Laboratory Safety Guide

Faculty of Agriculture
University of Jaffna
Sri Lanka
2026
(Version 1)

PRECIDA-UOJ

Project for Research & Education Capacity Improvement in Dry Zone Agriculture at University of Jaffna

This guide was developed by the following members of the Faculty of Agriculture, University of Jaffna, in consultation with JICA-PRECIDA (The Project for Research and Education Capacity Improvement in Dry Zone Agriculture at the University of Jaffna).

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Message from JICA-PRECIDA

JICA-PRECIDA is delighted to collaborate with the academic staff of the Faculty of Agriculture, University of Jaffna, in the development and publication of the Laboratory Safety Guide. We are pleased to announce the formulation of safety guidelines for the faculty, staff, and students of the Faculty of Agriculture.

A safe and secure university environment is built through the cooperation of all members-students, faculty, and staff alike. Safety is not something to be left to others; it is something each of us must actively protect and cultivate.

In the settings of education and research, various risks may arise from experiments and fieldwork to daily commuting and the use of facilities. The ability to anticipate hazards and respond appropriately not only enhances the quality of learning and research but also forms the foundation for safeguarding the lives and health of everyone.

This guidebook summarizes essential safety and health knowledge, key points for accident prevention, and guidelines for action in emergencies. It is intended for use not only by students but also by faculty and staff in their daily work and teaching, helping to pass on a culture of safety to future generations.

Safety is not merely a “set of rules” but a “culture.” Regardless of position or role, let us speak up, share ideas for improvement, and work together to create a safer and more comfortable university environment for all.

Prof. Tohru Mitsunaga
Chief Advisor
JICA-PRECIDA Capacity Development Project
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List of Abbreviations

AI – Artificial Insemination

ALCOA - Attributable, Legible, Contemporaneous, Original, and Accurate

AV – Artificial Vagina

BTL - Biotechnology Laboratory

CEA - Central Environmental Authority

CIP - Cleaning in Place

COP - Cleaning Out of Place

CCP - Critical Control Points

CPR - Cardiopulmonary Resuscitation

EC – Electrical Conductivity

GC - Gas Chromatograph

GHP – Good Hygienic Practices

GHS - Globally Harmonized System

GMP – Good Manufacturing Practices

GPS - Global Positioning Systems

HACCP - Hazard Analysis Critical Control Point

MSDS - Material Safety Data Sheets

NIOSH - National Institute of Occupational Safety and Health

PPE - Personal Protective Equipment

RPL- Reproductive Physiology Laboratory

SDS – Safety Data Sheet

SLSI - Sri Lanka Standards Institution

SOP - Standard Operating Procedure

Introduction

The Faculty of Agriculture, University of Jaffna, Sri Lanka, is committed to fostering a safe, healthy, and environmentally responsible environment for teaching, learning, and research. Safety in laboratories is an integral part of academic and research excellence. Adherence to good laboratory practices to ensure a safe working environment is a shared responsibility among staff, students, researchers, and visitors. This Laboratory Safety Guide explains the minimum requirements and practices required to ensure the safety of people, facilities, and the environment.

The guidelines outlined in this guide apply to all individuals who enter or conduct activities in the laboratories and related facilities of the Faculty of Agriculture, University of Jaffna. The aim of this guide is to provide a comprehensive framework for minimizing risks associated with working in our laboratories, where teaching and research involve a wide range of activities.

This guideline emphasizes the minimum requirements for controlling potential chemical, biological, and physical hazards in agricultural laboratories. This document is not meant to replace any rules or protocols already in place in individual laboratories. Instead, it should be read and used alongside local safety manuals, chemical hygiene plans, biosafety procedures, emergency and first-aid guidelines, and all relevant legal and regulatory requirements. By clearly outlining these minimum expectations, the faculty aims to foster a shared culture of safety, responsibility, and professionalism across all teaching and research activities.

Objectives of this guide are to;

- establish minimum safety standards across all laboratories
- ensure the safety and well-being of all laboratory users
- safeguard the environment and the surrounding community
- promote a culture of responsibility and safe practices
- provide guidance for biosafety and chemical safety
- strengthen emergency preparedness
- encourage continuous improvement in laboratory safety management

Target users of this guide;

The target users of this guide are lecturers, temporary lecturers, temporary demonstrators, technical officers, lab attendants, undergraduate students, postgraduate students, research assistants, visiting researchers, and collaborators. All personnel mentioned are required to read this manual thoroughly before utilizing the laboratories in order to fully understand its contents, prevent serious accidents, and respond promptly and appropriately in the event of an emergency.

Implementation of laboratory induction for students using this guide;

This guide serves as supporting material for courses identified in the syllabi under technical subject areas, particularly the course AC 11041 (FS/AB) Laboratory Techniques. In addition, for fourth-year students, it is recommended to conduct a Laboratory Orientation Program prior to the commencement of the undergraduate research period. The program is designed to prepare students for their undergraduate research projects by strengthening their understanding of laboratory safety protocols, good laboratory practices, proper equipment handling, and research documentation standards. The interactive orientation provides students with valuable insights and practical knowledge, ensuring they are well equipped to begin their research with confidence, safety, and a strong sense of responsibility.

Laboratory safety committee

1. Dr. Mrs. S. Sivakanthan, Senior Lecturer, Department of Agricultural Chemistry, Faculty of Agriculture, University of Jaffna
2. Dr. Mrs. A. Shayanthan, Senior Lecturer, Department of Agricultural Chemistry, Faculty of Agriculture, University of Jaffna
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8. Dr. K. Jeyavanan, Senior Lecturer, Department of Agronomy, Faculty of Agriculture, University of Jaffna
9. Technical officers

Emergency Contacts

Each laboratory must display emergency contact information in a clearly visible location, including:

■ Faculty of Agriculture, Kilinochchi Premises, University of Jaffna

- Dean's office: 021 206 0175
- Deputy Registrar/Kilinochchi Premises: 021 206 0180

■ Laboratory In-Charge

- Heads of Departments (contact details are displayed in the respective laboratories)
- Technical officers (contact details are displayed in the respective laboratories)

■ General emergency contacts

- Fire service division/Kilinochchi: 0212 283 333
- Kilinochchi General Hospital: 0212 285 329
- Medical emergencies in Kilinochchi: 1990 (immediately to reach the free Suwa Seriya Ambulance Service)

Responsibilities of Personnel

Dean of the Faculty

- Provide leadership and overall commitment to health, safety, and environmental management within the Faculty.
- Ensure adequate resources (financial, infrastructural, and human) are allocated for the effective implementation of safety measures.
- Approve Faculty-wide safety policies and monitor their compliance.

Heads of Departments

- Implement and enforce faculty safety policies at the departmental level.
- Ensure that laboratory facilities are maintained to meet safety standards.
- Appoint departmental safety coordinators/committees where necessary.
- Ensure staff and students under the department are trained in laboratory safety.
- Ensure that all visiting researchers, external collaborators, students, trainees, and other authorized personnel using the laboratories are informed of the laboratory safety manual, safety procedures, and emergency protocols.
- Ensure that all such personnel receive appropriate safety training or possess the necessary competency and qualifications to safely use laboratory facilities, equipment, chemicals, and materials before being permitted to work independently in the laboratory.
- Ensure that only authorized and adequately trained personnel are allowed access to laboratory facilities and equipment.

Academic Staff

- Integrate safety principles into teaching and practical classes.
- Ensure that course-related laboratory activities are conducted in compliance with safety guidelines.
- Provide students with adequate training and supervision on safe laboratory practices.

Research Supervisors

- Ensure that students, research assistants, and research personnel under their supervision are informed of and comply with the laboratory safety manual, safety regulations, and emergency procedures.
- Provide adequate training to ensure that both students and researchers are skilled enough to use the equipment and perform experiments in the lab without posing any danger.
- Identify the possible dangers related to research activities and implement appropriate controls to mitigate such risks.

- Make sure that proper personal protective equipment (PPE) is provided and utilized by the supervised personnel.
- Supervise laboratory operations and make sure that safe laboratory practices are adhered to.
- Promptly report any incident, accident, injury, spillage, and unsafe situation within the lab to the Head of the Department.
- Supervise researchers and students to ensure safe handling of chemicals, equipment, machinery, and biological materials.
- Provide training on emergency procedures and safety requirements specific to each research project.
- Ensure that hazardous chemicals, biological materials, and laboratory waste are properly handled, stored, labeled, and disposed of according to established procedures.
- Ensure that students and research personnel do not work alone in laboratories when conducting hazardous procedures or outside approved working hours without authorization.

Technical Officers

- Maintain laboratory equipment, instruments, farm machinery, and safety systems in safe working order.
- Ensure proper storage, labelling, and inventory management of chemicals and biological materials.
- Assist in training students and staff in the safe operation of laboratories.
- Assist in enforcing the laboratory safety manual and ensure that all users comply with established safety rules and procedures.
- Support emergency response procedures and ensure safety equipment is functional.
- Ensure safe storage, labeling, and handling of chemicals, biological materials, and hazardous substances in accordance with safety standards.
- Provide technical guidance and support to students, researchers, and staff on the safe operation of laboratory equipment and procedures.
- Report faulty equipment, unsafe conditions, accidents, and hazards promptly to the relevant academic or Head of the Department.
- Ensure proper segregation, collection, and disposal of laboratory waste.
- Support emergency preparedness by being familiar with emergency procedures and assisting during incidents such as spills, fires, or accidents.
- Ensure that unauthorized or untrained persons do not operate laboratory equipment or access restricted areas without approval.

Laboratory Attendants

- Support laboratory operations by maintaining cleanliness and order.

- Assist with preparation and safe disposal of laboratory materials as instructed by supervisors/ technical officers.
- Report hazards, spills, or unsafe conditions immediately to supervisors, technical officers, or the Head of the Department.

Research Assistants

- Comply with the laboratory safety manual, safety procedures, and all relevant institutional safety regulations at all times.
- Attend and complete required laboratory safety training before commencing any laboratory work.
- Follow all instructions provided by research supervisors and technical officers regarding safe laboratory practices.
- Conduct risk assessments for assigned tasks under the guidance of supervisors.
- Report accidents, incidents, and unsafe practices to the Technical Officer, Head of the Department, or supervisors.
- Maintain accurate records of laboratory activities in accordance with safety requirements.
- Use appropriate PPE at all times and ensure it is worn correctly during laboratory activities.
- Perform laboratory work only after ensuring they are competent and authorized to handle specific equipment, chemicals, or biological materials.
- Follow standard operating procedures (SOPs) for all experimental work and avoid unsafe or unauthorized practices.

Students (Faculty of Agriculture, University of Jaffna)

- Complete all required safety training before undertaking laboratory work.
- Comply with laboratory safety rules, including wearing PPE.
- Conduct risk assessments for assigned tasks under the guidance of supervisors.
- Conduct themselves responsibly in the laboratories.
- Immediately report unsafe conditions, accidents, or incidents to the technical officer, Head of the Department, and supervisors and when necessary, to the security officer of the faculty.
- Follow all instructions given by lecturers, demonstrators, research supervisors, and technical officers during laboratory sessions.
- Conduct only authorized experiments and use laboratory equipment, chemicals, and materials only under supervision unless permitted.
- Maintain cleanliness and proper housekeeping of work areas before, during, and after laboratory activities.

- Handle chemicals, biological materials, and equipment responsibly and ensure proper labeling, storage, and disposal as instructed.
- Immediately report all accidents, injuries, spills, breakages, and unsafe conditions to the technical officer, supervisor, and Head of the Department.
- Do not work alone in laboratories, especially when handling hazardous materials or potentially dangerous equipment or machinery or performing potentially dangerous procedures.

Outside Researchers / Collaborators

- Obtain prior approval from the relevant Head of the Department through the proper channel before accessing laboratories or field facilities.
- Follow faculty safety policies and instructions.
- Work under the supervision of a designated staff member when required.
- Complete all required safety training prior to undertaking laboratory work/ provide evidence of safety training and competency in laboratory practices.
- Comply with laboratory safety rules, including wearing PPE.
- Conduct themselves responsibly in laboratories.
- Immediately report unsafe conditions, accidents, or incidents to the Technical Officer, Head of the Department, or supervisors.

Visitors

- Must be accompanied by an authorized staff member while in the laboratory.
- Must follow all posted safety instructions, including wearing appropriate PPE if required.
- Restricted from engaging in laboratory work unless formally approved and trained.

Ethics in Laboratory and Research Practices

Ethical conduct is fundamental to maintaining trust, integrity, and professionalism in all academics, research, and extension activities within the Faculty of Agriculture, University of Jaffna.

In general, all personnel are expected to,

- Respect human health and safety by prioritizing safe practices over convenience or speed.
- Minimize waste, pollution, and environmental harm during laboratory activities.
- Maintain honesty and integrity in recording, reporting, and communicating scientific results.
- Respect property and facilities by using equipment responsibly and avoiding misuse or damage.
- Uphold fairness and respect in interactions with colleagues, students, and collaborators, fostering a culture of inclusivity and responsibility.
- Ensure accountability by taking responsibility for one's own actions and immediately reporting unsafe practices, hazards, or ethical breaches.

Part A

Laboratory Safety



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1. General Laboratory Safety

1.1 Basic Facilities

Every laboratory under the Faculty of Agriculture should be equipped with essential safety facilities. All personnel should familiarize themselves with the location and proper use of these resources before commencing work:

- **First Aid Kit** – stocked with basic medical supplies or immediate response to minor injuries.
- **Hand Washing Facilities** – to be used frequently, especially before leaving the laboratory or after handling chemicals and biological materials.
- **Eyewash Station (where available)** – for rapid flushing in case of chemical splashes to the eyes and **Safety Shower (where available)** – for full-body decontamination in case of chemical spills on the body. (Usually located near the door)
- **Fire Extinguishers and Fire Alarm Button** – located at clearly marked points near to each laboratory.

1.2 Assembly point

In case of an emergency, all personnel inside the buildings must proceed immediately to the designated emergency assembly point, located in the open area in front of the JICA Research and Training Building. Remain at the assembly point and keep a safe distance from any potential hazards until further instructions are provided.

1.3 Safety Guidelines

1.3.1 General Guidelines (Personal Conduct)

- Follow all laboratory rules and guidelines.
- Wear appropriate PPE (e.g., lab coat, gloves, goggles, closed footwear) as required for specific laboratory activities.
- Do not eat, drink, chew gum, or apply cosmetics in laboratories.
- Keep personal belongings outside the laboratory in the designated places.
- Maintain a clean and uncluttered workspace.
- Report all accidents, injuries, near misses, or unsafe conditions immediately to the supervisor or technical officer or Head of the Department.
- Do not work alone when handling hazardous materials or equipment (e.g. concentrated corrosive chemicals, high-temperature or high-pressure apparatus, biological agents, or high-speed mechanical/electrical equipment etc.)
- Respect shared equipment and other laboratory users.
- Dispose waste properly.

Images of basic facilities

- **First Aid Kit** – stocked with basic medical supplies or immediate response to minor injuries.





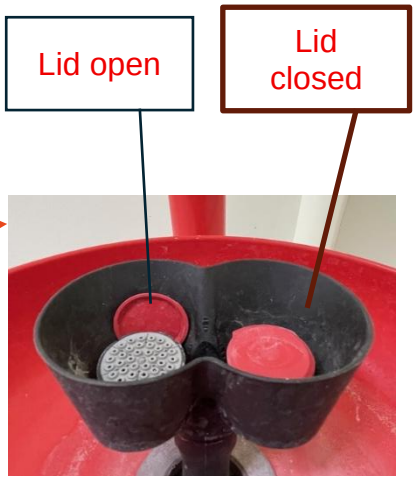
- **Hand Washing Facilities** – to be used frequently, especially before leaving the laboratory or after handling chemicals and biological materials.



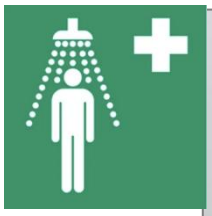
- **Eyewash Station (where available)** – for rapid flushing in case of chemical splashes to the eyes.







- **Safety Shower (where available)** – for full-body decontamination in case of chemical spills on the body.





- **Fire Hose and Fire Extinguishers** – located at clearly marked points near to each laboratory.





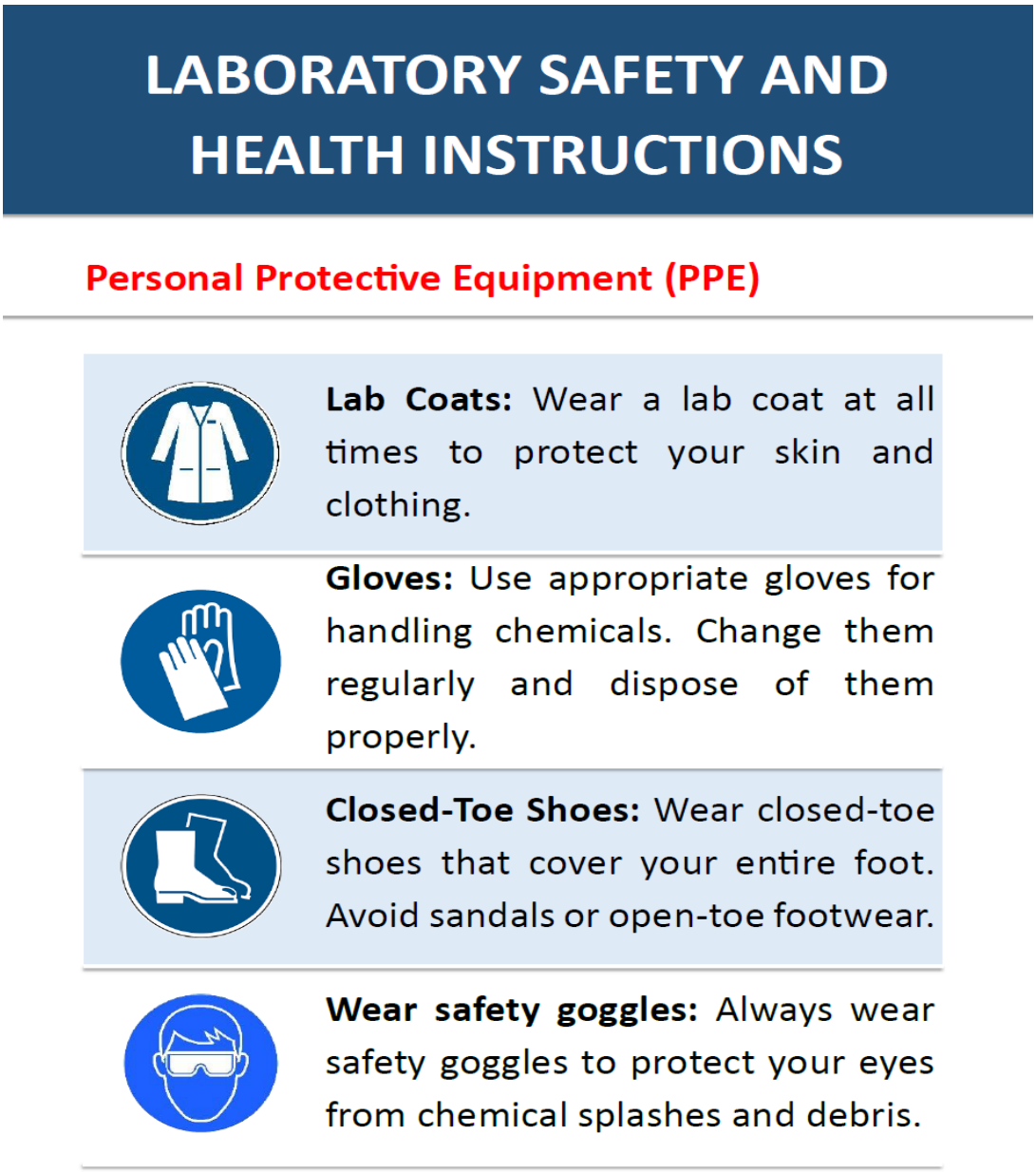
- **Fire Alarm Button**– located at clearly marked points near to each laboratory.



1.3.2 Understanding Basic Safety Instructions and Symbols

- **Mandatory PPE:** Lab coat and gloves are required at all times during laboratory work. Eye protection (safety goggles or safety glasses) must be worn whenever handling chemicals, performing experiments with a risk of splashing or vapor exposure, or as instructed by the supervisor. A face mask must be worn when handling toxic fumes, fine powders, biological materials, or any procedure that may generate airborne contaminants.

Sample of PPE poster at the Laboratory



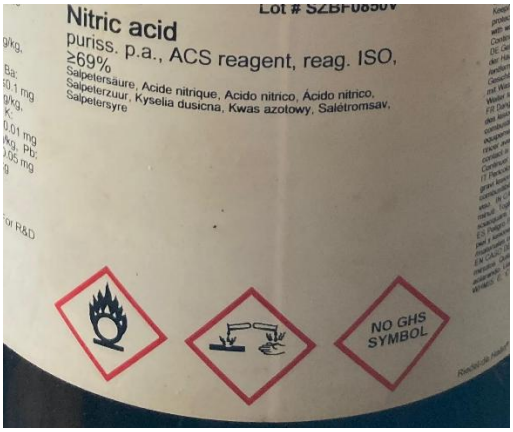
Safety symbols: Check the symbols in the Chemical bottles, known as GHS (Globally Harmonized System) pictograms, which are red-bordered diamond shapes with black icons that indicate physical, health, or environmental dangers. Posters displaying and their meanings should be displayed prominently in each laboratory. All laboratory users must be able to recognize and understand standard international safety symbols, including but not limited to Explosive, Flammable, Corrosive, Toxic, Biohazard, Radioactive etc.

GHS (Globally Harmonized System) pictograms



Examples of hazard symbols found on chemical containers









1.3.3 Emergency Response and First Aid

In case of injury,

- Provide basic first aid immediately using the first aid kit.
- Report the incident to the supervisor or technical officer or Head of the Department immediately.
- For serious injuries, call emergency medical services and keep the injured person comfortable until help arrives.
- Record all incidents (including near misses) in the laboratory incident log.

For chemical splashes to the eyes,

- Immediately use the eyewash station and flush eyes continuously for at least 15 minutes**,** keeping eyelids open with fingers.
- Remove contact lenses immediately if present.
- Seek medical attention even if no pain or irritation remains after flushing.

For skin contact with chemicals,

- Use the safety shower (if available) or wash the affected area thoroughly with running water for at least 15 minutes**.**
- Remove contaminated clothing, shoes, or accessories promptly.
- Do not use neutralizing agents unless instructed in the chemical's Material Safety Data Sheet (MSDS).

- Seek medical assistance if irritation, burns, or pain persists.

In case of fire,

- Alert nearby personnel.
- If trained and only if safe, use the appropriate fire extinguisher (CO_2, foam, or dry powder depending on the type of fire).
- If clothing catches fire, use the fire blanket or stop–drop–roll method.
- Evacuate the laboratory immediately using the nearest safe exit.

For spills,

- Alert others in the laboratory and restrict access to the area.
- Wear appropriate PPE before attempting cleanup.
- For small spills: use the spill kit provided, following the standard operating procedure for that substance (chemical, biological, or oil).
- For large spills or unknown hazards: evacuate immediately and contact the supervisor, technical officer, or head of the department or emergency response team.

For electrical incidents,

- Do not touch a person who is in contact with live electrical equipment.
- Disconnect the power source if safe to do so.
- Call emergency services and administer Cardiopulmonary Resuscitation (CPR) if trained and required.

For gas leaks (e.g., LPG, compressed gases),

- Do not operate electrical switches or flames.
- Evacuate the area immediately and inform technical staff or emergency responders.
- Shut off the main gas supply if safe to do so.

Emergency evacuation procedures

- Leave all equipment in a safe condition if time permits.
- Proceed quickly and calmly to the designated assembly point.
- Do not re-enter the building until cleared by emergency personnel.

Emergency contacts

- Each laboratory must display updated emergency contact numbers (provided in Section 3 of this guide).

1.3.4 Working alone and after hours

- Undergraduate students are not permitted to work alone in laboratories under any circumstances. They must be supervised by academic staff, research supervisors, or technical officers during all practical classes and research work.
- Postgraduate students and researchers may require access to laboratories outside regular hours. In such cases:
    - Prior approval must be obtained from the Head of Department and Research Supervisor.

- A Risk Assessment Form for working after hours must be completed and approved (see sample below (Checklist 1)).
- The researcher must sign in and out using the laboratory logbook.
- A designated emergency contact person must be informed of the working hours and location.
- High-risk activities (e.g., handling hazardous chemicals such as chloroform, sulphuric acid, con. HCl, formalin, cyanides, heavy metal salts, etc., pressurized gases (Eg: hydrogen gas used with the Gas Chromatography), and machinery such as hammer mills or grinders) are strictly prohibited when working alone.

- Visitors and outside researchers are not allowed to work alone under any circumstances.

Checklist 1: Working After Hours: Risk Assessment

Faculty of Agriculture, University of Jaffna
Name of the Researcher: _____
Name of the supervisor: _____
Department: _____
Location of Work: _____
Date(s) and Time(s) of Work: _____

Instructions: Tick (✓) each item as applicable. Identify hazards, ensure control measures are in place, and indicate whether it is safe to allow the activity to be conducted alone.

1. General Information

Item	Yes	No	NA	Remarks
Has the researcher completed mandatory laboratory induction?				
Supervisor and technical officer aware of working alone schedule?				
Emergency contact person identified and informed?				
Communication method available (phone)?				

2. Hazard Identification

Potential Hazard	Yes	No	NA	Control Measures
Handling hazardous chemicals (toxic, flammable, corrosive)				
Use of biological materials / microorganisms				
Working with sharp tools, glassware, or pressurized systems				

Operation of machinery or electrical equipment				
Compressed gases / cryogenic materials				
Work during night-time or outside normal hours				
Other hazards (specify)				

3. Risk Control Measures

Control Measure	Implemented	NA	Remarks
Use of PPE			
Safe handling procedures followed			
Emergency procedures (fire, chemical spill, injury) are known			
Access to first aid kit and emergency shower/eyewash			
Hazardous activities postponed until supervision is available			
Any others: Specify			

4. Supervisor Assessment

- Overall Risk Level: ☐ Low ☐ Medium ☐ High
- Recommendations / Additional Controls: _____

Declaration by Researcher:
I have read and understood the risks and control measures and agree to comply fully with Faculty safety policies while working alone.

Signature: _____ Date: _____

Approval

- Supervisor: _____ Date: _____
- Head of Department: _____ Date: _____

1.3.5 Usage of Laboratories by External Researchers

The laboratories of the Faculty of Agriculture, University of Jaffna, are primarily intended for teaching, research, and extension activities of the Faculty. However, under special circumstances, access may be granted to staff or researchers from outside the Faculty, subject to the following conditions:

(1) Approval process

- All requests for laboratory use by individuals or groups outside the Faculty must be made in writing and submitted to the Head of the Department through the Dean of the Faculty of Agriculture, University of Jaffna.
- Approval must be formally granted by the Dean, after which the request will be forwarded to the respective Head of Department for coordination and implementation.

(2) Conditions of use

- The nature of the intended work must be clearly described, including the proposed activities, duration, and safety considerations.
- Users must comply with all Faculty laboratory safety policies, SOPs, and emergency guidelines.
- Users must demonstrate competency in safe laboratory practices or complete training.
- High-risk activities may be restricted unless adequate supervision, risk assessments, and control measures are in place.

(3) Supervision and responsibility

- External users must work under the supervision of an authorized staff member designated by the Head of Department.
- Any incidents, damages, or safety breaches occurring during laboratory use will be the responsibility of both the external user and their supervising faculty contact.

(4) Resources and costs

- Approval may be subject to availability of space, equipment, and consumables.
- Where applicable, costs for consumables, utilities, or technical support must be borne by the external user or their institution, as determined by the faculty.

1.3.6 Restrictions

Access to the laboratories of the Faculty of Agriculture, University of Jaffna, is strictly controlled to ensure the safety of personnel, protection of equipment, and compliance with regulatory requirements. The following restrictions apply to all users, including students, staff, researchers, and visitors:

1. Mandatory induction and training

- All personnel must complete a laboratory induction program before being allowed to work in any laboratory.
- Induction includes familiarization with laboratory safety rules, proper use of PPE, emergency procedures, handling of chemicals and biological materials, and operation of equipment.

- Records of completed inductions must be maintained by the Technical Officer.

2. **Restricted areas**
    - High-risk areas, such as chemical storage rooms, biosafety laboratories, equipment rooms, and specialized experimental zones, are accessible only to authorized and trained personnel.
    - Entry to these areas requires written approval and may be limited to supervised activities.
3. **Visitor restrictions**
    - All visitors, including external collaborators, contractors, or guests, must be accompanied at all times by an authorized staff member.
    - Visitors are not permitted to operate equipment, handle chemicals, or conduct experiments unless formally authorized, trained, and supervised.
4. **Prohibition of unsanctioned activities**
    - Conducting experiments, using equipment, or handling hazardous materials without proper authorization and supervision is strictly prohibited.
    - Activities outside the scope of approved work must receive written approval from the Dean and Head of Department.
5. **Enforcement**
    - Heads of the Departments, Supervisors and Technical Officers are responsible for ensuring compliance with all access and conduct restrictions.
    - Non-compliance may result in immediate cancellation of laboratory privileges and reporting to the Faculty authorities for further action.

1.3.7 Laboratory Logbooks for Safety and Compliance

All laboratories should maintain logbooks relevant to their specific activities and safety requirements of their laboratories.

- **Laboratory entry/attendance logbook:** Records names, date, time in/out
- **Equipment usage logbooks:** For all instruments such as balances, centrifuges, autoclaves, spectrophotometers etc. Includes user name, department, date, purpose, number of samples, time, operating conditions, and any issues
- **Equipment maintenance and calibration logbooks:** Records routine maintenance, servicing, and calibration to ensure data reliability and regulatory compliance.
- **Chemical inventory logbook:** Lists chemicals, quantities, date of purchase, storage location, and expiry dates
- **Chemical usage logbook (if applicable):** Record usage of hazardous or controlled chemicals to support waste management.
- **Waste disposal logbook:** Records type of waste, quantity, method of disposal, date and name of the person. It includes chemical, biological, and sharps waste

- **Accident logbook:** Records spills, injuries, and corrective actions taken.
- **Induction logbook:** Records safety training, and lab inductions.
- **Visitor logbook:** Records details of visitors entering the laboratory.

1.3.8 Laboratory induction

Laboratory induction is a mandatory prerequisite for anyone who wishes to work in the laboratories of the Faculty of Agriculture, University of Jaffna.

Objectives of Laboratory Induction

- Familiarize personnel with laboratory rules, regulations, and expected conduct.
- Introduce the proper use of PPE and safety devices.
- Explain the location and proper use of emergency equipment**,** such as first aid kits, eyewash stations, safety showers, fire extinguishers, and spill kits.
- Guide on handling chemicals, biological materials, machinery, and other hazardous equipment safely.
- Ensure understanding of emergency response procedures**,** including fire, chemical spills, injuries, and evacuation.
- Highlight ethical responsibilities, biosafety, and environmental stewardship in laboratory work.

(1) Induction Process

- All new personnel, including undergraduate and postgraduate students, staff, researchers, and external collaborators, must complete laboratory induction before commencing any laboratory work**.**
- Induction is provided by the technical officers, or designated supervisors**.**
- Personnel must demonstrate understanding of safety rules and procedures, including the ability to locate and use emergency facilities.
- Completion of induction is recorded and documented.

(2) Lab-Specific Induction Checklist

In addition to the general induction, each laboratory maintains a Lab-Specific Induction Checklist tailored to the particular hazards, equipment, and procedures of that laboratory.

- Personnel must review and acknowledge the lab-specific checklist before using the laboratory independently.
- Lab-specific checklists include additional information such as restricted areas, specialized equipment training, chemical or biological hazards, and emergency contacts.
- Records of completed lab-specific inductions are maintained for compliance and auditing purposes.

(3) Sample laboratory induction checklist

The following is a sample laboratory induction checklist, which may be modified by each laboratory to suit the specific nature of its activities.

Checklist 2: Laboratory Induction Checklist
Faculty of Agriculture
University of Jaffna

Instructions: Laboratory access is permitted only after completing the induction and checklist.

Inductee name		Inductor name		
Department				
Faculty		Date:		
University				
☐ Staff	☐Undergraduate student of the Faculty of Agriculture	☐ Postgraduate student of the Faculty of Agriculture	☐ Other researchers	☐ Any others (Specify)
Purpose				
Research title				

PART A – INDUCTOR SIGN-OFF (to be completed by the person conducting the induction)

The following has been demonstrated/explained to the inductee.

INTRODUCTION
☐ Introduction to laboratory staff and students ☐ Explain responsibilities ☐ Tour of laboratory spaces
ACCESS AND SECURITY
☐ Advise that the lab needs to be kept locked at all times (if applicable) ☐ Allocate workspace / office space ☐ Explain booking system for equipment.
EMERGENCY AND FIRST AID
☐ Explain emergency and incident reporting procedures ☐ Show emergency exit points ☐ Show first aid kit locations in the laboratories ☐ Show emergency shower and eyewash locations and explain how to use them ☐ Show fire extinguisher locations in the laboratories

☐ Show chemical spill kit locations and explain how to use
RISK MANAGEMENT
☐ Show where the MSDS for the chemicals are located ☐ Show where the SOPs and manuals for the equipment are located ☐ Explain laboratory rules and housekeeping ☐ Explain the Risk Assessment process requirements prior to starting work ☐ Explain the need for equipment training and authorization prior to using equipment ☐ Explain after -hours work requirements ☐ Explain PPE requirements and signage
CHEMICAL SAFETY
☐ Explain labelling and storage requirements for solutions and samples ☐ Show MSDS folders ☐ Explain chemical waste management procedures
MICROBIAL SAFETY
☐ Explain labelling and storage requirements for microbial samples ☐ Explain microbial waste management procedures
EQUIPMENT INDUCTIONS (List out the equipment that requires training before use)

PART B – TO BE COMPLETED BY THE INDUCTEE

GENERAL LABORATORY SAFETY CHECKLIST (Mandatory for All Users)
☐ Attended laboratory safety induction ☐ Read and understood laboratory rules and regulations ☐ Aware that eating, drinking, and smoking are prohibited ☐ Understands the importance of good housekeeping ☐ Knows emergency exits ☐ Can identify fire extinguishers, eyewash stations, and safety showers ☐ Understands accident, spill, and incident reporting procedures ☐ Aware of restrictions on working alone and after-hours access
PERSONAL PROTECTIVE EQUIPMENT (PPE)
☐ Aware of mandatory PPE requirements ☐ Knows when and how to use gloves, goggles, masks, and lab coats ☐ Understands that PPE must not be worn outside the laboratory
CHEMICAL HANDLING AND SAFETY (For Chemical and Related Labs)

☐ Can identify chemical hazard symbols ☐ Understands how to read SDS ☐ Trained in safe chemical handling and storage ☐ Knows proper use of fume hoods ☐ Understands chemical labeling requirements ☐ Aware of chemical spill response procedures ☐ Understands chemical waste segregation and disposal
FOOD PROCESSING LABORATORY PRACTICES (Where applicable)
☐ Understands food hygiene and sanitation requirements ☐ Knows procedures to prevent cross-contamination ☐ Trained in safe operation of food processing equipment ☐ Aware of risks associated with heat, steam, and pressure ☐ Understands cleaning and sanitation procedures after use
MICROBIOLOGICAL LABORATORY SAFETY (Where applicable)
☐ Trained in aseptic techniques ☐ Understands biosafety principles and contamination control ☐ Knows correct use of biosafety cabinets ☐ Trained in autoclave operation and sterilization procedures ☐ Understands biological waste segregation and disposal ☐ Aware that cultures and contaminated materials must not leave the lab
EQUIPMENT USE
☐ Received training before operating laboratory equipment ☐ Aware of relevant SOPs and logbook requirements ☐ Understands responsibility to report faulty or damaged equipment ☐ Knows correct shutdown and cleaning procedures after use
WASTE MANAGEMENT
☐ Understands segregation of chemical, biological, sharps, and general waste ☐ Knows labeling requirements for waste containers ☐ Aware of prohibited disposal methods (e.g., sink disposal without approval)

PART C – DECLARATIONS OF COMPLETION AND COMPETENCE

I understand my responsibilities with regard to laboratory safety and I agree to comply with all laboratory rules and safety procedures.			
Signature of Inductee:		**Date:**	
I have provided the information specified in Part A. Based on the competency assessment, I approve lab access to the listed area(s) for this individual.			
Signature of Inductor:		**Date:**	

1.4 Waste management

Each laboratory has different types of bins depending on the nature of the waste generated. In general, there are 4 types of waste collection bins as indicated below.

- **General waste bin:** To dispose of general waste not contaminated with any hazardous materials.
- **Sharp waste bin** – To dispose of needles, blades, broken glass, and other items that can cause cuts or punctures.
- **Chemical waste bin:** To dispose of any chemical waste/ gloves or any other items contaminated with hazardous chemicals.
- **Biohazard bin** – To dispose of any clinical laboratory waste, gloves, or any other items contaminated with biohazardous materials.
- **Radioactive waste bin** (Shielded Containers) -To dispose of waste contaminated with radioactive isotopes.

2. Chemical safety

This section applies to all laboratories that handle chemicals.

2.1 Introduction to Chemical Safety

Chemical safety is a fundamental aspect of laboratory practice, particularly in agricultural research and teaching, where a wide range of reagents, solvents, and agrochemicals are routinely used. Proper chemical safety ensures the protection of personnel, the environment, and laboratory infrastructure while enabling effective and responsible scientific work. This includes understanding the hazards associated with chemicals, recognizing appropriate handling and storage procedures, and knowing the correct responses to accidents or spills. Compliance with institutional policies, legal requirements, and internationally recognized safety standards is essential. All laboratory users must be familiar with MSDS/SDS, follow proper labeling practices (see the section 7.4 for details), and employ suitable PPE.

2.2 Chemical Hazard Identification

Chemicals are categorized based on their inherent hazards, which determine how they must be handled, stored, and disposed of. Common classifications include:

- **Flammable** – Chemicals that can ignite easily, such as ethanol, acetone, and many organic solvents. These should be kept away from open flames, heat sources, and sparks.
- **Corrosive** – Acids and bases capable of causing severe skin burns or eye damage (e.g., hydrochloric acid, sodium hydroxide). Appropriate PPE and containment are essential.
- **Toxic / harmful** – Chemicals that can cause acute or chronic health effects if inhaled, ingested, or absorbed through the skin (e.g., pesticides, formaldehyde). Exposure must be minimized using fume hoods and PPE.

- **Oxidizing** – Substances that can cause or intensify fires or explosions by providing oxygen to combustible materials (e.g., potassium permanganate, hydrogen peroxide).
- **Reactive / Unstable** – Chemicals that can react violently under certain conditions, such as shock, heat, or contact with water (e.g., sodium metal, picric acid). Special storage and handling procedures are required.
- **Other Hazards** – Including carcinogens, mutagens, teratogens, and environmentally hazardous chemicals, which require additional control measures.

2.3 Understanding Material Safety Data Sheets (MSDS/SDS)

MSDS or SDS are critical documents that provide detailed information about each chemical's properties, hazards, safe handling procedures, and emergency measures. Laboratory personnel must be able to:

- Locate and access the SDS for every chemical used in their work.
- Interpret hazard symbols, precautionary statements, and recommended PPE.
- Follow instructions for storage, handling, disposal, and emergency response.
- Ensure SDS are up-to-date and stored in a readily accessible location within the laboratory.

2.4 Labeling Requirements

Proper labeling of all chemical containers is essential to prevent accidental misuse and exposure. Labels should include:

- Chemical name and concentration (if applicable)
- Hazard symbols (Globally Harmonized System – GHS)
- Precautionary statements (e.g., "Keep away from heat," "Wear gloves and eye protection")
- Date of preparation (if applicable) and the name of the person responsible
- Expiry date or date of opening for unstable chemicals/ or chemicals with short shelf life (fatty acid methyl ester standards, ferrous sulphate, hydrogen peroxide, etc.) or prepared reagents (enzymes, buffers, culture media)
- Any specific storage or disposal instructions

2.5 Storage of chemicals

2.5.1 General principles

- Chemicals must be stored separately based on their hazard class, not alphabetically, unless within separate hazard groups. For example, acids should never be stored with bases, oxidizers should be kept away from flammable materials, and reactive metals should be separated from water and moisture sources.
- Keep all containers tightly closed when not in use to prevent leaks, evaporation, and contamination.
- Avoid storing chemicals on countertops, in fume hoods, or on the floor. These areas increase the risk of spills, accidental exposure, and fire hazards.

- Use spill trays where needed (e.g., under waste collection bottles) to contain accidental leaks.
- Date chemicals on receipt and when opened, and note expiry or maximum storage time where applicable. This helps to identify materials that may degrade or become unsafe over time.
- Maintain a chemical inventory that is reviewed regularly. This supports safe storage, planning, and compliance with institutional safety programs.
- Perform periodic clean-outs to remove outdated or unused chemicals.
- Avoid direct sunlight and heat sources in storage areas, as they can degrade containers and chemicals.
- Chemicals, particularly volatile solvents, should be stored in well-ventilated areas or in flammable storage cabinets to prevent accumulation of vapors.
- Liquids, corrosives, and chemicals prone to leaks should be stored in trays or secondary containers to contain spills and prevent damage to shelving or adjacent chemicals.
- Frequently used chemicals should be easily accessible, while highly hazardous or rarely used chemicals may be stored in designated cabinets. A clear labeling and inventory system reduces the risk of accidents.
- Do not store any chemicals under sinks (except properly labeled, non-hazardous cleaners).
- Flammable liquids and solvents must be stored in certified flammable storage cabinets or purpose-built storage rooms.

2.5.2 Specific chemical storage requirements

Chemicals shall be stored in designated storage areas according to their chemical compatibility, hazard classification, and recommended storage conditions. Appropriate segregation shall be maintained to prevent accidental mixing, chemical reactions, fires, or other hazardous incidents. All chemicals shall be properly labelled, and storage cabinets shall display relevant hazard warning signs. The following table outlines the specific storage requirements for different categories of chemicals. All laboratory personnel shall strictly follow these requirements when storing, handling, and retrieving chemicals.

Table 1: Classes of chemicals storage requirements

Class of chemicals	Examples	Storage recommendation
Acids	hydrochloric acid, nitric acid, acetic acid, sulphuric acid, perchloric acid, phosphoric acid	Keep acids separate from bases, reactive metals (e.g., sodium, potassium), and materials that can generate toxic or flammable gases. Store oxidizing acids away from organic acids and flammable materials. Store in a ventilated corrosives cabinet on protected shelving using secondary containment; keep away from water sources Do not store under the sink Do not store acids on metal shelving For mixed corrosive cabinets, place nitric and hydrochloric acid in separate drip trays to prevent dangerous gas formation.
Bases/ caustics	sodium hydroxide, potassium hydroxide, ammonium hydroxide, calcium hydroxide, hydroxylamine, tetramethylethylamine, diamine, trimethylamine	Separate bases from acids and incompatible substances such as explosives or organic peroxides. Do not store caustic solutions in aluminum trays as they can corrode the metal. Store in a separate cabinet, preferably with ventilation, corrosive cabinet or storage area with a spill tray, away from potential water sources (DO NOT store under the sink)
Flammables	Liquids: hexane, toluene, isopropanol, Ethanol, Ethyl Acetate, Methanol, Acetone, Benzene, Xylene, Toluene Diethyl Ether, Tetrahydrofuran, Acetonitrile, Glacial Acetic Acid Solids: Charcoal, Carbon, Paraformaldehyde, Phosphorus, Magnesium	Store in approved cabinets and away from ignition sources such as heaters, burners, or direct sunlight. Always keep flammables stored inside an approved flammable cabinet and away from oxidizers, corrosives, heat or ignition sources (e.g., radiators, electric power panels)

Explosives	Picric Acid, Ammonium Nitrate, Nitro Urea, Trinitroaniline, Benzoyl Peroxide, Trinitrobenzene, Trinitrobenzoic Acid, Trinitrotoluene, Urea, Nitrate, Trinitrophenol	Store in a secure location away from other chemicals; store in an area away from friction or shock
Oxidizers	peroxides, nitrates, perchlorates, permanganates, sodium hypochlorite, ethyl acetate, iodine, benzoyl peroxide, potassium dichromate, chlorates, bromates, and superoxides, ammonium persulfate, ferric chloride	Store in secondary containment away from combustible and reducing agents.
Water-Reactive Substances	sodium metal, potassium metal, calcium carbide, magnesium metal, sodium borohydride, alkali metal hydrides	Store in cool, dry areas isolated from moisture and water sources.
Light-Sensitive chemicals	Dichlorophenolindophenol, vitamin C, beta-carotene, iodine	Light-sensitive chemicals should be kept in amber bottles in dark, cool places.
Peroxide-Forming Chemicals	acrylonitrile, isopropyl alcohol, ethers (e.g. diethyl ether, isopropyl ether), acetals and ketals, aldehydes (e.g. acetaldehyde, benzaldehyde) vinyl and vinylidene compounds, dienes, tetrahydrofuran, dioxane, Butylated Hydroxytoluene (BHT) isopropyl ether	Peroxide-forming chemicals require airtight containers and must be segregated from oxidizers and acids.
Toxic Chemicals	Chloroform, Cyanides, Heavy metal compounds (e.g. Cadmium, Mercury, Osmium, Oxalic Acid, Phenol, Formic Acid), Formamide, Carbon Tetracholride, 2Mercaptoethanol Phenol, Hydrofluoric Acid (highly	Store according to hazard level and Store in a dark, dry, ventilated, cool area in an unbreakable chemically resistant secondary container (polyethylene) Cyanides: segregate from aqueous solutions, acids and oxidizers.

	acute poison), Acrylamide, Ethidium Bromide, Sodium Azide	
Carcinogens	Benzidine Beta-Naphthylamine Benzene Methylene Chloride Beta-Propiolactone Carbon Tetrachloride	Label all containers as "Cancer Suspect Agents" or the equivalent. Store according to the hazardous nature of the chemical, using appropriate security when necessary.
Teratogens	Lead Compounds, Mercury Compounds, Benzene Aniline	Label all containers as "Suspect Reproductive Hazard" or "Reproductive Effecter" Store according to the hazardous nature of the chemical, using appropriate security when necessary
Flammable Compressed Gases	Hydrogen, methane, propane	Keep cylinders upright, secured with chains or straps, and separate oxidizing gases from flammable gases. Ensure proper labeling and pressure relief devices are in place.
Chemicals with multiple hazards (multiple hazard pictograms)	Methanol, chloroform, sulphuric acid, phenol, acetonitrile	Some chemicals may carry more than one hazard classification and therefore display multiple GHS pictograms on their labels. In such cases, storage and segregation should be based on a hazard hierarchy, giving priority to the most severe risk. Generally, the order of priority is: pyrophoric and water-reactive substances first, followed by flammable substances, oxidizing agents, toxic , and corrosive substances

Adapted from https://ors.od.nih.gov/sr/dohs/Documents/chemical-segregation-table.pdf

2.5.3 Labeling and Documentation

- All chemical containers, including secondary containers, must be clearly labeled with the chemical name, hazard symbols, concentration, and date of receipt or preparation.
- Maintain an up-to-date chemical inventory for each laboratory, including storage location, quantity, and expiry date.

2.5.4 Chemical compatibility

Understanding chemical compatibility is important because incompatible chemicals can react dangerously when stored, handled, or disposed of together, causing risk to people, property, and the environment. A detailed table on chemical segregation and storage can be displayed in

the laboratories that use chemicals. The following guide could help segregate the chemicals for the safest possible storage.

Chemical compatibility guide

Hazard/s	GHS code	GHS pictogram						
• Flammables	GHS02							
• Oxidizers, fire hazard	GHS03							
• Acute toxicity	GHS06							
• Skin corrosion/burns • Eye damage • Corrosive to metals	GHS05							
• Chronic health hazards	GHS08							
• Explosives, fire hazard	GHS01							

Compatible | compatible under certain concerns: refer to SDS | Incompatible

2.5.5 Temperature and Environmental Control

- Store temperature-sensitive chemicals according to manufacturer instructions. Refrigeration may be required for some reagents, but avoid storing flammables in domestic refrigerators.
- Protect chemicals from direct sunlight, moisture, and excessive heat.
- Maintain stable shelving to prevent containers from tipping or falling.

2.5.6 Security and Access

- High-risk chemicals should be stored in locked cabinets accessible only to authorized personnel.
- Technical Officers and Heads of Departments are responsible for monitoring chemical storage and ensuring compliance with safety policies.

2.6 Handling of Chemicals

Safe handling of chemicals is essential to minimize the risk of exposure, accidents, and environmental contamination in agricultural laboratories. Laboratory personnel must follow established procedures, use appropriate PPE, and utilize engineering controls such as fume hoods and ventilation systems.

2.6.1 Safe Transfer, Weighing, and Mixing Practices

- **Transfer of Chemicals:** Always use appropriate containers and tools (spatulas, pipettes, funnels) to transfer chemicals. Avoid pouring directly from large containers; use smaller, labeled intermediate containers when possible.
- **Weighing Chemicals:** Conduct weighing of solids on a clean, stable surface, preferably in a balance enclosure or on a secondary tray to contain spills. Avoid creating dust clouds when handling powders.
- **Mixing Chemicals:** Mix chemicals slowly and in small quantities when possible, adding reagents gradually while observing for reactions. Always follow the experiment's SOP and check compatibility before mixing.
- **Minimizing Exposure:** Keep chemicals away from the body, avoid inhalation of vapors, and prevent contact with skin or eyes. Use tools or tongs when handling hot or reactive substances.

2.6.2 Use of PPE

- **Gloves:** Wear chemically resistant gloves appropriate for the substances being handled (e.g., nitrile, latex, neoprene). Inspect gloves for damage before use.
- **Goggles or Face Shields:** Protect eyes from splashes, fumes, and flying particles. Standard safety goggles are required when handling corrosives, flammables, or reactive chemicals.
- **Lab Coat / Protective Clothing:** Wear a lab coat that covers arms and torso; use aprons or additional protection if handling highly corrosive or staining chemicals.
- **Respirators:** Use appropriate respirators when working with volatile, toxic, or dusty chemicals, as determined by the chemical's MSDS/SDS and risk assessment.

PPEs used in chemical laboratories



Table 2: Different types of gloves used while handling chemicals

Type	Sample image	Use
Natural latex gloves		Natural latex gloves offer excellent flexibility, tactile sensitivity, and superior resistance to water-soluble chemicals, acids, bases, and salts. However, they degrade rapidly when exposed to petroleum-based hydrocarbons, oils, and greases, making synthetic alternatives necessary for those specific hazards.
Nitrile gloves		Best for chemical handling, microbiology, and general laboratory tasks. Resistance to punctures, chemicals, and abrasions.
Vinyl Gloves		Non-hazardous materials handling, light cleaning tasks, and situations where glove changes are frequent.
Neoprene Gloves		Provide excellent chemical resistance and are often used in situations where protection against a wide range of chemicals is required. They offer good flexibility and are resistant to tears and punctures.

2.6.3 Use of Chemical Fume Hoods and Ventilation

- **Fume Hoods:** Perform work with volatile, flammable, or toxic chemicals inside properly functioning chemical fume hoods. Ensure the sash is at the recommended height and the hood airflow is operational before starting work.

Working in a fume hood



- **Ventilation:** Maintain general laboratory ventilation to minimize accumulation of vapors. Avoid working in enclosed or poorly ventilated spaces with hazardous chemicals.
- **Local Exhaust Systems:** Use local exhaust or other engineering controls when handling chemicals that generate dust, aerosols, or fumes outside of a fume hood.

2.6.4 General Safety Practices

- Never work alone with hazardous chemicals unless approved and risk-assessed.
- Avoid eating, drinking, applying cosmetics, or handling contact lenses in areas where chemicals are used.
- Keep work areas organized, and immediately clean up spills using appropriate procedures.
- Always return chemicals to their designated storage locations after use.
- Follow all laboratory-specific SOPs and instructions provided by supervisors.

2.6.5 Chemical Waste Management

Proper management of chemical waste is a critical component of laboratory safety, protecting personnel, the environment, and complying with legal and institutional requirements. Chemical wastes should never be discharged into sinks.

- Laboratories must follow the Guidelines for the Management of Scheduled Waste in Sri Lanka published by the Central Environmental Authority for waste disposal.
- Maintain records of waste disposal, including type, quantity, and date, for compliance and auditing purposes.
- Staff and students must be trained in approved waste management procedures to ensure legal and environmental compliance.

(1) Disposal of Chemical Waste

- **Solid Waste:** Includes solid chemicals, chemical contaminated papers, gloves, pipette tips, etc.
- **Liquid Waste:** Includes spent reagents, solvents, and wash solutions. Liquid waste should be collected in compatible containers and clearly labeled according to hazard type (e.g., flammable, acidic, basic, toxic, and heavy metals). Never pour chemicals down sinks unless specifically permitted and neutralized.
- **Hazardous Waste:** Highly toxic, reactive, or environmentally harmful chemicals such as chloroform, halogenated chemicals (carbon tetrachloride), methanol, ethidium bromide, sodium azide, etc.) require specialized collection, containment, and disposal following the guidelines.
- **Neutralization of aqueous wastes:**
  - The pH of a chemical waste should be within the range found in natural waters (pH 6.5 to 8.5), or close to it, if the waste is to be discharged from a laboratory into the sewer system. Dilute acid or alkali (e.g., sodium carbonate) can be used for pH adjustment, or acidic and alkaline wastes can be carefully mixed, taking into account any possible interactions.
  - Neutralization must be carried out in well-ventilated areas or under a fume hood, using appropriate PPE, and with continuous monitoring to avoid exothermic reactions or gas release.
- **Dissolved salts**
  - Identify the type of salt waste first. Some salts are relatively harmless (e.g., sodium chloride), while others may contain toxic metals or hazardous ions. Salt wastes should never be disposed of indiscriminately into sinks unless explicitly permitted by institutional guidelines.
  - Collect salt wastes in labeled containers, indicating the chemical name, concentration, and hazard level. Keep incompatible salts separate to avoid unwanted reactions. Store containers in designated waste areas.
  - If the salt contains heavy metals, toxic ions, or hazardous components, it must be handled as hazardous chemical waste and disposed of through approved waste management systems arranged by the institution.
- **Water-miscible liquids**

  The most common water-miscible wastes are short-chain alcohols (e.g. methanol, ethanol, methylated spirits, 1-propanol, 2-propanol), short-chain ketones (e.g. acetone, 2-butanone). All of these substances are readily consumed by microorganisms in the

sewer but are highly flammable, so they should be extensively diluted, at least 1 part waste to 20 parts water, before being poured down the drain.

- **Water-immiscible liquids – non-halogenated**
  Hydrocarbon solvents, such as hexane and petroleum fractions, are the most common wastes. They should be retained in a labelled waste container for collection by a waste service. Do NOT pour them down the drain, even in small quantities.
- **Water-immiscible liquids – halogenated**
  Halogenated compounds should be retained in a labelled waste container for collection by a waste service. Do NOT pour them down the drain, even in small quantities, since many are flammable and many are highly toxic to aquatic life.

- Do NOT mix the halogenated and nonhalogenated liquid wastes, since the halogenated wastes are more expensive to recycle and cannot be easily incinerated due to the formation of dioxins and other toxic halogenated compounds during combustion.
- If a small quantity of a halogenated compound is added to a container of non-halogenated waste, the whole volume must be treated as halogenated, at much greater cost.

(2) Empty chemical bottles

Empty chemical bottles containing water-soluble liquids, e.g., acids, acetone, ethanol, should be rinsed with water, and the rinse treated as liquid waste. Empty chemical bottles of water-immiscible liquids, e.g., hydrocarbons, should be drained of contents, then the film of remaining liquid allowed to evaporate (leave lid off, in a fume hood until odour can no longer be detected); do not rinse bottle with water. The label on the bottle should be removed or rendered illegible, so that the bottle is not regarded legally (and logically) as a bottle containing a chemical. Follow the local rules for the recycling of glass or plastic.

2.6.6 Spill and accident response

Effective response to chemical spills and accidents is essential to protect laboratory personnel, prevent environmental contamination, and minimize damage to equipment and facilities. Laboratory users must be familiar with procedures for small and large spills, proper use of spill kits, evacuation protocols, and incident reporting.

(1) Procedures for Chemical Spills

- Small Spills:
  - Contain the spill immediately using absorbent materials such as sodium bicarbonate (baking soda) or sodium carbonate for acid or alkaline spills or spill pads.
  - Avoid direct contact with the chemical; wear appropriate PPE.
  - Clean the area thoroughly following laboratory-specific procedures for neutralization or disposal if required.
  - Ensure proper ventilation to reduce inhalation exposure.

- Large or Hazardous Spills:
    - Evacuate the area immediately if the spill poses a significant risk (toxic fumes, fire hazard, or reactive chemicals).
    - Close doors to contain the area and prevent others from entering.
    - Activate emergency response procedures and alert the personnel in the area.
    - Do not attempt to clean highly hazardous spills such as concentrated sulphuric acid, perchloric acid, nitric acid, cyanides, hydrazine, mercury unless trained and equipped with proper protective equipment.

(2) Use of Spill Kits

- Laboratories must maintain spill kits appropriate for the chemicals in use (e.g., acids, bases, solvents, biohazards).
- Spill kits typically include: absorbent materials, neutralizing agents, PPE, brushes, dustpans, and disposal bags.
- Personnel must be trained in the proper use of spill kits, including containment, neutralization, and safe disposal of contaminated materials.

(3) Evacuation Procedures

- Know the location of exits and assembly points in the laboratory.
- Evacuate promptly in the event of a chemical spill that produces toxic fumes, fire, or other immediate hazards.
- Only return to the laboratory once authorized by emergency or safety personnel.

(4) Reporting and Documentation of Chemical Incidents

- All spills and accidents, regardless of size, must be reported immediately to the laboratory supervisor or in-charge.
- Record details including:
    - Date, time, and location of the incident
    - Chemicals involved and estimated quantity
    - Cause and circumstances of the spill or accident
    - Actions taken to contain and clean up
    - Any injuries or exposures and medical treatment provided
- Documentation ensures compliance with institutional and legal requirements and helps prevent future incidents through risk assessment and procedural improvements.

2.6.7 Equipment for Emergency and Procedures

Laboratory personnel must be familiar with the location, proper use, and maintenance of emergency equipment to respond effectively to accidents involving chemicals, fire, or injuries.

Prompt and correct use of emergency equipment can prevent severe injuries and minimize damage to facilities.

Eyewash Stations

- Located in every laboratory handling hazardous chemicals.
- Use immediately in the event of chemical splashes to the eyes.
- Flush eyes continuously with running water for at least 15 minutes while holding eyelids open.
- Seek medical attention immediately after using the eyewash station.

Safety Showers:

- Used for large chemical spills on the body or clothing.
- Activate the shower and rinse the affected area thoroughly for at least 15 minutes.
- Remove contaminated clothing while under the shower to ensure effective decontamination.
- Follow up with medical evaluation if necessary.

Fire Extinguishers

- Laboratories must be equipped with suitable fire extinguishers according to the types of chemicals and equipment present.
- Personnel should be trained in the PASS technique:
  - **P**ull the pin
  - **A**im at the base of the fire
  - **S**queeze the handle
  - **S**weep side to side
- Ensure knowledge of different fire extinguisher classes (A, B, C, D, F) and their appropriate use for fires involving ordinary combustibles, flammable liquids, electrical equipment, metals, or cooking oils.
  - **Class A fires** – are fires involving organic solids like paper, wood, etc
  - **Class B fires** – are fires involving flammable liquids
  - **Class C fires** – are fires involving flammable gases
  - **Class D fires** – are fires involving burning metals
  - **Class F fires** – are fires involving fats such as those used in deep fat fryers
  - **Electrical fires (the letter E is not used. Instead, the symbol of an electric spark is displayed)** – are fires caused by electrical equipment
- Report all fire incidents to the laboratory supervisor and emergency services, even if extinguished.

First Aid for Chemical Exposure

- Skin Contact: Remove contaminated clothing and rinse the affected area with running water for at least 15 minutes. Seek medical attention for severe burns or corrosive exposure.
- Eye Contact: Use an eyewash station immediately, flushing continuously for 15 minutes. Medical evaluation is required.
- Inhalation**:** Move the affected person to fresh air immediately. Administer oxygen if trained and available, and seek medical help if symptoms persist.
- Ingestion: Do not induce vomiting unless directed by medical personnel. Provide water if appropriate and seek immediate medical attention.
- First aid kits should be readily accessible**,** regularly checked, and replenished with necessary supplies.

Training and Familiarization

- All personnel must be trained in the use of emergency equipment as part of laboratory induction.
- Supervisors must ensure that all equipment is in working order and that personnel are confident in responding to emergencies.

2.7 Transport of Chemicals within Campus

Safe transport of chemicals is essential to prevent spills, exposure, and accidents when moving reagents and hazardous substances between laboratories.

2.7.1 Safe Carrying of Chemicals

- Always transport chemicals in approved containers that are compatible with the chemical type and in good condition.
- Avoid carrying large quantities at once; use smaller containers to minimize risk.
- Carry containers carefully, keeping them upright, and avoid sudden movements or impacts that could cause spills or breakage.
- Personnel should wear appropriate PPE during transport, including lab coat, gloves, and eye protection.

2.7.2 Use of Secondary Containers

- Whenever possible, place primary chemical containers in secondary containment such as trays, buckets, or boxes to contain any leaks or spills during transport.
- Secondary containers provide additional protection for flammable liquids, corrosives, and toxic chemicals.
- Ensure the secondary container is clearly labeled and does not exceed recommended weight limits for safe carrying.

2.7.3 Minimizing Risk of Spills and Exposure

- Keep containers sealed at all times and ensure labels are visible to alert others of potential hazards.
- For field work, transport chemicals in designated kits or carriers with compartments to separate incompatible chemicals.
- Never leave chemicals unattended during transfer.

2.8 Training and Competency

All laboratory personnel should be properly trained and competent in chemical safety, as it is essential to maintain a safe and responsible research and teaching environment.

2.8.1 Mandatory Chemical Safety Training

- All personnel, including undergraduate and postgraduate students, academic staff, research assistants, technical officers, and external collaborators, must complete mandatory chemical safety training before handling any chemicals.
- Training covers general laboratory safety, proper handling and storage of chemicals, emergency procedures, use of PPE, and understanding hazard classifications and MSDS/SDS.
- Completion of training should be documented.

2.9 Documentation and Record-Keeping

Accurate and up-to-date documentation is essential for effective chemical safety management. Proper record-keeping ensures compliance with institutional and legal requirements, facilitates hazard management, and supports training and emergency preparedness.

2.9.1 Maintaining Chemical Inventory Logs

- Every laboratory must maintain a current chemical inventory that lists all chemicals in use or storage.
- The inventory should include:
    - Chemical name and concentration
    - Quantity and storage location
    - Hazard classification
    - Date of receipt and expiration
    - Responsible personnel
- Regular updates to the inventory are required, particularly after use, disposal, or addition of new chemicals.

2.9.2 Recording MSDS/SDS

- MSDS/SDS for all chemicals must be readily accessible to all laboratory personnel.
- SDS documents should be organized in a manner that allows quick reference during handling, emergencies, or training.

- Electronic and/or hard copy systems can be used, but documents must be up-to-date and reflect any changes in chemical composition, hazards, or regulatory status.

2.10 Risk Management

No research or operational work with hazardous chemicals can be undertaken until a risk assessment of the work is conducted and it is demonstrated that any hazards can be controlled. The researcher should understand the storage and handling requirements of the chemicals to be used, including any incompatibility considerations, specific first aid requirements, emergency response and spill containment requirements, occupational exposure limits, and specific PPE requirements, and should consult with the supervisor and the laboratory-in-charge about the identified risks.

The researcher can assess the safety-related characteristics of each chemical used in the experiment or operation to determine whether it presents high, moderate, or low risk. Safety-related characteristics include toxicity and health hazards (acute and chronic), flammability, reactivity, and whether the chemical is an oxidizer or peroxide-former. This information can be obtained from Globally Harmonized System (GHS) labeling, Safety Data Sheets, and other literature sources.

2.10.1 Identification of Risks

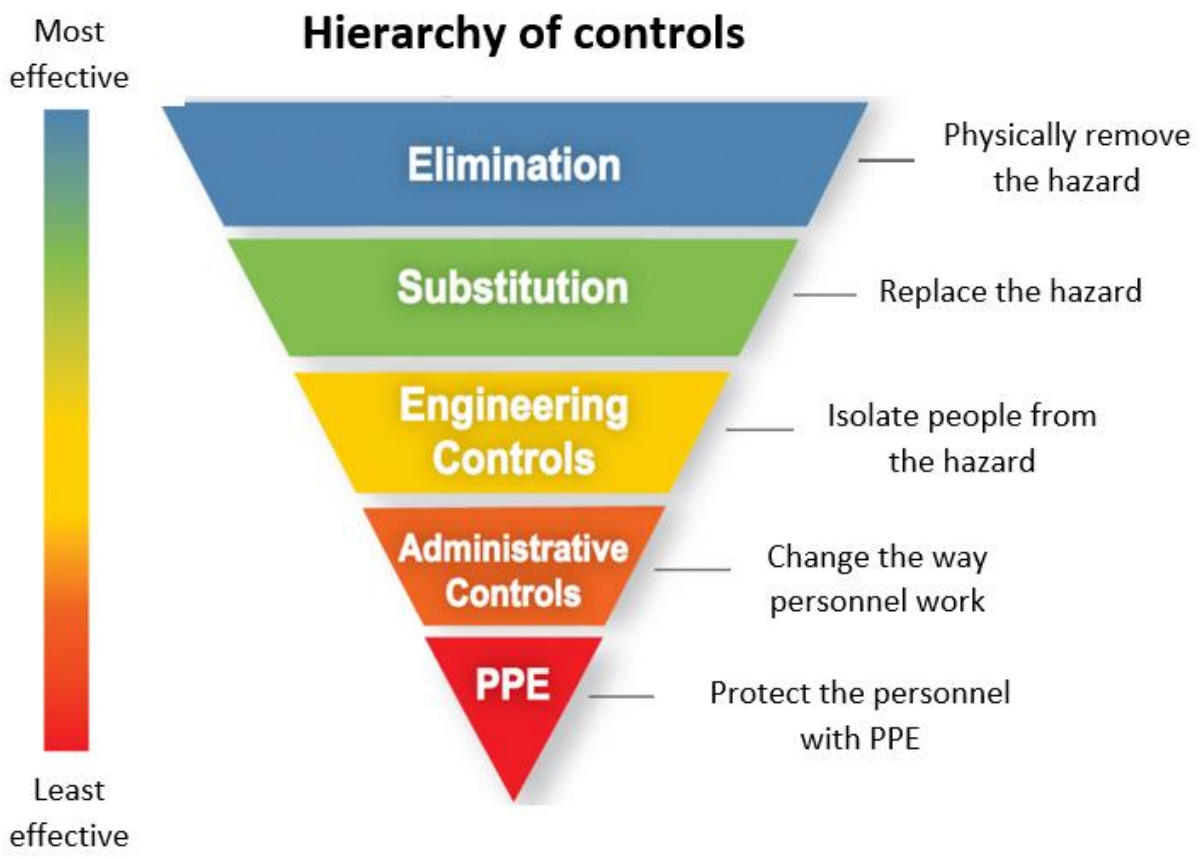
To identify the risks in any experiments that include chemicals, take into account:

- Physicochemical hazards of the chemicals and their classification (e.g. Hazardous Chemical and/or Dangerous Goods)
- Operating temperature
- Volatility or dustiness
- Amounts to be used
- Frequency of use
- Any possible new or unknown substances that may be generated in the course of the activity
- Any potential hazardous conditions that may be generated (e.g. high pressure, vacuum)
- Potential routes of exposure
- Equipment that will be used in conjunction with the chemicals
- Waste generation and disposal process
- Transporting of chemicals and/or chemical waste between labs and/or sites
- Other hazardous tasks or activities that may need to occur as part of the process (e.g. operating equipment, handling biological materials).

2.10.2 NIOSH's hierarchy of control of hazards

National Institute for Occupational Safety and Health (NIOSH) is a United States federal agency responsible for research and recommendations on workplace safety and health. The Hierarchy

of Control is a fundamental concept in occupational safety that ranks methods for reducing or eliminating workplace hazards from most to least effective.



(Image Courtesy: NIOSH, 2021)

2.10.3 Risk Assessment Matrix

A Risk Assessment Matrix is a simple but powerful tool used to evaluate and prioritize risks by combining two factors: how likely something is to happen and how severe its consequences would be. It is commonly used alongside the hierarchy of controls.

Core idea

Every hazard is assessed using:

- Likelihood (Probability): How often or how easily the event could occur
- Consequence: How serious the consequences would be if it happened

Table 3: Risk matrix

Consequence / Likelihood/ probability	Insignificant	Minor	Major
Likely	**Medium risk**	**High risk**	**High risk**
Possible	**Low/Medium risk**	**Medium risk**	**High risk**
Impossible	**Low risk**	**Low risk**	**Medium risk**

Table 4: Explanation of likelihood

Likelihood	Explanation	Example
Impossible	The hazardous event is expected to occur during normal laboratory activities or has a high probability of occurring if controls are inadequate.	Inhalation of solvent vapours when handling volatile chemicals outside a fume hood; minor splashes during frequent chemical transfers.
Possible	The hazardous event could occur under certain circumstances, but is not expected during routine work when appropriate controls are followed.	Skin contact with chloroform due to accidental splashing; a small chemical spill during transfer.
Likely	The hazardous event is not reasonably expected to occur because of the nature of the activity and the controls in place.	Accidental ingestion of a laboratory chemical.

Table 5: Explanation of consequences

Consequence	Description	Example
Insignificant	No injury or health effects, or only negligible effects that do not require first aid or medical treatment.	Brief exposure to a low-hazard chemical with no symptoms; a small spill that can be cleaned up immediately without exposure.
Minor	Minor injury or temporary health effects requiring first aid or causing short-term discomfort, with full recovery expected.	Mild skin irritation from chemical contact; minor eye irritation; headache or dizziness from brief exposure to solvent vapours.
Major	Serious injury, significant health effects, permanent disability, hospitalization, long-term illness, or death.	Severe chemical burns; significant inhalation of toxic vapours; liver or kidney damage from chemical exposure; exposure to a carcinogenic chemical over time.

Table 6: Explanation of risk level

Risk level	Description	Example
Low risk	The likelihood of occurrence is very low, or the consequences are negligible.	A small quantity of a low-hazard chemical handled according to established procedures.
Medium risk	The hazard could result in minor injuries or health effects, or a severe consequence is possible but highly unlikely.	Accidental skin contact with chloroform while wearing appropriate PPE.
High risk	Either the likelihood of occurrence is high or the consequences are severe.	Inhalation of chloroform vapours outside a fume hood, where significant exposure could cause serious health effects.

Table 7: Example- Risk assessment of Chloroform

Hazard	Likelihood	Consequence	Risk Level
Inhalation of vapours outside a fume hood	Likely	Major	High
Skin contact during transfer	Possible	Minor	Medium
Eye splash during handling	Possible	Minor	Medium
Small spill without exposure	Possible	Insignificant	Low
Long-term repeated exposure without adequate controls	Possible	Major	High
Accidental ingestion	Impossible	Major	Medium

Checklist 3: Template for Risk Assessment

Name of the researcher:		For Office Use
Name of the supervisor:		Risk Assessment No.
Department:		Reviewed by:
Faculty:		Approved by:
University:		Date:
Title of the study:		
Purpose of the Study Eg: Undergraduate research, postgraduate research (M.Sc., M.Phil., Ph.D.), any other research, student practical etc.		
Duration of the study:		
1. Chemical Information		
Chemical name (SDS Section 1): CAS number (SDS Section 1): Physical state (SDS Section 9): ☐ Solid ☐ Liquid ☐ Gas Description of experiment:		

2. Chemical hazard classification (SDS Section 2)

☐ Flammable
☐ Highly flammable
☐ Explosive
☐ Oxidizing agent
☐ Corrosive – Acid
☐ Corrosive – Alkali
☐ Toxic (acute toxicity)
☐ Harmful / Irritant
☐ Carcinogenic
☐ Mutagenic
☐ Reproductive toxin
☐ Sensitizer (skin/respiratory)
☐ Environmental hazard (aquatic toxicity)
☐ Compressed gas
☐ Cryogenic hazard
☐ Reactive / unstable
☐ Water-reactive
☐ Peroxide-forming chemical
☐ Other hazard category (covered in SOP)

3. Potential exposure routes (SDS Section 2)

☐ Inhalation
☐ Skin contact
☐ Eye contact
☐ Ingestion (accidental)
☐ Dust/aerosol exposure
☐ Gas/vapour exposure
☐ No significant exposure under normal use

4. Risk level (based on SDS & use condition)
(Use the Risk Assessment Matrix Provided in Table 3)

☐ Low risk
☐ Medium risk
☐ High risk

5. Engineering controls

☐ Fume hood required

☐ Biosafety cabinet required

☐ Local exhaust ventilation

☐ General laboratory ventilation

☐ Closed system operation required

☐ Gas monitoring system required

☐ Any others

☐ No special engineering control required

6. Personal protective equipment (PPE)

☐ Lab coat

☐ Safety goggles

☐ Face shield

☐ Nitrile gloves

☐ Neoprene gloves

☐ Latex gloves

☐ Respirator (dust/organic vapour)

☐ Heat-resistant gloves

☐ Closed-toe shoes

7. Storage requirements

☐ Special storage cabinet, specify

☐ Refrigerated storage (2–8°C)

☐ Deep freezer storage (-20°C / -80°C)

☐ Dry and cool storage

☐ Ventilated storage area

☐ Store away from sunlight

☐ Store away from heat sources

☐ No special storage required

☐ Any others

8. Spill / emergency response

☐ Spill kit available

☐ Chemical neutralization required (acid/base)

☐ Absorbent material required

☐ Evacuation required for major spill

☐ Immediate area isolation required

☐ Fire extinguisher required nearby

☐ Eye wash station required

☐ Safety shower required

☐ Notify safety officer immediately

☐ Waste disposal as hazardous spill material

☐ Any others

9. Waste disposal category

☐ Aqueous waste

☐ Organic solvent waste

☐ Halogenated waste

☐ Non-halogenated waste

☐ Acidic waste

☐ Alkaline waste

☐ Heavy metal waste

☐ Toxic chemical waste

☐ Sharps contaminated waste

☐ Neutralization required before disposal

☐ Any others

10. Administrative controls

☐ Training required before use

☐ Standard Operating Procedure (SOP) available

☐ SOP must be strictly followed

☐ Restricted access (authorized personnel only)

☐ Supervisor approval required

☐ Risk assessment review required before experiment

☐ Emergency contact list available

☐ Any others

11. Additional control measures (if applicable)

☐ Work in small quantities only

☐ Substitute with a less hazardous chemical if possible

☐ Minimize exposure time

☐ Any others

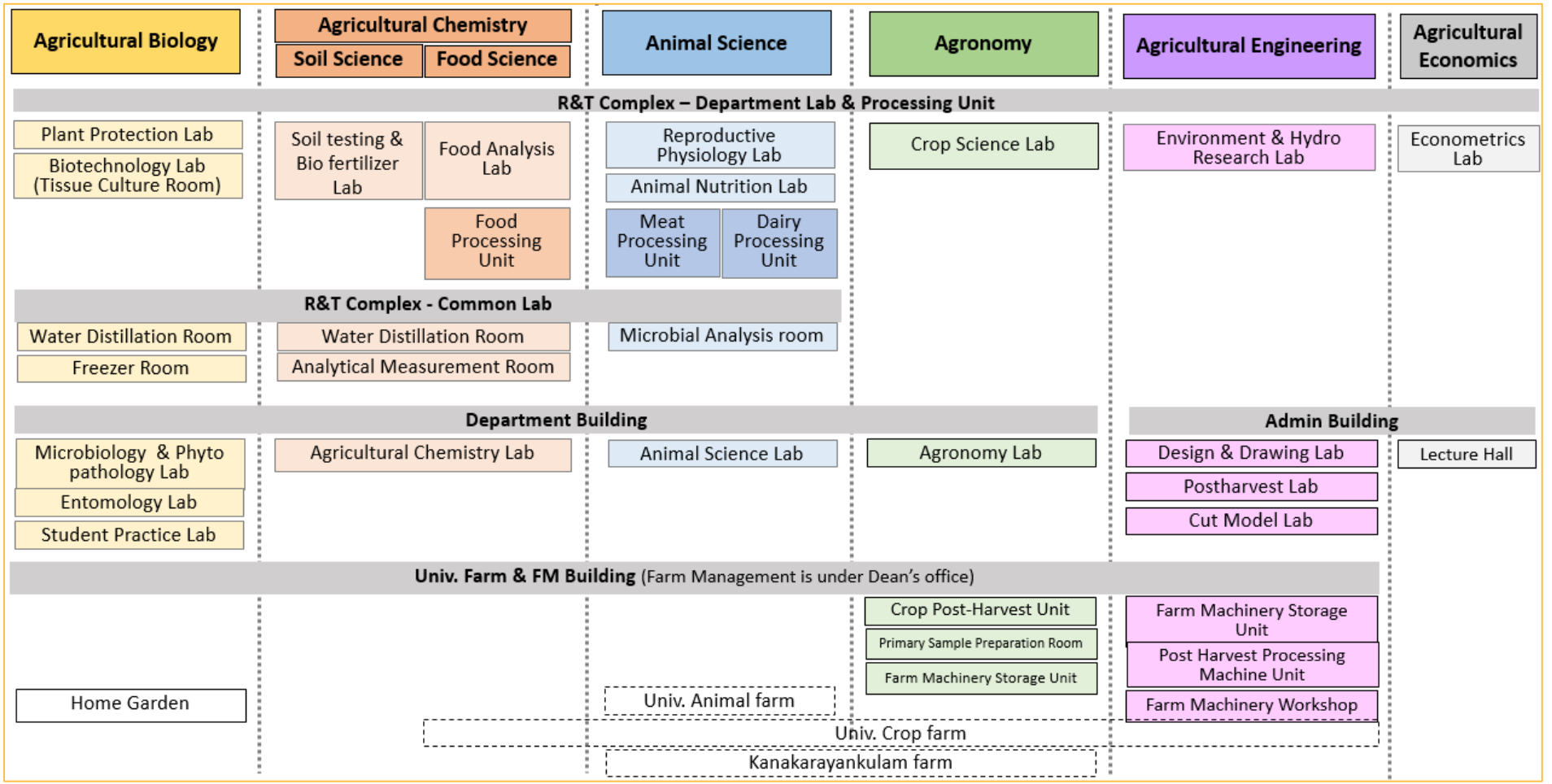
Part B

Standard Operating Procedures (SOPs) for the Laboratories



Faculty of Agriculture
University of Jaffna
Sri Lanka
2026
(Version 1)

Organogram of the Faculty Laboratories and Farms



Department of Agronomy

Crop Science Laboratory

1. Title: Laboratory Conduct and Safety Rules for Crop Science Laboratory

2. Purpose

- To provide guidelines ensuring safe and proper practices in the Crop Science Laboratory.
- To minimize risks when handling agro-chemicals, sophisticated, fire-risk instruments, electrical leakage, and operating laboratory equipment.
- To establish proper procedures for maintaining crop science tools.

3. Scope

- These rules apply to all staff, students, and authorized visitors accessing the Crop Science Laboratory.
- Equipment use: plant growth chamber, laminar flow cabinet, autoclave, incubator, refrigerator, oven, centrifuge, microscopes
- Safe storage and handling of chemicals, consumables, and equipment in the storeroom

4. Procedure

4.1 Obligations

- All personnel must strictly follow this SOP and related institutional guidelines.
- Only trained and authorized personnel are permitted to conduct laboratory analyses.
- PPE including lab coat, gloves, and closed footwear is mandatory.
- Any deviation from SOPs must be documented and approved by the Head of the Department.

4.2 Laboratory Access

- Entry is restricted to authorized staff, students, and approved visitors.
- Visitors must sign the laboratory entry register and be accompanied by authorized personnel.
- Eating, drinking, smoking, and use of personal electronic devices for non-laboratory work are prohibited.

4.3 General Laboratory Safety Rules

- Maintain cleanliness of work benches and floors at all times.
- Handle acids, alkalis, solvents, and volatile chemicals in a fume hood.
- Follow MSDS for all chemicals.
- Wash hands before leaving the laboratory.
- Immediately report spills, breakages, and accidents to the Technical Officer, Supervisor, and Head of the Department.

4.4 Storeroom Rules

- Chemicals and consumables must be properly labeled with hazard symbols and the date of storage.
- Equipment and glassware should be returned to designated shelves after use.
- Hazardous materials must be segregated (flammables, corrosives, oxidizers).
- MSDS must be available for all chemicals.
- Expired consumables or chemicals must be reported for safe disposal.

5. Equipment Usage / Specific rules

Autoclave

- Only trained personnel may operate the autoclave.
- Check water level before each cycle.
- Do not overfill; allow proper steam circulation.
- Use heat-resistant gloves when unloading.
- Never open the door until the pressure gauge reads zero.
- Record each use in the autoclave logbook.

Refrigerator/ Freezer

- Use separate compartments for chemicals, reagents, and biological samples.
- Label all stored items with name, date, and user.
- Defrost and clean monthly.
- No food or drink is allowed.

Fume Hood

- Use for handling volatile chemicals or harmful fumes only.
- Keep the sash at the recommended height during operation.
- Do not store equipment permanently inside.
- Ensure continuous airflow before starting work.
- Report malfunction immediately.

Water Bath / Shaker

- Fill with distilled water only.
- Do not operate without a sufficient water level.
- Regularly check temperature calibration.
- Clean weekly to prevent microbial growth.

Analytical / Electronic Balance

- Keep balance on a vibration-free surface.
- Calibrate bimonthly.
- Never weigh hot or wet items.
- Keep the weighing chamber clean and free from dust.

pH Meter/ Conductivity Meter

- Calibrate before each use with standard buffer solutions (pH 4, 7, 10).
- Rinse the electrode with distilled water after use.
- Keep the electrode immersed in the storage solution when not in use.

Magnetic Stirrer

- Place a stir bar gently in the beaker before switching on.
- Do not use cracked glassware.
- Adjust speed gradually.
- Avoid overheating.

Microcentrifuge

- Balance microtubes accurately.
- Secure the lid before operation.
- Never open the lid during spinning.
- Clean rotors and chambers regularly.

Laminar Flow Cabinet

- Switch on UV light 15–20 minutes before use for sterilization.
- Turn off UV before beginning work; switch on blower.
- Disinfect the surface with 70% ethanol before and after use.
- Do not block airflow vents.
- Avoid rapid hand movements that disturb airflow.
- Calibrate thermal container periodically.

SPAD Meter (Chlorophyll Meter)

- Open the meter and indicator for calibration.
- Maintain internal conditions.
- Clean with mild disinfectant monthly.
- Record chlorophyll and usage monthly.

Colorimeter

- Open the meter and indicator for calibration.
- Maintain internal conditions.
- Clean with mild disinfectant monthly.
- Record colour measurement and usage monthly.

Seed Germination Incubator

- Maintain Temperature level and humidity as per protocol.
- Open the door briefly to maintain internal conditions.
- Clean with mild disinfectant monthly.
- Record temperature daily.

Growth Chamber

- Maintain Temperature level and humidity as per protocol.
- Open the door briefly to maintain internal conditions.
- Clean with mild disinfectant monthly.
- Record temperature and humidity daily.

Bottle Collar

- Maintain Temperature level and humidity as per protocol.
- Open the door briefly to maintain internal conditions.
- Clean with mild disinfectant monthly.
- Record temperature daily.

Stereo Microscope with Camera & Computer

- Handle with both hands (base and arm).
- Clean lenses only with lens paper.
- Switch off and cover after use.
- Avoid exposure to dust and direct sunlight.

Seed Separator

- Open to maintain internal conditions.
- Clean with mild disinfectant monthly.
- Record Usage time

Seed Divider

- Open to maintain internal conditions.
- Clean with mild disinfectant monthly.
- Record Usage time

Ovens

- Use only for drying equipment and glassware.
- Avoid placing plastic materials inside.
- Do not overload shelves.
- Ensure the oven is switched off after use.

Green Leaf Area Meter

- Handle with both hands (Meter and Scanner).
- Clean Meter & scanner only with lens paper.
- Switch off and cover after use.
- Avoid exposure to dust and Other Color Ink Dust

6. Sample Handling

- Samples must be clearly labeled with unique identifiers, date, and user initials
- Proper preservation and storage conditions must be followed
- Cross-contamination must be avoided through good laboratory practice

- Storage locations must be recorded in sample inventory logs

7. Chemical / Media Handling

- Use only properly labeled chemicals and culture media.
- Follow MSDS guidelines for storage and handling.
- Media preparation and sterilization details are maintained in the laboratory manual.

8. Data Management, Documentation, and Record keeping

- All experiments must be recorded in laboratory notebooks or electronic systems
- Raw data must be stored securely and not overwritten
- File naming and storage must ensure traceability
- Data integrity principles (ALCOA - Attributable, Legible, Contemporaneous, Original, and Accurate) must be followed

9. Waste Disposal

- Crop or biological waste must be decontaminated before disposal
- Waste must be disposed according to designated waste containers
- Hazardous chemicals must be disposed of according to institutional guidelines
- Waste disposal records must be maintained

10. Emergency Procedures & Reporting

- Use appropriate fire extinguishers and evacuate immediately is the number one priority. If a safe-level fire occurs due to an equipment electrical shortage or any other failure, try to turn off the main power.
- Handling of acid: Immediately flush the affected area with water for at least 15 minutes at the emergency shower or eye-wash station.
- If power fails during usage of leaf area meter, plant growth chamber, oven and any instrument, immediately turn off the heat source.
- In case emergency, Contact Lab Coordinator, Campus Security, University Doctor, and Technical Support (Instrument repairs)

11. Review and Updates

- This SOP will be reviewed every two years or earlier if new equipment, procedures, or hazards are introduced.

Forest Science Laboratory

1. **Title:** Laboratory Conduct and Safety Rules for Forest Science Laboratory

2. **Purpose**
   - To provide guidelines ensuring safe and proper practices in the Forest Science Laboratory.
   - To minimize risks when handling sophisticated, fire-risk instruments, electrical leakage, and flying, and operating laboratory equipment.
   - To establish proper procedures for maintaining forestry tools.

3. **Scope**
   - These rules apply to all staff, students, and authorized visitors accessing the forest science Laboratory.
   - Equipment use: diameter tape, clino meter, multispectral drone, increment borer, Global positioning system
   - Safe storage and handling of equipment and tools in the storeroom

4. **Procedure**

4.1 Obligations
- All personnel must strictly follow this SOP and related institutional guidelines.
- Only trained and authorized personnel are permitted to conduct equipment use.
- PPE including lab coat, gloves, and closed footwear is mandatory.
- People who obtain drone training can use and fly the drone
- Any deviation from SOPs must be documented and approved by the Head of the Department.

4.2 Laboratory Access
- Entry is restricted to authorized staff, students, and approved visitors.
- Visitors must sign the laboratory entry register and be accompanied by authorized personnel.
- Eating, drinking, smoking, and use of personal electronic devices for non-laboratory work are prohibited.

4.3 General Laboratory Safety Rules
- Maintain cleanliness of work benches and floors at all times.
- Handle all forestry tools carefully.
- Follow MSDS for all instruments.
- Wash hands before leaving the laboratory.
- Immediately report spills, breakages, and accidents to the Technical Officer, Supervisor, and Head of the Department.

4.4 Storeroom Rules

- Equipment and tools should be returned to designated shelves after use.
- Battery of Electronic devices must be removed and stored properly.
- MSDS must be available for all instruments.
- Expired batteries and tools must be reported for safe disposal.

5. Equipment Usage / Specific rules

Multi-spectral drone

- Only trained personnel may operate the drone.
- Must operate with the presence of technical or trained staff from agronomy
- Check that all available instruments are available before use.
- Battery charger level and drone charger level should be full before use
- Only allowed to fly for an outdoor experiment
- Record each use in the drone in logbook.

Diameter Tape

- Use carefully when using.
- Folding and tearing must be prohibited.
- Clean monthly.
- Roll up and keep inside the box after use

Clinometer

- Use carefully when using.
- Damaging or falling must be prohibited
- Clean monthly.

Global Positioning Systems (GPS)

- Use this instrument by referring the guide
- Charge properly before use
- Long pressing or damaging the instruments must be prohibited
- Splitting water or immersing in the water must be prohibited
- Report malfunction immediately.

6. Data Management, Documentation, and Record keeping

- All experiments must be recorded in laboratory notebooks or electronic systems
- Raw data must be stored securely and not overwritten
- File naming and storage must ensure traceability
- Data integrity principles (ALCOA) must be followed

7. Waste Disposal

- Electronic waste must be disposed.
- Waste must be disposed according to designated waste containers
- Hazardous waste must be disposed of according to institutional guidelines

- Waste disposal records must be maintained

8. Emergency Procedures & Reporting

- Use appropriate fire extinguishers and evacuate immediately is the number one priority. If the safe level fire due to the equipment's electric shortage or any failure, try to turn off the main power.
- Handling of drone: Immediately report any accident happened when flying the drone.
- If power fails during usage of forestry equipment and tools, immediately switch off the instruments or report to respective in-charge.
- In case emergency, Contact Lab Coordinator, Campus Security, University Doctor, and Technical Support (Instrument repairs)

9. Review and Updates

- This SOP will be reviewed every two years or earlier if new equipment, procedures, or hazards are introduced.

Agro-met Laboratory

1. Title: Laboratory Conduct and Safety Rules for Agrometeorology (Agro-met) Laboratory

2. Purpose

- To provide guidelines ensuring safe and proper practices in the Agro-met Laboratory.
- To minimize risks when handling sophisticated, fire-risk instruments, electrical leakage, and flying, and operating laboratory equipment.
- To establish proper procedures for maintaining forestry tools.

3. Scope

- These rules apply to all staff, students, and authorized visitors accessing the Agro-met Laboratory.
- Equipment use: rain gauge, pan evaporimeter, Wet and dry Thermometer, Sunshine Recorder, Watch Dog (Weather Station),
- Safe storage and handling of equipment and tools in the storeroom

4. Procedure

4.1 Obligations

- All personnel must strictly follow this SOP and related institutional guidelines.
- Only trained and authorized personnel are permitted to conduct equipment use.
- PPE including lab coat, gloves, and closed footwear is mandatory.
- People who obtain drone training can use and fly the drone
- Any deviation from SOPs must be documented and approved by the Head of the Department.

4.2 Laboratory Access

- Entry is restricted to authorized staff, students, and approved visitors.
- Visitors must sign the laboratory entry register and be accompanied by authorized personnel.
- Eating, drinking, smoking, and use of personal electronic devices for non-laboratory work are prohibited.

4.3 General Laboratory Safety Rules

- Maintain cleanliness of work benches and floors at all times.
- Handle all agro-met instruments carefully.
- Follow MSDS for all instruments.
- Wash hands before leaving the laboratory.
- Immediately report spills, breakages, and accidents to the Technical Officer, Supervisor, and Head of the Department.

4.4 Storeroom Rules

- Batteries of Electronic devices must be removed and stored properly.
- MSDS must be available for all instruments.
- Expired batteries and tools must be reported for safe disposal.

5. Equipment Usage / Specific rules

Rain gauge (1)

- Only trained personnel may operate the agro-met instruments.
- Must operate with the presence of technical or trained staff from agronomy
- Check that all available instruments are available before use.
- Only allowed to fly for an outdoor experiment
- Record each use in the drone in logbook.

Wet and dry thermometer

- Use carefully when use.
- Folding and falling and breaking must be prohibited.
- Clean monthly.
- Keep inside the box after use

Sunshine Recorder

- Use carefully when using.
- Touching and carrying must be prohibited
- Clean monthly.

Watch Dog (Weather Station)

- Use this instrument by referring to the guide
- Do not change the data cable in different port
- Long press or damage the instruments must be prohibited

- Report malfunction immediately.

6. Data Management, Documentation, and Record keeping

- All experiments must be recorded in laboratory notebooks or electronic systems
- Raw data must be stored securely and not overwritten
- File naming and storage must ensure traceability
- Data integrity principles (ALCOA) must be followed

7. Waste Disposal

- Waste must be disposed of according to designated waste containers
- Hazardous waste must be disposed of according to institutional guidelines
- Waste disposal records must be maintained

8. Emergency Procedures & Reporting

- Use appropriate fire extinguishers and evacuate immediately is the number one priority. If safe level fire due to the equipment's electric shortage or any failure, try to turn off the main power.
- Handling of thermometer: when a mercury thermometer is damaged, report respective staff.
- In case of an emergency, contact lab Coordinator, Campus Security, University Doctor, and Technical Support (Instrument repairs)

9. Review and Updates

- This SOP will be reviewed every two years or earlier if new equipment, procedures, or hazards are introduced.

Seed Physiology Laboratory

1. Title: Laboratory Conduct and Safety Rules for Seed Physiology Laboratory

2. Purpose

- To provide guidelines ensuring safe and proper practices in the Seed Physiology Laboratory.
- To minimize risks when handling agro-chemicals, sophisticated, fire-risk instruments, electrical leakage, and operating laboratory equipment.
- To establish proper procedures for maintaining Seed Physiology tools and materials.

3. Scope

- These rules apply to all staff, students, and authorized visitors accessing the Seed Physiology Laboratory.
- Equipment use: seed germination chamber, grain moisture meter, seed purity board, laminar flow cabinet, autoclave, incubator, refrigerator, oven, centrifuge, microscopes
- Safe storage and handling of chemicals, consumables, and equipment in the storeroom

4. Procedure

4.1 Obligations

- All personnel must strictly follow this SOP and related institutional guidelines.
- Only trained and authorized personnel are permitted to conduct laboratory analyses.
- PPE including lab coat, gloves, and closed footwear is mandatory.
- Any deviation from SOPs must be documented and approved by Head of the Department.

4.2 Laboratory Access

- Entry is restricted to authorized staff, students, and approved visitors.
- Visitors must sign the laboratory entry register and be accompanied by authorized personnel.
- Eating, drinking, smoking, and use of personal electronic devices for non-laboratory work are prohibited.

4.3 General Laboratory Safety Rules

- Maintain cleanliness of work benches and floors at all times.
- Handle acids, alkalis, solvents, and volatile chemicals in a fume hood.
- Follow MSDS for all chemicals.
- Wash hands before leaving the laboratory.
- Immediately report spills, breakages, and accidents to the Technical Officer, Supervisor, and Head of the Department.

4.4 Storeroom Rules

- Chemicals and consumables for seed testing must be properly labeled with hazard symbols and the date of storage.
- Equipment and glassware should be returned to designated shelves after use.
- Hazardous materials must be segregated (flammables, corrosives, oxidizers).
- MSDS must be available for all chemicals.
- Expired consumables or chemicals must be reported for safe disposal.

5. Equipment Usage / Specific rules

Grain moisture meter

- Check the working condition before use
- Remove battery after use
- Avoid areas closer to water spills

- Record each use in the logbook.

Seed Purity board

- Use light and purity board carefully
- Plug-in the light lamp before use
- Remove electric connection after use
- Record each use in the autoclave logbook.

Refrigerator/ Freezer

- Use separate compartments for chemicals, reagents, and biological samples.
- Label all stored items with name, date, and user.
- Defrost and clean monthly.
- No food or drink is allowed.

Fume Hood

- Use for handling volatile chemicals or harmful fumes only.
- Keep the sash at the recommended height during operation.
- Do not store equipment permanently inside.
- Ensure continuous airflow before starting work.
- Report malfunction immediately.

Water Bath / Shaker

- Fill with distilled water only.
- Do not operate without a sufficient water level.
- Regularly check temperature calibration.
- Clean weekly to prevent microbial growth.

Analytical / Electronic Balance

- Keep balance on a vibration-free surface.
- Calibrate bimonthly.
- Never weigh hot or wet items.
- Keep the weighing chamber clean and free from dust.

Laminar Flow Cabinet

- Switch on UV light 15–20 minutes before use for sterilization.
- Turn off UV before beginning work; switch on blower.
- Disinfect the surface with 70% ethanol before and after use.
- Do not block airflow vents.
- Avoid rapid hand movements that disturb airflow.
- Calibrate thermal container periodically.

Seed Germination Incubator

- Maintain Temperature level and humidity as per protocol.

- Open the door briefly to maintain internal conditions.
- Clean with mild disinfectant monthly.
- Record temperature daily.

Growth Chamber

- Maintain Temperature level and humidity as per protocol.
- Open the door briefly to maintain internal conditions.
- Clean with mild disinfectant monthly.
- Record temperature and humidity daily.

Stereo Microscope with Camera & Computer

- Handle with both hands (base and arm).
- Clean lenses only with lens paper.
- Switch off and cover after use.
- Avoid exposure to dust and direct sunlight.

Seed Separator

- Open to maintain internal conditions.
- Clean with mild disinfectant monthly.
- Record Usage time

Seed Divider

- Open to maintain internal conditions.
- Clean with mild disinfectant monthly.
- Record Usage time

Oven

- Use only for drying equipment and glassware.
- Avoid placing plastic materials inside.
- Do not overload shelves.
- Ensure the oven is switched off after use.

6. Sample Handling

- Samples must be clearly labeled with unique identifiers, date, and user initials
- Proper preservation and storage conditions must be followed
- Cross-contamination must be avoided through good laboratory practice
- Storage locations must be recorded in sample inventory log

7. Chemical / Media Handling

- Use only properly labeled chemicals and culture media.
- Follow MSDS guidelines for storage and handling.
- Media preparation and sterilization details are maintained in the laboratory manual.

8. Data Management, Documentation, and Record keeping

- All experiments must be recorded in laboratory notebooks or electronic systems
- Raw data must be stored securely and not overwritten
- File naming and storage must ensure traceability
- Data integrity principles (ALCOA) must be followed

9. Waste Disposal

- Crop or biological waste must be decontaminated before disposal
- Waste must be disposed according to designated waste containers
- Hazardous chemicals must be disposed of according to institutional guidelines
- Waste disposal records must be maintained

10. Emergency Procedures & Reporting

- Use appropriate fire extinguishers and evacuate immediately is number one priority. If a fire is at a safe level due to an equipment electrical shortage or any failure cause, try to turn off the main power.
- Handling of acid: Immediately flush the affected area with water for at least 15 minutes at the emergency shower or eye-wash station.
- If power fails during usage of leaf area meter, plant growth chamber, oven and any instrument, immediately turn off the heat source.
- In case of an emergency, contact the Lab Coordinator, Campus Security, University Doctor, and Technical Support (Instrument repairs)

11. Review and Updates

- This SOP will be reviewed every two years or earlier if new equipment, procedures, or hazards are introduced.

Department of Animal Science

Animal Nutrition Laboratory

1. Title: Laboratory Conduct and Safety Rules for the Animal Nutrition Laboratory (ANL)

2. Purpose

- To provide guidelines ensuring safe and proper practices in the Animal Nutrition Laboratory.
- To ensure safe, efficient, and ethical use of laboratory resources for teaching, research, and training related to animal nutrition.

3. Scope

3.1 These rules apply to all staff, students, and authorized visitors accessing the Animal Nutrition Laboratory.

3.2 Activities covered:

- Preparation and maintenance of reagents and chemicals.
- Calibration and maintenance of balances, centrifuges, and analytical instruments.
- Safe storage and disposal of biological and chemical waste.
- Documentation of experiments, results, and sample inventories.
- Supporting other departmental courses that involve animal nutrition components.

4. Procedure

4.1 Obligations

- All laboratory users must comply with safe practices and act responsibly.
- Hazards must be reported immediately to the Laboratory Coordinator/ Technical officer.
- Reckless handling of specimens, cultures, or chemicals is prohibited.
- All users must:
    - Follow supervisor/laboratory instructions
    - Wear required PPE (lab coat, gloves, mask, closed shoes)
    - Handle specimens, rearing materials, and media cultures with care
    - Maintain cleanliness to avoid cross-contamination

4.2 Laboratory Access

- Only trained and authorized personnel are allowed entry.
- Visitors must sign the entry register and be accompanied by staff.
- Personal belongings (bags, phones, food) are not allowed inside.
- Visitors must obtain prior approval (24 hours in advance) and always be accompanied.
- After-hours access is discouraged; logbook entries are required for essential work.

4.3 General Laboratory Safety Rules

- PPE: Lab coats, closed shoes, and gloves are compulsory. Masks or goggles are necessary.
- Personal hygiene: Wash hands regularly; cover cuts with a waterproof dressing.
- Food/drinks: Not permitted in the laboratory or store.
- Hair and belongings: Long hair tied back; personal items stored in lockers outside.
- Emergency equipment: Fire extinguishers, spill kits, first aid, and eyewash must remain accessible.
- Incident reporting: All accidents, injuries, or contamination must be reported immediately.

4.4 Equipment-Specific Rules

Analytical Balance / Weighing Balance / Electronic Balance

- Keep balance on a vibration-free surface.
- Calibrate bimonthly.
- Never weigh hot or wet items.
- Keep the weighing chamber clean and free from dust.
- Clean the balance after the measurement.

Autoclave

- Only trained personnel may operate the autoclave.
- Check water level before each cycle.
- Do not overfill; allow proper steam circulation.
- Use heat-resistant gloves when unloading.
- Never open the door until the pressure gauge reads zero.
- Record each use in the autoclave logbook.

Bomb Calorimeter

- Always check for gas leaks before ignition
- Do not exceed the recommended oxygen pressure
- Handle the bomb calorimeter as it operates under high pressure
- Maintain constant water volume and stirring speed

Centrifuge

- Balance all tubes before starting the centrifuge.
- Never open the lid while spinning.
- Clean spills immediately.
- Ensure temperature settings are appropriate for biological samples.
- Maintain a use and maintenance log.

Drying Cabinet

- Use only for drying glassware and instruments, not samples.
- Do not exceed the recommended temperature.
- Ensure items are clean before loading.
- Switch off after use and allow cooling before removing items.

Fiber Analyzer

- Add enzymes or reagents according to the method
- Calibrate the instrument periodically
- Always run blanks and standards alongside samples

Flame Photometer

- Warm up the instrument.
- Calibrate with standards.
- Aspirate sample.
- Record readings.
  Safety: Handle the gas supply carefully.

Fume Hood

- Use for handling volatile chemicals or harmful fumes only.
- Keep the sash at the recommended height during operation.
- Do not store equipment permanently inside.
- Ensure continuous airflow before starting work.
- Report malfunction immediately.

Grinder/ Homogenizer

- Ensure all safety guards are in place before operation.
- Clean all components immediately after use to prevent biofilm formation.
- Balance samples properly before high-speed mixing.
- No Dry Running (Grinders): Do not run the grinder dry (without product) for more than a few seconds, as this causes rapid heat build-up that can damage components and melt product residue.
- Monitor Pressure (Homogenizers): For high-pressure homogenizers, monitor the pressure gauge. Avoid rapid pressure changes (up or down) and use the emergency stop immediately if you observe abnormal vibrations or leaks.

Kjeldahl Apparatus

- Ensure the proper cooling before handling the hot component
- Do not open digestion or reaction chambers during operation
- Work in a well-ventilated area or fume hood, especially when using acids, alkalis or catalysts
- Avoid inhalation of fumes and direct contact with reagents

Magnetic Stirrer

- Place a stir bar gently in the beaker before switching on.
- Do not use cracked glassware.
- Adjust speed gradually.
- Avoid overheating.

Muffle Furnace

- Only trained personnel may operate.
- Use heat-resistant gloves when handling hot materials.
- Do not place flammable materials inside the furnace.

Oven

- Set required temperature.
- Load materials.
- After drying, allow cooling.
- Use for drying only laboratory-approved materials.
- Do not place flammable materials inside.

pH Meter

- Calibrate before each use with standard buffer solutions (pH 4, 7, 10).
- Rinse the electrode with distilled water after use.
- Keep the electrode immersed in the storage solution when not in use.

Refrigerator

- Use separate compartments for chemicals, reagents, and biological samples.
- Label all stored items with name, date, and user.
- Defrost and clean monthly.
- No food or drink is allowed.

Soxhlet Apparatus

- Turn on the cooling water supply to the condenser first
- Always operate in a well- ventilated area or fume hood to prevent inhalation of hazardous vapors
- Periodically verify the heating unit with a calibrated thermometer

Vortex Mixer

- Hold the tube firmly at an angle while vortexing.
- Use capped tubes only.
- Do not press the head continuously for long periods.
- Wipe spills immediately.

Water Bath with Shaker

- Fill with distilled water only.
- Do not operate without a sufficient water level.
- Regularly check temperature calibration.
- Clean weekly to prevent microbial growth.

4.5 Storeroom Rules

- Chemicals and consumables must be properly labeled with hazard symbols and the date of storage.
- Equipment and glassware should be returned to designated shelves after use.
- Hazardous materials must be segregated (flammables, corrosives, oxidizers).
- MSDS must be available for all chemicals.
- Expired consumables or chemicals must be reported for safe disposal.

5. Emergency Procedures

- Fire: Use fire extinguishers; evacuate immediately.
- Spills: Use chemical or biological spill kits. Report to the coordinator.
- Exposure: Wash under safety shower/eyewash; seek medical attention.
- Power failure: Switch off incubators, centrifuges, and microscopes to prevent damage.

6. Waste Disposal

- Autoclave biological waste (Media, contaminated tissue sample) before disposal.
- Sharps in designated sharps bins.
- Chemical waste is disposed of according to hazard classification.
- Glass waste collected in separate bins.

7. Review and Update

- This SOP will be reviewed every two years or earlier if new equipment, procedures, or hazards are introduced.

Reproductive Physiology Laboratory (RPL)

1. Title: Laboratory Conduct and Safety Rules for the Reproductive Physiology Laboratory (RPL)

2. Purpose

- To provide guidelines ensuring safe and proper practices in the Reproductive Physiology Laboratory.
- To ensure safe, efficient, and ethical use of laboratory resources for teaching, research, and training related to animal reproductive physiology and reproductive biotechnology.

3. Scope

These rules apply to all staff, students, and authorized visitors accessing the Reproductive Physiology Laboratory.

Activities covered:

- Preparation and maintenance of reagents, stains, and extenders.
- Calibration and maintenance of microscopes, centrifuges, and analytical instruments.
- Safe storage and disposal of biological and chemical waste.
- Semen storage and evaluation.
- Histological tissue preparation.
- Documentation of experiments, results, and sample inventories.
- Supporting other departmental courses that involve reproductive physiology components.

4. Procedure

4.1 Obligations

- All laboratory users must comply with safe practices and act responsibly.
- Hazards must be reported immediately to the Laboratory Coordinator/ Technical Officer.
- Reckless handling of specimens, cultures, or chemicals is prohibited.
- All users must:
    - Follow supervisor/laboratory instructions
    - Wear required PPE (lab coat, gloves, mask, closed shoes)
    - Handle specimens, rearing materials, and fungal cultures with care
    - Maintain cleanliness to avoid cross-contamination

4.2 Laboratory Access

- Only trained and authorized personnel are allowed entry.
- Visitors must sign the entry register and be accompanied by staff.
- Personal belongings (bags, phones, food) are not allowed inside.
- Visitors must obtain prior approval (24 hours in advance) and always be accompanied.
- After-hours access is discouraged; logbook entries are required for essential work.

4.3 General Laboratory Safety Rules

- PPE: Lab coats, closed shoes, and gloves are compulsory. Masks or goggles are necessary.
- Personal hygiene: Wash hands regularly; cover cuts with a waterproof dressing.
- Food/drinks: Not permitted in the laboratory or store.
- Hair and belongings: Long hair tied back; personal items stored in lockers outside.
- Emergency equipment: Fire extinguishers, spill kits, first aid, and eyewash must remain accessible.
- Incident reporting: All accidents, injuries, or contamination must be reported immediately.

4.4 Equipment-Specific Rules

Analytical / Electronic Balance

- Keep balance on a vibration-free surface.
- Calibrate bimonthly.
- Never weigh hot or wet items.

- Keep the weighing chamber clean and free from dust.

Artificial Insemination (AI) Kit for Field

- Keep all AI tools sterile and organized in a clean box.
- Sterilize after each field visit.
- Maintain field-use record.
- Avoid exposure to heat or sunlight.

Artificial Vagina (AV) for Cattle

- Clean, sterilize, and dry before and after each use.
- Maintain water temperature (42–45 °C) for collection.
- Check the liner for damage.
- Lubricate properly with non-toxic lubricant.

Artificial Vagina for Goat

- Follow the same hygiene protocol as for cattle.
- Adjust internal pressure suitable for goat species.
- Store in clean, dry conditions.

Autoclave

- Only trained personnel may operate the autoclave.
- Check water level before each cycle.
- Do not overfill; allow proper steam circulation.
- Use heat-resistant gloves when unloading.
- Never open the door until the pressure gauge reads zero.
- Record each use in the autoclave logbook.

Biological Microscope

- Handle with both hands (base and arm).
- Clean lenses only with lens paper.
- Switch off and cover after use.
- Avoid exposure to dust and direct sunlight.

CO_2 Incubator

- Maintain CO_2 level and humidity as per protocol.
- Open the door briefly to maintain internal conditions.
- Clean with mild disinfectant monthly.
- Record temperature and CO_2 daily.

Centrifuge Refrigerator

- Balance all tubes before starting the centrifuge.
- Never open the lid while spinning.
- Clean spills immediately.
- Ensure temperature settings are appropriate for biological samples.
- Maintain a use and maintenance log.

Dilating Bougie for Cow & Heifer (SU Type)

- Clean and sterilize thoroughly before use.
- Use appropriate lubricant.
- Handle with care to prevent injury to the reproductive tract.

Drying Cabinet

- Use only for drying glassware and instruments, not samples.
- Do not exceed the recommended temperature.
- Ensure items are clean before loading.
- Switch off after use and allow cooling before removing items.

Embryo Collector

- Use under sterile conditions.
- Flush media must be pre-warmed and filtered.
- Clean and autoclave reusable components.

Embryo Transfer Equipment & Accessories

- Handle under aseptic conditions.
- Sterilize and store properly after use.
- Record donor and recipient IDs for each transfer.
- Ensure equipment calibration before use.

Embryo Transporter

- Maintain constant temperature (approx. 37 °C) during transport.
- Label with donor, recipient, and date details.
- Disinfect after every use.
- Calibrate thermal container periodically.

Fume Hood

- Use for handling volatile chemicals or harmful fumes only.
- Keep the sash at the recommended height during operation.
- Do not store equipment permanently inside.
- Ensure continuous airflow before starting work.
- Report malfunction immediately.

Inverted Microscope

- Use only for live-cell or semen observation.
- Keep the stage and lenses clean.
- Do not adjust internal parts without supervision.
- Cover after use and log usage.

Laminar Flow Cabinet

- Switch on UV light 15–20 minutes before use for sterilization.
- Turn off UV before beginning work; switch on blower.
- Disinfect the surface with 70% ethanol before and after use.

- Do not block airflow vents.
- Avoid rapid hand movements that disturb airflow.

Liquid Nitrogen Gas Handling

- Always wear cryogenic PPE (gloves, goggles, apron).
- Never transport in sealed containers.
- Avoid skin contact — may cause frostbite.
- Store cylinders upright and secured.

Liquid Nitrogen Freezer

- Operate in a well-ventilated area.
- Use cryogenic gloves, face shield, and apron.
- Never seal the container tightly.
- Refill only with approved-grade LN_2.
- Regularly monitor LN_2 level and record.

Magnetic Stirrer

- Place stir bar gently in the beaker before switching on.
- Do not use cracked glassware.
- Adjust speed gradually.
- Avoid overheating.

Microcentrifuge

- Balance microtubes accurately.
- Secure the lid before operation.
- Never open the lid during spinning.
- Clean rotors and chambers regularly.

Oven

- Use only for drying equipment and glassware.
- Avoid placing plastic materials inside.
- Do not overload shelves.
- Ensure the oven is switched off after use.

pH Meter

- Calibrate before each use with standard buffer solutions (pH 4, 7, 10).
- Rinse the electrode with distilled water after use.
- Keep the electrode immersed in the storage solution when not in use.

Refrigerator / Freezer

- Use separate compartments for chemicals, reagents, and biological samples.
- Label all stored items with name, date, and user.
- Defrost and clean monthly.
- No food or drink is allowed.

Semen Injector & Tube for Cow

- Use sterile sheaths and catheters.
- Do not reuse disposable parts.
- Clean the AI gun after every insemination.

Semen Injector & Tube for Goat

- Follow the same hygiene procedure as for cattle.
- Use species-appropriate catheters.

Sperm Counting Plate (Hemocytometer)

- Clean and dry after every use.
- Handle with care to avoid scratches.
- Use the cover glass properly placed before counting.

Thawing Device for Frozen Semen

- Maintain constant water temperature (usually 37 °C).
- Avoid direct contact between straws.
- Clean and disinfect after each session.

Ultrasound Pregnancy Detector

- Apply coupling gel before use.
- Clean probe with 70% alcohol after each exam.
- Do not submerge electronic parts in water.
- Store in a dust-free, dry environment.

Vaginal Speculum for Cow

- Sterilize before and after each use.
- Lubricate properly before insertion.
- Handle carefully to prevent injury.
- Store in a clean, dry container.

Vaginal Speculum for Goat

- Same sterilization and lubrication procedure as cow.
- Use only the appropriate size for the species.

Vortex Mixer

- Hold the tube firmly at an angle while vortexing.
- Use capped tubes only.
- Do not press the head continuously for long periods.
- Wipe spills immediately.

Water Bath / Shaker

- Fill with distilled water only.
- Do not operate without a sufficient water level.
- Regularly check temperature calibration.

- Clean weekly to prevent microbial growth.

4.5 Storeroom Rules

- Chemicals and consumables must be properly labeled with hazard symbols and the date of storage.
- Equipment and glassware should be returned to designated shelves after use.
- Hazardous materials must be segregated (flammables, corrosives, oxidizers).
- MSDS must be available for all chemicals.
- Expired consumables or chemicals must be reported for safe disposal.

5. Emergency Procedures

- Fire: Use fire extinguishers; evacuate immediately.
- Spills: Use chemical or biological spill kits. Report to the coordinator.
- Exposure: Wash under safety shower/eyewash; seek medical attention.
- Power failure: Switch off incubators, centrifuges, and microscopes to prevent damage.

6. Waste Disposal

- Autoclave biological waste (Media, contaminated tissue sample) before disposal.
- Sharps in designated sharps bins.
- Chemical waste is disposed of according to hazard classification.
- Glass waste collected in separate bins.

7. Review and Update

- This SOP will be reviewed every two years or earlier if new equipment, procedures, or hazards are introduced.

Dairy and Meat Processing Unit

1. Title: Laboratory Conduct and Safety Rules for the Dairy and Meat Processing Unit

2. Purpose

1. To establish guidelines for maintaining a safe, hygienic, and efficient working environment within the Dairy and Meat Processing Unit.
2. To minimize occupational hazards associated with handling live animal products, raw meat, processed meat products, milk and dairy products, equipment, cleaning agents, and laboratory chemicals.
3. To ensure compliance with food safety, sanitation, and quality assurance requirements in accordance with Good Manufacturing Practices (GMP), Good Hygiene Practices (GHP), and Hazard Analysis and Critical Control Point (HACCP) principles.
4. To prevent contamination, cross-contamination, and foodborne hazards during meat processing, dairy processing, storage, packaging, and quality evaluation.

3. Scope

These rules apply to all staff, students, and authorized visitors entering the Dairy and Meat Processing Unit.

Activities covered:

- Milk and Meat receiving, inspection, cutting, deboning, trimming, grinding, mixing, stuffing, smoking, cooking, chilling, freezing, and packaging.
- Production of dairy products such as yoghurt, cheese, paneer, and value-added dairy products.
- Production of meat products such as sausages, burgers, meatballs, nuggets, cured meats, smoked meats, and value-added meat products.
- Quality control, microbiological testing, physicochemical analysis, and sensory evaluation of dairy and meat products.
- Storage and handling of raw materials, ingredients, additives, packaging materials, and finished products.

4. Procedure

4.1 Obligations

- All users shall comply with established safety, hygiene, and operational procedures.
- Users shall maintain a clean and professional working environment at all times.
- Any accident, injury, contamination event, equipment malfunction, or unsafe condition shall be reported immediately to the Technical Officer.
- Users shall follow all GMP, GHP, HACCP, and occupational safety requirements.

4.2 Laboratory Access

- Only trained and registered personnel are allowed entry.
- Mandatory induction includes:
    - General laboratory safety and Food Safety (HACCP) orientation
    - Training in aseptic techniques and product handling
    - Safe operation of heavy-duty processing equipment (e.g., Pasterurization unit, Meat Mincer, Bowl Chopper)
    - Chemical, reagent, and raw material storage procedures
- Visitors must obtain prior approval (24 hours in advance) and always be accompanied, adhering strictly to PPE and hygiene rules.
- After-hours access is discouraged; logbook entries are required for essential work.

4.3 General Laboratory Safety and Hygiene Rules

Personal Hygiene and Attire

- Strict personal hygiene is the primary defense against food contamination.
- Attire Requirements
    - Proper Uniform: Wear clean uniforms with no tears.

- Footwear: Wear closed-toe shoes with flat soles (no heels). Footwear must be kept clean.
- Hair Restraints: Use hairnets and beard nets (if applicable) to completely confine hair.
- Jewellery/Nail Polish: Remove all jewellery. Do not wear nail polish.

Handwashing

Wash hands and arms thoroughly with soap and water at the following times:

- Before commencing or resuming work.
- After using the toilet.
- After handling rubbish or cleaning tasks.
- After using a handkerchief or touching your hair/face.
- Before and after handling milk and raw meat.
- Before handling dairy products and cooked meat.
- When leaving the laboratory area (even if gloves and a lab coat were worn).

Wounds and Illness

- Wounds: All open cuts or wounds must be protected with a secure, waterproof covering (e.g., a bandage and a glove).
- Report Illness: Immediately inform your supervisor if you have any of the following symptoms:
  - Jaundice (yellowing of eyes/skin)
  - Diarrhea, vomiting, or fever
  - Sore throat with fever
  - Boils, infected cuts, or discharges from ears, nose, or eyes
  - Excessive coughing or sneezing

4.4 Meat/Sample Handling and Storage Rules

Preventing Contamination and Cross-Contamination

These rules prevent the transfer of harmful substances between surfaces, equipment, and milk and meat.

Handling Separation

- Separate raw milk and dairy products
- Separate Raw/Cooked: Always separate raw, cooked, and new from old meat.
- Separate Equipment: Use separate, designated equipment and utensils when preparing dairy products, milk, raw meats, poultry, and seafood to prevent cross-contamination.
- Meat wrap: Keep meat covered until it is ready for use.
- Close the lid: Keep the raw milk in the refrigerator until it is ready for use.
- Packaging: Use suitable packaging materials to protect meat from contamination.

Cleaning and Sanitizing

- Sanitize Surfaces: Thoroughly clean and sanitize all food surfaces, equipment, and utensils.
  - Use hot water and detergent for cleaning.

    - Follow with a chemical sanitizer or sufficient hot water, as detergents alone do not kill bacteria.
- Workplace Cleanliness: Keep the entire workplace clean to minimize the risk of cross-contamination from pests, dirt, and grease.
- End-of-Lab Cleanup: At the end of every lab session, return clean glassware to its proper place, clean your benchtop, and ensure all electrical devices and water are turned off.

Cleaning and Sanitation Procedures

- Designated Tools: Use equipment, utensils, and cutting boards that are specific to the task (e.g., separate for raw vs. cooked/ready-to-eat meat).
- Standard Operating Procedures (SOPs): Follow documented SOPs for the Cleaning In Place (CIP) or Cleaning Out of Place (COP) of all machinery

Monitoring and Control

- Critical Control Points (CCPs): For equipment that controls a CCP (e.g. sterilizer), the operational limits (like time and temperature) must be constantly monitored and recorded.
- Calibration: Ensure all critical measurement devices (thermometers, pH meters) are regularly calibrated and verified against established standards.
- Maintenance Products: Only food-grade lubricants and chemicals are to be used on or near food contact equipment. Store all maintenance chemicals (including cleaning agents) separately from food ingredients and finished products.
- Physical Hazards: Routinely inspect equipment for signs of wear and tear to prevent physical contaminants (metal, plastic) from entering the food stream.
- MSDS must be available for all chemicals.
- Expired materials or chemicals must be reported for safe disposal.

General Lab Conduct and Safety

These rules are essential for maintaining a safe and professional laboratory environment.

Prohibited Items and Activities

Rule	Detail
No food/drink	Do not prepare, store, or consume food or beverages in the laboratory.
No smoking	Do not smoke in the laboratory.
No unauthorized equipment	Do not store or use personal food equipment (microwaves, coffee makers, refrigerators) in the lab area.
No personal lab wear	Do not wear or bring lab coats, gloves, or other lab items into break areas or other areas where food is consumed.
No unapproved experiments	Never perform an unauthorized experiment or work without an instructor present.
No removal of items	Never remove any chemicals, glassware, or other lab materials from the lab.

Chemical and Equipment Safety

- Eye Protection: Safety goggles (department-approved) must be worn in the lab at all times.
- Chemical handling:
    - Never taste or inhale fumes or vapors. Use fume hoods for dangerous chemicals.
    - Rinse spills off skin immediately with large amounts of water.
    - Label all containers to identify their contents.
    - Avoid putting excess chemical back into a reagent bottle; dispose of it properly.
- Hot objects: Avoid touching hot objects. Use beaker tongs to handle heated containers.

4.5 Equipment-Specific Rules

Dairy Processing Unit

Balances

- Clean the balance pan after every use, especially after measuring sticky or dusty materials

Butter Churner

- Keep hands away from moving paddles.
- Ensure lid is secured before operation.
- Disconnect power before cleaning.
- Fill with properly ripened cream.
- Operate until butter granules form.
- Drain buttermilk and wash butter properly.
- Use for butter production from cream.
- Cream should be chilled and properly fermented.

Cheese Presser

- Keep fingers away from pressing plates.
- Apply pressure gradually.
- Ensure stable placement of moulds.
- Clean surfaces thoroughly after use.
- Place curd into moulds properly.
- Apply recommended pressure for required duration.
- Remove cheese carefully after pressing.
- Use for whey removal and cheese shaping.
- Curd should be properly drained before pressing.

Cream Separator

- Ensure machine balance before starting.
- Do not touch rotating bowl during operation.
- Clean separator discs carefully.
- Avoid operating at excessive speed.

- Pour warm milk slowly into the inlet.
- Collect cream and skim milk separately.
- Wash all parts after use.
- Use for separating cream from milk.
- Milk temperature should generally be around 35-45°C.

Refrigerator

- Maintain and monitor temperature
- Prevent cross-contamination: Store food based on its required cooking temperature
- Ready-to-Eat (RTE) foods must be stored above raw meats, poultry, and seafood
- Store raw meat, poultry, and fish on the lowest shelves to prevent drips from contaminating other products
- All food must be stored in covered, food-grade containers
- Ensure air circulation and regular cleaning

Yoghurt Incubator

- Maintain hygienic conditions.
- Avoid electrical contact with water.
- Monitor temperature regularly.
- Set incubation temperature and time.
- Remove products after coagulation.
- Use for controlled yoghurt fermentation.
- Ideal incubation temperature is usually 40-45°C.

Meat Processing Unit

Balances

- Clean the balance pan after every use, especially after measuring sticky or dusty materials

Bowl Chopper

- Ensure the safety cover is properly closed before operation.
- Keep hands away from rotating blades during operation.
- Do not overload the machine.
- Switch off and unplug before cleaning.
- Wear gloves during blade handling.
- Check blade tightness regularly.
- Cut meat into small pieces before loading.
- Remove product only after blades stop completely.
- Clean immediately after use.
- Use for fine chopping and emulsifying meat products.
- Operate on a stable, dry surface.

Grinders

- Ensure all safety guards are in place before operation

- Clean all components immediately after use to prevent biofilm formation
- Balance samples properly before high-speed mixing
- No Dry Running (Grinders): Do not run the grinder dry (without product) for more than a few seconds, as this causes rapid heat build-up that can damage components and melt product residue
- Monitor Pressure (Homogenizers): For high-pressure homogenizers, monitor the pressure gauge. Avoid rapid pressure changes (up or down) and use the emergency stop immediately if you observe abnormal vibrations or leaks

Ice Flake Machine

- Avoid contact with moving internal parts.
- Clean regularly to prevent contamination.
- Ensure proper drainage.
- Turn on water supply before operation.
- Collect ice using clean scoops.
- Empty storage bin regularly.
- Use for producing flake ice for food preservation.
- Requires continuous clean water supply.

Meat Mincer

- Never insert fingers into the feed opening.
- Use a pusher instead of hands.
- Ensure all parts are assembled correctly.
- Disconnect power before dismantling.
- Keep blades sharp to avoid motor strain.
- Feed chilled boneless meat gradually.
- Use the pusher continuously.
- Clean grinding plates and blades after use.
- Use for grinding boneless meat.
- Meat should be semi-frozen or chilled.
- Avoid processing large bones or hard materials.

Refrigerator

- Maintain and monitor temperature
- Prevent cross-contamination: Store food based on its required cooking temperature
- Ready-to-Eat (RTE) foods must be stored above raw meats, poultry, and seafood
- Store raw meat, poultry, and fish on the lowest shelves to prevent drips from contaminating other products
- All food must be stored in covered, food-grade containers
- Ensure air circulation and regular cleaning

Shear Force Test Machine

- Keep hands away from moving probes.

- Handle sharp cutting attachments carefully.
- Calibrate the machine before testing.
- Switch off after use.
- Place cooked meat sample properly.
- Run the test according to standard settings.
- Record force values carefully.
- Use to measure meat tenderness.
- Samples should be uniform in size.

Smoke Chamber

- Avoid touching hot surfaces.
- Maintain proper ventilation.
- Keep flammable materials away.
- Monitor temperature continuously.
- Use gloves.
- Hang products evenly inside the chamber.
- Set required smoke and temperature levels.
- Clean ash and residue regularly.
- Use for smoking meat or fish products.

5. Emergency Procedures and Reporting

- Report Accidents: Notify your instructor immediately of all accidents, spills, or injuries, no matter how minor.
- Know Emergency Locations: Learn to locate and operate the safety shower, fire extinguisher, eye-wash fountain, fire blanket, and fire exit.
- Controlled Substances: Do not come to the lab under the influence of drugs or alcohol.

Fire: Use fire extinguishers; evacuate immediately.

Spills (Chemical/Biological): Use appropriate spill kits. Report to coordinator.

Exposure: Wash under safety shower/eyewash; seek medical attention.

Product Contamination: Isolate the batch immediately, quarantine, and report for investigation.

6. Waste Disposal

- Place all liquid and solid wastes in designated containers
- Place general waste in plastic-lined bins. Remove waste regularly, and ensure external bins are covered.
- Broken Glass: Clean up broken glassware immediately and place it in the designated container.
- Biological Waste (e.g., spoiled food): Dispose of via designated sealed containers. Autoclaving may be required for high-risk microbial cultures.
- Chemical waste is disposed according to hazard classification.
- Food Waste (non-hazardous scraps) collected in separate, clearly lined bins.

7. Review and Update

This SOP will be reviewed every two years or earlier if new equipment, processing techniques, or food safety regulations are introduced.

Department of Agricultural Biology

Entomology Laboratory

1. Title: Laboratory Conduct and Safety Rules for the Entomology Laboratory (EL)

2. Purpose

- To provide guidelines ensuring safe and proper practices in the Entomology Laboratory.
- To minimize risks when handling insect collections, rearing insects, conducting Trichoderma and acarology works, and operating laboratory equipment.
- To establish proper procedures for maintaining insect cultures and preserving samples.

3. Scope

3.1 These rules apply to all staff, students, and authorized visitors accessing the Entomology Laboratory.

3.2 Activities covered:

- Insect rearing and handling of insect cultures
- Preservation and maintenance of insect collections (boxes/trays)
- Trichoderma culture works in relation to entomopathogenic fungi
- Acarological works (mites and related arthropods)
- Equipment use: laminar flow cabinet, autoclave, incubator, refrigerator, oven, centrifuge, microscopes
- Safe storage and handling of chemicals, consumables, and equipment in the storeroom

4. Procedure

4.1 Obligations

- All laboratory users must comply with safe practices and act responsibly.
- Hazards must be reported immediately to the Laboratory Coordinator.
- Reckless handling of insect specimens, cultures, or chemicals is prohibited.
- All users must:
    - Follow supervisor/laboratory instructions
    - Wear required PPE (lab coat, gloves, mask, closed shoes)
    - Handle live insects, rearing materials, and fungal cultures with care
    - Maintain cleanliness to avoid cross-contamination

4.2 Laboratory Access

- Only trained and registered personnel are allowed entry.
- Mandatory induction includes:
    - General laboratory safety orientation

    - Training in insect rearing and culture maintenance
    - Safe handling of Trichoderma and acarological specimens
    - Chemical and consumable storage procedures
- Visitors must obtain prior approval (24 hours in advance) and always be accompanied.
- After-hours access is discouraged; logbook entries are required for essential work.

4.3 General Laboratory Safety Rules

- PPE: Lab coats, closed shoes, and gloves are compulsory. Masks or goggles are necessary.
- Personal hygiene: Wash hands regularly; cover cuts with a waterproof dressing.
- Food/drinks: Not permitted in the laboratory or store.
- Hair and belongings: Long hair tied back; personal items stored in lockers outside.
- Emergency equipment: Fire extinguishers, spill kits, first aid, and eyewash must remain accessible.
- Incident reporting: All accidents, injuries, or contamination must be reported immediately.

4.4 Major Equipment & Specific Rules

Laminar Flow Cabinet

- Sterilize surface with 70% ethanol before and after use.
- Operate with gloves, mask, and lab coat.
- Keep airflow unblocked.

Autoclave

- Only trained staff may operate.
- Load materials properly, avoiding overfilling.
- Use gloves when removing hot loads.

Incubator/Refrigerator

- Label all cultures (date, name, contents).
- No food or drinks allowed.
- Regularly check and record temperature.

Oven

- Use for drying only laboratory-approved materials.
- Do not place flammable materials inside.

Centrifuge

- Balance tubes before starting.
- Do not open the lid while in motion.

Microscopes

- Clean lenses with lens paper only.
- Switch off and cover after use.

4.5 Insect and Culture Handling Rules

- **Insect Rearing**
  - Maintain proper rearing conditions (temperature, humidity, light).
  - Label cultures clearly with species name, stage, and date.
  - Dispose of dead insects and waste materials safely.
- **Insect Collections (boxes/trays)**
  - Handle with clean hands/gloves.
  - Protect from moisture, pests, and direct sunlight.
  - Keep records of collection and accession.
- **Trichoderma and Entomopathogenic Fungi Work**
  - Conduct under laminar flow or biosafety cabinet.
  - Dispose of fungal waste via autoclaving.
  - Avoid cross-contamination with insect colonies.
- **Acarology Works (mites, etc.)**
  - Maintain cultures under designated controlled conditions.
  - Label and record specimens.
  - Use disinfectants to prevent contamination.

4.6 Storeroom Rules

- Chemicals and consumables must be properly labeled with hazard symbols and date of storage.
- Equipment and glassware should be returned to designated shelves after use.
- Hazardous materials must be segregated (flammables, corrosives, oxidizers).
- MSDS must be available for all chemicals.
- Expired consumables or chemicals must be reported for safe disposal.

5. Emergency Procedures

- Fire: Use fire extinguishers; evacuate immediately.
- Spills: Use chemical or biological spill kits. Report to the coordinator.
- Exposure: Wash under safety shower/eyewash; seek medical attention.
- Power failure: Switch off incubators, centrifuges, and microscopes to prevent damage.

6. Waste Disposal

- Autoclave biological waste (insects, cultures) before disposal.
- Sharps in designated sharps bins.
- Chemical waste is disposed according to hazard classification.
- Glass waste collected in separate bins.

7. Review and Update

- This SOP will be reviewed every two years or earlier if new equipment, procedures, or hazards are introduced.

Plant Protection and Biocontrol Laboratory (PPL)

1. Title: Laboratory Conduct and Safety Rules for the Plant Protection and Biocontrol Laboratory (PPL)

2. Purpose

- To provide comprehensive guidelines ensuring a safe, efficient, and contamination-free working environment in the Plant Protection and Biocontrol Laboratory.
- To minimize risks associated with handling plant pathogens/biocontrol agents, chemicals, nematodes, and laboratory equipment.
- To ensure compliance with university, national, and international laboratory safety standards.

3. Scope

These rules apply to all academic staff, research staff, students, and visitors working in or accessing the Plant Protection and Biocontrol Laboratory.

The SOP covers activities related to:

- Plant pathology and microbiology work (sterilization, microscopy, culture handling)
- Plant protection experiments (bioassays, growth chambers, autoclave use)
- Nematology works (egg extraction, sieving, Baermann funnel, Fenwick can, etc.)
- Equipment operation (laminar flow, bio-safety cabinet, incubator, oven, shaker, pH meter, balance, homogenizer, grinders, distillation apparatus)
- Chemical handling and storage in the laboratory's chemical store

4. Procedure

4.1 Obligations

- All laboratory users must follow safe work practices and act responsibly.
- Hazards must be reported immediately to the Laboratory Coordinator.
- Misuse of laboratory facilities or safety equipment is strictly prohibited.
- Compliance with Occupational Safety and Health (OSH) requirements is mandatory.
- Users must:
    - Follow instructions given by supervisors/technical officers.
    - Wear appropriate PPE.
    - Avoid reckless or harmful behaviour.
    - Ensure their own safety and that of others.

4.2 Laboratory Access

- Only trained staff and registered students are permitted inside.
- Mandatory induction/training includes:
    - General laboratory orientation
    - Plant pathology/biocontrol practices (sterilization, culture handling, microscopy)

    - Nematology practical training
    - Chemical store access and safety procedures
- Access is by authorization from the Laboratory Coordinator.
- Visitors must obtain prior approval (at least 24 hours before) and must always be accompanied.
- After-hours access is discouraged; if essential, logbook entries are mandatory.

4.3 General Laboratory Safety Rules

- PPE: Laboratory coat, closed footwear, and task-specific protective gear (gloves, safety glasses, masks) must be worn.
- Personal hygiene: Wash hands before leaving; cover cuts/wounds with waterproof dressings.
- Food/drinks: Not permitted inside laboratories or chemical storage.
- Hair and belongings: Long hair tied back; coats, bags, and personal items stored in lockers.
- Emergency equipment: Ensure accessibility of fire extinguishers, spill kits, eyewash stations, safety showers, and first aid kits.
- Incident reporting: All accidents, breakages, and chemical spills must be reported immediately and documented.

4.4 Equipment-Specific Rules (need to finish the induction and training before use)

Autoclave:

- Only trained users may operate.
- Do not overload; ensure proper waste segregation before sterilization.
- Use heat-resistant gloves when removing items.

Laminar Flow & Biosafety Cabinet:

- Disinfect the work area before and after use.
- Operate with gloves, a lab coat, and a mask.
- Do not block airflow.

Microscopes (light, stereo, compound):

- Handle with care; use lens paper for cleaning.
- Switch off and cover after use.

Plant Growth Chamber/Incubator:

- Label all stored materials with name, date, and contents.
- Avoid overloading; maintain cleanliness.

Oven/Shaker/Balance/pH meter/Grinders/Homogenizer:

- Clean equipment after use.
- Calibrate balances and pH meters regularly*.
- pH meter - Make sure the reading prob has been dipped in the saturated KCl solution after use
- Avoid cross-contamination of plant/soil samples.

Nematology Equipment (sieves, Baermann funnel, Fenwick can):

- Wash and dry sieves after use.
- Dispose of extracted nematode suspensions safely.
- Prevent mixing of samples.

Distillation Apparatus:

- Operate under supervision.
- Ensure water supply is adequate before switching on.
- Be careful for overflow.

4.5 Chemical Mini Store Rules

- Chemicals must be clearly labelled with name, hazard symbols, and date of entry.
- Segregate chemicals (acids, bases, flammables, oxidizers, toxics).
- MSDS must be available for all chemicals.
- Containers >2L must be transported in carriers.
- Expired or unused chemicals must be disposed of according to the university's hazardous waste policy.

5. Emergency Procedures

- Fire: Use a fire blanket/extinguisher; evacuate immediately.
- Spillages: Contain with spill kit; report to coordinator.
- Exposure: Use a safety shower/eyewash; seek medical attention.
- Power failure: Switch off sensitive instruments.

6. Waste Disposal

- Autoclave biological waste before disposal.
- Sharps in designated sharps containers.
- Chemicals disposed of according to hazard classification.
- Glassware waste in separate bins.

7. Review and Update

- This SOP will be reviewed every two years or earlier if new equipment/procedures are introduced.

Plant Tissue Culture Laboratory

1. Title

Laboratory Conduct and Safety Rules for the Plant Tissue Culture Laboratory

2. Purpose

- To ensure safe, aseptic, and efficient operation of the Plant Tissue Culture Laboratory.
- To minimize contamination risks during in vitro plant culture activities.

- To standardize laboratory practices for teaching, research, and training in plant tissue culture.

3. Scope

This SOP applies to all academic staff, technical staff, researchers, undergraduate and postgraduate students, and authorized visitors using the Plant Tissue Culture Laboratory.

Covered Activities

- Media preparation and sterilization
- Aseptic inoculation and sub-culturing
- Maintenance of in vitro cultures
- Hardening and acclimatization of plantlets
- Operation of tissue culture equipment
- Teaching practicals and student research activities

4. Procedure

4.1 Obligations

- All users must comply with laboratory safety rules and aseptic practices.
- Laboratory hazards, contamination events, and equipment faults must be reported immediately to the Technical officer
- Misuse of laboratory facilities or deviation from SOPs is prohibited.

4.2 Laboratory Access

- Access is restricted to trained and authorized personnel only.
- Mandatory induction includes:
  - General laboratory safety
  - Aseptic techniques in plant tissue culture
  - Equipment operation (laminar flow, autoclave, growth room)
- Visitors require prior approval and must be accompanied at all times.
- After-hours access is discouraged and must be recorded in the logbook if approved.

4.3 General Laboratory Safety Rules

- PPE (lab coat, closed footwear, gloves, mask/hair cover where required) is mandatory.
- Food, drinks, and personal belongings are not permitted in laboratory areas.
- Hands must be washed before leaving the laboratory.
- Emergency equipment (fire extinguisher, first aid kit, eyewash) must remain accessible.
- All incidents must be reported and documented.

4.4 Equipment-Specific Rules *(use only after training)*

Laminar Flow Cabinet

- Disinfect before and after use.
- Do not obstruct airflow.
- UV lamps must not be operated when personnel are present.

Autoclave

- Operated only by trained users.
- Do not pack too many items inside the autoclave chamber or pack them too tightly together. Overloading can prevent proper circulation of steam around the materials, leading to incomplete sterilization; follow proper waste segregation.
- Use heat-resistant gloves when unloading.

Growth Room

- Maintain cleanliness and controlled access.
- Label all cultures clearly with date and identification.

Balances, pH meters, ovens, refrigerators

- Clean after use.
- Follow calibration and maintenance schedules.
- pH electrodes must be stored in appropriate solution after use.

4.5 Clean Zone Management

- Laboratory areas are segregated into:
    - Media preparation area
    - Aseptic inoculation area
    - Culture incubation/growth room
- Entry protocols (clean footwear, PPE, hand hygiene) must be followed.
- Regular surface disinfection and scheduled cleaning are mandatory.

5. Chemical and Media Handling

- Use only properly labeled chemicals and culture media.
- Follow MSDS guidelines for storage and handling.
- Heat-labile components such as antibiotic solutions (ampicillin, kanamycin), plant growth regulators, vitamins, enzyme preparations must be filter-sterilized.
- Media preparation and sterilization details are maintained in the laboratory manual.

6. Waste Disposal

- Biological waste such as microbial cultures, infected plant materials, and contaminated media must be autoclaved before disposal.
- Sharps must be discarded in designated sharps containers.
- Chemical waste disposal must follow university hazardous waste guidelines.
- Contaminated cultures must be sealed and autoclaved prior to disposal.

7. Teaching and Student Use

- Teaching practicals must be supervised by academic or technical staff.
- Students may not access the laboratory unsupervised.
- Student cultures must be clearly labeled and stored separately from research materials.
- The laboratory must be cleaned and reset after teaching sessions.

8. Emergency Procedures

- Fire: Evacuate immediately and use fire extinguishers if safe.
- Chemical exposure: Use eyewash/safety shower and seek medical assistance.
- Power failure: Stop aseptic work, secure cultures, and report immediately.
- Emergency contact details must be displayed at the laboratory entrance.

9. Documentation and Record Keeping

The following records must be maintained:

- Media preparation register
- Autoclave log
- Culture inventory and growth room register
- Equipment calibration and maintenance logs
- Training and access records
- Incident and contamination reports

10. Review and Update

- This SOP will be reviewed every two years or earlier if new equipment, procedures, or
- regulations are introduced.
- Revisions must be approved by the Head, Department of Agricultural Biology.

Biotechnology (Molecular Biology) Laboratory (BTL)

1. Title

Laboratory Conduct, Safety, and Operational Guidelines for the Molecular Biology Laboratory

2. Purpose

This SOP provides standardized guidelines for the safe and effective operation of the Molecular Biology Laboratory. It ensures good laboratory practice, contamination control, proper use of equipment, reliable data generation, and compliance with institutional and quality standards for teaching, research, and training activities.

3. Scope

This SOP applies to all academic staff, technical officers, researchers, undergraduate and postgraduate students, and authorized visitors using the Molecular Biology Laboratory. It covers routine molecular biology activities including:

- DNA and RNA extraction
- PCR and qPCR
- Agarose gel electrophoresis and gel documentation
- Sample preparation for sequencing
- Data management and laboratory waste disposal

4. Responsibilities

4.1 Technical officer / Supervisor

- Ensure users are trained and comply with this SOP
- Oversee equipment operation, maintenance, and calibration
- Maintain SOP revisions and laboratory records
- Report and address deviations, incidents, or equipment failures

4.2 Technical Staff

- Support day-to-day laboratory operations
- Maintain equipment logs, reagent inventories, and waste disposal records
- Assist with training and supervision of students

4.3 Researchers and Students

- Follow SOPs and good laboratory practices
- Maintain accurate experimental records
- Report equipment malfunction or safety concerns immediately

5. General Laboratory Practices

5.1 Laboratory Access and Conduct

- Access is restricted to trained and authorized personnel
- PPE (lab coat, gloves, closed footwear) is mandatory
- Food, beverages, and personal belongings are prohibited
- Workspaces must be cleaned before and after use

5.2 Contamination Control

- Maintain separate areas for pre-PCR and post-PCR work where possible
- Use aerosol-resistant filter tips and dedicated pipettes
- Follow unidirectional workflow from clean to amplified DNA areas
- Regular surface decontamination using 70% ethanol or approved agents

6. Equipment Usage

Major equipment includes:

- PCR thermal cyclers
- Gel electrophoresis units and power supplies
- Gel documentation systems
- Spectrophotometers (e.g., NanoDrop)
- Centrifuges

Equipment must be:

- Operated only by trained users
- Logged after use where applicable
- Cleaned and maintained according to manufacturer and laboratory guidelines

Detailed operating instructions are provided in the Laboratory Manual.

7. Sample Handling

- Samples must be clearly labeled with unique identifiers, date, and user initials
- Proper preservation and storage conditions must be followed
- Cross-contamination must be avoided through good laboratory practice
- Storage locations must be recorded in sample inventory logs

8. Data Management and Documentation

- All experiments must be recorded in laboratory notebooks or electronic systems
- Raw data must be stored securely and not overwritten
- File naming and storage must ensure traceability
- Data integrity principles (ALCOA) must be followed

9. Waste Disposal

- Biological waste must be decontaminated before disposal
- Ethidium bromide and other hazardous chemicals must be disposed of according to institutional guidelines
- Sharps must be discarded in designated containers
- Waste disposal records must be maintained

10. Safety and Emergency Procedures

- Emergency equipment must remain accessible
- Spills, accidents, or exposures must be reported immediately
- Power failures or equipment breakdowns must be logged and reported
- Emergency contact details must be displayed in the laboratory

11. Training and Teaching Use

- Teaching practicals must be supervised
- Students are not permitted unsupervised access
- Student experiments must be clearly labeled and segregated from research samples
- Laboratory facilities must be restored after teaching sessions

12. Review and Updates

This SOP shall be reviewed every two years or earlier if:

- New equipment is introduced
- New molecular techniques are implemented
- Institutional or safety regulations are updated
- Revisions must be approved by the Head, Department of Agricultural Biology.

Department of Agricultural Chemistry

Soil Testing Laboratory and Biofertilizer Laboratory

1. Title

Laboratory Conduct and Safety Rules for the Soil Testing Laboratory and Biofertilizer Laboratory

2. Purpose

The purpose of this Standard Operating Procedure (SOP) is to establish standardized laboratory practices in accordance with the guidelines and regulatory frameworks applicable in Sri Lanka. These procedures aim to ensure quality assurance, biosafety, accuracy, traceability, and environmental compliance in Soil Testing and Biofertilizer Laboratory operations.

3. Scope

This SOP applies to all personnel, students, researchers, and visitors involved in laboratory activities related to:

- Soil sample collection, processing, analysis, and reporting
- Microbial isolation, culture maintenance, and biofertilizer production
- Use of laboratory equipment and chemicals
- Waste management and biosafety practices

4. Procedure

4.1 Obligations

- All personnel must strictly follow this SOP and related institutional guidelines.
- Only trained and authorized personnel are permitted to conduct laboratory analyses.
- PPE including lab coat, gloves, and closed footwear is mandatory.
- Any deviation from SOPs must be documented and approved by the Head of the Department.

4.2 Laboratory Access

- Entry is restricted to authorized staff, students, and approved visitors.
- Visitors must sign the laboratory entry register and be accompanied by authorized personnel.
- Eating, drinking, smoking, and use of personal electronic devices for non-laboratory work are prohibited.

4.3 General Laboratory Safety and Hygiene Rules

- Maintain cleanliness of work benches and floors at all times.
- Handle acids, alkalis, solvents, and volatile chemicals in a fume hood.
- Follow MSDS for all chemicals.

- Wash hands before leaving the laboratory.
- Immediately report spills, breakages, and accidents to the Technical Officer, Supervisor, and Head of the Department.

4.4 Soil Sample Collection SOP

Sampling Depth

- Agricultural crops: 0–15 cm
- Plantation crops: 0–30 cm

Sampling Method

- Collect a minimum of 10–15 cores per hectare randomly in a zig-zag pattern.
- Avoid field boundaries, fertilizer bands, compost pits, and waterlogged areas.
- Mix thoroughly and collect composited samples~500 g composite sample.

Labeling and Transport

- Label with sample ID, location, crop, date.
- Air-dry samples and transport in clean polythene bags.

4.5 Sample Preparation SOP

- Air-dry soil in shade.
- Crush gently and pass through a 2 mm sieve.
- Store in labeled airtight containers.
- Prevent cross-contamination during sample preparation.

Microbial Cultures and Biofertilizer Samples

- Handle all cultures using aseptic techniques.
- Store mother cultures at 4°C or as glycerol stocks (a final concentration of 20%) at −80°C.
- Clearly label cultures with strain name, date, and operator initials.

5. Equipment-Specific Rules

- Operate instruments only after proper training.
- Calibrate instruments such as pH meters, EC meters, balances, and spectrophotometers regularly.
- Autoclaves must be operated according to prescribed temperature and pressure settings.
- Report malfunctioning equipment immediately and record in the maintenance log.

EC Meter

- Switch on the EC meter and allow to stabilize.
- Calibrate using standard KCl solution.
- Rinse probe with distilled water.
- Immerse probe in sample; avoid air bubbles.
- Record EC value and temperature.

- Rinse probe after use and switch off.
- Safety: Handle solutions carefully; avoid probe damage.
- Maintenance: Weekly calibration; store probe in appropriate solution.

pH Meter

- Switch on and calibrate using pH 4.0, 7.0, and 10 buffers.
- Rinse electrode with distilled water.
- Immerse electrode in sample; stir gently.
- Allow reading to stabilize and record.
- Rinse electrode and store in electrode storage solution.
- Safety: Glass electrode—handle carefully.

Soil Texture Analyzer

- Prepare soil sample as per standard method.
- Load sample into analyzer.
- Select appropriate analysis program.
- Start analysis and record results.
- Clean sample chamber after use.

Refrigerator

- Maintain temperature at 2–8 °C.
- Label all stored items with date and name.
- Do not overload shelves.
- Clean monthly.
- Safety: Avoid storing incompatible chemicals.

Water Bath

- Fill water bath to required level.
- Set temperature and allow stabilization.
- Place samples securely.
- After use, switch off and drain if required.

Autoclave

- Load materials without overpacking.
- Add sufficient water.
- Set to 121 °C, 15 psi, 15–30 min.
- Allow pressure to return to zero before opening.
- Safety: Risk of burns—use heat-resistant gloves.

Muffle Furnace

- Set required temperature.
- Place crucibles using tongs.
- Allow furnace to cool before removal.
- Safety: High-temperature hazard. Use appropriate PPE

Distillation Unit

- Fill boiler with tap water.
- Switch on heating unit.
- Collect distilled water in clean container.
- Switch off and clean periodically.

Weighing Balance

- Level and calibrate balance.
- Use clean, dry containers.
- Record weight.
- Clean pan after use.

Centrifuge

- Balance tubes properly.
- Set speed and time.
- Start centrifuge and wait until complete stop.
- Safety: Never open while running.

Magnetic Stirrer

- Place beaker on stirrer.
- Add stir bar.
- Set speed gradually.

Shaker

- Secure flasks or bottles.
- Set speed and duration.
- Start shaker and monitor.

Single Sieve Analyzer

- Place sieve securely.
- Load sample.
- Operate analyzer for set time.
- Collect and weigh fractions.

Flame Photometer

- Warm up instrument.
- Calibrate with standards.
- Aspirate sample.
- Record readings.
- Safety: Handle gas supply carefully.

Vortex Mixer

- Place tube on mixer head.
- Press gently to mix.

- Remove after mixing.

Oven

- Set required temperature.
- Load materials.
- After drying, allow cooling.

Pressure Plate Apparatus

- Saturate soil samples.
- Place on pressure plate.
- Apply required pressure.
- Collect and record moisture data.

Spectrophotometer

- Switch on and warm up.
- Calibrate with blank.
- Measure sample absorbance.
- Record results.

Volumenometer

- Calibrate instrument.
- Place sample in chamber.
- Record volume reading.
- Clean chamber after use.

Note: All procedures shall be performed in accordance with laboratory safety rules and relevant national/international standards.

6. Emergency Procedures and Reporting

- All emergencies shall be managed in accordance with institutional safety guidelines and national occupational safety regulations applicable in Sri Lanka.
- Chemical spills must be handled using designated spill kits and reported immediately to the Technical Officer, Head of the Department, and Supervisor.
- Fire emergencies shall be managed following the Fire Safety Regulations of Sri Lanka, using appropriate fire extinguishers and evacuation procedures.
- In case of personal injury, chemical exposure, or biological exposure, first aid shall be administered immediately and the incident reported to the Head of Department and recorded in the Incident Report Register.
- Serious incidents must be communicated to relevant university authorities and, where applicable, to national regulatory bodies.

7. Waste Disposal

- Waste segregation shall follow the guidelines issued by the Central Environmental Authority (CEA), Sri Lanka.

- Chemical wastes, including acids, alkalis, and heavy metals, shall be neutralized and disposed of as per institutional approval.
- All biological wastes shall be autoclaved and disposed of following biosafety guidelines applicable in Sri Lankan laboratories.
- Sharps and contaminated materials shall be disposed of in labeled, puncture-proof containers approved by the institution.
- Segregate waste into chemical, biological, and general waste categories.
- Neutralize acids and bases before disposal.
- Autoclave all biological waste prior to disposal.
- Dispose waste according to institutional biosafety and environmental regulations.

8. Review and Update

- This SOP shall be reviewed at least once every two (2) years or earlier if required by changes in national regulations, institutional policies, or audit findings.
- Revisions shall consider updates from the Department of Agriculture (Sri Lanka), Sri Lanka Standards Institution (SLSI), CEA and relevant university authorities.
- All revisions shall be documented in the SOP Revision History and approved by the Head of Department.

Food Analysis Laboratory

1. Title: Laboratory Conduct and Safety Rules for the Food Analysis Laboratory

2. Purpose

- To establish safety protocols for the use of hazardous chemicals (strong acids, bases, and flammable solvents) and the operation of specialized analytical instrumentation in food analysis.

3. Scope

- These protocols apply to all staff, students, and authorized visitors accessing the Food Analysis Laboratory.

4. Chemical Safety and Flammable Liquids

- Fume Hood Usage: All solvent extractions and acid digestions must be performed inside a certified fume hood.
- Flammable Storage: Store solvents in a dedicated fire-rated flammable storage cabinet. Never store more than the daily requirement on the benchtop.
- Static and Ignition: No open flames (Bunsen burners) are permitted while flammable solvents are in use.

- Chemical Spills: Maintain a spill kit containing acid neutralizers and absorbent pads for organic solvents.

5. Equipment-Specific Rules

Texture Analyzer

- Fix the appropriate probe for the test.
- Place the sample on the platform properly
- Set test parameters such as speed, strain and trigger force
- Wipe down probes and platform with appropriate cleaner

Force Gauge

- Switch on the force gauge and set it to zero (tare)
- Fix the sample securely to the hook or testing platform
- Apply force gradually until the sample breaks or deforms
- Ensure the calibration weights are within the rated capacity of the instruments

Homogenizer

- Switch on the homogenizer only after the probe is immersed in the sample
- Do not touch the probe or moving parts while the homogenizer is running
- Hold the homogenizer firmly and vertically during operation

Rotary Evaporator

- Secure the round-bottom flask firmly using a Keck clip
- Lower the flask slowly into the heating bath
- Start rotation before applying vacuum
- Adjust bath temperature according to the boiling point of the solvent

Water Bath with Stirring

- Fill the water bath with sufficient water
- Set the required temperature and stirring speed
- Remove the sample after the required heating period
- Avoid spilling water near electrical parts
- Don not touch the water directly; risk of burns

Soxhlet Apparatus

- Turn on the cooling water supply to the condenser first
- Always operate in a well- ventilated area or fume hood to prevent inhalation of hazardous vapors
- Periodically verify the heating unit with a calibrated thermometer

Fiber Analyzer

- Add enzymes or reagents according to the method
- Calibrate the instrument periodically
- Always run blanks and standards alongside samples

Protein Analyzer (Kjeldahl digestion)

- Ensure the proper cooling before handling hot component
- Do not open digestion or reaction chambers during operation
- Work in a well ventilated area or fume hood, especially when using acids, alkalis or catalysts
- Avoid inhalation of fumes and direct contact with reagents

Milk Fat Analyzer

- Switch on the instrument and allow it to warm up properly
- Perform a "Zero check" and de-aerate syringes if required by the manufacturer
- Place the cup in the analyzer and select the appropriate milk type

Fume Hood

- Keep doors and windows near the hood closed to maintain airflow balance
- Avoid sudden arm movements in and out of the hood
- Check that the fume hood is switched ON and airflow is functioning properly
- UV light should be switched on for 15-30 minutes before use to ensure proper sterilization of the fume hood

Bomb Calorimeter

- Always check for gas leaks before ignition
- Do not exceed the recommended oxygen pressure
- Handle the bomb calorimeter as it operates under high pressure
- Maintain constant water volume and stirring speed

Analytical Balance

- Place the balance on a stable, vibration-free surface
- Ensure the leveling bubble is perfectly centered before use
- Close all draft shield doors completely before recording the final weight
- Clean the weighing pan gently with a soft brush or wipe after every use

pH Meter

- Keep the electrode submerged in storage solution when not in use; never let it dry out
- Rinse the electrode thoroughly with distilled water
- Calibrate the meter daily using at least two standard buffer solutions (e.g., pH 4.0, 7.0, or 10.0)
- Ensure the temperature compensation matches the sample temperature

Colony Counter

- Ensure the grid plate is clean and free of old markings before placing the petri dish
- Adjust the magnifying glass and illumination intensity to clearly distinguish colonies
- Use the felt-tip marker probe firmly on the dish surface to ensure the electronic counter registers each touch
- Reset the digital counter to zero before beginning a new plate count

Stereomicroscope

- Always carry the microscope with two hands: one on the arm and one under the base
- Adjust the interpupillary distance and diopter settings to match your eyesight before focusing
- Turn on the appropriate light source (incident/top light for opaque samples, transmitted/bottom light for transparent samples)
- Clean the optical lenses only with specialized lens paper and approved cleaning solution

Moisture Meter

- Ensure the sample is ground or prepared to a uniform consistency as required by the product profile
- Weigh and spread the sample evenly across the sample pan to ensure uniform heating
- Select the correct drying program (temperature and shut-off criteria) for the specific sample matrix
- Wait for the heating chamber to cool down to room temperature before starting the next test

Water Activity Meter

- Fill the sample cup halfway; do not overfill to prevent contamination of the sensor
- Seal the sample chamber immediately after inserting the cup to prevent moisture loss to the environment
- Wait for the reading to stabilize completely and the "measurement complete" indicator to signal
- Clean the sensor chamber gently with specified cleaning kits if volatile components contaminate it

Grinder

- Ensure the grinding chamber and blades are completely dry and free of residue before loading
- Do not exceed the maximum fill line or maximum volume limit of the grinding chamber
- Disconnect the power plug before removing the ground sample or cleaning the blades

Oven

- Do not overload the shelves; leave sufficient space between items for proper hot air circulation
- Avoid placing flammable, explosive, or highly volatile materials inside standard drying ovens
- Keep the oven door closed as much as possible to maintain temperature stability and uniformity
- Use heat-resistant gloves or tongs when inserting or removing items from the hot chamber

Muffle Furnace

- Use only high-temperature crucibles for sample ashing
- Raise and lower the temperature gradually to prevent thermal shock to the furnace lining and crucibles
- Keep the heavy furnace door closed tightly during operation to prevent extreme heat loss
- Wear heavy-duty, heat-resistant safety gloves and use long tongs when retrieving samples at high temperatures

Shaker

- Distribute flasks evenly across the platform to maintain balance
- Set the RPM (speed) gradually from low to high to avoid sudden splashing
- Wipe up any liquid spills immediately to protect the electronic drive mechanism beneath the platform

Hotplate

- Never leave an active hotplate unattended, especially when heating flammable solvents
- Ensure the exterior of the glassware is completely dry before placing it on the heated surface
- Do not place plastic containers, paper, or aluminum foil directly onto the heating plate
- Turn off the power and unplug the unit when heating is complete; treat the top surface as hot long after switching off

Magnetic Stirrer

- Center the vessel directly over the middle of the stirrer base for maximum magnetic coupling
- Drop the appropriate-sized magnetic stir bar into the liquid gently to avoid cracking the glassware
- Turn the speed dial up slowly to prevent the stir bar from decoupling and bouncing erratically
- Use a magnetic retriever tool to remove the stir bar from the solution before pouring or cleaning

6. Waste Disposal

- Acidic/alkaline Waste: Neutralize to pH 6–7 before disposal, or collect in a dedicated hazardous waste bin for professional disposal.
- Glassware: Rinse solvent-contaminated glassware in the hood before moving to the washing station
- Solid and Biological Waste: Food Samples: Non-hazardous food scraps (post-analysis) should be placed in plastic-lined bins. If the sample is spoiled or contains microbial cultures, it must be autoclaved before disposal.
- Contaminated Consumables: Gloves, filter papers, and weighing boats contaminated with hazardous chemicals must be disposed of in the "Hazardous Solid Waste" bin, not the general trash.

- Broken Glass: All broken pipettes, beakers, or glass wool from any analysis must be placed in a puncture-proof Sharps Box.

General Rules for Disposal

- The "Golden Rule": Never pour solvents, fats, or concentrated acids down the sink. This prevents pipe corrosion and environmental contamination.
- Labeling: Every waste container must be labeled with the Start Date, Chemical Name, and Concentration.
- Filling Limit: Never fill waste bins beyond 80% capacity to allow for vapor expansion.
- Fume Hood: Keep waste containers capped and stored inside a fume hood or a ventilated cabinet to prevent the buildup of toxic or flammable vapors.

7. Emergency response

Acid Burn

- Immediately flush the affected area with water for at least 15 minutes at the emergency shower or eye-wash station.

Power Failure

- If power fails during a Kjeldahl digestion or solvent extraction or any instrument, immediately turn off the heat source.

Chemical Spills

- Small Acid/Base Spills: Neutralize with sodium bicarbonate (for acids) or citric acid (for bases). Wipe the area with absorbent pads and rinse it with water.
- Flammable Solvent Spills: Immediately extinguish all heat sources and unplug equipment. Alert others and evacuate. Use specialized organic vapor absorbent pillows. Warning: Do not use a vacuum cleaner to pick up flammable liquid spills.

Fire Emergency

- Solvent Fires: use a Class B (CO_2 or Dry Chemical) extinguisher. Never use water on a solvent fire.
- Instrument Fires: Turn off the main power switch if safe to do so. Use a CO_2 extinguisher to avoid damaging the delicate circuitry of the instruments.

Equipment Failure

- Bomb Calorimeter Overpressure: If the pressure gauge exceeds safe limits or the vessel leaks, evacuate the immediate area and wait for the pressure to stabilize or vent safely according to the manufacturer’s instructions.
- Kjeldahl Fume Leak: If pungent gases or Ammonia fumes escape, immediately turn off the digestion/distillation unit, increase the fume hood speed to "High," and evacuate the lab until the air clears.
- Rotary Evaporator Implosion: If glassware cracks under vacuum, immediately turn off the vacuum pump and the rotation. Carefully clean up glass shards using tongs and a brush; never use bare hands.

Personal Injury and Exposure

- Chemical Splash (Eyes): Proceed immediately to the Eyewash Station. Flush eyes with water for at least 15 minutes, holding eyelids open. Seek medical attention.
- Chemical Burn (Skin): Remove contaminated clothing and use the Safety Shower for 15 minutes.
- Thermal Burns: For burns from hot pan or crucibles, run cool (not cold) water over the burn for 10 minutes. Do not apply ointments or bandages until the heat has dissipated.

8. Review and Update

This SOP will be reviewed every two years or earlier if new equipment, analytical techniques, or food safety regulations are introduced.

Food Processing Unit

1. Title: Laboratory Conduct and Safety Rules for the Food Processing Unit

2. Purpose

- To provide guidelines ensuring safety, hygienic, and proper practices in the food processing unit
- To minimize risks when handling raw food materials, heated products, processing equipment, and conducting chemical analysis
- To establish proper procedures for maintaining sample integrity, preventing cross-contamination, and ensuring food safety standards (HACCP/GMP)

3. Scope

These rules apply to all staff, students, and authorized visitors accessing the food processing unit.

Activities covered:

- Food preparation, processing, and preservation (heating, cooling, drying, fermentation)
- Quality control and chemical analysis of food and food products (e.g. proximate analysis)
- Sensory evaluation and storage of finished food samples
- Equipment use: dryers (cabinet, microwave, freeze, spray, and oven), autoclave, juicer, peeler, packing machines (vacuum, nitrogen, and normal), extruder, pH meters, balances, and Refrigerator
- Safe storage and handling of chemicals, raw materials, and glassware.

4. Procedure

4.1 Obligations

- All laboratory users must comply with safe and hygienic practices and act responsibly.

- Hazards, unhygienic conditions, or equipment malfunctions must be reported immediately to the technical officer.

4.2 Laboratory Access

- Only trained and registered personnel are allowed entry.
- Mandatory induction includes:
    - General laboratory safety and food safety (HACCP) orientation
    - Training in aseptic techniques and product handling
    - Safe operation of heavy-duty processing equipment (e.g., autoclave, spray dryer)
    - Chemical, reagent, and raw material storage procedures
- Visitors must obtain prior approval (24 hours in advance) and always be accompanied, adhering strictly to PPE and hygiene rules.
- After-hours access is approved only under the supervision of technical officers or academic staff members.
- Logbook entries must be completed for all equipment.

4.3 General Laboratory Safety and Hygiene Rules

Personal Hygiene and Attire

Strict personal hygiene is the primary defense against food contamination.

Attire Requirements

- Proper Uniform: Wear clean uniforms with no tears.
- Footwear: Wear closed-toe shoes with flat soles (no heels). Footwear must be kept clean.
- Hair Restraints: Use hairnets and beard nets (if applicable) to completely confine hair.
- Jewellery/Nail polish: Remove all jewellery. Do not wear nail polish.

Handwashing

Wash hands and arms thoroughly with soap and water at the following times:

- Before commencing or resuming work.
- After using the toilet.
- After handling rubbish or cleaning tasks.
- After using a handkerchief or touching your hair/face.
- Before and after handling raw food.
- Before handling cooked food.
- When leaving the laboratory area (even if gloves and a lab coat were worn).

Wounds and Illness

- Wounds: All open cuts or wounds must be protected with a secure, waterproof covering (e.g., a bandage and a glove).

- Report Illness: Immediately inform your supervisor if you have any of the following symptoms:
    - Jaundice (yellowing of eyes/skin)
    - Diarrhea, vomiting, or fever
    - Sore throat with fever
    - Boils, infected cuts, or discharges from ears, nose, or eyes
    - Excessive coughing or sneezing

4.4 Food/Sample Handling and Storage Rules

Preventing contamination and Cross-contamination

These rules prevent the transfer of harmful substances between surfaces, equipment, and food.

Food handling separation

- Separate raw/cooked: Always separate raw, cooked, and new food from old food.
- Separate equipment: Use separate, designated equipment and utensils when preparing raw foods to prevent cross-contamination.
- Food coverage: Keep food covered until it is ready for use.
- Packaging: Use suitable packaging materials to protect food from contamination.

Cleaning and Sanitizing

- Sanitize surfaces: Thoroughly clean and sanitize all food surfaces, equipment, and utensils.
    - Use hot water and detergent for cleaning.
    - Follow with a chemical sanitizer or sufficient hot water, as detergents alone do not kill bacteria.
- Workplace cleanliness: Keep the entire working place clean to minimize the risk of cross-contamination from pests, dirt, and grease.
- End-of-Lab cleanup: At the end of every lab session, return clean glassware to its proper place, clean your benchtop, and ensure all electrical devices and water are turned off.

Cleaning and Sanitation procedures

- Designated tools: Use equipment, utensils, and cutting boards that are specific to the task
- Standard Operating Procedures (SOPs): Follow documented SOPs for the Cleaning In Place (CIP) or Cleaning Out of Place (COP) of all machinery

Monitoring and Control

- Critical Control Points (CCPs): For equipment that controls a CCP (e.g. sterilizer), the operational limits (like time and temperature) must be constantly monitored and recorded.
- Calibration: Ensure all critical measurement devices (thermometers, pH meters) are regularly calibrated and verified against established standards.

- Maintenance Products: Only food-grade lubricants and chemicals are to be used on or near food contact equipment. Store all maintenance chemicals (including cleaning agents) separately from food ingredients and finished products.
- Physical Hazards: Routinely inspect equipment for signs of wear and tear to prevent physical contaminants (metal, plastic) from entering the food stream.
- MSDS must be available for all chemicals.
- Expired materials or chemicals must be reported for safe disposal.

General Lab Conduct and Safety

These rules are essential for maintaining a safe and professional laboratory environment.

Prohibited items and activities

Rule	Detail
No food/drink	Do not prepare, store, or consume food or beverages in the laboratory.
No smoking	Do not smoke in the laboratory.
No unauthorized equipment	Do not store or use personal food equipment (microwaves, coffee makers, refrigerators) in the lab area.
No personal lab wear	Do not wear or bring lab coats, gloves, or other lab items into break areas or other areas where food is consumed.
No unapproved experiments	Never perform an unauthorized experiment or work without an instructor present.
No removal of items	Never remove any chemicals, glassware, or other lab materials from the lab.

Chemical and Equipment safety

- Eye Protection: Safety goggles (department-approved) must be worn in the lab at all times.
- Chemical handling:
    - Never taste or inhale fumes or vapors. Use fume hoods for dangerous chemicals.
    - Rinse spills off skin immediately with large amounts of water.
    - Label all containers to identify their contents.
    - Avoid putting excess chemicals back into a reagent bottle; dispose of it properly.
- Hot objects: Avoid touching hot objects. Use beaker tongs to handle heated containers.

4.5 Equipment-Specific Rules

Twin screw extruder

- Safety first: Unplug the machine before assembling, disassembling, cleaning, or clearing a jam. Never insert hands or tools while the motor is running
- Follow the Recipe: Strictly use the manufacturer's specified flour-to-liquid ratio to prevent motor strain and damage to the screw/barrel
- Immediate cleaning: Clean all food-contact parts immediately after use
- No submerging: Never immerse the motor base or electrical components in water
- Wipe them clean with a damp cloth only
- Cool down: Do not run the machine for multiple consecutive cycles without allowing the recommended cooling-off period to prevent the motor from overheating

Autoclave

- Only trained personnel may operate
- Monitor pressure and temperature closely
- Use heavy-duty heat-resistant gloves when loading/unloading hot products
- Wait for Zero: NEVER open the door until the pressure gauge reads ZERO and the temperature has dropped below 65 oC (or machine indicates safe)
- Open Slowly: Stand back and crack the door slowly to allow residual steam to escape safely before fully opening and removing items

Dryers (e.g., Cabinet, Spray, Microwave and Oven)

- Use only laboratory-approved materials or products for drying
- Do not place flammable materials inside
- Ensure exhaust fans are operational during use
- Prevent Overheating: Never exceed the maximum temperature limits specified for the product

Homogenizer/Grinders

- Ensure all safety guards are in place before operation
- Clean all components immediately after use to prevent biofilm formation
- Balance samples properly before high-speed mixing
- No Dry Running (Grinders): Do not run the grinder dry (without product) for more than a few seconds, as this causes rapid heat build-up that can damage components and melt product residue
- Monitor Pressure (Homogenizers): For high-pressure homogenizers, monitor the pressure gauge. Avoid rapid pressure changes (up or down) and use the emergency stop immediately if you observe abnormal vibrations or leaks

Balances

- Clean the balance pan after every use, especially after measuring sticky or dusty materials

pH Meters

- Calibrate pH meters daily (pH 4, 7 and 10) and ensure probes are stored in the correct buffer solution
- The electrode must be rinsed with distilled or deionized water between every sample and every buffer. Never wipe the glass bulb; gently blot the excess water

Refrigerator

- Maintain and monitor temperature
- Prevent cross-contamination: Store food based on its required cooking temperature
- Ready-to-Eat (RTE) foods must be stored above raw meats, poultry, and seafood
- Store raw meat, poultry, and fish on the lowest shelves to prevent drips from contaminating other products
- All food must be stored in covered, food-grade containers
- Ensure air circulation and regular cleaning

Spray Dryer

- Ensure the atomizing nozzle or rotary atomizer is clean, clear of blockages, and properly aligned before starting
- Preheat the drying chamber to the specified inlet and outlet temperatures using ambient air before feeding the product
- Monitor feed pump speed continuously to maintain a steady flow rate and prevent wet droplets from hitting the chamber walls
- Allow the system to cool down completely before opening the chamber to collect powder or starting the clean-in-place (CIP) cycle

Dough Mixer

- Secure the correct mixing attachment tightly to the shaft before adding ingredients
- Lock the mixing bowl and safety guard firmly in position; the machine should not operate if the safety guard is open
- Start the mixer at the lowest speed setting to prevent ingredient splash-out, then gradually increase to the target speed
- Never reach into the bowl or use a spatula while the mixing arm is in motion; always press the emergency stop first

Normal Packing Machine

- Check and align the packaging film roll or pouch feed system to ensure smooth tracking
- Calibrate the sealing jaw temperature and dwell time according to the specific thickness and material of the packaging film
- Ensure the forming tube and cutting blades are free of product debris or plastic residue build-up

- Verify that the mechanical sealing and cutting timing matches product specifications before running production

Nitrogen (Gas Flush) Packing Machine

- Check and align the packaging film roll or pouch feed system to ensure smooth tracking
- Calibrate the sealing jaw temperature and dwell time according to the specific thickness and material of the packaging film
- Ensure the forming tube and cutting blades are free of product debris or plastic residue build-up
- Verify that the gas flushing and nitrogen pressure levels match product specifications before running production

Vacuum Packing Machine

- Check and align the packaging film roll or pouch feed system to ensure smooth tracking
- Calibrate the sealing jaw temperature and dwell time according to the specific thickness and material of the packaging film
- Ensure the forming tube and cutting blades are free of product debris or plastic residue build-up
- Verify that the vacuum pressure levels and evacuation time match product specifications before running production

Fruit Pulper and Squeezer

- Select and install the correct screen sieve mesh size based on the fruit type and desired pulp smoothness
- Sort and pre-wash raw fruits, ensuring large seeds, stones are removed
- Feed the fruits into the hopper at a steady, controlled rate to avoid overloading the internal paddles or screw press
- Flush the internal screens with clean water immediately after production to prevent fruit fiber and sugar from drying and clogging the mesh

Freeze Dryer

- Freeze the liquid or solid samples completely at ultra-low temperatures before placing them into the drying chamber
- Inspect the chamber door gasket and apply a thin layer of vacuum grease if necessary to guarantee an airtight seal
- Defrost and drain the ice condenser coils thoroughly after venting the chamber and removing the lyophilized products

5. Emergency procedures and Reporting

- Report accidents: Notify your instructor immediately of all accidents, spills, or injuries, no matter how minor.
- Know emergency locations: Learn to locate and operate the safety shower, fire extinguisher, eye-wash fountain, fire blanket, and fire exit.

- Controlled Substances: Do not come to the lab under the influence of drugs or alcohol.

Fire: Use fire extinguishers; evacuate immediately.

Spills (Chemical/Biological): Use appropriate spill kits. Report to technical officer.

Exposure: Wash under safety shower/eyewash; seek medical attention.

Product Contamination: Isolate the batch immediately, quarantine, and report for investigation.

6. Waste Disposal

- Place all liquid and solid waste in designated containers
- Place general waste in plastic-lined bins. Remove waste regularly, and ensure external bins are covered.
- Broken Glass: Clean up broken glassware immediately and place it in the designated container.
- Biological Waste (e.g., spoiled food): Dispose of via designated sealed containers. Autoclaving may be required for high-risk microbial cultures.
- Chemical waste is disposed according to hazard classification.
- Food Waste (non-hazardous scraps) collected in separate, clearly lined bins.

7. Review and Update

This SOP will be reviewed every two years or earlier if new equipment, processing techniques, or food safety regulations are introduced.

Department of Agricultural Engineering

Environment & Hydro Research Lab

1. Title: Laboratory Conduct and Safety Rules for the Environment & Hydrology Research Laboratory

2. Purpose

- To provide guidelines ensuring safe and proper practices in the Environment & Hydrology Research Laboratory.
- To minimize risks associated with handling environmental and hydrological samples, operating laboratory instruments, and conducting analytical procedures.
- To establish proper procedures for safe operation, maintenance, and storage of laboratory equipment and materials.

3. Scope

These rules apply to all staff, students, researchers, and authorized visitors accessing the Environment & Hydrology Research Laboratory.

4. Procedure

4.1 Obligations

- All laboratory users must comply with safe laboratory practices and act responsibly.
- Hazards, accidents, and equipment malfunctions must be reported immediately to the Laboratory Coordinator.
- Misuse of laboratory facilities, instruments, and safety equipment is strictly prohibited.
- All users must:
  - Follow the instructions given by supervisors/technical officers
  - Wear appropriate PPE (Personal Protective Equipment) (lab coat, gloves, masks, closed footwear)
  - Handle samples, instruments, and chemicals carefully
  - Maintain cleanliness and proper housekeeping practices
  - Record equipment usage in relevant logbooks

4.2 Laboratory Access

- Only trained and authorized personnel are permitted inside the laboratory.
- Mandatory induction includes:
  - General laboratory safety orientation
  - Safe handling of environmental and hydrological samples
  - Instrument operation and maintenance procedures
  - Chemical handling and storage procedures

- Visitors must obtain prior approval and must always be accompanied.
- After-hours access is discouraged; if essential, logbook entries are mandatory.

4.3 General Laboratory Safety Rules

- PPE: Laboratory coat, gloves, and closed footwear are compulsory. Safety glasses and masks should be used where necessary.
- Personal hygiene: Wash hands before leaving the laboratory; cover cuts and wounds with waterproof dressings.
- Food or drinks: Not permitted inside the laboratory.
- Hair and belongings: Long hair tied back; personal items kept outside working benches.
- Emergency equipment: Fire extinguishers, spill kits, eyewash stations, and first aid kits must remain accessible.
- Incident reporting: All accidents, injuries, chemical spills, and equipment failures must be reported immediately.
- Electrical safety: Ensure equipment is switched off after use and avoid handling electrical equipment with wet hands.

4.4 Equipment-Specific Rules

Shaking Incubator
- Ensure samples are tightly sealed before operation.
- Balance flasks properly before starting.
- Clean spills immediately after use.

Muffle Furnace
- Only trained personnel may operate.
- Use heat-resistant gloves when handling hot materials.
- Do not place flammable materials inside the furnace.

Hot Air Oven
- Use only laboratory-approved materials.
- Avoid overloading the chamber.
- Allow cooling before removing samples.

Incubator
- Label all stored samples clearly.
- Maintain recommended operating temperature.
- Clean regularly to prevent contamination.

Water Bath
- Maintain proper water level before operation.
- Avoid electrical contact with water.

- Switch off after use.

Refrigerator

- Store only laboratory samples and reagents.
- Label all stored items with date and contents.
- No food or drinks allowed.

Digital Balance

- Ensure balance is calibrated before use.
- Do not place wet or hot materials directly on the balance.
- Clean after every use.

pH Meter / EC Meter / Pocket EC Meter / DO Meter

- Calibrate before measurements.
- Rinse probes with distilled water after use.
- Store probes according to manufacturer instructions.

Tensiometer

- Handle carefully to avoid damage to ceramic tips.
- Ensure proper installation before measurements.
- Clean and store properly after use.

Soil Moisture Meter

- Avoid excessive force during insertion into soil.
- Clean probes after each use.

Tipping Bucket

- Ensure proper leveling before operation.
- Keep free from debris and blockage.

Whiteness Meter

- Keep optical surfaces clean.
- Avoid direct exposure to dust and moisture.

Electromagnetic Current Meter

- Handle sensors carefully during field and laboratory use.
- Ensure cables and connections remain dry and undamaged.
- Store safely after use.

5. Sample Handling

- All environmental and hydrological samples must be labeled clearly with sample ID, date, and researcher name.
- Samples should be stored under appropriate conditions to avoid contamination and degradation.

- Hazardous chemicals and reagents must be handled according to MSDS guidelines. Glassware and measuring instruments should be cleaned immediately after use.
- Avoid cross-contamination during sample preparation and analysis.

6. Chemical / Media Handling

- Chemicals must be properly labeled with hazard symbols and storage dates.
- Flammable and corrosive chemicals should be stored separately.
- Equipment should be returned to designated storage areas after use.
- Broken or damaged equipment must not be used and should be reported immediately.
- MSDS must be available for all chemicals used in the laboratory.

7. Data Management, Documentation, and Record Keeping

- All laboratory users must maintain proper records of laboratory activities, equipment usage, and sample handling procedures.
- The laboratory maintains an In and Out Register Book for all research students, staff, and authorized users entering the laboratory.
- Users must record their name, date, in-time, and out-time when entering and leaving the laboratory.

- Any equipment taken outside the laboratory for practical classes, field work, research activities, or other authorized purposes must be recorded in the Equipment Loan Book.

  Users must enter:
  - Name of the equipment
  - Date and time of issue
  - Purpose of use
  - Expected return date and time
  - Signature of the user
  - Signature of the laboratory attendant/authorized officer
- Separate record files/logbooks must be maintained for each instrument available in the laboratory.

  - Users must record:
    - Date and time of use
    - Name of the user
    - Purpose of use
    - Operating duration or conditions
    - Any faults, damages, or maintenance requirements observed during operation
- For equipment related to distilled water usage, users must additionally record the amount of distilled water consumed during operation.
- Calibration, maintenance, and servicing records of all instruments must be maintained properly and updated regularly.
- Sample records and laboratory observations must be documented clearly and stored securely for future reference.

- All laboratory documents, logbooks, and records must be kept in designated storage locations and made available for inspection when required.
- Unauthorized alteration or removal of laboratory records is strictly prohibited.

8. Waste Disposal

- Chemical waste must be disposed of according to hazard classification.
- Glass waste must be collected in designated containers.
- Sharp materials must be disposed in sharps bins.
- General laboratory waste should be separated appropriately.
- Wastewater and environmental samples must not be discharged without approval.

9. Emergency Procedures & Reporting

- Fire: Use appropriate fire extinguishers and evacuate immediately.
- Chemical spills: Use spill kits and inform the laboratory coordinator immediately.
- Electrical accidents: Disconnect the power supply if safe to do so and seek assistance.
- Exposure to chemicals: Wash the affected area immediately and seek medical attention.
- Equipment malfunction: Switch off the equipment and report to technical staff.
- Power failure: Switch off all instruments to prevent damage when power returns.

10. Review and Updates

- This SOP will be reviewed every two years or earlier if new equipment, procedures, or hazards are introduced.

Common Laboratories

Analytical Measurement and Water Distillation Room

1. Title: Laboratory Conduct and Safety Rules for the Analytical Measurement and Water Distillation Room

2. Purpose: This SOP establishes consistent procedures for the safe, efficient, and responsible operation of the Instrumental Analysis Laboratory. It ensures personnel safety, preserves analytical data integrity, protects equipment, and supports compliance with institutional safety and quality standards.

3. Scope: This SOP applies to all academic staff, technical officers, undergraduate students, postgraduate students, research assistants, visiting researchers, and authorized personnel using the Analytical Measurement and Water Distillation Room and its associated facilities, including;

- Water Distiller
- Water Deionizer
- UV-Visible Spectrophotometer
- Fluorimeter
- Gas Chromatograph (GC)

4. Procedure

4.1 Obligations

- Read and comply with this SOP before using the laboratory.
- Attend relevant safety and instrument training sessions.
- Wear appropriate PPE such as a lab coat, gloves, and closed shoes.
- Report accidents, incidents, equipment malfunctions, and unsafe conditions immediately.
- Maintain laboratory cleanliness. The table in the laboratory should be kept clean, and any spills should be cleaned up immediately.
- Personal belongings cannot be taken inside the laboratory.
- Any materials, including glassware, notebooks, etc., should not be left in the laboratory after use.
- The user should not leave any waste in the laboratory.
- Chemicals should not be poured into the sinks.
- The user must enter the details in the entry register as well as the equipment-specific logbook.
- Users shall inspect equipment before use and report abnormalities immediately.
- Equipment shall not be modified without authorization.

- Any damage caused through negligence may result in suspension of laboratory privileges.

4.2 Laboratory Access

- Laboratory access is restricted to authorized personnel only.
- The user must be properly trained and competent to operate the equipment safely and effectively.
- Use laboratory equipment only after receiving approval from the Head of the Department of Agricultural Chemistry through the proper channel.
- Students must work under the supervision of authorized staff.
- Visitors must obtain prior approval before entering the laboratory.
- Equipment reservations must be made through the online system. Details are available on the Department of Agricultural Chemistry website, and a QR code linking to the system is posted on the lab door.
- After-hours or holiday access is permitted only with prior approval.

4.3 General Laboratory Safety Rules

- PPE: Lab coats, closed shoes, and gloves are compulsory.
- Food/drinks: Not permitted in the laboratory or store.
- Hair and belongings: Long hair tied back; personal items are not allowed.
- Incident reporting: All accidents, incidents, injuries, etc. must be reported immediately.

4.4 Equipment-Specific Rules

Water Distiller and Deionizer

- Operate according to manufacturer's instructions.
- Ensure adequate water supply before operation.
- Check for leaks regularly.
- Switch off equipment after use if continuous operation is not required.
- Record maintenance and filter replacement activities.

UV-Visible Spectrophotometer

- Allow sufficient warm-up time before analysis.
- Use clean, scratch-free cuvettes.
- Select the cuvettes suitable for the wavelength range being analyzed (e.g., quartz cuvettes for UV measurements).
- Handle optical components carefully.
- Do not force cuvettes into the sample holder
- Do not force instrument compartments.
- Clean sample compartments after use.
- Handle cuvettes by the frosted sides or upper edges only to avoid contamination of optical surfaces.
- Ensure that cuvettes are filled to the recommended level and are free from air bubbles.

- Never place leaking, overflowing, or improperly sealed sample containers inside the instrument.
- Do not touch, clean, or attempt to adjust internal optical components
- Do not use highly volatile, corrosive, or flammable solvents unless approved by the laboratory supervisor and compatible with the instrument.
- After use, remove all samples and cuvettes from the instrument.
- Clean and dry cuvettes immediately after use and return them to their designated storage location.
- Wipe the sample compartment if necessary and ensure the instrument is left in a clean condition.
- Never attempt to operate the instrument with protective covers removed.
- Avoid direct viewing of the UV light source, as exposure to ultraviolet radiation may cause eye injury.

Fluorimeter

- Use only appropriate cuvettes recommended by the manufacturer.
- Protect samples and standards from excessive light exposure.
- Avoid contamination of optical surfaces.
- Follow instrument-specific calibration procedures before analysis.

Gas Chromatograph (GC)

- Only trained personnel may operate the GC.
- Verify gas cylinder connections and pressure settings before use.
- Check for gas leaks using approved leak detection methods.
- Ensure proper ventilation during operation.
- Follow established procedures for column installation and maintenance.
- Shut down the instrument according to manufacturer guidelines after use.
- Record instrument operating parameters and maintenance activities.
- Users shall receive specific training on GC operation, gas cylinder safety, and ECD detector safety before independent use.
- Report unusual chromatograms, detector instability, gas leaks, pressure fluctuations, or instrument alarms immediately.

Pre-operation checks

- Verify that carrier gas, makeup gas, and detector gas supplies are sufficient before analysis.
- Check gas pressures and flow rates before starting the instrument.
- Inspect gas lines, fittings, and regulators for damage or deterioration.
- Confirm that leak checks have been performed before operation.
- Ensure the column is properly installed and conditioned according to laboratory procedures.
- Verify that the detector, injector, and oven temperatures are appropriate for the analytical method.

Injector and oven safety

- Injector ports, detector ports, transfer lines, and oven compartments operate at high temperatures and may cause burns.
- Do not touch heated zones during operation.
- Allow sufficient cooling time before performing maintenance.

Sample introduction precautions

- Samples shall be filtered to prevent contamination of the injection port and column.
- Use only clean GC vials and septa.
- Ensure vials are properly labeled.
- Avoid overloading the column by injecting excessive sample concentrations.
- Use syringes appropriate for GC applications.
- Inspect syringes for damage before use.

Column protection

- Avoid sudden temperature changes that may damage the column.
- Do not exceed the manufacturer's recommended temperature limits.
- Oxygen exposure to heated columns shall be minimized.

Electron Capture Detector (ECD) safety

- The ECD contains a sealed radioactive source (Nickel-63).
- Users shall not attempt to dismantle, open, modify, or repair the detector.
- Only authorized service personnel may perform maintenance involving the ECD detector housing.
- The detector shall never be tampered with under any circumstances.
- Any damage or suspected damage to the ECD detector shall be reported immediately to the laboratory supervisor.
- Radioactive source identification labels shall remain visible and intact.
- The ECD shall be operated only within the manufacturer's recommended temperature and flow-rate ranges.
- Laboratory personnel shall comply with institutional radiation safety requirements applicable to ECD-equipped instruments.
- The ECD detector shall not be disposed of as normal laboratory waste.
- Relocation, disposal, or servicing of the detector shall be conducted according to applicable radiation safety regulations.

Solvent and chemical safety

- Use only high-purity solvents suitable for GC analysis.
- Flammable solvents shall be handled away from ignition sources.
- Avoid inhalation of solvent vapors.

Shutdown procedure

- Follow the shutdown sequence.
- Ensure detector and oven temperatures are reduced according to the manufacturer's recommendations.
- Close gas supplies when the instrument is shutdown.
- Remove all samples and clean the work area after use.

- *Please see the safety measures related to gas cylinders under the section 9. Emergency Procedures & Reporting.*

5. Sample Handling

- Label all samples clearly with sample identification, date, and analyst name.
- Samples shall not be stored in the laboratory and must not be left unattended at any time.
- Sample preparation cannot be performed in this laboratory.
- Prevent sample spills during handling, and analysis. Any spill must be cleaned immediately following the appropriate safety procedures.
- No waste may be left in the laboratory.

6. Chemical Handling

- Use appropriate PPE when handling chemicals.
- The use of hazardous chemicals or samples shall be conducted in accordance with applicable safety guidelines, and all laboratory users present must be informed of the associated hazards so that appropriate precautions can be taken.
- No waste may be left in the laboratory.
- Chemical waste must not be poured into laboratory sinks.

7. Data Management, Documentation, and Record Keeping

- Record instrument usage in designated logbooks.
- Retain analytical data, chromatograms, spectra, calibration records, and maintenance records.

8. Waste Disposal

Waste disposal is not permitted in this laboratory. Please ensure that all waste is taken back to your main laboratory for proper disposal. Visitors who use only this laboratory must consult the staff in charge regarding waste disposal procedures.

9. Emergency Procedures & Reporting

Chemical spills

- Alert personnel in the affected area.
- Follow spill response procedures.
- Use spill kits where appropriate.
- Report all spills to the Technical Officer, Head of the Department and Supervisor.

Fire emergency

- Activate the fire alarm if necessary.

- Evacuate immediately using designated exit routes.
- Do not use elevators during evacuation.
- Assemble at the designated emergency assembly point.

Personal injury

- Provide first aid if trained to do so.
- Seek medical attention when necessary.
- Report all injuries immediately.

Gas cylinder safety rules

- Only trained and authorized personnel may handle, connect, disconnect, or transport gas cylinders.
- Gas cylinders shall be secured upright at all times using approved chains, straps, or cylinder brackets.
- Cylinders shall be stored in well-ventilated areas away from heat sources, ignition sources, direct sunlight, and combustible materials.
- Protective valve caps shall remain in place when cylinders are not connected for use.
- Gas cylinders shall not be rolled, dragged, dropped, or subjected to mechanical impact.
- Use only regulators, tubing, and fittings specifically designed and rated for the gas and operating pressure.
- Before use, inspect cylinders, regulators, hoses, and connections for damage, corrosion, or leaks.
- Leak testing shall be performed using an approved leak detection solution or instrument.
- Open flames shall never be used to detect leaks.
- Cylinder valves shall be opened slowly and closed immediately after use when the gas supply is no longer required.
- Empty cylinders shall be clearly labeled and stored separately from full cylinders.
- Hydrogen cylinders shall be stored and used in well-ventilated areas due to the high flammability of hydrogen gas.
- Hydrogen cylinders shall be kept away from sparks, open flames, hot surfaces, electrical equipment that may generate sparks, and other ignition sources.
- Smoking is strictly prohibited in areas where hydrogen or other flammable gases are stored or used.
- Hydrogen gas systems shall be checked regularly for leaks before operation of the Gas Chromatograph (GC).
- In the event of a suspected hydrogen leak, immediately stop work, eliminate ignition sources if safe to do so, evacuate the area if necessary, and notify the laboratory supervisor or emergency response personnel.
- Gas cylinder storage areas shall be clearly labeled with appropriate hazard signage.
- Emergency contact information and gas shut-off procedures shall be readily available near gas cylinder storage and usage areas.

Equipment failure

- Stop operation safely.

- Notify the laboratory supervisor or technical officer.
- Record the incident in the equipment maintenance log.

10. Review and Updates

- This SOP will be reviewed every two years or earlier if new equipment, procedures, or hazards are introduced.

Freezer and Water Distillation Room

Use and Maintenance of Deep freezer (–20°C) and Ultra deep freezer (–80°C)

1. Purpose
To ensure proper use, storage, maintenance, and safety of samples stored in –20°C and –80°C freezers, while maintaining sample integrity and equipment efficiency.

2. Scope
This SOP applies to all academic staff, technical staff, postgraduate students, and undergraduate students using the common laboratory freezers.

3. Responsibilities
- Head/ Department of Agricultural Biology: Overall supervision and compliance
- Technical Officer from Department of Agricultural biology: Maintenance, monitoring, and record keeping
- Users: Proper labeling, storage, and adherence to SOP

4. General Guidelines
- Freezers are to be used only for research and teaching purposes
- Unauthorized storage is strictly prohibited
- All users must comply with labeling and documentation procedures
- No label = No storage policy will be strictly followed

5. Sample Labeling and Storage Procedure
5.1 Sample Labeling
All samples must be clearly labeled before storage with:
- Name of the user
- Date of storage
- Sample type (e.g., DNA, RNA, tissue, culture)
- Project/Experiment ID

Labels must be legible, waterproof, and securely attached.

5.2 Storage Arrangement
- Use designated racks/boxes, and allocate clearly defined storage locations for each department based on usage requirements.

- Indicate storage location clearly (Freezer / Rack / Box)
- Avoid overloading the freezer
- Store samples in assigned compartments

5.3 Freezer Log Book/ Record Keeping

All users must record:

- Name of user
- Date of storage
- Sample description
- Storage location (rack/box)
- Date of removal

5.4 Inventory and Monitoring

- Maintain an updated inventory list
- Temperature must be monitored daily or weekly and recorded

6. Temperature Settings

- Deep Freezer: Short- to medium-term storage
- Ultra deep Freezer: Long-term storage (DNA, RNA, enzymes, sensitive samples)
- Temperature settings must not be altered without authorization

7. Access and Handling

- Minimize door opening time
- Ensure the door is tightly closed after use
- Avoid frequent or unnecessary access

8. Maintenance

- Regularly check:
    - Temperature stability
    - Door seals
    - Frost accumulation
- Defrost deep freezer periodically
- Defrost ultra deep freezer only under supervision
- Report malfunctions immediately to the Technical Officer

9. Safety Precautions

- Do not store:
    - Flammable or hazardous chemicals (e.g., ethanol, methanol, acetone, chloroform, diethyl ether, xylene, formaldehyde, phenol)
    - Unlabeled samples
- Use protective gloves when handling frozen materials
- Avoid direct skin contact with –80°C surfaces

10. Power Supply and Backup

- Freezers must be connected to a stable power supply
- Ultra deep freezer must be connected to UPS/generator backup
- Do not unplug or switch off without authorization
- During power interruptions, do not open freezer doors

11. Disposal of Samples

- Remove expired or unused samples periodically
- Dispose according to laboratory biosafety guidelines
- Unlabeled samples will be discarded after prior notice

12. Emergency Procedures

12.1 Power Failure

- Keep freezer doors closed
- Inform Technical Officer / Head of the department immediately

12.2 Equipment Failure

- Transfer critical samples to backup freezer if available
- Record the incident

13. Future Improvements

- Installation of UPS for uninterrupted operation
- Expansion of storage capacity
- Establishment of a digital inventory system
- Acquisition of additional freezer units if required

14. Compliance

Failure to comply with this SOP may result in:

- Removal of samples
- Restriction of freezer access

Use and Maintenance of Ice Flaking Machine

1. Purpose

To ensure the safe, hygienic, and efficient operation of the ice flaking machine and to maintain a continuous supply of ice for teaching, research, and laboratory activities.

2. Scope

This SOP applies to all academic staff, technical staff, postgraduate students, and authorized undergraduate students using the ice flaking machine in the common laboratory.

3. Responsibilities

Head of Department: Overall supervision and compliance with this SOP.

Technical Officer:

- Operation, maintenance, cleaning, and monitoring of the machine.

- Maintenance of records and log books.
- Reporting equipment malfunctions.

Users:

- Proper use of the machine.
- Compliance with hygiene and safety requirements.
- Accurate record keeping.

4. General Guidelines

- The ice flaking machine is intended **for laboratory use only**.
- Ice produced shall not be used for human consumption.
- Only authorized personnel (assigned by the department) may operate the machine.
- Users shall follow all safety, hygiene, and record-keeping requirements.
- The area surrounding the machine shall be kept clean and dry.

5. Operating Procedure

5.1 Before Operation

- Ensure that the machine is connected to a stable power supply.
- Verify that the water supply is available and functioning properly.
- Check that the drainage system is not blocked.
- Ensure that the ice storage compartment is clean.
- Confirm that there are no visible leaks or unusual sounds.

5.2 During Operation

- Switch on the machine according to the manufacturer's instructions.
- Allow sufficient time for ice production.
- Collect ice using the designated scoop only.
- Avoid direct hand contact with ice.
- Close the storage compartment immediately after removing ice.

5.3 After Use

- Return the scoop to its designated location.
- Ensure that the storage compartment is properly closed.
- Remove any spilled ice or water around the machine.
- Record usage details in the log book.

6. Hygiene and Handling

- Use only clean scoops and containers.
- Do not place laboratory samples, tubes, gloves, or chemicals inside the ice storage compartment.
- Do not touch ice directly with bare hands.
- Keep the ice storage compartment covered when not in use.
- Ensure that the machine and surrounding area remain clean.

7. Log Book and Record Keeping

7.1 User Log Book

All users shall record:

- Date
- Name
- Department/Project
- Purpose of use
- Approximate quantity of ice used
- Time of use
- Signature

7.2 Maintenance Log

The Technical Officer shall record:

- Cleaning dates
- Servicing dates
- Repairs conducted
- Filter replacement dates
- Equipment issues and corrective actions

7.3 Inspection Records

Weekly inspections shall be documented, including:

- Machine condition
- Water supply status
- Drainage condition
- Ice production efficiency

8. Maintenance

- Clean the machine regularly.
- Check for leaks, unusual noise, or poor ice production.
- Report any malfunction to the Technical Officer immediately.
- Inspect water inlet connections.
- Check filters and replace if necessary.
- Review maintenance records.
- Schedule servicing by qualified personnel or the supplier.

9. Safety Precautions

- Do not operate the machine with wet hands.
- Do not attempt repairs without authorization.
- Do not insert hands or objects into moving parts.
- Keep the floor dry to prevent slips and falls.
- Report electrical faults immediately.
- Ensure proper grounding of the equipment.

10. Water Supply Requirements

- Use clean water for ice production.
- Filtered water is recommended to improve ice quality and equipment lifespan.
- Do not use contaminated water sources.

11. Power Supply

- Ensure connection to a stable electrical supply.
- Protect the machine from voltage fluctuations where possible.
- Avoid frequent switching on and off.
- During power interruptions, switch off the machine until power is restored.

12. Waste and Drainage Management

- Ensure proper drainage of excess water.
- Do not block drainage outlets.
- Clean drainage areas regularly.
- Dispose of waste water according to laboratory practices.

13. Emergency Procedures

- In case of a power failure, switch off the machine and wait until the power supply is restored before restarting.
- In case of water leakage, stop using the machine and inform the Technical Officer immediately.
- In case of unusual noise, reduced ice production, or equipment malfunction, discontinue use and report the issue to the Technical Officer.
- Do not attempt repairs without authorization.

14. Future Improvements

- Installation of voltage stabilizers or UPS systems.
- Expansion of ice production capacity based on laboratory demand.
- Development of a digital inventory and maintenance monitoring system.

15. Compliance

Failure to comply with this SOP may result in:

- Restriction of access to the equipment.
- Removal of user privileges.
- Reporting of repeated non-compliance to the Head of Department.

*For the details on water distiller and deionizer, please refer the section under Analytical Measurement and Water Distillation Room.

Microbial Analysis Room

1. Title: Laboratory Conduct and Safety Rules for the Microbial Analysis Room

2. Purpose

1. To provide guidelines ensuring safe and proper practices in the Microbial Analysis Room.

2. To ensure safe, efficient, and ethical use of laboratory resources for teaching, research, and training related to microbial analysis.

3. Scope

3.1 These rules apply to all staff, students, and authorized visitors accessing the Microbial Analysis Room.

3.2 Activities covered:

- Preparation and maintenance of media, reagents, and chemicals.
- Cleaning and maintenance of the laminar floor and incubator.
- Safe storage and disposal of biological and chemical waste.
- Documentation of experiments, results, and sample inventories.
- Supporting other departmental courses that involve microbial analysis.

4.0 Procedure

4.1 Obligations

- All laboratory users must comply with safe practices and act responsibly.
- Hazards must be reported immediately to the Laboratory Coordinator/ Technical officer.
- Reckless handling of specimens, cultures, or chemicals is prohibited.
- All users must:
    - Follow supervisor/laboratory instructions
    - Wear required PPE (lab coat, gloves, mask, closed shoes)
    - Handle specimens, rearing materials, and media cultures with care
    - Maintain cleanliness to avoid cross-contamination

4.2 Laboratory Access

- Only trained and authorized personnel are allowed entry.
- Visitors must sign the entry register and be accompanied by staff.
- Personal belongings (bags, phones, food) are not allowed inside.
- Visitors must obtain prior approval (24 hours in advance) and always be accompanied.
- After-hours access is discouraged; logbook entries are required for essential work.

4.3 General Laboratory Safety Rules

- PPE: Lab coats, closed shoes, and gloves are compulsory. Masks or goggles are necessary.
- Personal hygiene: Wash hands regularly; cover cuts with a waterproof dressing.
- Food/drinks: Not permitted in the laboratory or store.
- Hair and belongings: Long hair tied back; personal items stored in lockers outside.
- Emergency equipment: Fire extinguishers, spill kits, first aid, and eyewash must remain accessible.
- Incident reporting: All accidents, injuries, or contamination must be reported immediately.

4.4 Equipment-Specific Rules

Laminar Flow Cabinet

- Switch on UV light 15–20 minutes before use for sterilization.
- Turn off UV before beginning work; switch on blower.
- Disinfect the surface with 70% ethanol before and after use.
- Do not block airflow vents.
- Avoid rapid hand movements that disturb airflow.

Incubator/Refrigerator

- Label all cultures (date, name, contents).
- No food or drinks allowed.
- Regularly check and record temperature.

5. Emergency Procedures

- Fire: Use fire extinguishers; evacuate immediately.
- Spills: Use chemical or biological spill kits. Report to the coordinator.
- Exposure: Wash under safety shower/eyewash; seek medical attention.
- Power **failure**: Switch off incubators, centrifuges, and microscopes to prevent damage.

6. Waste Disposal

- Autoclave biological waste (Media, contaminated tissue sample) before disposal.
- Sharps in designated sharps bins.
- Chemical waste is disposed of according to hazard classification.
- Glass waste collected in separate bins.

7. Review and Update

- This SOP will be reviewed every two years or earlier if new equipment, procedures, or hazards are introduced.

References

1. https://case.edu/ehs/safety-subject/chemical-safety/chemical-compatibility-and-storage
2. https://ors.od.nih.gov/sr/dohs/Documents/chemical-segregation-table.pdf
3. https://pubchem.ncbi.nlm.nih.gov/ghs/
4. https://www.bio21.unimelb.edu.au/sites/www.bio21.unimelb.edu.au/files/files/Lab%20Induction%20Checklist%20and%20Assessment%20template.docx
5. https://www.monash.edu/__data/assets/pdf_file/0004/189517/risk-management-chemical.pdf
6. National Academies of Sciences, Engineering, and Medicine. 2016. Chemical Laboratory Safety and Security: A Guide to Developing Standard Operating Procedures. Washington, DC: The National Academies Press. https://doi.org/10.17226/21918.
7. NIOSH. 2021. Hierarchy of Controls. Washington, DC: NIOSH.
8. WHO. 2020. Laboratory Biosafety Manual, 4th Edition. Geneva: World Health Organization.

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