FACULTY OF SCIENCE

Laboratory Operation, Safety & Health Handbook

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List of Abbreviation

BSC	**Bio-Safety Cabinet**
BSL	**Bio-Safety Level**
CDC	**Center for Disease Control and Prevention**
DNA	**Deoxyribonucleic Acid**
DSA	**Department of Student Affairs**
DSS	**Department of Safety and Security**
FSc	**Faculty of Science**
FYP	**Final Year Project**
GMO	**Genetically Modified Organism**
HBV	**Hepatitis B Virus**
HEPA	**High Efficiency Particulate Air**
HIV	**Human Immunodeficiency Virus**
HOD	**Head od Department**
IPSR	**Institute of Postgraduate Studies and Research**
LEV	**Local Exhaust Ventilation**
LMSA	**Laboratory Management and Safety Administration**
OSH	**Occupational Safety and Health**
PPE	**Personal Protective Equipment**
SDS	**Safety Data Sheet**
SOP	**Standard Operating Procedure**
URS	**Undergraduate Research Scheme**
UV	**Ultra Violet**

UNIVERSITI TUNKU ABDUL RAHMAN

OCCUPATIONAL SAFETY & HEALTH

POLICY STATEMENT

Universiti Tunku Abdul Rahman is committed to provide a safe and healthy environment for all our staff and students and recognizes its obligations under the Occupational Safety and Health Act 1994.

In its mission to extend knowledge, the University is also committed to stimulate learning and achieve the highest standards of occupational safety and health in accordance with best practices.

UTAR SAFETY & HEALTH POLICY:

1. To establish and maintain a safe environment for staff and students;
2. To identify and eliminate hazards in order to prevent accidents;
3. To promote safety consciousness and responsibility; and
4. To involve administrative and academic staff in safety planning and implementation.

The University expects staff and students to comply with its occupational safety and health policies, procedures and guidelines, and to conduct themselves in a safe manner, not placing themselves or others at risk. Management staff are responsible for the safety and health of staff and students working under their direction.

The University is also committed to provide a safe and healthy environment for its visitors and members of the public who come into University premises or are affected by the University activities. Contractors working in University premises are also required to conduct their activities in a manner that ensures the safety, health and welfare of others.

As a teaching and research institution, with responsibilities to the wider community, the University is committed to providing its staff and students with appropriate occupational safety and health, education and exposure, practical work and role models.

1 INTRODUCTION

The purpose of this handbook is to provide guidance and provide knowledge of laboratory rules and standard operating procedure from the aspect of safety and health. This guide is meant to provide sufficient information to protect and reduce risk of accidents among the laboratory occupants. This guide can be divided into three major sections, which are information a laboratory user needs to know *before*, *during* and *after* each laboratory session. This guide is by no means exhaustive and is updated from time to time.

1.1 OCCUPATIONAL SAFETY AND HEALTH

Occupational Safety and Health Act 1994 (OSHA 1994) is an Act that provides legislative framework to secure the safety, health and welfare among all Malaysian workforces and to protect others against risks to safety or health in relation to the activities of persons at work stated under OSHA 1994. The aim is to promote safety and health awareness and establish effective safety organization and performance through self-regulation designed to suit the particular industry or organization.

Anyone (including visitors, students, academic staff and laboratory staff) who is in the compound of UTAR is categorized as an employee while UTAR represents the employer under this act. There are two clauses applicable to all of us:

1.1.1 General duties of employers to their employees - Section 15 (1)

It shall be the duty of every employer to ensure, so far as is practicable, the safety, health and welfare at work of all his employees which includes the following:

- Provision and maintenance of compounds and systems of work that are, so far as is practicable, safe and without risks to health;
- The making of arrangements for ensuring, so far as is practicable, safety and absence of risks to health in connection with the use or operation, handling, storage and transport of chemicals;
- The provision of such information, instruction, training and supervision as is necessary to ensure, so far as is practicable, the safety and health of his employees at work;
- So far as is practicable, as regards any place of work under the control of the employer, the maintenance of it in a condition that is safe and without risks to health and the provision and maintenance of the means of access to and egress from it that are safe and without such risks;
- Provision and maintenance of a working environment for his employees that is, so far as is practicable, safe, without risks to health, and adequate as regards to facilities for their welfare at work.

1.1.2 General duties of employees at work - Section 24 (1)

It shall be the duty of every employee while at work –

- To take reasonable care for the safety and health of himself and of other persons who may be affected by his acts or omissions at work;
- To co-operate with his employer or any other person in the discharge of any duty or requirement imposed on the employer or that other person by this Act or any regulation made thereunder;
- To wear or use at all times any protective equipment or clothing required or provided by the employer for the purpose of preventing risks to his safety and health; and
- To comply with any instruction or measure on occupational safety and health instituted by his employer or any other person by or under this Act or any regulation made thereunder.

2 DISCLAIMER

This safety handbook serves as basic rules and guidelines for safe working environment in a laboratory. Individual supervisors are ultimately responsible in ensuring that safe work practices and standard operating procedures are adhered to.

3 DECLARATION OF HEALTH CONDITIONS

Students suffering from serious medical health conditions are advised to notify the laboratory staff. Examples include epilepsy, asthma, allergies, heart diseases, ect. This will allow laboratory staff to be more alert in cases of emergencies.

4 USE OF LABORATORIES

A person who works in a laboratory must receive sufficient training to become more informed about potential hazards in the laboratory. Laboratory users must attend a safety briefing given by laboratory staff before beginning their bench work. This briefing includes the safety and health guidelines, hazards in the laboratories, personal protective equipment, waste disposal, safety signs and emergency response; and handling, storage and disposal of hazardous and non-hazardous waste. Briefings will be conducted as follows:

(a) FYP Students – arranged by FYP Coordinators.
(b) URS Students – once every trimester (Please refer to Appendix A)*.
(c) Others – by appointment*.

* Contact Nicholas Ooh at oohkf@utar.edu.my for arrangements.

The operational hours of the laboratories in Faculty of Science are 9.00 a.m. to 5.00 p.m. (Office hours) on Mondays to Fridays. The laboratories are not open on weekends and public holidays. To work out of these hours:

(a) Postgraduates, Postdocs & Research Assistants
Students are required to fill in the log book for working after office hours. The logbooks are located on every floor of Faculty of Science. For new postgraduates, kindly refer to the Deputy Dean (R&D and Postgraduate Programmes) if any further information is required.

(b) FYP & URS
Students may apply for extension by filling the form "After Office Hour Extension" (Appendix B) with the permission of your supervisor. This is subject to the approval of academic HoDs. Supervisors are required to be present throughout.

Keys may be borrowed if required. Refer to Appendix C for guidelines on borrowing keys to access the laboratories.

4.1 DISCIPLINARY RECORD SYSTEM

This disciplinary record system is applicable to Undergraduate Research Scheme and Final Year Project students. After attending the safety briefing, students are required to register in the disciplinary record system (link: https://fyp-disciplinary.bubbleapps.io/) and the system will take effect immediately. The list of offenses and action taken is tabled in Appendix D.

5 PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE refers to equipment which will protect the user against health or safety risks at work. PPE can include clothing, gloves, eye protection, footwear, etc. It is important for PPE to be properly fitted and has to be properly removed and disposed to avoid contamination to self, others and the environment. The proper sequence for putting on and removing PPE is shown in Table 5.1 and Table 5.2 respectively.

Any person who enters the laboratory should be appropriately attired. The following dress code should be adhered to:

- Long pants
- Closed-toed shoes
- Long hair must be tied to the back
- Laboratory coat
- Any additional PPE according to work performed. Eg: goggles, etc.
  (Refer to Section 5.1 to Section 5.6).

Students who are found to violate the dress code will be asked to leave the laboratory immediately. Disciplinary action will be taken and students will be barred from entering the laboratory.

1. GOWN • Fully cover torso from neck to knees, arms to end of wrists and wrap around the back • Fasten in back of neck and waist	
2. MASK OR RESPIRATOR • Secure ties or elastic bands at middle of head and neck • Fit flexible band to nose bridge • Fit snug to face and below chin • Fit-check respirator	
3. GOGGLES OR FACE SHIELD • Place over face and eyes and adjust to fit	
4. MASK OR RESPIRATOR • Extend to cover wrist of isolation gown	

Table 5.1: Sequence for putting on PPE.
(Source: http://resiliencesystem.com/fr/node/7156)

1. GLOVES • Outside of gloves is contaminated! • Grasp outside of glove with opposite gloves hand; peel off • Hold removed glove in gloved hand • Slide fingers of ungloved hand under remaining glove at wrist • Peel glove off over first glove • Discard gloves in waste container	
2. GOGGLES OR FACE SHIELD • Outside of goggles or face shield is contaminated • To remove, handle by head band or ear pieces • Place in designated place for reprocessing or in waste container	
3. GOWN • Gown front and sleeves are contaminated! • Unfasten ties • Pull away from neck and shoulders, touching inside of gown only • Turn gown inside out • Fold or roll into a bundle and discard	
4. MASK OR RESPIRATOR • Front of mask/respirator is contaminated- DO NOT TOUCH! • Grasp bottom, then top ties or elastics and remove • Discard in waste container	

Table 5.2: Sequence for removing PPE.
(Source : http://resiliencesystem.com/fr/node/7156)

5.1 EYE AND FACE PROTECTION

Eye protection should be worn at all times while working with hazardous chemicals, biological materials or physical hazards in the laboratory. The use of contact lenses is highly discouraged in the laboratory as it can complicate the injury in the event of an accident. Table 5.3 shows various types of protection for the eyes and face according to the work performed.

Table 5.3: Eye and face protection.

Safety glasses	Provide adequate eye protection from hazards such as minor chemical splashes.	
Splash goggles	Provide eye protection from chemical splashes and particles associated with grinding, broken glass, ect.	
Laser goggles	Reduces the transmittance of laser beams while maintaining visibility for the user.	
Face Shield	Provides additional protection to the user when used with safety glasses or splash goggles.	

5.2 HAND PROTECTION

Most accidents involving hands and arms are due to chemicals, cuts and abrasions, as well as change in temperature. Gloves are most commonly used to protect the hands. The correct utilization of hand protection can shield from potential chemical and physical hazards. Proper selection of gloves is essential as it acts as a barrier to the chemicals/biological materials/physical hazards. Table 5.4 shows the application of various types of gloves.

Table 5.4: Selection of gloves.

Disposable latex gloves	Resistant to ketones, alcohols, caustics, and organic acids. Suitable for use when handling biological materials and conforms to the ASTMD 6319, EN455 or EN374 standards.	
Nitrile gloves	Resistant to alcohols, caustics, organic acids, and some ketones. Suitable for use when handling biological materials.	
Cryogenic gloves	Protect hands from extremely cold temperatures.	
Polyvinyl alcohol gloves	Resistant to chlorinated solvents, petroleum-based solvents and aromatics.	
Cut-resistant gloves	Protect hands from cuts while working with sharp tools or sharps such as broken glass.	
Heat-resistant gloves	Protect hands against the hazards of high-heat.	

"Double-gloving" is a common practice when handling extremely hazardous chemicals such as ethidium bromide or phenol; whereby a pair of disposable gloves is worn on top of another. It is a good practice to check the condition of the gloves frequently to watch for signs of degradation such as tearing or changes in colour or texture.

Gloves should be properly removed and disposed to minimize contaminating the user and the surroundings. Figure 5.1 shows six easy steps to remove disposable gloves.

Figure 5.1: Proper removal of disposable gloves.
(Source: https://www.globus.co.uk/how-to-safely-remove-disposable-gloves)

5.3 PROTECTIVE CLOTHING

Long pants and covered shoes should be worn at all times in the laboratory. Loose or torn apparel should be avoided to reduce risks of entanglement.

5.3.1 LAB COAT

Lab coats must be worn at all times in the laboratory. The following are guidelines on the use of lab coats:

- Wear a lab coat that fits your body properly.
- Lab coats should be properly buttoned.
- Lab coats should not be worn outside of laboratories, except when going from one laboratory to another.

5.3.2 CHEMICAL RESISTANCE APRON

Chemical resistance aprons may provide extra protection when carrying out experiments. For example, a high-necked, calf or ankle length, rubberized laboratory apron should be worn when handling large quantities of corrosive liquids in open containers.

5.3.3 PLASTIC APRON

Single-use plastic aprons are recommended for general use when there is the possibility of sprays or spills, to protect clothes that cannot be taken off.

5.3.4 DISPOSABLE LAB COAT OR GOWN

Single use gowns are used to protect the laboratory user's body areas and prevent contamination of clothing with blood, bodily fluid, and other potentially infectious material.

5.3.5 TYVEK COVERALLS FOR BSL 3

Tyvek coveralls offer protection against liquid, oils, chemicals, and airborne elements. The material is made of high density polythene fibers that are resistant to wear and tear. By offering a high level of protection, it allows the user to focus on the task rather than worrying about risk of exposure.

5.4 RESPIRATORY PROTECTION

A respirator is a device designed to protect the user from inhalation of harmful substances. Examples of respirators are shown in Table 5.5. If used correctly, the respirator can protect the user from:

- Fumes and smokes. E.g.: welding fume
- Harmful dusts. E.g.: Lead, silica, and other heavy metals
- Gases and vapours. E.g.: Chemicals
- Oxygen deficiency.
- Biological hazards. E.g.: Tuberculosis, whooping cough, and flu viruses

Table 5.5: Types of available respirators.

Disposable particulate respirator	Protects user from dust inhalation. Can also be used for paint fumes, moderate level of organics, acid fumes, mercury; with limited protection. **N series**: No oil is present is present in the air. **R series**: Oil is present, only for single shift use. **P series**: Oil is present, use according to manufacturer instruction.	
Half face cartridge respirator	Most frequently used, especially when there is little or no problem of irritation or absorption of material through skin.	
Full face cartridge respirator	Similar to half-face respirators. However, mask covers the upper part of the face protecting the eyes.	

Users must inspect their respirators before and after every use. The following criteria should be met when checking:

- Sealing surfaces are clean and free of cracks and holes.
- Rubber and elastic parts have good flexibility; show no sign of deterioration.
- Inhalation and exhalation valves are clean.
- Straps are sufficiently elastic and free from worn areas.

A respirator should be replaced if it does not meet any of the above criteria.

<u>Additional notes - for cartridge respirators:</u>

- An effective seal should be ensured by performing a positive and negative pressure check (Figure 5.2).
- Check for scratches, smudges or any other damage that may impede visibility when using full face respirators.

Figure 5.2: Inspection of respirator to ensure proper seal. No leakage should occur. (Left) – Negative pressure check. (Right) – Positive pressure check.

5.4.1 DISPOSABLE PARTICULATE RESPIRATOR

Dust masks must be maintained in a clean condition by storing in a plastic bag before use. Masks are not meant to be shared. Dispose the mask if it is damaged, soiled or causes increased breathing resistance.

5.4.2 CARTRIDGE RESPIRATOR

For non-disposable respirators, cleaning and disinfection of the respirator is needed after each use. Filters and cartridges should be disassembled and washed with mild detergent in warm water. If the cleaning agent used does not contain a disinfecting agent, the components of the respirator should be immersed in a solution of sodium hypochlorite (30 mL household bleach in 7.5 L of water) before rinsing off with warm water and dried thoroughly. Organic solvents and high heat should not be used when cleaning and drying respirators to avoid damage to the elastic components.

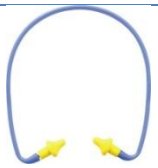
Respirators should be stored carefully to prevent damage from dust, heat, and moisture; as well as damage to the soft rubber components. Filters and cartridges should be removed and stored separately to prevent cross contamination.

Cartridges and filters should be changed periodically. If you experience resistance in breathing or detected breach of odour into the respirator, inspect the respirator and change the filter. In case of any damage to the respirator, the repairs should only be carried out by experienced personnel. Do not attempt to replace parts or make adjustments or repairs beyond the manufacturer's recommendations.

5.5 HEARING PROTECTION

According to OSH regulations, exposure to noise levels of 85 decibels and above will require the user to utilize hearing protection. Depending on the exposure levels and use, Table 5.6 shows devices which can be used.

Table 5.6: Types of hearing protection.

Disposable earplugs	Suitable for use in hot, humid or confined spaces.	
Reusable earplugs	Reusable earplugs are for a single user only.	
Headband plugs	Suitable for users who are working with equipment that has moving parts.	
Sealed earmuffs	Provide better protection for user who moves in and out of noisy areas frequently.	

5.6 FOOT PROTECTION

In laboratories, where there are chemical, biological as well as physical hazards; wearing proper foot protection is a must. Sandals, open-toed or similar perforated shoes must be avoided at all time. Shoes worn should be comfortable for the user. In certain cases, chemical-resistant rubber boots may be necessary. Shoe covers should be worn if user is working with a large amount of chemicals or if a chemical spillage occurs.

Figure 5.3: Shoe covers. These are usually used to protect the shoes when cleaning up a chemical spillage.

6 CHEMICAL SAFETY

6.1 HAZARD SYMBOLS

Hazard symbols are used to classify the hazards posed by the chemical product and communicate safety and health information on labels and safety data sheets. They are usually printed on the labels of chemical bottles to inform the user of the possible risks. Common hazard symbols are shown in Table 6.1.

Table 6.1: Hazard symbols and their descriptions.

Hazard Label	Description	Hazard Label	Description
	• Carcinogen • Respiratory sensitizer • Reproductive toxicity • Target organ toxicity		• Explosives • Self-reactive • Organic peroxides
	• Acute toxicity		• Flammables • Pyrophorics • Self-heating • Emits flammable gas
	• Skin irritation • Eye irritation • Skin sensitizers		• Compressed gases
	• Eye corrosion • Skin corrosion • Corrosive to metal		• Oxidizers • Organic peroxides
	• Aquatic toxicity • Harmful to environment		• Biohazards • Biohazard infectious materials

It is important to recognize the risks involved before handling each chemical in order to take suitable precaution steps when handling them.

6.2 SAFETY DATA SHEET (SDS)

The Safety Data Sheet (SDS) is a document that warns on the potential hazards (health, reactivity, fire and environmental) and how to work safely with the chemical. Information which can be found in an SDS include:

1. Production and Company Identification
2. Hazard Identification
3. Composition / Information on Ingredients
4. First Aid Measures
5. Fire Fighting Measures
6. Accidental Release Measures
7. Handling and Storage
8. Exposure Controls / Personal Protection
9. Physical and Chemical Properties
10. Stability and Reactivity
11. Toxicological Information
12. Ecological Information
13. Disposal Consideration
14. Transport Information
15. Regulatory Information
16. Others

It is vital to read the SDS before working with the chemicals and in cases of emergency, the SDS can be viewed in the laboratory office.

6.3 STORAGE OF CHEMICALS

Every container used to store chemicals should be in good condition and clearly labeled. If expansion of the container is observed, try to release the pressure by opening the cap slowly if possible. Otherwise, notify laboratory staff.

Chemicals should be stored in suitable cabinets, away from offices and without blocking any emergency exits. Ensure that the chemicals are stored in a well-ventilated area with controlled temperature. Fume hoods are not meant for chemical storage.

Care should be taken not to store incompatible chemicals close to each other. The following categories of chemicals should be kept separately: oxidizers, water reactives, flammables, acids, and caustics (bases). Examples of chemicals in these categories can be found in Appendix E. Separate cabinets are available for storage of acids and flammables in the common laboratory.

Compatible chemical groups are shown in Appendix F, while incompatible chemical groups are shown in Appendix G.

6.4 SPECIFIC HANDLING OF CHEMICALS

6.4.1 HANDLING OF CORROSIVES

Glass bottles used for storing corrosive liquids should be stored in acid cabinets or on polyethylene trays. They should be stored below eye level away from metal containers. There should be no heat source nearby.

The dilution of acid releases heat (exothermic). As such, the pouring of acids should be done slowly to avoid a vigorous reaction.
CAUTION: Always add acid to water when diluting acids.

6.4.2 HANDLING OF FLAMMABLES AND COMBUSTIBLES

Flammable liquids: solvents with flashpoint below 37.8 °C.
Combustible liquids: solvents with flashpoint above 37.8 °C.

Flammable and combustible liquids should be stored in the flammables cabinet. These liquids should only be used in the fume hood after ensuring that there are no heat sources nearby. Use nitrile gloves when handling these liquids.

6.4.3 HANDLING COMPRESSED GASES

Gas cylinders should be safely secured at all times whether or not it is in use. Ensure that the area is well ventilated when compressed gases are used. Whenever the gas regulator is removed, a valve protection cap should be used.

Cylinders of compressed gases are potentially able to release energy causing the tank to be a projectile. Be careful not to drop a cylinder and avoid collision with other objects. Use a gas cylinder trolley when moving/transporting tanks.

6.4.4 HANDLING OF CRYOGENS

Common cryogens used in the laboratory are liquid nitrogen and liquid helium. Always wear proper protective clothing and cryogenic gloves which are always available near the location of cryogenic tanks. Be careful to avoid spillage and contact with cryogens as it will cause frost bite.

Do not vent cryogenic storage tanks in an enclosed area as asphyxiation may occur. The buildup of pressure in cryogenic tanks can cause explosions. Always use only specific containers and tools which are made to withstand the extreme low temperatures without turning brittle.

6.4.5 HANDLING OF CARCINOGENS – IN ELECTROPHORESIS

Chemicals used in electrophoresis (both agarose and SDS-PAGE) are often hazardous. Examples include:

- Ethidium bromide – mutagen, irritant
- Acarylamide – Carcinogen, neurotoxin, irritant
- Phenol – corrosive, toxic, irritant
- Chloroform – suspected carcinogen, toxic

As such, care is to be taken when handling these materials.

GENERAL WORK PRACTICE

Agarose Gel Electrophoresis

The microwave is used to melt the agarose in a buffer solution. Aluminum foil cannot be microwaved, ensure that it is not used to cover the conical flask when microwaving. Heat the agarose in short durations, mixing well in between heating until all the agarose is melted. Allow the solution to cool down to approximately 50 – 60 ºC before pouring into casting trays. Wear heat resistant gloves and point the flask away from you.

Where possible, use safer alternatives to ethidium bromide for staining of agarose gel. If using ethidium bromide, bring only the agarose gel to D105A for staining. Do not bring other materials such as gel tray, electrophoresis set, ect.

Apply double layers of gloves (Refer to Section 5.2) when handling ethidium bromide. After staining and viewing of gel, immediately dispose contaminated gel and gloves into the designated bin. Wash your hands before leaving this laboratory.

6.4.6 HANDLING OF FOOD SAMPLES IN THE LABORATORY

All edible samples meant for experiment purpose shall not be eaten after the samples are brought into laboratory except for Food Science Laboratory. All apparatus and facilities are assumed to be contaminated with chemicals. As such, edible items are no longer safe for consumption after coming into contact with these apparatus or chemicals. The use of personal apparatus in the laboratory is discouraged to avoid contamination.

7 ENGINEERING CONTROL

Engineering controls refer to a vast spectrum of interventions with the purpose of reducing or eliminating a worker's exposure to chemical or physical hazards. It is a physical modification to a process or equipment to prevent release of contaminants into the workplace. The engineering control used depends on the process, nature of the contaminant, and route of exposure (inhalation, dermal, or ingestion). A successful isolation of contaminants usually is made up of several engineering controls. Several common engineering controls are described below. It is vital to differentiate between the following three engineering controls: fume hood, laminar air flow and biosafety cabinet.

7.1 LABORATORY FUMEHOOD

Fumehood, also known as Local Exhaust Ventilation (LEV) is one of the best engineering control methods available with the aim to ***reduce the risks of exposure to hazardous or toxic fumes, vapors or dust***. It is used to exhaust hazardous vapours and flammable gases from escaping to general areas. Fume hoods are not meant for storage of chemicals. Excessive materials in the fume hood can cause blockage of air vents leading to changing of airflow patterns, thus reducing its efficiency. For a quick test to ensure that the fume hood is operational, place a piece of paper at the sash and observe the flow of air.

GUIDELINES – USING A FUME HOOD

- The sash of the fume hood functions as a physical barrier between the user and the environment in the fume hood. The sash of the fume hood should be kept as low as possible (no higher than 50 cm) to ensure efficiency of the fume hood.
- For optimum elimination of fumes, place the materials 15 cm from the vents. Do not block the baffle opening at any time (Figure 7.1).

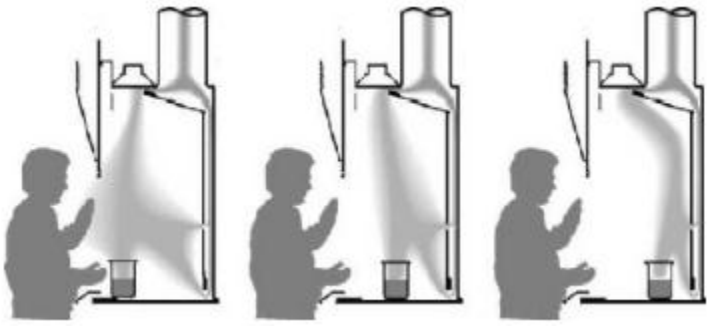


Figure 7.1: Placement of materials in a fume hood. (Left to right) Bad placement, good placement, and optimum placement.

- If equipment has to be placed in the fume hood, the equipment should be raised 2.5 cm above the work surface to improve air circulation. Test tube racks made of metal or wood blocks can be used to raise the equipment provided they are not reactive with the chemicals used in the fume hood (Figure 7.2).

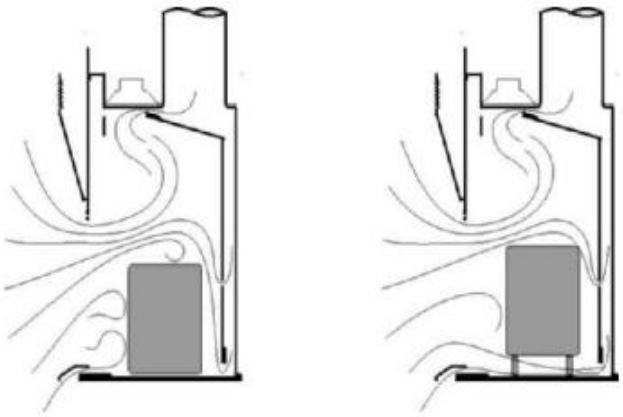


Figure 7.2: Placement of equipment in a fume hood. (Left to right) Before and after raising of equipment using a metal rack.

- Minimize movements in front of the fume hood when it is in use. Ideally, all the doors and windows should be closed. With these precautions, the chances of hazardous fumes being released into the laboratory will be reduced.

7.2 LAMINAR FLOW CABINETS

Laminar flow cabinets only offer protection to the ***biological specimens from contaminants in the air*** by creating a particle free environment. They do not provide protection to the user and should not be used for handling infectious materials. It is usually used for pouring agar plates, transferring of medium and transfer of biosafety level I microorganisms (Refer to Section 7.3). The direction of air flow in a laminar flow cabinet is shown in Figure 7.3.

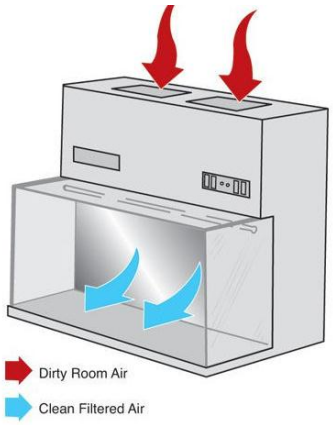


Figure 7.3: Air flow of a laminar flow cabinet.

GUIDELINES ON USING A LAMINAR FLOW CABINET

- The fan should be allowed to run during use starting from 5 minutes prior and kept on for 5 minutes after completion of work. Before and after work, the surface of the interior should be surface sterilized with 70 % ethanol. All BSCs comes with UV lights. UV lights should be turned off when the cabinet is in use. Ensure the cleanliness of the UV bulb by wiping it with alcohol moisten cloth weekly as dust can reduce the transmission of UV rays.
- Plan the work properly by placing all the required materials in the BSC in an arranged manner so that used items do not contaminate the clean ones. Clean cultures (left) can be inoculated (middle) and contaminated pipette tips can be discarded (right).
- Observe a 10-15 cm working distance from the front of the BSC. All the work should be conducted on the tray and not over the grille. Avoid rapid or sudden movement as the action can disrupt the airflow pattern.
- Exercise caution when using a Bunsen burner in a BSC as the heat released will harm the HEPA filters as well as disrupt the airflow pattern. Heat contamination can be eliminated or minimized by using sterile disposable items.

7.3 BIOSAFETY CABINETS

Biosafety cabinets are a form of biocontaintment which is a safe method for managing biological infectious materials in the laboratory ***to reduce or eliminate exposure to the laboratory occupants and the environment outside***. Biocontaintment can be categorized by the effect to the environment as biological safety levels (BSL) and there are four categories namely BSL1 to BSL4. A summary of these four categories are shown in Table 7.1.

Biosafety Level 1 (BSL1) - involves well studied organism which are not known to consistently cause disease in healthy adults and ***pose minimal hazards to the user and environment*** (CDC, 1997). At this level, precautionary measures are minimal with just gloves and facial protection. Work can be conducted even on an open bench using standard microbiological practices.

Biosafety Level 2 (BSL2) – similar to biosafety level 1 but involves ***moderate potential of hazard to the user and environment***. It includes bacteria and viruses which can cause mild disease to humans but is difficult to spread via aerosol in the lab. Genetically modified organisms (GMO) are also categorized as biosafety level 2 organisms. Users must receive training in handling these pathogenic microorganisms before beginning lab work. In cases where the infectious organism can be transferred via aerosol or splash, a Biological Safety Cabinet (BSC) is to be used.

Biosafety Level 3 (BSL3) – involves clinical, diagnostic, teaching, research or production facilities which are ***working with indigenous or exotic agents which can cause serious or lethal diseases after inhalation***. It includes bacteria and viruses which cause severe to fatal disease to humans but for which treatment exists. All the work has to be carried out within biological safety cabinets.

Biosafety Level 4 (BSL4) – involves exotic agents that can pose a ***high risk of aerosol-transmitted laboratory infections which can cause severe to fatal disease in humans for which vaccines or treatments are not available***. Laboratory users are to be trained in handling extremely infectious agents and understand all the safety practices. All activities have to be confined in Class II or III biosafety cabinets with one-piece positive pressure personnel suits ventilated with life support system.

It is important to select a suitable biosafety cabinet for use based on the microorganisms handled. BSCs are equipped with high efficiency particulate air (HEPA) filters. There are 3 classes of BSCs. The different classes of BSCs are described below:

7.3.1 CLASS I BSC

The air circulates within the laboratory, enters the work space and exits through the HEPA filter after going through the rear plenum. Class I BSC offers protection to the user and environment, but it does not protect research materials from environment contamination. Figure 7.4 (left) shows the direction of air flow in Class I BSCs.

7.3.2 CLASS II BSC

The air from the laboratory is drawn through the supply grille at the front of the work area and enters the rear plenum, passing through a fan. Portions of air pass through an exhaust filter or supply filter. Only HEPA filtered air is in contact with the work area, providing protection of research materials from environment contamination. Only a limited amount of chemicals can be used in Class II (Type B) BSC as they discharge the air into building exhaust systems. Figure 7.4 (middle) shows the direction of air flow in Class II BSCs.

7.3.3 CLASS III BSC

These BSCs are totally enclosed, gas-tight cabinets designed for work with the riskiest pathogens. The air is filtered before being removed. An example of a Class III BSC is shown in Figure 7.4 (right).

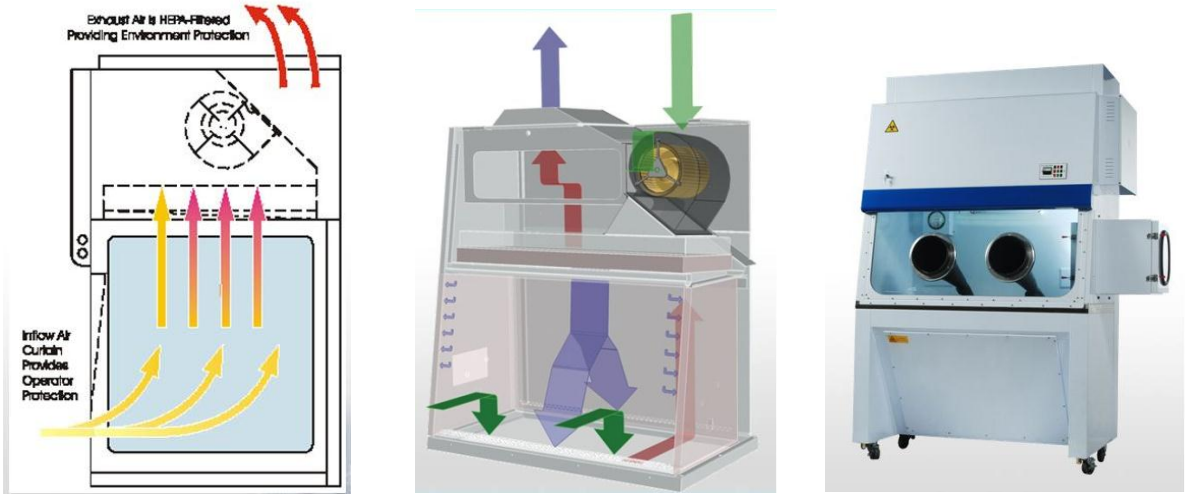


Figure 7.4: (left to right) Class I, Class II and Class III BSC. Class I and II BSC exhausts filtered air back into the laboratory. As such, chemicals which release hazardous vapours must not be used in these BSCs. Most BSCs have a removable work surface tray and front grille; the space underneath requires regular clean up to avoid contamination. It is recommended to perform disinfection with 10 % bleach followed by 70 % ethanol regularly.

Table 7.1: Summary of BSL1 – BSL4.

Biosafety Level	BSL1	BSL2	BSL3	BSL4
Infectious Agents	Unlikely to cause disease in healthy humans or animals Low individual and community risk	Can cause human or animal disease but unlikely to be a serious hazard Moderate individual risk, limited community risk Effective treatment available	Cause serious human or animal disease but not usually spread by casual contact High individual risk, low community risk	Cause very serious human or animal disease, often untreatable and transmitted High individual risk, high community risk
Examples of infectious agents	-	E. coli, California encephalitis viruses, many influenza viruses	Anthrax, Q fever, tuberculosis, Hantaviruses, HIV	Ebola viruses, Herpes B virus (Monkey virus), foot and mouth disease
Safety Practices	Hand washing facilities, PPE, autoclave	Class I BSC plus autoclave, PPE	Class II BSC plus autoclave, PPE to include solid front laboratory clothing, head covers, dedicated footwear, gloves, appropriate respiratory protection	Class III BSC, positive pressure ventilated suits
Admin Control	Basic safe laboratory practices	Use of PPE, laboratory coat worn only in the laboratory, gloves, decontamination	Users must be fully trained, written protocols, showers, waste disposed of as contaminated, use of BSC & PPE	Access only to certified staff, rigorous sterilization/ decontamination procedure

7.4 USAGE OF INSTRUMENTS

Users are required to comply to the operating procedures for the usage of instruments. A logbook is provided beside most of the equipment. Users are required to record the usage of the instrument in the logbook after every use. Failure to do so will result in penalties being imposed; please refer to Appendix D for the list of disciplinary offenses.

7.5 BOOKING OF INSTRUMENTS

All equipment needs to be booked prior to use. Booking of common equipment such as centrifuge, water bath, drying oven, shaking incubator, etc will be in the form of sticky labels. The label should display information as follows; name, contact number, duration, and supervisor's name. Booking of mid-range equipment such as rotary evaporator, double beam spectrophotometer, etc can be made online. Please refer to laboratory staff for further information. Laboratory management has to the right to cancel the booking slot if the user is late by 15 minutes.

7.6 BREAKDOWN OF INSTRUMENTS

Breakdown of instruments needs to be reported to laboratory staff without any delay. The report should include the name of instrument, model, location and problem encountered. Please refer to Appendix H for the SOP on reporting breakdown of instruments.

8 DISINFECTION

Disinfection is a process of eliminating all pathogenic microorganisms on objects with the exception of those with large numbers of bacterial endospores. The following are the groups of microorganisms according to decreasing resistance to disinfectants; bacterial endospores, mycobacteria, nonlipid or small viruses (poliovirus, rhinovirus), fungi, vegetative bacteria, and lipid or medium sized virus (herpes simplex, HIV, HBV).

GUIDELINES FOR DISINFECTION

- If available, follow instructions on label for dilution of disinfectant and time required for optimal disinfection. Failure to comply to instructions may render the disinfectant ineffective. Disinfectants requiring pre-use dilution must be treated as hazardous chemicals while mixing.
- Clean surfaces that may have been contaminated at the end of the task.
- Choose or start using disinfectant with lowest possible of toxicity. The most common disinfectants used are alcohols and bleach. Table 8.1 shows a summary of the common disinfectants used in a laboratory.

Table 8.1: Summary of common disinfectants.

Disinfectant	Disinfection Level	*1	2	3	4	5	Remark
Alcohols (Ethanol or Isopropanol)	Intermediate	+	+	–	+/–	+	- evaporates quickly - flammable
Phenolics (0.4% - 5 %)	Intermediate	+	+	+/–	+	+	- penetrates latex gloves - irritates eyes/skin - may leave residue
Glutaraldehyde (2%-5%)	High	+	+	+	+	+	- for un-autoclavable items - strong odour
Quarternary Ammonium (0.5%-1.5%)	Low	+	+	–	–	+/–	- ineffective against gram-negative bacteria, - low odour
Iodophors (30-1000 ppm iodine)	Intermediate	+	+	+	+/–	+/–	- inactivated by organic matter
Chlorine (100-1000 ppm)	Intermediate	+	+	+	+/–	–	- prepared daily - corrosive - irritant to eyes/skin

* 1=Bacteria, 2=Lipophilic Viruses, 3=Hydrophilic Viruses, 4=Mycobacterium, 5=Fungi

+ indicates suitable disinfectant, − indicates unsuitable disinfectant

8.1 USING ALCOHOL AS SURFACE DISINFECTANT

The most commonly used surface disinfectant in the laboratory is 70 % ethanol. Spray the surface that is in need of disinfection with 70 % ethanol and wipe dry with a paper towel or cloth before any work is done. Exercise caution as traces of alcohol on gloves or any apparatus can catch fire if exposed to an open flame such as lighted Bunsen burners. Ethanol is a highly flammable solvent and is near colourless when ignited. Care should be taken when handling apparatus such as inoculating loops and "hockey sticks". Ensure that the tools are cooled down before dipping them into the ethanol solution.

8.2 USING BLEACH AS SURFACE DISINFECTANT

Household bleach contains sodium hypochlorite which is a strong oxidizing agent which can disinfect potentially infectious materials. It is recommended that freshly diluted bleach be used as sodium hypochlorite in bleach can break down into salt and water; hence losing its disinfecting ability. A ratio of 1:10 bleach and water (final concentration approximately 0.5 %) is suitable for routine cleaning and disinfecting. Bleach is a corrosive chemical. It can cause corrosion on stainless steel. However, this residue can be cleaned with 70 % ethanol or water. As bleach and ammonia can react to produce chloramine which is a type of respiratory irritant; it is advisable not to mix bleach with other cleaning agents which contain ammonia.

8.3 USING BLEACH AS SPILLAGE DISINFECTANT

Household bleach can be used to clean up biohazard spillage by preparing 10000 ppm chlorinated solution (1mL of 5% sodium hypochlorite in 5mL of water). Allow at least 20 minutes of contact time before the spillage is cleaned up.

8.4 USING PEROXIDE-BASED DISINFECTANT (e.g. Virkon)

Peroxide-based disinfectants can also be used besides bleach and alcohol based. One of the commonly available products is Virkon®. Follow the instructions provided strictly.

8.5 USING CHLORINE-BASED DISINFECTANTS (e.g. Germisep)

Besides household bleach, other chlorine-based disinfectants are also available, such as Germisep®. Follow the instructions provided strictly.

8.6 USING STEAM AS DISINFECTANT (AUTOCLAVING)

The autoclave machine will be handled by laboratory assistants, 3 times a day according to the pre-determined schedule. Please refer to the schedule on the door of D014B-1. Users are required to record their items in the logbook, and place the items to the designated rack. When the queue is long, priority will be given to medium and agar. Once autoclaved, the items will be placed on a bench in D014B for collection; while medium and agar will be placed in the oven in D014B.

9 WASTE MANAGEMENT

Waste should be kept in suitable containers and locations before they are disposed. Table 9.1 indicates suitable materials to be used for the storage of waste.

Table 9.1: Suitable materials for storage of waste.

Waste	HDPE	Glass	Metal	Biohazard Bag
Halogenated solvents		√	√	
Non-halogenated solvents	√	√	√	
Aqueous waste	√	√	√	
Acidic/Basic Waste	√	√		
Mixture of the above	√	√		
Biological solids				√
Biological liquids				√ **(Double bag)**

9.1 HAZARDOUS WASTE

Hazardous waste comprise of any substance which will be hazardous to living organisms when discharged. Most of the chemicals in the laboratory can be classified as hazardous waste except for uncontaminated aqueous buffers such as phosphates or bicarbonates. Hazardous waste should not be discharged into the natural environment. If in doubt, please consult the laboratory staff. The safety data sheet (SDS) can be referred to for correct disposal of hazardous materials. Always try to minimize the amount of waste generated. A simple guideline is provided in Appendix I.

DISPOSAL OF HAZARDOUS WASTE

- Wear suitable PPE when handling waste (goggles, lab coat and nitrile gloves).
- A suitably-sized container should be chosen depending on the volume of waste. Waste bottles should be labelled before use. Labels can be obtained from the respective Laboratory Office.
- Do not completely fill the bottle; only fill up to 80% of the container.
- Do not mix incompatible chemical waste (Refer to Appendix G).
- Temporary hazardous waste storage is located at the back of D012B. Once containers are 80 % filled, move them to the temporary storage.

9.2 SHARPS

9.2.1 BROKEN GLASSWARE

Broken glassware should be disposed into the designated black bin labeled “BROKEN GLASSWARE ONLY”. The glassware should be free from chemical residues. Any breakage should be reported to the laboratory office; the form for glassware breakage can be obtained from the laboratory office.

9.2.2 BIOLOGICAL SHARPS

Used needles, razors, scalpel blades and other similar items should be discarded into the sharps bin. A sample is shown in Figure 9.1. These sharp items should not be left unattended as it may cause cuts. Ideally, sharps bin should be kept close to the location where sharp items are used. Used needles should never be recapped, sheared, broken or bended under any circumstances. Sharp waste should not exceed two thirds of the container.

Figure 9.1: Sharps bin used for disposal of sharp items.

9.3 BIOHAZARD WASTE

Biohazard waste refers to waste containing any human or animal anatomical part or fluid, bacteria, fungus, and microorganisms.

DISPOSAL OF BIOHAZARD WASTE

- Biohazard waste is to be disposed in biohazard bag. They can come in a variety of colours such as transparent, yellow, blue or red.
- Separate plastic ware such as tips and centrifuge tubes from liquid waste to prevent punctures. All biohazard waste should be double bagged to minimize spillage.
- Biohazard waste can be disposed in D015C on working days.

9.3.1 ANIMAL CARCASS

Animal carcass should be packed into biohazard bags and tied securely. They bags are to be placed into a designated freezer located in D014B until the day of disposal for inceneration.

9.3.2 GENETICALLY MODIFIED ORGANISMS

Waste containing genetically modified organisms should be autoclaved before the waste can be transferred to the biohazard waste room in D015C on working days. Only the autoclave for waste located in D015C can be used for this purpose.

9.4 CARCINOGENIC WASTE

Gloves and other materials contaminated with carcinogenic waste (e.g. agarose gels) are to be disposed in the designated area in D105A only. The decontamination process will be carried out by laboratory staff.

10 EMERGENCY RESPONSE

In the event of an accident or emergency, time is of the essence. It is important to identify the cause and respond in a suitable manner to minimize damage and hazards to users of the laboratory. The flowchart for response procedure in an emergency can be found in Appendix L. The SOP for handling emergency/accident in laboratory involving student can be found in Appendix J. All incidents (including accidents, near miss, dangerous occurrence, ect.) should be reported as shown in Appendix K. General emergency contact numbers are listed in Appendix M.

10.1 CHEMICAL SPILL

For hazardous chemicals, immediately inform the laboratory staff. Proper PPE with the aid of the Safety Data Sheet (SDS) is crucial in avoiding bodily injury and exposure to hazards. Spill kits are available in all laboratory offices. Read the emergency and medical procedures highlighted in the SDS before cleaning up the chemical spillage.

For indoor spillage:

- Eliminate source of ignition if the spillage involves flammable materials.
- Prevent the spread of the spilled chemical with absorbent materials and immediately turn on fume hoods/ventilators to promote air circulation.
- Remove any obstacles near the spilled area and inform the nearest Laboratory Office.
- Perform clean up and dispose the waste generated accordingly.

For outdoor spillage:

- Contain the spill using suitable materials. E.g. spill kit, spill pillow or sand.
- Cordon off the affected area. Do not leave the affected area unattended.
- Inform the nearest laboratory office, providing the location of spillage and the name of the spilled chemical.

Please refer to Appendix N for details of the Chemical Spill Response Team members.

EMERGENCY SHOWER AND EYE WASH STATION

Emergency showers and eye wash stations provide on-the-spot decontamination and reduce serious injuries. A sample is shown in Figure 10.1. Emergency showers should not be obstructed and be readily available. The lid of the eye wash station must be closed when not in use to prevent accumulation of dust. The use of emergency showers and eye wash stations are dependent on location of spillage:

Body: Wash affected areas thoroughly using emergency shower for 15 minutes before removing contaminated clothing.

Eye: Flush eyes thoroughly at eye wash station for 15 minutes.

Report immediately to nearest Laboratory Office, providing name of chemical spilled. If further treatment is needed, bring along the SDS to the attending doctor.

Figure 10.1: Emergency Shower and Eye Wash Station

10.2 BIOLOGICAL SPILL

Cordon off the affected area and notify laboratory staff immediately. Appropriate PPE such as shoe cover, gloves, lab coat, goggles, and face mask must be worn. Pour disinfectants (70% ethanol or 10% bleach solution) on the spill. Cover the spill with paper towels and allow 30 minutes of contact time. Place all the contaminated materials into a biohazard bag and autoclave it. Wash the area again with disinfectant. Do not pick up any glass shards (if any) with bare hands, use a dust pan instead. Wash hands with soap after the disinfection process. The biological spill kit is available in D015, D105, and D204.

Please refer to Appendix O for details of the Biological Spill Response Team members.

10.3 MERCURY SPILL

Mercury vapours are highly volatile and toxic. Cordon off the affected area and notify laboratory staff immediately. Small amounts of mercury can be collected using a mercury disposal kit. When larger droplets are removed, use mercury neutralizing solution (20% calcium sulphide or saturated sodium thiosulphate) to wash the affected area.

Note: If the spillage is very large (e.g. broken manometer), the area has to be evacuated and warning signs erected. Inform laboratory staff immediately.

10.4 FIRE

Every laboratory user must be aware of the location of the fire extinguisher, fire alarm and emergency exits. In the event of fire, attempts to extinguish the fire should only be carried out if the situation is safe and the user is able to handle a fire extinguisher. All fire extinguishers in Faculty of Science can be used for Class A, B, and C fires. Class D fires are made up of combustible metals such as sodium, potassium, lithium or other metals which can be oxidized easily. Class D fires can only be extinguished using sand.

- **DO NOT ENDANGER YOURSELF.**
- Immediately vacate the building following the emergency escape routes. DO NOT USE ELEVATORS.
- Immediately inform laboratory staff or the Department of Safety and Security.

If clothing is on fire, put out fire using emergency shower or roll on the floor. If fire blanket is available, use the fire blanket to put off the fire and remove the fire blanket once the fire is put out. **DO NOT USE THE FIRE EXTINGUISHER ON HUMANS.**

10.5 INHALATION OF CHEMICAL VAPOURS

Immediately move away to an area with fresh air. Keep calm and keep breathing. Inform laboratory staff and seek further treatment if necessary.

10.6 INGESTION OF CHEMICALS

Do not induce vomiting. Never give anything by mouth to an unconscious person. Inform laboratory staff and consult a doctor immediately, providing the name of the ingested chemical.

11 FIRST AID

First aid is the immediate treatment or care given to a victim of an accident or sudden illness before qualified health personnel attends to provide treatment. Most of the laboratory staff are qualified first aiders. They can be approached in their respective offices in the event of an emergency. The aims of first aid are to:

- Preserve life
- Prevent injury from worsening
- Reduce pain
- Care of unconscious

The standard operating procedures can be found in Appendix P.

FIRST AID KITS

First aid kits are available in most of the laboratory and in all the laboratory offices. In the case of emergency and first aid treatment is required; please approach laboratory staff for help. If you do not know how to use the first aid kits, kindly ask for help. Improper handling of first aid kits will expose other users to risk of infection.

Table 11.1: Contents of a Basic First Aid Kit.

Content of a First Aid Kit
Absorbent gauze
Adhesive bandages
Roller bandage
Scissors and tweezers
Triangle bandages
Antiseptic cream
Sterile eye pads
Adhesive tape
Alcohol wipe
Burn sheet
Safety pins
Cotton wool

APPENDIX A

Universiti Tunku Abdul Rahman
Faculty of Science

STANDARD OPERATING PROCEDURE

Title: Undergraduate Research Scheme Student SOP in Faculty of Science

Document no.: **FS-LMSA-SOP-URS**	Lab Location: **All FSc laboratories**
Issue Date: **25 July 2018**	Revision No: **00**
Prepared by: **Ooh Keng Fei**	

A . Safety & Health Briefing Registration

- **Safety and Health briefing will be held once in every semester (3 times in a year). Failure to attend this briefing will disqualify the URS student from entering the laboratory.**
- **This Safety and Health briefing is a briefing organized by Faculty of Science and it is totally different from the Workshop organized by IPSR.**

1. URS student shall fill up a form pertaining registration in D011 this includes student who is in the process of registration with IPSR.
2. Announcement of briefing will be made known to all registered students.
3. Safety and Health Briefing will be conducted on week 3 and week 10 on long semester, week 4 on short semester.
4. URS student will receive a URS tag upon briefing.
5. The URS tag has to be worn at all time during their period in the laboratories.
6. URS student who wish to enter postgraduate laboratory in D213A & B must be accompanied by their respective postgraduate student under the same supervisor at all times.
7. Working hours for URS student is from 9.00 a.m to 5.00 p.m. If URS student need extension, the extension procedure shall follow **After Office Hour Extension SOP.**
8. A copy of briefing attendance will be circulated to all Department Representative, Dr Ooi Zhong Xian and Dr Phoo Lee Quen for record and notification. This includes information if particular student has any medical health condition.
9. It is compulsory for URS student to register themselves in the Disciplinary Record System.
10. All URS student shall return the URS tag to Mr Ooh Keng Fei (Nicholas) when they have completed their program.
11. Supervisors are to report to Mr Ooh Keng Fei (Nicholas), Dr Ooi Zhong Xian, and Dr Phoon Lee Quen when the URS student has completed the program.

APPENDIX B

Universiti Tunku Abdul Rahman

USE OF LABORATORY AFTER OFFICE HOURS
Application form

Applicant(s)

Student Name			
Student ID			
Email Address			
Contact number			
Programme			
Year/Semester			
Signature			

Project details

Project Title			
Project Supervisor			
Lab Name		Room No	
Date	From to	Time	From to
Comments from supervisor		Signature	
Date			

Approval from Head of Dept / Dean

Name		Signature	
Date			

**A copy shall be given to the lab coordinator/lab staff*

Note:

- *Students shall be liable for any damages of laboratory properties due to individual negligence as agreed in the student's declaration form.*
- *Damages/missing of equipment must be reported to the lab staff immediately.*

APPENDIX C

Universiti Tunku Abdul Rahman **Faculty of Science** **STANDARD OPERATING PROCEDURE**	
Title: **Laboratory Key Borrowing for Working after Office Hours, Weekends or Public Holidays**	
Document no.: **FSc/LMSA/SOP/Key**	Lab Location: **All FSc laboratories**
Issue Date: **10 October 2017**	Revision Date:
Prepared by: **Ooh Keng Fei**	HOD Approval Signature:

A) For <u>Final Year Project</u>:

1) Undergraduate students need to apply for extension by filling up the form in the laboratory office (Appendix B – Use of Laboratory After Office Hours) and submit to HOD for approval.
2) After approval from HOD, supervisor needs to request for the key online.
   Link: https://goo.gl/forms/i9BWxWjOXfIxWErd2
3) Supervisor obtains the key(s) required from LMSA staff. Approved extension form is to be submitted to LMSA staff. Supervisors to record in key-borrowing logbook the key(s) taken. LMSA staff to update the online key-borrowing logbook.
4) Supervisor must return the key(s) latest by 12.00 p.m. the next working day or as requested.
5) Supervisors to record in key-borrowing logbook the key(s) returned. LMSA staff to record returning of key(s) in online key-borrowing logbook.

*Laboratory keys should not be held by undergraduate students.

B) For <u>Postgraduate</u>:

1) Postgraduate student to submit online request for key(s).
   Link: https://goo.gl/forms/i9BWxWjOXfIxWErd2
2) Keys to postgraduate labs – maximum loan duration: 1 year. To be renewed on a yearly basis if necessary.
3) Keys to teaching labs – to be returned latest by 12.00 p.m. the next working day or as requested.

4) Postgraduate student to obtain the key(s) requested from LMSA staff. Postgraduate student to record key(s) taken in key-borrowing logbook. LMSA staff to update the online key-borrowing logbook.
5) Postgraduate student to record name and lab details in the logbook for postgraduates working after office hours.
6) Postgraduate student must return the key(s) as stated in the online record (expected return date).
7) Postgraduate student to record in key-borrowing logbook the key(s) returned. LMSA staff to record returning of key(s) in online key-borrowing logbook

*All key(s) must be returned prior to the submission of the final revised copies of dissertation to IPSR. Students will not be recommended to the Board of Examiners for the award of PhD/Master degree if they fail to return to the key(s) as scheduled.

C) For <u>Staff</u>:

1) Staff to submit online request for key(s) and obtains the key(s) required from LMSA staff. Staff to record in key-borrowing logbook the key(s) taken. LMSA staff to update the online key-borrowing logbook.
2) Staff must return the key(s) latest by 12.00 p.m. the next working day or as requested. Staff to record in key-borrowing logbook the key(s) returned. LMSA staff to record returning of key(s) in online key-borrowing logbook.

D) The key holders **should not**:-

1) Loan key(s) without authorization to another person.
2) Duplicate key(s)
3) Alter key(s), lock(s), and/or mechanism
4) Propping of door / leave door unlocked
5) Admit unauthorized person(s) into FSc's laboratories.

E) The key holders are responsible in ensuring that **all the lights, air conditioning and unused instruments have been turned off and the laboratory door is locked** before leaving; or when you leave the lab for any period of time during the evenings and weekends.

F) For late return of key(s), the persons who have borrowed the key(s) will be fined **RM 10.00** per key per working day.

G) Persons in violation of this key borrowing policy shall be issued a **warning letter** from the university and shall be assessed damage and/or replacement costs. All keys should be returned as requested or before permanently leaving the university.

APPENDIX D

LIST OF OFFENSES IN DISCIPLINARY RECORD

Policy	Examples	Action Taken
Abuse and misuse of chemicals	Weighing excess chemical without verifying the amount of the chemicals needed for experiment; Error in titration experiments include using the wrong concentration to begin with or prepared incorrectly; etc	1. Verbal warning and the offense will be recorded in the FYP disciplinary system.
Does not clean up laboratory work area when requested by lab staff or FYP coordinator	Absence without valid reason when spring cleaning is needed; does not participate in cleanup work; etc.	1. Verbal warning and lab staff or FYP coordinator reserve the right to request the student to clean up the laboratory areas on another day. The offense will be recorded in the FYP disciplinary system.
Abuse of misuse of the equipment/instrument	The equipment/instrument is mishandled; did not turn off the equipment/instrument after use; act of sabotage; not following the standard operating procedure (SOP) of the equipment/instrument; etc.	1. If student being caught by lab staff, the student will be barred from using the same type of equipment/instrument in FSc for 5 working days and will be recorded in the FYP disciplinary system. 2. If no student admitting the offense, all student will be barred from using the same type of equipment/instrument in the affected lab for 5 working days and will be recorded in the FYP disciplinary system.
Fail to fill out the logbook of the equipment/instrument before or after use		1. Verbal warning for first offense and will be recorded in the FYP disciplinary system. 2. Second offense onward, student will be barred from using the equipment/ instrument for 24 hours and recorded in the FYP disciplinary system.
Accident occurs due to neglect or reckless acts of students	Did not follow the safety instruction; adding water to concentrated acid; spillage due to negligence or careless	The student will be barred from entering the lab in FSc for 7 working days and will be

	actions; accident occurs caused by dropping chemical containers or when transporting the chemicals or corrosive solution without cap; etc.	recorded in the FYP disciplinary system and also will be reported to the Faculty Management.
Stay in the laboratory office hours and without approved extension form		1. Verbal warning and student are required to leave the laboratory immediately for first offense and will be recorded in the FYP disciplinary system. 2. Second offense onwards, the student will be barred from entering the lab for 48 hours and required to leave the laboratory immediately and also will be recorded on the FYP disciplinary system.
Stay in the laboratory after office hour with approved extension form but without supervision by supervisor or co-supervisor	Supervisor or co-supervisor does not monitor the student until the end of extension period.	The student will be barred from applying extension for subsequent 7 days and are instructed to leave the laboratory immediately and will be recorded in the FYP disciplinary system.
Not wearing the required Personal Protective Equipment (PPE) properly when handling chemical reagents	When the required PPE is not worn properly, this includes lab coat, goggles, close toed shoe, and gloves; etc.	1. Verbal warning and requested to wear the required PPE for first and second offense and will be recorded in the FYP disciplinary system. 2. Third offense onwards, student will be barred from entering the laboratory for 24 hours and will be recorded in the FYP disciplinary system.
Stay in the laboratory without appropriate attire or applying cosmetics	Wearing shorts, skirt, slippers, sandals, long hair not tied, etc.	Verbal warning and the student is only allowed to enter laboratory when the appropriate attire is worn and also recorded in the FYP disciplinary system.
Disposing waste without segregation, label, and categorization	Disposing any toxic or hazardous waste by pouring into sink; mixing halogenated and non-halogenated solvent together; waste container is not labeled or incomplete form submission; etc.	Verbal warning and will be recorded in FYP disciplinary system.

APPENDIX E
GUIDE TO COMMON CHEMICALS ACCORDING TO CLASS

Isocyanates & Cyanides	1) Alcohols 2) Aqueous solutions 3) Non-halogenated Solvents 4) Ketones	Strong Bases/Acids	Water Reactive	1) Strong Oxidizers 2) Peroxides 3) Strong Reducers	Metal hydrides/ Solid metals
Methylene diphenyl diisocyanate Toluene diisocyanate Hexamethylene diisocyanate Isophorone diisocyanate Methyl isocyanate HCN KCN	Methanol DNS Ethanol Hexane Pentane Acetone Acetophenone Etc Dilute acids Dilute bases	**Oxidizing Mineral Acids** H_2SO_4 HNO_3 Perchloric Chloric Chromic **Non-Oxidizing** HCl HF	Acetic Anhydride Acetyl Chloride Aluminum Bromide Aluminum Chloride Phosphorus Pentachloride Phosphorus Pentoxide Thionyl Chloride Li, Na, K metals and their hydrides	**Oxidizers** Ammonium persulfate H_2O_2 KNO_3 $KMnO_4$ & Manganates Nitric Acid & Nitrate Compounds Chromic/Dichromic acids Chlorates Chlorox (ClO^-) O^2, F_2, Br_2, Cl_2, I_2 **Reducers** Ba, Ca, Mg, Na, K, $LiAH_4$, $NaHB_4$	LiH NaH **Alkaline Earth Metals** Na, K, Li **Fine metal powder** Mg, Al, Zn

Appendix F
COMPATIBLE CHEMICAL GROUPS

INORGANIC

- metals, hydrides
- halides, sulfates, sulfites, thiosulfates, phosphates, halogens
- amides, nitrates * (except ammonium nitrate), nitrites, azides *, nitric acid
- hydroxides, oxides, silicates, carbonates, carbon
- sulfides, selenides, phosphides, carbides, nitrides
- chlorates, perchlorates*, perchloric acid*, hypochlorites, peroxides*, hydrogen peroxide
- arsenates, cyanides, cyanates
- borates, chromates, manganates, permanganates
- acids (except nitric acid)
- sulfur, phosphorus, arsenic, phosphorus pentoxide*

ORGANIC

- acids, anhydrides, peracids
- alcohols, glycols, amines, amides, imines, imides
- hydrocarbons, esters, aldehydes
- ethers*, ketones, ketenes, halogenated hydrocarbons, ethylene oxide
- epoxy compounds, isocyanates
- peroxides, hydroperoxides, azides*
- sulfides, polysulfides, nitriles
- phenols, cresols

* Exercise extra caution when handling these chemicals due to their instability.

Appendix G
INCOMPATIBLE CHEMICALS GROUPS

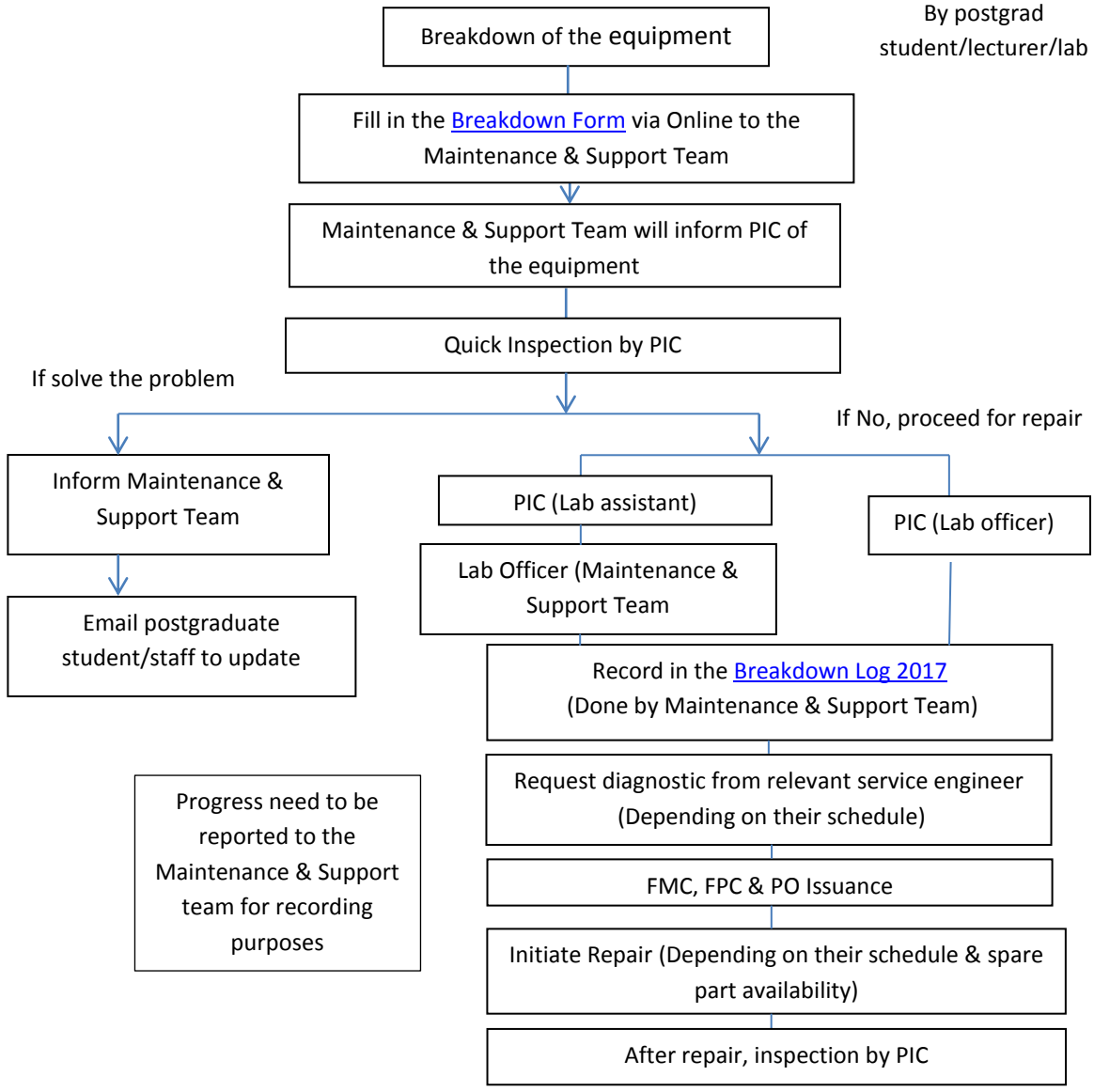
Chemical	Incompatible with
Acetic Acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetone	Concentrated nitric and sulfuric acid mixtures, chlorinated solvent/alkali mixtures
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Alkali & alkaline earth metals (such as powdered aluminum, or magnesium, calcium, lithium, sodium, potassium)	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury (in manometers, for example), chlorine, calcium hypo-chlorite, iodine, bromine, hydro-fluoric acid (anhydrous)
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, finely divided organic or combustible materials
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Any reducing agent
Azides	Acids
Bromine	See chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents
Carbon tetrachloride	Sodium
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
Chromic acid & chromium trioxide	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Chloroform	Strong bases, ketones and strong base, alkaline metals, aluminum, strong oxidizers
Copper	Acetylene, hydrogen peroxide
Cumene hydro peroxide	Acids (organic or inorganic)
Cyanides	Acids
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, halogens
Fluorine	Everything
Hydrocarbons (such as butane, propane, benzene)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide

Hydrocyanic acid	Nitric acid, alkali
Hydrofluoric acid (anhydrous)	Ammonia (aqueous or anhydrous)
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitro methane, combustible materials
Hydrogen sulfide	Fuming nitric acid. oxidizing gases
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Sulfuric acid
Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy me
Nitrites	Acids
Nitroparaffins	Inorganic bases, amines
Oxalic acid	Silver, mercury
Oxygen	Oils, grease, hydrogen; flammable liquids, solids or gases
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorus (white)	Air, oxygen, alkalies, reducing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulfuric and other acids
Potassium perchlorate (see also chlorates)	Sulfuric and other acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulfides	Acids
Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals, such as sodium, lithium)
Tellurides	Reducing agents

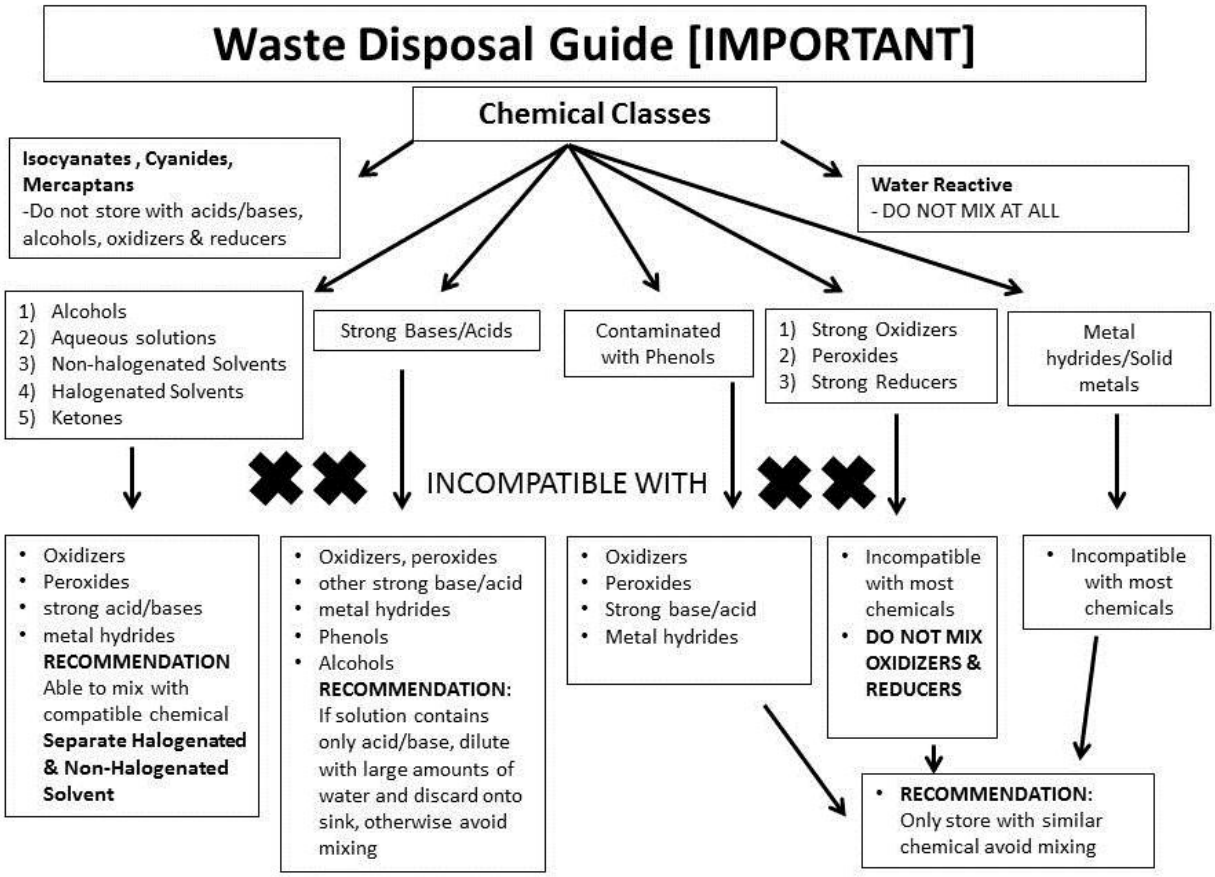
APPENDIX H

EQUIPMENT BREAKDOWN REPORTING FLOWCHART

Universiti Tunku Abdul Rahman **Faculty of Science** **STANDARD OPERATING PROCEDURES**	UTAR UNIVERSITI TUNKU ABDUL RAHMAN
Title: **Equipment Breakdown**	
Document no.:	Lab Location: **All lab Faculty Science**
Issue Date:	Revision Date: -
Prepared by: **Nurul Illiana Mazlishah**	



APPENDIX I
WASTE DISPOSAL GUIDE



APPENDIX J

Universiti Tunku Abdul Rahman **Faculty of Science** **STANDARD OPERATING PROCEDURE**	
Title: **Handling Emergency/Accident in Laboratory Involving Student**	
Document no.:	Lab Location: **All FSc Laboratories**
Issue Date: 18 December 2017	Revision Date: -
Prepared by: Ooh Keng Fei	

When an accident happened in a laboratory

1) The accident should be reported to nearest laboratory staff/first aider within 3 minutes.
2) Access the seriousness of the injury of the student.

A) Injury Required First Aid Treatment Only

3) If the injury is not serious, treat the student with first aid treatment.
4) Record the accident in the **Incident/Accident Report form**.
5) Send the signed **Incident/Accident Report form** to Mr Ooh Keng Fei.

B) Serious Injury

3) Treat the student with first aid treatment.
4) Inform Laboratory Management Safety & Administration Head of Department (LMSA), Dr Ooi Zhong Xian, extension 4707.
5) If further treatment needed out of UTAR Perak Campus (i.e: Hospital Kampar), inform Department of Safety and Security (DSS),

   Mr Ramasamy, extension 2220 or

   Mr Prakash, extension 2222.
6) If the case required immediate medical attention, send the student to hospital first.
7) Inform Department of Student Affairs (DSA),

   Mr Khor Chein Yen, extension 2280 or
   Mr Phoon Sau Wai, extension 2280.
   or DSA Hotline 016 210 0864.
8) Liaise with DSA staff in the hospital for them to take over the case.
9) Record the accident in the **Incident/Accident Report form**.
10) Send the signed **Incident/Accident Report form** to Mr Ooh Keng Fei.

APPENDIX K

INCIDENT / ACCIDENT REPORT (Part A)

(Report of an accident, near miss, dangerous occurrence, occupational poisoning and occupational disease)

INCIDENT / ACCIDENT INFORMATION

Date		Time	
Faculty / Division / Department		Location / Room No	
Brief details of the incident / accident			
Names of witnesses, contact numbers / addresses (if possible and available)			
1.	2.	3.	4.

PERSONAL INFORMATION (INJURED PARTY)

Name	Male / Female *	Date of Birth /Age*
Address	Staff/Student/Visitor*	Staff No / Student No*
	Department / Course / Occupation	
Home Phone Number	Mobile Phone Number	

ADDITIONAL INFORMATION

Nature and site of injury (state L or R for limbs/eyes etc.)	
Person sent to: * Hospital / Home / Returned to work / Other	
Medical leave from to	
Brief statement from injured person (if possible)	
Signature of injured person (if possible)	Date:
Signature of Supervisor / Manager	Date:

* Delete as appropriate # if the incident/accident requires investigation, proceed to Part B.

INCIDENT / ACCIDENT INVESTIGATION REPORT (Part B)

To be completed by the investigator (Supervisor/HOD/OSH Committee/SHO)

Name of Investigator	Faculty/Div/Dept.	Designation/ID	Phone ext no.

Date of Incident / Accident	Time of Incident / Accident

(i) 1. Injury details 2. First aid given 3. Medical treatment given (if any)

(ii) Description of the Incident / Accident

(iii) Actual and / or possible causal factors

(iv) Involvement of equipment / substance / other persons

(v) Property damage

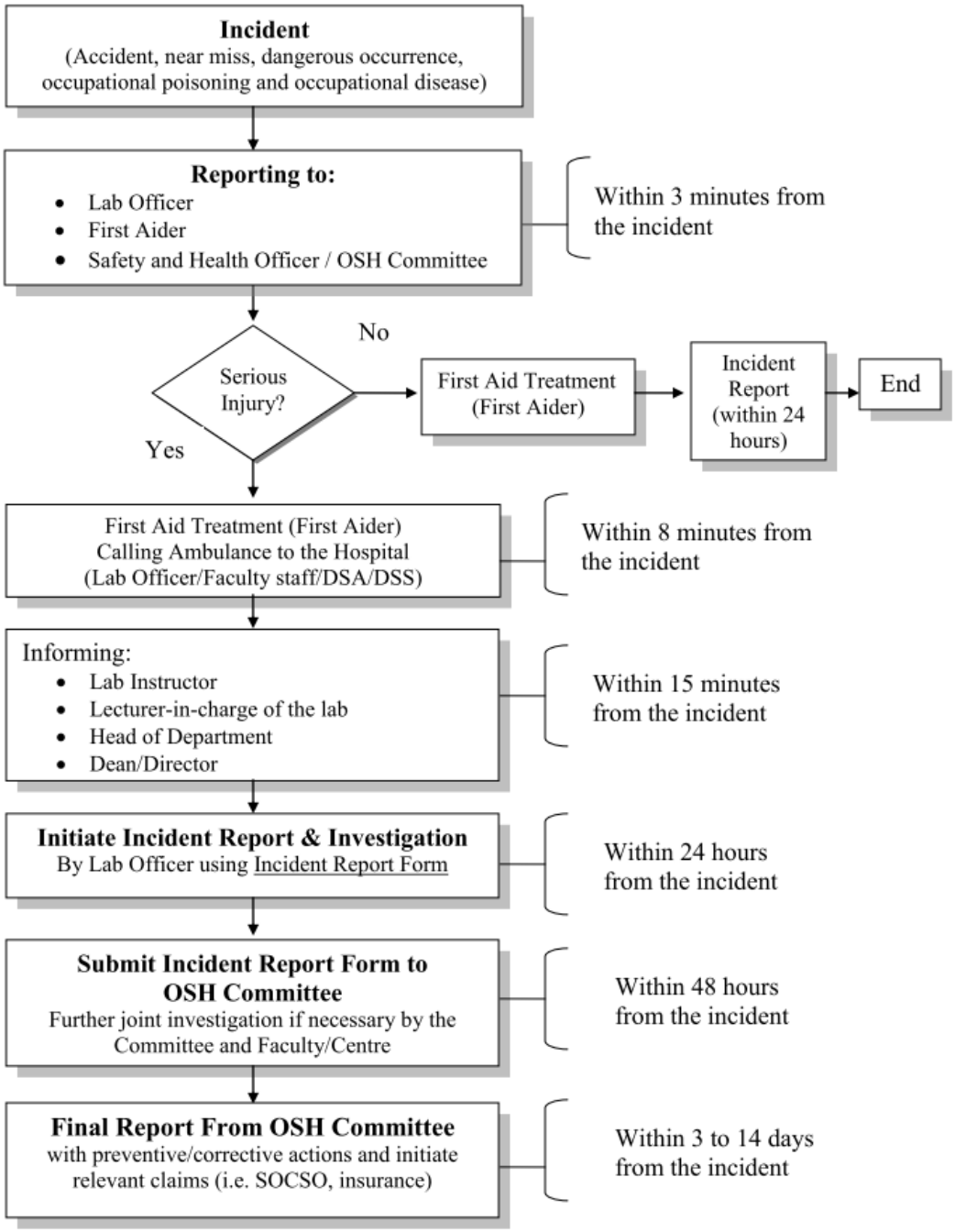
(vi) Remedial action recommended

Signature of investigator	Date

Attachment: YES /NO

APPENDIX L

Flow Chart of Emergency Response on Lab Incident/Accident



APPENDIX M

EMERGENCY CONTACT NUMBERS KAMPAR CAMPUS

1	**DEPARTMENT OF SAFETY & SECURITY (DSS)**	**A) 05-468 8888 EXT. 2222** **B) SOUTH GATE EXT. 2540** **C) EAST GATE EXT. 2527** **D) HOTLINE** **016 – 2100 863 (24 HRS)** **016 – 2100 864 (AFTER 5.30 P.M)**
2	**POLICE, FIRE, BRIGADE & AMBULANCE**	**999** **112 (MOBILE PHONE)**
3	**POLICE STATION** **- KAMPAR** **- CONTROL ROOM**	**05 – 465 2222** **05 – 465 0020**
4	**BALAI BOMBA** **- KAMPAR** **- GOPENG**	**05 – 466 4444** **05 – 359 4444**
5	**HOSPITAL** **- KAMPAR**	**05 – 465 3333**
6	**FSc LABORATORY MANAGEMENT & SAFETY ADMINISTRATION HOD**	**Dr Ooi Zhong Xian** **05 – 468 8888 (Ext.: 4707)**
7	**FSc SAFETY COORDINATOR**	**Nicholas Ooh** **05 – 468 8888 (Ext.: 3001)** **016 – 373 8001**

APPENDIX N

Chemical Spill Response Team

Name	Contact Number
Mr Nicholas Ooh	016 – 373 8001
Mr Leong Thung Lim	011 – 1094 5439
Mr Seou Chi Kien	014 – 944 6327
Mr Goh Wee Sheng	Ext.: 3001
Ms Wong Wei Seng	Ext.: 3001

APPENDIX O

Biological Spill Response Team

Venue	Name	Contact Number
Second floor	Mr Saravanan	012 – 578 2103
	Mr Tie Shin Wei	016 – 868 1942
First floor	Ms Natrah	Ext.: 2291
	Ms Nurfarhana	Ext.: 2549
Ground floor	Ms Nur Izzati	Ext.: 3002
	Mr Zaini	Ext.: 3002
	Mr Zulhilmi	Ext.: 2553

APPENDIX P

STANDARD OPERATING PROCEDURES

1.0 Purpose

The objective of this SOP is to ensure that the university adopts a common reporting and investigation protocol for incidents and accidents involving injuries that will help to ensure the injured or suddenly ill person in the campus and during events / functions is provided immediate basic level emergency medical aid until competent medical care is obtained.

2.0 Team Membership

Medical and First Aid (MFA) members are UTAR staff and students who have undergone Basic First Aid training, able to work with others in a team to perform the required duties during emergency.

Staff and students who have undergone Basic First Aid training are invited to join MFA and the team leader is to circulate and update the names and contacts of team members to DSS, Faculty office and DSA.

3.0 Procedures

3.1 First Aiders

3.1.2.1 The provision of a service for emergency treatment, of injury or illness within their competencies.

3.1.2.2 Arranging prompt and appropriate referral for patients who require further treatment

3.1.2.3 The maintenance of first aid facilities, including first aid equipment and checking and restocking first aid kits.

3.1.2.4 The recognition and reporting of deficiencies in the first aid service to Department of Safety & Security / Occupational Safety & Health (OSH) Committee / Safety & Health Officer (SHO)

3.2 First Aid Assessment

First Aid assessment must be undertaken in each department / lab / work station to determine what are the appropriate first aid facilities and suitably trained people. The assessment should be documented in consultation with the first aider and the OSH Committee (Medical & First Aid Team) with consideration to;

3.2.1 size and layout of the workplace

3.2.2 The number and distribution of staff including arrangement such as shift work and after working hours.

3.2.3 The nature of the hazards and the severity of the risk

3.2.4 The location of the workplace

3.2.5 Known occurrences of accidents or illness.

The first aid assessment process can be organized through the OSH Committee (Medical & First Aid Team).

3.3 First Aiders

The number and competencies of first aiders will vary between workplaces depending on assessment factors. It is desirable that first aiders be selected from those staff members whose duties normally do not take them away from the workplace.

Prospective first aiders should be:

3.3.1 staff who show evidence of enthusiasm and a capacity to deal with injury and illness

3.3.2 able to relate well to other staff or students

3.3.3 in reasonable health

3.3.4 able to exercise sound judgment especially in relation to the need to involve other support services

3.3.5 able to call away from their ordinary work at short notice

3.3.6 appointed to this role of their own, free will

First aiders undertake the initial treatment of people suffering injury and illness. The treatment provided by first aiders should be consistent with their training and competency. When in doubt a first aider should recommend that a staff / student seek medical advice. A first aider should not be responsible for ongoing care.

3.4 First Aid Kits

The nominated first aider shall be responsible for maintaining the first aid kit i.e. to ensure it is always stocked and date of expiry of its items. The first aid kits should not be locked.

3.5 Signage

The location of each kit shall be signposted.

3.6 The Content

Contents shall be supplied in quantities appropriate to the work area and be reviewed and maintained on a regular basis by the first aiders.

First aid kits should include the following items but not be limited to:

1. 5 Triangular bandages 130cm x 90cm x 90cm
2. Sterile eye pads
3. Non-sterile 4x4" gauze pads
4. Sterile 4x4" gauze pads
5. Sterile 10x10" gauze pads
6. Elastic bandage
7. 4 Roller bandages 7.5 cm
8. 4 Roller bandages 3 cm.
9. 4 Roller bandages 2.5 cm
10. Cold pack compress gel
11. Burn sheet/dressing
12. Pairs of gloves (disposable / non sterile)
13. Stainless steel bandage scissors
14. Adhesive tape
15. Sterile multi-trauma dressing/gauze
16. Alcohol prep pads
17. Antiseptic cream
18. Cotton buds
19. Barrier device for CPR (pocket mask, face shield)
20. Elastoplasts / sterile adhesive dressing
21. Safety pin for triangular bandages
22. Thermometer
23. First aid manual
24. Waterproof waste bag
25. Inventory of box contents (checklist) Emergency services

Advice on the purchase of first aid kit/equipment and replenishment may be gained through Department of Safety & Security (DSS).

3.7 Recording Reporting and Confidentiality

First aiders must record all first aid treatments on the Incident / Accident Report (Appendix K). The original copy of the first aid record must be forwarded to DSS. If first aiders have been advised that persons in their workplace have medical conditions they are required to such information in the utmost confidence. Such information may only be revealed to the appropriate personnel, should a medical emergency occur.

3.8 Employee Awareness

The names of first aiders and their contact numbers should be displayed near all first aid kits and in a central location in each area. All new employees must be informed of who the area first aider is and how first aiders can be contacted.

4.0 Injury/Sudden Illness Reporting Procedures

4.1 Who to contact in case of emergency?

4.1.1 During Office Hours

All incidents/accidents related injuries/sudden illness occurring in the University campus/event must be immediately reported to the office of Department of Safety and Security (DSS). The staff of DSS will make all necessary referrals to ensure prompt treatment for the injury, including arrangement for transport of the injured person.

DSS staff is to contact first aiders in DSS / those closest to the place of the incident/accident to render first aid and to prepare the person for transport to the nearest hospital/clinic for medical attention.

DSS is to ensure updated DSS office extension numbers, list of First Aiders and contact numbers and other emergency numbers are placed at the strategic area of every Faculty and Department General Office and in OSH material linked to UTAR main webpage.)

If the person who is injured/ill is conscious, he should be warned not to move until a first aider has attended to him. This person should be warned not to exert himself and, if appropriate, should be moved to a safe area.

If the wounded person is immobile and unconscious, arrangement should be made to transport him to the nearest clinic / hospital.

4.1.2 After Office Hours

In case of any incident/accident related injuries/sudden illness occurring in the University campus/event *venues*, either:

(a) Call the Emergency number which is updated and notice placed at every floor of each building by DSS or
(b) Call for the nearest security guard to contact security officer/supervisor on duty.
(c) The security officer/supervisor on duty will make all necessary referrals to ensure prompt treatment for the injury, including arrangement for transport of the injured person.
(d) DSS staff is to ensure all the updated emergency numbers, first aiders' names and contact numbers and security offices' extension numbers are made available at the strategic areas of the campus / event venue.

4.2 Pre-Arrival Treatment

First Responders are a vital link in the emergency medical system. All individuals attempting to care for the injured prior to MFA member's arrival shall be treated with professionalism and all attempts should be made to obtain their identity details.

4.3 Physician on Scene

If a physician on scene identifies himself or herself as such, the following procedures shall be followed:

- The physician's specialty field and location of practice should be obtained.
- The physician must be advised of his or her responsibility to accompany the ambulance to the hospital should he or she engage injured care and render advanced techniques. Should the physician refuse this responsibility, his assistance to the injured should be refused too.

4.4 All costs incurred to be directed to DHR/DSA for verification and decision on settlement.

5.0 Precautions

5.1 No personnel should enter the accident scene without authorization.

5.2 In case of obvious death and the MFA member decides not to perform resuscitation, the following procedure is to be followed:

- Preserve all incident related scenes
- Clear all bystanders from the immediate area, but note the names of those present. Preserve the scene exactly as you found it;
- Do not touch the patient, except to determine the presence of vital signs of life.
- Never cover the patient's face with anything unless directed by the medical examiner.

5.3 Incident / accident scene

When at the scene of an incident / accident, treat the patient as necessary, but make every attempt to leave the scene exactly as it was upon arrival. Record all first aid actions accurately on the report sheets.

5.4. Fire Alarms

MFA member should generally not enter a building in which a fire alarm has been activated. If on scene during an alarm, MFA members should gather at the security guard house outside the building and assist other public safety personnel as needed.

6.0 Communication

Effective and efficient communication network is necessary for the first aid operation.

a) MFA members should have their mobile communication devices switched on while in campus / event.

b) Contact number of nearby hospital, clinics, and ambulance should be placed at the strategic area in office of DSS / guard house / DSA office / Faculty office.

7.0 Medical Equipment

7.1 The First Aid Register

OSH Committee is required to maintain a register of qualified first aiders at all campuses. The register shall be displayed in a central area and contain first aider names, first aider locations, contact numbers, first aid qualifications, first aider providers, dates of certification and dates of expiry.

7.1.1 First Aid Kits have to be placed in all offices of every campus. Person in charge has to re-stock used / expired items.

7.1.2 The following equipment have to be placed at the sick-bay of every campus:

i. First Aid Kit
ii. Wheel Chair
iii. Stretcher
iv. Movable Bed
v. Movable Ward Screen

8.0 Records / Documentation

8.1 General guidelines

DSS is to keep record of the periodic equipment inventory of MFA and all equipment must also be visually checked prior to using them at the event. Any malfunctioning equipment should be noted so that repair may be arranged as soon as possible.

8.2 Accident / Incident Report

Every person who receives medical care from MFA member should have an Incident or Accident Investigation Report Form submitted. The purpose of this report is to record the unusual operating condition or occurrence, to document all injured persons interaction and care given for minor injuries This form must be completed in its entirety without exception and submit to DSS through the Head of Department within 72 hours of the accident / incident, copies of the form is to be sent to DHR/DSA.

8.3 Patient Refusal of Treatment Form

It is important that a Patient Refusal of Treatment Form be filled out in its entirety if an event attendee refuses care from MFA member. The form shall be completed and be witnessed.

MFA member may not act as a witness. If a witness is not available, it shall be noted on the Refusal of Treatment Form.

Intoxicated patients may not sign a Patient Refusal of Treatment Form. A responsible party must be secured for intoxicated patients, and that party must sign the form.

9.0 Training

9.1 Training and Certification

First Aid training must be undertaken by an approved body / organization and based on the outcomes of the assessment.

First aid in the workplace training must cover basic first aid and Cardio Pulmonary Resuscitation (CPR)

A First Aid in the workplace certificate will last two/three years.
When renewal of certificate falls due, first aiders should be free to relinquish their first aid appointment, if they so desire, as personal commitment is essential.

The cost of attending a training course will be met by the appropriate faculty/division/department

9.2 All MFA members have to be trained in administering first aid to injured person, plan to evacuate from the place of an incident to the nearest health institution as well as to assist the physician in his work.

9.3 MFA members should attend at least one refresher course/ other courses related to medical / first aid every year.

10.0 Event Operation

- Unless the event is scheduled for over 6 hours, there will be one shift per event.
- The OSH committee will determine the exact number of MFA members needed at each shift based on:

  a) The number of attendees expected – generally 2 per 1000
  b) The size of arena
  c) The number of floors (levels)

Each team shall normally comprise a minimum of 2 members. Shifts begin one hour prior to the event and last until the event location is clear of attending people

UNIVERSITI TUNKU ABDUL RAHMAN

PATIENT REFUSAL OF TREATMENT FORM

Date of Incident / Accident:

Location of accident / incident :
(Campus / name of building, floor etc)

Name of Injured person:

Student ID / NRIC No. / Passport No.:

Address: (i) Residential:

(ii) Mailing :

Injuries suffered:

Treatment requested by injured person:

Reasons for refusal of treatment:

Witness:

Name:
Student ID / STAFF ID/ NRIC NO./ Passport No.
Address:

Signature of Injured: Date: