



**AMREF INTERNATIONAL UNIVERSITY**

**SCHOOL OF MEDICAL SCIENCES**

**DEPARTMENT OF REHABILITATION MEDICINE**

**BACHELOR OF SCIENCE IN PHYSIOTHERAPY**

**END OF TRIMESTER EXAMINATIONS JANUARY TO APRIL 2025**

**COURSE CODE: PHT 224**

**COURSE TITLE: NEUROSCIENCE**

**DATE: 11:15am**

**TIME: 1.15Pm**

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**INSTRUCTIONS TO CANDIDATES**

**Answer All Questions**

**Section A: Multiple Choice Questions (MCQ)**

**30 Marks.**

**Section B: Short Answer Questions (SAQ)**

**20 Marks.**

**Section C: Long Answer Question (LAQ)**

**20 Marks**

**TIME: 2 Hours**

SECTION A: MULTIPLE CHOICE QUESTIONS (MCQ) 30 MARKS

1. The cerebral aqueduct is a canal connecting 3rd and 4th ventricles. What brain structure would likely contain it?
  - A. Thalamus
  - B. Hypothalamus
  - C. Pons
  - D. Midbrain
  - E. Medulla
2. Hemorrhage of the main blood vessel which supplies the basal ganglia (e.g. caudate, putamen, and globus pallidus) is likely to involve which other nearby structure:
  - A. Hippocampus
  - B. Substantia nigra
  - C. Red nucleus
  - D. Mammillary body
  - E. Internal capsule
3. If a patient cannot see the left-most part of his left visual field (but can see in all other areas), he may have a lesion
  - A. In the left optic nerve
  - B. In the right optic nerve
  - C. In the left optic tract
  - D. In the right optic tract
  - E. In the optic chiasm
4. Fill in the blanks: in the vestibular system, otolith organs detect \_\_\_ and semicircular canals are sensitive to
  - A. head rotation to the left / head rotation to the right
  - B. head rotation to the left / tilts of the head
  - C. head rotations / force of gravity
  - D. force of gravity / rotations of the head
5. While taking a 9.01 exam, a student impales himself in the belly in despair. After which, he notices that, from the belly down, he can only feel pain on the right side of his body. Conversely, he can only experience tactile sensations on the left side of his body from the belly down. Where did he lesion himself?
  - A. The right dorsal column at the cervical level
  - B. The right dorsal column at the lumbar level
  - C. The left dorsal column at the cervical level
  - D. The left dorsal column at the lumbar level
6. You pick up an ice cube. Which aspect of the ice do you notice first and why?
  - A. You notice it's cold because the axons conveying temperature are thin.
  - B. You notice it's cold because the axons conveying temperature are thick.
  - C. You notice it's smooth because the axons conveying tactile sensation are thin.
  - D. You notice it's smooth because the axons conveying tactile sensation are thick.

7. In sensory pathways, changes in stimulus intensity are signaled by corresponding changes in the
- A. Amplitude of action potentials (in millivolts) of an active neuron
  - B. Number and/or firing frequency of active neurons
  - C. Refractory period (in milliseconds) of an active neuron
  - D. Axonal conductance of an active neuron
8. Agnosias are the inability to recognize objects even when the ability to recognize their components (simple sensory skills) are intact. Damage to which component of the nervous system is likely to cause an agnosia?
- A. Peripheral sensory neurons
  - B. Ventral posterior nucleus of the thalamus
  - C. primary somatosensory cortex
  - D. secondary somatosensory cortex
  - E. posterior parietal cortex
9. Mr. Stanilopolis recently fell. He told his therapist that he fell because he was not wearing his glasses. However, his daughter reports to the therapist that her father commonly walks with a broad-based gait, uses furniture in the home to help him stabilize his balance while walking, and frequently loses his balance in dim light and unlevel surfaces. The daughter also states that her father commonly complains of dizziness (vertigo), ear ringing (tinnitus), and decreased hearing. Upon examination, the therapist finds an abnormal presence of nystagmus. She suspects impairment of which neurological system?
- A. visual system
  - B. proprioceptive system
  - C. vestibular system
  - D. autonomic nervous system
10. Ann and Amanda are in a car traveling to school. Amanda is a passenger in the front seat while Ann drives. Amanda is using this commuting time to catch up on reading for her classes. Fifteen minutes into the drive, Amanda begins to sweat and feel nauseated. She first attributes her discomfort to a lack of breakfast. Amanda continues to read but feels increasingly dizzy, faint, and nauseous. She tells Ann, who recognizes Amanda's condition as motion sickness and advises her to stop reading and instead watch the oncoming traffic. Ann recognizes that motion sickness is often caused by:
- A. An incongruence between proprioceptive and vestibular system signals reaching the cortex
  - B. Incongruent signals traveling to the cortex from the reticular activating and inhibiting systems
  - C. Parasympathetic nervous system dominance (over sympathetic nervous system activity)
  - D. An incongruence between visual and motion signals reaching the vestibular system

11. Sophia has chronic pain and tenderness throughout her neck, back, shoulders, and legs. She also reports extreme fatigue, sleep dysfunction, common headaches, and periods of cognitive fog. Sophia's physicians cannot find an anatomical cause of her pain. Patients with this condition are also likely to be diagnosed with chronic fatigue syndrome, rheumatoid arthritis, Lyme disease, and irritable bowel syndrome. This condition is known as:
- A. Lupus
  - B. Myasthenia gravis
  - C. Epstein-barr virus
  - D. Fibromyalgia
12. Mr. Shibata has intense burning that extends down both legs. This condition is called \_\_\_\_\_ and is a form of \_\_\_\_\_.
- A. Causalgia; dysesthesia
  - B. Thermohypoesthesia; thermesthesia
  - C. Paresthesia; hyperalgesia
  - D. Allodynia; hyperalgesia
13. Mr. Kaminski, who has diabetes, presents with weakness, numbness, paresthesia, and causalgia in his lower and upper extremities. He reports that this condition first developed bilaterally in his feet and legs, and then progressed to both hands and arms. This type of peripheral neuropathy is called \_\_\_\_\_ and results from \_\_\_\_\_.
- A. Plexopathy; damage to the brachial or lumbar plexus
  - B. Radiculopathy; nerve root impingement
  - C. Polyneuropathy; bilateral damage to multiple peripheral nerves
  - D. Mononeuropathy; damage to one peripheral nerve
14. Mr. Kaminski, in the above question, was diagnosed with:
- A. Stocking and glove neuropathy
  - B. Radial nerve compression
  - C. Sciatic nerve compression
  - D. Reflex sympathetic dystrophy
15. After Alex's spinal cord injury, he can no longer feel sensation (discriminative touch, pressure, vibration, proprioception, and kinesthesia) at or below his injury level at T10. Which spinal cord tract is responsible for discriminative touch, pressure, vibration, proprioception, and kinesthesia?
- A. Dorsal columns
  - B. Lateral spinothalamic
  - C. Anterior spinothalamic
  - D. Cuneocerebellar
16. After his auto vehicle accident, Lorenzo lies in a coma with his upper and lower extremities in spastic extension. This condition is called \_\_\_\_\_ and \_\_\_\_\_ results
- A. Decorticate rigidity; corticospinal tracts
  - B. Decerebrate rigidity; corticospinal tracts from a lesion to the
  - C. Decorticate rigidity; extrapyramidal spinal cord tracts in the brainstem
  - D. Decerebrate rigidity; extrapyramidal spinal cord tracts in the brainstem

17. Since her head injury causing cerebellar damage, Mrs. Johnson has difficulty understanding where her limbs are in relation to each other and where her body is in space. Which neurological system is responsible for the recognition of an organism's position in relationship to the environment?
- A. Vestibular system
  - B. Proprioceptive system
  - C. Basal ganglia system
  - D. Ventricular system
18. Mr. Tomlinson had a right hemisphere stroke 2 weeks ago. When his therapist passively moves his left elbow joint into extension, the elbow joint is initially highly spastic and cannot be moved. With sustained stretched on the elbow flexors, the spasticity suddenly gives way and the elbow joint can be moved into extension. This type of spasticity is referred to as:
- A. Cogwheel rigidity
  - B. Lead pipe rigidity
  - C. Clonus
  - D. Clasp knife phenomenon
19. After taking neuroleptic medication all of her adult life for schizophrenia, April has developed tongue protrusions, facial grimacing, blepharospasm, and lip smacking. These involuntary movements are collectively called \_\_\_\_\_ and result from long-term treatment with dopamine receptor antagonists.
- A. Tics
  - B. Chorea
  - C. Tardive dyskinesia
  - D. Idiopathic dystonia
20. Ms. Graham displays ataxia, intention tremors, broken speech, and nystagmus. Her physician suspects a lesion of the \_\_\_\_\_.
- A. Basal ganglia
  - B. Brainstem
  - C. Cortex
  - D. Cerebellum
21. Mr. Choi has been diagnosed with a tumor in his right secondary somatosensory area. As a result, he has difficulty identifying objects with his left hand (with vision occluded). The umbrella term for this disorder is called:
- A. Tactile agnosia
  - B. Primary sensation
22. Mr. Morrissey had a stroke to his brainstem, which damaged the structure responsible for states of wakefulness. As a result, he lies in a stuporous, unarousable state. The structure likely damaged was the:
- A. Reticular inhibiting system
  - B. Reticular activating system

23. After a drug overdose that damaged her ventral pons, Lin lost all voluntary muscle control, including the ability to speak. The muscles controlling her eyeball movements are the only muscles over which she still retains control. Lin lies in a hospital bed and is conscious but cannot communicate. This state is called:
- A. Brain death
  - B. Persistent vegetative state
  - C. Coma
  - D. Locked-in syndrome
24. Mr. Tarantino had a right hemisphere stroke and as a result has hemiplegia and hemiparesthesia in both left upper and lower extremities. Despite this severe impairment, Mr. Tarantino is cheerful and has no awareness of his deficits. This morning, he asked his nurse to remove the leg that was in his bed all night. This severe neglect syndrome is called:
- A. Anosognosia
  - B. Unilateral neglect
  - C. Body image dysphoria
  - D. Aggramation
25. After his motorcycle accident 1 year ago, Jim's personality and behavior have changed significantly. He now has severe short-term memory problems and is disorganized, foul-mouthed, and impulsive. Jim can neither foresee the consequences of his actions nor does he possess insight into his behaviors. Damage of which cerebral lobe would largely be responsible for these problems?
- A. Occipital
  - B. Temporal
  - C. Frontal
  - D. Parietal
26. After his brain injury, Jack has difficulty regulating his temperature, has experienced acne due to hormonal imbalances, and is unable to assume a normal sleep-wake cycle. Which neurological structure is primarily thought to be responsible for these functions?
- A. Hypothalamus
  - B. Thalamus
  - C. Cerebellum
  - D. Brainstem
27. After a gunshot wound to the head, Jose has been in a vegetative state. Although he shows no response to verbal commands, his cough and gag reflex, swallowing reflex, and pupillary response all remain intact. Which neurological structure is responsible for these reflexive functions?
- A. Thalamus
  - B. Brainstem
  - C. Frontal lobe
  - D. Basal ganglia

28. From the time Francis was a young child, he displayed tics and uncontrollable movements (eg, tongue protrusion and neck snapping). Although these dyskinesias have improved somewhat as he has aged, they still remain to a moderate extent as an adult. Which neurological structure is believed to be responsible for this movement disorder?
- A. Occipital lobe
  - B. Brainstem
  - C. Hippocampus
  - D. Basal ganglia
29. Mateo's doctors ordered this test after he was admitted to the emergency room with an acute spinal cord injury. This test uses magnets and radio waves to detect subtle electromagnetic fields in soft tissue. This test can provide high resolution images of Mateo's injury level and is called:
- A. positron emission tomography
  - B. magnetic resonance imaging
  - C. single photon emission tomography
  - D. computed tomography
30. Mrs. Marrero has been diagnosed with Parkinson disease. The loss of this neurotransmitter from the substantia nigra and the nigrostriatal pathway is a primary cause of Parkinson disease, causing movement paucity, festinating gait, and masked face. This neurotransmitter is called:
- A. Dopamine
  - B. Serotonin
  - C. Norepinephrine
  - D. Glutamate

SECTION B: SHORT ANSWER QUESTIONS (SAQ)  
ANSWER ALL QUESTIONS. Each question is 5 marks

20 MARKS

1. Compare the sympathetic and parasympathetic nervous system (5 marks)
2. Describe the three types of pathways for bringing sensory information from the body to the brain (5 MARKS)
3. A 25-year-old man sustained an incomplete spinal cord injury in an industrial accident. His left leg is paralyzed. All sensations are intact above the L2 spinal cord level. In the left lower extremity, he can distinguish between test tubes filled with warm or cold water and can distinguish between sharp and dull stimuli. In the right lower extremity, he can distinguish between two closely spaced points applied to the skin and can accurately report the direction of passive movements of the joints. With his eyes closed, the following deficits are noted: Left lower extremity: cannot report direction of passive joint movement of the hip, knee, ankle, and toes; distinguish between two closely spaced points applied to the skin; nor detect vibration. Right lower extremity below L4 level: cannot distinguish between test tubes filled with warm or cold water, or between sharp and dull stimuli.
  - i. Explain the pattern of sensory loss seen in this person (4 MARKS)
  - ii. What is the name of the syndrome affecting this person (1 MARK)
4. Describe Babinski's sign, clonus, and the clasp-knife response (5 MARKS)

SECTION C: LONG QUESTIONS (LAQS)  
ANSWER ANY TWO QUESTIONS

20 MARKS

1. The basal ganglia filters and integrates information from the cortex associated with different functions, one of which is motor function. The subthalamic nucleus is part of the Basal ganglia
  - i. Name and draw the basal ganglia pathway where the subthalamic nucleus (STN) is involved. (5 MARKS)
  - ii. Describe the outcome of the activation of this pathway by the cortex with regard to movement (3 MARKS)
  - iii. Indicate all the neurotransmitters involved (2 MARKS)
2. Describe the characteristics of acute and chronic nociceptive pain in terms of causes, client report, function, and consequences.
3. Compare causes, pathologies, and prognoses of mononeuropathy, multiple mononeuropathy, and polyneuropathy.