

Rules and Guidelines on Chemical Safety

1. General rules in chemical laboratories

- a. Only authorized personnel can enter chemical laboratories using their own Staff, Student, or Temporary Card, following guidelines stated at [this website](#).
- b. All laboratory members must familiarize themselves with the locations of 1) first-aid boxes, 2) spill kit, 3) fire extinguishers, 4) fire blankets, 5) emergency showers and eye-wash stations, 6) emergency and fire alarms, and 7) [emergency escape routes](#).
- c. Usage of spill kit, fire extinguishers and fire blankets **must be reported** to the technician-in-charge (TIC) or the supervisor-in-charge (SIC) of the laboratory so that the equipment can be replenished immediately.
- d. The TIC should 1) inspect the laboratory every 6 months or more frequently by going through checklists for [General Safety](#) and [Chemical Safety](#), and 2) regularly inspect first-aid boxes to ensure the items inside are sufficiently stocked.
- e. Smoking, eating and drinking in chemical laboratories are **strictly forbidden**. Do not wear cosmetics, and never store food or drink in laboratory refrigerators.
- f. Tie back or restrain long hair. **Long pants** and **closed-toe shoes** should be worn for protection while working in the laboratory. High heel shoes should never be worn in chemical laboratories.
- g. To avoid contamination, do not wear lab coat and/or gloves outside chemical laboratories. Do not touch door handles, door/light switches, lift buttons, or your personal belongings (e.g., mobile phone) when wearing gloves.
- h. Keep the workplace clean and tidy. All used apparatus and equipment must be cleaned at the earliest possible moment after use. Spillages must be cleaned up immediately, while fume cupboards and benches should be cleaned regularly.
- i. Fume cupboards are not for storage. Do not store excessive equipment or chemical bottles inside fume cupboards. **The TIC may relocate equipment, chemicals, or samples inside fume cupboards that are not in use.**
- j. When using a fume cupboard, keep the sash opening below the maximum working sash height. **Pull down the sash when the fume cupboard is not in use.**
- k. Always keep exits, passageways, and access to emergency equipment clear. Do not leave reagent/solvent bottles on the floor or along aisles.
- l. **Avoid working alone.** If necessary, build a buddy system for your lab mate to check with you from time to time.
- m. Broken glass and sharp objects (e.g., syringe needles) must be discarded into **designated bins for glass and sharps**. Chemical residues on syringes or syringe needles should be removed beforehand in a safe manner.
- n. If you need advice or assistance, please contact your supervisor, Engineering Manager (Dr. Scott Chan: mechanwk@hku.hk), Dr. Celine Sun (hongsun@hku.hk), Dr. James Bok (slbok@hku.hk) or the Safety Office (safety@hku.hk).

2. Chemical purchases

In Hong Kong, there are several ordinances that regulate the import, storage and/or use of chemicals, which include but not limited to the following:

[Import and Export Ordinance, Chapter 60](#)

[Dangerous Drugs Ordinance, Chapter 134](#)

[Control of Chemicals Ordinance, Chapter 145](#) (*)

[Dangerous Goods Ordinance, Chapter 295](#) (*)

[Chemical Weapons \(Convention\) Ordinance, Chapter 578](#)

[Hazardous Chemicals Control Ordinance, Chapter 595](#)

[Mercury Control Ordinance, Chapter 640](#) (*)

Ordinances marked with (*) will be further discussed in Sections 8–10.

Purchase, storage and use of explosives, biohazardous materials and radioactive substances are **strictly forbidden** in this department (see Section 8.1). The chemical purchase requestor (“the requestor”), usually a research postgraduate student or a postdoctoral fellow, must make sure that the purchase is **in compliance with governmental regulations** by searching in the “enter keyword(s)” field at <https://www.elegislation.gov.hk>. The requestor may consult the chemical supplier, the technician-in-charge (TIC), or those in Section 1n.

Moreover, the requestor must provide the following information for the chemical purchase: 1) chemical name, 2) CAS number, 3) size of the chemical (in terms of mass or volume), 4) number of chemical bottles, 5) brand, 6) product number, 7) unit price, 8) a link for accessing the material safety data sheet of the chemical (MSDS link), 9) name of the requestor, and 10) date of request. The requestor may use the **Chemical Purchase Form** available on the [Moodle page on safety](#) under Chemical Safety (Chemical purchase form.xlsx).

The requestor should then provide the above information to his/her supervisor and the TIC for review. **Their approval must be obtained before making any chemical purchase**, and chemicals should be purchased through trusted chemical suppliers. In addition, **reimbursement for chemical purchases is not accepted**, and never hand-carry any chemical from overseas.

The TIC should check if the chemical to be purchased is classified as dangerous goods (Section 8) or a controlled chemical (Section 9). A general practice is to pay attention to bulk purchases (e.g., chemical size exceeding 1 kg or 1 L) and ban purchases of any controlled chemical. If necessary, consult those in Section 1n. Moreover, the TIC should ask the requestor about the storage location of the new chemical when it arrives, and record the location in a **chemical list** (Section 7) before arranging payment for the chemical purchase.

3. Chemical storage

- a. Chemical storage should be kept as **low** as possible. Limit the amount of volatile or flammable materials to the minimum required.
- b. Clearly label chemical bottles and storage areas. Replace old and fading labels before they become difficult to read.
- c. Students or staff should clearly label samples prepared by themselves. If the samples are to be kept in the department after his/her studentship or contract ends, the samples **must** be labelled with 1) a **full chemical name** and/or a chemical structure, 2) his/her name, and 3) the research group that he/she belongs to.
- d. Chemical bottles should be sealed with **parafilm** and stored in proper places as recorded in a chemical list (Section 7). Store heavier items on lower shelves.
- e. All laboratory members including the SIC must inform the TIC if new or additional chemicals are brought into the laboratory.
- f. Before opening or buying new bottles of chemicals, use the ones that have been opened first.
- g. Store volatile, flammable (e.g., solvents), and pungent (e.g., thiols) chemicals inside ventilated cupboards.
- h. Provide a means to contain spills (e.g., trays/double containment), especially for the storage of carcinogens and highly toxic chemicals.
- i. Separate incompatible chemicals by physical barriers. For example, the following classes of chemicals are mutually incompatible: acids, bases, oxidizers, pyrophoric, flammables, toxic, and water reactive.
- j. Use only **spark-proof refrigerators** for storing chemicals at low temperature.
- k. The integrity of chemical bottles should be examined regularly. If damaged caps or bottles are found, replace them as soon as possible.
- l. Chemicals, particularly those known to decompose with time, should be marked with the date of receipt or the opening time. Observe their shelf-life limits and dispose of them properly beyond the expiry date, or when their quality turns bad.
- m. Please refer to Section 8 for information about storage of dangerous goods.

4. Handling chemicals

- a. Use the safest chemical at minimal quantity for your experiments.
- b. Read the **material safety data sheet (MSDS)** before handling chemicals. MSDS provides detailed information about the physical, chemical, and physiological properties, as well as handling procedures of the chemical.
- c. If you are not sure about how to handle a certain chemical or reaction, **do not proceed**. Consult a senior member in the laboratory, or those in Section 1n.
- d. Personal protective equipment (PPE, including safety goggles, gloves, lab coat, face shields, etc.) **must be worn** in places where chemicals are handled. Even if

- you have not started handling chemicals yourself, wearing PPE protects you from potential accidents when others around you are dealing with chemicals.
- e. Isolate hazardous operations, **especially those on a large scale**, in separate fume cupboards or even rooms. Notify personnel in the laboratory before conducting such operations and limit the number of people involved.
 - f. Conduct all operations involving hazardous materials (e.g., gas, vapour, fine powder, and airborne particulates) in a fume cupboard or other control equipment (e.g., gloveboxes).
 - g. **Heaters must be kept away from wash bottles.** Heat flammable solvents only using electrically heated water/oil baths or heating mantles inside fume cupboards, and **switch off the heaters after use.**
 - h. Avoid heating chemicals in a closed system due to the risk of explosion. If such operation is required, assess the risk before doing so. For example, one should know about the boiling point of the liquid and determine if gas will be generated. If necessary, use proper containers that can withstand pressure (e.g., seal tubes), add blast shields, and add a label warning others that a pressurized container is present in the fume cupboard.
 - i. Be cautious when opening bottles which may be under pressure (e.g., solvents).
 - j. Fine-powdered chemicals (e.g., silica gel, **nano-powders** with submicron particle size) should be handled inside fume cupboards (include weighing). A mask or respirator should be worn. Clean up any dust (on spatula/weighing paper/spillages) with wet tissue (if the chemical is compatible with water). Discard the contaminated tissue by enclosing it in a glove, followed by tying a knot on the glove. Please refer to the [Interim Guidelines on the Safe Use of Engineered Nanomaterials](#) for more information.
 - k. Bottles which contain corrosive fumes (e.g., concentrated hydrochloric acid, ammonium hydroxide) must be opened inside fume cupboards. If necessary, cover the bottle with a towel/tissue paper to divert any chemical spray.
 - l. Always use appropriate pipetting devices. **Do not pipette by mouth.**
 - m. Provide a means in advance for confining spillages shall they occur. For example, perform filtration on a spill tray, and **transport chemical bottles in suitable secondary containers.**
 - n. Transport chemical bottles with durable baskets, or trays on a trolley. If they are too heavy to carry (e.g., bottles of solvent), transport them using appropriate trolleys. Make sure that they do not topple during transportation, and do not over-stack them. For example, put the bottles inside a suitable carton box.
 - o. Please refer to Section 8 for information about handling dangerous goods.

5. Handling chemical waste

- a. Laboratory members must be responsible for properly disposing of chemical waste created by themselves as early as possible.
- b. Students or staff must properly dispose of unwanted chemical samples prepared by themselves before their studentship or contract ends.
- c. Never pour organic waste, chemicals with high aquatic toxicity, or aqueous waste containing heavy metals into the sink.
- d. **Reactive and/or toxic chemicals** must be properly quenched (i.e., made non-reactive and/or toxic) before being discarded.
- e. Dispose of chemical waste into suitable pails according to the waste type, such as aqueous alkali waste, aqueous acid waste, halogenated organic waste, and non-halogenated organic waste.
- f. Make sure that the waste you pour into the pail is **compatible** with the content inside. You may refer to the Hazardous Waste Compatibility Chart printed on Appendix VI of the guidelines on [Chemical Waste](#). If you are not sure or cannot find a suitable waste pail, inform the TIC. Consult the Safety Office if necessary.
- g. **Label the waste type on waste bottles clearly** and empty the bottles into proper waste pails as soon as possible. Do not store excessive amount of chemical waste inside fume cupboards.
- h. Inform the TIC if you find chemicals, samples or waste that are poorly labeled or unknown. Do not dispose of them on your own. Consult the Safety Office if necessary.
- i. Waste pails **must be capped properly** after filling and before transporting.
- j. **Do not fill up chemical waste pails more than 80% full.** Otherwise, they will be damaged due to pressure build-up, and result in leakage.
- k. Please further refer to the guidelines on [Chemical Waste](#).

6. Response to accidents and emergency

6.1 General

- a. When the fire alarm is heard and/or seen (flashing lights) **continuously**, evacuate immediately following the steps below:
 - i. Switch off flammable gas taps/valves.
 - ii. Pull down the sash of fume cupboards.
 - iii. Leave the building and go to the assembly point according to the [fire evacuation plan](#). **Do not go back to your office to collect your belongings, and do not use elevators.**
 - iv. Keep away from the building until permission to re-enter the building is given by the fire brigade and the security.
- b. The **fire alarm** is to be activated for emergency situations requiring the evacuation of the building, including fires, toxic gas release, or chemical accidents that

- cannot be confined in a room. Activation of the alarm will **automatically** inform the fire station to dispatch the fire brigade.
- The **emergency alarm** (available in some laboratories) is to be activated in the event of a chemical spillage, traumatic injury, splash in eyes, and other accidents. The emergency alarm is a local siren which alerts people on the same floor to warn them against entering the room where the alarm is activated. Its activation does not yet signal a full building evacuation, and it does not automatically notify the fire station.
 - In case of accidents, inform the technician-in-charge or the staff-in-charge of the laboratory, or the Engineering Manager (Dr. Scott Chan, Tel: 3917 8983) as soon as possible. Phone numbers are available on the placard at the entrance of each laboratory.
 - In case of **emergency**, immediately call the security control centre (Tel: 3917 2882) or dial 999 directly.
 - All accidents and incidents of dangerous occurrences (e.g., fires, chemical spills, injuries) must be reported to the Engineering Manager (Dr. Scott Chan) **as early as possible** for filling relevant accident forms.

6.2 Fire

- Prioritize lives and your own safety in case of a fire.
- If you see a person on fire, smother the flames with a fire blanket or get the person to a safety shower, whichever is easier and faster.
- Tackle fire with appropriate fire extinguishing tools depending on the fire type. You may refer to [this pamphlet](#) or the table below:

Type of extinguisher suitable for extinguishing fire involving				
Type of fire	Paper, Textiles, Wood, Plastic	Flammable liquids, Solvent, Oil, Grease	Electrical appliances, Motors, Electrical switches	Size of a typical fire extinguisher
Type of extinguisher				
Carbon Dioxide Gas	-	✓	✓	4.5 kg
Water	✓	-	-	9 litre
Dry Powder	✓	✓	✓	5 kg
Clean Agent	✓	✓	✓	1 to 18 kg
Foam	✓	✓	-	9 litre

- d. If your attempt in extinguishing the fire is not successful, activate the **fire alarm** nearby and follow the evacuation procedures (Section 6.1a). Inform immediately the security control centre (Tel: 3917 2882). The fire would have engulfed the room before you get another extinguisher.
- e. If you witness the fire, report to the firefighters or security to inform them the location of the fire, and provide other necessary information (e.g., the type of fire, and the kinds of dangerous goods present in the room).

6.3 Chemical spillage

- a. The individual(s) who caused the spill is responsible for prompt and proper clean-up. Notify everyone in the laboratory immediately when chemical spill occurs and inform the TIC and the SIC of the laboratory.
- b. If the spill occurs inside the fume cupboard, turn off all electrical equipment inside and pull down the sash. Press the **emergency purge button** on the fume cupboard to activate maximum evacuation of air out of it.
- c. If the spill occurs on the open ground (less than 4 L), handle it with the **spill kit** if it is safe to do so. The area should be ventilated by pressing the **emergency purge button** on nearby fume cupboards. Please refer to Section 12 of [Chemical Safety in Laboratories](#) for more instructions on using the spill kit.
- d. If you cannot confine the spill using the spill kit (more than 4 L) or it is not safe to handle, leave the room immediately, then close the door of the laboratory. Activate the **emergency alarm**, followed by calling the Engineering Manager (Dr. Scott Chan, Tel: 3917 8983) or the security control centre (Tel: 3917 2882). If the emergency alarm is not available, alert others nearby, if it is safe to do so, not to enter the room where chemical spillage has occurred.
- e. If the spill cannot be confined in one room, activate the **fire alarm** nearby and follow the evacuation procedures (Section 6.1a). Inform immediately the security control centre (Tel: 3917 2882).

6.4 Skin/eye contact with chemicals

- a. Attend to any people who may be contaminated. Contaminated clothing must be removed immediately.
- b. For skin contact, excessive chemicals on the skin should be wiped off first. The affected skin should be rinsed with water for at least 5 minutes, followed by soap. Consult a physician afterwards at the UHS clinic at HKU, or in a hospital.
- c. For hydrofluoric acid (HF) burns, apply calcium gluconate gel on the affected skin after rinsing it with water for 5 minutes.
- d. For eye contact, flush the affected person's eyes at the eye-wash station for at least 5 minutes.

- e. After preliminary treatment for severe skin contact (e.g., over a large area), as well as 6.4 c & d, inform **immediately** the security control centre (Tel: 3917 2882) or dial 999 to bring the patient to Queen Mary Hospital (the hospital closest to HKU). Inform medical personnel the chemical involved.
- f. Inform the TIC or the SIC of the laboratory, as well as the Engineering Manager (Dr. Scott Chan, Tel: 3917 8983).

7. Chemical list

A chemical list must be kept for recording chemical storage in each laboratory, which **must** include **1)** the lab location, and **2)** contact information of the staff-in-charge (SIC) and the technician-in-charge (TIC) of the lab, as well as a contact person working in the lab (a research postgraduate student or a postdoctoral fellow). For each chemical, information including **1)** chemical name, **2)** CAS number, **3)** size (amount of chemical, in terms of mass or volume), **4)** quantity (number of bottles), **5)** brand, and **6)** location code **must** be recorded. A chemical list template for each lab (Form 1) is provided on the [Moodle page on safety](#) (under Chemical Safety), and you may refer to Figure 1 for the compulsory information to be included in the list.

Form 1 - Chemical List for each lab					
Lab location					
	Name	Telephone no.	Email		
SIC of the lab					
Contact person					
TIC of the lab					
Compulsory information					
Chemical name	CAS No.	Size (mass / vol)	Qty	Brand	Location code

Figure 1 Compulsory information to be included in the chemical list.

For **1)** chemical name, an **English** name of the chemical must be provided, which may be accompanied by a Chinese name or abbreviated name(s). Additional information such as purity, molecular weight, etc., can be written in the **Remarks** column (Figure 2, the optional information section). For **3)** size, it refers to the amount of chemical as stated in the package label of the chemical bottle. The actual amount of chemical remaining in the bottle can be recorded in the **Remarks** column.

For **6**) location code, please follow the convention as follows:

Y/B/R/G/C + number

Y: yellow cabinet, B: blue cabinet, R: refrigerator; G: glovebox; C: others

For example, Y1 means yellow cabinet no.1; G2 means glovebox no.2 (given that there is already G1 in the room). You can also assign a name to each shelf/drawer/box inside each cabinet to record the location of the chemical more precisely in the **Location ref.** column (Figure 2). Please **affix a label on each chemical bottle** which shows the lab location and location code (e.g., HWLG03-2 / R1).

The **Ownership** column (Figure 2) will be useful for shared labs (e.g., HWLG03-2) to record the owner (i.e., which research group) of each chemical. It is highly recommended to label the owner of each chemical bottle in shared labs. Besides, the **Solvent** column (Figure 2) may be used to identify flammable solvents used in large quantities for easier management.

In addition, some chemicals are classified as dangerous goods, and they have a unique **UN number** and belong to different dangerous goods classes (**DG Class**). UN numbers can be found in material safety data sheets (MSDS), and the DG Class can be searched by UN number at [this website](#). **UN number, DG Class and MSDS link** are strongly recommended to be included in the chemical list, as such information may be requested by the Safety Office for auditing purposes.

Location ref.	Remarks	Ownership	Date	Stock-takin	Stock-taking notes	Solvent? (Y if yes)

UN number	DG Class	MSDS link	Lot/Batch number	Expiry Date	Input "Y" if it will be disposed

Figure 2 Optional information to be included in the chemical list.

The chemical list template also contains columns (Figure 3) for inputting additional information for the Labpack form provided by the Safety Office for disposing surplus/expired chemicals (Appendix VIII of the [HKU Chemical Waste Policy](#)). As requested by the chemical waste collecting company, physical state of the chemical (S: solid, L: liquid, M: mixture/sludge), and the type of container/lid/cap (G: glass, P: plastic, M: metal) need to be provided. Moreover, it is highly recommended to provide the CAS number of the chemical in the Remarks field in the Labpack form.

Moreover, the TIC should compile a chemical list for each supervisor (Form 2, as shown in Figure 4) in their lab(s). The template is also available on the [Moodle page on safety](#) (under Chemical Safety).

Extra information for Labpack form (for disposing surplus/expired chemicals)						
Chemical formula	Physical state (S/L/M)	Container size (in mL)	Container type (G/P/M)	Lid/Cap Type (G/P/M)	Chemical amount (in g or mL)	Remarks

Figure 3 Extra information for the Labpack form.

Form 2 - Chemical List for each supervisor									
Supervisor									
Compulsory information									
SIC	Contact person	TIC	Lab locatio	Chemical name	CAS No.	Size (mass / vo ^{tt})	Qty	Brand	Location code

Figure 4 Screenshot of the chemical list template for each supervisor (Form 2).

8. Dangerous goods

8.1 General information

Dangerous goods are classified into Classes 1–9 as shown in Figure 5. You may refer to [this pamphlet](#) for more details. **Purchase, storage and use of Class 1 (explosives), Class 6.2 (biohazardous materials) and Class 7 (radioactive substances) are strictly forbidden in this department.** Biohazardous materials include all viable infectious (e.g., medical/clinical sample or waste), pathogenic (e.g., bacteria, viruses, parasites, fungi), or toxin-producing agents, prions, biologically derived toxins, or nucleic acid constructs that **have the potential to affect the health** of humans, animals, plants, or the environment (University of California, Davis, 2008; HKU Safety Office, 2014).

As prescribed in the [Dangerous Goods Ordinance, Chapter 295](#), the Fire Services Department of Hong Kong regulates the manufacture, conveyance, storage, and use of dangerous goods of [Classes 2, 3, 4, 5, 6.1, 8 & 9](#), as well as [Class 9A](#). You may search the General Exempt Quantity (**GEQ**, in kg or L) for storage of each dangerous good via this [link](#), by the name or the UN number provided in the (material) safety data sheet (MSDS/SDS). For each class of dangerous goods, there is also an Aggregate Exempt Quantity (**AEQ**) for storage. You may refer to the AEQ for storage in General & Special Premises as shown in [this website](#).

Please make sure that the amount of chemicals stored in each laboratory does not exceed the GEQ and AEQ. Moreover, the quantity of chemicals in each laboratory should be kept as **LOW** as justifiable according to their usage. **Chemicals in excessive amounts, even not exceeding the legal exempt quantity, may be relocated to designated dangerous goods stores managed by the Safety Office.**



Figure 5 Classification of dangerous goods.

8.2 Class 2 dangerous goods (compressed/liquified gases)

The storage limit of Class 2 dangerous goods is described by the water capacity (volume) of the gas container/cylinder, and the AEQ for this class is 300 L. Typically, the GEQ of a Class 2.1 chemical (flammable gas) is 75 L, and that of a Class 2.2 chemical (non-flammable and non-toxic gas) is 150 L. Besides, many Class 2.3 chemicals (toxic gas) have no exempt quantity for their storage and use.

According to the Safety Office, HKU currently does not hold a license for gases which are **toxic and oxidizing** (Class 2.3 gas with subsidiary hazard 5.1), and gases which are **toxic and oxidizing and corrosive** (Class 2.3 gas with subsidiary hazards 5.1 and 8), such as chlorine (UN 1017) and compressed nitric oxide (UN 1660). Purchase, storage and use of such gases **are not allowed**.

For safety measures and precautions for handling compressed/liquified (cryogenic) gases, please refer to [this document](#) (sections 9 and 10) issued by the Safety Office.

8.3 Class 3 dangerous goods (flammable liquids)

Special attention shall be paid to this class of dangerous goods, which include many organic solvents that are used in large amounts. The Safety Office has set the storage limit of Class 3 chemical in each laboratory to be **20 L of any one substance**, and **40 L in aggregate**.

In terms of safety precautions, solvents **must not be exposed to direct sunlight**. Their transfer should be performed inside a fume cupboard. Bottles of solvent must not be placed inside fume cupboards for long-term storage, kept on the floor, or stored in the corridors. Instead, solvents bottles must be **stored inside designated fire-resistant and vented cupboards** after use, and they should be placed on suitable spill trays. Beakers or dishes must not be used for long-term storage of solvents, and **broken caps of solvent bottles should be replaced as soon as possible**. If flammable liquids need to be stored at low temperature, store them in **spark-proof refrigerators** only.

Solvent drums (20 L) can be placed on a spill tray (>20 L in capacity) on the floor if there is insufficient space in vented cupboards for their storage. When transferring solvents from drums to bottles, use proper siphon pumps instead of pouring directly, and place the receiving bottle(s) on a spill tray.

Please also note that ethereal solvents (e.g., diethyl ether, tetrahydrofuran (THF), 1,4-dioxane) can form explosive peroxides upon prolonged storage. Normally, chemical stabilizers have been added to commercially available ethereal solvents to suppress peroxide formation. However, please check the shelf-life of these solvents and be cautious when opening old bottles of them. It is recommended to discard them beyond the expiry date. Moreover, avoid long-term storage of distilled ethereal solvents as stabilizers will be removed upon distillation.

8.4 Class 4, 5, 6.1, 8 & 9 dangerous goods

For many of these classes of dangerous goods, the GEQ is 10 kg (solids)/L (liquids), and the AEQ for each class is 100 kg (solids)/L (liquids). Although the exempt quantity seems large, please obtain/store the smallest quantity of these chemicals that would be sufficient for your work, and opt for less hazardous alternatives whenever possible. Before handling them, please make sure you have reviewed the **MSDS, safety precautions, standard operating procedures (SOPs), and proper method of disposal/handling spillages**.

8.4.1 Class 4 (flammable solids, air and/or water-reactive chemicals)

Some of them require handling with air-free techniques, especially those liable to spontaneous combustion (Class 4.2 dangerous goods) and generation of flammable

gases upon reaction with water (Class 4.3 dangerous goods). Handle them in gloveboxes if necessary.

8.4.2 Class 5 (oxidizing agents)

They should be separated from other chemicals as they are incompatible with many organic compounds and acids. Special attention shall be paid to perchloric acid and perchlorate salts as they are notoriously explosive. Operations involving heating of concentrated perchloric acid must be performed in special fume cupboards with water wash-down facilities. Besides, strongly acidic and oxidizing solutions such as **aqua regia** and **piranha solution** are extremely hazardous, and they must be handled within fume cupboards. Unspent solutions of them **must not be stored** and must be quenched properly.

8.4.3 Class 6.1 (toxic chemicals)

Examples of this class include cyanides and water-soluble barium salts. They should be stored inside a toxic cabinet which can be locked and managed by a senior member in the laboratory. A logbook shall be kept for recording the amount of toxic chemicals used each time.

8.4.4 Class 8 (corrosive chemicals)

Acids and base should be **separately** stored. Acids should be stored inside **plastic** cupboards, or at least on a plastic spill tray. Acid-incompatible chemicals, such as bases, fluoride and cyanide salts, must not be stored inside acid cupboards. For chemicals that produce acidic fumes upon reaction to moisture (e.g., acyl chlorides, silyl chlorides, thionyl chloride), please contain the chemical bottles in a zip lock bag.

Concentrated acids, as well as volatile acids and bases, must be handled inside fume cupboards, including opening bottles of them. Concentrated acids (except hydrofluoric acid) should be transferred using glass pipettes instead of syringes connected to metal needles. For dilution of acid/base, always add concentrated acid/base to water, but not the other way around. Perform acid/base dilution or neutralization slowly under an ice-water bath, as these processes are exothermic (i.e., involving heat generation).

8.4.5 Hydrofluoric acid

Experiments with hydrofluoric acid (HF) must be carried out after receiving approval from the supervisor-in-charge (SIC) and the technician-in-charge (TIC) of the laboratory, and your supervisor. Everybody inside the laboratory must be notified when HF is being used, and it must be handled inside fume cupboards under supervision by another experienced laboratory member. **Never handle HF with glassware**, and double-check the compatibility of the containers for holding HF.

As recommended by HKU Department of Chemistry, protective gear made of polyvinyl chloride (PVC) should be worn when working with HF. Full length PVC coveralls with sleeves to the wrist or a full-length PVC apron with sleeve protectors, a face shield, rubber boots, and safety goggles should be worn. When small amounts of HF are handled in the fume cupboard, mid-arm length PVC gloves must be worn.

According to the Safety Office, spillages of HF can be handled using the absorbent pads supplied in spill kits available in laboratories. On the other hand, HF causes wounds on the skin which are difficult to heal, and **calcium gluconate gel** is highly recommended for emergency handling of HF skin burns. For additional information about handling HF, you can refer to the [guidelines](#) provided by Harvard University.

If you have further questions about dangerous goods, please consult those in Section 1n.

9. Controlled chemicals

As prescribed in the Control of Chemicals Ordinance (Chapter 145), a license is required for importing, exporting, possessing and manufacturing certain chemicals which can be used for making dangerous drugs or psychotropic substances. The ordinance and the list of chemicals can be found [here](#). Please pay special attention to chemicals listed in **Schedule 1** and **Schedule 2** of the ordinance.

Do not purchase, store, or manufacture any of the controlled chemicals included in Schedule 1 or Schedule 2 on your own. Note that the salts of these substances are also under control. Offenders to the Control of Chemicals Ordinance are liable to a fine of \$1,000,000 and to imprisonment for 15 years. You may refer to the Excel file on the [Moodle page on safety](#) (under Chemical Safety: controlled_chemicals.xlsx). The file includes the CAS number of chemicals listed in Schedules 1 and 2, including some (but not all) of their salt forms and isomers.

Please inform the TIC or the SIC if you find any **Schedule 1** or **Schedule 2** chemical in your laboratory. If you have further questions, please consult those in Section 1n.

10. Mercury & mercury compounds

The Mercury Control Ordinance (Chapter 640) regulates the import, export, keeping and use of mercury, mercury mixtures and mercury compounds, which are classified into **Part I** and **Part II** Chemicals. For details, please visit the following websites:

https://www.epd.gov.hk/epd/english/resources_pub/resources_subject/mco.html

<https://www.elegislation.gov.hk/hk/cap640>

Part I Chemicals include i) elemental mercury, and ii) mercury mixture having a mercury concentration of at least 95% by weight. **For importing Part I Chemicals** for laboratory-scale research or used as a reference standard, please make sure that the total quantity of mercury imported in the shipment **does not exceed 250 g**.

Part II Chemicals include i) elemental mercury, ii) mercury mixture having a mercury concentration of at least 95% by weight, and iii) mercury compounds. They can be only used for laboratory-scale research or as a reference standard. **Please make sure that the total amount of Part II Chemicals in each laboratory does not exceed 500 g**. Please note that if two or more separate laboratories are situated on the same floor of a building, and the operation of those laboratories is supervised by the same person (whether alone or jointly with another person), those laboratories are regarded as a single laboratory.

Please inform the TIC or the SIC if you find that there amount of **Part II** chemicals in your laboratory exceeds 500 g. If you have further questions, please consult those in Section 1n.