INSTRUCTIONS: Attempt ALL the questions in SECTION A and ANY TEN from SECTION B

TIME: 3 HOURS

SECTION A (40 Marks)

1. Which of the following cavities contains a component of the central nervous system?
   a. abdominal
   b. pelvic
   c. cranial
   d. thoracic

2. Which structure predominates in the white matter of the brain?
   a. myelinated axons
   b. neuronal cell bodies
   c. ganglia of the parasympathetic nerves
   d. bundles of dendrites from the enteric nervous system

3. Which part of a neuron transmits an electrical signal to a target cell?
   a. dendrites
   b. soma
   c. cell body
   d. axon

4. Which term describes a bundle of axons in the peripheral nervous system?
   a. nucleus
   b. ganglion
   c. tract
   d. nerve

5. Aside from the nervous system, which other organ system develops out of the ectoderm?
   a. digestive
   b. respiratory

c. integumentary
d. urinary

6. Which primary vesicle of the embryonic nervous system does not differentiate into more vesicles at the secondary stage?
   a. prosencephalon
   b. mesencephalon
   c. diencephalon
   d. rhombencephalon

7. Which adult structure(s) arises from the diencephalon?
   a. thalamus, hypothalamus, retina
   b. midbrain, pons, medulla
   c. pons and cerebellum
   d. cerebrum

8. Which non-nervous tissue develops from the neuroectoderm?
   a. respiratory mucosa
   b. vertebral bone
   c. digestive lining
   d. craniofacial bone

9. Which structure is associated with the embryologic development of the peripheral nervous system?
   a. neural crest
   b. neuroaxis
   c. rhombencephalon
   d. neural tube

10. Which lobe of the cerebral cortex is responsible for generating motor commands?
    a. temporal
    b. parietal
    c. occipital
    d. frontal

11. What level of the brain stem is the major input to the cerebellum?
    a. midbrain
    b. pons
    c. medulla
    d. spinal cord

12. What condition causes a stroke?
    a. inflammation of meninges
    b. lumbar puncture
    c. infection of cerebral spinal fluid
    d. disruption of blood to the brain

13. What type of ganglion contains neurons that control homeostatic mechanisms of the body?
    a. sensory ganglion
    b. dorsal root ganglion
    c. autonomic ganglion
    d. cranial nerve ganglion

14. What is the name for a bundle of axons within a nerve?
    a. fascicle
    b. tract
    c. nerve root
    d. epineurium

15. What type of receptor cell is responsible for transducing pain stimuli?
    a. mechanoreceptor
    b. nociceptor
    c. osmoreceptor
    d. photoreceptor

16. Which of these structures is not under direct control of the peripheral nervous system?
    a. trigeminal ganglion
    b. gastric plexus
    c. sympathetic chain ganglia
    d. cervical plexus

17. Which of these cranial nerves is part of the gustatory system?
    a. olfactory
    b. trochlear
    c. trigeminal
    d. facial

18. Axons from which neuron in the retina make up the optic nerve?
    a. amacrine cells
    b. photoreceptors
    c. bipolar cells
    d. retinal ganglion cells

19. What type of receptor cell is involved in the sensations of sound and balance?
    a. photoreceptor
    b. chemoreceptor
    c. mechanoreceptor
    d. nociceptor

20. What type of reflex can protect the foot when a painful stimulus is sensed?
    a. stretch reflex
    b. gag reflex
    c. withdrawal reflex
    d. corneal reflex

SECTION B (40 Marks)

1. What responses are generated by the nervous system when you run on a treadmill? Include an example of each type of tissue that is under nervous system control.

2. When eating food, what anatomical and functional divisions of the nervous system are involved in the perceptual experience?

3. Multiple sclerosis is a demyelinating disease affecting the central nervous system. What type of cell would be the most likely target of this disease? Why?

4. Which type of neuron, based on its shape, is best suited for relaying information directly from one neuron to another? Explain why.

5. Studying the embryonic development of the nervous system makes it easier to understand the complexity of the adult nervous system. Give one example of how development in the embryonic nervous system explains a more complex structure in the adult nervous system.

6. Meningitis is an inflammation of the meninges that can have severe effects on neurological function. Why is infection of this structure potentially so dangerous?

7. Why are ganglia and nerves not surrounded by protective structures like the meninges of the CNS?

8. Damage to specific regions of the cerebral cortex, such as through a stroke, can result in specific losses of function. What functions would likely be lost by a stroke in the temporal lobe?

9. Why do the anatomical inputs to the cerebellum suggest that it can compare motor commands and sensory feedback?

10. The sweetener known as stevia can replace glucose in food. What does the molecular similarity of stevia to glucose mean for the gustatory sense?

11. Following a motorcycle accident, the victim loses the ability to move the right leg but has normal control over the left one, suggesting a hemi-section somewhere in the thoracic region of the spinal cord. What sensory deficits would be expected in terms of touch versus pain? Explain your answer.

12. A pituitary tumor can cause perceptual losses in the lateral visual field. The pituitary gland is located directly inferior to the hypothalamus. Why would this happen?

13. A target effector, such as the heart, receives input from the sympathetic and parasympathetic systems. What is the actual difference between the sympathetic and parasympathetic divisions at the level of those connections (i.e., at the synapse)?

14. Damage to internal organs will present as pain associated with a particular surface area of the body. Why would something like irritation to the diaphragm, which is between the thoracic and abdominal cavities, feel like pain in the shoulder or neck?

15. Medical practice is paying more attention to the autonomic system in considering disease states. Why would autonomic tone be important in considering cardiovascular disease?

16. Horner's syndrome is a condition that presents with changes in one eye, such as pupillary constriction and dropping of eyelids, as well as decreased sweating in the face. Why could a tumor in the thoracic cavity have an effect on these autonomic functions?

17. The cardiovascular center is responsible for regulating the heart and blood vessels through homeostatic mechanisms. What tone does each component of the cardiovascular system have? What connections does the cardiovascular center invoke to keep these two systems in their resting tone?

18. Why does smoking increase the risk of heart disease? Provide two reasons based on autonomic function.

19. Learning to ride a bike is a motor function dependent on the cerebellum. Why are the different regions of the cerebellum involved in this complex motor learning?

20. Alcohol intoxication can produce slurred speech. How is this related to cerebellar function?