



**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: 24th February 2022

TIME: 3 HOURS (9:00AM – 12:00 PM)

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

CLINICAL ENGINEERING

SECTION 1

MULTIPLE CHOICE QUESTIONS

40 MARKS

1. What is the maximum reading for BP machine?
 - a) 300mmHg
 - b) 3000mmHg
 - c) 200mmHg
 - d) 180mmHg
2. Listed below are part of vacuum extractor, which one is not
 - a) Vacuum bottle
 - b) Pressure gauge
 - c) Vacuum regulator
 - d) Bacterial filter
3. Which among the following is not a unit of air pressure measurement?
 - a) Bar
 - b) Psi
 - c) N/m^2
 - d) mmHg
4. Which one of the following is the function of laryngoscope?
 - a) Check the eye
 - b) Check the ear
 - c) Check the nose
 - d) Assist in inserting endotracheal tube
5. What causes the bulb of the BP machine to remain squeezed when squeezed?
 - a) Inlet valve lockage
 - b) Outlet valve blockage
 - c) Release valve blockage
 - d) None of the above
6. Which one of the following statements is true about the upholding sterility in the infant incubator?
 - a) Installation of micro fitters
 - b) Use of distilled water
 - c) Transparent and easy to clean canopy
 - d) All of the above
7. What type of balance is used to measure light objects?
 - a) Spring balance
 - b) Beam balance
 - c) Lever balance
 - d) None of the above

8. The following are medical gases which one is not correctly matched with its function
- a) Oxygen life support
 - b) Nitron oxide anesthetic
 - c) Carbon dioxide gas loss of pain
 - d) Medical air- driving gas
9. Semi-permanent dirt in the optical section of the diagnostic set is removed by
- a) Wire brush
 - b) Soft brush
 - c) Soaking in hydraulic acid
 - d) Soaking in xylene
10. Heat water to produce steam, cool steam to condense to water. Which method of water treatment is described above
- a) De-ionization
 - b) Distillation
 - c) Re-verse osmosis
 - d) Purification
11. Sterilization involves the use of a physical or chemical procedure to
- a) Remove visible soil from surgical instruments
 - b) Destroy none-pathogenic organisms
 - c) Destroy all forms of microbial life including highly resistant bacterial spores
 - d) Destroy all forms of microbial life except highly resistant bacterial spores
12. What is the purpose of a fuse connected to the medical equipment?
- a) Protects the equipment for over current
 - b) Protects the equipment in case of short circuit
 - c) Isolate the equipment in case of faulty circuit
 - d) All of the above
13. Which of the following is true for microscope filters?
- a) They improve image contrast
 - b) They increase light intensity
 - c) They produce infrared rays
 - d) They produce colored image
14. Why is it important to test between live and body of the equipment before you hand it over to the user
- a) To ensure the equipment is safe
 - b) To ensure the equipment has enough current
 - c) To ensure the equipment has enough voltage
 - d) To check if the heart is connected properly

15. What is the function of a tachogenerator in an infant incubator?
- Fan-fail detector
 - Fan motor speed control
 - Supply emergency d.c
 - Supply power to audio alarm
16. Under what conditions can you carry the windings of a suction machine motor
- Power on and meter set at ohms range
 - Power off and meter set at ohms range
 - Power on and Set at ampere range
 - Power on and meter set at voltage range
17. Which type of transformer is suitable for operating theatre table?
- Auto-transformer
 - Step-down transformer
 - Isolation transformer
 - Current transformer
18. You are required to order for the bulbs of ophthalmoscope, below are factors to consider which one is true
- Terminal thread or pin type
 - Voltage and wattage rating
 - Size and shape of the bulb
 - All of the above
19. Which of the following statements is true?
- Sliding weight balance is equipped with two known weight which can be moved on setting scales (one micro, the other macro)
 - Analytical balance functions by comparing known weight masses with that of substance of unknown weight
 - For the spring balance, its function is based on a mechanical property of spring as the force exercised on a spring is proportional to the springs elasticity constant
 - Substitution balance is a balance with a single plate. A known mass is placed on the weighing plate
20. Biomedical engineering students on attachment at Kenyatta Hospital were required to replace a faulty power cable of a centrifuge. Which one below is the correct steps of ordering of the material
- 1.5m² twin with earth 2 meters
 - 1.5m² two wire cable 2 meters
 - 2.5m² twin with earth 2 meters long
 - 2.5m² two wire cable 2 meters long

21. The following are supplies in the dental department, which one is not?
- a) Water
 - b) Vacuum
 - c) Drainage
 - d) Nitrous oxide
22. How does vacuum control valve of a suction machine work?
- a) Allow air for atmosphere
 - b) Vent the vacuum out
 - c) Slow down the pump
 - d) Block the pump from sucking air
23. What is the function of the PH meter?
- a) Used for determining the concentration of hydrogen
 - b) Measures the mass of body
 - c) Used in the laboratory to carry out inactivation process
 - d) Used to purify water
24. Which type of lenses are used in the microscopes
- a) Concave
 - b) Convex
 - c) Plain mirrors
 - d) Both A and B
25. Which one of the following is not a function of the water supplied to the dental unit?
- a) Driving the pneumatic tools
 - b) For the patient to rinse his/her mouth
 - c) Flushing the cuspidor bowl
 - d) Cooling the tool during the drilling/grinding procedures
26. Which component is used to initiate light automatic change in the theatre light
- a) Contactor
 - b) Isolator switch
 - c) Filters
 - d) Can and follower
27. What is the color of carbon dioxide gas cylinder?
- a) Black with white strip
 - b) Grey
 - c) Blue
 - d) Maroon
28. What causes the preselected volume of air to flow into the patient by communicating directly with breathing circuit?
- a) Nebulizer
 - b) Microcontroller
 - c) Bellows
 - d) Humidifier

29. Which one among the following statements about compressed air is not correct?
- a) Forced air
 - b) Reduced air
 - c) Condensed air
 - d) Pressured air that is forced into a smaller space
30. What is the purpose of hot air oven?
- a) Sterilization
 - b) Baking
 - c) Incubation
 - d) Culture and sensitivity tests
31. The type of motor used in laboratory centrifuge is
- a) Capacitor start motor
 - b) Shaded pole motor
 - c) Split phase motor
 - d) Universal motor
32. What is the purpose of hanging chains on the theatre table to floor?
- a) To dissipate any accumulative changes
 - b) To reinforce the stability of the theatre table
 - c) To hold auxiliary attachment
 - d) Controls up and down movements of theatre table
33. The safety device that is used to protect the heating elements of an autoclave against the overheating caused by dry boiling is
- a) Pressure switch
 - b) Safety valve
 - c) Solenoid valve
 - d) Float switch
34. It generates regular impulse because they are electrically unstable referred to as pace-maker which part of the heart is referred to above
- a) S.A node
 - b) A.V node
 - c) A.V bundles
 - d) Bundles of His
35. Which type of single-phase motor is used for the theatre suction machine?
- a) Capacitor-start motor
 - b) Capacitor-start capacitor-run motor
 - c) Shade pole motor
 - d) Capacitor-run motor

36. Sprayvit hand piece is connected with the following supplies Except
- Water
 - Compressed air
 - Medicine
 - Lubricating oil
37. The following are types of bacteriological incubators. Which one is not?
- Gravity convection type
 - Forced convection type
 - Fixed temperature type
 - Stirred type
38. The following are requirements for compressed air supplied to the dental department. EXCEPT
- Pressure
 - Quality
 - Slow rate
 - Pipe dimension
39. Which of the following balances is used in medical laboratories?
- Actual molar concentration of hydrogen ions
 - Actual molar concentration of hydroxyl ions
 - The disillusion constant of the acid
 - Temperature
40. Which one of the following is not a need of a baby weighing scale?
- Check feeding of the baby
 - Check growth of the baby
 - For giving of medication
 - Weighing of the baby food stuff

SECTION 2

SHORT ANSWER QUESTIONS

40 MARKS

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|---|----|---|---------|
| 1 | a | State any three advantages of using high frequency current in the electrosurgical equipment | 3 marks |
| | b | State any two methods of sterilization | 2 marks |
| 2 | a | Name the type of motor which is commonly used in the medical suction machine | 1 mark |
| | b | State one main safety hygiene precaution taken while handling medical suction machine | 1 mark |
| | c | State three commonly used types of pumps in a medical suction machine | 3 marks |
| 3 | a | Name two major parts of the following diagnostic set equipment's | |
| | i | Ophthalmoscope | 2 mark |
| | ii | Lanyrygnoscope | 2 mark |
| | b | What is the purpose of a rheostat in the diagnostic set? | 1 mark |

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|---|-----|--|---------|
| 4 | a | Name two measurements which digital blood pressure machine gives | 2 marks |
| | b | What picks the sound variations in analogue blood pressure machine? | 1 mark |
| | c | State two categories of blood pressure measurement | 2 marks |
| 5 | | Outline the five steps when checking the proper functioning of a blood pressure (BP) machine | 5 marks |
| 6 | a | The three main gases that are supplied to anaesthetic machine | 3 mark |
| | b | Which medical gas is referred to as laughing gas | 1 mark |
| | c | Which gas is used for blending purposes | 1 marks |
| 7 | a | State the function of the following lab equipment | 5 marks |
| | i | Centrifuge | 1 mark |
| | ii | De-ionizer | 1 mark |
| | iii | Microscope | 1 mark |
| | iv | P.H meter | 1 mark |
| | v | Flame photometer | 1 mark |
| 8 | a | State four risks encountered in operation theatre room | 4 marks |
| | b | What is the color code of nitrous oxide cylinders used in Kenya | 1 mark |

SECTION 3 LONG ANSWER QUESTION 20 MARKS

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|---|----|---|---------|
| 1 | a | Explain three functions of air compressor in a dental unit | 3 marks |
| | b | Explain the importance of maternity bed | 2 marks |
| | c | Explain how basic requirement of an infant incubator is achieved | 8 marks |
| | d | Discuss maintenance done on electric suction machine made of vane pumps under the following major parts | |
| | i | Pumps | 3 marks |
| | ii | Motors | 4 marks |