

RESOURCES ON LABORATORY SAFETY AND MANAGEMENT

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Science Education - Laboratory Safety and Management

Description	Web Address
1. Resources on laboratory safety and management	Read More
2. Activities on laboratory safety for students	Read More
3. Training activities	Read More
4. Disposal of chemical wastes	Read More
5. Survey on school laboratory accidents	Read More
6. Laboratory layout and facilities	Read More
7. Collection form for laboratory safety resources	Read More
8. Useful links	Read More

The Education Department (ED) and the Education and Manpower Bureau (EMB) merged with effect from 1 January 2003 and continued to use the name Education and Manpower Bureau (EMB). With effect from 1 July 2007, the Education and Manpower Bureau (EMB) was renamed as Education Bureau (EDB). Please note that the names "Education Department" or "Education and Manpower Bureau" still appear in materials and web pages which were produced before 1 July 2007.



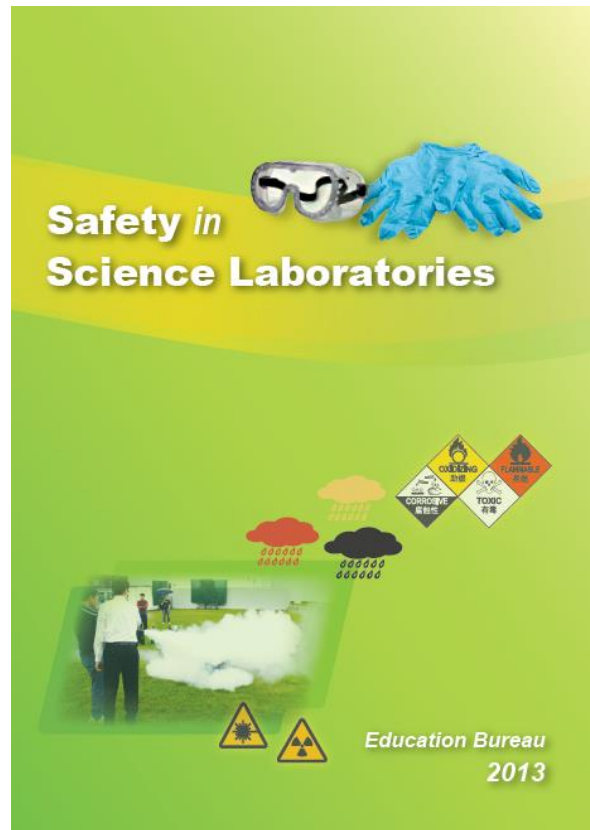
<http://www.edb.gov.hk/en/curriculum-development/kla/science-edu/ref-and-resources/lab-safety-and-management.html>

(<http://www.edb.gov.hk/cd/sc> ➔ References & Resources ➔ Laboratory Safety and Management)

Resources on Laboratory Safety and Management

- Handbook on safety in science laboratories
- Posters on laboratory safety
- Hazard warning symbols for chemicals
- Activities on laboratory safety for students
- Materials of training workshops
- Material safety data sheet (MSDS)
- Web-based courses on laboratory safety and management

Handbook on Safety in Science Laboratories



English version:

http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/SafetyHandbook2013_English.pdf

Chinese version:

http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/SafetyHandbook2013_Chinese.pdf

APPENDIX XI

INCOMPATIBLE CHEMICALS

Some chemicals are "incompatible" because they react together to pose corrosive, toxic, fire and explosive hazards. As far as it is practicable, incompatible chemicals should be stored away from each other.

Nitric acid, concentrated
Metals and organic compounds

When mixed, a fire may occur or toxic fumes of oxides of nitrogen may produce.

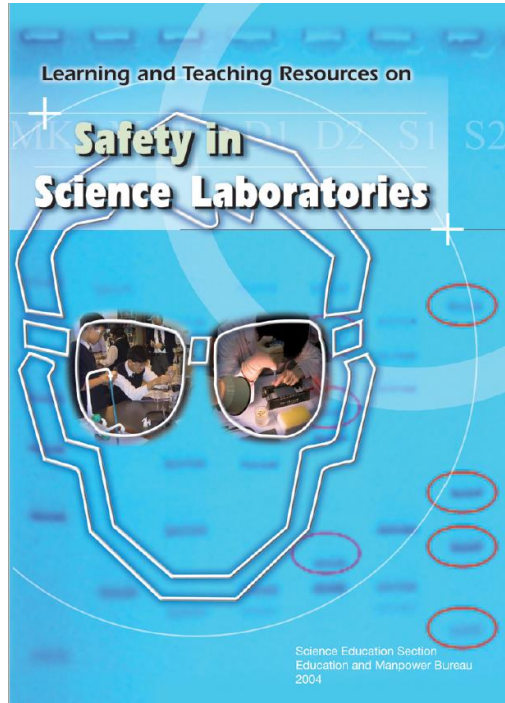
Propanone (acetone)
Trichloromethane (chloroform) (When mixed, an explosion may occur.)

Concentrated nitric and sulphuric acid mixtures

Chemical	Incompatible chemical(s):
Calcium oxide	Water, fluorine and strong acids
Carbon, activated	Calcium chlorate(I) (calcium hypochlorite) and other oxidising agents
	Hydrogen and acids
	Alkalis, amines, acids, hydroxyl (glycol), oxides,
	Copper, chromium, iron and their salts, nitric acid, potassium manganate(VII) (potassium permanganate), phenylamine (aniline)
Hypochlorites	Acids, activated carbon

Chemical	Incompatible chemical(s)
Methanal (formaldehyde) and formalin	Strong acids, strong bases, alkali metals, amines, ammonia, phenol <i>When mixed with concentrated hydrochloric acid, BCME (bis(chloromethyl) ether), a strong carcinogen, is formed.</i>
Nitrates	Sulphuric acid
Nitric acid, concentrated	Metals and organic compounds <i>When mixed, a fire may occur or toxic fumes of oxides of nitrogen may produce.</i>
Potassium manganate(VII) (potassium permanganate)	Ethane-1,2-diol (ethylene glycol), propane-1,2,3-triol, benzaldehyde, sulphuric acid, hydrogen peroxide, chemically active metals
Propanone (acetone)	Trichloromethane (chloroform) (<i>When mixed, an explosion may occur.</i>), concentrated nitric and sulphuric acid mixtures
Silver	Ethanedioic acid (oxalic acid), 2,3-dihydroxybutanedioic acid (tartaric acid), ammonia and ammonium compounds
Sodium	Water, aqueous solutions of chemicals, acids and halogenated hydrocarbons
Sodium nitrate(III) (sodium nitrite)	Cyanides, strong acids, combustible materials, organic materials, ammonium nitrate and other ammonium salts
Sulphides	Acids, zinc, copper, aluminium, and their alloys
Sulphuric acid	Alkalis, chlorates(V), chlorates(VII) (perchlorates), manganates(VII) (permanganates), ethanoic anhydride (acetic anhydride), combustible materials, cyanides, sulphides, metals <i>Concentrated sulphuric acid reacts violently with water.</i>
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens

Learning and Teaching Resources on Safety in Science Laboratories



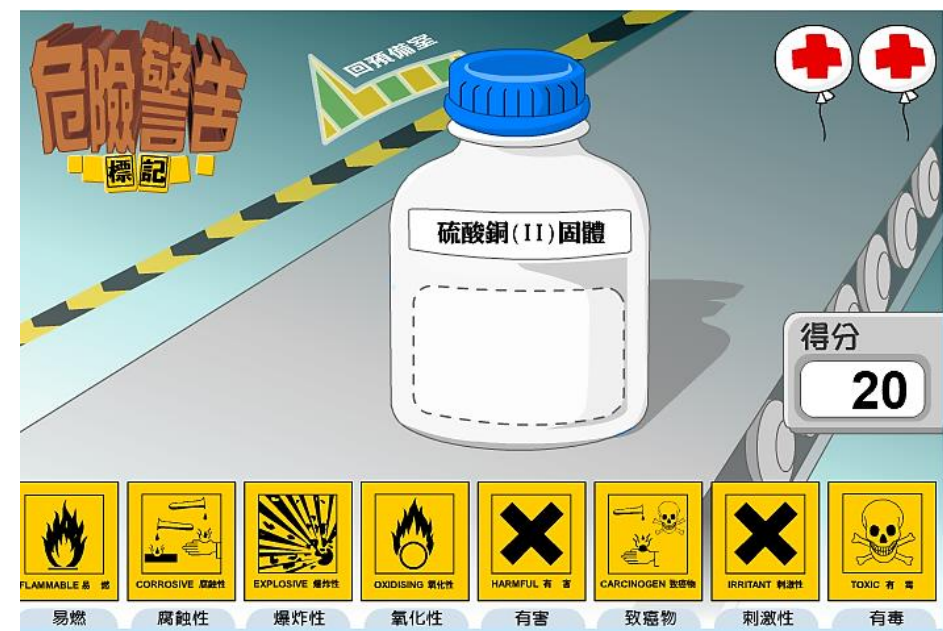
- Suggested teaching strategies for lessons on laboratory safety
- Exemplars of learning activities
 1. Laboratory safety rules
 2. Eye protection
 3. Safety information on chemicals
 4. Risk assessment
 5. What if a laboratory accident happens?

English version:

http://cd1.edb.hkedcity.net/cd/science/laboratory/SAFETY/safety_exemplars_e.pdf

Chinese version:

http://cd1.edb.hkedcity.net/cd/science/laboratory/SAFETY/safety_exemplars_c.pdf



https://cd1.edb.hkedcity.net/cd/science/s1_to_3/ses/

Hazard warning labels



Biohazard 生物危害



小心輻射



激光危險

Printing labels for chemicals

<http://www.oshc.org.hk/download/download/4/chemical2005.zip>

化學品安全標籤 Label All Chemicals

物質名單 List of Substances

1,1,1-Trichloroethane; Methyl Chloroform
1,1,2,2-Tetrachloroethane
1,1-Dichloroethane; Ethylidene Chloride
1,2-Diaminoethane; Ethylenediamine
1,2-Dichloroethane; Ethylene Dichloride
1,2-Dimethoxyethane; Ethylene Glycol
1,4-Dioxan

搜尋物質 Search Substance

Type the substance to search:
trichloro

☐ Exact Match Search

搜尋結果 Search Result

1,1,1-Trichloroethane; Methyl Chloroform
Chloroform; Trichloromethane
Methyltrichlorosilane; Trichloro(methyl)silane
Trichloroethylene
Trichlorosilane

Total: 5 records found.

物質名稱 Name of Substance

Trichloroethylene

危險情況 Particular Risks

1. Harmful by inhalation and if swallowed
2.
3.
4.

安全措施 Safety Precautions

1. Avoid contact with eyes
2.
3.
4.
5.
6.

分類 Classifications

HARMFUL
有害

危險分類及
指明符號



化學品的化學名
稱或普通名稱

Trichloroethylene
三氯乙烯 (鎗水)

Particular Risks :
危險情況 :

- Harmful by inhalation and if swallowed
吸入或吞食後都對人體有害

Safety Precautions :
安全措施 :

- Avoid contact with eyes
避免沾及眼睛

固有危險情況
的指示

須採取的安全
措施的指示

Posters

基本實驗室規則 BASIC LABORATORY RULES

✓ 應做事項 DO'S

- 1 應嚴格遵從教師的指示
Follow strictly the instructions given by your teacher
- 2 應使用適當的安全設施及個人防護裝備
Use appropriate safety facilities and personal protective equipment
- 3 如有意外應即向教師報告
Report all accidents to your teacher at once





✗ 禁止事項 DON'TS

- 1 切勿在教師不在場時進入實驗室
Do not enter a laboratory unless a teacher is present
- 2 切勿進行任何未經教師准許的實驗
Do not attempt any experiment without your teacher's permission
- 3 切勿在實驗室內飲食、嬉戲或奔跑
Do not eat, drink, play or run about in the laboratory

實驗室安全 人人有責
SAFETY IS EVERYONE'S RESPONSIBILITY

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認識危險 防患未然 KNOW THE HAZARDS AND TAKE SAFETY MEASURES



接觸液體或固體可能導致嚴重腐蝕。
Substances which may cause severe damage to skin, eyes or metal.



爆炸性物質。在受到震動、摩擦或火源時，可能發生爆炸。
Substances which may explode under conditions of shock, friction or heat.



極易燃。在接觸火源時，可能發生火災。
Substances which may catch fire easily.



極強氧化性。可能導致火災或爆炸。
Substances which may cause fire or explosion by oxidizing other materials.



極高急性毒性。吞食、吸入或接觸後，可能導致嚴重健康損害。
Substances which may cause severe health damage through ingestion, inhalation or contact.



可能導致嚴重健康損害。吞食、吸入或接觸後，可能導致嚴重健康損害。
Substances which may cause severe health damage through ingestion, inhalation or contact.



對水生環境極具危害性。可能導致水生生物死亡。
Substances which may cause severe harm to aquatic life.



極強腐蝕性。可能導致嚴重健康損害。
Substances which may cause severe health damage by corrosion.



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確保實驗室空氣流通 ENSURE GOOD LABORATORY VENTILATION



注意 WARNING:
在使用本生燈或化學品時，應關掉所有空調設備，並開動排氣扇和打開所有窗戶。
When Bunsen burners or chemicals are to be used, all air-conditioners should be switched off and exhaust fans switched on. The windows should be left open.

實驗室安全 人人有責
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Enhance Safety in Practical Activity – Risk Assessment

An analysis of a practical activity to identify hazards and to take precautions to minimise the risk

Material Safety Data Sheets (MSDS)









- City University of Hong Kong

http://cd1.edb.hkedcity.net/cd/science/laboratory/safety/msds_ss_2000.pdf

- CLEAPSS

<http://science.cleapss.org.uk/resource/Student-Safety-Sheets-ALL.pdf>

including Copper oxides, carbonate, sulfate, chloride, nitrate

Substance	Hazard	Comment
Copper (metal)	LOW HAZARD	Sharp edges can present a risk of cuts.
Copper(I)/(II) oxides Cuprous / cupric oxide	   CORR.* IRRITANT ENVIR.	DANGER. Copper(I) oxide: *causes serious eye damage; skin irritant; harmful if swallowed/inhaled; toxic to aquatic life. WARNING. Copper(II) oxide: causes serious eye irritation; skin; harmful if swallowed/inhaled; toxic to aquatic life.
Copper(II) carbonate hydroxide <u>Basic copper carbonate</u>	  IRRITANT ENVIRONMENT	WARNING. Copper(II) oxide: causes serious eye irritation; skin irritant; harmful if swallowed/inhaled, toxic to aquatic life. Also known as <i>malachite</i> .
	 ENVIR*.	DANGER. Solids and solutions ($\geq 1.0M$ sulfate, $\geq 1.3 M$ nitrate): skin irritant; cause serious eye damage; harmful if swallowed (especially saturated solutions for crystal-growing). Solid* only: very toxic to aquatic life. Water added to anhydrous solid copper(II) sulfate(VI) produces heat.
	 IRRITANT	DANGER. Sulfate/nitrate $< 1.0M/1.3M$ and $\geq 0.2M/0.15M$: skin irritant; cause serious eye damage. WARNING Sulfate/nitrate $< 0.2M/0.15M$ and $\geq 0.02M/0.05M$: irritating to skin and eyes. LOW HAZARD Sulfate/nitrate $< 0.02M/0.05M$. Benedict's solution and Fehling's solution both contain dilute copper(II) sulfate(VI) but Fehling's solution has other hazards.
	 ENVIRONMENT	WARNING. Eyes; skin; harmful if swallowed; toxic to aquatic life.
		WARNING. Eyes; skin; toxic to aquatic life; harmful if swallowed ($\geq 1.8M$).

duce risk

solids and all but the most dilute solutions

**e undertaken? What are the hazards?
wrong?**

eg. solutions spurting out of test tubes when heated or solutions decomposing to toxic products when heated to dryness

- **How serious would it be if something did go wrong?**
eg. are there hazardous reaction products (such as chlorine from the electrolysis of copper chloride)?
- **How can the risk(s) be controlled for this activity?**
eg. can it be done safely? Does the procedure need to be altered? Should goggles or safety spectacles be worn?

Emergency action

- | | |
|----------------------------------|--|
| • In the eye | Flood the eye with gently-running tap water for 10 minutes. Consult a medic. |
| • Swallowed | Do no more than wash out the mouth with drinking water. Do not induce vomiting. Consult a medic. |
| • Dust breathed in | Remove the casualty to fresh air. Consult a medic if breathing is difficult. |
| • Spilt on the skin or clothing | Remove contaminated clothing and rinse it. Wash off the skin with plenty of water |
| • Spilt on the floor, bench, etc | Scoop up solid (take care not to raise dust). Wipe up small solution spills or any traces of solid with cloth; for larger spills use mineral absorbent (eg, cat litter). |

- What are the details of the activity to be undertaken? What are the hazards?
- What is the chance of something going wrong?
- How serious would it be if something did go wrong?
- How can the risk(s) be controlled for this activity?

e.g. Can it be done safely? Does the procedure need to be altered? Should goggles or safety spectacles be worn?

DANGER

Solids and solutions ($\geq 1.0\text{M}$ sulfate, $\geq 1.3\text{M}$ nitrate): skin irritant; cause serious eye damage; harmful if swallowed...

1	Microorganisms	50	Hydrogen
2	Enzymes	51	Oxygen & ozone
3	Human body fluids and tissues	52	Sulfur dioxide
4	Food testing (1)	53	Nitrogen oxides
5	Food testing (2)	54	Chlorine
6	Humans as the subject of investigation (1)	55	Bromine
7	Humans as the subject of investigation (2)	56	Iodine
8	Humans as the subject of investigation (3)	57	Hydrogen peroxide
9	Disinfectants	58	Carbon & its oxides
		59	Hydrogen sulfide & other sulfides
10	Electricity	60	Ethanol
11	Radioactive materials	61	Propanone
12	Electromagnetic radiation	62	Chlorinated hydrocarbons
		63	Hydrocarbons
20	Hydrochloric acid	64	Carbohydrates
21	Nitric(V) acid	65	Methanol
22	Sulfuric(VI) acid	66	Higher alcohols (propanols, butanols, pentanols)
23	Ethanoic (acetic) acid	67	Methanal
24	Phosphoric(V) acid	68	Ethanal and higher aldehydes
25	Citric, oxalic & tartaric acid	70	Dyes & indicators
26	Salicylic acid, aspirin, salol, oil of wintergreen	71	Sharps
		72	Animals (dead) and animal parts
30	Ammonia	73	Animals (living)
31	Sodium hydroxide	74	Plants, fungi and seeds
32	Calcium hydroxide & oxide	75	Fieldwork
33	Sodium & calcium carbonates	76	Bioreactors and fermenters
34	Sodium & potassium salts	77	Working with DNA
35	Sodium sulfites, thiosulfate & persulfate	78	Genetic modification
36	Magnesium & calcium salts		
37	Ammonium salts	80	Alkali metals
38	Iron & its compounds	81	Group II metals
39	Boron compounds	82	Sulfur & phosphorus
40	Copper & its compounds	90	Vocabulary
41	Sodium chlorate(I) (hypochlorite)	91a	Chemical safety symbols
42	Barium compounds	91b	Non-chemical safety signs & symbols
43	Lead & its compounds	92	Using a Bunsen burner
44	Mercury & its compounds	93	Heating non-flammable liquids & solids in test tubes
45	Aluminium & its compounds	94	Heating flammable liquids & solids in test tubes
46	Silver & its compounds	95	Handling hot liquids in beakers
47	Chromium & its compounds	96	Risk assessment
48	Manganese & its compounds	97	Transferring (handling) solid chemicals
49	Zinc & its compounds	98	Transferring (handling) liquid chemicals
		99	Waste disposal

Web-based Courses on Laboratory Safety and Management



- Introduction
- Introduction to Course Contents
- General Topics**
- Subject Specific Topics

General Topics

- [Laboratory Safety Management](#)
- [Action in an Emergency](#)
- [Fire Safety and Fire Fighting Equipment](#)
- [Gas Cylinder Safety](#)
- [Operations and Maintenance of Laboratory Fume Cupboard, and Laboratory Ventilation](#)
- [Personal Protection Equipment](#)
- [Hazardous Waste Management](#)
- [Legislations Related to Science Laboratory of Secondary Schools](#)
- [Risk Assessment](#)

Subject Specific Topics

Biology related topics

- [Regulation and Use of Autoclaves](#)
- [Safety of Biotechnology Experiments in Secondary Schools](#)
- [Safety in Microbiology](#)

Chemistry related topics

- [Chemical Safety](#)
- [Handling of Chemical Spills](#)

Physics related topics

- [Radiation Safety](#)
- [Electrical Safety](#)
- [Non-ionizing Radiation Safety](#)
- [Laser Safety](#)



<http://minisite.proj.hkedcity.net/safetyonline/eng/index.html>

Responsibilities in maintaining a safe learning and working environment

Who should be responsible?

- Students
- Teachers
- Laboratory Technicians
- Panel Chairpersons
- School Authority

Safety is Everyone's Responsibility

Reasons to establish a safety management system

- Comply with the following legal requirements
 - Occupational Safety and Health Ordinance & Regulation 職業安全及健康條例
 - Education Ordinance 教育規例
 - Dangerous Goods (General) Regulations 危險品（一般）規例
 - Waste Disposal (Chemical Waste) (General) Regulation of the Waste Disposal Ordinance
廢物處置（化學廢物）（一般）規例

Safety Management

- Setting up a Standing Committee on Laboratory Safety to:
 - convene regularly to discuss issues related to lab safety
 - plan and conduct lab safety programmes
 - ensure implementation of risk assessments for science experiments
 - carry out safety inspections regularly
 - formulate, implement and revise the emergency plan
 - conduct evacuation drills regularly
 - discuss on how to provide students with special education needs greater support or supervision in the laboratory

Thank you!