

**TECHNICAL UNIVERSITY OF MOMBASA**

**FACULTY OF APPLIED AND HEALTH SCIENCES**

**DEPARTMENT OF MEDICAL SCIENCES**

UNIVERSITY EXAMINATION OF DEGREE

BACHELOR OF MEDICAL LABORATORY SCIENCE (BMLS )

**AMLS 4141: MEDICAL PHYSIOLOGY I**

END OF SEMESTER EXAMINATION **SERIES** MAY 2016 PAPER TWO

**TIME** 2 HOURS

**SECTION A; Attempt all questions in this section**

1. As a result of mitosis, each new cell has:
  - a. Twice as many chromosomes as its parent cell
  - b. Half as many chromosomes as its parent cell
  - c. four times as many chromosomes as its parent cell
  - d. the same number of chromosomes as its parent cell
  - e. none of the above
  
2. Which of the following correctly lists the levels of organization from least complex to most complex?
  - a. cellular, tissue, chemical system, organ, organism
  - b. chemical, cellular, tissue, organ, system, organism

- c. tissue, cellular, chemical, organ, system, organism
  - d. chemical, tissue, cellular, system, organ, organism
  - e. organism, system, organ, tissue cellular, chemical
3. An organ is defined as a structure that has a specific structure and is composed on two or more different types of:
- a. Molecules
  - b. Cells
  - c. Systems
  - d. Tissues
  - e. Membranes
4. Which statement is not true concerning characteristics of life?
- a. All body cells exhibit irritability to some extent
  - b. Each organ system is isolated from all other body systems
  - c. Growth can be an increase in size due to an increase in the number of cells
  - d. Reproduction occurs on both the cellular and organismal level
  - e. Non of the above
5. The plasma membrane of a neuronal axon is depolarized to threshold.
- Which of the following is **not** a **direct** effect of this depolarization?
- a. closing the inactivation gates of voltage-gated  $\text{Na}^+$  channels

- b. release of neurotransmitter from the axon terminal
- c. initiation of an action potential
- d. opening the activation gates of voltage-gated  $\text{Na}^+$  channels
- e. opening the activation gates of delayed rectifier  $\text{K}^+$  channels

6. In which of the following is a transport protein most correctly matched with its function?

- a. voltage-gated  $\text{Na}^+$  channel -- rapid depolarization phase of the action potential
- b. CFTR -- maintaining low  $[\text{Ca}^{++}]$  in cytoplasm
- c. delayed rectifier  $\text{K}^+$  channel -- primarily responsible for the resting membrane potential
- d.  $\text{Na}^+$ /glucose co-transporter -- keeping  $[\text{Na}^+]$  low in the cytoplasm
- e.  $\text{Na}^+/\text{K}^+$  ATPase -- repolarization phase of action potential

7. Which of the following is true?

- a. The nicotinic acetylcholine receptor is a G-protein linked receptor.
- b. ATP is hydrolyzed to cyclic AMP by phosphodiesterase.
- c. The muscarinic acetylcholine receptor is a ligand-gated channel.
- d. DAG and  $\text{IP}_3$  are produced by the cleavage of a membrane phospholipid.
- e. Cyclic AMP is the second messenger that leads to neurotransmitter release.

8. The muscle end-plate potential is:

- a. an example of an excitatory post-synaptic potential
- b. due to ion flow through a voltage-dependent channel
- c. equal to the Nernst potential for  $\text{Na}^+$  across the muscle cell membrane
- d. a type of action potential
- e. a hyperpolarization of the pre-synaptic membrane

9. Which of the following would most quickly and most directly lead to the depolarization of an otherwise normal, resting neuron?

- a. inhibit the  $\text{Na}^+/\text{K}^+$  ATPase
- b. open  $\text{K}^+$  channels in the cell membrane
- c. add 155 mM urea to the extracellular fluid
- d. increase the activity of the  $\text{Na}^+/\text{K}^+$  ATPase
- e. replace most of the extracellular  $\text{Na}^+$  with  $\text{K}^+$

10. The role of transverse tubules in skeletal muscle fibers is to
- a.** connect the sarcomeres to each other
  - b.** binds the myofibrils
  - c.** quickly spread the action potential
  - d.** connect the sarcolemma to the sarcoplasmic reticulum (SR)
  - e.** bind to the DHP receptors
11. Voluntary skeletal muscles in the leg are innervated by:
- a.** postganglionic neurons
  - b.** somatic motor neurons
  - c.** preganglionic neurons
  - d.** CNS fibers
  - e.** all these
12. Acetylcholine is released by:
- a.** all postganglionic autonomic neurons
  - b.** preganglionic sympathetic neurons
  - c.** all postganglionic sympathetic neurons
  - d.** a and c
  - e.** all of these are true
13. Osmosis is a special case of
- a.** filtration
  - b.** active transport
  - c.** carrier transport
  - d.** diffusion
  - e.** facilitated diffusion
14. In a cell, movement of molecules from an area of low concentration to an area of high concentration
- a.** uses facilitated diffusion
  - b.** requires cellular energy
  - c.** needs associated (peripheral) proteins
  - d.** requires both cellular energy and facilitated diffusion
  - e.** uses its concentration gradient to move
15. Red blood cells would swell in which type of solution?
- a.** hypotonic

- b. isotonic**
  - c. hypertonic**
  - d. hydrophilic**
  - e. lipophilic**
16. Indicate in which compartment you would find a low concentration of both  $K^+$  ions and Proteins
- a. intracellular fluid**
  - b. plasma**
  - c. interstitial fluid**
  - d. extracellular fluid**
  - e. none of these**
17. At the peak of an action potential, which of the following are true?
- a.  $K^+$  channels are closed**
  - b. the membrane = +30 mV**
  - c.  $Na^+$  channels are open**
  - d. the membrane = +60 mV**
  - e. all of these are true**
18. The speed of conduction of a nerve impulse can be determined by which of the following factors?
- 1. temperature   2. diameter of axon   3. stimulus frequency   4. myelin sheath   5. stimulus strength**
- a. 1, 3, 5 and 4**
  - b. 1, 2 and 3**
  - c. 3 and 1**
  - d) 3 and 2**
  - e) 4, 2 and 1**
19. All of these characteristics belong to graded potentials, except for:
- a. they have constant magnitude**
  - b. there are no refractory periods**
  - c. summation is possible**
  - d. typically occurs at the cell body of a neuron**
  - e. they are decremental**
20. The type of neuron that communicates information from the central to the peripheral nervous system.
- a. sensory neuron**
  - b. interneuron**
  - c. motor neuron**
  - d. afferent neuron**
  - e. glial cell**
21. Movement of solvent and dissolved substances across a cell membrane by hydrostatic pressure is
- a. filtration**
  - b. facilitated diffusion**

- c. osmosis
  - d. simple diffusion
  - e. active transport
22. The substance acetylcholine (ACh) is released from synaptic vesicles by the process of
- a. phagocytosis
  - b. simple diffusion
  - c. passive transport
  - d. exocytosis
  - e. endocytosis
23. A reflex arch consists of which of the following
- a. Sensory neurone, afferent neurone, receptor ,synapse, motor neurone effector organ
  - b. Receptor ,affarent neurone, synapse,sensory neurone,effector organ
  - c. Receptor ,motor neurone, synapse,sensory neurone effector organ.
  - d. Receptor sensory neurone synapse affarent neurone effector organ
  - e. Receptor affarent neurone, synapse motor neurone effector organ
24. Which of the following is not true about monosynaptic reflex
- a. Consists of only one synapse within the CNS
  - b. Sensory neuron synapses directly with the motor neuron
  - c. The response is flexor muscle contraction and inhibition of extensor muscles
  - d. The Stretch Reflex is an example of monosynaptic reflex
  - e. The withdrawal reflex is not an example of monosynaptic reflex
25. Which of the following is the site of energy production in a cell
- a. Endoplasmic reticulum
  - b. Mitochondria
  - c. Plasma membrane
  - d. Ribosomes
  - e. nucleus
26. Which of the following is permanent cells of the CNS
- a. neurone
  - b. osteoblast
  - c. fibroblast
  - d. neuroblast
  - e. purkinjer cells

27. Which of the following statements about neurones is not true
- a. the basic functional unit of the nervous system
  - b. Respond to physical and chemical stimuli
  - c. Produce and conduct electrochemical impulses
  - d. Release chemical regulators
  - e. can divide by mitosis

28. Which of the following statements below is not true
- a. Lysosomes produces lytic enzymes
  - b. Mitochondria is the site of energy production
  - c. Nucleus contain the genetic information
  - d. Golgi apparatus is the site of protein synthesis
  - e. All the above

29. In Isometric muscle contraction .
- a. Muscle shorten during contraction
  - b. Occurs in smooth muscle only
  - c. used for body movements
  - d. muscle is prevented from shortening in contraction
  - e. none of the above

30. Which of the following cells secretes myelin
- a. Ependymal cells
  - b. Satellite cells
  - c. Osteocytes
  - d. fibrocytes.
  - e. oligodendrocytes

### Section B

Answer all the questions

30. a. Describe the process by which material move across the cell membrane i.e membrane transport. (15 marks)
- 30.b. Describe the cell membrane structure. ( 5 marks)
32. Describe the process of action potential and how they are generated and propagated. (20 marks)