TEVETA

Technical Education, Vocational and Entrepreneurship Training Authority

DIPLOMA IN BIOMEDICAL ENGINEERING TECHNOLOGY

LEVEL 6 YEAR II EXAMINATION

FINAL INTEGRATED SUMMATIVE EXAMINATION

SITTING: JULY /AUGUST 2026

SUBJECT: MEDICAL GASES

TIME: THREE (3) HOURS **TOTAL MARKS: 100**

PASS MARK: 50

INSTRUCTIONS TO CANDIDATE

1. Write your Examination number and National Registration Card (NRC) number on the answer booklet provided. Ensure you append your signature in the space provided on the answer booklet.
2. Write the ANSWER SCRIPT SERIAL NUMBER on the examination register and on the entry slip.
3. This paper has TWO (2) Sections.
   - Answer ALL questions in section A
   - Answer FIVE (5) questions in Section B. Question one (1) is compulsory then answer any other four (4) questions from the remaining six (6) questions.
4. Diagrams may be used where necessary to clarify your answer.
5. Cell phone and programmable calculators are not allowed in the examination room.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION A- MULTIPLE CHOICE QUESTION **[TOTAL: 20 MARKS]**

ANSWER ALL QUESTIONS BY CHOOSING THE BEST OPTION

1. The main purpose of a manifold system in hospitals is:
A. Sterilization of equipment
B. Distribution and regulation of medical gases
C. Monitoring patient of patient oxygen saturation
D. Storage of surgical tools

2. Which gas is most critical for patient survival in manifold systems?
A. Nitrous oxide
B. Oxygen
C. Carbon dioxide
D. Helium

3. Failure of a manifold system during surgery may lead to:
A. Increased hospital bills
B. Interruption of oxygen supply
C. Delay in sterilization
D. Staff shortage

4. Biomedical engineering technologists ensure manifold systems operate safely by:
A. Administering drugs
B. Calibrating gauges and alarms
C. Performing surgery
D. Scheduling nurses

5. Which of the following is NOT a responsibility of biomedical technologists?
A. Preventive maintenance
B. Fault diagnosis
C. Patient diagnosis
D. Documentation

6. Proper functioning of manifold systems prevents:
A. Cylinder theft
B. Pressure fluctuations damaging equipment
C. Staff absenteeism
D. Overcrowding in wards

7. Manifold systems switch between cylinders to:
A. Save electricity
B. Ensure continuous gas supply
C. Reduce staff workload
D. Increase cylinder lifespan

8. Calibration of manifold gauges ensures:
A. Accurate pressure readings
B. Faster cylinder replacement
C. Reduced patient waiting time
D. Lower hospital costs

9. Documentation in manifold maintenance is important because:
A. It tracks patient recovery
B. It ensures compliance with standards
C. It reduces cylinder size
D. It improves staff scheduling

10. Preventive maintenance of manifold systems includes:
A. Cleaning and inspection
B. Administering of oxygen to patients
C. Patient counselling on oxygen uses
D. Hiring staff of clean the manifold

11. Which hospital department relies most on uninterrupted oxygen supply?
A. Male medical ward
B. Intensive Care Unit (ICU)
C. Female ward
D. Radiology ward

12. A sudden drop in manifold pressure may cause:
A. Equipment malfunction
B. Staff panic
C. Increased hospital bills
D. Non of the above

13. Biomedical engineering technologists repair manifold faults such as:
A. Leaks and faulty regulators
B. Broken surgical theatre table
C. Suction machine low pressure
D. All of the above

14. Manifold systems are critical in hospitals because they:
A. Reduce staff workload
B. Guarantee emergency backup supply
C. Increase cylinder lifespan
D. Lower oxygen cost

15. Which of the following gases is commonly supplied through manifolds?
A. Oxygen and nitrous oxide
B. Hydrogen and oxygen
C. Chlorine and Carbon dioxide
D. Neon and Nitrogen

16. Biomedical engineering technologists maintain manifold systems to:
A. Ensure patient safety
B. Reduce hospital staff
C. Increase cylinder size
D. Improve hospital running efficiency

17. Pressure regulators in manifold systems are used to:
A. Control gas flow and pressure
B. Store surgical tools
C. Monitor patient vitals
D. Sterilize equipment

18. Faulty manifold alarms may lead to:
A. Delayed detection of cylinder depletion
B. Increased patient satisfaction
C. Reduced staff workload
D. Faster cylinder replacement

19. Biomedical engineering technologists record manifold inspections to:
A. Track compliance and safety
B. Monitor patient weight
C. Reduce staff workload
D. Increase cylinder lifespan

20. Proper manifold functioning ensures:
A. Continuous gas supply and patient safety
B. Reduced hospital bills
C. Faster staff promotions
D. Increased cylinder size

SECTION B: **TOTAL MARKS: 80**

THERE ARE SEVEN (7) QUESTIONS IN THIS SECTION, ANSWER FIVE (5) QUESTIONS. QUESTION ONE (1) IS COMPULSORY.

QUESTION 1 (COMPULSORY)

a) Explain **four (4)** reasons for proper functioning of manifold systems in hospital medical gas supply. [12 marks]

b) Describe **four (4)** responsibilities of biomedical engineering technologists in maintaining manifold systems. [8 marks]

[TOTAL MARKS 20]

QUESTION 2

a) List **five (5)** preventive maintenance practices for medical gas gauges to ensure reliability and safety. [5 marks]

b) Explain **five (5)** safety measures that must be observed when handling and maintaining gauges and regulators in hospital gas systems. [10 marks]

[TOTAL MARKS 15]

QUESTION 3

a) State the colour code of the reticulation system of the following:

i) Vacuum [1 mark]

ii) Oxygen [1 mark]

iii) Medical air [1 mark]

iv) Nitrous oxide [1 mark]

b) Indicate:

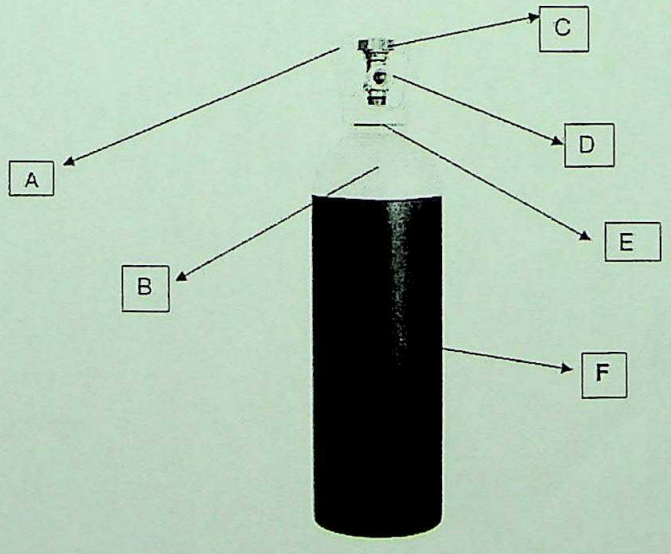
i) **five (5)** safety features of a reticulation system. [5 marks]

ii) **Six (6)** department which usually have the reticulation system. [6 marks]

[TOTAL MARKS 15]

QUESTION 4

a) Label the following parts A, B,C, D, E and F of a cylinder below. [6 marks]



b) Describe the colour coding of the following gas cylinder according to ISO standard
   i) Oxygen cylinder [3 marks]
   ii) Carbon dioxide cylinder [2 marks]
   iii) Nitrous oxide cylinder [2 marks]
   iv) Nitrogen cylinder [2 marks]

[TOTAL MARKS 15]

QUESTION 5

a) State **three (3)** types of pressure regulators [3 marks]
b) List **four (4)** safety consideration when using pressure regulators. [4 marks]
c) Explain **four (4)** ways of maintaining pressure regulator. [8 marks]

[TOTAL MARKS 15]

QUESTION 6

a) Define fractional distillation [2 marks]
b) List:
   i) **Four (4)** major parts of a liquid oxygen plant. [4 marks]
   ii) **Four (4)** safety features of a Vacuum Insulated Evaporator (V.I.E). [4 marks]
c) Explain the process of liquid oxygen production. [5 marks]

[TOTAL MARKS 15]

QUESTION 7

a) List **four (4)** types of oxygen delivery masks. [4 marks]
b) State the types of oxygen deliver mask to be used when delivering the following rates.
   i) 1 LPM – 6 LPM [1 mark]
   ii) 6 LPM – 10 LPM [1 mark]
   iii) 10 LPM – 15 LPM [1 mark]
c) Describe the working principle of non-heated humidifier bottle in humidifying oxygen. [8 marks]

[TOTAL MARKS 15]