CHAPTER 2

The Biology of Mind

CHAPTER OVERVIEW

Chapter 2 is concerned with the functions of the brain and its component neural systems, which provide the basis for all human behavior. Under the direction of the brain, the nervous and endocrine systems coordinate a variety of voluntary and involuntary behaviors and serve as the body’s mechanisms for communication with the external environment.

The brain consists of the brainstem, the thalamus, the cerebellum, the limbic system, and the cerebral cortex. Knowledge of the workings of the brain has increased with advances in neuroscientific methods. Studies of split-brain patients have also given researchers a great deal of information about the specialized functions of the brain’s right and left hemispheres.

Many students find the technical material in this chapter difficult to master. Not only are there many terms for you to remember, but you must also know the organization and function of the various divisions of the nervous system. Learning this material will require a great deal of rehearsal. Working the chapter review several times, drawing and labeling brain diagrams, and mentally reciting terms are all useful techniques for rehearsing this type of material.

NOTE: Answer guidelines for all Chapter 2 questions begin on page 52.

CHAPTER REVIEW

First, skim each section, noting headings and boldface items. After you have read the section, review each objective by answering the fill-in and essay-type questions that follow it. As you proceed, evaluate your performance by consulting the answers beginning on page 52. Do not continue with the next section until you understand each answer. If you need to, review or reread the section in the textbook before continuing.

Introduction (pp. 47–48)

Objective 1: Explain why psychologists are concerned with human biology, and describe the ill-fated phrenology theory.

1. In the most basic sense, every idea, mood, memory, and behavior that an individual has ever experienced is a ________________ phenomenon.

2. The theory that linked our mental abilities to bumps on the skull was ________________.

3. Researchers who study the links between biology and behavior are called ________________

4. We are made up of smaller and smaller ________________; we are also part of larger ________________. Thus, we are ________________ systems.

Neural Communication (pp. 48–54)

Objective 2: Describe the parts of a neuron, and explain how its impulses are generated.

1. Our body’s neural system is built from billions of nerve cells, or ________________. Information arriving in the brain and spinal cord from the body travels in ________________ neurons. Instructions from the brain and spinal cord are sent to the body’s tissues via ________________ neurons. The neurons that enable internal communication within the brain are called ________________.
8. To trigger a neural impulse, __________ signals minus __________ signals must exceed a certain intensity, called the __________. Increasing a stimulus above this level __________ (will/will not) increase the neural impulse’s intensity. This phenomenon is called an __________.

9. The strength of a stimulus __________ (does/does not) affect the intensity of a neural impulse. A strong stimulus __________ (can/cannot) trigger more neurons to fire.

Objective 3: Describe how nerve cells communicate.

10. The junction between two neurons is called a __________, and the gap is called the __________. This discovery was made by __________.

11. The chemical messengers that convey information across the gaps between neurons are called __________. These chemicals bind to receptor sites and unlock tiny channels, allowing electrically charged __________ to enter the neuron.

12. Neurotransmitters influence neurons either by __________ or __________ their readiness to fire. Excess neurotransmitters are reabsorbed by the sending neuron in a process called __________.

Outline the sequence of reactions that occur when a neural impulse is generated and transmitted from one neuron to another.
Objective 4: Describe how neurotransmitters influence behavior, and explain how drugs and other chemicals affect neurotransmission.

13. A neurotransmitter that is important in muscle contraction is _______________; it is also important in learning and _______________.

14. Naturally occurring opiatelike neurotransmitters that are present in the brain are called _______________. When the brain is flooded with drugs such as _______________ or _______________, it may stop producing these neurotransmitters.

15. Drugs that produce their effects by mimicking neurotransmitters are called _______________. Drugs that block the effects of neurotransmitters by occupying their _______________ are called _______________. While certain _______________ drugs create a temporary “high” by mimicking the endorphins, the poison _______________ produces paralysis by blocking the activity of the neurotransmitter ACh.

The Nervous System (pp. 55–58)

Objective 5: Identify the two major divisions of the nervous system, and describe their basic functions.

1. Taken altogether, the neurons of the body form the _______________.

2. The brain and spinal cord form the _______________ nervous system. The neurons that link the brain and spinal cord to the body’s sense receptors, muscles, and glands form the _______________ nervous system.

3. Sensory and motor axons are bundled into electrical cables called _______________.

4. The division of the peripheral nervous system that enables voluntary control of the skeletal muscles is the _______________ nervous system.

5. Involuntary, self-regulating responses—those of the glands and muscles of internal organs—are controlled by the _______________ nervous system.

6. The body is made ready for action by the _______________ division of the autonomic nervous system.

7. The _______________ division of the autonomic nervous system produces relaxation.

Describe and explain the sequence of physical reactions that occur in the body as an emergency is confronted and then passes.

8. Neurons cluster into work groups called _______________.

9. Automatic responses to stimuli, called _______________, illustrate the work of the _______________. Simple pathways such as these are involved in the _______________ response and in the _______________ reflex.

Beginning with the sensory receptors in the skin, trace the course of a spinal reflex as a person reflexively jerks his or her hand away from an unexpectedly hot burner on a stove.

The Endocrine System (pp. 58–60)

Objective 6: Describe the nature and functions of the endocrine system and its interaction with the nervous system.

1. The body’s chemical communication network is called the _______________. This system transmits information through chemical messengers called _______________ at a much _______________ (faster/slower) rate than the nervous system, and its effects last _______________ (a longer time/a shorter time).
2. In a moment of danger, the autonomic nervous system orders the ___________ glands to release ___________ and ___________.

3. The most influential gland is the ___________, which, under the control of an adjacent brain area called the ___________, helps regulate ___________ and the release of hormones by other endocrine glands.

Write a paragraph describing the feedback system that links the nervous and endocrine systems.

5. By comparing scans taken less than a second apart, the ___________ detects oxygen-laden blood flow to the part of the brain thought to control the bodily activity being studied. Using this technique, researchers found that blood flow to the back of the brain ___________ (increases/decreases) when people view a scene because that is where ___________ information is processed.

Objective 8: Describe the components of the brainstem, and summarize the functions of the brainstem, thalamus, and cerebellum.

6. The oldest and innermost region of the brain is the ___________.

7. At the base of the brainstem, where the spinal cord enters the skull, lies the ___________, which controls ___________ and ___________. Just above this part is the ___________, which helps coordinate movements.

8. Nerves from each side of the brain cross over to connect with the body’s opposite side in the ___________.

9. The finger-shaped network of neurons, the ___________, is contained inside the brainstem and plays an important role in controlling ___________. Electrically stimulating this area will produce an ___________ animal. Lesioning this area will cause an animal to lapse into a ___________.

10. At the top of the brainstem sits the ___________, which serves as the brain’s sensory switchboard, receiving information from all the senses except ___________ and routing it to the regions dealing with those senses. These egg-shaped structures also receive replies from the higher regions, which they direct to the ___________ and to the ___________.

The Brain (pp. 60–81)

Objective 7: Describe several techniques for studying the brain.

1. Researchers sometimes study brain function by producing ___________ or by selectively destroying brain cells. The oldest technique for studying the brain involves ___________ of patients with brain injuries or diseases.

2. The ___________ is an amplified recording of the waves of electrical activity that sweep across the brain’s surface.

3. The technique depicting the level of activity of brain areas by measuring the brain’s consumption of glucose is called the ___________.

Briefly explain the purpose of the PET scan.

4. A technique that produces clearer images of the brain (and other body parts) by using magnetic fields and radio waves is known as ___________.


11. At the rear of the brainstem lies the _________________. It influences one type of ________________ and memory. It also coordinates voluntary movement and ________________ control.

12. The lower brain functions occur without ________________ effort, indicating that our brains process most information ________________ (inside/outside) of our awareness.

Objective 9: Describe the structures and functions of the limbic system, and explain how one of these structures controls the pituitary gland.

13. Between the brainstem and cerebral hemispheres is the ________________ system. One component of this system that processes memory is the ________________.

14. Aggression or fear will result from stimulation of different regions of the lima bean-sized neural clusters, the ________________.

15. We must remember, however, that the brain ________________ (is/not) neatly organized into structures that correspond to our categories of behavior. For example, aggressive behavior ________________ (does/not) involve neural activity in many brain levels.

16. Below the thalamus is the ________________, which regulates bodily maintenance behaviors such as ________________, ________________; ________________ ________________, and ________________ behavior. This area also regulates behavior by secreting ________________ that enable it to control the ________________ gland. Olds and Milner discovered that this region also contains ________________ centers, which animals will work hard to have stimulated.

17. Some researchers believe that alcohol dependence, drug abuse, binge eating, and other ________________ disorders may stem from a genetic _________________.

in the natural brain systems for pleasure and well-being.

Objective 10: Describe the structure of the cerebral cortex, and explain the various functions of the four lobes.

18. The most complex functions of human behavior are linked to the most developed part of the brain, the _________________.

This thin layer of interconnected neural cells is the body’s ultimate control and _________________.

19. The cells that support, protect, and nourish cortical neurons are called _________________. These cells may also play a role in ________________ and ________________.

20. Compared to the cortexes of lower mammals, the human cortex has a ________________ (smoother/more wrinkled) surface. This ________________ (increases/decreases) the overall surface area of our brains.

21. List the four lobes of the brain.

a. ________________ c. ________________

b. ________________ d. ________________

Objective 11: Summarize some of the findings on the functions of the motor cortex and the sensory cortex, and discuss the importance of the association areas.

22. Electrical stimulation of one side of the ________________ cortex, an arch-shaped region at the back of the ________________ lobe, will produce movement on the opposite side of the body. The more precise the control needed, the ________________ (smaller/greater) amount of cortical space occupied.

Findings from clinical trials involving ________________ ________________, in which, for example, recording electrodes were implanted in this area of a 25-year-old man’s brain, raise hopes that people who are ________________ may one day be able to control machines directly with their ________________.
23. At the front of the parietal lobes lies the __________ cortex, which, when stimulated, elicits a sensation of _____________.

24. The more sensitive a body region, the greater the area of ____________ devoted to it.

25. Visual information is received in the ____________ lobes, whereas auditory information is received in the ____________ lobes.

26. Areas of the brain that don’t receive sensory information or direct movement but, rather, integrate and interpret information received by other regions are known as ____________. Approximately ____________, of the human cortex is of this type. Such areas in the ____________ lobe are involved in judging, planning, and processing of new memories and in some aspects of personality. In the ____________ lobe, these areas enable mathematical and spatial reasoning, and an area of the ____________ lobe enables us to recognize faces.

27. Although the mind’s subsystems are localized in particular brain regions, the brain ____________ (does/does not) act as a unified whole.

Objective 12: Discuss the brain’s plasticity following injury or illness.

28. The quality of the brain that makes it possible for undamaged brain areas to take over the functions of damaged regions is known as ____________. This quality is especially apparent in the brains of ____________ (young children/adolescents/adults).

29. Although severed neurons usually ____________ (will/will not) regenerate, some neural tissue can ____________ in response to damage. The form of therapy aimed at helping to reprogram a damaged brain is called ____________-____________ therapy. New evidence suggests that adult mice and humans ____________ (can/cannot) generate new brain cells through a process called _____________. Research also reveals the existence of master ____________ cells in the human embryo that can develop into any type of brain cell.

Objective 13: Describe split-brain research, and explain how it helps us understand the functions of our left and right hemispheres.

30. The brain’s two sides serve differing functions, which is referred to as hemispheric specialization, or ____________. Because damage to it will impair language and understanding, the ____________ hemisphere came to be known as the ____________ hemisphere.

31. In treating several patients with severe epilepsy, Vogel and Bogen separated the two hemispheres of the brain by cutting the ____________ ____________. When this structure is severed, the result is referred to as a ____________ ____________.

32. In a split-brain patient, only the ____________ hemisphere will be aware of an unseen object held in the left hand. In this case, the person would not be able to ____________ the object. When different words are shown in the left and right visual fields, if the patient fixates on a point on the center line between the fields, the patient will be able to say only the word shown on the ____________.

Explain why a split-brain patient would be able to read aloud the word pencil flashed to his or her right visual field, but would be unable to identify a pencil by touch using only the left hand.

33. When the “two minds” of a split brain are at odds, the ____________ hemisphere tries to rationalize what it doesn’t understand. The ____________ hemisphere often acts on
autopilot. This phenomenon demonstrates that the ____________ mind _____________ (can/cannot) control our behavior.

34. Deaf people use the ____________ hemisphere to process sign language.

35. Although the ____________ hemisphere is better at making literal interpretations of language, the ____________ hemisphere excels at quick, intuitive responses and at copying drawings, ____________ ___________ perceiving objects, and perceiving ____________ .

Objective 14: Discuss research findings on brain organization and handedness.

36. In all cultures of the world, most of the human population is ____________ (right/left)-handed. Genetic factors ____________ (play/do not play) a role in handedness. This handedness bias is unique to humans and to our nearest ____________ relatives.

PROGRESS TEST 1

Multiple-Choice Questions

Circle your answers to the following questions and check them with the answers beginning on page 53. If your answer is incorrect, read the explanation for why it is incorrect and then consult the appropriate pages of the text (in parentheses following the correct answer).

1. The axons of certain neurons are covered by a layer of fatty tissue that helps speed neural transmission. This tissue is
   a. dopamine.
   b. the myelin sheath.
   c. acetylcholine.
   d. an endorphin.

2. Heartbeat, digestion, and other self-regulating bodily functions are governed by the
   a. voluntary nervous system.
   b. autonomic nervous system.
   c. sympathetic division of the autonomic nervous system.
   d. somatic nervous system.

3. A strong stimulus can increase the
   a. speed of the impulse the neuron fires.
   b. intensity of the impulse the neuron fires.
   c. number of times the neuron fires.
   d. threshold that must be reached before the neuron fires.

4. The pain of heroin withdrawal may be attributable to the fact that
   a. under the influence of heroin the brain ceases production of endorphins.
   b. under the influence of heroin the brain ceases production of all neurotransmitters.
   c. during heroin withdrawal the brain’s production of all neurotransmitters is greatly increased.
   d. heroin destroys endorphin receptors in the brain.

5. The brain research technique that involves monitoring the brain’s usage of glucose is called (in abbreviated form) the
   a. PET scan.
   b. fMRI.
   c. EEG.
   d. MRI.

6. The effect of a drug that is an antagonist is to
   a. cause the brain to stop producing certain neurotransmitters.
   b. mimic a particular neurotransmitter.
   c. block a particular neurotransmitter.
   d. disrupt a neuron’s all-or-none firing pattern.

7. Though there is no single “control center” for emotions, their regulation is primarily attributed to the brain region known as the
   a. limbic system.
   b. brainstem.
   c. reticular formation.
   d. cerebellum.

8. Which is the correct sequence in the transmission of a simple reflex?
   a. sensory neuron, interneuron, sensory neuron
   b. interneuron, motor neuron, sensory neuron
   c. sensory neuron, interneuron, motor neuron
   d. interneuron, sensory neuron, motor neuron
9. In a resting state, the axon is
   a. depolarized, with mostly negatively charged ions outside and positively charged ions inside.
   b. depolarized, with mostly positively charged ions outside and negatively charged ions inside.
   c. polarized, with mostly negatively charged ions outside and positively charged ions inside.
   d. polarized, with mostly positively charged ions outside and negatively charged ions inside.

10. Which of the following is typically controlled by the right hemisphere?
    a. language
    b. learned voluntary movements
    c. arithmetic reasoning
    d. perceptual tasks

11. Dr. Hernandez is studying neurotransmitter abnormalities in depressed patients. She would most likely describe herself as a
    a. personality psychologist.
    b. phrenologist.
    c. psychoanalyst.
    d. biological psychologist.

12. The increasing complexity of animals' behavior is accompanied by an
    a. increase in the size of the brainstem.
    b. increase in the depth of the corpus callosum.
    c. increase in the size of the frontal lobes.
    d. increase in the amount of association area.

13. Voluntary movements, such as writing with a pencil, are directed by the
    a. sympathetic nervous system.
    b. somatic nervous system.
    c. parasympathetic nervous system.
    d. autonomic nervous system.

14. A neuron will generate action potentials when it
    a. remains below its threshold.
    b. receives an excitatory input.
    c. receives more excitatory than inhibitory inputs.
    d. is stimulated by a neurotransmitter.

15. Which is the correct sequence in the transmission of a neural impulse?
    a. axon, dendrite, cell body, synapse
    b. dendrite, axon, cell body, synapse
    c. synapse, axon, dendrite, cell body
    d. dendrite, cell body, axon, synapse

16. Chemical messengers produced by endocrine glands are called
    a. agonists.
    b. neurotransmitters.
    c. hormones.
    d. enzymes.

17. Following a head injury, a person has ongoing difficulties staying awake. Most likely, the damage occurred to the
    a. thalamus.
    b. corpus callosum.
    c. reticular formation.
    d. cerebellum.

18. An experimenter flashes the word FLYTRAP onto a screen facing a split-brain patient so that FLY projects to her right hemisphere and TRAP to her left hemisphere. When asked what she saw, the patient will
    a. say she saw FLY.
    b. say she saw TRAP.
    c. point to FLY using her right hand.
    d. point to TRAP using her left hand.

19. Cortical areas that are not primarily concerned with sensory, motor, or language functions are
    a. called projection areas.
    b. called association areas.
    c. located mostly in the parietal lobe.
    d. located mostly in the temporal lobe.

20. In the brain, learning occurs as experience strengthens certain connections in cell work groups called
    a. action potentials.
    b. neural networks.
    c. endocrine systems.
    d. dendrites.
Matching Items

Match each structure or technique with its corresponding function or description.

Structures

1. hypothalamus
2. lesion
3. EEG
4. fMRI
5. reticular formation
6. MRI
7. thalamus
8. corpus callosum
9. cerebellum
10. amygdala
11. medulla

Functions or Descriptions

a. amplified recording of brain waves
b. technique that uses radio waves and magnetic fields to image brain anatomy
c. serves as sensory switchboard
d. contains reward centers
e. tissue destruction
f. technique that uses radio waves and magnetic fields to show brain function
g. helps control arousal
h. links the cerebral hemispheres
i. influences rage and fear
j. regulates breathing and heartbeat
k. enables coordinated movement

PROGRESS TEST 2

Progress Test 2 should be completed during a final chapter review. Answer the following questions after you thoroughly understand the correct answers for the section reviews and Progress Test 1.

Multiple-Choice Questions

1. The visual cortex is located in the
   a. occipital lobe.  c. frontal lobe.
   b. temporal lobe.  d. parietal lobe.

2. Which of the following is typically controlled by the left hemisphere?
   a. spatial reasoning
   b. word recognition
   c. the left side of the body
   d. perceptual skills

3. When Sandy scalded her toe in a tub of hot water, the pain message was carried to her spinal cord by the __________ nervous system.
   a. somatic  c. parasympathetic
   b. sympathetic  d. central

4. Which of the following are governed by the simplest neural pathways?
   a. emotions
   b. physiological drives, such as hunger
   c. reflexes
   d. movements, such as walking

5. Melissa has just completed running a marathon. She is so elated that she feels little fatigue or discomfort. Her lack of pain is probably the result of the release of
   a. ACh.  c. dopamine.
   b. endorphins.  d. norepinephrine.

6. In the brain, I outnumber neurons. I also provide nutrients to the neurons and help remove excess neurotransmitters. I am a
   a. hormone.
   b. myelin sheath.
   c. glial cell.
   d. gland.

7. The technique that uses magnetic fields and radio waves to produce computer images of structures within the brain is called
   a. the EEG.  c. a PET scan.
   b. a lesion.  d. MRI.

8. The myelin sheath that is on some neurons
   a. increases the speed of neural transmission.
   b. slows neural transmission.
   c. regulates the release of neurotransmitters.
   d. prevents positive ions from passing through the membrane.
9. I am a relatively fast-acting chemical messenger that affects mood, hunger, sleep, and arousal. What am I?
   a. acetylcholine
   b. dopamine
   c. norepinephrine
   d. serotonin

10. The neurotransmitter acetylcholine (ACh) is most likely to be found
    a. at the junction between sensory neurons and muscle fibers.
    b. at the junction between motor neurons and muscle fibers.
    c. at junctions between interneurons.
    d. in all of these locations.

11. The gland that regulates body growth is the
    a. adrenal.
    b. thyroid.
    c. hypothalamus.
    d. pituitary.

12. Epinephrine and norepinephrine are ______ that are released by the ______ gland.
    a. neurotransmitters; pituitary
    b. hormones; pituitary
    c. neurotransmitters; thyroid
    d. hormones; adrenal

13. Jessica experienced difficulty keeping her balance after receiving a blow to the back of her head. It is likely that she injured her
    a. medulla.
    b. thalamus.
    c. hypothalamus.
    d. cerebellum.

14. Moruzzi and Magoun caused a cat to lapse into a coma by severing neural connections between the cortex and the
    a. reticular formation.
    b. hypothalamus.
    c. thalamus.
    d. cerebellum.

15. Research has found that the amount of representation in the motor cortex reflects the
    a. size of the body parts.
    b. degree of precise control required by each of the parts.
    c. sensitivity of the body region.
    d. area of the occipital lobe being stimulated by the environment.

16. The effect of a drug that is an agonist is to
    a. cause the brain to stop producing certain neurotransmitters.
    b. mimic a particular neurotransmitter.
    c. block a particular neurotransmitter.
    d. disrupt a neuron’s all-or-none firing pattern.

17. The nerve fibers that enable communication between the right and left cerebral hemispheres and that have been severed in split-brain patients form a structure called the
    a. reticular formation.
    b. association areas.
    c. corpus callosum.
    d. parietal lobes.

18. Beginning at the front of the brain and moving toward the back of the head, then down the skull and back around to the front, which of the following is the correct order of the cortical regions?
    a. occipital lobe; temporal lobe; parietal lobe; frontal lobe
    b. temporal lobe; frontal lobe; parietal lobe; occipital lobe
    c. frontal lobe; occipital lobe; temporal lobe; parietal lobe
    d. frontal lobe; parietal lobe; occipital lobe; temporal lobe

19. Following a nail gun wound to his head, Jack became more uninhibited, irritable, dishonest, and profane. It is likely that his personality change was the result of injury to his
    a. parietal lobe.
    b. temporal lobe.
    c. occipital lobe.
    d. frontal lobe.

20. Three-year-old Marco suffered damage to the speech area of the brain’s left hemisphere when he fell from a swing. Research suggests that
    a. he may never speak again.
    b. his motor abilities may improve so that he can easily use sign language.
    c. his right hemisphere may take over much of the language function.
    d. his earlier experience with speech may enable him to continue speaking.
Matching Items
Match each structure or term with its corresponding function or description.

**Structures or Terms**

1. right hemisphere
2. brainstem
3. temporal lobes
4. occipital lobes
5. plasticity
6. neurogenesis
7. reuptake
8. limbic system
9. association areas
10. left hemisphere
11. glial cells

**Functions or Descriptions**

a. the formation of new neurons
b. specializes in rationalizing reactions
c. support cells of the nervous system
d. specializes in spatial relations
e. brain areas containing the auditory cortex
f. brain areas containing the visual cortex
g. oldest part of the brain
h. regulates emotion
i. the brain’s capacity for modification
j. absorption of excess neurotransmitters
k. brain areas involved in higher mental functions

In the diagrams to the right, the numbers refer to brain locations that have been damaged. Match each location with its probable effect on behavior.

**Location**

1.
2.
3.
4.
5.
6.
7.
8.

**Behavioral Effect**

a. vision disorder
b. insensitivity to touch
c. motor paralysis
d. hearing problem
e. lack of coordination
f. abnormal hunger
g. split brain
h. sleep/arousal disorder
PSYCHOLOGY APPLIED

Answer these questions the day before an exam as a final check on your understanding of the chapter's terms and concepts.

Multiple-Choice Questions

1. A biological psychologist would be more likely to study
   a. how you learn to express emotions.
   b. how to help people overcome emotional disorders.
   c. life-span changes in the expression of emotion.
   d. the chemical changes that accompany emotions.

2. The part of the human brain that is most like that of a fish is the
   a. cortex.
   b. limbic system.
   c. brainstem.
   d. right hemisphere.

3. You are able to pull your hand quickly away from hot water before pain is felt because
   a. movement of the hand is a reflex that involves intervention of the spinal cord only.
   b. movement of the hand does not require intervention by the central nervous system.
   c. the brain reacts quickly to prevent severe injury.
   d. the autonomic division of the peripheral nervous system intervenes to speed contraction of the muscles of the hand.

4. In order to pinpoint the location of a tumor, a neurosurgeon electrically stimulated parts of the patient's sensory cortex. If the patient was conscious during the procedure, which of the following was probably experienced?
   a. "hearing" faint sounds
   b. "seeing" random visual patterns
   c. movement of the arms or legs
   d. a sense of having the skin touched

5. If Dr. Rogers wishes to conduct an experiment on the effects of stimulating the reward centers of a rat's brain, he should insert an electrode into the
   a. thalamus.
   b. sensory cortex.
   c. hypothalamus.
   d. corpus callosum.

6. A split-brain patient has a picture of a knife flashed to her left hemisphere and that of a fork to her right hemisphere. She will be able to
   a. identify the fork using her left hand.
   b. identify a knife using her left hand.
   c. identify a knife using either hand.
   d. identify a fork using either hand.

7. Several shy neurons send an inhibitory message to neighboring neuron Joni. At the same time, a larger group of party-going neurons sends Joni excitatory messages. What will Joni do?
   a. fire, assuming that her threshold has been reached
   b. not fire, even if her threshold has been reached
   c. enter a refractory period
   d. become hyperpolarized

8. Following Jayshee’s near-fatal car accident, her physician noticed that the pupillary reflex of her eyes was abnormal. This may indicate that Jayshee’s ______ was damaged in the accident.
   a. occipital cortex
   b. autonomic nervous system
   c. left temporal lobe
   d. cerebellum

9. Anton is applying for a technician's job with a neurosurgeon. In trying to impress his potential employer with his knowledge of the brain, he says, “After my father’s stroke I knew immediately that the blood clot had affected his left cerebral hemisphere because he no longer recognized a picture of his friend.” Should Anton be hired?
   a. Yes. Anton obviously understands brain structure and function.
   b. No. The right hemisphere, not the left, specializes in picture recognition.
   c. Yes. Although blood clots never form in the left hemisphere, Anton should be rewarded for recognizing the left hemisphere's role in picture recognition.
   d. No. Blood clots never form in the left hemisphere, and the right hemisphere is more involved than the left in recognizing pictures.

10. I am a relatively fast-acting chemical messenger that influences movement, learning, attention, and emotion. What am I?
    a. dopamine
    b. a hormone
    c. acetylcholine
    d. glutamate
11. Dr. Johnson briefly flashed a picture of a key in the right visual field of a split-brain patient. The patient could probably
   a. verbally report that a key was seen.
   b. write the word key using the left hand.
   c. draw a picture of a key using the left hand.
   d. do none of these things.

12. In primitive vertebrate animals, the brain primarily regulates _______; in lower mammals, the brain enables _______.
   a. emotion; memory
   b. memory; emotion
   c. survival functions; emotion
   d. reproduction; emotion

13. Since Malcolm has been taking a drug prescribed by his doctor, he no longer enjoys the little pleasures of life, such as eating and drinking. His doctor explains that this is because the drug
   a. triggers release of dopamine.
   b. inhibits release of dopamine.
   c. triggers release of ACh.
   d. inhibits release of ACh.

14. A scientist from another planet wishes to study the simplest brain mechanisms underlying emotion and memory. You recommend that the scientist study the
   a. brainstem of a frog.
   b. limbic system of a dog.
   c. cortex of a monkey.
   d. cortex of a human.

15. Which of the following was a major problem with phrenology?
   a. It was "ahead of its time" and no one believed it could be true.
   b. The brain is not neatly organized into structures that correspond to our categories of behavior.
   c. The brains of humans and animals are much less similar than the theory implied.
   d. All of these were problems with phrenology.

16. I am a relatively slow-acting (but long-lasting) chemical messenger carried throughout the body by the bloodstream. What am I?
   a. a hormone
   b. a neurotransmitter
   c. acetylcholine
   d. dopamine

17. Your brother has been taking prescription medicine and experiencing a number of unpleasant side effects, including unusually rapid heartbeat and excessive perspiration. It is likely that the medicine is exaggerating activity in the
   a. reticular formation.
   b. sympathetic nervous system.
   c. parasympathetic nervous system.
   d. amygdala.

18. Dr. Frankenstein made a mistake during neurosurgery on his monster. After the operation, the monster "saw" with his ears and "heard" with his eyes. It is likely that Dr. Frankenstein "rewired" neural connections in the monster's
   a. hypothalamus.
   b. cerebellum.
   c. amygdala.
   d. thalamus.

19. A bodybuilder friend suddenly seems to have grown several inches in height. You suspect that your friend's growth spurt has occurred because he has been using drugs that affect the
   a. pituitary gland.
   b. thalamus.
   c. adrenal glands.
   d. medulla.

20. Raccoons have much more precise control of their paws than dogs. You would expect that raccoons have more cortical space dedicated to "paw control" in the _______ of their brains.
   a. frontal lobes
   b. parietal lobes
   c. temporal lobes
   d. occipital lobes

**Essay Question**
Discuss how the endocrine and nervous systems become involved when a student feels stress—such as that associated with an upcoming final exam. (Use the space below to list the points you want to make, and organize them. Then write the essay on a separate sheet of paper.)
KEY TERMS

Writing Definitions
Using your own words, on a piece of paper write a brief definition or explanation of each of the following terms.

1. biological psychology
2. neuron
3. sensory neurons
4. motor neurons
5. interneurons
6. dendrite
7. axon
8. myelin sheath
9. action potential
10. threshold
11. synapse
12. neurotransmitters
13. reuptake
14. endorphins
15. nervous system
16. central nervous system (CNS)
17. peripheral nervous system (PNS)
18. nerves
19. somatic nervous system
20. autonomic nervous system
21. sympathetic nervous system
22. parasympathetic nervous system
23. reflex
24. endocrine system
25. hormones
26. adrenal glands
27. pituitary gland
28. lesion
29. electroencephalogram (EEG)
30. PET (positron emission tomography) scan
31. MRI (magnetic resonance imaging)
32. fMRI (functional magnetic resonance imaging)
33. brainstem
34. medulla
35. reticular formation
36. thalamus
37. cerebellum
38. limbic system
39. amygdala
40. hypothalamus
41. cerebral cortex
42. glial cells
43. frontal lobes
44. parietal lobes
45. occipital lobes
46. temporal lobes
47. motor cortex
48. sensory cortex
49. association areas
50. plasticity
51. neurogenesis
52. corpus callosum
53. split brain