14. Located in the brainstem, this structure controls breathing and heartbeat.
15. The thin outer covering of the cerebral hemispheres.
16. Junction between the axon tip of the sending neuron and the dendrite or cell body of the receiving neuron.
17. Amplified recording of the waves of electrical activity of the brain.
19. Destruction of tissue.
20. Technique that uses magnetic fields and radio waves to produce computer-generated images of brain structures.
22. Located at the back and base of the brain, these lobes contain the visual cortex, which receives information from the eyes.
23. The part of the limbic system involved in regulation of the emotions of fear and rage.
26. Situated between the frontal and occipital lobes, these lobes contain the sensory cortex.

DOWN

1. Limbic system structure that regulates hunger, thirst, and body temperature and contains the so-called reward centers of the brain.
2. Large band of neural fibers that links the right and left hemispheres.
3. Technique that measures the levels of activity of different areas of the brain by tracing their consumption of a radioactive form of glucose.
4. Neural impulse generated by the movement of positively charged atoms in and out of channels in the axon's membrane.
5. Neurotransmitter that triggers muscle contractions.
8. Simple, automatic, inborn response to a sensory stimulus.
10. Doughnut-shaped neural system that plays an important role in the regulation of emotions and basic physiological drives.
11. Natural opiatelike neurotransmitters linked to pain control and to pleasure.
13. Division of the peripheral nervous system that controls the glands and the muscles of internal organs.
17. The body's slower chemical communication system, consisting of glands that secrete hormones into the bloodstream.
18. The brain and spinal cord, collectively, are the _____ nervous system.
21. An impairment of language as a result of damage to any of several cortical areas.
24. More numerous than cortical neurons, these cells of the brain guide neural connections and provide nutrients and insulating myelin.
25. Extension of a neuron that sends impulses to other nerve cells or to muscles or glands.

ANSWERS

Chapter Review

Introduction

1. biological
2. phrenology
3. biological psychologists

Neural Communication

1. biopsychosocial; subsystems; systems; system
2. biological; psychological; social-cultural
3. neurons
4. dendrites
5. axon; myelin sheath
6. **a.** dendrites
   b. cell body
   c. axon
   d. myelin sheath
7. action potential; axon
8. negatively; positively; resting potential; selectively permeable
9. positively; depolarized
10. refractory period; positively
11. excitatory; inhibitory; threshold; will not; all-or-none
12. does not
13. synapse; synaptic cleft (gap); Sir Charles Sherrington
14. neurotransmitters; ions
15. exciting; inhibiting; reuptake

A neural impulse is generated by excitatory signals minus inhibitory signals exceeding a certain threshold. The stimuli are received through the dendrites, combined in the cell body, and electrically transmitted in an all-or-none fashion down the length of the axon. When the combined signal reaches the end of the axon, chemical messengers called neurotransmitters are released into the synaptic cleft, or gap, between two neurons. Neurotransmitter molecules bind to receptor sites on the dendrites of neighboring neurons and have either an excitatory or inhibitory influence on that neuron's tendency to generate its own neural impulse.

16. dopamine; serotonin; norepinephrine; gamma-aminobutyric acid (GABA); glutamate
17. acetylcholine (ACh)

18. endorphins; heroin; morphine
19. agonists; receptor sites; antagonists; opiates; curare
20. blood-brain barrier
21. Parkinson's; dopamine; L-dopa

The Nervous System

1. nervous system
2. central; peripheral
3. nerves
4. sensory; interneurons
5. motor
6. somatic
7. autonomic
8. sympathetic
9. parasympathetic

The sympathetic division of the autonomic nervous system becomes aroused in response to an emergency. The physiological changes that occur include accelerated heartbeat, elevated blood sugar, dilation of arteries, slowing of digestion, and increased perspiration to cool the body. When the emergency is over, the parasympathetic nervous system produces the opposite physical reactions.

10. reflexes; spinal cord; knee-jerk; pain

From sensory receptors in the skin the message travels via sensory neurons to an interneuron in the spinal cord, which in turn activates a motor neuron. This motor neuron causes the muscles in the hand to contract, and the person jerks his or her hand away from the heat.

11. neural networks

The Endocrine System

1. endocrine system; hormones; slower; a longer time
2. adrenal; epinephrine; norepinephrine
3. pituitary; hypothalamus; growth

The hypothalamus in the brain influences secretions by the pituitary. The pituitary regulates other endocrine glands, which release hormones that influence behavior. The hypothalamus monitors these changes in blood chemistry and thereby adjusts its inputs to the pituitary.

The Brain

1. lesions; clinical observation
2. electroencephalogram (EEG)
3. PET scan

By depicting the brain's consumption of radioactively labeled glucose, the PET scan allows researchers to see which brain areas are most active as a person performs various tasks. This provides additional information on the specialized functions of various regions of the brain.

4. MRI (magnetic resonance imaging)
5. functional MRI; anterior cingulate cortex; urges
6. brainstem
7. medulla; breathing; heartbeat; pons
8. brainstem
9. reticular formation; arousal; alert (awake); coma
10. thalamus; smell; medulla; cerebellum
11. cerebellum; nonverbal learning; balance
12. conscious; outside
13. limbic; hippocampus
14. amygdala
15. psychosurgery; seldom
16. hypothalamus; hunger, thirst, body temperature (or sex); hormones; pituitary; reward
17. addictive; reward deficiency syndrome
18. cerebral cortex; information-processing
19. glial cells; learning; thinking
20. more wrinkled; increases
21. **a.** frontal lobe
    b. parietal lobe
    c. occipital lobe
    d. temporal lobe
22. motor; frontal; greater; neural prosthetics; paralyzed; thoughts (or brains)
23. sensory; touch
24. sensory cortex
25. occipital; temporal
26. association areas; three-fourths; frontal; parietal; temporal
27. aphasia; Broca's area; Wernicke's area; angular gyrus
28. unified whole
29. plasticity; young children
30. will not; reorganize; can; stem
31. left; dominant (major)
32. corpus callosum; split brain
33. right; name; right

The word *pencil* when flashed to a split-brain patient's right visual field would project only to the opposite, or left, hemisphere of the patient's brain.