



(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 LABORATORY
SCIENCES/ BACHELOR OF SCIENCE IN MEDICAL
BIOTECHNOLOGY**

COURSE CODE: BML 218

**COURSE TITLE: LABORATORY DIAGNOSTICS AND
INSTRUMENTATION**

DATE: 11TH DECEMBER 2023

TIME: 8.00-10.00AM

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)

- Differential centrifugation is based on the differences in of biological particles of different

 - Size, density
 - Sedimentation rate, sizes and density
 - Size, structure
 - Mass, size

- _____ is a pressure chamber used to carry out processes at high temperature and pressure.

 - Oven
 - Micro clave
 - Autoclave
 - Hot air oven

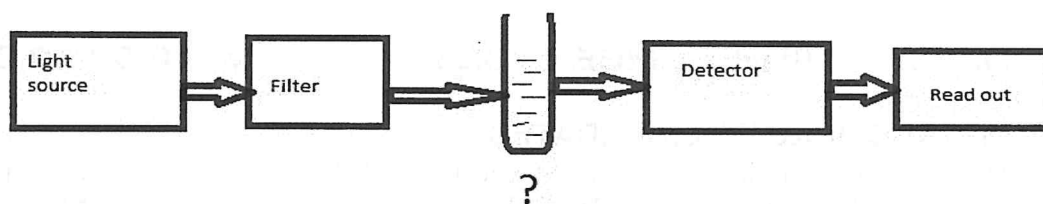
- Colorimetry is based on the amount of light of a particular wavelength:

 - Being reflected by the sample
 - Being absorbed by the sample
 - Being refracted by the sample
 - Being scattered by the sample

- In photometers, the readings of the specimen are initially obtained in the form of which of the following parameters?

 - Transmittance
 - Absorption
 - Wavelengths
 - Volume

- In the diagram of single beam photometer given below, identify the component that is not marked.



- Monochromator
 - Absorption filter
 - Sample holder
 - Interference filter
- Which one of the following statements about the basic principle of sedimentation is not true
 - The denser a biological structure is, the faster it sediments in a centrifugal field
 - The more massive a biological particle is, the slower it moves in a centrifugal field
 - The denser the buffer system is, the slower the particle will move in a centrifugal field
 - The greater the centrifugal force is, the faster the particle sediments - Which of the following is/are appropriate care and maintenance of centrifuges?
 - Proper balancing of centrifuge
 - Avoid long time exposure of the rotors to alkaline solution and acidic buffers

- iii. Cleaning centrifuges and rotors with coarse brushes and then wash them with distilled or deionized water after every run
 - iv. For overnight storage, the rotor are left upside down and then positioned in a safe and dry place
 - A. i, ii, iii only
 - B. ii, iii, and iv only
 - C. i, ii, and iv only
 - D. All of these
8. What is called centrifugation?
 - A. Separated through spinning
 - B. Separate components at higher temperature
 - C. Separate components at lower temperature
 - D. Separated through evaporation
 9. Chromatography is a physical method that is used to separate and analyse -----
 - A. Simple mixtures
 - B. Complex mixtures
 - C. Viscous mixtures
 - D. Metals
 10. In chromatography, which one of the following can the mobile phase be made of?
 - A. Solid or liquid
 - B. Liquid or gas
 - C. Gas only
 - D. Liquid only
 11. Liquid chromatography can be performed in which of the following ways?
 - A. Only in columns
 - B. Only on plane surfaces
 - C. Either in columns or on plane surfaces
 - D. Neither in columns nor on plane surfaces
 12. In Gas-liquid phase chromatography, the stationary phase is composed of _____ and the mobile phase is made of _____
 - A. Solid, liquid
 - B. Liquid, liquid
 - C. Liquid, gas
 - D. Solid, gas
 13. Ion exchange chromatography is based on the
 - A. Electrostatic attraction
 - B. Electrical mobility of ionic species
 - C. Adsorption chromatography
 - D. Partition chromatography
 14. Which one of the following is used as a carrier gas in gas chromatography.....
 - A. Carbon dioxide
 - B. Helium
 - C. Oxygen
 - D. Nitrogen
 15. Which one of the following factors does not influence electrophoretic mobility?
 - A. Molecular weight
 - B. Shape of molecule
 - C. Size of molecule
 - D. Stereochemistry of molecule

16. When is electrophoresis not used?
- Separation of proteins
 - Separation of amino acids
 - Separation of Lipids
 - Separation of nucleic acids
17. Which one of the following cannot be achieved using electrophoresis?
- Comparing two sets of DNA
 - Organizing DNA by shape of backbone
 - Organizing DNA fragments from largest to smallest
 - Organizing DNA in order we can see
18. Which one of the following statements about agarose gel electrophoresis is False?
- Electrophoresis in agarose is a common way to separate DNA molecules according to size.
 - Ethidium bromide is used to detect DNA.
 - Under the influence of the electrical field, positively charged DNA will migrate towards the negative charged end of the gel.
 - It is used to separate molecules in laboratories based on their charge and density
19. Which one of the following factors will not affect the rate of migration of DNA in agarose gels?
- DNA concentration
 - Gel concentration
 - Voltage
 - DNA conformation
20. Ethidium bromide is a stain that specifically binds to DNA or RNA and appears _____ if viewed under ultraviolet light.
- Red
 - Yellow
 - Orange
 - Blue

SECTION B: Short Answer Questions (40 Marks)

- Derive the Beer – Lambert's equation (5marks).
- Discuss the major components of colorimeter (5marks).
- Briefly explain five (5) uses of incubators in the laboratory (5marks).
- Discuss two (2) types of water bath used in biomedical research laboratories (5marks).
- Discuss five (5) precautions that need to be observed when using autoclave in the laboratories (5marks).
- Explain the clinical applications of nephelometry (5marks).
- Explain five (5) uses of instruments in a biomedical laboratories (5marks).
- Differentiate between flame photometry and spectrofluorimetry (5marks).

SECTION C: Long Answer Questions (60 Marks)

- Describe the practical isolation of ribosomes in a biomedical laboratory (20marks).
- Discuss in detail application of the Beer – Lamberts law in clinical diagnosis of diseases (20marks).
- Illustrate the application of electrophoresis in management of sickle cell disease (20marks).