Nervous System

Part A. Multiple Choice

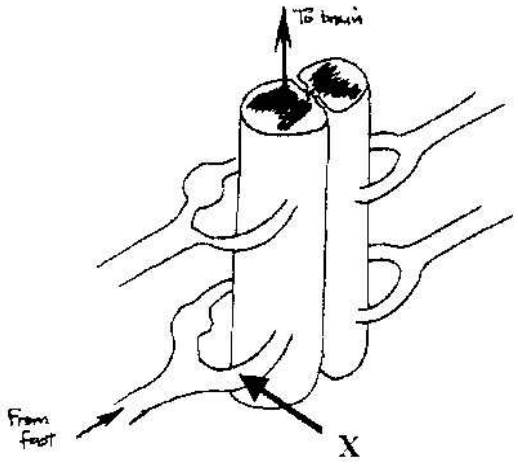
1. What is the majority of the gray matter of the CNS composed of?
   A. Cell bodies of motor neurons and interneurons.
   B. Cell bodies of sensory neurons and interneurons.
   C. Cell bodies of motor neurons and sensory neurons.
   D. Cell bodies of motor neurons, sensory neurons, and interneurons.

2. Some external stimuli cause immediate responses through the use of
   A. many interneurons.
   B. sensory neurons to the brain.
   C. simplified pathways called reflex arcs.
   D. rapid transmission along the spinal cord.

3. From which regions of the CNS do the sympathetic neurons arise?
   A. Cranial and sacral.
   B. Lumbar and sacral.
   C. Cranial and thoracic.
   D. Thoracic and lumbar.

4. The part of a motor neuron **MOST** likely damaged if you cut your arm is the
   A. axon.
   B. effector.
   C. dendrite.
   D. cell body.

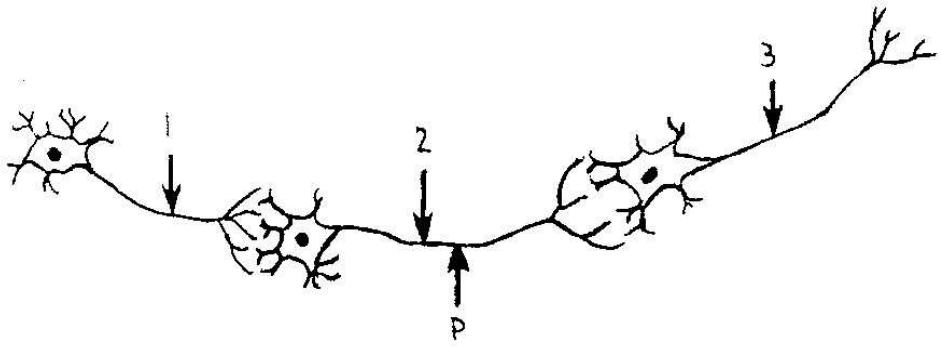
Use the following diagram to answer the next question.



5. The sketch shows the neural pathway between the foot and the brain. If damage occurs at location **X**, the person
   A. would no longer be able to feel pain or move the foot.
   B. would still be able to move the foot and feel pain in it.
   C. would be able to feel pain in the foot, but not be able to move it.
   D. would be able to move the foot, but no longer be able to move it.

6. Which of the following relationships is the **MOST** similar to the relationship between nerve and neuron?
   A. Tissue – cell.
   B. Enzyme – substrate.
   C. Protein – amino acid.
   D. Blood vessel – blood.

Use the following diagram to answer the next question.

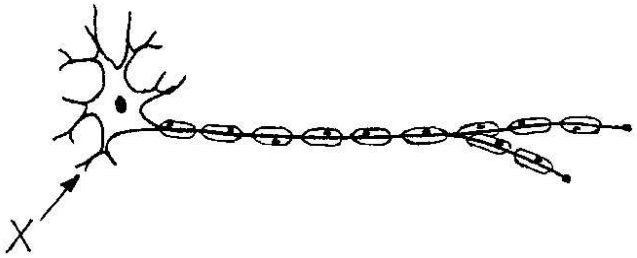


7. When the axon of neuron #2 is stimulated at point **P** and a nerve impulse is generated in both directions, this impulse can only be transmitted from
   A. neuron 2 to neuron 1 by the movement of ions.
   B. neuron 2 to neuron 3 by the movement of ions.
   C. neuron 2 to neuron 1 by the release of neurotransmitters.
   D. neuron 2 to neuron 3 by the release of neurotransmitters.

8. Which of the following structures is found only in the central nervous system?
   A. The axon of an interneuron.
   B. The axon of a motor neuron.
   C. The dendrite of a sensory neuron.
   D. The cell body of a sensory neuron.

9. Which of the following neurons is **NOT** a participant in a spinal reflexive action?
   A. Motor neuron.
   B. Sensory neuron.
   C. Spinal interneuron.
   D. Cerebral interneuron.

Use the following diagram to answer the next question.

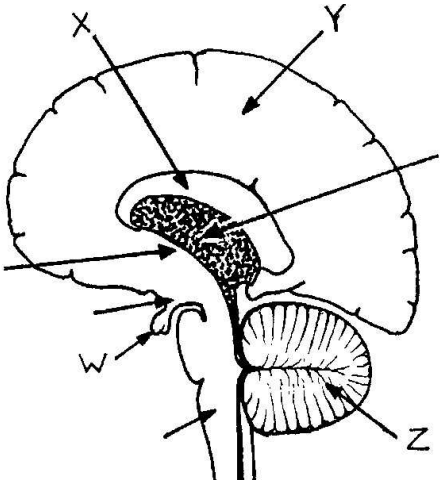


10. In the transmission of impulses, structure **X** normally receives stimulation from
    A. a receptor.
    B. an interneuron.
    C. a motor neuron.
    D. a muscle or gland.

11. Which of the following structures normally send impulses toward a cell body?
    A. Sensory axon and motor axon.
    B. Sensory dendrite and motor axon.
    C. Sensory axon and motor dendrite.
    D. Sensory dendrite and motor dendrite.

12. Observable evidence of damage to the cerebellum would **MOST** likely include
    A. hiccups.
    B. paralysis.
    C. lack of coordination.
    D. involuntary twitching.

Use the following diagram to answer the next THREE questions.



13. The structure labeled **X** is the
    A. cerebrum.
    B. cerebellum.
    C. hypothalamus.
    D. corpus callosum.

14. The structure labeled **Y** is the
    A. cerebrum.
    B. cerebellum.
    C. hypothalamus.
    D. corpus callosum.

15. A function for the structure labeled **Z** is to
    A. sort and relay sensory stimuli.
    B. initiate the “fight or flight” response.
    C. integrate muscle position and balance.
    D. channel information between the two hemispheres.

16. Which of the following is a correct body response to the hypothalamus detecting that blood is too warm?
    A. Contraction of the spleen.
    B. Constriction of hair follicles.
    C. Dilation of arterioles to the skin.
    D. Generation of involuntary muscle spasms.

17. Which brain part is **BEST** associated with reflexive actions?
    A. Cerebrum.
    B. Cerebellum.
    C. Hypothalamus.
    D. Medulla oblongata.

18. Which part of the brain is mismatched with its function?
    A. Cerebrum – sensory perception.
    B. Cerebrum – integrated thought processes.
    C. Medulla oblongata – breathing rate and heart rate.
    D. Corpus callosum – directing sensory impulses to the correct cerebral association area.

19. Which of the following **MOST** correctly describes the connections from the hypothalamus to the pituitaries?
    A. Nerves to both the anterior and posterior pituitary glands.
    B. Capillaries to both the anterior and posterior pituitary glands.
    C. Nerves to the anterior pituitary gland and capillaries to the posterior pituitary gland.
    D. Capillaries to the anterior pituitary gland and nerves to the posterior pituitary gland.

20. During the resting potential, which of the following conditions exists outside the neuron?
    A. Excess K^{1+}.
    B. Excess Na^{1+}.
    C. Excess negative organic ions.
    D. Equal concentrations of Na^{1+} and K^{1+}.

21. In a normal functioning axon, nerve impulses travel
    A. toward the cell body.
    B. away from the cell body.
    C. to a dendrite and a synaptic junction.
    D. first toward, then away from the CNS.

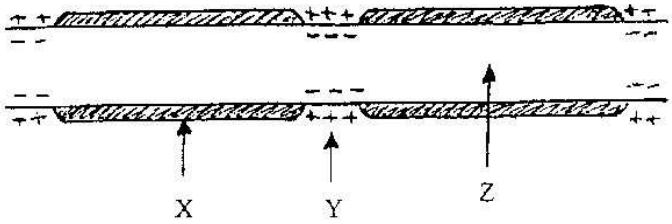
22. Which of the following is **NOT** true of myelin?
    A. It is composed of Schwann cells.
    B. It allows impulses to travel faster.
    C. It prevents cross-communication between neurons.
    D. It ensures neurotransmitters are not lost during synaptic transmission.

23. Which of the following voltage readings is definitely mismatched?
    A. +40 mV – resting potential.
    B. 0.0 mV – sodium rushing in.
    C. -65 mV – Na/K pump functions.
    D. -10 mV – potassium rushing out.

24. Which of the following events occurs at the **LEADING** edge of an impulse?
    A. K^{1+} enters the neuron.
    B. K^{1+} leaves the neuron.
    C. Na^{1+} enters the neuron.
    D. Na^{1+} leaves the neuron.

25. The Na/K pumps are primarily responsible for establishing and maintaining
    A. action potentials.
    B. resting potentials.
    C. synaptic transmission.
    D. secretion of salts from neurons.

Use the following diagram to answer the next THREE questions.



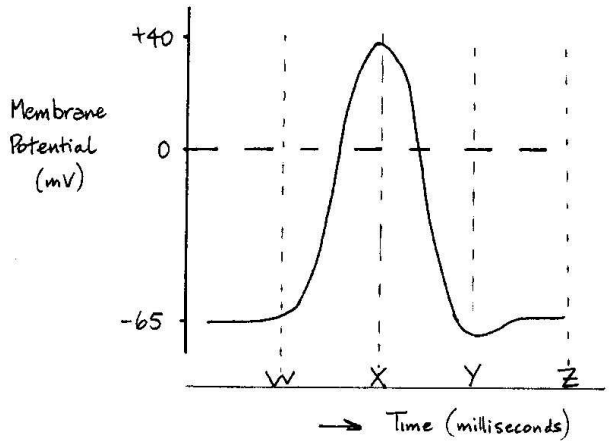
26. The shaded structures at **X** allow vertebrates to
    A. synthesize acetylcholine.
    B. distinguish between different stimuli.
    C. respond quickly to their environment.
    D. store ATP needed for impulse transmission.

27. Arrow **Y** is pointing at a
    A. synaptic gap.
    B. Schwann cell.
    C. myelin sheath.
    D. node of Ranvier.

28. At the resting phase the largest concentration of potassium ions can be found at
    A. position X.
    B. position Y.
    C. position Z.
    D. positions X and Y.

29. Which of the following is characteristic of a resting potential?
    A. Secretion of calcium ions.
    B. Neurotransmitters move into the axon.
    C. Depolarization of the postsynaptic membrane.
    D. A net negative charge on the inside of the axon.

Use the following graph to answer the next two questions.



30. Which of the following occurs between times **X** and **Y**?
    A. Repolarization.
    B. Depolarization.
    C. Resting potential.
    D. Refractory period.

31. During which time period are sodium ions diffusing into the axoplasm?
    A. Between W and X.
    B. Between X and Y.
    C. Between Y and Z.
    D. Before W and after Z.

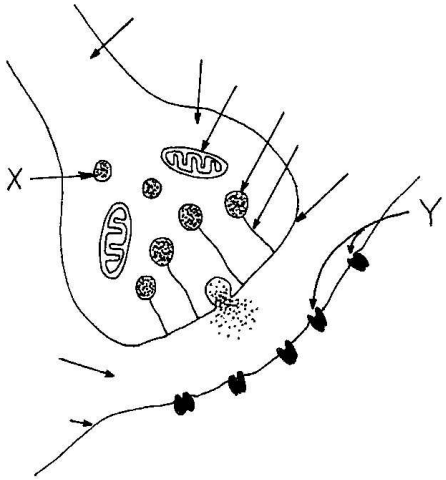
32. The phenomenon that each impulse conducted by a neuron is the same "strength" regardless of the strength of the stimulus is known as
    A. action potential.
    B. semi-conservative.
    C. refractory response.
    D. all-or-none response.

33. Which process ensures that a greater concentration of sodium ions is maintained outside the axon relative to the axoplasm?
    A. Diffusion through sodium channels.
    B. Transport by carriers and the use of ATP.
    C. Exocytosis due to infolding of the membrane.
    D. Facilitated transport by sodium-potassium carriers.

34. Transmission of an impulse from one neuron to another is dependent upon all of the following **EXCEPT ONE**. Which one?
    A. Enzymes.
    B. Synaptic membranes.
    C. The presence of Ca^{2+}.
    D. Neurotransmitter molecules.

35. One role of the mitochondria in the synaptic knob (terminus) of an axon would be to provide energy for the
    A. pumping of sodium across the synapse.
    B. pumping of potassium across the synapse.
    C. synthesis and exocytosis of neurotransmitters.
    D. synthesis of a receptor site on the post-synaptic membrane.

Use the following diagram to answer the next TWO questions.



36. What is the function of the structure labeled **X**?
    A. It transports ATP away from the mitochondria.
    B. It transports sodium and potassium to the receptors.
    C. It transports neurotransmitters towards the cell body.
    D. It transports neurotransmitters to the presynaptic membrane.

37. What does structure **Y** represent?
    A. A sodium-potassium pump on an axon.
    B. A receptor on a postsynaptic membrane.
    C. An attachment site for calcium ions on a dendrite.
    D. A production site for enzymes that destroy neurotransmitters.

38. The release of neurotransmitters into the synaptic gap is an example of
    A. exocytosis.
    B. endocytosis.
    C. active transport.
    D. facilitated transport.

39. Which of the following **BEST** describes the function of the ANS?
    A. Voluntary and controls smooth muscle.
    B. Voluntary and controls skeletal muscle.
    C. Involuntary and controls smooth muscle.
    D. Involuntary and controls skeletal muscle.

40. Motor axons of the sympathetic nervous system release
    A. adrenalin.
    B. noradrenalin.
    C. acetylcholine.
    D. acetylcholinesterase.

41. Stimulation of the parasympathetic nervous system promotes increases
    A. heart rate.
    B. breathing rate.
    C. smooth muscle activity.
    D. blood flow to skeletal muscles.

42. The neurotransmitter from an unknown neuron was collected and applied to an isolated heart. It caused a decrease in the heart rate. It was **MOST** likely
    A. noradrenalin from a sympathetic neuron.
    B. acetylcholine from a sympathetic neuron.
    C. noradrenalin from a parasympathetic neuron.
    D. acetylcholine from a parasympathetic neuron.

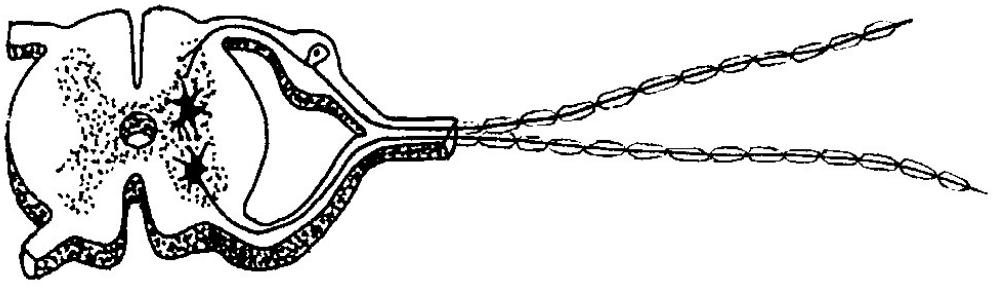
43. The autonomic nervous system includes the
    A. brain and spinal cord.
    B. somatic nervous system.
    C. cerebellum and the medulla oblongata.
    D. sympathetic and parasympathetic divisions.

44. If fluid were taken from the area around a rapidly beating heart and applied to a stomach, it would **MOST** likely cause the stomach to
    A. speed up.
    B. slow down.
    C. secrete gastric juice.
    D. increase its oxygen uptake.

45. Adrenaline is produced and released by the
    A. pancreas.
    B. adrenal cortex.
    C. adrenal medulla.
    D. posterior pituitary.

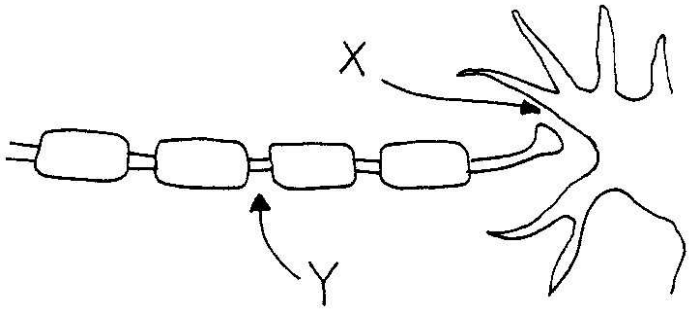
Part B. Written Answers

Use the following diagram to answer the first question.



1. a. **IDENTIFY** the sensory and motor neuron by labeling them in the above picture.
   b. **LABEL** the axon and dendrite of both of the cells identified in Part a.
   c. **DRAW** arrows to indicate the direction of impulse transmission in this diagram.

Use the following diagram to answer the next question.



1. Nerve impulse transmission is different in the area marked "**X**" and the area marked "**Y**".
   a. Describe the process that occurs at **X** when a nerve impulse travels through the area.
   b. Describe the process that occurs at **Y** when a nerve impulse travels through the area.

3. a. What is the effect of myelin during saltatory transmission?
   b. Describe another role of Schwann cells in a mixed nerve.

4. From which specific regions of the CNS do the various autonomic nerve fibers originate?

5. Use a sketch help explain the neuroendocrine control function of the brain.

6. Give **TWO** reasons why impulses can only be transmitted in one direction during synaptic transmission.

7 a. Describe the body's response to increased stimulation by the sympathetic nervous system.
   b. How does this prepare the body to respond to emergency situations?