



**KENYA MEDICAL TRAINING COLLEGE
FACULTY OF REHABILITATIVE SCIENCES
DEPARTMENT OF MEDICAL ENGINEERING**

**FINAL QUALIFYING EXAMINATION
FOR
CERTIFICATE IN MEDICAL ENGINEERING TECHNOLOGY**

PAPER: CLINICAL ENGINEERING THEORY

DATE: 22nd July 2021

TIME: 3 HOURS (9:00AM – 12:00 NOON)

INSTRUCTIONS

1. This paper consists of:
 - Section 1 (40 Multiple Choice Questions)
 - Section 2 (8 Short Answer Questions)
 - Section 3 (1 Long Answer Question)
2. Attempt **ALL** Questions
3. Write the **EXAMINATION NUMBER** given on all the answer sheets provided and on the question paper.
4. Ensure that all examination answer scripts are handed in at the end of the examination
5. Ensure you sign the examination register provided

EXAMINATION NUMBER

1. A clinical officer at certain health center observed while taking blood pressure of a patient that the bulb remains in a squeezed position after squeezing. What could be the possible fault of the blood pressure machine?
 - a) Outlet valve blocked
 - b) Inlet valve blocked
 - c) Release valve blocked
 - d) Filter at the top of the glass tube was blocked
2. Direct blood pressure measurement is sometimes to as?
 - a) Auscultatory method
 - b) Palpatory method
 - c) Oscillometric method
 - d) Invasive method
3. What is used to clean resistant dirt of optical section of diagnostic set?
 - a) Dry brush
 - b) Compressed air
 - c) A tissue soaked in xylene
 - d) Clean rag
4. Which of the following is a reason as to why exhausted batteries should not be left in a diagnostic set?
 - a) Corrosion
 - b) Deformation
 - c) Electrical short circuit
 - d) Electrical earth leakage
5. Which of the following is an advantage of pure electrical operation table?
 - a) Low capital investment
 - b) No skills in operation
 - c) Unlimited movement
 - d) Restricted use
6. Which of the following does not influence the degree of hemostasis during tissue cutting?
 - a) The shape of the electrode used
 - b) The intensity of the low frequency current and power

- c) The tissue properties
 - d) The characteristic of the high frequency waveform
7. When tissue is heated by electric current, heating is dependant on the following except?
- a) The distance between tissue and electrode
 - b) Duration of application
 - c) Current density
 - d) Specific resistance of the tissue
8. How often should a weighing scale be calibrated?
- a) Every day
 - b) Every alternate day
 - c) Every week
 - d) Every month
9. Which among the following is NOT a prerequisite of a good weighing scale?
- a) Have a rechargeable battery
 - b) Should be made of non- stick plastic
 - c) Reproducibility of weights measured
 - d) Easy to clean the baby tray
10. How can absorbance and Transmittance of a colorimeter be mathematically expressed?
- a) $A = \log_{10} \frac{1}{T}$
 - b) $A = ECL$
 - c) $A = \frac{I_t}{I_o}$
 - d) $A = \frac{I}{T}$
11. The cutting effect of the surgery hand piece used in dental depends on the following factors, which one is NOT among the factors?
- a) Shape of the electrode
 - b) State of the tissue
 - c) Duration of action
 - d) Type of voltage
12. Which of the following part does not belong to the anaesthetic machine?
- a) Oxygen flush valve

- b) Pop off valve
 - c) Leads
 - d) Canisters
13. What is the process of restoring the ion exchange resins of a demineralizer?
- a) Softening
 - b) Exhaustion
 - c) Restoration
 - d) Regeneration
14. What is the importance of humidity in the infant incubator?
- a) To minimize cross – infection
 - b) To minimize the vapour loss from the baby
 - c) To keep temperature constant
 - d) To ensure hygienic and sterility
15. Who among the following personnel operates from the sterile theatre zone?
- a) The theatre nurse
 - b) The theatre assistant
 - c) The anesthetist
 - d) The theatre biomedical technician
16. What are the applications of centrifugation?
- a) To separate two miscible substances and analyze the hydro dynamic properties
 - b) To separate two miscible substances and water treatment
 - c) Purification of mammalian cells and water treatment
 - d) Analyze the hydro dynamic properties of macromolecules and water treatment
17. What is the maximum speed of low speed centrifuge?
- a) 1000 – 2000rpm
 - b) 2000 – 3000rpm
 - c) 3000 – 4000rpm
 - d) 4000 – 5000rpm
18. What is the temperature range of a hot air oven?
- a) $0^{\circ}C$ - $100^{\circ}C$
 - b) $50^{\circ}C$ - $100^{\circ}C$

- c) $0^{\circ}\text{C} - 300^{\circ}\text{C}$
 - d) $50^{\circ}\text{C} - 300^{\circ}\text{C}$
19. How is heat transferred in bacteriological incubator?
- a) Radiation and thermal convectional
 - b) Thermal conduction and thermal convectional
 - c) Thermal conduction
 - d) Thermal insulation and thermal conduction
20. Which one of the following is a disadvantage of electromechanical theatre table?
- a) Theatre unsafe
 - b) Limited movement
 - c) Unhygienic
 - d) Long patient preparation
21. What is the function of tumbler filling?
- a) To clean and dry cavity
 - b) Suck the saliva
 - c) Patients to rinse their mouth
 - d) To drain the water
22. Which type of electrode is not used in the surgical diathermy?
- a) Needle electrode
 - b) Lead I, and III
 - c) Loop electrodes
 - d) Coagulation electrodes
23. The electrodes used in PH measurement have which of the following internal resistance?
- a) Very low resistance
 - b) Very high resistance
 - c) Moderate resistance
 - d) No resistance
24. Which of the following is not a defective in PH meter?
- a) Defective electrode
 - b) Defective Input circuitry
 - c) Defective electronic circuit

- d) Defective calibration
25. Which among the following is not the best method for storing Medical gases?
- a) Medical gases should be stored in a wet place for cooling
 - b) Medical gases should be stored in a well ventilated area
 - c) Medical gases should be stored in a clean area
 - d) Medical gases should be stored near combustible materials
26. Which is the best method of eliminating electrostatic sparks in the theatre?
- a) All portable operating rooms must not be connected through conductive material to the floor
 - b) Sparkless switches should not be installed in the portable operation room
 - c) All operating rooms should be connected through a conductive material to the floor
 - d) If conductive floors are used, wet towels should be used from the table to the floor
27. In which of the following ways can zero drift be used in PH meter?
- a) Using filter
 - b) Using balanced and differential amplifiers
 - c) Giving zero adjustment arrangement
 - d) Keeping the input impedance high
28. How is the vacuum control valve fitted to adjust the degree of vacuum required in a medical suction machine regulated?
- a) Releasing the vacuum to the atmosphere
 - b) Opening the suction circuit to allow vacuum in
 - c) Opening the suction circuit to allow secretion in
 - d) Opening the suction circuit to allow air in.
29. What is the function of nitrous oxide gas?
- a) As a diluent for pure oxygen
 - b) Detoxification for heroin addicts
 - c) In general anesthesia for producing analgesic and anaesthetic effect
 - d) As a carrier gas for volatile anesthetic agents
30. A unit bar is used to measure atmospheric pressure, 1 bar is about the same pressure caused by?
- a) 10m meters high column of water

- b) 10 meters high column of mercury
 - c) 10 cm high column of water
 - d) 100cm high column of mercury
31. Which of the following is not true about direct method of blood measurement?
- a) It is a complex procedure which involves a lot of risk
 - b) It allows continuous beat to beat blood pressure monitoring
 - c) It allows accurate blood pressure reading
 - d) It works effectively and easy to operate
32. Which of the following refers to the superficial tissue destruction without affecting deep seated tissues in electro surgery?
- a) Bipolar coagulation
 - b) Electrosurgical fulguration
 - c) Electrosurgical cutting
 - d) Electrosurgical desiccation
33. Which of the following is not a wave form for electrosurgical unit?
- a) Coag wave form
 - b) Blended waveform
 - c) Trapezium waveform
 - d) Cut waveform
34. Which of the following is not a requirement in operating theatre?
- a) Reflective wall finishes
 - b) Adequate space
 - c) Fewer space
 - d) Smooth wall
35. The actual service life of a dental chair is influenced by the following except?
- a) Environment
 - b) Extent of use
 - c) Cleaning and maintenance when necessary
 - d) Preventive maintenance of normal service
36. What are the components of ECG monitor?
- a) Alarm system, communication links, EEG sensor

- b) Display, Communication links, cannular needle
 - c) Sensors, transducers, Display
 - d) Cannular needle, transducer, sensor
37. Which one of following lists of elements used in the infant incubator to fulfill the hygiene requirements?
- a) Micro filters, distilled water
 - b) Controlled personnel and electric heater
 - c) Cleanliness and fan
 - d) Fan and thermometer
38. The following are characteristics of beam balances except?
- a) Beam balances are used in laboratories and pharmacy for weighing chemicals
 - b) Beam balance have to be exactly levelled to allow accurate weighing
 - c) The object to be weighed is compared with the calibrated weight
 - d) Used to weigh objects in grams only
39. Which of the following is a dental unit accessory?
- a) Micro – motor hand piece
 - b) Ultrasonic hand piece
 - c) Turbine hand piece
 - d) Spray vit
40. Which one is not a pneumatic system used in the dental chair ?
- a) Directional control valve
 - b) Motor driven compressor
 - c) Turbine hand piece
 - d) Air receive

SECTION 2

1. Explain how Photoelectric Colorimeter can be easily used to measure the ability of any solution to absorb the light waves of various wavelengths 5 marks
2. How are the below tests performed during the calibration of weighing equipment?
 - i) Repeatability test 2.5 marks
 - ii) Weighing test 2.5 marks
3. Name the FIVE types of hot air oven used in sterilization 5 marks
4. i) Explain how nitrogen is adsorbed in the first molecular sieve bed in an oxygen concentrator 2 marks
 - ii) What is the process of switching the sieve beds in oxygen concentrator? 1 mark
 - iii) What is the function of switch valve in oxygen concentrator? 2 marks
5. State the uses of the Five types of medical gas used in the hospital 5 marks
6. What are some of the preventive maintenance carried out on anaesthetic vaporizer? 5 marks
7. What are some of the monthly maintenance requirements for a dental chair? 5 marks
8. What is the procedure of operating a suction machine? 5 marks

SECTION 3

1. a) As a biomedical technician, what are some of the preparations you should consider before you start calibration of weighing equipment? 10 marks
 - b) State any FIVE advantages of hot air oven over autoclave 5 marks
 - c) What are some of the safety precautions that should be taken when cleaning or disinfecting ECG cables and lead wires? 5 marks