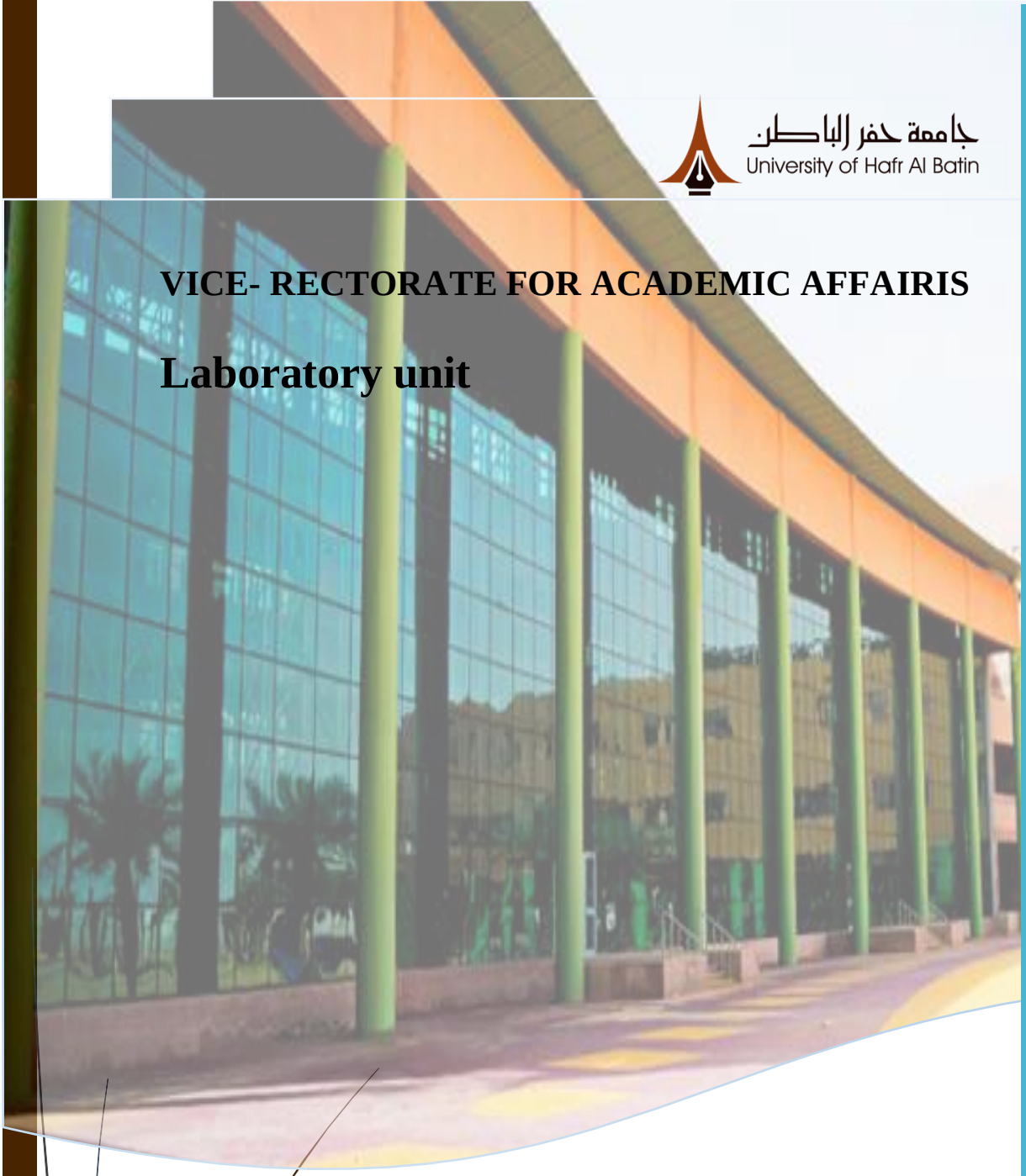

جامعة حفر الباطن
University of Hafr Al Batin

VICE- RECTORATE FOR ACADEMIC AFFAIRIS

Laboratory unit

Laboratory Safety Manual

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بسم الله الرحمن الرحيم

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Laboratory Safety Manual

Introduction

The safety manual in laboratories in educational institutions is one of the most important guiding sources manuals. It aims at achieving a safe work environment which will be free from all risks by adhering to a set of preventive measures. These measures aim at protecting lives and property from potential risks by developing a set of instructions to Follow during emergencies to support the implementation of the quality management system as well as the adoption of international standards in occupational safety and to spread awareness in security and culture among all concerned individuals.

Vision

Achieving the highest levels of safety to protect the environment and laboratory workers from potential damage.

The message

Providing effective management to ensure the safety of individuals, property and buildings in the college, in a manner that creates a safe environment for work.

Objectives

1- Follow the basic safety rules in the laboratory.

2- How to deal with materials, especially dangerous ones, and dispose them in a safe and sound manner.

3- Using and maintaining materials, tools and devices in correct scientific ways.

4- Guiding staff and students on how safely handling laboratories and avoid risks.

5. Familiarity with emergency procedures, including knowledge of the location and use of emergency equipment.

Lab Technician

The laboratory technician is the person in charge of the laboratory. He \ She is entrusted with coordinating with the faculty members and teaching assistants in completing the practical experiments prescribed in the study programs. Perform his \her mission and do his duty to the fullest.

Lab Technician Tasks:

- Ensure the safety of proper storage procedures for materials, especially highly flammable materials.
- Ensure the safety of storage procedures for scientific devices.
- Ensure the availability of fire extinguishing devices and their suitability for operation.

- Ensuring the implementation of general hygiene instructions, collection and disposal of exhaust and proper storage
- Putting up signs for laboratories and emergency exit signs.
- Ensure that flammable materials are not stored in open containers or near heat sources such as stoves, heaters and ovens.
- Receiving chemicals, devices and tools and ensuring their validity.
- Providing first aid and ensuring the availability of its supplies.
- Preparing the lab before entering the students, preparing tools and reagents, and ensuring that students comply with all instructions.
- Send maintenance requests to specialized companies and follow up on equipment repair.
- Carrying out a periodic inventory of chemical materials and submitting requests for the need for missing materials and disposal of expired materials.
- Ensure that all unnecessary devices and equipment (electricity, water, gas, vacuum) are closed at the end of work and after students and professors leave.
- Keep cupboards, drawers and doors closed and corridors clean and unobstructed.
- Immediately disconnect the power from the device when a short circuit is observed electrical or anywhere in the laboratory.

General safety rules in laboratories

1- Wearing personal protective equipment

2- Maintaining cabinets, drawers and doors closed and corridors clean and free of obstructions.
3- In the event of spillage of some materials, the floors must be cleaned to prevent slips.
4- Do not smell, taste, or touch any bottle containing chemicals, as most chemicals are dangerous and poisonous.
5- Do not throw burning matches in the trash to avoid a fire outbreak.
6- When heating a flammable chemical such as alcohol, indirect heating should be used, and be sure that there is no flame near the workplace.

7- It is forbidden to add one chemical substance to another if you do not know the interactions of the additives with each other so as not to cause an explosion, ignition or the release of toxic fumes.
8- Chemical or biological wastes are not disposed of in sewage water because some of them interact with water and may cause corrosion in sewage pipes.
9- It is not allowed to enter the laboratory except for students, workers and those who have permits from supervisors.
10- Adherence to and following all warning and guiding signs posted inside the laboratories.
11- Informing and training students of the emergency plan that laboratory supervisors should set and follow in the event of an emergency accident in the laboratory.
12- Providing the laboratory with biological safety cabinets to protect laboratory personnel who deal with samples containing microorganisms.
13. Determining a supervisor for each laboratory and providing the students and the security department in order to communicate with them if the need arises.
14 - Securing emergency exits and not occupying them with obstacles.
15 - Periodic maintenance of all safety and security tools inside the laboratories.
16- Avoiding erroneous practices inside and outside laboratories.

17- Ensure that gloves and protective clothing are disposed of in a proper manner in order to prevent the transfer of infectious substances outside the places where they are used.

18- Spreading awareness of the dangers of biological samples and experimental animals and the importance and necessity of safe handling

19- Awareness of the importance and necessity of dealing with unknown bacteria with caution.

20 - Providing first aid supplies in laboratories and training workers on infection control and applying safety and health procedures.

21- Periodic medical examination of workers with experimental animals and biological samples for early detection of infection.

22- In the case of working with lasers and ultraviolet rays, glasses made of a special material must be used.

23- Make sure the electrical connections from your lab or laboratory technician are correct before connecting the electrical current.

24. - It is advisable not to replace the three-pin socket with connections, because this leads to not benefiting from the grounding system (earth discharge of electricity).

25- The electrical current should be cut off from the device, the experiment should be stopped, and the maintenance team should be notified immediately in case of feeling excessive heat in the sockets and wires of electrical and electronic devices and tools, as well as when they cause electric charges when dealing with them.

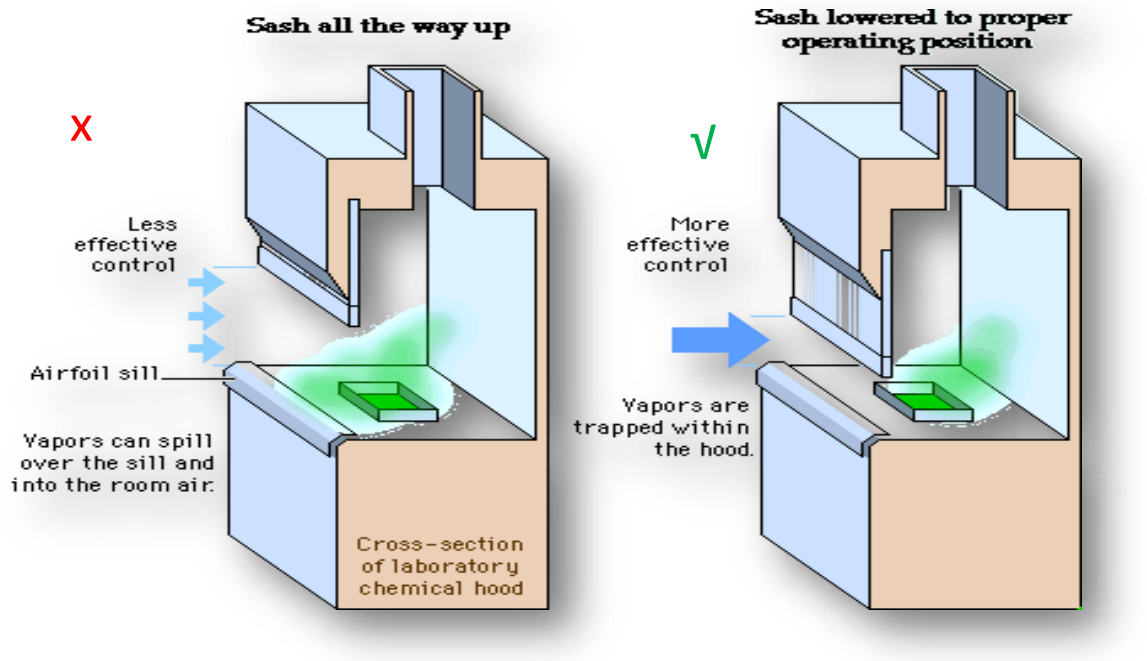
26 - Avoid dealing with electricity near water, as it is necessary to always make sure that the work surfaces and the floor are completely dry.

27- The need to ensure that the power button in electrical and electronic devices and tools is in the off position before connecting them to electricity.

28- The necessity of informing the teacher or the laboratory technician about the electrical circuit before switching on the electrical current.

Laboratory Safety Measures

(Fume Hoods)



Safety Procedures and Laboratory Quality

1. The laboratory space must be commensurate with the number of students in order to allow them to move freely during the experiments without crowding.

2- The design of the lab is easy to clean. The presence of carpets or rugs on the laboratory floor is a violation of the design requirements of the laboratory.

3- Equipping laboratories with natural and artificial lighting and ventilation according to the permissible limits in this field, and following up on the periodic maintenance of industrial lighting and ventilation equipment.

4- The surface of the laboratory table must be resistant to water, moderate heat, organic solvents, acids, alkalis, and chemicals used to sterilize work surfaces and equipment.

5- It is preferable that the furniture does not occupy more than one third of the area of the lab.

6- There should be clear corridors for quick rescue and emergency exits that open to the outside

7. The necessity of equipping laboratories with comfortable and easy-to-move benches inside the laboratory, whose height can be controlled at any time. Depending on the height of the student, chairs and other lab furniture are covered with a non-textile material.

8- Windows shall be provided with fireproof curtains.

Warning Signs for Chemicals

The danger of the substance and how to deal with it Warning signs and their meaning	Warning signs for chemicals
Danger: This substance is dangerous to health if it is inhaled, ingested or in contact with the skin, as it may cause death. Warning: Handle it with extreme caution, and avoid contact with the skin, inhaling its vapors, tasting it, or using the oral administration method using a pipette. A doctor should be called immediately if this occurs	
Danger: It is highly effective as its reactions are accompanied by chemical explosions that may sometimes be destructive to facilities Warning: Do not transport with explosive, toxic or oxidizing materials. Do not store with acids. Do not heat the liquids of these materials on a direct flame, but in a water bath.	
Danger: If the chemicals carrying this signal come into contact with tools or living tissues, they will be eaten and destroyed. Warning: Avoid contact with the skin, inhaling its vapors, or dropping it on tools and surfaces. .	
Danger: Chemicals with this sign cause damage and damage to body tissues if inhaled or come in contact with them. Warning: Avoid the vapors rising from it, avoid contact with the skin and eyes, and consult a doctor immediately if this occurs.	

Danger: Chemicals with this sign cause damage and damage to body tissues if inhaled or come in contact with them. Warning: Avoid the vapors rising from it, avoid contact with the skin and eyes, and consult a doctor immediately if this occurs.	
Danger: It is very harmful if a person is exposed to it. The type of damage varies according to the type of radiation, its intensity and the time of exposure *Warning: Handle these materials with extreme caution, avoiding friction, shock, electric sparks or heat when handling them.*	
Danger: It is very harmful if a person is exposed to it. The type of damage varies according to the type of radiation, its intensity and the time of exposure Warning: Handle these materials with extreme caution, avoid exposure to them, wear their clothes, and use devices designed to measure radioactivity.	
Danger: Substances that are not necessarily combustible in themselves, but can, by releasing oxygen from them, cause or assist in the combustion of other materials. Warning: Organic oxidants are one of the most dangerous substances because they are the third head of the fire triangle (fuel - heat - oxygen).	

Proper ways to store materials and devices

First, storing chemicals

Chemicals are classified according to their danger

1- Class (A) flammable substances (solvents).

2- Class (B) self-inflammable materials.

3- Class (C) explosive materials.

4- Class (D) toxic substances.

5- Class (E) acids and bases.

One of the safety requirements in storing chemicals

- Separate chemicals whose presence is inconsistent with each other.

Separation of acids from bases.

- Store highly toxic substances in a designated place with a warning label label.

Separation of acids from flammable materials.

- Items that need to be refrigerated, stored in a special laboratory refrigerator.

Flammable materials are stored in a special cupboard.

- Safety data sheets for chemicals The location of these statements should be known to all.

- Second: Storage of equipment and tools
- Keeping devices and tools in a dry place free from moisture and water sources to prevent the formation of rust on them, which leads to their damage.
- Keeping electronic and electrical devices away from chemicals in general, as vapors rising from some of them may damage these devices.
- Keeping devices away from heat sources, as some of them include plastic in their installation. If they are exposed to certain temperatures, they may be damaged, and some of these devices are affected by simple temperatures.
- It is forbidden to store appliances and tools under the washbasins in order to protect them from damage in the event of any malfunction in the washbasin.
- Commitment to the arrangement and cleanliness of the devices and tools used to ensure safety for all.

Chemical Waste Disposal Methods

Water-soluble chemicals: they can be disposed of through sewage and subsequently to treatment plants.

Flammable solvent solutions: they must be diluted to a large degree with water before being poured into the drain in order to avoid the risk of fire that may arise from it.

- Strong acids and bases: they must be diluted to a pH between (3-11 pH) before pouring them into the sewer, provided that the rate of discharge into the drain is not less than 50 cm3/min) of the concentrated substance.

- Highly toxic substances: mercury, nickel, arsenic, chromium, cadmium, zinc, phenolic compounds, cyanide and sulfur are prohibited from being disposed of in the drains.

- Care must be taken and extreme attention should be given to the fact that the sewage network inside the laboratory is connected to each other, so pouring a substance through a cesspool in one of the labs may cause a dangerous reaction when it meets a material spilled from another cesspool.

laboratory Hazards

1. Fire in one of the factories, offices or warehouses.
2. Leak of harmful gases from various laboratories in the college.
3. Leak of chemicals in chemistry laboratories.
4. Handling of biological samples and experimental animals
5. Types of rays and ways to properly deal with them.
6. Electricity

1- Fires

The most important causes of fires in laboratories.

Poor storage of flammable and explosive materials.

Electrical faults that are near flammable materials.

Lighting fires near dangerous places.

Sparks or an unusual rise in temperature.

The process of evacuating the laboratory in the incident of a fire

The Process of Evacuating the laboratory in a fire

- In the incident of a fire, the following actions are taken:
- - The laboratory technician present at the time of the crisis must quickly deal with the fire using the means available to him according to the training he received and according to the size or extent of the fire spread.
- - Ensure that the fire alarm has announced a fire in the building, and the laboratory technician does not contact the building monitor.
- - When the fire is out of control, the speed of communication with the building supervisor and supervisor, respectively.
- - The floor specialist and the building superintendent must quickly evacuate the laboratory in which the fire is from students, professors, and workers.
- - Gathering individuals at the assembly point specified by the Disaster and Crisis Management Committee.
- - Evacuating what can be evacuated from the materials close to the ignition and flammable areas so that the fire can be contained and prevented from spreading.
- It is forbidden to approach flaming gases fires due to the possibility of an explosion and leave that to the specialized firefighting teams.

Types of Fire Extinguishers

Important information must be available on the stickers for extinguishers.

Extinguisher type and expiration date.

Types of fires that are used to extinguish them

Fires that are forbidden to be used to extinguish them.

How to use Fire Extinguishers

After controlling the fire and extinguishing the it:

- A report of the incident must be submitted explaining the causes of the fire, its location, the measures taken to extinguish it, the time and capacity in which the fire broke out, and the time of extinguishing it.

- And also a report of the dusty losses on it.

First aid in case of skin burns with chemicals

The cause must be removed immediately and the affected part washed with water.

The use of pressured water should be avoided so as not to damage the patient's skin.

- The clothes of the injured person should be removed in case they are exposed to chemicals if possible, otherwise an amount of water or anti-chemical should be poured on the clothes.

- The chemical substance must be neutralized to reduce its effect on the patient as follows:

Exposure to acids is equivalent to applying a weak base such as baking soda on the affected part

- Exposure to alkalis is equivalent to applying weak acids, light vinegar, citric acid, or lemon juice, except for eye injury.

- The injured must be treated in case he suffers from other complications such as pain, and finally, he must be transferred to the hospital after performing the first aid operations.

2. Gas leak

- Proper measures to be taken in the event of a gas leak
- Disconnect the main source of electricity first.
- Separate the main source of gas.
- Open windows and doors in the laboratory.
- Evacuation of the laboratory from students and staff.
- Notify the administration and the responsible authorities at the same time (gas company - fire department - ambulance).
- Inform students to remain calm, not to be cluttered, to abide by the terms of the test, and to prevent speaking

3.Chemical leak

Act immediately to stop and reduce the source of the leak.

Power cut off.

Issue the alert and inform the relevant officials of the crisis and disaster management team and the head of the concerned department.

Immediate evacuation of workers present in the place, taking into account the direction of the wind.

If the leak is in a closed place, the windows and doors are closed and fans and air conditioners are turned off to prevent the spread of gases and vapors to other places.

The accident is not dealt with except after wearing the necessary protective clothing designed to deal with this type of material. Protective clothing is preferred against chemical and biological materials.

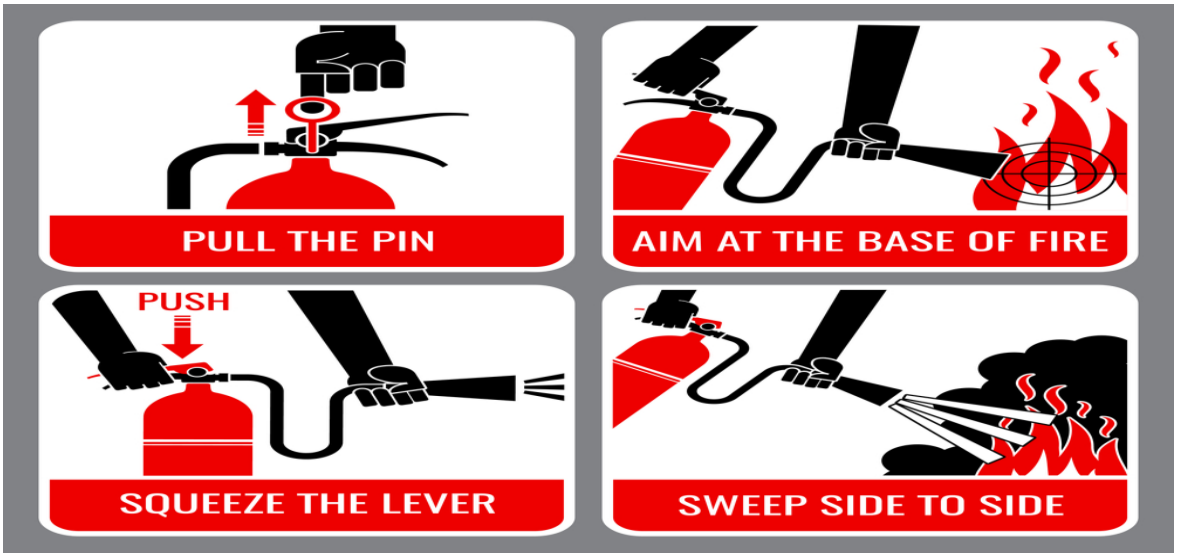
Collecting materials, either with absorbent materials (sponge), or assembling materials inside plastic bags or plastic containers, while placing these packages inside larger packages.

Remove contamination and extinguish any flame or fire that may result.

Performing first aid for any injuries that may result, informing the responsible authorities to transport the injured and taking the necessary measures towards their treatment.

Therefore, it is necessary to work on gathering the correct information as quickly as possible.

Decontamination is an important procedure that requires training.



4.Handling of Biological Samples

- In the event of being bitten or scratched, the wound should be washed with anti-bacterial materials and water for a period of not less than 10 minutes.
- The victim was rushed to the hospital to receive appropriate treatment
- Write a report explaining the circumstances and how the injury occurred.
- In the event of an infection spreading as a result of working in a factory, the factory must be immediately evacuated, the effects of pollution removed, the factory closed and disinfected, as well as the isolation of its employees, taking the necessary measures.
- Contact the crisis and disaster management team and the head of the concerned department to communicate and coordinate with the responsible authorities to prevent the spread of infection.
- Gathering correct information on the causes of the spread of infection as soon as possible to ensure success in controlling and evaluating situations.
- Review the methods of handling biological samples, dealing with experimental animals, and disposing of biological waste.

5- Types of Rays and Ways to properly deal with

1-Lasers

Laser rays must be handled with extreme caution and use appropriate condoms according to the attached leaflets because they cause blindness in less than a second if they are highly concentrated as a result of burning the retina.

2- Infrared

Caution must be taken when dealing with it and the use of safety glasses and the period of dealing with it should be reduced, as excessive exposure to it can damage the lens of the eye.

3- X-rays

It should be dealt with by specialists only, as it may cause burns that are difficult to heal.

4- Ultraviolet rays:

Appropriate filters and protection shields must be used when using the mercury arc because it produces these rays, which are harmful rays.

5- Microwave radiation:

It is necessary to deal with these rays with the utmost caution and to use protective masks in the meantime and to follow the instructions of the attached leaflets and not to be exposed to them for long periods of time because they cause damage to the exposed objects.

5- Leak of Radioactive Materials

Procedures to be followed when radiation leakage occurs:

Immediately work to stop the source of leakage and reduce it.

Immediate evacuation of the workers presents in the place, taking into account the direction of the wind, according to the evacuation plan

Inform the safety officer of radiation/toxic chemicals.

The accident is only dealt with after wearing the necessary and designated protective clothing.

Conduct the necessary examination if the leakage occurred on the workers' clothes.

6- Electricity.

- Follow the general safety rules in dealing with electricity.
- - Identify the harmful electrical effect and the risks resulting from it.
- Learn first aid in the event of an accident as a result of improper use
- - Do not overload electrical circuits or sockets, especially multi-slot sockets, as placing many sockets in one socket constitutes an excessive load on the electrical circuit