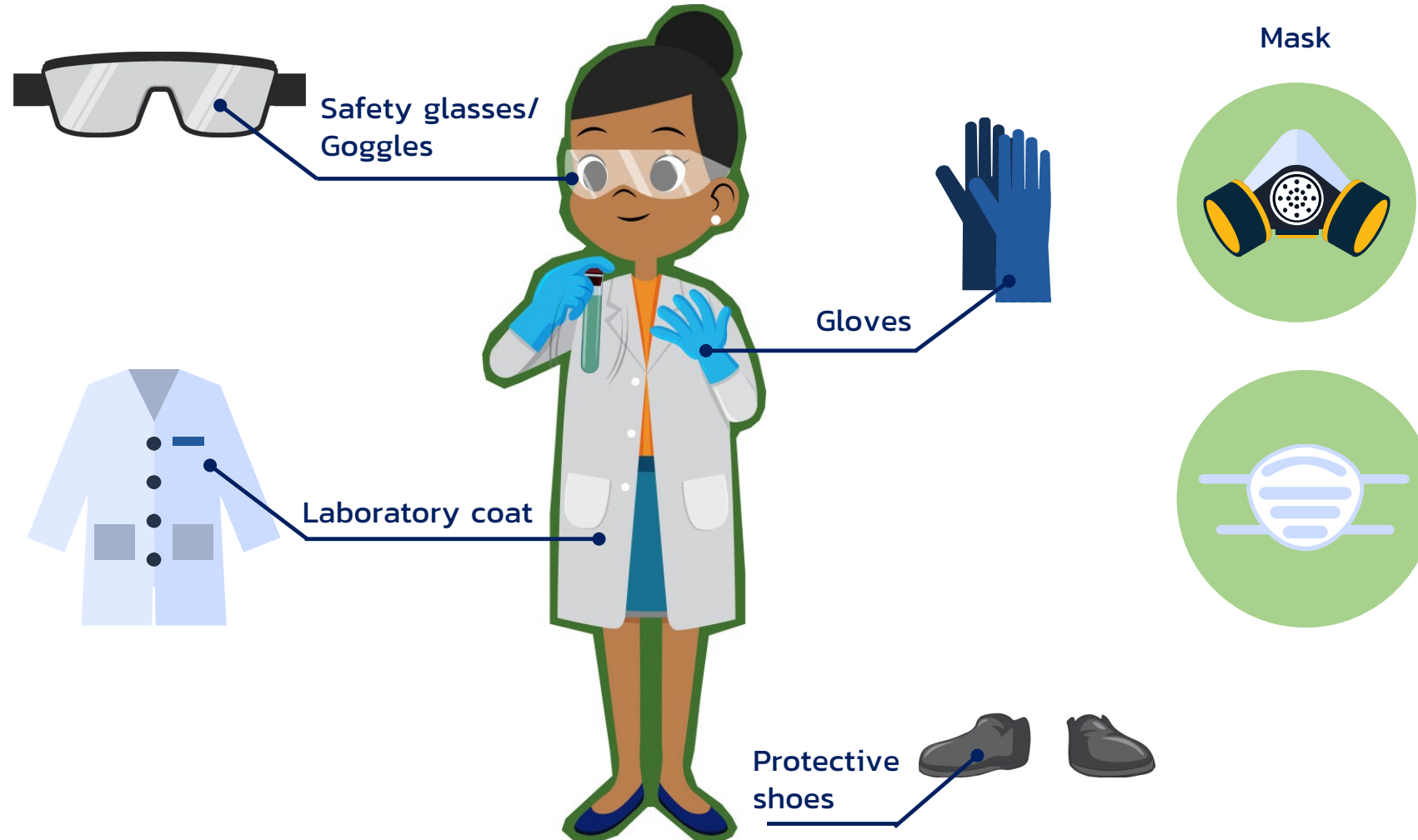
- 7.** Safety glasses or goggles must be worn in the laboratory.
- 8.** Contact lenses are not be permitted.
- 9.** Lab coat must be worn and all buttons properly.
- 10.** A necktie must be taken off or kept inside a shirt in the laboratory.
- 11.** Long hair has to be kept tied back in the laboratory. Do not permit to wear caps or scarves.
- 12.** Do not smoke cigarette.
- 13.** Food and drink is strickly prohibited in the laboratory.

## 6. Laboratory Best Practices.



- 14.** Electrical cords and plugs must be kept and maintained in the good conditions.
- 15.** Know where the following things are: the nearest emergency exit, fire extinguishers, emergency equipment and first aid kits.
- 16.** Do not lock the entrance door at work.
- 17.** Dispose of chemicals as instructed in #12. Hazardous Waste Practices.
- 18.** Always turn off power and gas valve after use or leaving a lab.
- 19.** After removing gloves, wash hands before leaving a lab.
- 20.** Whenever the accident is minor or severe, it is needed to report to advisor or lab supervisor. Do not solve a problem yourself if the situation cannot be controlled.

# 7. Personal Protective Equipment, (PPE)



# 8. Emergency safety equipment



**8.1** Emergency shower station

**8.2** Emergency eyewash station

## Inspection

It is required a weekly visual inspection of the flushing fluid.

Eyewash and shower stations must be in accessible locations that require no more than 10 seconds to reach.



# 8. Emergency safety equipment



## 8.3 Fire Extinguishers



### 1. Pressurized water

Water extinguishers are for Class A fires only

Water should not be used on Class B or C fires. The discharge stream could spread the flammable liquid in a Class B fire or could create a shock hazard on a Class C fire.



### 2. Carbon dioxide

Carbon dioxide can be used on Class B & C fires. They are usually ineffective on Class A fires.



### 3. Dry Chemical Powder

It is effective on Class A, B, and C fires. This agent also works by creating a barrier between the oxygen element and the fuel element on Class A fires. Ordinary dry chemical is for Class B & C fires only.



### 4. Wet chemical

Wet chemical of Class K extinguishers were developed for modern, high efficiency deep fat fryers in commercial cooking operations.

# 8. Emergency safety equipment



## 8.3 Fire Extinguishers



### 5. Dry Powder

Dry powder extinguishers are for Class D or combustible metal fires, only. They are ineffective on all other classes of fires.



### 6. Dry Powder

Halogenated or Clean Agent extinguishers include the halon agents as well as the newer and less ozone depleting halocarbon agents. They extinguish the fire by interrupting the chemical reaction and/or removing heat from the fire triangle. Clean agent extinguishers are effective on Class A, B and C fires.



<https://bit.ly/2R8zupj>

## 8. Emergency safety equipment



### 8.4 Manual fire alarm activation



### Recommendation

Manual fire alarm activation should be checked by a competent person at least once a year.

### 8.5 Gas detector



## 8. Emergency safety equipment

### 8.6 First Aid Kit



- ✓ The purpose of first aid equipment is to minimize a level of injuries (e.g. sharp injuries, abrasions, scalds).
- ✓ The common kits mostly contain: alcohol or non alcohol antiseptic wipes, band-aids, cotton swabs, iodide, bandages, gauze, saline, burn dressing, forceps and scissors.

# 9. Systems of classification of chemicals



## 9.1 Globally Harmonized System of Classification and Labeling of Chemicals (GHS)












Classification of the hazards of chemicals according to the GHS rules into physical hazards, health hazards and environmental hazards.

Communication of the hazards and precautionary information using Safety Data Sheets and labels.

# 9. Systems of classification of chemicals

## GHS CLASSIFICATIONS



GHS PICTOGRAMS		
<p><b>Health Hazard</b> Carcinogens, respiratory sensitisers, reproductive toxicity, target organ toxicity, germ cell mutagens</p> 	<p><b>Flame</b> Flammable gases, liquids, &amp; solids; self-reactives; pyrophorics;</p> 	<p><b>Exclamation Mark</b> Irritant, dermal sensitiser, acute toxicity (harmful)</p> 
<p><b>Gas Cylinder</b> Compressed gases; liquefied gases; dissolved gases</p> 	<p><b>Corrosion</b> Skin corrosion; serious eye damage</p> 	<p><b>Exploding Bomb</b> Explosives, self-reactives, organic peroxides</p> 
<p><b>Flame Over Circle</b> Oxidisers gases, liquids and solids</p> 	<p><b>Environment</b> Aquatic toxicity</p> 	<p><b>Skull &amp; Crossbones</b> Acute toxicity (severe)</p> 

# 9. Systems of classification of chemicals



## The Basic Parts of A GHS-Compliant Label

**1** → **n-Propyl Alcohol**  
UN No. 1274  
CAS No. 71-23-8

**2** → **DANGER**

**3** → Highly flammable liquid and vapor. Causes serious eye damage. May cause drowsiness and dizziness.

**4** → Keep away from heat/sparks/open flames/hot surfaces. No smoking. Avoid breathing fumes/mist/vapours/spray. Wear protective gloves/protective clothing/eye protection/face protection. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present. Continue rinsing.

**5** → Fill Weight: 18.65 lbs.      Lot Number: B56754434  
Gross Weight: 20 lbs.      Fill Date: 6/21/2013  
Expiration Date: 6/21/2020

See SDS for further information.

**6** →

**5** → Acme Chemical Company • 711 Roadrunner St. • Chicago, IL 60601 USA • www.acmechem.com • 123-444-5567

1. **Product Identifier** - Should match the product identifier on the Safety Data Sheet.
2. **Signal Word** - Either use "Danger" (severe) or "Warning" (less severe)
3. **Hazard Statements** - A phrase assigned to a hazard class that describes the nature of the product's hazards
4. **Precautionary Statements** - Describes recommended measures to minimize or prevent adverse effects resulting from exposure.
5. **Supplier Identification** - The name, address and telephone number of the manufacturer or supplier.
6. **Pictograms** - Graphical symbols intended to convey specific hazard information visually.

Sample label courtesy of Weber Packaging Solutions • www.weberpackaging.com

# 9. Systems of classification of chemicals

## 9.2 European Economic Community (EEC)





















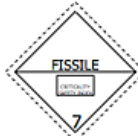




# 9. Systems of classification of chemicals



## 9.3 United Nations (UN)

Class 1 Explosives	Class 2 Gases	Classes 3 and 4: Flammable liquids and solids	Other GHS transport classes	Non-GHS transport pictograms	
 <p>Divisions 1.1-1.3</p>	 <p>Flammable gases</p>	 <p>Flammable liquids</p>	 <p>5.1 Oxidizing substances</p>	 <p>6.2 Infectious substances</p>	 <p>RADIOACTIVE I Radioactive material</p>
 <p>Divisions 1.1-1.3</p>	 <p>2 Non-flammable non-toxic gases</p>	 <p>4 Flammable solids</p>	 <p>5.2 Organic peroxides</p>	 <p>9 Miscellaneous dangerous substances and articles</p>	 <p>RADIOACTIVE II Radioactive material</p>
 <p>Divisions 1.1-1.3</p>	 <p>2 Toxic gases</p>	 <p>4 Substances liable to spontaneous combustion</p>	 <p>6 Toxic substances</p>		 <p>RADIOACTIVE III Radioactive material</p>
 <p>Divisions 1.1-1.3</p>		 <p>4 Substances which in contact with water emit flammable gases</p>	 <p>8 Corrosive substances</p>		 <p>FISSILE Radioactive material</p>

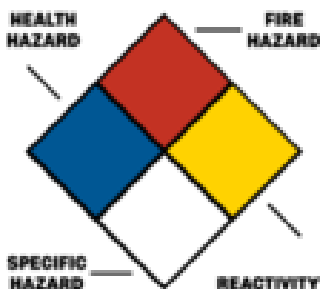
[www.conceptdraw.com/examples/transportation-pictogram](http://www.conceptdraw.com/examples/transportation-pictogram)

# 9. Systems of classification of chemicals

## 9.4 National Fire Protection Association (NFPA)

### HAZARD AWARENESS CHART

#### HAZARD CLASSIFICATIONS



HEALTH HAZARD      FIRE HAZARD  
SPECIFIC HAZARD      REACTIVITY

	<b>FIRE HAZARD</b>
	<b>HEALTH HAZARD</b>
	<b>REACTIVITY</b>

#### PERSONAL PROTECTION PICTOGRAMS

Safety Goggles	Face Shield	Apron	Dust Mask	Vapour Respirator
Self-Contained Air Respirator	Gloves	Boots	Full Protection Suit	No Smoking

#### HAZARD SYMBOLS

Compressed Gas	Flammable Material	Oxidizing	Explosion Hazard	Harmful or Fatal
Biohazardous/Infectious	Corrosive	Health Hazard	Harmful	Harmful to the Environment

<http://siam-shipping.com/transport-hazardous-items/>

# 10. Safety Data Sheet (SDS)



- ✓ An SDS must be available for each hazardous substance in a laboratory chemical inventory.
- ✓ Laboratory supervisors are responsible for keeping SDS current and making them available to all laboratory employees throughout the work day.
- ✓ SDS must be in a central location that can be accessed immediately in the event of an emergency.
- ✓ Electronic copies may be kept in a file on a group drive, or hard copies maintained in a central location in the laboratory.
- ✓ The SDS follows a 16 section format according to GHS.

# 10. Safety Data Sheet (SDS)



## 1 Identification of the substance or mixture and of the supplier

- GHS product identifier.
- Other means of identification.
- Recommended use of the chemical and restrictions on use.
- Supplier's details (including name, address, phone number, etc.).
- Emergency phone number.

# 10. Safety Data Sheet (SDS)



## SECTION 1: Identification

### 1.1. Identification

Product form	: Substance
Substance name	: Acetone
Chemical name	: 2-Propanone
CAS No	: 67-64-1
Product code	: LC10420, LC10425
Formula	: C <sub>3</sub> H <sub>6</sub> O
Synonyms	: 2-propanone / beta-ketopropane / dimethyl formaldehyde / dimethyl ketone / dimethylketal / DMK (=dimethyl ketone) / keto propane / methyl ketone / pyroacetic acid / pyroacetic ether / pyroacetic spirit

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

Use of the substance/mixture	: Solvent Cleaning product Chemical raw material
------------------------------	--

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

LabChem Inc  
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court  
Zelienople, PA 16063 - USA  
T 412-826-5230 - F 724-473-0647  
[info@labchem.com](mailto:info@labchem.com) - [www.labchem.com](http://www.labchem.com)

### 1.4. Emergency telephone number

Emergency number	: CHEMTREC: 1-800-424-9300 or 011-703-527-3887
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# 10. Safety Data Sheet (SDS)



## 2 Hazard identification

- ✓ GHS classification of the substance/mixture.
- ✓ GHS label elements
- ✓ Other hazards which do not result in classification (e.g., dust explosion hazard) or are not covered by the GHS.

# 10. Safety Data Sheet (SDS)



## SECTION 2: Hazard(s) identification

### 2.1. Classification of the substance or mixture

#### GHS-US classification

Flammable liquids Category 2 H225  
Serious eye damage/eye irritation Category 2A H319  
Specific target organ toxicity (single exposure) Category 3 H336

Full text of H statements : see section 16

### 2.2. Label elements

#### GHS-US labeling

Hazard pictograms (GHS-US) :



GHS02

GHS07

Signal word (GHS-US) :

Danger

Hazard statements (GHS-US) :

H225 - Highly flammable liquid and vapor  
H319 - Causes serious eye irritation  
H336 - May cause drowsiness or dizziness

Precautionary statements (GHS-US) :

P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking  
P233 - Keep container tightly closed  
P240 - Ground/bond container and receiving equipment  
P241 - Use explosion-proof electrical, lighting, ventilating equipment  
P242 - Use only non-sparking tools  
P243 - Take precautionary measures against static discharge

# 10. Safety Data Sheet (SDS)

## 3 Composition/ Information on ingredients



### Substance

- ✓ chemical elements and their compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurities derived from the process used, but excluding any solvent, which may be separated without affecting the stability of the substance or changing its composition.

### Mixtures

- ✓ The chemical identity and concentration or concentration ranges of all ingredients which are hazardous within the meaning of the GHS and are present above their cutoff levels.



# 10. Safety Data Sheet (SDS)



## CAS Number (Chemical Abstracts Service Number)

- ✓ Unique numerical identifier to every chemical substance.
- ✓ Maximum to 10 digits.
- ✓ Divided into 3 parts by hyphen.
- ✓ Mixtures don't have CAS Number.

CAS Number	Substance Name
50-78-2	Aspirin
7732-18-5	Water
50-99-7	D-Glucose
7647-14-5	Sodium Chloride
50-00-0	Formaldehyde

# 10. Safety Data Sheet (SDS)



## SECTION 3: Composition/Information on ingredients

### 3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	GHS-US classification
Acetone (Main constituent)	(CAS No) 67-64-1	100	Flam. Liq. 2, H225 Eye Irrit. 2A, H319 STOT SE 3, H336

Full text of hazard classes and H-statements : see section 16

### 3.2. Mixture

Not applicable

# 10. Safety Data Sheet (SDS)



## 4 First aid measures

- ✓ Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion.
- ✓ Most important symptoms/effects, acute and delayed.
- ✓ Indication of immediate medical attention and special treatment needed, if necessary.

# 10. Safety Data Sheet (SDS)



## SECTION 4: First aid measures

### 4.1. Description of first aid measures

- First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with labored breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.
- First-aid measures after inhalation : Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.
- First-aid measures after skin contact : Wash immediately with lots of water. Soap may be used. Do not apply (chemical) neutralizing agents. Remove clothing before washing. Take victim to a doctor if irritation persists.
- First-aid measures after eye contact : Rinse immediately with plenty of water. Do not apply neutralizing agents. Take victim to an ophthalmologist if irritation persists.
- First-aid measures after ingestion : Rinse mouth with water. Immediately after ingestion: give lots of water to drink. Do not give milk/oil to drink. Do not induce vomiting. Give activated charcoal. Call Poison Information Centre ([www.big.be/antigif.htm](http://www.big.be/antigif.htm)). Consult a doctor/medical service if you feel unwell. Ingestion of large quantities: immediately to hospital. Doctor: gastric lavage.

### 4.2. Most important symptoms and effects, both acute and delayed

- Symptoms/injuries : Not expected to present a significant hazard under anticipated conditions of normal use.
- Symptoms/injuries after inhalation : EXPOSURE TO HIGH CONCENTRATIONS: Feeling of weakness. Irritation of the respiratory tract. Nausea. Vomiting. Headache. Central nervous system depression. Dizziness. Narcosis. Excited/restless. Drunkenness. Disturbed motor response. Respiratory difficulties. Disturbances of consciousness.
- Symptoms/injuries after skin contact : ON CONTINUOUS EXPOSURE/CONTACT: Dry skin. Cracking of the skin.
- Symptoms/injuries after eye contact : Irritation of the eye tissue.
- Symptoms/injuries after ingestion : Dry/sore throat. Risk of aspiration pneumonia. Symptoms similar to those listed under inhalation. AFTER ABSORPTION OF LARGE QUANTITIES: Irritation of the gastric/intestinal mucosa. Change in the blood composition. Change in urine output. Renal disease. Enlargement/disease of the liver.
- Symptoms/injuries upon intravenous administration : Not available.
- Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Skin rash/inflammation. Dry/sore throat. Headache. Nausea. Feeling of weakness. Loss of weight. Possible inflammation of the respiratory tract.

# 10. Safety Data Sheet (SDS)



## 5 Firefighting measures

- ✓ Suitable (and unsuitable) extinguishing media.
- ✓ Specific hazards arising from the chemical  
(e.g., nature of any hazardous combustion products).
- ✓ Special protective equipment and precautions for firefighters.

# 10. Safety Data Sheet (SDS)



## SECTION 5: Firefighting measures

### 5.1. Extinguishing media

- Suitable extinguishing media : Preferably: alcohol resistant foam. Water spray. Polyvalent foam. Alcohol-resistant foam. BC powder. Carbon dioxide.
- Unsuitable extinguishing media : Solid water jet ineffective as extinguishing medium.

### 5.2. Special hazards arising from the substance or mixture

- Fire hazard : DIRECT FIRE HAZARD. Highly flammable. Gas/vapor flammable with air within explosion limits. INDIRECT FIRE HAZARD. May be ignited by sparks. Gas/vapor spreads at floor level: ignition hazard. Reactions involving a fire hazard: see "Reactivity Hazard".
- Explosion hazard : DIRECT EXPLOSION HAZARD. Gas/vapour explosive with air within explosion limits. INDIRECT EXPLOSION HAZARD. Heat may cause pressure rise in tanks/drums: explosion risk. may be ignited by sparks. Reactions with explosion hazards: see "Reactivity Hazard".
- Reactivity : Upon combustion: CO and CO<sub>2</sub> are formed. Violent to explosive reaction with many compounds. Prolonged storage: on exposure to light: release of harmful gases/vapours. Reacts violently with (strong) oxidizers: peroxidation resulting in increased fire or explosion risk.

### 5.3. Advice for firefighters

- Firefighting instructions : Cool tanks/drums with water spray/remove them into safety. Physical explosion risk: extinguish/cool from behind cover. Do not move the load if exposed to heat. After cooling: persistent risk of physical explosion.
- Protection during firefighting : Heat/fire exposure: compressed air/oxygen apparatus.

# 10. Safety Data Sheet (SDS)



## 6 Accidental release measures

- ✓ Personal precautions, protective equipment and emergency procedures.
- ✓ Environmental precautions.
- ✓ Methods and materials for containment and cleaning up.

# 10. Safety Data Sheet (SDS)



## SECTION 6: Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

#### 6.1.1. For non-emergency personnel

- Protective equipment : Gloves. Protective goggles. Protective clothing. Large spills/in enclosed spaces: compressed air apparatus. See "Material-Handling" to select protective clothing.
- Emergency procedures : Keep upwind. Mark the danger area. Consider evacuation. Seal off low-lying areas. Close doors and windows of adjacent premises. Stop engines and no smoking. No naked flames or sparks. Spark- and explosion-proof appliances and lighting equipment. Keep containers closed. Wash contaminated clothes.

#### 6.1.2. For emergency responders

- Protective equipment : Equip cleanup crew with proper protection.
- Emergency procedures : Ventilate area.

### 6.2. Environmental precautions

Prevent spreading in sewers.

### 6.3. Methods and material for containment and cleaning up

- For containment : Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Try to reduce evaporation. Measure the concentration of the explosive gas-air mixture. Dilute/disperse combustible gas/vapour with water curtain. Provide equipment/receptacles with earthing. Do not use compressed air for pumping over spills.
- Methods for cleaning up : Take up liquid spill into inert absorbent material, e.g.: sand, earth, vermiculite. Scoop absorbed substance into closing containers. See "Material-handling" for suitable container materials. Spill must not return in its original container. Carefully collect the spill/leftovers. Damaged/cooled tanks must be emptied. Do not use compressed air for pumping over spills. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.



# 10. Safety Data Sheet (SDS)



## 7 Handling and storage

- ✓ Precautions for safe handling.
- ✓ Conditions for safe storage, including any incompatibilities

# 10. Safety Data Sheet (SDS)



## 8 Exposure controls/personal protection

- ✓ Control parameters, e.g., occupational exposure limit values or biological limit values.
- ✓ Appropriate engineering controls.
- ✓ Individual protection measures, such as personal protective equipment.

# 10. Safety Data Sheet (SDS)



## SECTION 8: Exposure controls/personal protection

### 8.1. Control parameters

Acetone (67-64-1)		
ACGIH	ACGIH TWA (ppm)	500 ppm (Acetone; USA; Time-weighted average exposure limit 8 h; TLV - Adopted Value)
ACGIH	ACGIH STEL (ppm)	750 ppm (Acetone; USA; Short time value; TLV - Adopted Value)
OSHA	OSHA PEL (TWA) (mg/m <sup>3</sup> )	2400 mg/m <sup>3</sup>
OSHA	OSHA PEL (TWA) (ppm)	1000 ppm
IDLH	US IDLH (ppm)	2500 ppm
NIOSH	NIOSH REL (TWA) (mg/m <sup>3</sup> )	590 mg/m <sup>3</sup>
NIOSH	NIOSH REL (TWA) (ppm)	250 ppm

### 8.2. Exposure controls

Appropriate engineering controls

: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Personal protective equipment

: Safety glasses. Gloves. Protective clothing. Face shield. High gas/vapor concentration: gas mask with filter type A.



Materials for protective clothing

: GIVE EXCELLENT RESISTANCE: No data available. GIVE GOOD RESISTANCE: butyl rubber. tetrafluoroethylene. GIVE LESS RESISTANCE: chlorosulfonated polyethylene. natural rubber. neoprene. polyurethane. PVA. styrene-butadiene rubber. GIVE POOR RESISTANCE: nitrile rubber. polyethylene. PVC. viton. nitrile rubber/PVC.

Hand protection

: Gloves.

# 10. Safety Data Sheet (SDS)



## 9 Physical and chemical properties

- ✓ Appearance (physical state, color, etc.).
- ✓ Odor.
- ✓ Odor threshold
- ✓ pH
- ✓ Melting point/ Freezing point
- ✓ Initialing boiling point and boiling range
- ✓ Flash point
- ✓ Evaporation rate
- ✓ Flammability (solid, gas).

# 10. Safety Data Sheet (SDS)



## 9 Physical and chemical properties

- ✓ Upper/ lower flammability or explosive limits
- ✓ Vapor pressure
- ✓ Vapor density
- ✓ Relative density
- ✓ Solubility
- ✓ Partition coefficient
- ✓ Auto-ignition temperature
- ✓ Decomposition temperature

# 10. Safety Data Sheet (SDS)



## 10 Stability and reactivity

- ✓ Chemical stability
- ✓ Possibility of hazardous reactions.
- ✓ Conditions to avoid (e.g., static discharge, shock or vibration).
- ✓ Incompatible materials.
- ✓ Hazardous decomposition products.

# 10. Safety Data Sheet (SDS)



## SECTION 10: Stability and reactivity

### 10.1. Reactivity

Upon combustion: CO and CO<sub>2</sub> are formed. Violent to explosive reaction with many compounds. Prolonged storage: on exposure to light: release of harmful gases/vapours. Reacts violently with (strong) oxidizers: peroxidation resulting in increased fire or explosion risk.

### 10.2. Chemical stability

Unstable on exposure to light.

### 10.3. Possibility of hazardous reactions

Not established.

### 10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

### 10.5. Incompatible materials

Strong acids. Strong bases.

### 10.6. Hazardous decomposition products

fume. Carbon monoxide. Carbon dioxide.

# 10. Safety Data Sheet (SDS)



## 11 Toxicological information

Concise but complete and comprehensible description of the various toxicological (health) effects and the available data used to identify those effects, including:

- ✓ Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact).
- ✓ Symptoms related to the physical, chemical and toxicological characteristics.
- ✓ Delayed and immediate effects and also chronic effects from short- and long-term exposure.
- ✓ Numerical measures of toxicity (such as acute toxicity estimates).



# 10. Safety Data Sheet (SDS)



## 12 Ecological information

- Ecotoxicity (aquatic and terrestrial, where available).
- Persistence and degradability.
- Bioaccumulative potential.
- Mobility in soil.
- Other adverse effects.

# 10. Safety Data Sheet (SDS)



## 13 Disposal considerations

- ✓ Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging

## 14 Transport information

- ✓ UN Number
- ✓ UN Proper Shipping Name
- ✓ Transport Hazard class(es).
- ✓ Packing group, if applicable.
- ✓ Marine pollutant (Yes/No).
- ✓ Special precautions which a user needs to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises.

# 10. Safety Data Sheet (SDS)



## 15 Regulatory information

- ✓ Safety, health and environmental regulations specific for the product in question.

## 16 Other Information

- ✓ including information on preparation and revision of the SDS

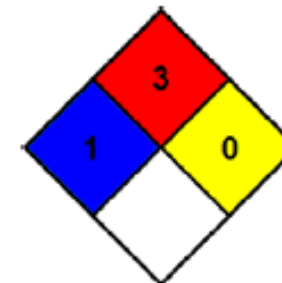
### SECTION 16: Other information

Revision date : 09/20/2016  
Other information : None.

Full text of H-phrases: see section 16:

H225	Highly flammable liquid and vapor
H319	Causes serious eye irritation
H336	May cause drowsiness or dizziness

NFPA health hazard : 1 - Exposure could cause irritation but only minor residual injury even if no treatment is given.  
NFPA fire hazard : 3 - Liquids and solids that can be ignited under almost all ambient conditions.  
NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



# 11. Chemical Handling and Practices



## General Practices

- 1.** Do not perform any experiments if they are not informed to advisor or lab supervisor such as a change of chemical or quantity.
- 2.** Read a label on chemical container before use. Pour chemical liquid by letting a label go inside a palm to protect the label from any spills.
- 3.** Transfer chemicals to a secondary container (e.g. beaker, flask) as necessary.
- 4.** Do not contact or breath chemicals directly.
- 5.** Wear appropriated chemical resistant gloves depend on type of chemicals. Sometimes, wearing two layers of gloves might be necessary at work.

# 11. Chemical Handling and Practices



## General Practices

- 6.** Keep in mind that used gloves are likely to be contaminated. To avoid contamination of public items, remove them and wash hands with water before leaving a lab.
- 7.** If the chemicals spill, the affected areas must be cleaned immediately.
- 8.** Laboratories have to be kept clean and tidy.
- 9.** Be careful when using mercury thermometer and need to know that:
  - Mercury spill needs an immediate attention as its vapor is highly toxic. Exposures to very small amounts of mercury can result in chronic health effect and death.
  - After mercury thermometer is used at high temperature, let it cool down to the room temperature before cleaning. Do not store mercury thermometer with other lab glassware.
  - Do not use mercury thermometer with cracks. Immediate notify your lab supervisor to discard it.

# 11. Chemical Handling and Practices



## 11.1 Chemical Handling and Practices



- ✓ The exist label of chemical container must be informative and not be altered, defaced and removed.
- ✓ Do not store incompatible chemicals closely together.

# Segregation of Chemical and Hazardous Substance for Storage according to Department of Industrial Works (2007)



Explosive substances



Compressed, liquefied and dissolved gases



Flammable liquids



Flammable solids



Toxic substances and infectious substances



Radioactive substances



Corrosive substances



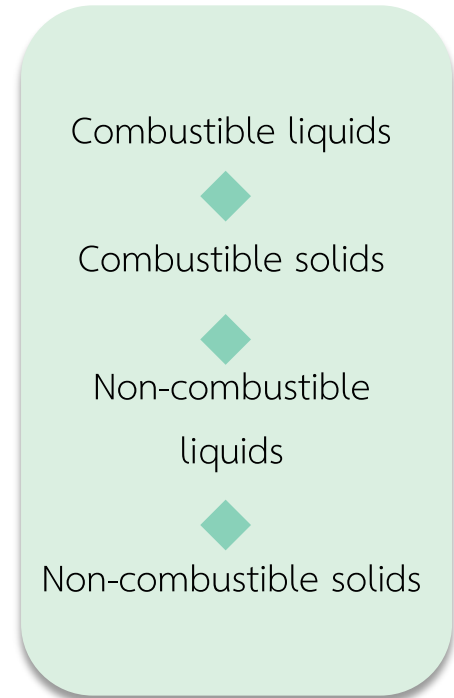
N.A.



Oxidizing substances



Peroxide substances



<https://bit.ly/3huyPZO>

# Chemical Storage



## ◆ Flammable

- ✓ Store flammables away from heat, ignition source and direct sunlight.
- ✓ Store solvent with low boiling point in good ventilation system.
- ✓ Segregate flammables from other chemicals.
- ✓ In laboratories, store flammable liquids in containers with no more than 20-litre capacity.
- ✓ Flammable liquids in quantities exceeding a total of 38 liters within a laboratory should be stored in approved flammable storage cabinets.
- ✓ Flammables that must be in the cool place should be stored in laboratory-safe or explosion proof refrigerator.





# Chemical Storage



## ◆ Corrosives

- ✓ Separate acids from bases and store them on a shelf lower than the eye level.
- ✓ Preferably store corrosives in special corrosive cabinets, with secondary container.
- ✓ Do not store incompatible acids closely together e.g. separate acetic acid from nitric acid.



## Chemical Storage



### ◆ Oxidizers and peroxide formers

- ✓ Store chemicals away from heat, ignition source and direct sunlight.
- ✓ Store chemicals away from flammables, combustibles and organic compounds.
- ✓ Store strong oxidizers such as chromic acid in glass or inert-materials.
- ✓ After opening, test for the peroxide formation before using peroxide formers.



## Chemical Storage

### ◆ Reactive chemicals

- ✓ Cabinet with reactive substances should have a warning sign (for example, “Reactive Substances – Keep Water Away”).
- ✓ Do not store water-reactives near other sources of water (e.g. sink, water bath) in the laboratory.
- ✓ Regularly check reactive chemicals to ensure they are in the good conditions.



# 11. Chemical Handling and Practices

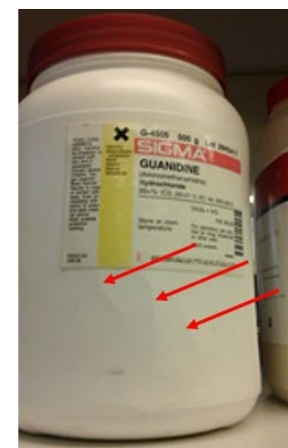


# 11. Chemical Handling and Practices

## 11.2 Transportation and handling chemicals

### Specific consideration

- ✓ Check the chemical container before transportation. If the container deteriorates, transfer chemical into a new suitable container.
- ✓ Don't transport incompatible chemicals together.



# 11. Chemical Handling and Practices

## 11.2 Transportation and handling chemicals

For a short distance transport of chemicals

- ✓ Use one hand to carry at the bottle neck or handle and another hand to support underneath the bottle. or use suitable container such as bucket to hold the bottle.



Do not just hold the bottle neck or handle because it might slip and caused chemical falls off, accidentally



# 11. Chemical Handling and Practices

## 11.2 For a long distance transportation of chemicals

### Out of the laboratory or the building

- ✓ PPE and appropriate containers, such as stainless steel or plastic buckets, are required. Do not use basket because it could not hold chemical leakage.

### Transportation a large number of chemicals

- ⚠ Don't place chemicals into a cart directly but place them into a suitable secondary container.
- ✓ Ensure a secondary container can hold all of the contents when chemical leakage.



# 11. Chemical Handling and Practices



## Transportation of compressed gas

- ✓ Caps MUST be on a cylinder during any transport.
- ✓ It is allowed to transport a short distance with a rotating bottom but do it carefully.
- ✓ To transport a long distance, place cylinder on transport cart, secure with chain or belt.
- ✓ Do not use public elevator/ walkway for chemical transportation.



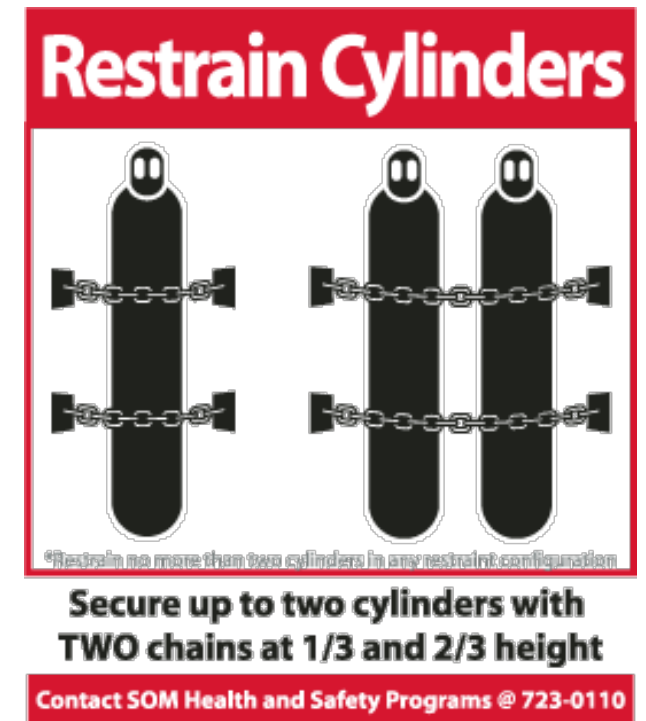


# 11. Chemical Handling and Practices



## Handling of compressed gas

- ✓ Clearly identify compressed gas cylinder.
- ✓ Gas cylinders shall be stored in well ventilated, dry, and out of direct sunlight, heat and ignition sources
- ✓ If possible, keep gas cylinders outside the lab and connect it with appropriated pipelines.
- ✓ Cylinders must be secured in an upright position by a cylinder stand, clamp and chain or cable at 2 points approximately 1/3 and 2/3 of the height of the cylinder.
- ✓ Segregate empty/ full/ in use compressed gas with tags.



# 11. Chemical Handling and Practices

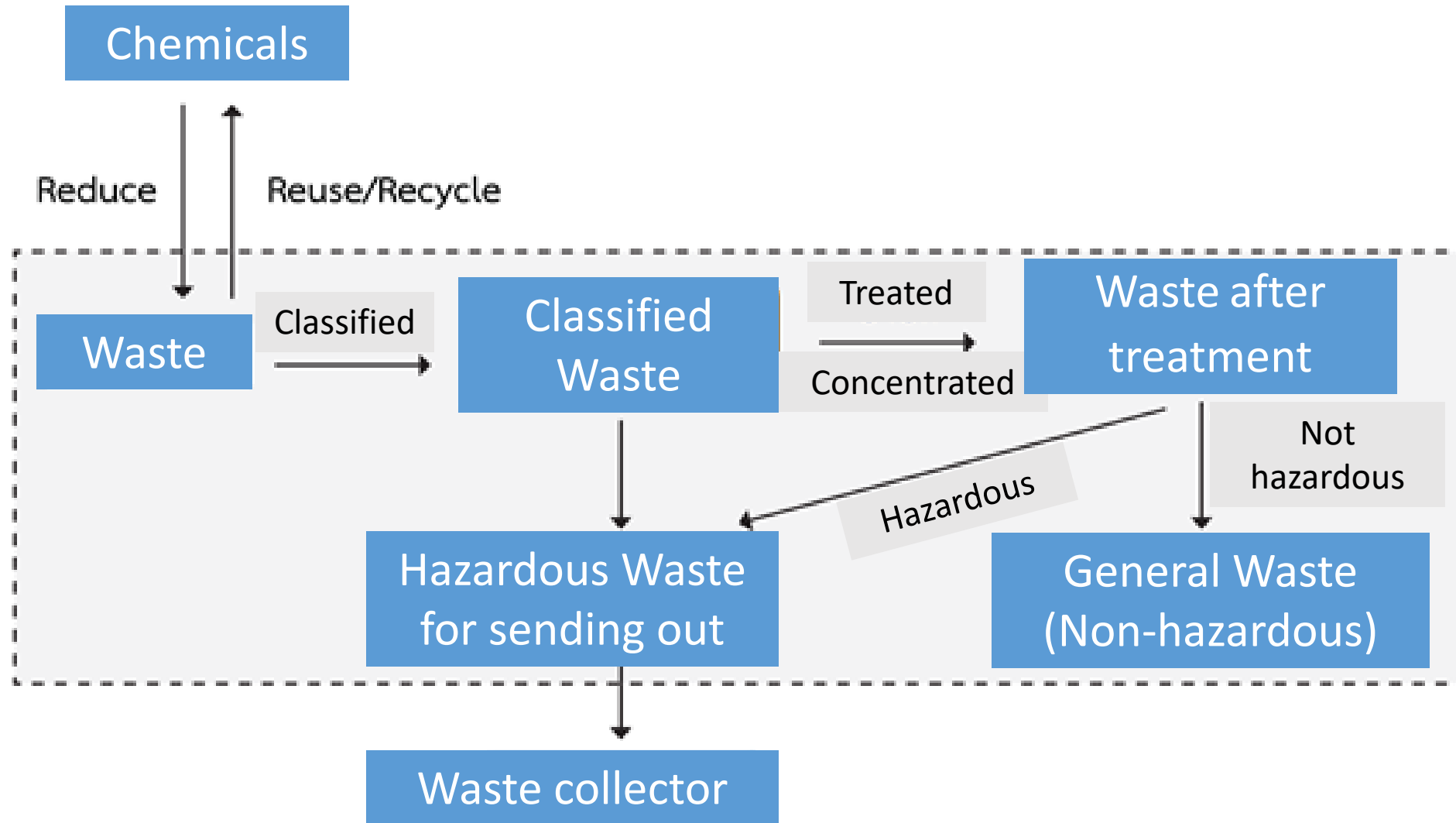


## Handling of compressed gas

- ✓ Securely install the valve protection devices when the cylinder is not in use, such as caps or guards.
- ✓ Keep oxygen gas cylinder away from flammable and toxic gas.
- ✓ Inspect the gas cylinder condition every 6 months by consulting gas suppliers.
- ✓ Securely cap the cylinder valve before a transportation.
- ✓ Ensure to use a right regulator which is compatible to the type of gas. Connection, fittings and lines must be tight before use.
- ✓ Don't use oil or lubricants on cylinder valve



# 12. Hazardous Waste Practices



## 12. Hazardous Waste Practices



### 12.1 Waste Reduction



#### Reduce:

- ✓ To do a research work in micro-scale or small-scale experiments.
- ✓ Demonstration or used any medias such as VDO instead of actual experiment.
- ✓ Suggest a proper way to reduce chemical waste.

## 12. Hazardous Waste Practices



### 12.1 Waste Reduction



#### Reuse:

- ✓ After experiment, solvent which is not being used, can be collected and used for other purpose such as cleaning glassware.
- ✓ Solid supported reagent/catalyst can be reused.
- ✓ Empty solvent containers can be used after a proper clean.

## 12. Hazardous Waste Practices



### 12.1 Waste Reduction



#### Recycle:

- ✓ Solvent recovery: solvent, from the rotary evaporation or solvent used to clean glassware, could be reused after proper purifications such as a fractional distillation.
- ✓ Recovery of precious metals from wastes.
- ✓ Old or expired chemicals which deteriorated could be purified by proper methods.

# 12. Hazardous Waste Practices



## 12.2 Classification of Hazardous Wastes according to WasteTrack system

Category I: Special Waste

Category II: Cyanide Waste

Category III: Oxidizing Waste

Category IV: Mercury Waste

Category V: Chromate Waste

Category VI: Heavy Metal Waste

Category VII: Acid Waste

Category VIII: Alkaline Waste

Category IX: Petroleum Products Waste

Category X: Oxygenated Waste

Category XI: NPS Waste

Category XII: Halogenated Waste

Category XIII(a): Combustible Solid Waste

XIII(b): Incombustible Solid Waste

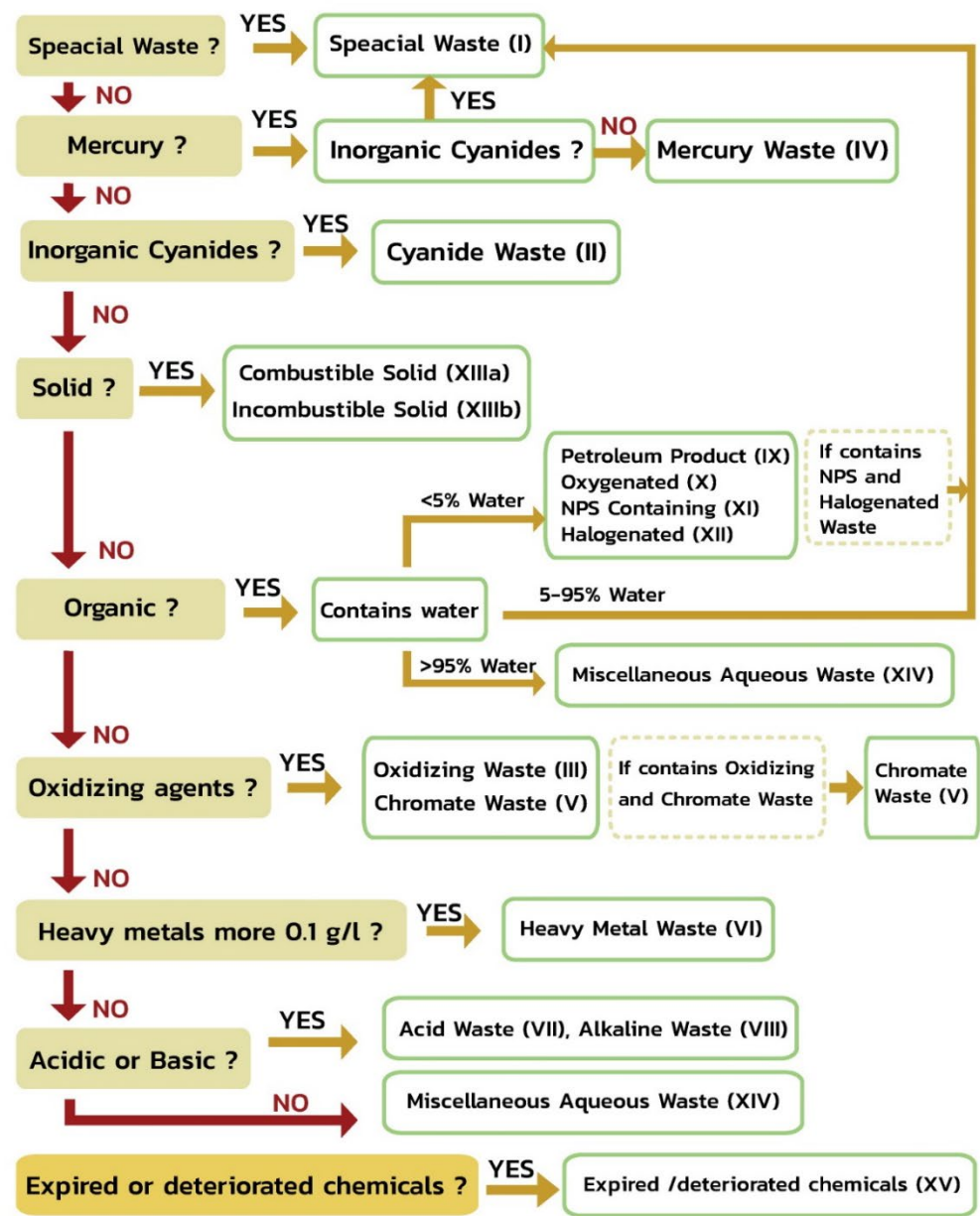
Category XIV: Miscellaneous Aqueous Waste

Category XV: Expired Waste or Deteriorated Waste

# 12. Hazardous Waste Practices



Flowchart for WasteTrack-  
Classification of Hazardous  
Wastes





# 12. Hazardous Waste Practices



**ของเสียอันตราย (Hazardous Waste)**

WasteTrackID

ประเภทของเสีย (เลือกเพียง 1 รายการเท่านั้น) ปริมาณ (ระบุหน่วยเป็น V/kg) \_\_\_\_\_

<input type="checkbox"/> I: Special waste	<input type="checkbox"/> VI: Heavy metal waste	<input type="checkbox"/> XI: NPS containing
<input type="checkbox"/> II: Cyanide waste	<input type="checkbox"/> VII: Acid waste	<input type="checkbox"/> XII: Halogenated waste
<input type="checkbox"/> III: Oxidizing waste	<input type="checkbox"/> VIII: Alkaline waste	<input type="checkbox"/> XIIIa: Combustible solid
<input type="checkbox"/> IV: Mercury waste	<input type="checkbox"/> IX: Petroleum products	<input type="checkbox"/> XIIIb: Incombustible solid
<input type="checkbox"/> V: Chromate waste	<input type="checkbox"/> X: Oxygenated waste	<input type="checkbox"/> XIV: Miscellaneous aqueous waste

ส่วนประกอบ	ปริมาณ (%)

**สัญลักษณ์แสดงความเป็นอันตราย (เลือกได้มากกว่า 1 ข้อ)**

				อื่นๆ (ระบุ)
ไวไฟ	กัดกร่อน	เป็นพิษ	ตัวออกซิไดส์	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

ภาควิชาเคมี คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ชื่อห้องปฏิบัติการ \_\_\_\_\_

ชื่อผู้รับผิดชอบ \_\_\_\_\_

หมายเลขโทรศัพท์ \_\_\_\_\_

วันที่เริ่มบรรจุ \_\_\_\_\_

วันที่หยุดบรรจุ \_\_\_\_\_

**Example: Appropriated Hazardous Waste Label**

## 12. Hazardous Waste Practices



### Remarks

- ⚠ Don't contain hazardous waste until the container is full. It is recommended to have a free space at least 20% of the container.
- ✓ Store wastes at a well ventilated area until wastetrack administrator will contact and has an appointment for waste pick-up.
- ✓ For transportation, a bottle cap must be close tightly. Waste container, especially with liquids, must be stored into a suitable secondary container.
- ✓ Use a cart for transportation of wastes.
- ✓ Use a freight elevator to transport waste containers, if possible.



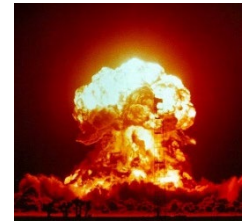


# Incident case: chemical waste container explosion because of an incompatible reaction

$\text{HNO}_3$  + acetone



Exothermic reaction



## 12. Hazardous Waste Practices



### 12.3 Self-organized Waste Management

#### Non-hazardous waste

- ✓ Drying agents such as  $\text{Na}_2\text{SO}_4$  and  $\text{MgSO}_4$  that have no contamination of hazardous chemicals (such as toxics, corrosives, oxidizing agents, flammables) can be disposed into a waste bin.
- ✓ Aqueous waste which consist of non-toxic organics or inorganic less than 5% can be disposed into a waste bin.
- ✓ Solid waste such as clean broken glasses, filter papers, drying agents with no contamination of toxics or other hazardous chemicals can be disposed to a waste bin.

# 12. Hazardous Waste Practices



## 12.3 Self-organized Waste Management

### Chemical treatment of wastes



Acidic or Basic solution (VII, VIII)



Oxidizers (III)



Water reactives/ air reactives

### Treatment methods



Neutralized and disposed to the drain with a good water flush.



Reduced with appropriated reducer and keep it into a suitable container before going down a drain with a good water flush or waste pick-up.



Quenched in water or weak acid and keep it into a suitable container before going down a drain with a good water flush or waste pick-up.

# 12. Hazardous Waste Practices



## 12.3 Self-organized Waste Management

### Chemical treatment of wastes



Solid waste with solvent



Heavy metal in small quantity (<100 mg/L)

### Treatment methods



Make them dry and classified as incombustible solid waste (XIIIb).



Precipitated as their insoluble salts by suitable method and concentrated by evaporation of solvent.

# 13. Chemicals Spill Response Procedure



## 13.1 Chemical Spills onto the person

- ✓ Inform advisor or lab supervisor immediately.
- ✓ Clothing contaminated with spills has to be removed immediately. Wipe out all traces of contaminant on the body as much as possible
- ✓ Wash immediately with plenty of water at least 15 minutes
- ✓ In case of chemicals spilled or contaminated into eyes, rinse immediate with plenty of water at least 15 minutes and gently hold eyelid open while the water flushes it out. The accident is reported to advisor or lab supervisor immediately. Patient should be sent to hospital and immediately consult a doctor



# 13. Chemicals Spill Response Procedure



## 13.2 Inhalation of chemical

- ✓ Remove a patient into fresh air. If respiratory problem arise, then consult a doctor

## 13.3 Ingestion of chemical

- ✓ If swallowed, a patient must seek a doctor immediately. If possible, bring the chemical label or SDS to give a necessary information to a doctor. Do not induce vomiting.



# 13. ข้อปฏิบัติเมื่อสารเคมีหกหรือสารเคมีเข้าสู่ร่างกาย



## 13.4 Chemical spills

- ✓ Inform advisor or lab supervisor immediately.
- ✓ If solid spilled, use broom to clean up the spills and collect them into a suitable closed container
- ✓ If liquid spilled, use a suitable absorbent for absorbing chemicals. For example:
  - ▶ Acid spills are neutralized with sodium bicarbonate ( $\text{NaHCO}_3$ ) or sodium carbonate ( $\text{Na}_2\text{CO}_3$ )
  - ▶ Base or caustic spills are neutralized with sodium bisulphate ( $\text{NaHSO}_4$ ) or citric acid
  - ▶ Organic solvent spills can be absorbed by sand or appropriated absorbents
  - ▶ Mercury spills can be used commercially sulfur powder to absorb mercury which later be collected into a suitable closed container.

# 14. Chemicals Spill Response Procedure (in Large Qty)



- 1.** Notify all other people who could be affected by a large chemical spill to leave the affected area.
- 2.** Inform advisor or lab supervisor immediately.
- 3.** If chemical spill onto the body, do an emergency respond as instructed in #13.1 “chemical spill onto the person”.
- 4.** To deal with a large of chemical spill, it is good to have a relevant information in the section 6: accidental release measures of SDS.

# 14. Chemicals Spill Response Procedure (in Large Qty)



- 5.** A person who takes in charge chemical clean-up is necessary to:
- ▶ access a risk, which posed by chemical hazards and working process, as well as prepare an emergency plan.
  - ▶ wear appropriated PPE which depend on the level of those chemical hazards. However, it is required to wear at least these items: gloves, respirator as well as safety glasses or chemical splash safety goggles.
  - ▶ clean up immediately.

# 14. Chemicals Spill Response Procedure (in Large Qty)



- 6.** In case chemical spill is uncontrolled or high-hazard, it is necessary to inform advisor or lab supervisor to evacuate people out of the affected area immediately.
- 7.** In case water is used for clean-up, be aware of contaminant going down to the drain. However, it depend on chemicals. If acidic or basic spill, it can go down to the drain after neutralization or dilution.
- 8.** After spilled clean-up, it is required to complete the incident report by advisor or lab supervisor as instructed in #16 incident reporting
- 9.** It is recommended to have a chemical spill kit available in the laboratory. The kits should have the following items: absorbent materials for acid and base spills, gloves, dustpan, polypropylene broom as well as disposal bags with tape or twist ties.

# 14. Chemicals Spill Response Procedure (in Large Qty)



## 10. For spills of liquid

- ▶ It is desirable to contain the spill with appropriate absorbents such as chemical-adsorbent spill pillows, vermiculite or cat litter (odorless type) After the absorbents containing chemical spill, it must be treated as chemical waste and kept into the suitable container. The spilled area has to be clean with water several times.
- ▶ If acid spills, they are neutralized with sodium bicarbonate ( $\text{NaHCO}_3$ ) or sodium carbonate ( $\text{Na}_2\text{CO}_3$ ). If base or caustic spills, they are neutralized with sodium bisulfate or citric acid and checked the pH by using pH paper before down to the drain.
- ▶ If you encounter a large spill of flammable solvents, turn off heating equipment such as oven. nearby the affected area.

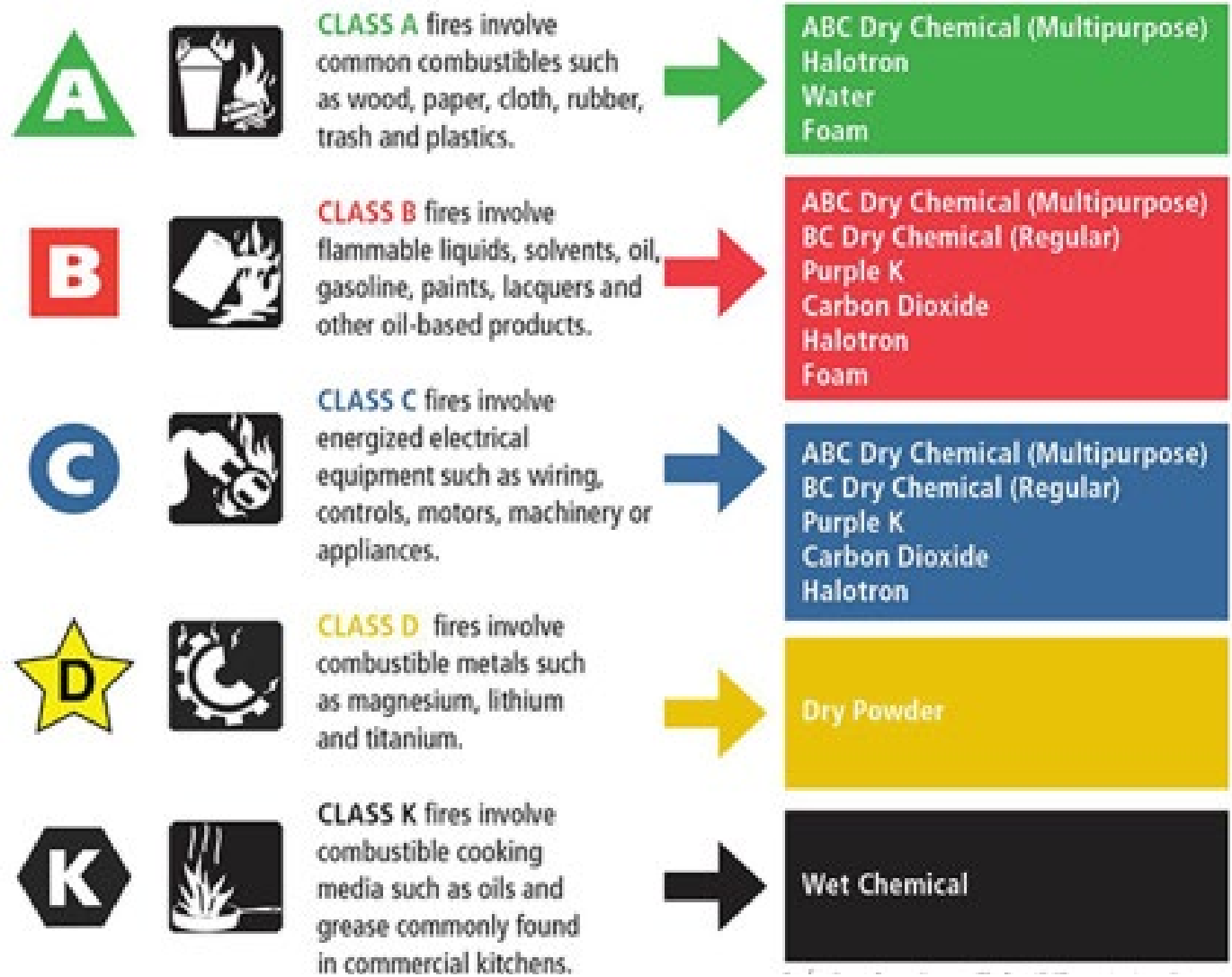
## 11. For spills of solids

- ▶ If high toxic chemicals spills, do an emergency response as instructed in #13.4 chemical spill.
- ▶ If non-toxic chemicals such as non-toxic inorganic salt, corrected them into the suitable closed container.

# 15. Fire response procedure



## 15.1 Class of fires and types of fire extinguishers



# 15. Fire response procedure



## 15.2 Fire in the laboratory

1. Don't panic, calm down and then decide how to response.
2. Turn off the electrical main power or safety cutout, close valves of compressed gas cylinders, move flammable and combustible materials nearby out of fires.
3. If you could put out a fire safely by yourself, do it quick.
4. Choosing the correct type of fire extinguisher for the relevant class of potential fire.
5. If you can not control a fire, inform your advisor or lab supervisor immediately. Then, pull a fire alarm to evacuate a building.



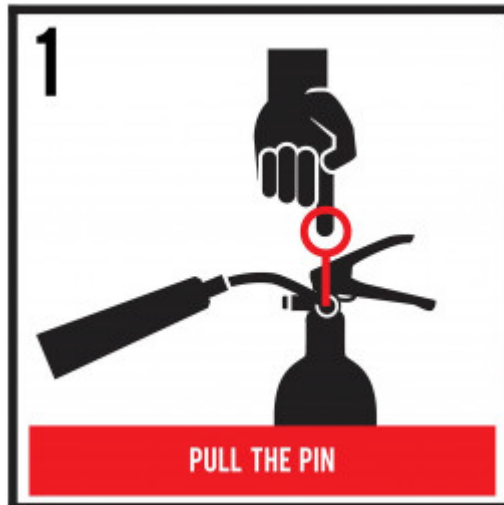


# 15. Fire response procedure



## 15.3 Using fire extinguishers

# P.A.S.S.



1. Pull the pin



2. Aim to the target



3. Squeeze the handle to begin the discharge



4. Sweep the discharge horizontally across the base of fire

# 15. Fire response procedure



## 15.4 Evacuation Plan for Fire Emergency

1. Always response to fire alarm, turn off the electrical main power or safety cutout, close valves of compressed gas cylinders.
2. Evacuate the building with evacuation route immediately . Do not use elevator!
3. Crawling low to the floor. Breathe through a wet towel that covers your nose and mouth.
4. Once you are outside the building, proceed to an designed assembly area.
5. Do not re-enter the building until told to do so by responding people.



# 16. Incident reporting



ศูนย์ความปลอดภัย อาชีวอนามัย และสิ่งแวดล้อม จุฬาลงกรณ์มหาวิทยาลัย (ศปอศ.)  
Center for Safety, Health and Environment of Chulalongkorn University (SHECU)

EN

User System

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## Training course:

Chemical Safety Training for Research Students and Researchers  
(For foreigners and international programs)

### Target groups

- Undergraduate students (4<sup>th</sup> year or higher) Graduate students (Master's or PhD)
- Researchers (post-doctoral researchers, lecturers and third parties working for the university)
- Lab officers (staff, Lab supervisor, scientific officers, scientists)

23-24 SEP 2020 | 25 SEP 2020  
TRAINING DATES 4.30 - 7.00 PM | EXAM DATE 4.30 - 5.30 PM

Zoom program

The online-registration will be available up to 20 September 2020.

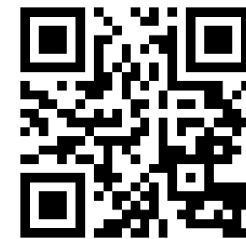


For further information please contact : Worluk Mansawat (Ph. D.) Tel. 02-218 5230 Center for Safety, Health and Environment (SHECU)

Navigation menu with buttons: Training / Seminar, Working Environment Measurement, Database System, ChemTrack&WasteTrack, Incident Report (highlighted with a red arrow), Emergency Response plan, CU-IBC, Annual Report



Unsafe condition report forms  
( SHECU.USC.01)



<https://bit.ly/3bHWZPk>

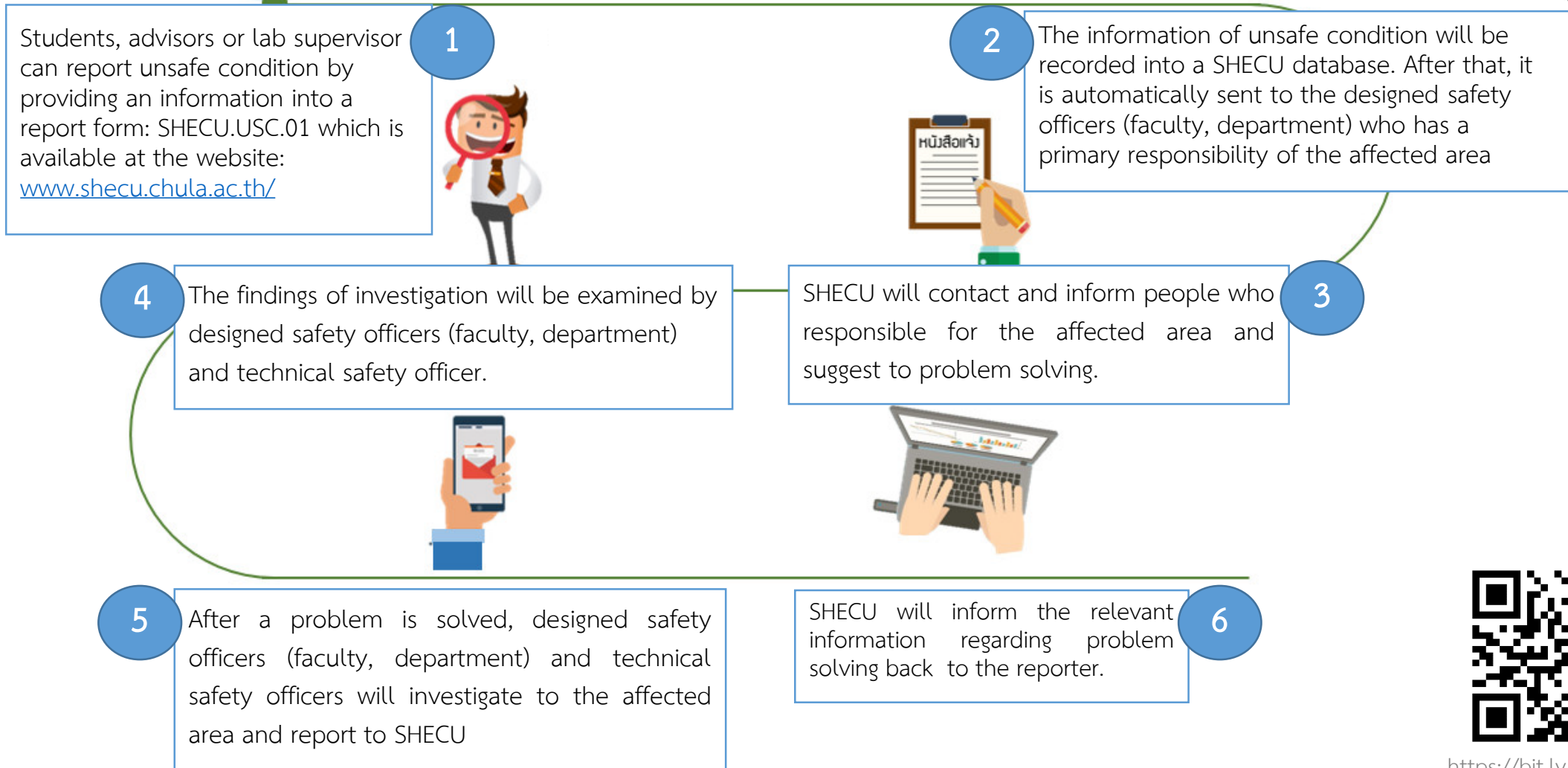


Near-miss/ Accident report  
(SHECU.ACC.01)



<https://bit.ly/3k0lDOb>

# Unsafe condition reporting procedure



<https://bit.ly/3bHWZPk>

## Near-miss/ Accident Reporting Procedure



Advisors or lab supervisor or safety officer have to report near-miss or accident by providing an information into an incident report form: SHECU.ACC.01 which is available at the website: [www.shecu.chula.ac.th/](http://www.shecu.chula.ac.th/) within 3 days after it happens



The information of near-miss or accident will be recorded into a SHECU database and automatically sent to the designed safety officers (faculty, department) who has a primary responsibility of the affected area.



The findings of investigation will be examined by designed safety officers (faculty, department) and technical safety officers. After that, they will complete an information of investigation to an incident report form: SHECU.ACC.02 to avoid a repetition



## Near-miss/ Accident Reporting Procedure



The accident report will be sent to designed executives such as department head, dean of a faculty, university president for suggestions or advise to avoid a repetition.



SHECU will send the summary report of the near-miss or accident to advisor/ lab supervisor and technical safety officer.



<https://bit.ly/3kfxdF6>

# References



1. Manual of Working Safely with Chemicals for Researchers (Thai), Center for Safety, Health and Environment of Chulalongkorn University
2. “Safety in Chemical Laboratories”, Prof. Dr. Tirayut Vilaivan



  
**THANK YOU**  
**FOR YOUR ATTENTION**

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**ANY QUESTIONS ?**