



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.

Tel: +254 (0)799529958, +254 (0)799529959, +254 (0)712524293

Website: [www.must.ac.ke](http://www.must.ac.ke) Email: [info@must.ac.ke](mailto:info@must.ac.ke)

---

## UNIVERSITY EXAMINATIONS 2023/2024

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN  
NURSING

### NND 3112/NNU 3112: MEDICAL PHYSIOLOGY I

**DATE: DECEMBER 2023**

**TIME: 2 HOURS**

---

**INSTRUCTIONS:** Answer all questions in the booklet provided

Ensure that all your answers are properly numbered

Section One: Multiple Choice Questions (MCQs): Write the correct answer on the space provided in the answer booklet. Each MCQ is one mark.

Section Two: Short Answer Questions – Answer questions following each other on the answer booklet

Section Three: Long Answer Questions – Answer the questions on the answer booklet

All questions are compulsory

---

### SECTION 1 MULTIPLE CHOICE (20 MARKS)

1. Which list below contains the four types of tissue?
    - a) Extracellular fluid, skeletal tissue, glandular tissue, connective tissue.
    - b) Extracellular fluid, muscle tissue, glandular tissue, cartilaginous tissue.
    - c) Neural tissue, skeletal tissue, epithelial tissue, cartilaginous tissue.
    - d) Neural tissue, muscle tissue, epithelial tissue, connective tissue.
  2. The major lipoprotein source of the cholesterol used in cells is
    - a) chylomicrons
    - b) intermediate-density lipoproteins (IDLs)
-

- c) albumin-bound free fatty acids
  - d) LDL
3. G protein-coupled receptors
- a) are intracellular membrane proteins that help to regulate movement within the cell.
  - b) are plasma membrane proteins that couple the extracellular binding of primary signaling molecules to activation of small G proteins.
  - c) are plasma membrane proteins that couple the extracellular binding of primary signaling molecules to the activation of heterotrimeric G proteins.
  - d) are intracellular proteins that couple the binding of primary messenger molecules with transcription.
4. Gap junctions are intercellular connections that
- a) primarily serve to keep cells separated and allow for transport across a tissue barrier.
  - b) serve as a regulated cytoplasmic bridge for sharing of small molecules between cells.
  - c) serve as a barrier to prevent protein movement within the cellular membrane.
  - d) are cellular components for constitutive exocytosis that occurs between adjacent cells.
5. Which of the following has the slowest conduction velocity?
- a)  $A\beta$  fibers
  - b)  $A\gamma$  fibers
  - c) B fibers
  - d) C fibers
6. The action potential of skeletal muscle
- a) has a prolonged plateau phase
  - b) spreads inward to all parts of the muscle via the T tubules.
  - c) causes the immediate uptake of  $Ca^{2+}$  into the lateral sacs of the sarcoplasmic reticulum.
  - d) is longer than the action potential of cardiac muscle

7. The functions of tropomyosin in skeletal muscle include
- sliding on actin to produce shortening.
  - releasing  $\text{Ca}^{2+}$  after initiation of contraction.
  - binding to myosin during contraction.
  - acting as a "relaxing protein" at rest by covering up the sites where myosin binds to actin
8. The cross-bridges of the sarcomere in skeletal muscle are made up of
- actin.
  - myosin.
  - troponin.
  - tropomyosin
9. Fast excitatory postsynaptic potentials (EPSPs)
- are a consequence of decreased  $\text{Cl}^-$  conductance.
  - occur in skeletal muscle.
  - can be produced by an increase in  $\text{Na}^+$  conductance.
  - can be produced by a decrease in  $\text{Ca}^{2+}$  conductance.
10. Which of the following is a ligand-gated ion channel?
- VIP receptor
  - norepinephrine receptor
  - GABAA receptor
  - GABAB receptor
11. Which of the following normally has a slowly depolarizing "prepotential"?
- sinoatrial node
  - atrial muscle cells
  - bundle of His
  - Purkinje fibers
12. Currents caused by opening of which of the following channels contribute to the repolarization phase of the action potential of ventricular muscle fibers?
- $\text{Na}^+$  channels
  - $\text{Cl}^-$  channels
  - $\text{Ca}^{2+}$  channels
  - $\text{K}^+$  channels

13. Lymph flow from the foot is
- a) increased when an individual rise from the supine to the standing position.
  - b) increased by massaging the foot.
  - c) increased when capillary permeability is decreased.
  - d) decreased when the valves of the leg veins are incompetent
14. The velocity of blood flow
- a) is higher in the capillaries than the arterioles.
  - b) is higher in the veins than in the venules.
  - c) is higher in the veins than the arteries.
  - d) falls to zero in the descending aorta during diastole.
15. The forced vital capacity is
- a) the amount of air that normally moves into (or out of) the lung with each respiration.
  - b) the amount of air that enters the lung but does not participate in gas exchange.
  - c) the largest amount of air expired after maximal expiratory effort.
  - d) the largest amount of gas that can be moved into and out of the lungs in 1 min
16. Surfactant lining the alveoli
- a) helps prevent alveolar collapse.
  - b) is produced in alveolar type I cells and secreted into the alveolus.
  - c) is increased in the lungs of heavy smokers.
  - d) is a glycolipid complex
17. Lymphoid stem cells proliferate into?
- a) Erythrocytes
  - b) Granulocytes
  - c) Thrombocytes
  - d) Lymphocytes
18. T-lymphocytes include all of the following except—
- a) CD4
  - b) Plasma
  - c) CD8
  - d) Memory

19. During forced inspiration, this muscle spreads the ribs apart, thus increasing thoracic volume?
- Scaleness
  - External intercostal
  - Internal intercostal
  - Abdominal obliques
20. The correct order of mitotic phases just before cytokinesis would be?
- Prophase, Metaphase, Anaphase, Telophase
  - Prophase, Anaphase, Metaphase, Telophase
  - Prophase, Telophase, Metaphase, Anaphase
  - Prophase, Metaphase, Telophase, Anaphase
21. Uncompensated respiratory acidosis differs from uncompensated metabolic acidosis in that
- plasma pH change is always greater in uncompensated respiratory acidosis compared to uncompensated metabolic acidosis.
  - there are no compensation mechanisms for respiratory acidosis, whereas there is respiratory compensation for metabolic acidosis.
  - uncompensated respiratory acidosis involves changes in plasma  $[HCO_3^-]$ , whereas plasma  $[HCO_3^-]$  is unchanged in uncompensated metabolic acidosis.
  - uncompensated respiratory acidosis is associated with a change in  $PCO_2$ , whereas uncompensated metabolic acidosis occurs along the isobar line for  $PCO_2$

## **SECTION II: SHORT ANSWER QUESTIONS (40 MARKS)**

### **ATTEMPT ALL THE QUESTIONS IN THIS SECTION**

- Describe the neural control of breathing (5 marks)
- Describe the electrical conduction system of the heart during the generation of the heart beat (5 marks)
- By help of a diagram, illustrate the transmission of an electrical impulse along myelinated neuron process (5 marks)
- Describe the ways  $CO_2$  is carried in blood (5 marks)
- State the physiological characteristics of the myocardium to its function (5 marks)

6. Describe the properties that make the alveolar capillary membrane well adapted to its function (5 marks)
7. Enumerate five factors that determine the speed of neuronal conduction (5 marks)
8. Define negative feedback mechanism and describe two examples (5 marks)

**SECTION III: LONG ANSWER QUESTIONS (40 MARKS)**

**ATTEMPT ALL QUESTIONS IN THIS SECTION**

1. A) Explain following terms as used in the respiratory system (10 marks)
  - a) Total lung capacity
  - b) Tidal volume
  - c) Vital capacity
  - d) Respiratory rate
  - e) Inspiration reserve volume
- B) Other than respiration, discuss other functions of the respiratory system? (10 marks)
2. With reference to Synapse
  - A. Using a diagram, describe the major types of synaptic transmission? (10 marks)
  - B. Giving examples, classify the various neurotransmitters based on chemical structure (10 marks)