



Standard Protocol For Maintenance of Science Departments & Disposal/ Management of Waste

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&

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St. Edmund's College
Shillong

Laboratory Waste Disposal &
Safety Procedures

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I. Introduction

The St. Edmund's College, Shillong has developed this manual to assist in the recognition, evaluation, and control of chemical, biological and physical hazards associated with the laboratory operations by various departments. This manual is intended to establish the basic safe operating practices so that faculty, project investigators, lab technicians, and students may carry out effective teaching and research programs in a safe and healthy environment.

This document to be used in conjunction with the gazette notifications of the National Green Tribunal and National Hazardous Waste Management System Ministry of Forest, Environment and Climate Change, Govt. of India, New Delhi. This government agency provides specific information on hazard assessment, training requirements, exposure monitoring procedures, and accident record keeping and reporting. This safety protocol procedures to me made available in each Laboratories of the college and to be made available to the various stakeholders as or when required.

This manual is not intended to be a complete listing of laboratory hazards or safe practices. Because of the diverse nature of work being conducted in the various departments, additional procedures or requirements may be necessary. For example, laboratories working with biological agents, radioisotopes, animals house, or labs generating chemical, biological or radioactive wastes all must adhere to strict policies and procedures. For information on these and other safety related policies please refer to the NGT guidelines (<http://envfor.nic.in/sites/default/files/Waste%20Management%20Rules.%202016.pdf>)

Individual laboratory stakeholders are responsible for their own safety and the safety of their co-workers and visitors to their laboratories. All staff, students and volunteers must demonstrate this responsibility in their actions and attitudes. It will be each laboratory worker's responsibility to wear the personal protective equipment (PPE) assigned to them, adhere to prescribed safety rules and regulations, and to know and follow all emergency procedures. Lab staff must pre-plan their work to ensure their safety and the safety of those individuals who work around them. The stakeholders are requested to follow the following:

- ✓ Completing a hazard assessment for all procedures
- ✓ Instructing laboratory personnel on potential hazards
- ✓ Correcting work errors and dangerous conditions
- ✓ Encouraging a positive attitude towards safety
- ✓ Selecting the proper personal protective equipment (PPE) and ensuring that it is worn



- ✓ Maintaining all relevant compliance records and programs
- ✓ Investigating the circumstances surrounding a laboratory accident and taking steps to avoid recurrence

The management of the college along with the Heads of the departments shall be responsible for supporting the Staff and students with all resources necessary to ensure safety compliance. This will include providing training to staff members and allowing for time away from work for training. The management would also be responsible for, or assigning a responsible party to control, maintain and supervise common use laboratories.

Environmental Health and Safety (EH&S) committee to be formed by the college shall be responsible for monitoring compliance and implementation of all safety and environmental regulations, for all main campus and off campus facilities. This will include, but is not limited to, regulation interpretation, implementation of programs, planning reviews, facility surveys, and training and educational services. EH&S shall have enforcement authority when dealing with unsafe or illegal situations.



II. DEFINITIONS

- A. "Solid Waste"** — any garbage, refuse, sludge from a waste treatment plant, water treatment plant, or air pollution control facility or other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, municipal, commercial, mining, and agricultural operations, and from community and institutional activities. Includes hazardous waste and industrial solid waste.
- B. "Hazardous Waste"** — any solid waste or combination of solid waste, material listed or identified in NGT Guidelines which because of its quantity, concentration, or physical chemical or infectious characteristics.
- C. "Disposal"** — the discharge, deposit, injection, dumping, spilling, or placing of any solid waste or hazardous waste (whether containerized or containerized) into or on any land or water so that such solid waste or any constituent thereof may enter the environment, or may be emitted into the air, or may be discharged into any water, including ground waters.
- D. "Identification Number"** — the numbers assigned by the National Green Tribunal, New Delhi to each generator, transporter, and processing, storage, or disposal facility.
- E. "Facility"** — all contiguous land, and structures, other appurtenances, and improvements on the land for storing, processing, or disposing of municipal hazardous waste or industrial solid waste.
- F. "Generator"** — any person, by site, who produces municipal hazardous waste or industrial solid waste; any person who possesses municipal hazardous waste or industrial solid waste to be shipped to any other person; or any person whose act first causes the solid waste to become subject to regulation. As a generator of hazardous waste, the University is responsible for the waste from "cradle-to-grave."
- G. "Manifest"** — a uniform hazardous waste tracking document which must accompany shipments of municipal hazardous waste or Class I industrial solid waste.



- H. "Permit"** — a written permit issued by the NGT which, by its conditions, may authorize the permittee to construct, install, modify, or operate a specified municipal hazardous waste or industrial solid waste storage, processing, or disposal facility in accordance with specified limitations.
- I. "Processing"** — the extraction of materials, transfer, volume reduction, conversion to energy, or other separation and preparation of solid waste for reuse or disposal, including the treatment or neutralization of hazardous waste, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, or do as to recover energy or material from the waste, or so as to render such waste non-hazardous or less hazardous, safer to transport, store, and dispose or amenable for recovery, storage, or reduced in volume.
- J. "Recyclable Materials"** — wastes that can be recycled. Recycled material consists of used, reused, or reclaimed material.
- K. "Reclaimed Material"** — processed or regenerated material recovered as a usable product. Examples include recovery of lead from spent batteries and regeneration of spent solvents.

III. Laboratory Safety Guidelines

Each laboratory in the college is unique, by virtue of the work being performed, the equipment in use, and the physical layout of space. Regardless of the characteristics, one must adhere to the basic safety policies. An annual Laboratory Safety Survey is to be performed by the appropriate authority to verify compliance with the safety norms in the labs. If a safety issue is observed the committee would offer recommendations in correcting the issues.

CHEMICAL HAZARD SYMBOLS

Chemical hazard symbols are found on some home products, as well as bottles of chemical reagents in the lab. Here, we take a look at European hazard symbols and the various dangers they warn of.

 <p>ENVIRONMENTAL HAZARD</p> <p>Indicates substances that are toxic to aquatic organisms, or may cause long lasting environmental effects. They should be disposed of responsibly.</p>	 <p>ACUTELY TOXIC</p> <p>Indicates life-threatening effects, in some cases even after limited exposure. Any form of ingestion and skin contact should be avoided.</p>	 <p>GAS UNDER PRESSURE</p> <p>Container contains pressurised gas. This may be cold when released, and explosive when heated. Containers should not be heated.</p>
 <p>CORROSIVE</p> <p>May cause burns to skin and damage to eyes. May also corrode metals. Avoid skin & eye contact, and do not breathe vapours.</p>	 <p>EXPLOSIVE</p> <p>May explode as a consequence of fire, heat, shock or friction. Chemicals with this label should be kept away from potential ignition sources.</p>	 <p>FLAMMABLE</p> <p>Flammable when exposed to heat, fire or sparks, or give off flammable gases when reacting with water. Ignition sources should be avoided.</p>
 <p>MODERATE HAZARD</p> <p>May irritate the skin, or exhibit minor toxicity. The chemical should be kept away from the skin and the eyes as a precaution.</p>	 <p>OXIDISING</p> <p>Burns even in the absence of air, and can intensify fires in combustible materials. Should be kept away from ignition sources.</p>	 <p>HEALTH HAZARD</p> <p>Short or long term exposure could cause serious long term health effects. Skin contact and ingestion of this chemical should be avoided.</p>

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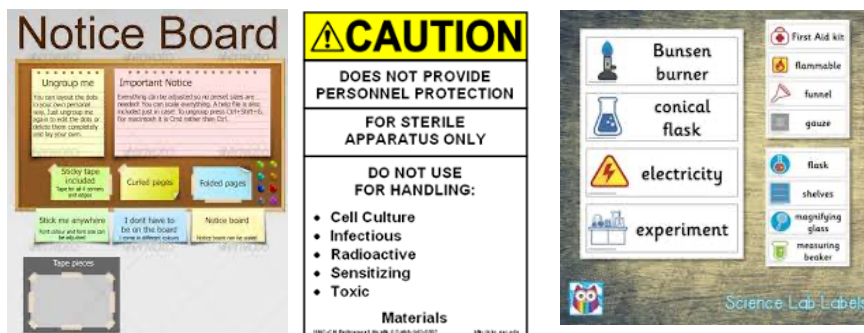
Source: Internet (Chemical Symbol)

A. HAZARD AWARENESS

It is the responsibility of the Staff to strive for a safe working environment in their laboratory specially when dealing with students.

Observed hazards or potential hazards must be identified and corrected immediately. The following table may be followed:

Sl	Hazard Identification Parameters	Description
1	Notice Boards	<ul style="list-style-type: none"> ✓ A notice board posted at all the entrances to the lab will identify the categories of potentially hazardous materials that maybe found in the lab at any given time and contact persons in case of emergency. ✓ Hazard warning stickers identify the potential chemical, biological or physical hazards that maybe in the laboratory. These stickers can be added or removed as needed for the changes in the laboratory inventory ✓ Emergency numbers of at least 2 individuals from the in case of emergency ✓



2	Labeling	<ul style="list-style-type: none"> ✓ The manufacturer's label will provide the initial information on the handling of any substance. Directions found on the label must be followed. All bottles and chemical containers must be labeled, including, flasks, beakers, etc. If abbreviations are used, a reference list of the abbreviations must be provided
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3 Chemical Inventories

A complete inventory of all chemicals at the worksite is required to be always maintained. An inventory must be carried out and updated at least annually to cross check against the previous inventory, cull out unused or expired chemicals, and check the condition of caps, bottles, and labels.

Chemical Inventory Table					
Area in Factory	Name	Amount on hand	Scale of use g/kg/ton ml/Lit ^r	Safety Information Hazard Band	Notes about handling, use, storage
Chemicals in the stoking area					
Chemicals being transferred and handle					
Chemicals involved in the Production Process					
Chemicals stored in places other than stoking area					
Chemicals in the solid waste					
Chemicals in waste water					
Chemicals in the air (emissions)					

4 Clothing and Footwear

- ✓ Full coverage shoes constructed of sturdy material shall be always worn. Sandals, clogs, and open toed shoes are not allowed in laboratories. Shorts and t-shirts are allowed if lab coats are worn when using chemical, biologicals, radio actives and animals.
- ✓ Clothing that is extremely loose or tight fitting should be avoided. Overly tight clothes, such as leggings and bodysuits are not recommended, as any spilled material will be held next to the skin by these garments.
- ✓ Long hair should be tied back so it does not encounter chemicals, biological



5 Food and Drink

- ✓ Food and drink should not be stored or consumed in areas where chemical, biological or radioactive substances are being used or stored.
- ✓ Break rooms or lunchrooms must be used where available. Food and drink may only be consumed in prescribed and clearly designated areas of the lab's office area, away from lab equipment and potentially contaminated airflow.
- ✓ Transport of samples and chemicals are not permitted through the designated area.



Equipment (e.g. microwaves), glassware or utensils that have been used for laboratory operations should never be utilized to prepare or consume food.

- ✓ Laboratory refrigerators and cold rooms may not be used for the storage of foods. Separate, clearly labeled appliances must be used. Sinks and drain boards used for washing food utensils should not be used for research purposes.



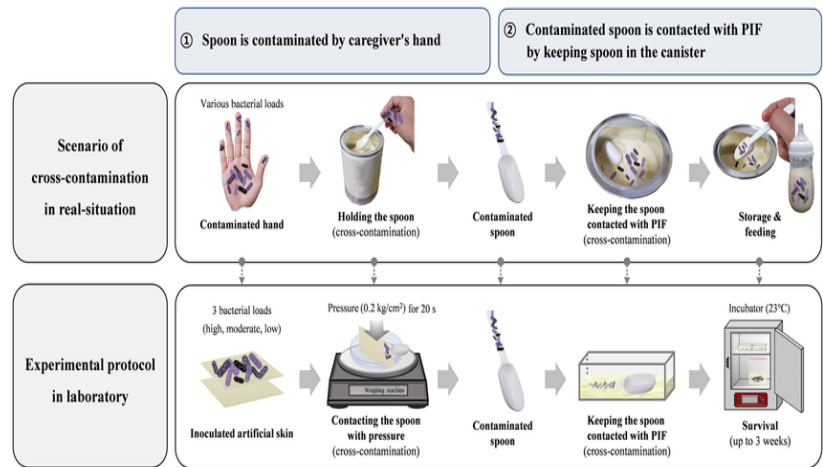
6 Smoking

Smoking is not allowed in any building or on campus



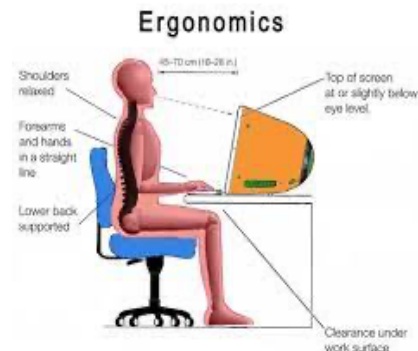
7 Cross Contamination Prevention

- ✓ Personal protective equipment (gloves, lab coats, etc.) is not permitted in public areas of the building such as restrooms, offices, and cafeterias.
- ✓ When working with chemical, biological or radioactive substances hands shall be washed often, especially after gloves have been removed and before leaving the lab.
- ✓ Lip balm, cosmetics, or contact lenses should not be applied or handled in the lab. Solutions must not be pipette or siphoned by mouth. Only mechanical pipette and siphoning aids to be used



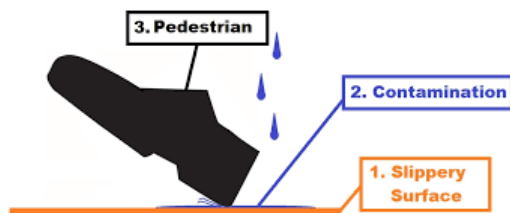
8 Ergonomics

Laboratory workers are at risk for repetitive motion injuries during routine laboratory procedures such as pipetting, working at microscopes and hoods, operating microtomes, using cell counters and video display terminals. By becoming familiar with how to control laboratory ergonomic risk factors, you can improve your comfort and productivity while lowering chances for occupational injuries.



9 Trip hazards and Spills

Trip hazards such as electrical or computer cords across floors, excess storage in walkways, etc. must be minimized. Irregular, bumpy or loose flooring should be reported to the maintenance department. Aisles, hallways and stairways must not be used for storage areas. Avoid excessive overhead storage. Shelves must be of sturdy construction, leveled, and if possible, attached to walls or cabinets so they do not tip. Do not overload shelves. Spills must be attended to immediately. Clean-ups should follow the completion of any operation or be done at the end of the day.



10 Lab Equipment

Refrigerators and freezers must be labelled to prevent samples and solutions from spilling when their doors are opened. Sharp edges or corners on equipment should be protected or equipment relocated to minimize injury. Microtome blades or other sharp objects must be removed from equipment or covered with a protective guard when not in use. Belt and pulley systems, such as on vacuum pumps, or any other pinch points must be covered by a protective guarding.

PETRI DISHES	HOT PLATES	FUNNELS	
EVAPORATING DISHES	TEST TUBE CLAMPS	TEST TUBE HOLDERS	
BUNSEN BURNERS	MICROSCOPE SLIDES	GRADUATED CYLINDERS	
SCOOPULAS	THERMOMETERS	GOGGLES	
TEST TUBES	MICROSCOPES	INDICATORS	
PH PAPER	FORCEPS	RULERS	TUBING
STOPPERS	BEAKERS	WIRE GAUZE	



11 Shared and Common Use Labs

The initial responsibility for housekeeping and the minimization of physical hazards and injuries in any shared lab or support space is the duty of all staff using the lab. It is imperative that all users cleanup after finishing the work.

Lab Design Best Practices

- Students should face teachers
- Share support / prep space (with adjacent lab spaces)
- Avoid raised reagent shelves
- Allow access to shared storage from hallways (without entering lab)
- Provide windows to general storage

12 Electrical Safety

The electrical demand in laboratories has grown tremendously since most buildings and labs were designed. It is imperative that the electrical systems in these buildings are not abused or overloaded. Lab staff cannot modify, install or remove electrical systems.



13 Electrical Cords

Electrical cords and plugs must be inspected routinely to identify cracked insulation or broken plugs. Any equipment found with damaged cords or plugs must be removed from service until it is repaired. Electrical cords cannot be run across floors, under rugs, through walls, doors, and windows





14 Surge Protection

The use of surge protection is recommended for all electrical equipment in labs. These should have internal fuses.



15 Sharps

- ✓ Sharps (needles, broken glass, scalpels, razorblades, etc.) must not be disposed in the regular waste stream. Needles and scalpels must be placed in red plastic "sharps" boxes and disposed of as biomedical waste. Syringes must be disposed of in the red sharps box for biomedical waste disposal whether they are contaminated.
- ✓ Uncapped needles must not be left where someone may sustain a needle stick. Used needles cannot be recapped, broken, bent, or sheared. If the needle and syringe are to be used again, it should be placed in a wide mouth jar, beaker, or otherwise secured so that staff using the area are protected from a needle stick injury. New needles (and syringes) should be stored in a secure cabinet
- ✓ Razor blades, microtome blades and other objects that may puncture trash bags or boxes, no matter if they are contaminated or not, must be disposed of into sharps boxes. Glassware disposal will vary depending on the building where it is generated. Biologically contaminated sharps must be properly inactivated before disposal.





16 Unattended Operations

- ✓ Operations and experiments that continue unattended for several
- ✓ hours or overnight must be pre-approved by the PI or laboratory supervisor.
- ✓ Plans should be made to eliminate the risk of hazards in the event of a failure in power, water, gas, or other service.
- ✓ Water cannot be left running and do not cover or black out lab door windows.
- ✓ Room lights should be left on and a notice placed on the lab door with the name and number of the researcher running the experiment and any pertinent information.

CAUTION: UNATTENDED EXPERIMENT!



17 Laboratory Security

- ✓ Laboratories must be locked if no one is in the lab. Acute toxins, select agents, controlled substances and radioisotopes must be appropriately secured.
- ✓ Do not hesitate to politely question anyone who does not belong in the area. If asked, it is requested that you decline to answer any questions about the contents or research being performed in the lab or the facility. If there is any concern about lab security or suspicious individuals, please contact appropriate authority.



18 Visitors

- ✓ Visitors must be escorted by lab staff
- ✓ Must be made aware of any potential hazards they may encounter in the lab.
- ✓ Wear the correct personal protective equipment for the hazards present in the lab, no matter if they are visitors or maintenance workers, no matter how long they will be in the lab.
- ✓ Abide by laboratory regulations for access and control of hazards.
- ✓ Pets are not allowed in labs. Only certified service animals may be allowed into the



respective departments



19 First Aid & Spill Kits

- ✓ A first aid kit shall be located in a clearly visible place in each laboratory. Additional first aid items may be required depending on the chemicals used in the lab.
- ✓ Commercial spill kits including instructions, absorbents, neutralizers, and protective equipment can be purchased through a commercial laboratory. Chemical spills can be handled effectively if preplanning has been conducted. Individual should become familiar with, and trained in proper cleanup procedures before a spill occurs



20 Fire Extinguishers

If a fire extinguisher is used, it cannot be rehung on the wall with it being serviced, as it will lose pressure and will not work again. If any fire broke kindly follow the word

R. A. C. E

R-Rescue, A - Alarm, C -Confine, E -Evacuate



21 Laboratory Equipment

- ✓ Always keep the manufacturer's operating manual with the instrument.
- ✓ Follow recommended maintenance procedures outlined in the manual.
- ✓ New operators should be trained by qualified lab personnel and familiarize themselves with the operating manual, including all pertinent safety information.
- ✓ Never remove hazard-warning labels from an instrument.
- ✓ Ensure that all equipment is grounded.
- ✓ Have a certified technician perform or oversee repairs





22 Refrigerators, Freezers, and Cold Rooms

Refrigeration systems, whether it is an appliance or building system, may not be modified or repaired by laboratory staff. Appropriate PPD personnel or certified refrigeration mechanic should be contacted to work on these systems. The refrigerant gas must be collected and recycled and must not be released to the environment.

Fridge-tag® recording sheet

District	Health Facility		Refrigerator No.								
Month/Year											
Equipment											
Day	AM	PM	▲ °C	AlarmOK	Duration	Initials	▼ °C	AlarmOK	Duration	Initials	
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

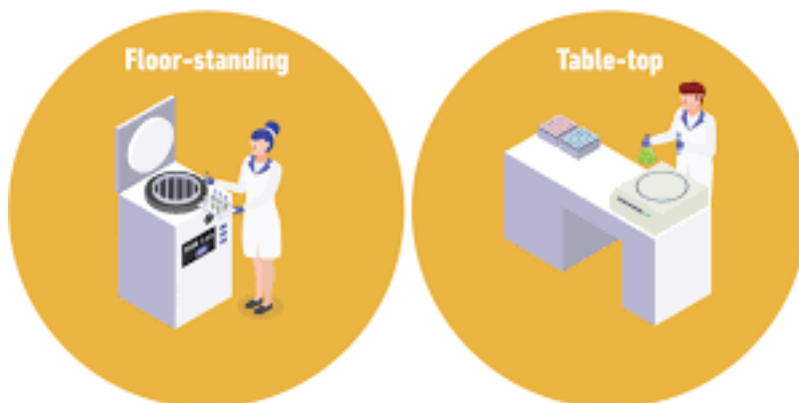
23 Flammable Storage Units

Household refrigerators and freezers are not equipped with electrical-safe controls and shall not be used to store flammable liquids. The flammable storage refrigerator/freezer is constructed with its controls mounted outside the storage compartment. This type of refrigerator is suitable for storing flammable liquids and is labeled by the manufacturer as such.



24 Centrifuges

- ✓ Label centrifuges used for biohazards or radioisotopes.
- ✓ Check the rotor for rough spots, pitting, and discoloration. If discovered, check with the manufacturer before using. Use professional rotor inspection services as required or recommended by the manufacturer.



25 Vacuum Systems

- ✓ Vacuum systems should not be used for any reason other than to pull vacuum on equipment. Do not use in-house plumbed or secondary vacuum pumps to remove water, dust, or other materials, even if there is a trapping reservoir to collect the material.
- ✓ All vacuum systems should be used with a secondary containment trap. Cold traps must be in place when flammable vapors are extracted by vacuum. It is strongly recommended that flow restrictors be used in line to minimize solvent loss.

26 Heating Equipment

Steam-heated devices shall be used rather than electrically heated devices or Bunsen Burners whenever possible. Steam-heated devices do not present shock or spark hazards and can be used with assurance that their temperature will not rise beyond 100°C.



27 Electrical Heating Devices

- ✓ Only hot plates with heating elements enclosed in a glass, ceramic, or insulated case should be used in laboratories. All electrical equipment must be UL approved.
- ✓ Heating mantles should be checked before each use for broken insulation and to assure that no water or other chemicals have been spilled into the mantle. Laboratory



workers should be careful not to turn a variable transformer so high as to exceed the input voltage recommended for the mantle by the manufacturer.

- ✓ Oil baths should always be monitored via a thermometer or other device to ensure that their temperature does not exceed the flash point of the oil being used.
- ✓ Smoke caused by the high temperature decomposition of the oil or of organic materials in the oil represents an inhalation hazard.
- ✓ Laboratory workers using an oil bath should guard against the possibility that water or another volatile substance could fall into the hot bath. Such an accident can splatter hot oil over a wide area.

WATER HEATERS, BOILERS

PIXEL PERFECT 64x64. EDITABLE STROKES



28 Gas Burners

- ✓ Where burners are used, distribute the heat with a wire gauze pad. Tubing for the gas should be checked to ensure it is properly attached, with clamps and is not cracked.
- ✓ Burners should not be used in fume hoods or biological safety cabinets, as the continual high volume airflow through these units may extinguish the flame and go unnoticed.
- ✓ Burners must not be left on when not in use.





29 Space heaters

- ✓ Personal or room space heaters are only allowed if they meet the following criteria, both of which are intended to minimize any chance of these units causing a fire.
- ✓ The unit must be either ceramic or oil filled. There cannot be any exposed or visible heating elements.
- ✓ They must have a “tip switch” which will shut off the unit if it gets knocked over



30 Glassware and Hoses

- ✓ Careful handling and storage procedures should be used to avoid damaging glassware. All glassware should be inspected prior to use. Damaged items should be discarded or repaired.
- ✓ Prior to use, all tubing and connections must be inspected. Replace cracked or split tubing before use. Ensure that all connections are secured, and the use hose clamps are required.
- ✓ Hand protection should be utilized when inserting glass tubing into stoppers or when placing rubber tubing on glass hose connections. Tubing should be fire polished or filed smooth and lubricated. A cloth should be wrapped around the glass. Hands should be held close together and the glass inserted with a slight twisting motion, avoiding excessive pressure.





31 Disposal of Used Equipment

- ✓ All laboratory equipment used in conjunction with chemical, biological or radioactive substances must be certified that it is safe for disposal or storage prior to its removal from the lab
- ✓ The department or lab will be responsible for the decontamination and/or disinfection of the equipment, draining all liquids and oils, and certifying that these procedures have been done properly.
- ✓ All equipment must be cleaned by the lab staff prior to the initiating the disposal process.
- ✓ Refrigerants (Freon) must be removed from any equipment prior to disposal. To dispose of a biological safety cabinet it must be decontaminated by a certified technician prior to disposal



32 Utility Systems

- ✓ Laboratory staff may not perform any modifications of any utility systems in buildings or labs.
- ✓ No part of the ventilation, electrical, plumbing (water and gas) may be tapped into, repaired, removed added or tampered with in any way by anyone except Operations personnel or licensed contractors.
- ✓ Flexible tubing, garden hoses and PVC piping are not acceptable as plumbing alternatives, including, but not limited to: tap, hot, chilled, waste water systems, steam lines, etc. in any



UF building. Flexible tubing for compressed laboratory gases or vacuum lines may be used after the cylinder's regulator or the stopcock, but the length of the tubing must be minimized.



33 Fume Hoods and Ventilation Systems

- ✓ Ventilation systems for laboratories are normally designed to provide 6 - 12 air changes per hour at a slightly negative pressure relative to hallways and office space. It is important to keep lab doors and windows closed as much as possible for proper pressure balance and ventilation of the lab.
- ✓ Chemical fume hoods are intended to remove vapors, gases, and dusts of toxic, flammable, corrosive, or otherwise dangerous materials.
- ✓ It is important for lab staff to understand how the chemical fume hood in the lab functions. All laboratory personnel must be trained in proper use of fume hoods.



34 Plumbing Systems

- ✓ Tap water will not be left flowing for prolonged experiments for longer than 30 minutes or



left unattended.

- ✓ A refrigerated re-circulating system must be used to cool experiments or equipment to minimize potential damage from leaks and flooding. The use of these closed loop systems is required to minimize the wasting of this valuable resource.
- ✓ Isolated or unused sinks and floor drains may be a source of foul odors if the traps dry out. Please ensure that all sinks have had water periodically run into them to fill the trap.



35 Chemical Storage and Compatibility

- ✓ Do not store liquid chemicals above shoulder height.
- ✓ Flammable chemicals in amounts exceeding 10 gallons must be stored in flammable storage cabinets or safety containers.
- ✓ Bottles may not be stored on the floor unless they are contained in tubs or other secondary containment.
- ✓ Excessive chemical storage in hoods is not acceptable; this practice interferes with the airflow in the hood and reduces the available workspace.
- ✓ Chemical waste shall be placed at the designated accumulation area, in appropriate receptacles, properly labeled and segregated by hazard class
- ✓ Ensure that phenol crystals are separated from oxidizers
- ✓ Cyanide compounds must not be stored near acids. (Accidental mixing may release cyanide gas.) All liquid chemicals must be segregated by hazard classification and stored only with compatible substances. The following categories of liquid chemicals should be segregated from other categories.
 - ✓ Acids: Organic acids should be kept separate from inorganic (mineral) acids.
 - ✓ Bases: May react violently with acids, oxidizers, or flammables.
 - ✓ Oxidizers: Keep away from acids, bases, organics, and metals; keep cool.
 - ✓ Flammable liquids: The excess over 10 gallons in any workspace must be stored in flammable

storage cabinets or in safety containers. Keep separate from acids, bases, and oxidizers.

- ✓ Toxic or poisonous liquids: Must be segregated and stored separately, as they could be released and/or intensified with
- ✓ reactions with the other chemicals. . Other chemicals, such as formaldehyde should be stored in plastic bottles at the lowest shelves or storage space. This will minimize the potential for spillage.
- ✓ Mercury: Must be stored in non-breakable secondary containers and kept on a bottom shelf of a closed cabinet.
- ✓ Non-hazardous/inert liquids- May be stored with any other category, but it is recommended that they also be segregated for consistency.



36 Corrosive Chemicals

Corrosives consist of four major classes: acids, bases, dehydrating agents and oxidizing agents. Inhalation of the vapors of these substances can cause severe respiratory tract irritation. Contact with these chemicals may cause burns to the skin, respiratory tract, and eyes.





DISPOSAL FOR BIOMEDICAL WASTE

Biomedical waste (BMW) is any waste produced during the diagnosis, treatment, or immunization of human or animal research activities pertaining thereto or in the production or testing of biological or in health camps. It follows the cradle to grave approach which is characterization, quantification, segregation, storage, transport, and treatment of BMW.

The basic principle of good BMW practice is based on the concept of 3Rs, namely, reduce, recycle, and reuse. The best BMW management (BMWMM) methods aim at avoiding generation of waste or recovering as much as waste as possible, rather than disposing. Therefore, the various methods of BMW disposal, according to their desirability, are prevent, reduce, reuse, recycle, recover, treat, and lastly dispose.

G.S.R. 343(E)-Whereas the Bio-Medical Waste (Management and Handling) Rules, 1998 was published vide notification number S.O. 630 (E) dated the 20th July, 1998, by the Government of India in the erstwhile Ministry of Environment and Forests, provided a regulatory frame work for management of bio-medical waste generated in the country;

And whereas, to implement these rules more effectively and to improve the collection, segregation, processing, treatment and disposal of these bio-medical wastes in an environmentally sound management thereby, reducing the bio- medical waste generation and its impact on the environment, the Central Government reviewed the existing rules;

And whereas, in exercise of the powers conferred by sections 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government published the draft rules in the Gazette vide number G.S.R. 450 (E), dated the 3rd June, 2015 inviting objections or suggestions from the public within sixty days from the date on which copies of the Gazette containing the said notification were made available to the public;

And whereas, the copies of the Gazette containing the said draft rules were made available to the public on the 3rd June, 2015;

And whereas, the objections or comments received within the specified period from the public in respect of the said draft rules have been duly considered by the Central Government;

Now, therefore, in exercise of the powers conferred by section 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), and in supersession of the Bio-Medical Waste (Management and Handling) Rules, 1998, except as respects things done or omitted to be done before such suppression, the Central Government hereby makes the as depicted in the table1

For further and elaborate details kindly refer to

https://dhr.gov.in/sites/default/files/Biomedical_Waste_Management_Rules_2016.pdf



The college must ensure to take effective steps for disposal of the biomedical waste which includes laboratory waste involving waste from DNA extraction, pathogens etc, and microbiological waste. Furthermore the educational institutes and other stakeholders shall form an Institute Biosafety committee or an Advisory committee to oversee the mechanism

Table 1: Biomedical waste classification – categories, treatment, processing, and disposal options

Category	Type of waste	Color and type of bag to be used	Treatment and disposal options
Yellow	Human anatomical waste	Yellow-colored nonchlorinated plastic bags	Incineration or plasma pyrolysis or deep burial
	Animal anatomical waste	Yellow-colored nonchlorinated plastic bags	Incineration or plasma pyrolysis or deep burial. In the absence of above facilities, autoclaving or microwave/hydroclaving followed by shredding/mutilation/combination of sterilization and shredding. Treated waste to be sent for energy recovery
	Soiled waste	Yellow-colored nonchlorinated plastic bags	Expired cytotoxic drugs and items contaminated with cytotoxic drugs to be returned back to the manufacturer or supplier for incineration at temperature >1200° C or to CBMWTF or hazardous waste treatment, storage, and disposal facility for incineration at >1200° C or encapsulation or plasma pyrolysis at 1200° C
	Expired or discarded medicines	Yellow-colored nonchlorinated plastic bags	Disposed of by incineration or plasma pyrolysis or encapsulation in hazardous waste treatment, storage, and disposal facility
	Chemical waste	Yellow-colored nonchlorinated plastic bags	After resource recovery, the chemical liquid waste shall be pretreated before mixing with other waste forms
	Chemical liquid waste	Separate collection system leading to effluent treatment system	Nonchlorinated chemical disinfection followed by incineration or plasma pyrolysis or for energy recovery
Red	Discarded linen, mattresses beddings contaminated with blood or body fluids	Nonchlorinated yellow plastic bags or suitable packing material	Pretreat to sterilize with nonchlorinated chemicals on-site as NACO or WHO guidelines, thereafter for incineration
	Microbiology, biotechnology, and other clinical laboratory waste	Autoclave safe plastic bags or containers	Autoclaving or microwaving/hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent to registered recyclers or for energy recovery or plastics to diesel or fuel oil or for road making
White (translucent)	Contaminated waste (recyclable)	Red-colored nonchlorinated plastic bags or containers	Autoclaving or dry heat sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete; combination of shredding cum autoclaving and sent for final disposal to iron foundries
Blue	Waste sharps including metals	Puncture proof, leak proof, tamper proof containers	Disinfection or through autoclaving or microwaving or hydroclaving and then sent for recycling
	Glassware	Cardboard boxes with blue-colored marking	
	Metallic body implants		

AIDS = Acquired immunodeficiency syndrome, NACO = National AIDS Control Organization, WHO = World Health Organization, CBMWTF = Common bio-medical waste treatment and disposal facility

[Datta P, Mohi GK, Chander J. Biomedical waste management in India: Critical appraisal. J Lab Physicians 2018;10:6-14.]



DISPOSAL FOR e-WASTE

[Kindly Note: The process for removal of the e waste depicted in the following datasheet is as per the Gazette Notification of the National Green Tribunal, New Delhi as powers exercise by sections 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government published the draft rules in the Gazette vide number G.S.R. 338 (E), dated the 3rd June, 2015 inviting objections or suggestions from the public within sixty days from the date on which copies of the Gazette containing the said notification were made available to the public on 26th October, 2016].

Short title and commencement.–

These rule may be called the E-Waste (Management)Rules, 2016.

Application.

These rules shall apply to every manufacturer, producer, consumer, bulk consumer, collection centers, dealers, e-retailer, refurbishes, dismantler and recycler involved in manufacture, sale, transfer, purchase, collection, storage and processing of e-waste or electrical and electronic equipment.

For further and elaborate details kindly refer to

https://cpcb.nic.in/uploads/Projects/E-Waste/e_waste_amendment_notification_06.04.2018.pdf



DISPOSAL FOR HAZARDOUS WASTE

[Kindly Note: The process for removal of the hazardous waste depicted in the following datasheet is as per the Gazette Notification of the National Green Tribunal, New Delhi as powers exercised by sections 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government published the draft rules in the Gazette vide number G.S.R. 395(E), dated the 3rd June, 2015 inviting objections or suggestions from the public within sixty days from the date on which copies of the Gazette containing the said notification were made available to the public on 26th October, 2016].

For further and elaborate details kindly refer to

<https://cpcb.nic.in/rules/>

- ✓ For the management of hazardous and other wastes, one shall follow the following steps, namely:-(a)prevention; (b)minimization;(c)reuse,(d)recycling;(e)recovery, utilization including co-processing; (f) safe disposal board.
- ✓ Where standard operating procedures or guidelines are not available for specific utilization, the approval must be sought from Central Pollution Control Board which shall be granting approval on the basis of trial runs and thereafter, standard operating procedures or guidelines shall be prepared by Central Pollution Control Board to ensure compliance to the standards notified under the Environment (Protection) Act, 1986.
- ✓ Standard Operating Procedure or guidelines for actual users.- The Ministry of Environment, Forest and Climate Change or the Central Pollution Control Board may issue guidelines or standard operating procedures for environmentally sound management of hazardous and other wastes from time to time.