



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

(MAIN CAMPUS)

**UNIVERSITY EXAMINATIONS (MAIN PAPER)**

**2023/2024 ACADEMIC YEAR**

**SECOND YEAR FIRST SEMESTER EXAMINATIONS  
FOR THE DEGREE  
OF  
BACHELOR OF SCIENCE IN MEDICAL  
BIOTECHNOLOGY/BACHELOR OF SCIENCE IN MEDICAL  
LABORATORY SCIENCES**

**COURSE CODE:** PML 216

**COURSE TITLE:** BIOSAFETY AND BIOSECURITY

**DATE:** 8<sup>TH</sup> DECEMBER 2023

**TIME:** 8.00-10.00AM

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**INSTRUCTIONS TO CANDIDATES**

This paper is divided into three sections, **A B** and **C**, carrying respectively: Multiple Choice Questions (**MCQs**), Short Answer Questions (**SAQs**) and Long Answer Questions (**LAQs**). **Answer all questions. DO NOT WRITE ON THE QUESTION PAPER.**

**TIME:** 2 Hours

MMUST observes ZERO tolerance to examination cheating

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This Paper Consists of 4 Printed Pages. Please Turn Over

**SECTION A: Multiple Choice Questions (20 Marks)**

1. Which are the first steps applied in proper waste management?
  - A. Minimization and Segregation
  - B. Segregation, Collection and Transportation
  - C. Packaging and Labeling
  - D. Collection, Decontamination and Packaging
2. The most appropriate temperature of autoclaving biohazardous waste is \_\_\_\_\_
  - A. 190°C
  - B. 121°C
  - C. 180°C
  - D. 195°C
3. Strengthening reliability among staff with access to biological materials can best be achieved by \_\_\_\_\_
  - A. Conducting a criminal background check prior to hiring individuals
  - B. Enhancing accountability & responsibility at laboratory and facility level
  - C. Conducting periodic psychological testing of individuals to check mental status
  - D. Investigating new employees job history for previous behavioral concerns evidence
4. Which one of the following is considered a biohazard material?
  - A. Blood
  - B. Urine
  - C. All body fluids
  - D. Stool
5. Which PPE is removed first while doffing after sample collection?
  - A. Lab coat
  - B. N95 mask
  - C. Gloves
  - D. Head/face shield
6. Working with infectious agents, a BSC would be regarded as a \_\_\_\_\_ containment device.
  - A. Tertiary
  - B. Secondary
  - C. Primary
  - D. Quaternary
7. Risk exposure varies with infectious material dose. It's therefore recommended that \_\_\_\_\_
  - A. One always use the highest biosafety level possible
  - B. One contacts the WHO for further clarification and information
  - C. Different procedures be used based on amounts or manipulations being performed
  - D. One uses the highest containment level possible
8. New laboratory activities involving new biological agents may/must \_\_\_\_\_
  - A. Proceed provided the requirements of the biosecurity program are followed
  - B. Proceed but training must be provided on safe handling of the activity
  - C. First undergo a risk assessment to determine unique biosecurity mitigation measures
  - D. Be reviewed during the next scheduled lab inspection for additional precautions

- A. Location of the service rooms at every lab corner
  - B. Activities with specific requirements that must be separated from main lab
  - C. UV lighting that may require open lighting system and no eye protection
  - D. Delineating laboratory activities to prevent cross-contamination
19. Equipment used to deploy a biological weapon is called \_\_\_\_\_
- A. Biological safety cabinets
  - B. Surveillance systems
  - C. Delivery systems
  - D. Decontaminating systems
20. Which one of the following is not an element of a biosecurity system?
- A. A control list of all biological substances
  - B. A system of licensing and auditing
  - C. Customer care and service
  - D. Vulnerability assessments and security plans

**SECTION B: Short Answer Questions (40 Marks)**

1. Enumerate 5 fields in which biosafety and biosecurity concepts apply (5 mks)
2. Explain the primary transmission routes that can result in laboratory infections (5 mks)
3. List the factors that can be considered when categorizing biohazard risk groups (5 mks)
4. Differentiate between the following as applied in biosafety and biosecurity:
  - (a) Biological agent and Pathogen (1 mks)
  - (b) Biosafety and Containment (1 mks)
  - (c) Contamination and Decontamination (1 mks)
  - (d) Risk and Consequence (1 mks)
  - (e) Level 1 and level 2 containment levels (1 mks)
5. Enumerate 5 major elements of a biosecurity plan (5 mks)
6. Explain transportation of biological materials from the lab (5 mks)
7. List the factors that can affect sterilization by heat (5 mks)
8. State the properties of an ideal disinfectant (5 mks)

**SECTION C: Long Answer Questions (60 Marks)**

1. Describe laboratory GMPPs, essential in the control of biohazardous risks (20 mks)
2. Discuss the considerations to be made in the selection of primary containment devices (20 mks)
3. Describe triple packaging for transportation of biohazardous materials (20 mks)

9. A \_\_\_\_\_ protection system is achieved by increasing the levels of biosecurity measures.
- Perimeter control
  - Fail-safe
  - Graded
  - Barrier control
10. What % of air is re-circulated in a Class II B Biosafety Cabinet?
- 70
  - 100
  - 30
  - 50
11. Which of the following is FALSE when working in a Class II BSC?
- Worker & material are protected because there is containment in the cabinet
  - Cultures in cabinet are sterile since air passes through HEPA filters
  - Using a Bunsen burner within the BSC helps to keep materials sterile
  - Exhaust air is HEPA filtered hence contaminants do not enter the lab
12. The acronym HEPA stands for \_\_\_\_\_
- High Efficiency Particles Air
  - High Efficiency Protection Air
  - High Efficiency Particulate Air
  - High Efficiency Pressurized Air
13. This BSC is the most commonly used for working with biological materials:
- Class IV
  - Class III
  - Class II
  - Class I
14. The minimum required PPE for work with risk group 2 microorganisms in the lab is \_\_\_\_\_
- Tyvek suit, 2 pairs of gloves, head covering and respirator
  - Lab coat, 1 pair of gloves, eye protection and respirator
  - Lab coat, 1 pair of gloves and eye protection
  - Lab coat, 2 pairs of gloves, coverall and respirator
15. When working with infectious materials, the best place to perform the work would be \_\_\_\_\_
- On the open laboratory bench
  - On a clean laboratory bench, wearing a dust mask
  - In a biological safety cabinet
  - In a fume hood
16. The following is one among the many duties of a biosecurity officer: \_\_\_\_\_
- Maintaining a good lab personnel record
  - Maintaining an up to date laboratory equipment record
  - Ensuring that all biosecurity procedures are correctly followed
  - Reporting the purchase, sale or handover of all lab purchases
17. Which one of the following is a characteristic of an effective biosafety manager?
- Uses all managerial skills
  - Uses power to get things safety done
  - Recognizes individual and group efforts
  - Leaves people do what they are able or want to do
18. For the optimal organization of the laboratory, the following is considered.