LEARNING OBJECTIVES

- Organize the hierarchy of the nervous system
- Locate and define the internal and external structures and their corresponding functions of the brain
- List and describe the cranial nerves and their functions
- Describe the sensory and motor functions of the brain with related structures
- Contrast the parasympathetic and sympathetic branches of the autonomic nervous system
- Discuss some representative diseases of the nervous system
FACTOIDS
1. The cerebellum was once thought only to assist with motor functions, acting to help other motor regions function. However, during the last
ETHICAL DILEMMAS
1. We talk a lot about confidentiality in health care. Regulations such as HIPAA legislate confidentiality for medical records. Yet, if a child is
ANSWERS TO TEST YOUR KNOWLEDGE
Test Your Knowledge 10–1 Answers, p. 223
1. d
2. c
3. d
4. c
5. c
6. b
Test Your Knowledge 10–2 Answers, p. 229
1. c
2. c
3. b
4. c

Test Your Knowledge 10–3 Answers, p. 233
1. a
2. a
3. b
4. c
5. b

Test Your Knowledge 10–4 Answers, p. 237
1. a
2. b
3. b
4. b

ANSWERS TO THE CASE STUDY, P. 241
His left frontal lobe is damaged. You can tell because he has lost motor control on the right side but has retained sensation on the right. The motor system is in the frontal lobe, whereas somatic sensory is in the parietal lobe. Also, the cerebral cortex is contralateral, so loss of movement on the right side of the body would indicate damage to the left side of the brain. He should be able to understand language because his parietal lobe (Wernicke’s area) is undamaged, but actually speaking may be difficult because of damage to Broca’s area in the frontal lobe.

ANSWERS TO REVIEW QUESTIONS, P. 242

Multiple Choice
1. c, 2. d, 3. a, 4. c, 5. b, 6. b, 7. b, 8. d

Fill in the Blank
1. basal nuclei
2. vision
3. descending; ascending
4. limbic system
5. medulla oblongata
6. basal nuclei/thalamus
Short Answer

1. There are 12 pairs of cranial nerves but 31 pairs of spinal nerves. Cranial nerves are attached to the brain, whereas spinal nerves are attached to the spinal cord. Cranial nerves may be sensory, motor, or mixed, whereas spinal nerves are all mixed. Cranial nerves often have specialized functions, but spinal nerves all carry the same kind of information.

2. The sympathetic nervous system controls fight-or-flight response, readying the body to expend energy. The parasympathetic is resting and digesting. The sympathetic neurons are thoracolumbar, whereas the parasympathetic neurons are craniosacral. The sympathetic ganglia are paravertebral, parallel to the spinal cord, whereas the parasympathetic ganglia are near the target organs. The sympathetic postganglionic neurons release norepinephrine, and the parasympathetic postganglionic neurons release acetylcholine.

3. The cerebral cortex generates the movement plan and sends orders directly to the ventral horn motor neurons. In addition, the cortex sends the planned movements to subcortical structures such as the thalamus, basal nuclei, and cerebellum. The subcortical structures fine-tune and coordinate the movement plan, send information down the spinal cord, and correct the orders originally sent by the cerebral cortex if necessary.

4. Somatic sensory information is sensed by receptors in your skin and joints. That information is transferred along a spinal nerve to the dorsal root and to the neuron cell body in the dorsal root ganglion. The information is carried into the spinal cord and enters one of the ascending spinal cord tracts. These tracts take the information to various parts of the brain. Conscious sensation is eventually mapped in the somatic sensory cortex, in the postcentral gyrus, and compared with other information by the somatic sensory association area, allowing understanding. (If the sensory information is on your face or head, the spinal cord is not involved. Information goes into the brain stem via cranial nerves, into a nucleus, and then to the brain.)

5. Movement plans are made in the premotor area and sent to the primary motor cortex in the precentral gyrus. Orders are sent directly from the primary motor cortex to the ventral horn motor neurons. The motor neurons send the orders to skeletal muscles, and they contract. The orders are sent via the ventral roots and spinal nerves. In addition, orders are sent from primary motor cortex to subcortical structures, including the basal nuclei, thalamus, and cerebellum. These nuclei form a complex neural loop that coordinates movements, sending corrective signals down the spinal cord to the ventral horn motor neurons. (If the movements are facial or head movements, the spinal cord is not involved. The motor neurons are in brainstem nuclei and communicate with muscles via cranial nerves.)