



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)
MAIN CAMPUS
UNIVERSITY EXAMINATIONS (MAIN PAPER)
2023/2024 ACADEMIC YEAR**

THIRD YEAR FIRST SEMESTER EXAMINATIONS

**FOR THE DEGREE
OF
BACHELOR OF SCIENCE IN MEDICAL BIOTECHNOLOGY**

COURSE CODE: BMB 316

**COURSE TITLE: BIO-TECHNIQUES FOR MEDICAL
BIOTECHNOLOGY**

DATE: 6TH DECEMBER 2023

TIME: 2.00-4.00PM

INSTRUCTIONS TO CANDIDATES

This paper is divided into three sections, A B and C, 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

This Paper Consists of 4 Printed Pages. Please Turn Over.

SECTION A: Multiple Choice Questions (20 Marks)

- The pH of a solution that contains 0.818 M acetic acid ($K_a = 1.76 \times 10^{-5}$) and 0.172 M sodium acetate is _____. The K_a of acetic acid is 1.76×10^{-5} .
 - 9.922
 - 5.432
 - 4.077
 - 8.568
- The addition of hydrofluoric acid and _____ to water produces a buffer solution.
 - HCl
 - NaNO_3
 - NaCl
 - NaF
- What is density gradient centrifugation used for?
 - Purification of viruses, ribosomes, and membranes
 - To remove small particles
 - To remove dirt
 - To get rid of big particles
- Which one of the following statements is true about polyclonal Antibodies?
 - Products of a single clone of plasma cells derived from B lymphocytes
 - They are directed against a single epitope
 - They have a great ability to precipitate the antigen
 - They display excellent specificity
- In Labelled immunotechniques, either the antigen or the antibody is labelled using any of the following except-----
 - Enzyme
 - Radio isotopes
 - Fluorescent substance
 - Polyclonal antibodies
- Which one of the following is used to separate cellular components, RNA/DNA, and peptides from biological samples?
 - Low-speed clinical centrifuges
 - Centrifuges for microsamples
 - High-speed multi-purpose centrifuges
 - High-speed centrifuges with a large capacity
- In what kind of chromatography is the mobile phase pushed under pressure through a small tube containing the stationary phase?
 - Column chromatography
 - Planar chromatography
 - Liquid chromatography
 - Gas chromatography
- Ion exchange chromatography relies on the-----
 - Electrostatic attraction
 - Electrical mobility of ionic species
 - Adsorption chromatography
 - Partition chromatography
- In paper chromatography, which one of the following is used as a spraying reagent?
 - Conc. HCl

- B. NaCl solution
 - C. Ninhydrin solution
 - D. CuSO₄ solution
10. Which one of the following best describes agglutination?
- A. A combination of soluble antigen with soluble antibody
 - B. A combination of particulate antigen with soluble antibody
 - C. A reaction that produces no visible end point
 - D. A reaction that requires instrumentation to read
11. The technique used to locate specific genes on the chromosome is called-----
- A. Dot blot technique
 - B. Western blotting
 - C. Colony hybridization
 - D. In situ hybridization
12. Which one of the following reagents is used for precipitating DNA
- A. Methanol
 - B. Chloroform
 - C. Isopropanol
 - D. Ethanol
13. In which of the following circumstances would the indirect Coombs' test be employed?
- A. Identification of the ABO blood groups
 - B. Identification of cold-reacting antibody
 - C. Identification of an unexpected IgG antibody
 - D. Identification of hemolytic disease of the newborn
14. Which one of the following correctly describes reverse passive agglutination?
- A. It is a negative test.
 - B. It can be used to detect autoantibodies.
 - C. It is used for identification of bacterial antigens.
 - D. It is used to detect sensitization of red blood cells.
15. For which one of the following tests is a lack of agglutination a positive reaction?
- A. Hemagglutination
 - B. Passive agglutination
 - C. Reverse passive agglutination
 - D. Agglutination inhibition
16. Which of the following will migrate faster?
- A. Supercoiled circular DNA
 - B. Nicked circular DNA
 - C. Single stranded DNA
 - D. Double stranded DNA
17. Electrophoresis cannot be used to separate _____
- A. DNA
 - B. RNA
 - C. Amino acid
 - D. Protein
18. Polymerase used for PCR is extracted from _____
- A. *Escherichia coli*
 - B. *Homo sapiens*
 - C. *Thermus aquaticus*
 - D. *Saccharomyces cerevisiae*
19. At what temperature do annealing of DNA and primer takes place?
- A. 42°C
 - B. 54°C

C. 74°C

D. 96°C

20. The cells are sorted by?

A. Dilution plating until there are only single cell in each well of microtitre plate

B. The differential weight

C. Electrostatic force

D. Magnetic force

SECTION B: Short Answer Questions (40 Marks)

1. Define the following terms. (4mks)
 - a. Titre
 - b. Monoclonal Antibodies
 - c. Immuno-electrophoresis
 - d. Immunoturbidity
2. Explain the quantitative precipitin curve (4mks).
3. Outline the factors that affect the separation of components in chromatography? (4mks)
4. Describe the process of DNA extraction (4mks)
5. Compare immunoprecipitation and immunoelectrophoresis (4 mks)
6. State the difference between Southern blotting and Western Blotting techniques (6mks)
7. Electrophoresis is significant technique in biotechnology
 - a. State the principle of this technique (2 mks)
 - b. Outline the procedure of this technique (3mks)
 - c. Describe the clinical application of electrophoresis (3mks)

SECTION C: Long Answer Questions (60 Marks)

1. Discuss ELISA technique in terms of:
 - a. The principle of ELISA (2mks)
 - b. General Procedure of ELISA (8mks)
 - c. Types of ELISA technique (5mks)
 - d. Application of ELISA technique in the medical field (5mks)
2. Centrifugation Technique is widely used in the medical biotechnology, describe this procedure in terms of?
 - a. Principle of Centrifugation (2mks)
 - b. Types of Centrifugation techniques (10mks)
 - c. Safety precaution to be taken when using this technique (8mks)
3. Discuss the polymerase chain reaction in terms of
 - a. The principle of the test (2mks)
 - b. Test Requirements and equipment (8mks)
 - c. General Procedure (10 mks)