

**FACULTY OF HEALTH SCIENCES**

**DEPARTMENT OF PHARMACY**

**HUMAN ANATOMY AND PHYSIOLOGY (FHS 2300)**

**SUPPLEMENTARY EXAMINATION**

TIME: 3 HOURS

AUGUST 2023

100 MARKS

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**INSTRUCTIONS**

**Answer all questions by choosing a letter corresponding to the correct answer(s)**

## **Nervous system**

1. Which of the following is the excitatory neurotransmitter in the CNS?
  - a. Acetylcholine
  - b. Glutamate
  - c. Serotonin
  - d. Dopamine
  
2. Which of the following amino acids act as neurotransmitters?
  - a. Glycine
  - b. Aspartate
  - c. Tryptophan
  - d. Phenylalanine
  
3. Which of the following describes temporal summation in a postsynaptic neuron?
  - a. Non-arrival of signals at the postsynaptic neuron
  - b. Arrival of signals at different times postsynaptic neuron
  - c. Arrival of signals at different locations on the postsynaptic neuron
  - d. Inhibition of transmission at a presynaptic neuron
  
4. Which of the following is/are characteristic of graded potentials?
  - a. They are all or none events
  - b. They are conducted decrementally
  - c. Cannot be summed
  - d. Depolarizing and hyperpolarizing
  
5. Which of the following equations is used to calculate the equilibrium potential for an ion?
  - a. Goldman-Getz equation
  - b. Henderson-Hasselbalch equation
  - c. Nernst equation
  - d. None of the above
  
6. Which of the following describes spatial summation in a postsynaptic neuron?
  - a. Non-arrival of signals at the postsynaptic neuron
  - b. Arrival of signals at different times postsynaptic neuron
  - c. Arrival of signals at different locations on the postsynaptic neuron
  - d. Inhibition of transmission at a presynaptic neuron
  
7. Which of the following is true for inhibitory postsynaptic transmission?
  - a. It involves a postsynaptic increase in  $\text{Cl}^-$  conductance
  - b. It involves hyperpolarization of the postsynaptic membrane
  - c. It involves depolarization of the presynaptic membrane
  - d. It involves hyperpolarization of the presynaptic membrane
  
8. Which of the following is true for electrical synapses but not for chemical synapses?
  - a. Requires presynaptic receptors
  - b. Involves exocytosis of neurotransmitters
  - c. It is made up of gap junctions
  - d. Involves the entry of calcium in the presynaptic cell

9. Which of the following is true for axonal action potentials?
- They are propagated bidirectionally due to refractory periods
  - They increase  $\text{Ca}^{2+}$  permeability at the axon terminal
  - They are propagated as a result of negative feedback of sodium entry
  - They vary with amount of stimulation
10. Which of the following is not part of the brain stem?
- Midbrain
  - Pons
  - Cerebellum
  - Medulla
11. Which cranial nerves supply the accessory muscles of respiration?
- Accessory
  - Abducent
  - Vagus
  - Intercostal
12. Which of the following equations is used to calculate the resting membrane potential?
- Goldman-Getz equation
  - Henderson-Hasselbalch equation
  - Nernst equation
  - None of the above
13. Which of the following are parts of the central nervous system?
- Vagus nerve
  - Brain
  - Spinal cord
  - All the above
14. Which of the following does not constitute the peripheral nervous system?
- Sympathetic nervous system
  - Spinal cord
  - Parasympathetic nervous system
  - All the above
15. Which of the following statements is true of neuroglia?
- They produce the myelin sheath
  - They have only one dendrite and one axon
  - It is the non-cellular material that supports the neurons
  - They are cells that link motor neurons to several cell types of the nervous system
16. What is the space between pre and post synaptic cells referred to as?
- Synapse
  - Axo-axonic space
  - Synaptic cleft
  - Voltage-gated channel
17. What is the name of the cell structure that carries incoming impulses towards the cell?
- Dendrite
  - Axon
  - Cell body
  - Ganglion

18. What would happen if the neuron lost its myelin sheath?
- The neuron would die
  - More  $\text{Na}^+$  channels would be exposed so that speed of conduction would increase
  - More  $\text{K}^+$  channels would be exposed allowing exit of  $\text{K}^+$  leading to hyperpolarization
  - More  $\text{Na}^+$  channels would be exposed and the speed of conduction would decrease
19. Which of the following best describes an absolute refractory period?
- A time during which a smaller than normal stimulus produces an action potential
  - Period when no amount of stimulation will produce an action potential
  - A larger than normal stimulation produces an action potential
  - Time when two stimuli in quick succession produce an action potential
20. Which of the following would conduct impulses at highest speed?
- Myelinated, large diameter axons
  - Unmyelinated large diameter axons
  - Myelinated, small diameter axons
  - Unmyelinated large diameter axons
21. The action potential occurs when which one of the following events occur?
- $\text{Na}^+$  rushes into the cell followed by  $\text{Cl}^-$
  - $\text{Na}^+$  rushes out of the cell followed by  $\text{PO}_4^{2-}$  rushing in
  - $\text{K}^+$  rushes into the cell followed by  $\text{Na}^+$  rushing out
  - $\text{Na}^+$  rushes into the cell followed by  $\text{K}^+$  rushing out
22. Which of the following is the role of calcium in transmission of electrical signals?
- Synthesis and packaging of neurotransmitter
  - Fusion of vesicle and plasma membranes to release of neurotransmitter
  - Re-uptake of neurotransmitter from synaptic cleft
  - Calcium has no role in transmission of signals
23. Which of the following is a characteristic of a graded potential?
- It is an all-or-none event
  - It results from an influx of potassium ions
  - It's magnitude varies with stimulation
  - It results from an efflux of sodium ions
24. Which of the following best describes a relative refractory period?
- A time during which a smaller than normal stimulus produces an action potential
  - Period when no amount of stimulation will produce an action potential
  - A larger than normal stimulation produces an action potential
  - Time when two stimuli in quick succession can produce an action potential
25. What event during the action potential changes the membrane potential from  $-70\text{mV}$  to  $+30\text{mV}$ ?
- $\text{Na}^+$  ions moving rapidly into the cell
  - $\text{Na}^+$  ions moving out of the cell
  - $\text{K}^+$  ions moving into the cell
  - $\text{K}^+$  ions moving out the cell
26. At which point is an electrical impulse is transmitted between the neuron and the muscle?
- Motor end plate
  - Neuromuscular junction
  - Nerve centre
  - Synapse

27. Which of the following cavities house the central nervous system?
- The cranial cavity
  - The abdominal cavity
  - The spinal and cranial cavities
  - The dorsal cavity
28. To what in the skin does the term 'nociceptors' refer?
- Sensors that detect movement of hair follicles
  - Any lamellated sensory corpuscle
  - The sensory receptor that is associated with the Merkel cells of the epidermis
  - Free nerve endings with large receptive fields that detect pain
29. What is responsible for the appearance of the grey matter in the spinal cord?
- Butterfly shaped area
  - Interneurons
  - Cell bodies and dendrites of efferent neurons
  - None of the above
30. Of the 31 pairs of spinal nerves, how many are thoracic?
- 8
  - 12
  - 5
  - 1
31. Which of the following is the function of glial cells in the CNS?
- To maintain homeostasis of the neurons
  - To transmit electrical signals
  - To stimulate interneurons
  - To initiate action potentials
32. Which of the following is/are an excitatory neurotransmitter(s) in the CNS?
- Glutamate
  - Acetylcholine
  - Dopamine
  - All of the above
33. Which of the following is the effect of depolarization at the chemical presynaptic terminal?
- Release of neurotransmitter
  - Fusion of membranes
  - Transfer of ions into postsynaptic neuron
  - Has no effect
34. Where is an action potential initiated?
- Soma
  - Axon hillock
  - Synaptic cleft
  - Postsynaptic terminal
35. Which of the following describes nodes of Ranvier?
- Areas along the axon that are devoid of myelin sheath
  - Areas of dendrites covered by fatty tissue
  - Location of docking of synaptic vesicles
  - Areas with high concentration of  $\text{Na}^+$  channels

36. Which part of a neuron has the highest concentration of Na<sup>+</sup> channels per square millimetre of cell membrane?
- Dendrites
  - Cell body
  - Initial segment
  - Axonal membrane under myelin

**Homeostasis and body planes**

37. Which of the following best describes anatomy?
- The study of body structures
  - The study of body functions
  - The breakdown of body structures
  - Levels of structural organization
38. In which of the following positions is away from the midline of the body?
- Dorsal
  - Erect
  - Lateral
  - Medial
39. Which of the following terms describes the body's ability to maintain its normal state?
- Catabolism
  - Tolerance
  - Homeostasis
  - Metabolism
40. Which of the following is flexible connective tissue that is attached to bones at the joints?
- Adipose
  - Cartilage
  - Epithelial
  - Muscle
41. Which of the following is characteristic of Negative Feedback?
- Always rising and falling
  - A negation of the initial disturbance
  - Amplifies the initial disturbance
  - All the above
42. Which of the following cavities are separated by the diaphragm?
- Abdominal and pelvic
  - Thoracic and abdominal
  - Dorsal and ventral
  - Pericardial and pleural
43. Midway through a 5-mile workout a runner begins to sweat profusely. The sweat glands producing the sweat would be considered which part of a feedback loop?
- Controlled condition
  - Receptors
  - Stimulus
  - Effectors

44. The physician directs the medical assistant to complete a request form for an X-ray study of the fibula. The procedure will be performed on which of the following structures?
- Heel
  - Lower leg
  - Thigh
  - Pelvis
45. The thoracic cage is a structural unit important for which of the following functions?
- Alimentation
  - Menstruation
  - Mentation
  - Respiration
46. In which of the following positions is toward the midline of the body?
- Dorsal
  - Medial
  - Lateral
  - Erect
47. Which of the following is characteristic of Positive Feedback?
- Always rising and falling
  - A negation of the initial disturbance
  - Amplification of the initial disturbance
  - All the above
48. In which areas does the extracellular fluid exist?
- Blood plasma
  - Interstitial fluid
  - Fluid within the cell
  - All the above
49. Which of the following combinations is true for homeostatic control systems?
- Negative feedback, hierarchy of importance, resetting of set points, balancing of inputs and outputs
  - Positive feedback, no resetting of set points, balancing of inputs and outputs, hierarchy of importance
  - Negative feedback, hierarchy of importance, set points cannot be reset, balancing of inputs and outputs
  - No resetting of set points, negative feedback, hierarchy of importance, balancing of inputs and outputs
50. Which plane of the body divides it into dorsal and ventral regions?
- Transverse
  - Axial
  - Coronal
  - Sagittal
51. The directional term 'superior' in anatomy means which of the following?
- Cephalic
  - Ventral
  - Caudal
  - Dorsal

52. Which of the following are components of a homeostatic control system
- Integrating centre
  - Receptor
  - Effector
  - All the above
53. Which of the following is/are the contents of the ventral cavity?
- Heart and lungs
  - Brain and spinal cord
  - Viscera
  - Gut, kidneys, liver, pancreas, spleen, bladder
54. Which of the following is not a component of a reflex arc?
- Knee cap
  - Efferent neuron
  - Afferent neuron
  - Quadriceps
55. Which of the stated relationship is correct?
- The heart is inferior to the clavicle
  - The shoulder is distal to the carpals
  - The phalanges are proximal to the metacarpals
  - The eye is medial to the eyebrows
56. Complete the sentence correctly: 'Cervical vertebrae are...
- Superior to the rib cage
  - Inferior to the thoracic vertebrae
  - Located between the thoracic and sacral vertebrae
  - Fused into a single bone called the sacrum

### **Muscle and muscle contraction**

57. Which of the following best describes excitation-contraction coupling?
- Linking of the myosin heads to the thin filaments
  - Hydrolysis of ATP to energize the remove the shield from thin filaments
  - Sequence of events through which an action potential leads to muscle contraction
  - The formation of the cross-bridge cycle
58. Which of the following is not a function of the skeletal system
- Support
  - Mineral homeostasis
  - Movement
  - Transport of oxygen
59. Which of the following does not contribute to muscle fatigue?
- Conduction failure
  - Lactic acid build-up
  - Inhibition of crossbridge cycling
  - Increased ATP concentration



60. Which of the following is true for muscle contraction in smooth muscle?
- Binding of  $\text{Ca}^{2+}$  to troponin
  - Binding of  $\text{Ca}^{2+}$  to calmodulin
  - Troponin moves tropomyosin from blocking position
  - All the above
61. In which of the following are the smooth muscles found?
- The heart
  - Blood vessel walls
  - The urinary bladder
  - Ducts of glands
62. Which of the following is not a function of skeletal muscle?
- Generation of heat
  - Enabling movement
  - Peristalsis
  - Maintaining posture
63. Which choice best describes the location of the majority of the musculo-skeletal system?
- It is in the dorsal cavity
  - It is in the ventral cavity
  - It is in the abdomino-pelvic cavity
  - It is not located in a body cavity
64. Of the 31 pairs of spinal nerves, how many are thoracic?
- 8
  - 12
  - 5
  - 1
65. Which of the following are events lead to increase in sarcoplasmic  $[\text{Ca}^{2+}]$ ?
- Opening of voltage gated and ligand gated  $\text{Ca}^{2+}$  channels
  - Closing of voltage gated  $\text{Na}^+$  channels
  - Delay in closure of  $\text{K}^+$  channels
  - Closing of ligand gated  $\text{Ca}^{2+}$  channels of sarcoplasmic reticulum
66. Which of following happens to Z lines during contraction of striated muscles?
- They move farther apart
  - They move towards one another
  - They are not affected at all
  - They slide past one another
67. Which of the following happens to the A band during contraction of striated muscles?
- Remains unchanged
  - It gets reduced
  - It increases the H zone
  - They move farther apart

68. Which of the following is characteristic of an action potential of cardiac muscle?
- Has a prolonged plateau phase
  - Spreads inwards to all parts of the muscle via the T-tubules
  - It is longer than action potential in a neuron
  - It is not essential for contraction
69. The functions of tropomyosin in skeletal muscles include which of the following?
- Sliding on actin to produce shortening
  - Releasing  $\text{Ca}^{2+}$  after initiation of contraction
  - Generating ATP
  - Shielding cross-bridge binding sites
70. Which one of the following is responsible for the plateau in cardiac muscle action potential?
- Opening of  $\text{Na}^+$  channels
  - Opening of  $\text{K}^+$  channels
  - Opening of  $\text{Ca}^{2+}$  channels
  - Release of acetylcholine

**Tissues, biological membranes and transport across biological membrane**

71. Which of the following is true for epithelial tissue?
- Has gap junctions
  - Lines the organs
  - Arranged in sheets
  - All the above
72. Which of the following is not part of the plasma membrane of the cell?
- Glycoproteins
  - Plasma proteins
  - Peripheral proteins
  - Integral proteins
73. Which of the following is true of cholesterol in the biological membrane?
- Confers strength/rigidity to the membrane
  - There is no cholesterol in the biological membrane
  - It is unevenly distributed in the biological membrane
  - It is responsible for transport of materials across the membrane
74. Which of the following are types of connective tissue?
- Cartilage
  - Blood and lymph
  - Membranes
  - All the above
75. Which of the following are true for osteoarthritis and not for osteoporosis?
- Breakdown of cartilage in joints
  - Depletion of calcium from bones
  - Porous bones
  - Affects females than males

76. Which is the function of transmembrane channel proteins in the biological membrane?
- Catalysing cellular reactions
  - Allows binding of one cell to another and provides stability and shape to the cell
  - Allow passage of specific ions/molecules
  - Allows recognition of specific molecules
77. Which junction allows cells to communicate rapidly with one another?
- Desmosome
  - Gap junction
  - Tight junction
  - Hemidesmosome
78. Which system transports large polar substances across the biological membrane?
- Endocytosis/Exocytosis
  - Primary active transport
  - Secondary active transport
  - Passive transport
79. The  $\text{Na}^+/\text{K}^+$  ATPase pump is an example of which transport system?
- Electrogenic
  - Electroneutral
  - Uniport
  - Symport
80. Which of the following chemical messengers acts on the cell that produces it?
- Paracrine messenger
  - Autocrine messenger
  - Hormone
  - Neurotransmitter
81. How do lipid soluble chemical messengers produce their effects on target cells?
- Binding to membrane receptors
  - Binding to intracellular receptors
  - Stimulating hydrolysis of cell membrane lipids
  - Activating channels on the plasma membrane
82. Which of the following is true for biological membranes?
- They are made up of mainly phospholipids molecules and a few protein molecules
  - They are impermeable to fat-soluble substances
  - They are freely permeable to all molecules
  - All the above
83. What is the primary force moving water from the blood plasma to the interstitial fluid?
- Active transport
  - Cotransport with  $\text{H}^+$
  - Facilitated diffusion
  - Filtration

84. Which of the factors affect cell membrane permeability?
- Thickness and surface area of the membrane
  - Lipid solubility of the substance in the cell membrane lipids
  - The molecular weight of diffusing substances
  - All of the above
85. Which form of membrane transport requires the expenditure of energy by the cell?
- Facilitate diffusion
  - Osmosis
  - Active transport
  - Diffusion
86. Which of the following is NOT a component of the cell membrane?
- Cholesterol
  - Proteins
  - Microfilament
  - Phospholipids
87. Which of the following statements about cell membranes is incorrect?
- The plasma membranes of adjacent cells are held together by desmosomes
  - It contains receptors for specific signaling molecules
  - It is composed of two layers of glycoprotein molecules
  - It is selectively permeable
88. What is the difference between simple squamous cells and simple columnar cells?
- Squamous cells are flattened while columnar cells are taller than they are wide
  - Simple squamous cells are one layer thick while simple columnar cells are several layers thick
  - Simple squamous cells are epithelial tissue while simple columnar cells are connective tissue
  - Squamous cells are flattened while columnar cells are cuboidal
89. Transport of D- and L- glucose proceeds at the same rate down an electrochemical gradient by which of the following processes?
- Cotransport
  - Simple diffusion
  - Primary active transport
  - Facilitated diffusion
90. Which of the following will double the permeability of a solute in a lipid bilayer?
- Doubling the oil/water partition coefficient of the solute
  - Doubling the molecular radius of the solute
  - Doubling the concentration difference of the solute across the bilayer
  - Doubling the thickness of the bilayer

91. Which of the following would occur as a result of the inhibition of Na<sup>+</sup>, K<sup>+</sup>- ATPase?
- Decreased intracellular Na<sup>+</sup> concentration
  - Increased intracellular Ca<sup>2+</sup> concentration
  - Increased Na<sup>+</sup>-glucose cotransport
  - Increased intracellular K<sup>+</sup> concentration
92. What mechanism ensures higher concentration of Na<sup>+</sup> in extracellular than in the intracellular fluid?
- Osmosis
  - Secondary active transport
  - The sodium- potassium pump
  - Facilitated diffusion
93. Why does the plasma membrane present a barrier to movement of electrolytes through it?
- There are no channels in the membrane for the passage of electrolytes
  - Electrolyte are too large to pass through membrane channels
  - Membrane proteins electrically repel charged particles
  - Electrolytes are not soluble in the lipid of the membrane
94. Which transport processes involved in transport of glucose from the intestinal lumen into a small intestinal cell is inhibited by abolishing the usual Na<sup>+</sup> gradient across the cell membrane?
- Simple diffusion
  - Primary active transport
  - Cotransport
  - Facilitated diffusion
95. Which of the following best describes second messengers?
- Substances that interact with first messengers outside the cell
  - Substances that bind to first messengers in the cell membrane
  - Substances that mediate the intracellular responses stimulation by hormones/neurotransmitters
  - Hormones secreted by cells in response to other hormones
96. Which of the following is true for the gap junctions?
- They are present in cardiac muscle
  - They are absent in striated muscle
  - They are abundant in electrical synapses
  - They are present in chemical synapses
97. What is the principal cation in the intracellular fluid?
- Sodium
  - Potassium
  - Calcium
  - Copper
98. Which organelle is the powerhouse of the cell?
- Nucleus
  - Cell membrane
  - Mitochondria
  - Lysosomes

99. Which is the most active site of protein synthesis?
- a. Nucleus
  - b. Ribosome
  - c. Mitochondrion
  - d. Cell sap
100. Which one is the largest particulate of the cytoplasm?
- a. Lysosomes
  - b. Mitochondria
  - c. Golgi apparatus
  - d. Endoplasmic reticulum