50

(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS (MAIN PAPER)

2023/2024 ACADEMIC YEAR
FORTH YEAR FIRST TRIMESTER EXAMINATIONS
FOR THE DEGREE
OF
BACHELOR OF SCIENCE IN MEDICAL BIOTECHNOLOGY

COURSE CODE: BMB 413

COURSE TITLE: NEUROSCIENCE

DATE: 7TH DECEMBER 2023 **TIME: 2.00-4.00 PM**

INSTRUCTIONS TO CANDIDATES

This paper is divided into three sections, **A B** and **C,** carrying respectively: Multiple Choice Questions (**MCQs**), Short Answer Questions (**SAQs**) and Long Answer Questions (**LAQs**). Answer all questions. **DO NOT WRITE ON THE QUESTION PAPER**

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over.

Section A: Multiple Choice Questions (20 marks)

1. What is the role of Schwann cells in neurotransmission?
   A. Thermal insulation of neuronal axons
   B. Limit the speed of the action potential
   C. Enhance the speed of the action potential
   D. Protect the neuronal soma from trauma
2. Which of the following is the first layer of neural network?
   A. Input layer
   B. Hidden layer
   C. Concurrent layer
   D. Outer layer
3. Convolutional neural network (CNN) is mostly used when there is an---------
   A. Structured data
   B. Unstructured data
   C. Concurrent data
   D. None of the above
4. The capacity of a neural network is defined by----------
   A. Traffic carry capacity of a network
   B. The total number of nodes in the network
   C. The number of patterns that can be stored and recalled in a network
   D. Concurrency in a network
5. How might optogenetics help treat psychiatric illnesses in humans?
   A. by monitoring the frequency of alpha waves in the brain
   B. by blocking receptor sites
   C. by decreasing the amount a patient needs to spend sleeping
   D. by activating and suppressing neurons involved with the release of specific neurotransmitters
6. Which one of the following is true for neural networks?
   A. It has set of nodes and connections
   B. Each node computes it's weighted input
   C. Node could be in excited state or non-excited state
   D. All of the above
7. The spike phase of the neuronal action potential is due to:----------
   A. The opening of voltage-gated Na+ channels
   B. The opening of voltage-gated K+ channels
   C. The closure of resting K+ channels
   D. The opening of voltage-gated Cl− channels
8. The hyperpolarization phase of the action potential is due to:----------
   A. The opening of voltage-gated Cl− channels
   B. The prolonged opening of voltage-gated K+ channels
   C. The closure of resting Na+ channels
   D. Due to the closure of Cl− channels
9. Which one of the following characteristics would you find in an excitatory neuron?
   A. Increase in activity of this neuron will result in lower activity in the neuron downstream
   B. Excitation of this neuron will result in release of glutamate from the presynaptic terminal
   C. Glutamic acid decarboxylase will be found in the presynaptic terminal
   D. Excitation of this neuron will result in an inhibitory postsynaptic potential (IPSP) in the postsynaptic neuron.
10. Electrical impulses gather and accumulate in which part of a neuron, in order to initiate an action potential?
    A. Dendrites
    B. Axon hillock

C. Axon terminal branches
D. Node of Ranvier

11. What is largely responsible for the negative resting membrane potential (around -70 mV) in a neuron?
    A. Axonal insulation by Schwann cells.
    B. Voltage-gated sodium channels opening.
    C. The action potential.
    D. Potassium leak currents.
12. All of these are subfields of neuroscience except:----------
    A. Neuropharmacology
    B. Computational neuroscience
    C. Nephrology
    D. Neuroimaging
13. Arificial Neural Networks is the collection of artificial _____
    A. Networks
    B. Neurons
    C. Synapses
    D. Weight
14. In ANN, Neurons interconnected among multiple network layers are referred to as _____
    A. Source
    B. Nodes
    C. Anodes
    D. Cathode
15. Weighted sums in ANNs are referred to as _____
    A. Input
    B. Output
    C. Activation
    D. Link
16. Input applied in ANN passed on to layers hidden to produce outcome is referred to as _____
    A. Signal Propagation
    B. Forward Propagation
    C. Backward Propagation
    D. Channel Propagation
17. Computational power in ANNs is determined by _____
    A. Networks
    B. Neurons
    C. Synapses
    D. Weights
18. Information is passed till it reaches the output in _____ type of ANN
    A. Recurrent Neural Networks
    B. Feed-forward Neural Networks
    C. Convolutional Neural Networks
    D. Deconvolutional Neural Networks
19. Facial recognitions & computer vision technologies use _____
    A. Recurrent Neural Networks
    B. Feed-forward Neural Networks
    C. Convolutional Neural Networks
    D. Deconvolutional Neural Networks
20. Text-to-speech conversion uses _____
    A. Recurrent Neural Networks
    B. Feed-forward Neural Networks
    C. Convolutional Neural Networks

D. Deconvolutional Neural Networks

SECTION B: Short Answer Questions (40 marks)

1. The Body's Silent Symphony, explain how balance is achieved (5marks)
2. Outline the fundamental components of artificial Neural Networks (5marks)
3. Describe the stages of sensation (5marks)
4. Explain Neural Networks in real-world scenarios (5marks)
5. Explain mechanism of optogenetics process (5marks)
6. Describe classifications of learning in neural network (5marks)
7. Describe the architecture of a typical feedforward Artificial Neural Network (5marks)
8. Describe the role of the reticular activating system (RAS) in arousal mechanisms (5marks)

SECTION C: Long Answer Questions (60 marks).

1. Discuss the classification neural networks (20 marks)
2. Explain machine learning and neural network computing as emerging neuro technology (20 marks)
3. Discuss the postural control neural pathways (20 marks)