



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

**FINAL QUALIFYING EXAMINATION  
FOR  
CERTIFICATE IN MEDICAL ENGINEERING TECHNOLOGY  
PAPER: CLINICAL ENGINEERING TECHNOLOGY THEORY**

**DATE: 2<sup>nd</sup> February, 2023**

**TIME: 3 HOURS (9:00 A.M – 12 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. All multiple choice questions **MUST** be answered in **CAPITAL LETTERS**
4. Write the **EXAMINATION NUMBER** given on all the answer sheets provided and on the question paper.
5. Ensure that all examination answer scripts are handed in at the end of the examination
6. Ensure you sign the examination register provided

**EXAMINATION NUMBER .....**

**CLINICAL ENGINEERING****SECTION 1: MULTIPLE CHOICE QUESTION (40 MARKS)**

1. High frequency currents are used for surgical purposes which involves?
  - A. Recording electrical activities in the heart
  - B. Protects patient against burn
  - C. Measuring amount of anesthetic gases flow in vaporizers
  - D. Cutting and coagulation
2. The laboratory equipment below are matched with their functions. Which one is wrongly matched?
  - A. Autoclave – used wet sterilization
  - B. Hot air oven – used in sterilizing glass ware
  - C. Spectrometer – used into determine the concentration of elements
  - D. Bacteriological incubator – used to kill microbes in instrument
3. Diopters is the unit of ability of the lens to magnify or diminishes the image. What determines it?
  - A. Refraction index
  - B. Focal length in meters
  - C. Reflection index
  - D. The reciprocal of focal length in meters
4. What leads to the corrosion of rheostat winding in a diagnostic set electrical system?
  - A. High current rating
  - B. High resistance
  - C. Open circuits
  - D. Short circuit
5. Which of the following statements describes the features of a steam generating vessel?
  - A. The generating vessel should be well insulated to prevent heat loss
  - B. The generating vessel should have a means of checking water level
  - C. The generating vessel should not be insulated to allow heat transfer
  - D. The generating vessel should not be a closed vessel to prevent explosion
6. A laboratory technician complained that the laboratory hot air oven showed heating errors. What could have been the probable cause of the error?
  - A. The circuit breaker was defective
  - B. The control was defective
  - C. The oven was not connected to the power
  - D. The connector cable was defective
7. The alternative method of blood pressure measurement in which stethoscope is not used to listen to Korotkoff sounds is called?
  - A. Pulsetory
  - B. Palpatory
  - C. Auscultatory

- D. Auscultoury
8. The ophthalmoscope in a diagnostic set is used in the examination of which organ of the body?
    - A. Eyes
    - B. Nose
    - C. Mouth
    - D. Ears
  9. What is the possible cause for a patient to experience burns when utilizing the electro surgical unit?
    - A. Sparks produced by the electrosurgical unit
    - B. Loosely attached return electrode
    - C. Pre-existing holes in the gloves
    - D. Radiofrequency capacitive coupling
  10. What is the purpose of using heat sensitive strips during autoclaving?
    - A. To check correct pressure of the machine
    - B. To check correct temperature of the machine
    - C. To check correct exposure time
    - D. To check on quality of the products
  11. In sterilization done by autoclave, the exposure to steam is done at what temperature
    - A. 120° C
    - B. 170° C
    - C. 121° C
    - D. 116° C
  12. Vacuum is one of the supplies in medical department. What is its pipeline colour code?
    - A. Blue
    - B. Grey
    - C. Yellow
    - D. Orange
  13. Which of the following does not comprise the functions of an anaesthetic machine?
    - A. Method of measuring flow rate of gases
    - B. Apparatus for scavenging anaesthetic gases in order to minimize environmental pollution
    - C. Means of supplying gases either from attached cylinders or from piped medical supplies
    - D. Breathing system and ventilator for delivering of gas
  14. What are the needs of a diathermy in medical field?
    - A. Surgical and therapeutic
    - B. Diagnostic and rehabilitative
    - C. Therapeutic and diagnostic
    - D. Surgical and rehabilitative



15. In centrifugation, which of the following forces is not used?
  - A. Centripetal force
  - B. Gravitational force
  - C. Centrifugal force
  - D. Electrostatic force
16. Which of the following pumps require least maintenance attention?
  - A. Piston pump
  - B. Venture pump
  - C. Diaphragm pump
  - D. Rotary pump
17. Which part of microscope is used to collect and focus light from the illuminating into the specimen
  - A. Condenser
  - B. Stage
  - C. Objective lenses
  - D. Aperture
18. The normal ECG tracing consist of the waves, which one of the waves represents the relaxation of ventricular muscles?
  - A. P-wave
  - B. T-wave
  - C. QRS-wave
  - D. S-wave
19. A water bath in the laboratory was reported having the problem of the water not getting hot. What is the probable cause of the problem?
  - A. The fuse is defective
  - B. The water bath is not connected
  - C. The switch is defective
  - D. The temperature control is not set
20. Which of the following is correctly matched with its meaning?
  - A. Desiccation – dehydration of tissue
  - B. Fulguration – electro-surgical dissection
  - C. Cutting – carbonization of tissue surface
  - D. Coagulation – carbonization of tissue surface
21. Which one of the following hand piece is used to remove tooth tissue efficiently and quickly with no pressure heat and vibration?
  - A. High speed hand piece
  - B. Electric hand piece
  - C. Low speed hand piece
  - D. Surgical hand piece

22. Semi-permanent dirt in the optical section of the diagnostic set is removed by?
- A. Wire brush
  - B. Soaking in xylene
  - C. Soft brush
  - D. Soaking in hydraulic acid
23. The main function of the zeolite through which air passes is?
- A. To remove nitrogen
  - B. To remove carbon dioxide
  - C. To remove Sulphur dioxide
  - D. To remove extra water content of the atmospheric air
24. The best statement to justify the need of two zeolite cylinders is?
- A. The period of oxygen outflow from one, coincides with the discharge of nitrogen from the other so that a continuous supply of oxygen enriched gas is delivered to the patient
  - B. Aluminum trisilicate removes nitrogen very efficiently
  - C. The presence of lithium in two cylinders helps in the delivery of oxygen enriched air
  - D. Removal of nitrogen increase the oxygen concentration by 50% only if one cylinder is present
25. Which one of the following is not part of tumbler filling circuit?
- A. Sight glass
  - B. Electric heater
  - C. Solenoid valve
  - D. Water filter
26. Differential centrifugation is based on the differences in ----- of biological particles of different ----
- A. Sedimentation rate, size and density
  - B. Size and structure
  - C. Size and density
  - D. Mass, and size
27. Why is steel wool used in fractional distillation?
- A. Increases the surface area
  - B. Improve the separation between the liquids
  - C. Increases the surface area and improve the separation between the liquids
  - D. Increases the surface area and the quality of the distillate
28. Which one of the following switches is safe for use in suction pumps?
- A. Mercury switch
  - B. Series switch
  - C. Toggle switch
  - D. Rotary switch

29. What kind of lights exists in the operational Theatre?
  - A. Fluorescent lamps
  - B. LED lights
  - C. Tungsten light
  - D. LCD
30. What is the purpose of bottle selection in the machine suction machine?
  - A. To control the flow of the fluid to the bottle
  - B. Exchange the bottle once the other one is full
  - C. It is anti-over flow device
  - D. Allows the fluid to be discharged for the bottle
31. The ability of the balance to produce the same result with one and the same load under the same measurement condition is known as?
  - A. Resolution
  - B. Accuracy
  - C. Repeatability
  - D. Linearity
32. Electrical power supply to the diagnostic set is from?
  - A. Dry cell batteries
  - B. Transformers
  - C. Wall socket
  - D. Automobile batteries
33. Which statement below best describe a compound light microscope?
  - A. It passes electrons through something to make s 3-D image
  - B. It sends electromagnetic waves through the body to make images
  - C. It uses lenses to magnify small object
  - D. It passes electrons through something to make flat images
34. The procedure done by a technician to check the accuracy of laboratory weighing equipment through off center load is?
  - A. Capacity
  - B. Calibration
  - C. Corner load
  - D. Drift
35. 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.



36. Which one of the following statement does not explain correction function of compressed air supplied to the dental unit?
- Flushing the cuspidor bowl
  - Cushion bearing for some turbine motors
  - Combines with water to effect a mist spray for cleaning of the treatment area
  - Operates the pneumatic controls
37. Which one of the following hand pieces requires drainage connection?
- Spray vit
  - Fiber optic
  - Cuspidor bowl
  - Ultrasonic hand piece
38. The following are statements about invasive blood pressure measurement. Which one is not?
- It's painful
  - It's Costly
  - Require surgery
  - It entails continuous monitoring
39. How is the total magnification in a high microscopy is obtained?
- Magnification power of objective lens
  - Magnification power of eye piece
  - Magnification power of both objective lens and eye
  - Magnification power of condenser
40. Which one of the following part of a laryngoscope serves to guide the instrument and deflect interference tissues?
- Flange
  - Blade
  - Spatula
  - Break

## **SECTION 2: SHORT ANSWER QUESTION (40 MARKS)**

41. Explain the function of the following
- Safety valves (1 mark)
  - Solenoid valve (1 mark)
  - Pressure switches (1 mark)
  - Float valves (1 mark)
  - PH meter (1 mark)
42. Highlight the general maintenance procedure for the PH meter's body (5 marks)
43. Name and briefly explain the two broad categories of leads in the ECG machine (5 marks)
44. State any five characteristics that an operating theatre lamp should possess (5 marks)
45. a) Which are the two types of human body pressure measured in the hospital (2 marks)
- b) Name three types of sphygmomanometers used in the hospital (3 marks)

46. a) State two types of the microscope (2 marks)
- b) Define the following terms as used in the microscope
- i. Resolving power (1 mark)
  - ii. Numerical aperture (1 mark)
  - iii. Resolution (1 mark)
47. State the function of the following laboratory equipment
- i. Water distiller (1 mark)
  - ii. Bacteriological incubator (1 mark)
  - iii. Water bath (1 mark)
  - iv. Colorimeter (1 mark)
  - v. Centrifuge (1 mark)
48. State the function of the following parts of a centrifuge
- i. Lid-lock (1 mark)
  - ii. Lid-switch (1 mark)
  - iii. Tacho-generation (1 mark)
  - iv. Out of balances sensor (1 mark)
  - v. Safety interlock (1 mark)

### SECTION 3: LONG ANSWER QUESTION (20 MARKS)

49. With the piping layout of the vertical movement of a dental chair provided

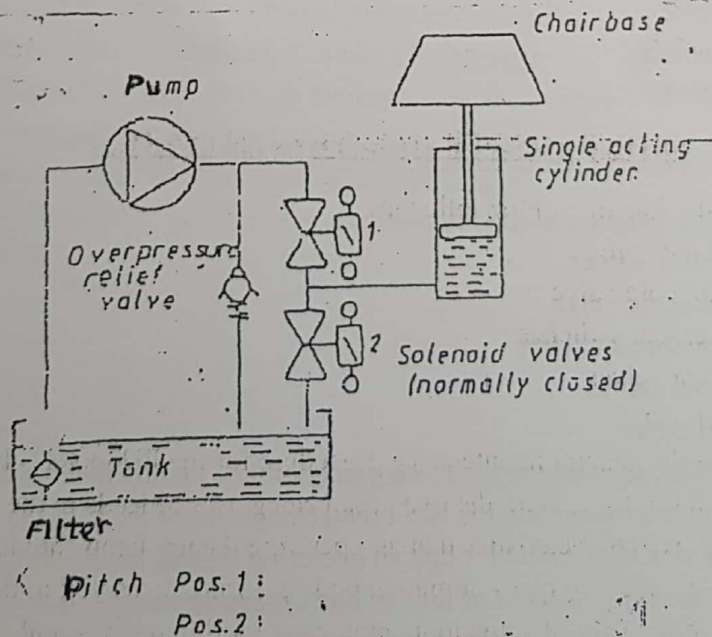


Fig. 1



- a) Draw a control circuit diagram which can be used to achieve the movement (5 marks)
- b) Briefly explain the operation of the circuit (5 marks)
- c) State five faults and their remedies in the above system (10 marks)