(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2023/2024 ACADEMIC YEAR

THIRD YEAR FIRST TRIMESTER EXAMINATIONS

FOR THE DEGREE

OF

BACHELOR OF SCIENCE IN MEDICAL BIOTECHNOLOGY

COURSE CODE: BMB 312

COURSE TITLE: MOLECULAR PHYSIOLOGY

DATE: 6TH DECEMBER 2023 **TIME: 8.00-10.00 AM**

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. Which cranial nerve is most associated with the auditory pathway?
   A. CN I
   B. CN V
   C. CN VIII
   D. CN X
2. What one is not a function of the non-leminscal auditory pathway?
   A. Conscious perception of sound
   B. Auditory reflexes
   C. Emotional response to sound
   D. Multisensory integration
3. The information which is represented by a signal is detected by specific receptors and converted to a cellular response; this conversion is called _____
   A. Signal amplification
   B. Signal transversion
   C. Signal transduction
   D. Signal integration
4. cAMP and cGMP are derived from----------
   A. ATP and GTP by the actions of adenylate cyclase and guanylate cyclase respectively
   B. GTP and ATP by the actions of adenylate cyclase and guanylate cyclase respectively
   C. ATP and GTP by the actions of guanylate cyclase and adenylate cyclase respectively
   D. none of the above
5. In terms of cell communication, what do bacterial pathogens such as cholera and anthrax have in common?
   A. They destroy the receptors for key signaling molecules
   B. They prevent the production of key signaling molecules
   C. They alter the chemical structure of key signaling molecules
   D. They block the normal functioning of signal transduction mechanism
6. What is the name of the protein signaling molecule that alters glucose uptake, and where would its receptors be located?
   A. Insulin; many different cell types that use glucose for fuel
   B. Insulin; beta cells of the pancreas
   C. PDGF; the blood
   D. NGF; the nerves involved in simple reflexes
7. What is the relationship between olfactory sensors and gustatory sensors?
   A. Gustatory hair can also detect odorants
   B. Olfactory hair can also detect tastants
   C. Olfactory sensors provides information about substance that we are about to taste
   D. No relation
8. When visual stimulus reaches receptors in retina of eye, first process involving absorption of physical energy by receptors is----------
   A. Reception
   B. Transduction
   C. Coding
   D. Adaptation
9. When visual stimulus reaches receptors in retina of eye, second process involving absorption of physical energy by receptors is----------
   A. Reception
   B. Transduction
   C. Coding

D. Adaptation

10. Which one of the following plasma membrane receptors activate signalling pathways usually by forming molecular dimers that result in protein phosphorylation reactions upon binding of their specific ligand?
    A. Steroid hormone receptors
    B. Receptor tyrosine kinases
    C. Ligand-gated ion channels
    D. G protein-coupled receptors
11. Which one of the following guanine nucleotide-binding proteins (G-protein) takes part in the regulation of vision?
    A. G_s family
    B. G_q family
    C. G_i family
    D. G_o family
12. Which one of the following signalling pathway is followed by the T lymphocyte's response to antigenic stimulation?
    A. Juxtacrine signalling
    B. Autocrine signalling
    C. Paracrine signalling
    D. Endocrine signalling
13. What molecules can directly convert extracellular signals into intracellular signals?
    A. Transmembrane proteins
    B. Cell-surface receptors
    C. GPCRs
    D. All of these
14. Which one of the following is an inhibitor of apoptosis?
    A. Caspase
    B. IAP
    C. SMAC
    D. DIABLO
15. Caspases belong to the class of _____
    A. Serine proteases
    B. Cystine proteases
    C. Aspertate proteases
    D. Hydrolases
16. Caspases can be activated by_____
    A. Cytochrome
    B. IAP
    C. DNase
    D. RNase
17. A signalling molecule that diffuses through the interstitial fluid and acts on nearby cells is called:----------
    A. Motor neuron
    B. Local regulator
    C. Transporter
    D. Transmitter
18. In many signalling cascades in prokaryotic and animal cells, the second messenger is---------
    A. cAMP
    B. cATP
    C. NO
    D. G proteins

19. Specialized receptors in the vertebrate eye that respond to light signals are:--------
    A. Rhodopsin
    B. Phytochrome
    C. Cryptochromes
    D. Melanophores
20. Neurotransmitters are released into the synapse at which of the following?
    A. Presynaptic membrane
    B. Postsynaptic membrane
    C. Golgi apparatus
    D. Axon hillock

SECTION B: Short Answer Questions (40marks)

1. Explain the inducers of apoptosis (5marks).
2. Explain the 4 physiological layers of the retina in visual physiology (5marks).
3. Explain the phosphatidylinositol signalling (5marks).
4. Describe the sound action potential generation pathway (5marks).
5. Describe the mechanism of action of steroid hormones in endocrine signalling (5marks).
6. Illustrate the process involved in taste sensory transduction (5marks).
7. Describe the role of second messengers in signal transduction (5marks).
8. Explain the role of Bcl-2 family proteins in the regulation of apoptosis (5marks).

SECTION C: Long Answer Questions (60marks)

1. Discuss the Receptor with tyrosine kinase mechanism of operations in cell signalling (20 marks)
2. Describe the intrinsic and extrinsic pathway in mitochondrial apoptosis (20marks)
3. Discuss the molecular physiology of trigeminal chemoreception in gustation (20marks)