



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

MAIN CAMPUS

UNIVERSITY EXAMINATIONS (MAIN PAPER)

2023/2024 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER EXAMINATIONS

**FOR THE DIPLOMA
IN
MEDICAL BIOTECHNOLOGY /MEDICAL LABORATORY
SCIENCES**

COURSE CODE: DMB/DML 112

**COURSE TITLE: BIOMEDICAL TECHNIQUES AND
INSTRUMENTATION**

DATE: 5TH DECEMBER 2023

TIME: 2.00-4.00PM

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

This Paper Consists of 4 Printed Pages. Please Turn Over

SECTION A: Multiple Choice Questions (20 Marks)

1. In de-ionization-----
 - A. Pure water is passed through anion and cation exchange resins.
 - B. De-ionized water has a high electrical conductivity.
 - C. De-ionized water has an acidic pH.
 - D. De-ionized water is not sterile.
2. The following does not apply when selecting an electric weighing balance over a mechanical one.
 - A. Use of electromagnetic force instead of weights.
 - B. Accuracy and precision.
 - C. A built-in taring mechanism.
 - D. Provide multiple application modes and weighing units.
3. Which one of the following is not part of good pipetting techniques that leads to proper dispensation?
 - A. Always store the pipette upright in a stand.
 - B. Keep the nozzle clean.
 - C. Check for accuracy and precision every few months.
 - D. Use a tip even if it doesn't form a complete seal with the pipette
4. In sterilization of materials in biomedical laboratory work an autoclave _____
 - A. Works by heating materials with steam under pressure.
 - B. Works by heating materials intermittently.
 - C. Is used exclusively on materials for disposal.
 - D. Eliminates pathogenic microbes by generating very low temperatures.
5. A hot air oven is supposed to be a common sight in biomedical laboratories because _____
 - A. It can serve as a bacteriological incubator.
 - B. As a sterilizer it uses strong heat under steam.
 - C. It comes from the factory set at fixed temperatures.
 - D. It is best used for sterilization of biomolecules for assay work and fabrics.
6. In a microscope, the condenser is a core component it _____
 - A. Is one of the mechanical parts.
 - B. Illuminates the study object.
 - C. Is an optical component.
 - D. Is located on the revolving nose
7. In the working of fluorescent microscopy, the study object _____
 - A. Is detectable by its emission of fluorescence when illuminated.
 - B. Is illuminated by fluorescence from a bulb built in the instrument.
 - C. Appears like dark outline against a bright background.
 - D. Is seen when the test specimen is placed below the condenser.
8. The purpose of an objective in a microscope is to _____
 - A. Enhance the visibility of the object through magnification.
 - B. Illuminate the object for clear visibility.
 - C. Enable color contrast of parts of the object.
 - D. Reduce eye fatigue for the microscopist.
9. Centrifugation is a basic procedure in biomedical laboratories. As its output the _____
 - A. Solid materials are always deposited at the bottom.
 - B. Material deposited at the bottom is the supernatant.

- C. Supernatant is commonly found at the bottom of specimen container.
D. Locations of the various portions of the suspension are indeterminate.
10. Which one of the following is false when using the still:
- A. There should be sufficient supply of cool running water to supply the condenser.
 - B. The boiler should not run dry.
 - C. Collection of the distilled water is collected in a PVC container.
 - D. Regularly clean the still
- 11 Mass spectrometers are used to determine which one of the following?
- A. Composition of sample
 - B. Concentration of element
 - C. Relative mass of atoms
 - D. Properties of sample
12. Which one of the following is true about Numerical aperture an objective?
- A. Is a designation of the amount of light entering the objective from the microscope field
 - B. It may be defined as the ability to level closely adjacent structural details as being actually separate and distinct
 - C. All of A and B above are correct
 - D. None of A and B above are correct
13. Concerning equipment maintenance and quality control, the following are practiced except _____
- A. Troubleshooting
 - B. Test and Equipment Calibration
 - C. Daily Checks
 - D. Service visits once every two years
14. Regarding Micropipettes, the following is true except _____
- A. Are calibrated TC the stated volume rather than TD
 - B. Volumes are expressed in microliters (μL)
 - C. Include adjustable volume electronic micropipetting device with ergonomic design.
 - D. Does not include electronic programmable multichannel pipette
15. One of the following is the correct order of the photometer components:
- A. Light source, Slits, Filters, cuvettes, detector and meter
 - B. Light source, Slits, Cuvettes, detector, filters and meter
 - C. Light source, detector, Slits, filters, Cuvettes and meter
 - D. Light source, detectors, filters, slits, cuvettes and meter
16. The rate of sedimentation during centrifugation depends on _____
- A. Radius of the centrifuge
 - B. Gravitational force
 - C. Centripetal force
 - D. Type of the centrifuge

17. The Beer- lamberts law states that _____
- Light absorption by light absorbing compounds is proportional to concentration of that substance.
 - Light absorption by light absorbing substance is proportional to the depth of light absorbing material.
 - Light absorption by light absorbing substance is proportional to concentration and depth of light absorbing substance.
 - Light absorption and emittance is inversely proportional to the concentration of the light absorbing substance provided other factors remain constant.
18. Western Blotting is _____
- A molecular technique for identification of microorganisms
 - A molecular technique used of DNA identification
 - A molecular technique used to separate and identify proteins
 - A molecular technique used for RNA identification
19. Which one of the following properties is not generally useful as a basis for physical separation
- Physical state
 - Solubility
 - Polarity
 - Molar absorptivity
20. The highest magnification of light microscope is _____
- 1500X
 - 2000X
 - 1000X
 - 2500X

SECTION B: Short Answer Questions (40 Marks)

- Differentiate between High performance liquid chromatography(HPLC) and ion-exchange chromatography (8 Marks)
- Discuss the Polymerase chain reaction (PCR) steps (8 Marks)
- Discuss the use, care and maintenance of a light microscope (8 Marks)
- Discuss the following instruments: (8 Marks)
 - Balances
 - Biosafety cabinets
 - Autoclaves
 - pH meters
- Discuss the separation characteristics of proteins and various protein purification methodologies (8 Marks)

SECTION C: Long Answer Questions (60 Marks)

- Discuss colorimeters and spectrophotometers stating their applications (20 Marks)
- Describe how we can use centrifuges in in macro molecule separation and their uses (20marks)
- Discuss the principles electrophoresis (20marks)