

12

Peripheral Nervous System

Answers and Explanations

I. Introduction to the Peripheral Nervous System

A. True–False Questions

1. True – Functionally, the CNS includes the brain and spinal cord and the PNS includes all other structures of the nervous system.
2. True – The direction of nerve impulses is from the receptor sites through the neurons that compose the sensory nerves and to the CNS.
3. False – Motor neurons transmit nerve impulses from the CNS to effector organs, causing them to respond.
4. False – The sensory neurons in a mixed nerve conduct impulses toward the CNS, and the motor neurons conduct impulses away from the CNS.

II. Cranial Nerves

A. Multiple Choice Questions

1. (b) – The olfactory and optic nerves arise from the forebrain, and the remaining 10 pairs of cranial nerves arise from the midbrain and brain stem.
2. (b) – The oculomotor nerve serves the medial rectus eye muscle that causes the eye to move medially.
3. (a) – The abducens nerve serves the lateral rectus ocular muscle, the trochlear nerve serves the superior oblique ocular muscle, and the oculomotor nerve serves the remaining four ocular muscles.
4. (b) – The sensory portion of the ophthalmic nerve serves the scalp and orbital region, the maxillary nerve serves the nasal and maxillary regions and the upper teeth, and the mandibular nerve serves the mandibular region and the lower teeth.
5. (c) – The facial nerve passes through the stylomastoid foramen of the skull.
6. (c) – The olfactory nerve is for smell, the optic nerve is for sight, and the vestibulocochlear nerve is for hearing and balance.
7. (a) – The tongue is innervated with four pairs of cranial nerves that have both motor and sensory functions.
8. (b) – The accessory nerve arises from nuclei within the medulla oblongata and from the first five segments of the cervical portion of the spinal cord.
9. (a) – The accessory nerve serves the sternocleidomastoid muscle, which turns the head when contracted.
10. (d) – The hypoglossal nerve passes through the hypoglossal canal of the skull.

B. True–False Questions

1. True – The numerous olfactory nerves arise from the olfactory epithelium of the nasal cavity.
2. False – Only the optic nerve fibers that originate from the medial side of the retina cross at the optic chiasma. Those that originate from the lateral side of the retina stay on the same side of the brain.
3. True – The visual cortex of the occipital lobes of the cerebrum is the visual center of the brain.
4. False – Trauma to the oculomotor nerve may cause persistent dilation of the pupil of the eye.
5. False – The muscles of mastication are innervated with motor fibers by the mandibular nerves of the trigeminal ganglia.
6. False – The abducens nerve serves the lateral rectus ocular muscle.
7. False – The muscles of facial expression are innervated by the facial nerves, but the muscles of mastication are innervated by the mandibular nerves of the trigeminal ganglia.
8. True – Both the cochlear nerve and the vestibular nerve innervate structures of the inner ear with sensory fibers.
9. True – Innervation of visceral organs with parasympathetic fibers is through the paired vagus nerves.
10. False – The accessory nerves innervate muscles within the neck.

III. Spinal Nerves

A. True–False Questions

1. True – All of the spinal nerves are mixed (contain both motor and sensory neurons).
2. True – The first seven pairs of cervical nerves emerge superior to the vertebrae for which they are named; the eighth pair emerges inferior to the seventh cervical vertebra.
3. True – Herpes zoster, commonly called shingles, is expressed as painful blisters along the paths of the affected peripheral sensory neurons.
4. True – The innervation pattern of an anterior ramus is confined to a particular dermatome.
5. True – The gray rami of the spinal nerves are composed of unmyelinated fibers.

IV. Nerve Plexuses

A. Multiple Choice Questions

1. (b) – Of the eight cervical spinal nerves, only the superior five (C1–C5) are involved in the formation of the cervical plexus.
2. (c) – There is no thoracic plexus of spinal nerves. There are, however, additional plexuses on the anterior side of the body.
3. (a) – Of the four plexuses of spinal nerves, only the brachial plexus is divided into roots, trunks, divisions, and cords.
4. (a) – The root of C7 becomes the middle trunk, and the roots of C8 and T1 become the inferior trunk.
5. (b) – Once divided into anterior and posterior divisions, the divisions converge to form posterior, medial, and lateral cords.
6. (c) – The femoral and obturator nerves arise from the lumbar plexus, and the sciatic nerve arises from the sacral plexus.
7. (d) – The abdominal wall is innervated by nerves arising from thoracic and lumbar spinal nerves.
8. (c) – The median nerve arises from the brachial plexus.

B. True–False Questions

1. True – T2–T12 give rise to intercostal nerves and are not involved in spinal nerve plexuses.
2. True – The pattern of convergence and then divergence at a nerve plexus ensures back-up innervation.
3. False – The phrenic nerves arise from the cervical plexus.
4. False – The location of formation of the brachial plexus is in the inferior cervical and clavicular regions. However, the nerves of the brachial plexus do travel through the brachial region, hence the name of this plexus.
5. False – The sciatic nerve is positioned posteriorly, beneath the gluteal muscles.

V. Reflex Arc and Reflexes

A. Multiple Choice Questions

1. (b) – The sympathetic trunk parallels the spinal cord as a part of the autonomic nervous system and is not a component of a reflex arc.
2. (a) – Somatic reflexes result in the contraction of skeletal muscles. The other kind are visceral reflexes, which result in the contraction of smooth or cardiac muscle. Visceral reflexes also cause glands to secrete.
3. (c) – A stretch reflex is monosynaptic because it involves only two neurons and one synapse. It is also ipsilateral, since it involves structures on the same side of the spinal cord.
4. (d) – The patellar (knee-jerk) reflex, initiated by tapping the patellar tendon, involves L2, L3, and L4.

B. True–False Questions

1. False – Skeletal muscles involved in respiration, swallowing, sneezing, and coughing respond to visceral reflexes.
2. True – The center, or association neuron (interneuron), is either in the spinal cord or within the brain.
3. True – The posterior horn consists of sensory neurons only.
4. True – Receptors and reflexes in all four limbs are involved in maintaining balance.
5. True – Babinski's reflex is normal in infants, however, because of the immaturity of their corticospinal tracts.

VI. Developmental Exposition of the Peripheral Nervous System

A. Completion Questions

1. dermatome
2. trigeminal
3. first cervical

VII. Chapter Review

A. Completion Questions

1. Mixed
2. 12/31
3. chemoreceptors
4. optic chiasma
5. oculomotor
6. ophthalmic
7. trigeminal/geniculate
8. vestibular/cochlear
9. vagus (X)
10. intervertebral
11. spinal ganglia
12. herpes zoster
13. cervical/brachial
14. sciatica
15. visceral (autonomic)

B. Matching Questions

1. (g)
2. (c)
3. (a)
4. (e)
5. (b)
6. (d)
7. (f)