

Hong Kong Institute of Vocational Education
(SHA TIN)

Department of Health and Life Sciences

Laboratory Safety Handbook

(AY2026-2027)

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Chapter 1 Safety Responsibility and Policy

The individual bears the primary responsibility for safety in the laboratory at the Institute. This means YOU. So:-

- don't take chances.
- obey the safety rules.
- if unsure - ASK.
- don't hurry; take your time and think about what you are doing.
- USE COMMON SENSE.

Safety is of paramount importance in laboratories. Safety can only be achieved through conscientious understanding of your work and your responsibilities to yourself and others.

- The Institute is responsible for providing safe operating conditions.
- Lecturers are responsible for minimizing the risk to students under their supervision in the Laboratory.
- You are responsible for safety on the job for yourself as well as your fellow worker. You should be alert and report unsafe conditions, procedures and acts.

The Department is responsible for planning, implementing and reviewing laboratory safety management. It is also responsible for administering and enforcing the safety policy of the Institute, Department and Section.

Chapter 2 Emergency Phone Number

1.	HKIVE(Sha Tin) Campus Secretariat	2606 9875/ 2687 3090
2.	Head of Health and Life Sciences Department	2606 9891
3.	Health and Life Sciences Staff Room (Room 216)	2256 7101/100
4.	Security Guard Office	2606 9705/700
5.	Ambulance (NT)	2735 3355
6.	Sha Tin Police Station	2694 6200
7.	Prince of Wales Hospital	2632 2211

In the event of

FIRE

Students should not attempt to put out fire. Alert lecturers and laboratory technicians at once. If your clothing is on fire, roll on the floor to put it out.

RUN AWAY EXPERIMENTS

Alert your lecturer immediately. Tell him the nature of the spills.

If you spill flammable liquid, you should at once

- Turn off all naked flame
- DON'T switch off or on ANY electrical appliances
- Open all doors and windows
- Immediately alert lecturers and technicians

When the fire alarm goes, switch off all electrical, water, and gas supplies. Stop your experiment and make sure that it is safe to be left alone. Then go to the nearest assembly area. Do not take the lift.

Chapter 3 Know Yourself and Emergency Equipment

3.1 About You

- Are you allergic to certain chemicals?

Allergy to chemicals can be caused by hyper-sensitivity and inheritance.

If you develop rash or feel uncomfortable on exposure to chemicals, report to the lecturer-in-charge and discuss with your personal doctor.

- Do you suffer from epilepsy?

If you do, no matter how mild, report to the lecturer-in-charge for your own safety in the laboratory, especially chemistry laboratory session.

- Do you have any physical disability?

If you do, discuss it with the lecturer-in-charge.

3.2 Note Position of Emergency Equipment and Learn How to Use

- Safety showers
- Eye wash fountains
- Fire blankets
- First aid kits
- Fire extinguishers
- Sodium bicarbonate mixtures, available in the chemistry laboratory.

If you are not sure how to use the emergency equipment, please ask for demonstration.

Chapter 4 Code of Good Practice in the Laboratory

You must not work in the Laboratory without the supervision of a lecturer or his deputy.

You should buy your own set of laboratory coat and goggle for hygiene purpose according to the standards approved by lecturer.

4.1 Personal Protection

1. Eye Protection must be worn at all times in the laboratory. Wearing contact lenses is not recommended. Laboratory coats should be worn and other protective clothing when applicable.
2. Face shields should be used when large quantities of chemicals are handled.
3. Food and drink must be excluded from all laboratories.
4. Potential hazards associated with any experiment must be determined before performing any experiment.
5. Dangerous chemicals must not be stored, prepared or used unless the area is properly equipped.
6. Mouth-pipetting is forbidden, even for non-toxic liquids. Always use a pipette filler.
7. Smoking is forbidden in the Laboratory.
8. Long hair should be properly tied up.
9. Avoid wearing loose attire such as: tie, scarf, cravat or necklace.
10. Don't run in the Laboratory. Sitting or kneeling on the floor can be very hazardous.
11. Shoes, rather than sandals should be worn.
12. Wash your hands regularly when working with chemicals, and always before you leave the laboratory.
13. Wear plastic disposable gloves when you are handling corrosive or toxic chemicals.

4.2. Good Housekeeping

1. Keep benches and floor TIDY and DRY. Spilt chemicals should be treated and cleaned immediately. Wet benches and floor should be mopped immediately.
2. Insoluble solids such as match sticks, boiling stone, filter paper etc. should not be disposed of in the sink or the water trough.
3. Immiscible solvents should be kept in a waste solvent bottle and should not be disposed of in the sink.
4. Flames are not to be left burning unattended. Turn off the Bunsen burner immediately after use.
5. In order to avoid contaminations, chemicals taken out of reagent bottles should never be returned.
6. Hot objects should be placed on a piece of cement plate.
7. Experiments should not be left unattended.
8. If you use highly reactive chemicals, flammable solvents, poisonous, biohazardous, carcinogenic substances, warning signs should be duly displayed.
9. Reagents and chemicals should be returned to the appropriate shelves immediately after use, with their labels facing the front.
10. Always keep the exits and fire fighting equipment clear from obstacles, such as bags, brief cases, umbrellas, stools etc.
11. Retorts should be lined up properly when returning them to the cupboard.
12. All cupboard doors should be closed immediately after use.

4.3. Students' Costume in Laboratory Sessions

1. Students must wear shoes before entering laboratories in Health and Life Sciences Department. No sandals/slippers would be allowed. "Shoes" must cover students' toes and heels.
2. Students should not wear hats during laboratory sessions unless authorized by lecturers or technical officers.
3. Students should wear goggles, hair band (if the length of hair is long) and laboratory coat before entering laboratories.
4. If student failed to comply with the above regulations, s/he would not be allowed to enter the laboratories.
5. The above costume requirements could be amended by the concerned lecturers according to the nature of laboratory activity.

Chapter 5 Chemical Hazards

The following are some common hazardous reagents used in the Chemistry Laboratories. Make sure you are familiar with the hazards associated in the use of these chemicals. **To protect yourself, wear eye goggles throughout the practical sessions in the Chemistry Laboratory.**

5.1 Unstable Chemicals

- (a) Acetylene gas is used in atomic absorption spectroscopy. It reacts with salts of silver, copper and other heavy metals to form acetylides. These are very unstable and explode even on gently touch. Acetylene must not be allowed to come in contact with copper or any alloy containing more than 70% copper.
- (b) Silver azide may be formed if a solution of ammoniacal silver nitrate is left standing. Silver azide is very unstable and explosion may occur a few hours after the solution is prepared, or immediately when a large quantity of the solution is handled. Never prepare more than a few cm³ of this solution. Treat the unused solution with hydrochloric acid to precipitate silver as silver chloride.
- (c) Chlorates and perchlorates: Most chlorates and perchlorates, (except sodium and potassium) are unstable. Sodium and potassium chlorates are stable if they are kept cool and away from direct contact with reducing agents such as carbon or organic solvents. Ammonium perchlorate should be treated with suspicion.
- (d) Chlorides of aluminium, silicon and titanium are readily hydrolysed by water giving off HCl gas. Badly stored bottles or ampoules may develop high pressures. Cool bottles or ampoules in ice water and use face shield and rubber gloves for handling these containers in a fume cupboard.
- (e) Ethers, dioxane and tetrahydrofuran: Peroxides are highly explosive. They may be formed from air oxidation of these solvents. They should not be kept for long periods in half-empty bottles. Decompose the peroxide by shaking with acidified iron (II) sulphate. Always check for the presence of peroxide before distillation (ask your Lecturer). Even if free from peroxides, distillation should be stopped when about 15% is left in the flask.
- (f) Nitro-organic compounds such as picric acid: They are potential explosives and should be kept damp. Avoid mechanically damaging these reagents to minimize the explosion risk.

- (g) Peroxides, benzoyl peroxide: Concentrated hydrogen peroxides should be handled with care and kept free from contact with organic matter. Organic peroxides are unstable. Benzoyl peroxide should be kept damp at all time on storage.

5.2 Highly Reactive Chemicals

- (a) Hydrochloric acid is a highly corrosive liquid. The gas, hydrogen chloride is a very toxic irritant, which is readily evolved from the concentrated acid. Concentrated hydrochloric acid should only be handled in a fume cupboard.
- (b) Nitric acid is as corrosive as hydrochloric acid. Fumes evolved from conc. nitric acid are highly toxic. It can only be handled in a fume cupboard. Many serious accidents are resulted from the addition of nitric acid to organic liquids, such as alcohols.
- (c) Perchloric acid has been known to react explosively on contact with organic matter, such as cork, rubber, wood or paper. You should only handle perchloric acid with concentration less than 20% whenever possible. **DO NOT BOIL OR EVAPORATE PERCHLORIC ACID ESPECIALLY IN THE FUME CUPBOARD.**
- (d) Sulphuric acid causes burns. Therefore, you must avoid skin contact. It reacts vigorously with water. One should always add the acid to water and not vice versa. You must prevent direct contact of sulphuric acid with permanganates, chlorates and azides.
- (e) Strong caustic solutions such as NaOH cause severe burns, consequently, you must avoid direct contact with skin. They are particularly damaging to the eyes. NaOH or KOH solids generate a lot of heat on contact with water. Suitable containers should be used when making up caustic solution from the solid.
- (f) Bromine is very corrosive liquid and causes severe burns. Always wear gloves and handle bromine in a fume cupboard.
- (g) Ammonia gas is highly toxic. 0.88 ammonia (i.e. 35% ammonia in water) gives off the gas readily. Containers should be kept cool and should not be exposed to heat. When you open a stock bottle or Winchester of ammonia, you should cover the stopper with a piece of damp cloth and open the bottle in a fume cupboard.

- (h) Phosphorus burns violently in air and causes severe burns which take a very long time to heal.
- (i) Alkali metals react violently with water. They have to be stored in paraffin oil to exclude air oxidation. Don't throw unreacted metals in the sink or wash the cutting knife with water.

Consult the Lecturer or Technician for safe disposal of the metals.

5.3 Flammable Chemicals

With the exception of water, the majority of solvents used in the Chemistry Laboratory are flammable, e.g.

- | | | |
|---------------------|----------------|-----------|
| • methanol | • acetone | • ether |
| • ethanol | • cyclohexane | • pentane |
| • isopropyl alcohol | • benzene | • toluene |
| • ethyl acetate | • ethylbenzene | • xylene |

- (a) Naked flames should be avoided. It is best to use an oil bath or heating mantle for heating.
- (b) Ensure the laboratory is properly ventilated.
- (c) Other flammable substances such as note books or books should be put away.
- (d) Unwanted solvents must be returned at once and should not be left on the bench.
- (e) Immiscible solvents should NEVER be poured down the drain.

5.4 Toxic chemicals

All chemicals in the Chemistry Laboratory by definition are poisonous. Some are more toxic than the others. Toxic chemicals may be

- quick-acting poisons
- cumulative poisons
- the cause of dermatitis (skin disease)
- Carcinogenic

Therefore you should pay special attention in the use of chemicals. You should:

- prevent inhalation of vapours or dust
- prevent contact with food
- prevent contact with skin
- no mouth pipetting

A number of reagents used in our laboratories are considered to be highly toxic and special procedures should be adopted during their use: -

- | | | |
|------------|------------------------|--------------------|
| • aniline | • carbon tetrachloride | • mercury |
| • asbestos | • chlorine | • nitrogen dioxide |
| • benzene | • cyanides | • carbon monoxide |
| • bromine | • hydrogen sulphide | • sulphur dioxide |
| • pyridine | | |

Always check with your Lecturer/Technician if you are in doubt if the reagent is toxic or not.

Protect yourself –

it is mandatory to wear a laboratory coat and goggles in the laboratory.

Wash your hands before you leave the laboratories.

Get your own set of laboratory coat and goggle ready for hygiene purpose.

Chapter 6 Waste Disposal

1. Non-toxic solid waste such as paper, wire etc. should be disposed of in the waste-bin and not in the sink or water trough.
2. Controls under the Waste Disposal (Chemical Waste) (General) Regulation, enacted under the Waste Disposal Ordinance (Cap. 354) have been introduced for chemical waste producers. Check if the spent chemicals is classifiable as chemical waste by reference to the guidance booklet issued by the Environmental Protection Department or your subject Lecturer/Technician. Chemical waste should be properly contained and labelled, and stored in a safe manner. Before you do so consult your Lecturer/Technician.
3. Spent organic solvents immiscible with water should be returned to the waste solvent bottle/can. Before you do so consult your Lecturer/Technician.
4. Small quantities of acids, alkalis or solvents miscible with water (such as ethanol, acetone etc.) may be disposed of by slowly pouring into a stream of water and flushing down the drain with a large quantity of water. Before you do so consult your Lecturer/Technician.
5. Noxious gases such as H_2S , NO_2 , HCl , Cl_2 , Br_2 , I_2 , NH_3 can only be manipulated and disposed of in the fume-cupboard. Therefore experiments in connection with these gases should be done in the fume-cupboard.
6. For the disposal of toxic liquids like amines, cyanide solutions; reactive solids like sodium metal or toxic solids, consult your Lecturer/Technician.

Chapter 7 Handling of Incompatibles

DO NOT MIX

1. Alkali metals, such as sodium, potassium, lithium and calcium with water, carbon dioxide, carbon tetrachloride, and other chlorinated hydrocarbons.
2. Acetic acid with chromic acids, nitric acid, perchloric acid, peroxides and permanganates.
3. Acetone with concentrated sulphuric and nitric acid mixtures.
4. Acetylene with copper (tubing), fluorine, bromine, chlorine, iodine, silver, mercury and their compounds.
5. Ammonium nitrate with acids, metal powders, flammable fluids, chlorates, nitrates, sulphur and finely divided organic or combustible matters.
6. Aniline with nitric acid, hydrogen peroxide.
7. Bromine with ammonia, acetylene, butadiene, butene, hydrogen, sodium carbide, turpentine and finely divided metals.
8. Chlorates with ammonium salts, acids, metal powders, sulphur, finely divided organic or combustible matters and carbon.
9. Chromic acid with acetic acid, naphthalene, camphor, alcohol, glycerin, turpentine and other flammable liquids.
10. Chlorine with ammonia, acetylene, butadiene, benzene and other petroleum fractions, hydrogen, sodium carbides, turpentine and finely divided powdered metals.
11. Cyanides with acids.
12. Hydrogen peroxide with copper, chromium, iron, most metals or their respective salts, flammable fluids and other combustible materials, aniline and nitromethane.
13. Hydrogen sulphide with nitric acid and oxidizing gases.
14. Hydrocarbons with fluorine, chlorine, bromine, chromic acid and sodium peroxide.
15. Iodine with acetylene and ammonia.

16. Mercury with acetylene.
17. Nitric acid with acetic, chromic and hydrocyanic acids, aniline, carbon, hydrogen sulphide, flammable media, fluids or gases and substances which can be readily nitrated.
18. Oxygen with oils, grease, hydrogen, flammable liquids, solids and gases.
19. Oxalic acid with silver and mercury.
20. Perchloric acid with acetic anhydride, bismuth and its alloys, alcohol, paper, woods and other organic materials.
21. Phosphorus pentoxide with water.
22. Potassium permanganate with glycerin, ethylene glycol, benzaldehyde, concentrated sulphuric acid.
23. Sodium peroxide with any oxidisable substances, for instance: methanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulphide, glycerin, ethylene glycol, ethyl acetate and furfural.
24. Sulphuric acid with chlorate, perchlorate, permanganate and water.

Chapter 8 Handling Glassware

If not properly handled, glass apparatus can present a serious hazard. These hazards can be minimized by exercising certain precautions:

1. **Students are requested to inspect all glassware given before performing the laboratory practical. If any crack or damage discovered, report to the teaching staff or technician immediately.**
2. Carry glass tubing or rod in a vertical position.
3. Protect your hands with a cloth towel when you insert a glass tubing OR thermometer into a stopper. (You must lubricate with water or glycerin before inserting.)
4. Always fire polish sharp edges immediately.
5. Do not use chipped glassware.
6. Use a safety screen for vacuum distillation.
7. Equipment under vacuum such as Dewar flasks or vacuum desiccators should be taped before use.

Chapter 9 Opening Chemical Containers

Reagent bottles should be opened with care, especially those containing strong acids and alkali.

1. Concentrated hydrochloric acid, nitric acid and ammonia solution bottles should only be opened in a ventilated fume-cupboard.
2. If the stopper is jammed, do not attempt to open it yourself. Ask the Lecturer or Technician to show you how to open a jammed bottle.
3. Do not attempt to open an ampoule yourself.
4. A small piece of paper should be inserted between the stopper and the ground glass joint of an empty reagent bottle on storage for ease of opening later.

Chapter 10 Use of Compressed Gas Cylinders

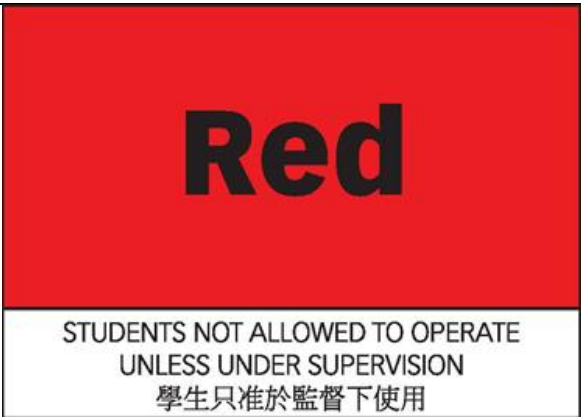
1. Before using any gas cylinder, check the colour code and marking (or stencilled name or label) on the body of the cylinder to identify the contents of the cylinder.
2. Be certain that the diaphragm control valve and the gas supply valves on the delivery line are all closed.
3. Slowly turn on the main valve at the top of the cylinder. The cylinder pressure gauge should deflect and give the cylinder pressure reading. If the reading is low, the cylinder is probably empty. Inform the Technician-in-charge at once. Never change any cylinder yourself.
4. Slowly open the diaphragm valve to give the required pressure on the delivery side pressure gauge. If the pressure falls, check for leakage in the delivery line using soap or detergent solution.
5. Inform the Technician-in-charge about any leakage, or faulty connectors and valves.
6. Never tamper with any part of a valve such as safety nuts or packing nuts.
7. Never loosen or tighten any connectors in the delivery line.
8. Slowly open the diaphragm valve to give the required pressure on the delivery side. This is shown on the delivery side pressure gauge. If the pressure falls, check for leakage in the delivery line using soap or detergent solution.
9. Turn on the gas supply valves on the delivery line. The delivery side pressure will fall. Adjust the diaphragm valve to keep the required pressure. Check for leakage at all the connection points again.
10. To cut off the gas supply, close the cylinder main valve, then the diaphragm valve, and all the gas supply valves in the order as given here.
11. When using combustible gases, flashback arrestors must be fitted between the cylinder and the equipment.
12. Never use grease or oil for sealing when you use oxygen.
13. Use a well ventilated fumehood for toxic or flammable gases.
14. In an emergency, shut off the main cylinder valve.

Chapter 11 Use of Compressed Air Outlets

1. Only pressure tubing should be used for the delivery of compressed air.
2. Every connection must be properly secured by using ring-type tubing clamps.
3. Always install a reducing valve for pressure regulation and a needle valve for flow control.
4. Never use compressed air for drying chemical apparatus. The pump oil will contaminate your system.

Chapter 12 Safety Instructions for Individual Laboratory

1. Instructions specific to particular laboratory may be issued to students from time to time. Read the instructions carefully before you begin the laboratory session or switch on the instrument.
2. 3 categories of Safety Colour Codes are implemented for special equipment in individual laboratory, details are as follows:

 Black STAFF ONLY 只准職員使用	Students are not allowed to operate the machine / equipment or handle the materials
 Red STUDENTS NOT ALLOWED TO OPERATE UNLESS UNDER SUPERVISION 學生只准於監督下使用	Students are not allowed to operate the machine / equipment or handle the materials unless under supervision
 Yellow STUDENTS NOT ALLOWED TO OPERATE UNLESS AFTER TRAINING 只准曾受訓練之學生使用	Students are not allowed to operate the machine / equipment or handle the materials unless after training