

Nervous System: Spinal Cord and Peripheral Nerves

11

Answer Key: Textbook page references are provided as a guide for answering these questions. A complete answer key was provided for your instructor.

OBJECTIVES

1. Describe the anatomy of the spinal cord and list its three functions.
2. Discuss reflexes and list four components of the reflex arc.
3. List and describe the functions of the 12 pairs of cranial nerves.
4. Do the following regarding the peripheral nervous system:
 - Identify the classification of spinal nerves.
 - List the functions of the three major plexuses.
 - Describe a dermatome.
 - Provide the functional classification of the peripheral nervous system.

Part I: Mastering the Basics

MATCHING

Nerve Tracts

Directions: In the spaces provided, indicate whether the following are sensory (S) or motor (M) structures or functions. See text, pp. 201-203.

1. _____ Descending tracts
2. _____ Carries information for touch, pressure, and pain
3. _____ Corticospinal tract
4. _____ Pyramidal tract
5. _____ Ascending tracts
6. _____ Electrical signal arises in the precentral gyrus of the frontal lobe
7. _____ Carries information to the parietal lobe

8. _____ Most neurons decussate in the medulla oblongata
9. _____ Extrapyramidal tracts
10. _____ Spinothalamic tract
11. _____ I feel pain in my little finger.
12. _____ I'm wiggling my toes.
13. _____ I'm cold.
14. _____ I'm winking.
15. _____ I'm hearing voices.
16. _____ Spinocerebellar

MATCHING

Reflexes

Directions: Match the following terms to the most appropriate definition by writing the correct letter in the space provided. See text, pp. 204-207.

- | | |
|---------------------------|---------------------------|
| A. Babinski reflex | E. patellar tendon reflex |
| B. Achilles tendon reflex | F. withdrawal reflex |
| C. gag reflex | G. pupillary reflex |
| D. baroreceptor reflex | |

1. _____ A protective reflex; quickly moves your finger away from a hot object
2. _____ This reflex helps you maintain a standing posture; also called the *knee-jerk reflex*.
3. _____ This reflex helps your body maintain a normal blood pressure.
4. _____ This reflex is elicited by stroking the sole of the foot; plantar flexion and curling of the toes are normal responses in an adult.
5. _____ This reflex causes the pupils of the eyes to constrict (become smaller) in response to light.

6. _____ A stretch reflex; tapping this tendon in the heel normally causes plantar flexion of the foot; also called the *ankle-jerk reflex*.
7. _____ This reflex involves the glossopharyngeal nerve and helps prevent food and water from going down the wrong way.

READ THE DIAGRAM**Reflex Arc**

Directions: Referring to Figure 11-5 in the textbook, fill in the spaces with the correct numbers. Some numbers may be used more than once. See p. 205.

1. _____ Result of the contraction of the quadriceps femoris
2. _____ Receptors in the thigh muscles are stimulated
3. _____ Motor neuron
4. _____ Sensory neuron
5. _____ Afferent neuron
6. _____ Efferent neuron
7. _____ Extension of the leg
8. _____ Information travels from the spinal cord to the muscle.
9. _____ Information travels from receptors in the muscle to the spinal cord.

MATCHING**Cranial Nerves**

Directions: Match the following terms to the most appropriate definition by writing the correct letter in the space provided. Some terms may be used more than once. See text, pp. 207-211.

- | | |
|----------------------|----------------|
| A. olfactory | F. hypoglossal |
| B. vestibulocochlear | G. oculomotor |
| C. vagus | H. trigeminal |
| D. accessory | I. facial |
| E. optic | |

1. _____ Senses hearing and balance
2. _____ The wanderer; widely distributed throughout the thoracic and abdominal cavities
3. _____ Helps control the movements of the tongue; cranial nerve XII

4. _____ Allows you to shrug your shoulders
5. _____ Damage to this nerve causes blindness
6. _____ Sense of smell
7. _____ Tic douloureux, a condition characterized by extreme facial and jaw pain, is caused by inflammation of this nerve.
8. _____ A dilated and fixed pupil is caused by pressure on this nerve.
9. _____ Inflammation of this nerve causes Bell's palsy, a paralysis of one side of the face.
10. _____ Nerve that supplies most of the extrinsic eye muscles; primary function is the movement of the eyeballs
11. _____ Carries sensory information from the eyes to the occipital lobe of the brain
12. _____ In addition to moving the eyeball, this nerve raises the eyelid and constricts the pupil of the eye.
13. _____ Anosmia
14. _____ Cranial nerve VIII
15. _____ Ototoxicity
16. _____ Ptosis of the lids
17. _____ Cranial nerve II
18. _____ Vertigo
19. _____ Can't smile, wrinkle forehead, secrete tears, or close eyes (on the affected side)
20. _____ Cranial nerve X

MATCHING**Spinal Nerves**

Directions: Match the following terms to the most appropriate definition by writing the correct letter in the space provided. Some terms may be used more than once. See text, pp. 210-214.

- | | |
|--------------------|-----------------|
| A. sciatic | E. femoral |
| B. axillary | F. cauda equina |
| C. radial | G. phrenic |
| D. common peroneal | H. plexus(es) |

- | | |
|---|--|
| <p>1. _____ Wristdrop is caused by damage to this nerve.</p> <p>2. _____ Crutch palsy is caused by damage to this nerve.</p> <p>3. _____ Nerve that supplies the diaphragm, an important breathing muscle</p> <p>4. _____ Spinal nerves are grouped and sorted here.</p> <p>5. _____ This large nerve leaves or emerges from the distal end of the spinal cord and supplies the buttocks and posterior thighs.</p> <p>6. _____ Nerve groupings that are described as cervical, brachial, and lumbosacral nerves</p> <p>7. _____ Severing of this nerve requires the use of a ventilator</p> <p>8. _____ Group of nerves that emerge from the distal end of the spinal cord; horse's tail</p> <p>9. _____ Innervates the inner thigh area</p> <p>10. _____ If damaged, causes footdrop</p> <p>11. _____ Must administer an intramuscular (IM) injection in the upper outer quadrant of the buttocks to avoid injuring this nerve</p> | <p>5. phrenic diaphragm motor gag reflex</p> <hr/> <p>6. CN VIII hearing vestibulocochlear facial nerve</p> <hr/> <p>7. CN II blindness ptosis of the lid optic</p> <hr/> <p>8. CN I CN III CN VIII CN II</p> <hr/> <p>9. optic sciatic olfactory oculomotor</p> <hr/> <p>10. ulnar dermatome radial median</p> <hr/> <p>11. vagus ptosis of the lid CN X "wanderer" nerve</p> <hr/> <p>12. cervical reflex arc thoracic lumbar</p> <hr/> <p>13. vagus sciatic common peroneal femoral</p> <hr/> <p>14. foramen cervical lumbosacral brachial magnum</p> <hr/> <p>15. anosmia footdrop wristdrop crutch palsy</p> <hr/> <p>16. CN I vision motor olfactory</p> <hr/> <p>17. CN III aphasia ptosis of the lid fixed-dilated pupil</p> <hr/> <p>18. hemi- meningo- para- quadra-</p> |
|---|--|

SIMILARS AND DISSIMILARS

Directions: Circle the word in each group that is least similar to the others. Indicate the similarity of the three words on the line below each question.

- | |
|---|
| <p>1. descending sensory corticospinal pyramidal</p> <hr/> <p>2. ascending motor spinothalamic sensory</p> <hr/> <p>3. motor efferent descending spinothalamic</p> <hr/> <p>4. Babinski reflex baroreceptor reflex reflex tachycardia withdrawal reflex</p> <hr/> |
|---|

19. CN VII optic nerve "weakest blink" orbicularis oculi
-
20. CN IX glossopharyngeal Babinski gag reflex
-

6. Which of the following is least related to the others?
- pyramidal tract
 - extrapyramidal tract
 - spinothalamic tract
 - corticospinal tract
7. What is the purpose of myelination?
- increases the speed of the nerve impulse
 - secretes cerebrospinal fluid
 - increases the phagocytic activity of the glia
 - separates neurons from the surrounding glia
8. Which of the following is least descriptive of the vagus nerve?
- CN X
 - distributed throughout the chest and abdomen
 - inflamed vagus nerve causes Bell's palsy
 - affects the function of the digestive tract
9. Which of the following is a true statement?
- The olfactory nerve is a motor nerve.
 - The second cranial nerve is a sensory nerve.
 - The phrenic, sciatic, and axillary nerves are cranial nerves.
 - The vagus nerve is confined to the cranium.
10. Which of the following is most descriptive of the cauda equina?
- spinal nerves that emerge from the tail end of the spinal cord
 - cells that secrete cerebrospinal fluid
 - glial cells that form the blood-brain barrier
 - meninges
11. Diagnostically, a needle is inserted between the third and fourth lumbar vertebrae into the subarachnoid space to
- relieve intracranial pressure from a closed head injury.
 - obtain a sample of cerebrospinal fluid.
 - administer blood.
 - assess the withdrawal reflex.
12. These nerves supply voluntary skeletal muscles, causing movement.
- somatic motor nerves
 - vagus nerve
 - parasympathetic nerves
 - sympathetic nerves

Part II: Putting It All Together

MULTIPLE CHOICE

Directions: Choose the correct answer.

- Which of the following is most descriptive of a descending tract?
 - afferent
 - sensory
 - spinothalamic
 - motor
- Which of the following is most likely to experience ototoxicity?
 - a furniture mover who strained his back
 - a person who was diagnosed with a tumor involving the second cranial nerve
 - a person who took an antibiotic drug that injured CN VIII
 - a person with Bell's palsy
- The pyramidal tract is
 - the major motor tract that originates in the precentral gyrus.
 - an ascending tract.
 - a sensory tract.
 - also called the *spinothalamic tract*.
- A student nurse is instructed to administer an IM injection in the upper outer quadrant of the buttocks to
 - prevent ototoxicity.
 - minimize systemic effects of the drug.
 - avoid penetration of the subarachnoid space.
 - avoid injury to the sciatic nerve.
- Which of the following is a function of the spinal cord?
 - secretes hormones that regulate blood glucose
 - is the seat of our emotions
 - acts as an important reflex center
 - carries sensory information, but not motor information

13. A mixed nerve is one that
 - a. only transmits information for pain.
 - b. only transmits information that originates in the precentral gyrus.
 - c. contains both sensory and motor fibers.
 - d. only affects organs that are in the abdominal cavity.
14. Which involuntary response to a stimulus is accomplished by these five structures—receptor, sensory neuron, integrating center, motor neuron, effector organ?
 - a. action potential
 - b. decussation
 - c. reflex arc
 - d. saltatory conduction
15. What is the effector organ in the knee-jerk or patellar tendon reflex?
 - a. quadriceps tendon
 - b. quadriceps femoris muscle
 - c. spinal cord
 - d. gastrocnemius
16. Which of the following is least descriptive of the oculomotor nerve?
 - a. CN III
 - b. controls the movement of the eyeball
 - c. increased intracranial pressure compresses this nerve, causes ptosis of the eyelid
 - d. carries sensory information from the eye to the occipital lobe (vision)
17. Which of the following is a consequence of damage to the glossopharyngeal nerve?
 - a. inability to shrug the shoulders and move the upper extremities
 - b. blindness
 - c. loss of the gag reflex and aspiration of food or water into the lungs
 - d. loss of balance
18. The phrenic nerve
 - a. is a cranial nerve.
 - b. exits the spinal cord at the level of T12.
 - c. innervates the major breathing muscle.
 - d. is classified exclusively as ascending and sensory.
19. The first three cranial nerves
 - a. are all sensory.
 - b. innervate the eye.
 - c. are all motor.
 - d. are the olfactory, optic, and oculomotor nerves.

20. Who likes to have the sole of his foot stroked?
 - a. Broca
 - b. Cy Attica
 - c. Achilles
 - d. Babinski

CASE STUDY

Jake and his friends were picnicking near a river. He dove into the river, hitting his head on a submerged rock. When he was pulled from the river by his friends, Jake was conscious but unable to move his body. There was no feeling in his upper or lower extremities. The paramedics stabilized his neck and spinal cord and transported him to the nearest trauma center. He had sustained a fracture at the C7 and C8 vertebrae.

1. Which of the following is indicated by the paralysis?
 - a. The break was accompanied by hemorrhage and severe blood loss.
 - b. An infection developed at the fracture site.
 - c. The spinal cord had been severed or compressed.
 - d. Severe brain damage had occurred.
2. Which of the following words best describes Jake's loss of function?
 - a. subdural hematoma
 - b. increased intracranial pressure
 - c. quadriplegia
 - d. poliomyelitis
3. Which statement is true regarding Jake's long-term recovery?
 - a. Complete recovery is likely within a 3-month period.
 - b. He will regain all motor activity but will not regain any sensory function.
 - c. He will require a ventilator to breathe and should regain full use of his upper and lower extremities within 3 months.
 - d. It is unlikely that he will regain full use of either his upper or lower extremities.
4. Which statement best explains the reason for the above answer?
 - a. Neurons within the CNS do not regenerate.
 - b. The reticular activating system reacts to trauma by "closing down"; a deep coma ensues.
 - c. Severe injury stops the formation of cerebrospinal fluid.
 - d. Injured neurons regenerate but take several months to do so.

Student Name _____

Part III: Challenge Yourself!**GROUPS AND PUZZLE**

1. Which group is incorrect?
 - a. cranial nerves: olfactory, optic, oculomotor
 - b. plexuses: cervical, brachial, lumbosacral
 - c. states of paralysis: paralysis, quadriplegia, dermatome
 - d. spinal nerves: phrenic, axillary, and sciatic
2. Which group is incorrect?
 - a. states of paralysis: paraplegia, quadriplegia, hemiplegia
 - b. nerve damage: crutch palsy, wristdrop, footdrop, Bell's palsy
 - c. cranial nerves: oculomotor, phrenic, vagus, vestibulocochlear
 - d. sensory nerves: olfactory, CN I, optic, CN VIII
3. Which group is incorrect?
 - a. spinal nerves: phrenic, axillary, sciatic
 - b. reflexes: baroreceptor, withdrawal, pupillary, gag
 - c. nerve damage: crutch palsy, wristdrop, footdrop, Bell's palsy
 - d. motor nerves: descending, efferent, spinothalamic

PUZZLE**Hint: Cleopatra's Favorite Motor Tract**

Directions: Perform the following functions on the Sequence of Words that follows. When all the functions have been performed, you are left with a word or words related to the hint. Record your answer in the space provided.

Functions: Remove the following:

1. Five cranial nerves
2. Innervates the diaphragm
3. Three nerve plexuses
4. Consequences of severing CNs II and VIII
5. Nerve damaged with crutch palsy
6. Nerves that carry information toward the CNS
7. Nerves that carry information from the CNS toward the effector organs, such as the muscles

8. Mapping of the skin indicating specific innervation
9. Nerve damaged in carpal tunnel syndrome
10. Clinical effects of inflammation of CN VII

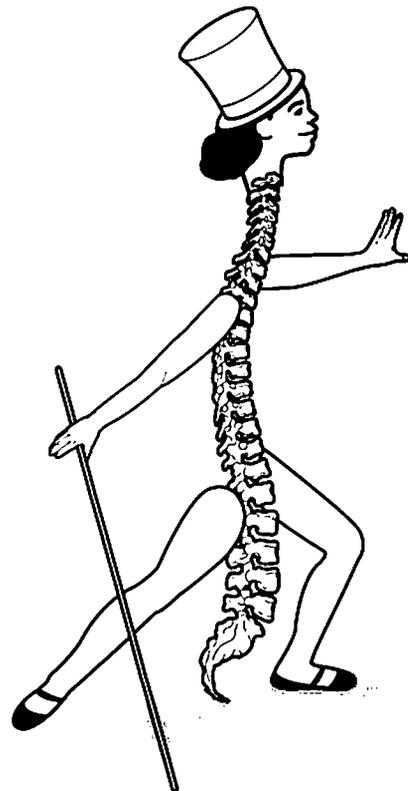
Sequence of Words

DERMATOME DEAFNESS BRACHIAL
 AXILLARY CERVICAL VESTIBULO CO
 CHLEAR PHRENIC SENSORY PYRAMI
 DAL BELL SPALSY OPTIC MEDIAN OC
 ULOMOTOR LUMBOSACRAL VAGUS
 BLINDNESS OLFACTORY CORTICOS
 PINAL MOTOR

Answer: _____

BODY TOON

Hint: Another Name for Lumbar Puncture



Answer: spinal tap