(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS 2019/2020 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DIPLOMA OF MEDICAL LABORATORY SCIENCES (DIRECT ENTRY)

COURSE CODE: **BMD 227**

COURSE TITLE: **BIOIMEDICAL TECHNIQUES AND INSTRUMENTATION.**

DATE: 10TH DECEMBER 2020 **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**).

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

SECTION A: MULTIPLE CHOICE QUESTIONS (MCQs)

Instructions to candidates

1. This section has twenty multiple choice questions, carrying a maximum of twenty (20) marks.
2. For each question select and indicate the correct option by writing the corresponding letter in the examination booklet.

1.The following are contents of the spill kit. Which one is not.
   a) Gloves
   b) Bleach
   c) Bandage
   d) Sand
2. 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.
3. 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.
4. Part of good pipetting techniques leads to proper dispension. Which one is not.
   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.
5. Which of the following is true in regards to the use of a microhaematocrit centrifuge.
   a) To diagnose and monitor anaemia
   b) To measure PCV to calculate MCHC in investigating IDA
   c) To perform microhaematocrit concentration techniques to detect motile trypanosomes and microfilariae
   d) All of the above.
6. Below are considerations to factor when selecting a waterbath over a dry heat block during incubation. Which one is not?
   a) When incubating a few samples in test-tubes
   b) When incubating liquids in flasks or other large containers.
   c) When incubating samples in test-tube racks.
   d) When incubating bottles of culture media
7. The following are effective ways of detecting complete sterilization cycles. Which one is the least reliable.
   a) Thermocouple and recorder.
   b) TST control strips.
   c) Adhesive sterilization tapes.
   d) Browne's indicator tubes.
8. The following are expounded on a user manual except.

a) Trouble shooting
b) Power requirements
c) Scheduled maintenance
d) Equipment operation

9. 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.
10. A hot air oven is supposed to be a common sight in biomedical laboratories
   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.
11. 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
12. In the working of a 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.
13. 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.
14. 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) Subnatant is commonly found at the bottom of specimen container.
   d) Locations of the various portions of the suspension are indeterminate.
15. In microscopy work, micrometry is a procedure that
   a) Measures object dimensions.
   b) Allows precise description of details of object morphology.
   c) Requires a camera to accomplish.
   d) Is routine in diagnostic laboratory work.
16. The fact about centrifuges is that
   a) For an angle-head centrifuge, the supernatant appears wedge-shaped.
   b) The subnatant is wedge-like for a swing-out centrifuge.
   c) For swing-out centrifuges, the tube holders stay vertical during centrifugation.
   d) Tube holders are oriented outwards during centrifugation.
17. In chromatographic analysis of material
   a) A column serves to adsorb analyte particles.
   b) The column is a pack of material adsorbing the stationary phase.
   c) The stationary phase is always a solid.
   d) The mobile phase serves as a vehicle for analyte transport and does not dissolve it.
18. A disadvantage of the heating block over the incubator and waterbath is that it

a) Can be used when the workloads is low.
b) Used when no bacteriological work is performed.
c) Reduces the risk of moisture entering tubes and interfering with reactions.
d) None of the above.

19. Which 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.

20. The following mixer is recommended for the safe mixing and emulsifying of samples and for dissolving substances in the preparation of reagents.
a) Roller mixer
b) Rotator / orbital mixer.
c) Vortex mixer.
d) Combined magnetic stirrer and hotplate.

SECTION B: SHORT ANSWER QUESTIONS (SAQs)

Q1. Define the following terms as used for power supply in the laboratory.
a) Frequency (**1 mark**).
b) Alternating current (**1 mark**).
c) Phase (**1 mark**).
d) Transformer (**1 mark**).
e) Inverter (**1 mark**).

Q2. State the circumstances under which hot air oven is preferable to an autoclave (**3 marks**)

Q3. Distinguish between the following:
a) Chromatic and spherical aberrations (**3 marks**)

b) Colorimeter and spectrophotometer (**3 marks**).

Q4. Advice on how glassware related accidents can be prevented in the Laboratory **(7 marks).**

Q5. In regard to microscopy:
(i) Explain the role of a stage condenser and an objective (**4marks**).
(ii) Under what circumstances is power ×100 preferred instead of the power ×40 objective? (**3 marks**).
(iii) Describe the working principle of the oil immersion objective (**3 marks**).

Q6. Explain the working of an angle head as opposed to that of a swing-out centrifuge (**3 marks**).

Q7. Describe the use of the air displacement pipette under the following circumstances:
(i) Pipetting aqueous solutions (**2 marks**).

(ii) Pipetting highly viscous fluids (**2 marks**).
(iii) Dilution (**2 marks**).

SECTION C: LONG ANSWER QUESTIONS (LAQs)

1. Advice the Ministry of Health, county Government of Kakamega, who are keen on purchasing biosafety cabinets class I, II, III and IV for their newly launched ultra-modern Laboaratory (**20marks**).
2. The autoclave plays a pivotal and critical role in the Laboratory. Discuss. (**20marks**)
3. Describe how we can use centrifuges in in macro molecule separation and their uses?