



**BACHELOR OF SCIENCE IN PHYSIOTHERAPY (DIRECT)  
SPECIAL/SUPPLEMENTARY**

**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. Mr. Stanilopolis's therapist administers the Romberg test to assess his balance. She asks Mr. Stanilopolis to stand with eyes closed, feet together, and shoulders flexed to 90 degrees (held in front of the body). Mr. Stanilopolis begins to sway and loses his balance. When using the Romberg test and removing visual cues, a patient's postural stability is based on:
  - A. Vestibular and proprioceptive information
  - B. Reticular formation and cerebellar information
  - C. Parasympathetic and sympathetic nervous system information
  - D. Basal ganglia information
2. Emile is walking home from work late at night. The street he is walking on is dimly lit and silent. Emile believes that he can hear someone walking behind him in the distance. He is carrying a large sum of money that he must deposit in the bank tomorrow. As he hears the footsteps growing closer, Emile's heart rate accelerates. The hunger that he felt has dissipated, as blood flow has shifted from his gastrointestinal tract to his skeletal muscles and brain. Emile's blood pressure has increased, and he feels alert and anxious. Which neurological system has become dominant and is responsible for these physiological changes?
  - A. Vestibular system
  - B. Parasympathetic nervous system
  - C. Sympathetic nervous system**
  - D. Enteric nervous system
3. After his below-the-knee amputation, Bill reports that he can still feel his lower left leg and foot. The phenomenon of phantom limb sensation is likely caused by which of the following:
  - A. Peripheral damage to the nerves that were surgically severed during amputation.
  - B. The formation of nerve fibromas in the residual limb of the amputated body part.
  - C. The cortical map of the body (homunculus) still retains the anatomical image of the amputated body part**
4. Mr. Zimmerman has foot drop and a steppage gait in which he lifts his right bent knee high enough to avoid dragging his foot. Compression of which nerve results in foot drop?
  - A. Sciatic nerve
  - B. Peroneal nerve**
  - C. Ulnar nerve
5. After an acute infectious illness, Mr. Benfenati has developed a progressive ascending muscular weakness in his limbs (flaccid paralysis occurs first in his lower extremities and progresses to his upper extremities), with a symmetric pattern. He also reports paresthesias and numbness in his distal extremities. After 1 month, Mr. Benfenati experiences a complete recovery. This disease process is called:
  - A. diabetes neuropathy

- B. poliomyelitis
  - C. Guillain-Barré syndrome**
  - D. myasthenia gravis
6. Alex, in the above question, has also lost his bilateral sense of pain and temperature at and below the lesion level. Which spinal cord tract is responsible for the sensation of pain and temperature?
- A. dorsal columns
  - B. lateral spinothalamic**
  - C. posterior spinocerebellar
  - D. rostral spinocerebellar
7. Mr. Kim had a complete spinal cord injury at L2. He experiences flaccidity in his lower extremities and hyporesponsive reflexes below the lesion level. Mr. Kim's spinal cord injury involved:
- A. lower motor neurons**
  - B. upper motor neurons
8. After her stroke, Mrs. Williams's occupational therapist fabricated a wrist cock-up splint for her spastic right wrist and hand. Splinting is a therapeutic technique that works on which of the following principles?
- A. A quick stretch of a spastic muscle group facilitates the Golgi tendon organs, which inhibit the spastic muscles.
  - B. Placing pressure on the muscle belly of a spastic muscle group facilitates the Golgi tendon organs, which inhibit the spastic muscles.
  - C. A sustained stretch of a muscle group facilitates the Golgi tendon organs, which inhibit the spastic muscles.**
9. Mrs. Goldstein has been diagnosed with Parkinson disease. When the therapist attempts to passively range her elbow joint, the movement is characterized by a uniform and continuous resistance to passive movement. This form of hypertonicity is known as:
- A. Cogwheel rigidity
  - B. Clasp knife phenomenon
  - C. Clonus
  - D. Lead pipe rigidity**
10. For example, when small objects are placed in Mr. Choi's left hand (with vision occluded), he cannot interpret them. This is called:
- A. Two-point discrimination
  - B. Agraphesthesia
  - C. Astereognosis**
  - D. Atopognosia
11. After Mr. Li's stroke, his therapist has observed visual-spatial problems. The therapist gives a pencil, eraser, and small box to Mr. Li and asks him to follow her directions: "Put the box on top of the table. Place the eraser inside of the box. Place the pencil next to the

box.” Mr. Li has difficulty following these directions. This visual-spatial problem is known as:

- A. Figure-ground discrimination disorder
  - B. Topographical disorientation
  - C. Position in space dysfunction**
  - D. Right-left discrimination disorder
12. Along with Wernicke aphasia, Ms. Walsh has difficulty understanding gestures and symbols commonly used in social communication. This form of receptive aphasia is called:
- A. aprosodia
  - B. dyslexia
  - C. asymbolia**
  - D. dyslexithymia
13. After sustaining a traumatic brain injury, Jayden lost his sense of smell and taste. Loss of these 2 senses likely resulted from damage to which cranial nerves?
- 1 olfactory nerve (CN 1)
  - 2 facial nerve (CN 7)
  - 3 glossopharyngeal nerve (CN 9)
  - 4 vagus nerve (CN 10)
  - 5 hypoglossal nerve (CN 12)
- A. 1, 2
  - B. 1, 2, 3
  - C. 1, 2, 3, 4**
  - D. 1, 2, 3, 4, 5
14. Emilia is experiencing tongue deviation to the right, atrophy and paralysis of the tongue, and dysphagia secondary to impaired tongue musculature. Her therapist immediately suspects impairment to which cranial nerve?
- A. CN 9 glossopharyngeal
  - B. CN 11 accessory nerve
  - C. CN 12 hypoglossal nerve**
  - D. CN 7 facial nerve
15. After a head injury resulting from a fall, Mrs. Mazziotta has lost both the gag and swallowing reflexes. She is also experiencing dysphonia (hoarse voice), dysphagia (difficulty swallowing), and dysarthria (difficulty speaking clearly). These symptoms likely result from damage to which 2 cranial nerves?
- A. CN 11 accessory nerve, CN 12 hypoglossal nerve
  - B. CN 9 glossopharyngeal nerve, CN 12 hypoglossal nerve
  - C. CN 10 vagus nerve, CN 8 vestibulocochlear nerve
  - D. CN glossopharyngeal nerve, CN 10 vagus nerve**
16. A nerve impulse jump from one \_\_\_\_\_ to another during saltatory conduction
- A. Synapse
  - B. Axon
  - C. Node of Ranvier**
  - D. Myelin sheath

17. \_\_\_\_\_ are the neurons carrying impulses away from the central nervous system
- A. **Efferent nerves**
  - B. Afferent nerves
  - C. Extensors
  - D. Sensory nerves
18. A membrane potential is the difference in electrical charge between
- A. Potassium and sodium ions
  - B. **The inside and outside of the cell**
  - C. Phosphoric acid and glycolipid layers
  - D. Resting and action potentials
19. The end of the rising phase of an action potential occurs when the
- A. Potassium channels close
  - B. **Sodium channels close**
  - C. Potassium channels open
  - D. Chloride channels open
20. After Joaquim's football accident in which he injured his brachial plexus, he has numbness, weakness, and paresthesias in his right forearm and hand. Joaquim's physician is sending him for a test that evaluates the presence of peripheral nerve disorder. This test involves the insertion of thin needles into specific muscles to detect electrical activity. This test is called:
- A. **Myelogram**
  - B. Electroencephalogram
  - C. Electromyogram
  - D. Computed tomography
21. Mr. Polito has been diagnosed with myasthenia gravis. This disease is caused when the body inappropriately produces antibodies against a specific neurotransmitter receptor site. This neurotransmitter is stored in the neuromuscular junction and is responsible for musculoskeletal movement. When this neurotransmitter is inhibited, muscle weakness and fatigue occur. This neurotransmitter is called:
- A. GABA
  - B. dopamine
  - C. norepinephrine
  - D. **acetylcholine**
22. \_\_\_\_\_ is a heightened response to a substance after a period of abstinence. The brain responds to re-exposure of the substance with increased pleasure. This phenomenon is the mechanism that commonly causes relapse after periods of abstinence.
- A. Tolerance
  - B. Priming
  - C. Cravings
  - D. **Sensitization**
23. Ms. Lee was diagnosed with a chronic autoimmune disorder affecting the neuromuscular junction of voluntary muscles. In this disease, acetylcholine receptor antibodies destroy

acetylcholine receptors at the neuromuscular junction, resulting in severe muscular weakness and fatigue. The disease first affects the eye and head musculature and then progresses to the limbs and respiratory muscles. This disease is known as:

- A. Amyotrophic lateral sclerosis
  - B. Multiple sclerosis
  - C. **Myasthenia gravis**
  - D. Muscular dystrophy
24. Ms. Mendoza was diagnosed with a tumour in her right optic tract. Her occupational therapist has detected a contralateral homonymous hemianopia causing:
- A. Right visual field cut.
  - B. **A left visual field cut.**
  - C. Complete blindness
  - D. Tunnel vision.
25. Mr. Takahashi was diagnosed with tunnel vision, in which the temporal fields in both eyes have been lost. This condition results from:
- A. Lesion to the right optic tract.
  - B. Lesion to the left optic tract.
  - C. Lesion to the lateral regions of the optic chiasm.
  - D. **Lesion to the central region of the optic chiasm.**
26. Ricardo is in first grade and has difficulty with attention and concentration. He becomes easily distracted by noise in the hallway or by movement and sound from his classmates. When distracted, Ricardo cannot refocus on his schoolwork and instead rises from his chair and walks around the classroom. Which neurological system plays a role in screening sensory information so that the cortex can attend to the most salient information while filtering extraneous information from the environment?
- A. Vestibular system
  - B. Enteric nervous system
  - C. Limbic system
  - D. **Reticular formation**
27. Emile is walking home from work late at night. The street he is walking on is dimly lit and silent. Emile believes that he can hear someone walking behind him in the distance. He is carrying a large sum of money that he must deposit in the bank tomorrow. As he hears the footsteps growing closer, Emile's heart rate accelerates. The hunger that he felt has dissipated, as blood flow has shifted from his gastrointestinal tract to his skeletal muscles and brain. Emile's blood pressure has increased, and he feels alert and anxious. Which neurological system has become dominant and is responsible for these physiological changes?
- A. Vestibular system
  - B. Parasympathetic nervous system
  - C. **Sympathetic nervous system**
  - D. Enteric nervous system
28. Adam has been taking codeine, a narcotic prescription medication for pain, after injuring himself at work. Although the narcotic controls his pain level, Adam has noticed that he

has developed constipation despite having no dietary changes. Explanations accounting for Adam's constipation include all but which one of the following?

- A. **Narcotics stimulate parasympathetic activity, thus shutting down peristalsis.**
  - B. Narcotics can change the level of serotonin in the enteric nervous system, thereby creating bowel problems.
  - C. Narcotics block messages sent from the enteric nervous system to the autonomic nervous system signalling the start and stop of peristalsis.
  - D. Drugs with morphine and narcotic properties attach to the intestine's opiate receptors and can produce constipation.
29. Mr. Zimmerman has foot drop and a steppage gait in which he lifts his right bent knee high enough to avoid dragging his foot. Compression of which nerve results in foot drop?
- A. Sciatic nerve
  - B. **Peroneal nerve**
  - C. Ulnar nerve
30. Mr. Kagan is experiencing numbness and weakness in his left arm and leg, blurred vision, dizziness, and confusion. His daughter calls 911, because she recognizes these signs as indicative of a:
- A. Visual-perceptual disorder
  - B. Migraine-induced aura
  - C. **Transient ischemic attack**
  - D. Tactile agnosia

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

**20 MARKS**

1. Describe stocking/glove distribution of sensory impairment (5 MARKS)
2. Describe the blood supply of the brain (5 MARKS)
3. Apply the Modified Ashworth Scale in Assessing spasticity (5 MARKS)
4. Explain the processes that maintain a negative resting membrane potential (5 MARKS)

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

**20 MARKS**

1. Compare and contrast mechanisms of and uses for computed tomography (CT), magnetic resonance imaging (MRI), diffusion tensor imaging (DTI), positron emission tomography (PET), and functional magnetic resonance imaging (fMRI) (10 marks)
2. Producing an action potential requires a sequence of three events. Draw a diagram how each event changes the membrane potential (10 marks)
3. Describe the roles of the pons, medulla, hypothalamus, and the emotion/motivation system in the regulation of autonomic functions (10 MARKS)