

LABORATORY SAFETY MANUAL



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The University's Health, Safety and Environment Policy

Statement of Policy

The Hong Kong Baptist University is committed to ensure, as far as reasonably practicable, the health and safety of all persons employed by the University, students and visitors at the University.

The University will take all reasonable measures to :

- (a) ensure that employees, students and visitors have safe entry to, exit from and occupancy of the University facilities;
- (b) provide each employee and student with the information, instruction, training and supervision necessary to ensure their safety and health;
- (c) provide proper facilities and procedures for the use, handling, storage, transportation and disposal of articles, hazardous materials and waste;
- (d) ensure that the machinery, equipment and tools used by the employees and students meet acceptable government and international health and safety standards;
- (e) ensure that every person granted access to the University is familiar with and uses the necessary safety materials, equipment, devices and clothing;
- (f) ensure that buildings, structures, plants and systems are safe and without risks to health;
- (g) provide appropriate first aid facilities and health services;
- (h) comply with relevant legislative requirements and other appropriate standards relating to occupational health & safety, fire safety and emergency measures.

All persons at the University must observe the University safety rules and procedures and to take reasonable care for the health and safety of himself and of other persons who may be affected by his acts or omissions.

The Health, Safety and Environment policy of the University will be implemented, audited and revised as necessary.

The University's Safety Management Structure



Terms of Reference of EHSC

- (a) To establish policies and procedures of the University Safety Programmes, and to oversee their implementation.
- (b) To ensure that the University safety policies and procedures, and relevant Government Ordinances and Regulations concerned with health, safety and environment are properly assigned and adhered to at all levels.
- (c) To advise on the promotion of education on health, safety and environment for students and staff.
- (d) To act as an advisory committee to the Senior Executive Committee (SECO) on the consideration of the departmental safety directives, standards and procedures.
- (e) To review the safety records and statistics of the University.
- (f) To appoint sub-committees or specialist committees as necessary to address unique or extraordinary safety issues.
- (g) To make recommendations on budget allocation for the University Safety Programmes.
- (h) To receive and consider suggestions, and to resolve complaints relating to health, safety and environmental matters of the University.

Sustainability, Health and Safety Section (SHS)

SHS is an executive arm of EHSC and its sub-committees. Its mission is to provide consultation and support in health, safety and environment for every operation of the Hong Kong Baptist University in fulfilling its educational mission.

The Purpose of the Laboratory Safety Manual

It is the intent of the University to provide a safe and healthy laboratory environment to all laboratory occupants through the establishment and maintenance of a Laboratory Safety Manual.

This Laboratory Safety Manual provides guidelines which are aimed to minimise or eliminate hazards in laboratories. The manual is prepared by SHS and approved by the Laboratory Safety Sub-Committee whose membership is as follows:

Laboratory Safety Sub-Committee

Chairman:	Dr. Joshua K.S. Ko	School of Chinese Medicine
Members:	Dr. Fu Junxue	Department of Physics
	Dr. Gray K.S. Ho	Department of Chemistry
	Dr. Anna O.W. Leung	Department of Biology
	Mr. Raymond C.M. Li	Estates Office
	Dr. Chan Wai-Man	Faculty of Science
	Dr. Patrick Y.K. Yue	Department of Biology
	Mr. Dennis P.K. Hui	SHS, Estates Office
	Mr. Aaron C.O. Tse	SHS, Estates Office

It is the responsibility of laboratory users, including visitors, students and staff members, to understand the safety and hazards associated with the substances and equipment in the laboratory and to follow the guidelines stated in this manual at all times. New laboratory users are requested to attend the Laboratory Safety Induction Programme as soon as commencement of duties.

To encourage compliance of the safety guidelines, laboratory users are required to read the relevant sections of the Manual thoroughly and acknowledge their intention in adhering the approved procedures by signing the appropriate section.

Regular internal safety inspections will be conducted by members of the Laboratory Safety Sub-Committee to reinforce the safe practices and conditions within the laboratory environment.

Any comments to further improve the safety standards of our laboratories are most welcome and can be channelled through members of the Laboratory Safety Sub-Committee.

This manual is regularly reviewed and updated, and the most up-to-date version is accessible on the SHS website <u>http://www.hkbu.edu.hk/~ehsu</u>.

Part I. General Laboratory Safety

1. Introduction

This section is intended to provide general guidelines for laboratory safety as the basis for maintaining a safe environment for laboratory users. Laboratory supervisors should develop rules that are specific for his or her laboratory. As a laboratory user, it is your responsibility to ensure that all regulations are observed prior to any operations.

2. General Laboratory Safety Guidelines

- 2.1 Determine the potential physical, chemical and biological hazards and the appropriate safety precautions before beginning any new or modified procedures. Read the MSDS for the reagents that you will be using. (Refer to Part II Chemical Safety for accessing MSDS)
- 2.2 Familiarise with the emergency procedures, alarms and evacuation routes. Know the location of emergency phone, emergency eyewash, safety showers and fire extinguishers and its proper operating procedures.
- 2.3 Do not smoke, apply make-up, consume food or beverages in laboratories. Never store food or drink in laboratory refrigerators.
- 2.4 Know the types of and the use of personal protective equipment available for your laboratory operation.
- 2.5 Wear protective clothing and gloves that are not permeable to the chemicals being used.
- 2.6 Proper eye protector must be worn in laboratories when handling with hazardous chemicals, dangerous machinery, laser equipment or biological agents.
- 2.7 Long hair and loose clothing should be confined when in the laboratory. Shoes must be worn at all times. Sandals or open toe shoes must not be worn in the laboratory.
- 2.8 All containers of chemicals should be correctly and clearly labelled. The label should provide hazard and safety information about the chemicals to other laboratory users.
- 2.9 All chemical wastes should be disposed of appropriately to the corresponding waste containers, log sheet should also be filled in properly.
- 2.10 Equipment should only be used for its designed purpose and should not operate any equipment that you are not familiar with.
- 2.11 Mouth pipette of chemicals must not be allowed. A pipette bulb or aspirator for pipetting chemicals should be used.
- 2.12 Exposure to gases, vapours and aerosols should be minimised. Appropriate safety equipment in conjunction with fume cupboard should be used whenever such exposure is expected.

- 2.13 Be alert to unsafe conditions and actions, and report them to the laboratory supervisor or principle investigator.
- 2.14 Hands and forearms should be washed thoroughly with soap and water before leaving the laboratory area.

3. <u>Housekeeping and Maintenance</u>

- 3.1 Eliminate safety hazards by maintaining laboratory work areas in a good state of order. Clean up should follow the completion of any operation or at the end of each day.
- 3.2 Chemical wastes should be kept segregated by hazard class and deposited in designated containers.
- 3.3 Keep laboratory floor dry at all times. Attend to spills of chemicals / water and warn other laboratory workers of the potential slipping hazards.
- 3.4 Do not use stairways and hallways as storage areas and never block access to exits, emergency equipment, or gas shut-off valve.
- 3.5 Laboratory equipment such as fume cupboards, centrifuges, vacuum pumps and ovens should be inspected and maintained regularly. The maintenance work should be carried out by authorized personnel and be documented.

4. Warning Placard

- 4.1 A warning placard is posted at the entrance of each laboratory to provide indication of the possible hazards in that laboratory and the appropriate personal protective equipment required. SHS can be consulted regarding the posting of appropriate signs e.g. radioactive or biological warning labels.
- 4.2 The warning placard also includes a list of emergency contact persons. In the event of an accident, chemical spills or fire, assistance from the people on that list may be requested.

5. <u>Unattended Experiments</u>

- 5.1 Laboratory operations involving hazardous substances are sometimes carried out continuously or overnight unattended. It is the responsibility of the people who design these experiments to ensure safety precautions are taken, particularly in the event of interruptions to utility services such as electricity, cooling water and inert gas.
- 5.2 Carefully examine how chemicals and apparatus are stored, considering the possibility for fire, explosion or unintended reactions.
- 5.3 Laboratory lights should be left on and signs should be posted at the laboratory door identifying the nature of the hazardous substance in use, emergency contact name and number.

5.4 Notify the Security Office and if necessary, arrangements should be made to periodically check on the operation by security guards.

6. <u>Use of Laboratories After Hours and Working Alone</u>

- 6.1 In general, students are not encouraged to carry out their laboratory work after normal office hours.
- 6.2 Staff and students want to work in laboratory after office hours should obtain approval from their supervisors in advance.
- 6.3 For safety reasons, staff and students must not be allowed to work alone in the laboratory after office hours, particularly when working with hazardous chemicals.
- 6.4 When performing laboratory work after office hours, a form of <u>Application for After</u> <u>Office Hour Laboratory</u> (Appendix I) should be completed, approved by their supervisors and posted on the door of the laboratory concerned. A copy of the form should be submitted to Departmental Office for record.¹
- 6.5 For those who have to work after 11:00 p.m., they should fill another form of <u>Application for Overstay in Laboratory</u> (Appendix II) with the approval from both their own Department and Estates Office (EO).²

door access approver if you have further questions on getting approval.

¹ The form is not applicable for laboratories under the security patrol list (e.g. installed smart card door access system). Laboratory users should get prior access approval from their own department. Please consult with your supervisor or

² The form is not applicable for laboratories under the security patrol list (e.g. installed smart card door access system). Laboratory users should get prior access approval from both their own department and EO. Please consult with your supervisor or door access approver if you have further questions on getting approval.

Part II. Chemical Safety

1. Introduction

This section provides the users with general guidelines on safe storage, use and disposal of chemicals in laboratory. The chemicals discussed in this section include elements, compounds, mixtures, commercial products, cleaning products, solvents, and lubricants. Many chemicals are poisonous, irritating, corrosive, carcinogenic, pyrophoric, or explosive. Chemicals that may be relatively safe when used alone can become very dangerous when mixing with other substances, either in a planned experiment or by accident. Therefore, personnel who handle chemicals must consider the potential hazards arising from individual chemicals as well as the combined effects and use appropriate controls and precautions.

2. <u>Material Safety Data Sheet (MSDS)</u>

- 2.1 MSDS provides detailed information on the physical, chemical, and physiological properties of a particular chemical and also on recommended handling procedures. These data sheets can be obtained from your chemical supplier or from the University network.
- 2.2 Two types of electronic database of MSDS, ChemWatch and CCINFO, can be accessed through the web page of Sustainability, Health and Safety Section (SHS) at www.hkbu.edu.hk/~ehsu/
 - then select Safety News
 - then select Online Chemical Database (Intranet only)
 - then select either ChemWatch or CCINFO

3. <u>Proper Labelling of Chemicals</u>

3.1 All containers of reagents and chemicals should be labelled properly with their chemical name, concentration, potential hazards and date of preparation.

4. General Handling of Chemicals

- 4.1 Laboratory reagents and chemicals should be capped and placed on the appropriate shelves immediately after use, with their labels to the front.
- 4.2 Laboratory cupboards and refrigerators should be inspected regularly. Unwanted chemicals should be safely disposed of. Food and beverages should not be stored in refrigerators or chemical storage areas.
- 4.3 Safety equipment should be used when handling with chemicals. The minimum personal protective equipment are laboratory coat, safety glasses and safety gloves.
- 4.4 When transporting chemicals from one area to another, bottle carriers or trolley should be used as secondary container to contain spillage in case of breakage.
- 4.5 All chemical wastes from the laboratory should be disposed of safely and in the

designated waste containers as outlined in Section 7, Chemical Waste Disposal.

5. <u>Storage of Chemicals</u>

- 5.1 Bulk quantities of dangerous goods (DG) should be stored in DG stores according to the requirements stated in the DG licences issued by the Fire Services Department under the DG Ordinance. Only small working quantities of chemicals are allowed to be kept in laboratories.
- 5.2 The chemical storage containers should be labelled clearly with the generic chemical name, type of hazard, special precautions and emergency information.
- 5.3 Flammable solvents should be stored in chemical safety storage cabinet or well-ventilated area away from burners, hot plates, and power sources. Domestic refrigerators should not be used for storage of flammable chemicals and should use "explosion-proof" or flammable-storage refrigerators or freezers.
- 5.4 Liquid samples stored in refrigerator should be in closed vessels and should be placed in drip-trays.
- 5.5 Carcinogenic and highly toxic chemicals should be stored in container with double containment.
- 5.6 Storage of chemicals, particularly for those known to decompose with time, should be marked with the date of receipt.
- 5.7 Incompatible chemicals must not be stored together and should be separated by physical barriers.

6. <u>Chemical Spillage</u>

- 6.1 Small amount of spillage (less than 1000 ml) can be cleaned up safely with the spillage kit provided at laboratories. There are a number of laboratory personnel who have been trained to handle spillages. All spillages of hazardous chemicals should be reported to SHS (ext. 7997).
- 6.2 If the spill is too large to clean up safely or if employees have been injured or areas have been contaminated, immediately call the Security Office (ext. 7777) or SHS (ext. 7997).
- 6.3 Emergency Response for Chemical Spill
 - 6.3.1 Alert all persons in the vicinity.
 - 6.3.2 If safe to do so, confine the spill with appropriate materials, turn off remotely all heat/ignition sources if flammable vapour is involved.
 - 6.3.3 Evacuate all persons in the affected areas and close the door. Press the emergency exhaust alarm located at the entrance of laboratory, if available, to extract the hazardous vapour.
 - 6.3.4 Inform the Security Office from a safe location.

6.3.5 If possible, maintain a safe distance from the scene and help to prevent entry.

6.3.6 If conditions allow, remain to assist emergency personnel.

7. <u>Chemical Waste Disposal</u>

- 7.1 The handling, collection, treatment and disposal of chemical waste are controlled by the Waste Disposal (Chemical Waste) (General) Regulation. All chemical wastes should be sent to the Chemical Waste Treatment Centre (CWTC) for treatment and disposal.
- 7.2 Chemical waste should be stored in containers of suitable design and construction so as to prevent leakage, spillage or escape of the contents under normal conditions of handling, storage and transport.
- 7.3 Various types of 20 litres waste container, provided by CWTC, are located at laboratories for chemical waste disposal. Users must check the label and discard the appropriate waste into designated container to avoid any mixing of incompatible waste.
- 7.4 Inventory of the types and quantities of chemical wastes being stored should be kept and regularly updated.
- 7.5 A suitable area should be provided for temporary storage of chemical waste before collection. The storage area should be located close to the source of waste generation to minimize waste handling and to facilitate management control. A hazard warning notice should be displayed for the attention of users at the storage area of chemical wastes.

Part III. Biological Safety

1. Introduction

This section contains the information necessary for the safe conduct of teaching and research involving potentially hazardous biological materials and to ensure that researchers who work with biohazardous materials have access to and understand the information needed to perform their work safely. Four "Biosafety Levels" have been classified according to the potential risk of the biological agents involved. These levels correspond to the perceived risk of exposure to biohazardous agents: the higher the Biosafety Level number, the higher the risk.

2. Biosafety Levels

- 2.1 **Biosafety Level 1** Laboratory activities classified at Biosafety Level 1 involve agents of no known or minimal potential hazard to laboratory personnel and the environment.
- 2.2 **Biosafety Level 2 -** Laboratory activities classified at Biosafety Level 2 involve agents of moderate potential hazard to personnel and the environment.
- 2.3 **Biosafety Level 3 -** Laboratory activities classified at Biosafety Level 3 involve agents that cause serious or potentially lethal disease following inhalation exposure.
- 2.4 **Biosafety Level 4** Laboratory activities classified at Biosafety Level 4 involve dangerous and exotic agents which present a high risk of life-threatening disease.

3. Recommended Biosafety Levels for Different Biological Agents

- 3.1 Biosafety Level 1
 - 3.1.1 Laboratory activities for Biosafety Level 1 require standard microbiological practices for sterile work and good standard laboratory practices.
 - 3.1.2 No specific equipment is required for this type of work.
 - 3.1.3 Basic facilities with primary containment should be provided with adherence to standard laboratory practices during open bench operations.
- 3.2 Biosafety Level 2
 - 3.2.1 Laboratory activities for Biosafety Level 2 require level 1 practices plus laboratory coats, protective gloves, appropriate biohazard warning signs, limited access and decontamination of all infectious wastes.
 - 3.2.2 Partial containment equipment (i.e. Class I or II Biological Safety Cabinet) should be used to conduct mechanical and manipulative procedures with high aerosol potential that may increase the risk of exposure to personnel.
- 3.3 Biosafety Level 3

- 3.3.1 Laboratory activities for Biosafety Level 3 require level 2 practices plus special laboratory clothing with controlled access.
- 3.3.2 Partial containment equipment as in level 2 should be used for all manipulations of infectious materials.
- 3.4 Biosafety Level 4
 - 3.4.1 Laboratory activities for Biosafety Level 4 require level 3 practices plus entrance through change room to put on laboratory clothing and shower on exit with all wastes decontaminated.
 - 3.4.2 Maximum containment equipment (i.e. Class III Biological Safety Cabinet or partial containment equipment in combination with full-body, air-supplied, positive-pressure personal suit) should be used for all procedures and activities.

4. Handling with Animals

- 4.1 Protective gloves should be worn during feeding, cleaning of cages and aquarium and performing experiments.
- 4.2 Animals should be kept in hygienic cages or aquarium of suitable sizes which should be cleaned regularly with disinfectants. Bedding materials should be changed daily and disposed of in a proper way.
- 4.3 Prolong exposure of allergenic substances associated with laboratory animals such as fur, feathers and insect-derived materials like faeces and body hairs should be avoided.
- 4.4 Sick or infected animals should be physically separated from other animals.
- 4.5 Working benches for handling animals should be properly decontaminated after use and separated for any other usage.
- 4.6 Hands should be washed thoroughly with disinfectant soap or detergent after handling with animals.

5. Biological Waste Disposal

- 5.1 Disposal of biological/clinical wastes are controlled by Waste Disposal (Clinical Waste) (General) Regulation. According to the "Code of Practice for the Management of Clinical Waste" issued by EPD, a licensed clinical waste collector should be appointed for the collection and disposal of the biological/clinical waste to a collection point or licensed clinical waste disposal facility.
- 5.2 Contaminated sharps and infectious wastes should be disinfected, properly packaged with appropriate types of container as stated below and marked with biohazard label before disposal.

Groups of Clinical Waste		Type(s) of	Colour	Sealing
		Container		
Group 1	Used or contaminated	Sharps box ^a	Yellow or	Proprietary
	sharps		combination of	closure ^b
			white and yellow	
Group 3	Human and animal	Heavy duty	Yellow	Plastic tie
	tissues	plastic bag ^c		
Group 2	Laboratory waste	Heavy duty	Red	Plastic tie
Group 4	Infectious materials	plastic bag		
Group 5	Dressings]		
Group 6	Other waste			

Remarks

- a. Conform to British Standard BS7320:1990 and capable of being safely incinerated.
- b. Properly sealed sharps boxes should be put into red heavy duty plastic bag.
- c. Minimum gauge of 150 micron if made from low density polyethylene or 75 microns if made from high density polyethylene or polypropylene and marked with a horizontal line to indicate the maximum volume.
- 5.3 Before the collection of waste, all biological tissues including dead animals should be stored in a freezer with proper packing to avoid cross contamination. A warning sign should be posted outside the freezer to alert other users.

Part IV. Radiation Safety

<u>1.</u> Introduction

The use of irradiating apparatus and radioisotopes which can emit ionizing radiation are regulated by Radiation Board of Hong Kong under the Radiation Ordinance. These materials and equipment must be handled and disposed of appropriately to avoid adverse effects to the users, public and environment.

Two Licences, Radioactive Substance Licence and Irradiating Apparatus Licence have been granted to HKBU by the Radiation Board. Under the complying conditions of the Licences, the purchasing, transport, storage, use and disposal of radioisotopes and irradiating apparatus must be strictly controlled. Furthermore, personnel registration, training, monitoring and medical surveillance must be implemented.

As stipulated by the Radiation Board, the University has appointed Mr. Aaron Tse of SHS as the Radiation Protection Officer (RPO) and Prof. Chris Wong as the Radiation Protection Advisor to assist in all matters related to complying with the requirements under the Radiation Ordinance and the establishment of the University's Radiation Safety Programmes.

2. General Requirements

- 2.1 All users (employees or students) handling any radioactive substance or irradiating apparatus should be registered with RPO before carrying out any related activities.
- 2.2 All users should wear a suitable personnel radiation monitoring device approved by the Radiation Board during any period in which the user would be exposed to radiation.
- 2.3 All users should undergo medical examination arranged by the Radiation Health Unit, including blood examination and the taking of relevant medical and occupational history, before engagement and every 14 months of work.
- 2.4 All users should always comply with all the requirements stated on the licence granted by the Radiation Board.
- 2.5 All users should report immediately to the RPO in case of spillage and loss of any radioactive substances.
- 2.6 All female users should report to the RPO as soon as possible if known to be pregnant for special monitoring arrangements.

3. Storage and Facilities for Handling Radioactive Materials

3.1 All radioisotopes must be stored and handled within the licensed radiation laboratories (SCT1401, OEM1202B and OEW1205) and the maximum activity permitted to be handled for each month as stated below:

Radionuclide	Description of substance	Maximum activity to be handled in a month			
		SCT1401, Cha Chi-Ming Science Tower	OEM1202B, Oen Hall Building	OEW1205, Oen Hall Building	
C-14	Unsealed liquid reagent	370.00kBq	9.25MBq		
P-32	Unsealed liquid reagent	100.00MBq			
H-3	Unsealed liquid reagent	120.00MBq			
S-35	Unsealed liquid reagent	100.00MBq			
Cs-137	Sealed solid (As contained in Model LS 6500 liquid scintillation counter s/n 7070977)	2.22MBq			
Uranyl acetate	Unsealed solid powder			0.052MBq	

Radionuclide	Description of substance	Storage location	Maximum activity to be handled in a month
		SCT709	1110MBq
Ni-63	Sealed source	SCT1009	555MBq
		SCT1110	555MBq
		SCM707	1295MBq
		SCT1212	1850MBq
		OEW1302	555MBq
		OEW902	555MBq
			1

- 3.2 All floors, walls, benches, tables and chairs of the radiation laboratories should be constructed of smooth impervious material with all joints effectively sealed for easy cleaning.
- 3.3 All floors, benches, tables and chairs should be cleaned at the end of each working day and the walls should be cleaned not less than once in each week.
- 3.4 All unsealed radioactive substance in powder, paste, gas or vapor form must be handled in an appropriated cabinet provided with exhaust ventilation of an approved type.
- 3.5 Suitable racks and receptacles should be provided for the storage of tools and handling unsealed radioactive substances and all racks and tools should be cleaned at the end of each working day.
- 3.6 All cleaning should be done by a wet method and properly recorded and all implements used should be properly washed after use and kept exclusively for that purpose.
- 3.7 The radiation for any accessible location inside the radiation laboratories and outside should not exceed 10 μ Sv/h and 1 μ Sv/h respectively.

- 3.8 All radiation laboratories should be only accessed by those registered users.
- 3.9 All purchases should be properly recorded and the record should be submitted to RPO quarterly.

4. Personal Protection for Handling Radioactive Materials

- 4.1 Radioactive substance means any substance which consists of or contains any radioactive chemical element whether natural or artificial and whose specific activity exceeds 75 bequerels (bq) of parent radioactive chemical element per gram of substance.
- 4.2 All users should be provided with washing facilities with soap, towels and nail brushes and an adequate supply of water free from radioactive contamination and should wash their hands before meal and before leaving the workplace.
- 4.3 All users should be supplied with a locker solely used for the storage of personal protective equipment which should not be taken out of the workplace.
- 4.4 All users should bring only essential belongings to the workplace, food and drinks are prohibited within the work area.
- 4.5 All users handling any unsealed radioactive substance should wear an overall and should be properly cleaned or disposed after each occasion of use.
- 4.6 All users handling any unsealed radioactive substance should wear gloves and headgear and should be properly washed after each use and renewed at least once each week.
- 4.7 All users handling any unsealed radioactive substance should be provided with an adequate supply of paper handkerchiefs.
- 4.8 All users handling any unsealed radioactive substance in liquid form should be provided with suitable protective screen placing between the face and the hands to effectively screen the face during the work.
- 4.9 All users should evacuated immediately in case of spillage and the area should be cleaned by wet method under the direct supervision of the laboratory-in-charge.

5. Waste Disposal

5.1 All wastes should be properly stored prior to disposal, the minimum delay period should not less than that as stated below:

Radionuclide	Minimum Delay Period			
	SCT1401,	OEM1202B, OEW120 Oen Hall Oen Hal		
	Cha Chi-Ming Science Tower Building Bui			
Wastes containing H-3	Nil			
Wastes containing C-14	Nil	Nil		
Wastes containing P-32	3 months			
Wastes containing S-35	10 months			
Waste containing Uranyl			Nil	
acetate				

- 5.2 All wastes should be properly treated for other hazardous natures after the minimum delay period before disposal.
- 5.3 All aqueous liquid wastes should be disposed of, after proper treatment, in 4 approximately equal portions at 7 days' intervals and followed by flushing with not less than 10 litre of water.
- 5.4 All solid wastes should be sealed, after proper treatment, in strong plastic bags or original package and delivered to supplier / public waste collection site by registered workers. All markings and labels showing radioactivity shall be removed from the wastes and package.
- 5.5 All wastes disposal should be properly recorded with details of the disposal radionuclides, physical and chemical forms, radioactivity at reference dates, dates of production and disposal, and disposal arrangements.

6. Use of Irradiating Apparatus

- 6.1 All irradiating apparatus (emitting ionizing radiation at a dose rate exceeding 5 μ Sv/hr at a distance of 5 cm from any accessible point of the surface of the apparatus) must apply for a licence from Radiation Board before use.
- 6.2 All radiation shielding enclosure or automatic radiation termination interlocking mechanism of the irradiating apparatus should not be changed.
- 6.3 All deviation of the existing setup including relocation of the apparatus should apply for approval from Radiation Board.
- 6.4 All supervisors of the irradiating apparatus should be responsible for the radiation safety of the installations.

Part V. Laser Safety

1. Introduction

Laser (Light Amplification by Stimulated Emission of Radiation) equipment is commonly used in laboratory for a variety of purpose such as alignment, spectrophotometry, non-linear optics, fibre communications, etc. The generation of an intense monochromatic and coherent radiation is the nature of laser. Such a intense power of emergency is capable of causing eye injury either temporally or permanently by looking directly into the laser beam or specular reflections. Moreover, high-power lasers can burn skin and cause fire as well as to damage exposed eye even by diffused reflections. Most injuries occurred in situations during alignment of laser systems or servicing of laser equipment. There are also additional hazards associated with high voltage, high pressure and toxic chemicals. Therefore, special precautions must be taken to minimize these potential hazards.

2. Classification of Laser

Lasers and laser systems are grouped into four classes according to the output power, wavelengths and its capacity to produce injuries. The corresponding precautions required for the safe use of lasers are determined by the laser classifications outlined as follows. Please check the manufacturer's operating instruction or laser hazard label for correct classification.

Class 1 Laser - A Class 1 laser is considered to be incapable of producing damaging radiations due to the low power output (below 0.4uw) and therefore exempt from most precautions.

Class 2 Laser (low power) - A Class 2 laser produces a low power output (0.4uw - 1mw) in the visible spectrum (0.4 - 0.7um) and eye protection is normally afforded by normal human aversion response to bright sources. However, injury could occur when stared directly at the beam for extended periods of time.

Class 3 Laser (medium power) - A Class 3 laser may be hazardous under direct and specular-reflection viewing conditions. Class 3 is divided into Class 3a & 3b. Class 3a laser produces medium power output (1 - 5 mw) in the visible spectrum and is hazardous when focused by optical instruments. Class 3b laser produces similar output power but in the invisible spectrum, so it is capable to produce injuries by exposure to the laser beam unknowingly.

Class 4 Laser (high power) - Any laser with output power greater than Class 3 is grouped under Class 4 laser. A Class 4 laser is hazardous to eye and skin from direct or diffuse reflection and is capable to cause fire. Class 4 lasers should be used with extreme cautions.

3. General Safety Precautions

- 3.1 All users should undergo eye examination before engagement and every 12 months of work.
- 3.2 Warning labels and tags should be placed on the laser housing and control

panel and must be clearly visible during operation.

- 3.3 The laser should only be operated by authorized persons and should not be left unattended during operation.
- 3.4 Adequate lighting is desirable during laser operation in order to minimize the size of pupil.
- 3.5 All shiny personal items such as watches, rings and bracelets should be removed during laser operation to prevent accidental reflection of the laser beam.
- 3.6 Safety eyewear should be worn for the specified laser whenever possible.
- 3.7 Never look into the laser beam or the reflections directly.
- 3.8 Exposure of the body to direct laser beam should be avoided.
- 3.9 Minimize the people in the working area during laser operations (especially during alignment).

Part VI. Special Hazards in Laboratory

1. Introduction

This section provides general information and guidelines to laboratory users on some special hazards that would be commonly found in laboratories such as the use of compressed gas cylinders, cryogenic materials and fume cupboards.

2. Compressed Gas Cylinder

- 2.1 All cylinders should be labelled with its gas contents and the date placed in service.
- 2.2 Compressed gas cylinders in the upright position should always be properly supported and secured.
- 2.3 Use only the right and permitted valves and regulators on compressed gas cylinders. Regulators must be free from oil and grease.
- 2.4 Always turn off a gas cylinder at the main valve after use and release any excess pressure in the regulator. The joints should be regularly checked for leakage.
- 2.5 Always move large gas cylinder on cylinder trolley. Do not drag, roll or slide cylinders.
- 2.6 Warning notices should be displayed where cylinders are used and stored. Store pressurised gas cylinders in a cool, well ventilated place.
- 2.7 The cylinder valve seating should be freed from dust by blowing before screwing on the regulator head.

3. <u>Cryogenic Materials</u>

- 3.1 Cryogenic liquids present special hazards; before using them you should familiarize yourself with the recommended handling precautions.
- 3.2 Liquefied gases should be handled in open vessels or approved vessels. An explosion can occur if a vessel containing the liquid becomes sealed.
- 3.3 The room must be well ventilated when pouring out liquefied gases and must not be poured near flames.
- 3.4 Care should be taken over the storage of ampoules in liquid nitrogen. If nitrogen is trapped inside a badly sealed ampoule, the ampoule will explode when withdraw from the nitrogen. The ampoule should be surrounded with cotton wool or cloth to reduce this risk.

4. <u>Fume Cupboard</u>

- 4.1 Fume cupboard is to protect the operator from the hazardous fumes emitted by chemicals and prevent the fumes from spreading into the laboratory area.
- 4.2 Fume cupboard is not used for storage of chemicals.
- 4.3 Beware of the different types of use (general, acid digestion or perchloric acid) stated on the top left of each fume cupboard and familiarize yourself with the basic operation guideline as indicated on the top right of the fume cupboard.
- 4.4 Whenever possible, experiments involving the use of toxic chemicals should be carried out in fume cupboards. In particular, wear eye protection and protective gloves, and clean up both the work area and equipment thoroughly after each use.
- 4.5 Always carry out distillations involving organic solvents or digestion procedures in fume cupboards. Distillations should not be left unattended.
- 4.6 Check the performance of the fume cupboards including face velocity periodically.
- 4.7 Guidelines for general safe use of fume cupboard:
 - 4.7.1 Verify that the fume cupboard is exhausting and working properly.
 - 4.7.2 Work with the sash lowered to the certification mark which indicates the proper face velocity. For adequate protection, the hood should not be used with the sash above this height.
 - 4.7.3 Locate work at least 6 inches inside the hood.
 - 4.7.4 Do not block the face of the hood, e.g. with shielding or large equipment.
 - 4.7.5 Do not block the space between tapered metal front lip and the work surface.
 - 4.7.6 Do not block rear exhaust slot.
 - 4.7.7 Secure paper and other lightweight materials to prevent blocking in the exhaust line.
 - 4.7.8 Do not perform experiment inside the cupboard when the audio and visual alarms are activated. Close the sash immediately and contact maintenance contractor for checking.
 - 4.7.9 In case of hazardous chemical spillage inside the fume cupboard, alert other people and evacuate immediately. Activate the emergency exhaust alarm outside the laboratory entrance.





Emergency Exhaust Alarm located next to the entrance of laboratories

Hong Kong Baptist University Application for After Office Hour Laboratory (8 P.M. - 11 P.M.)

(1)		Student I.D. Card No.:		
(2)				
:				
Date:				
Time:	From		То	
aboratory				
			Date:	
nt:				
	(1) (2) : Date: Time:	(1) (2) : Date: Time: From aboratory	Student I.D. (1) Card No.: (2)	Student I.D. (1) Card No.: (2)

Note:

- 1. This form should be submitted to Departmental General Office.
- 2. This form should be posted on the door of the laboratory.
- 3. This form is not applicable for laboratories under the security patrol list (e.g. installed smart card door access system). Laboratory users should get prior access approval from their own department. Please consult with your supervisor or door access approver if you have further questions on getting approval.

HONG KONG BAPTIST UNIVERSITY

APPLICATION FOR OVERSTAY IN LABORATORY (11 P.M. - 7 A.M.)

Venue :						
From :	(date)	(time)	То		(date)	(time)
Reason for Overstay :						
Name of Applicant :			Departme	ent:		
Staff/Student I.D. Card No. :			Contact Tel. / Pag	ger No. : _		
Details of Person(s) Accompanying, if any :		<u>Full Name</u>		<u>Staff</u>	/ Student I.D.	Card No.
-						
-						
-						
-						
-						
Recommended by Course Te	eacher / Supervi	sor :				
Signed and/or Chopped by Department Head :			Endorsed by Estates Office :			

Policies for Overstay

- In general, laboratory activities after normal office hours are discouraged and should only be considered when necessary. For safety reasons, staff and students must not be allowed to work alone in the laboratory after office hours, particularly when working with hazardous chemicals.
- 2. Applicant must have the form endorsed by the course teacher / supervisor and/or department head.
- 3. Application for overstay must obtain the approval of the Estates Office (EO) before noon of the requested day. Application form should be send to EO Office or by fax to 3411 5168.
- 4. Application for overstay must be in triplicate two copies retained by EO and the third copy retained by the applicant for posting at the entrance of laboratory or showing to security guard(s) when required.
- 5. This form is not applicable for laboratories under the security patrol list (e.g. installed smart card door access system). Laboratory users should get prior access approval from both their own department and EO. Please consult with your supervisor or door access approver if you have further questions on getting approval.