MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya
Tel: +254(0) 799 529 958, +254(0) 799 529 959, + 254 (0) 712 524 293,
Website: info@must.ac.ke Email: info@must.ac.ke

University Examinations 2023/2024

SECOND YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MEDICAL LABORATORY

HML 3225: BIOINSTRUMENTATION

DATE: APRIL 2024 **TIME: 2 HOURS**

INSTRUCTIONS: Attempt all the questions in both section A and B and two questions in section C

SECTION A (20 MARKS)

1. The total magnification of a microscope is calculated by multiplying the magnification of which two lenses?

    A. Objective and eyepiece lenses
    B. Condenser and objective lenses
    C. Objective and diaphragm lenses
    D. Eyepiece and condenser lenses

2. Which piece of laboratory glassware is used for mixing, heating, and storing liquids, and often has a narrow neck and a flat bottom?

    A. Erlenmeyer flask
    B. Test tube
    C. Beaker
    D. Volumetric flask

3. Which of the following contaminants can be effectively removed by a distiller?
    A. Chlorine
    B. Heavy metals
    C. Bacteria
    D. All of the above
4. Which of the following substances can be separated using a centrifuge?
    A. Gases
    B. Solids
    C. Liquids
    D. All of the above
5. Which of the following is NOT a common use of a centrifuge in biological research?
    A. Separating proteins from a cell lysate
    B. Isolating DNA from a blood sample
    C. Concentrating Parasites
    D. Analyzing atomic structure
6. What is the first step in a PCR cycle?
    A. Denaturation
    B. Annealing
    C. Extension
    D. Priming
7. Laboratory result must include the following important items EXCEPT
    A. Type of specimen analyzed
    B. Analyte of substance measured
    C. Patients history
    D. Reference ranges for quantitative tests
8. Which of the following is NOT required for a PCR reaction?
    A. DNA template
    B. Primers
    C. dNTPs (deoxynucleotide triphosphates)
    D. RNA polymerase
9. What is the total magnification in diameters after using ^{x}10 objective
    A. 200 diameter

B. 100 diameter

C. 1000 diameter

D. 10 diameter

10. What is the advantage of using a vortex mixer over manual mixing methods?

A. Higher precision in mixing ratios

B. Faster and more efficient mixing

C. Less risk of sample contamination

D. Greater versatility in sample handling

11. Which of the following substances is commonly used as a blank in spectrophotometry?

A. Distilled water

B. Sodium chloride

C. Ethanol

D. Hydrochloric acid

12. 1n electrophoresis negatively charged molecules move towards

A. The anode

B. The cathode

C. Both anode and cathode

D. None of the above

13. During electrophoresis, current is carried between the cathode and anode by

A. Buffer solution

B. Ions in the buffer solution

C. Voltage in the buffer solution

D. Voltage solution

14. What is the purpose of the tare function on a weighing balance?

A. To zero the balance

B. To calibrate the balance

C. To adjust the sensitivity of the balance

D. To turn off the balance

15. What is the main advantage of using an electronic balance over other types of balances?

A. It is less expensive

B. It is more sensitive

C. It requires less maintenance

D. It has a shorter lifespan

16. How does a urinometer measure specific gravity?

A. By measuring the volume of urine

B. By comparing the weight of urine to the weight of water

C. By testing the color of urine

D. By analyzing the pH of urine

17. What is the purpose of internal audits in a laboratory QMS?

A. To identify opportunities for improvement

B. To criticize employees

C. To punish employees

D. To increase costs

18.How do automated pipettes help ensure reproducibility in experiments?

A. By providing consistent volume settings

B. By allowing for manual adjustments during pipetting

C. By randomly dispensing volumes

D. By requiring frequent recalibration

19. What is the purpose of the ultraviolet (UV) light in a biosafety cabinet?

A. To provide additional illumination

B. To sterilize the work area when not in use

C. To maintain a constant temperature

D. To attract insects

20. Which biosafety cabinet class is typically used for working with highly infectious agents?

A. Class 1

B. Class 11

C. Class 111

D. Class IV

SECTION B: SHORT ANSWER QUESTIONS - Answer all questions (40 MARKS)

1. State how balances should be maintained in order to maintain proper function (5 marks)

2. Outline the step-by-step procedure that laboratory personnel should follow in the event of a breakage occurring in a centrifuge (5 marks)
3. What are the basic steps involved in a PCR cycle and the role of each step (5 marks)?
4. Using an illustration define accuracy and precision (5 marks)
5. Outline the principles of electrophoresis and its applications in molecular biology (5 marks)
6. Outline the processes occurring during flame photometer analysis (5 marks)
7. Explain how a colorimeter measures the absorbance or transmittance of light and convert it into quantitative data (5 marks)
8. What is the procedure of measurement of specific gravity by Urinometer? (5 marks)

SECTION C: LONG ANSWER QUESTIONS- Answer Two questions (40 MARKS)

1. Describe parts of a microscope and elaborate how you can take care of it (20 marks)
2. (i) Discuss the three types of transfer pipettes and the procedure for using each of them (10 marks)

   (ii) Describe the safety considerations during centrifugation (10 marks)
3. Discuss procedures of proper use, classification and maintenance of fume hoods and biosafety cabinets fitted with HEPA filters (20 marks)