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Name:_____ Class:_____ Date:_____

Chapter 02: Multiple Choice

1. The branch of science that is concerned with the study of the nervous system, especially the brain, is called:
   a. interdisciplinary science.
   b. neuroscience.
   c. developmental psychology.
   d. clinical psychology.

ANSWER: b

2. The branch of psychology that is focused on understanding the internal physical events and processes that correspond with our mental processes and behavior is called:
   a. biological psychology.
   b. clinical psychology.
   c. cognitive physiology.
   d. forensic psychology.

ANSWER: a

3. Psychologists are greatly interested in the biological bases of behavior. Which of the following questions reflects this interest?
   a. Why do people choose specific careers?
   b. Why do you get hungry?
   c. Why do some people use social media, while others dislike it?
   d. Why do people from different cultures have different values?

ANSWER: b

4. Neurons are:
   a. found in primates and humans, but not in other animals.
   b. highly specialized cells that receive and transmit information from one area of the body to another.
   c. found only in the spinal cord and bone marrow.
   d. highly specialized cells that produce myelin.

ANSWER: b

5. How many neurons exist in the human brain?
   a. 400,000 million
   b. 600 million
   c. roughly 1 billion
   d. roughly 90 billion

ANSWER: d

6. Sarah is a training to be a neuroscientist. She is most likely studying which topic?
   a. how conflict affects marital happiness
   b. which psychological test would best predict job success
   c. the age at which children understand abstract concepts

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d. brain development during adolescence

ANSWER: d

7. The _____ tell muscles whether to relax or contract.
   a. sensory neurons
   b. glial cells
   c. motor neurons
   d. interneurons

ANSWER: c

8. Information from specialized cells in the sense organs is conveyed to the brain by:
   a. sensory neurons.
   b. glial cells.
   c. motor neurons.
   d. hormones.

ANSWER: a

9. The three basic types of neurons are:
   a. glial cells, nodes of Ranvier, and myelin.
   b. dendritic neurons, axonal neurons, and body neurons.
   c. excitatory neurons, inhibitory neurons, and interneurons.
   d. sensory neurons, motor neurons, and interneurons.

ANSWER: d

10. _____ convey information about the environment from the sense organs to the brain, and _____ communicate information to the muscles and glands.
   a. Interneurons; glial cells
   b. Excitatory neurons; inhibitory neurons
   c. Sensory neurons; motor neurons
   d. Motor neurons; sensory neurons

ANSWER: c

11. The type of specialized cell whose main function is to communicate between neurons is a(n):
   a. interneuron.
   b. glial cell.
   c. motor neuron.
   d. sensory neuron.

ANSWER: a

12. _____ are the most prevalent neurons in the human nervous system.
   a. Interneurons

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b. Motor neurons
c. Sensory neurons
d. Glial cells

ANSWER: a

13. Which of the following statements about the properties of neurons is TRUE?
a. All neurons are the same size and shape.
b. The size and shape of neurons vary a great deal, reflecting their specialized functions.
c. Sensory and motor neurons are the same size and shape, and interneurons are long and thin.
d. Motor neurons outnumber interneurons by almost 10 to 1.

ANSWER: b

14. Which term refers to a structure that provides the energy needed for the neuron to function?
a. cell body
b. myelin sheath
c. axon
d. dendrite

ANSWER: a

15. Most neurons have all of the following parts, EXCEPT:
a. association areas.
b. a cell body and nucleus.
c. dendrites.
d. an axon.

ANSWER: a

16. The amount of information that a neuron can receive increases with the number of _____ that the neuron has.
a. axons
b. cell bodies
c. glial cells
d. dendrites and dendrite branches

ANSWER: d

17. Which part of the neuron receives messages from other neurons?
a. the axon
b. the nucleus
c. the dendrite
d. the sodium ion membrane

ANSWER: c

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18. Which of the following is TRUE about axons?
    a. Neurons that have a myelin sheath do not have an axon.
    b. Axons often have branches near their tips called "axon terminals."
    c. Axon terminals receive information from other neurons and from sensory receptor cells.
    d. Unmyelinated axons fire 20 times faster than do neurons with myelin sheaths.

ANSWER: b

19. A neuron may have thousands of _____, but can have only one _____.
    a. dendrites; axon
    b. cell bodies; dendrite
    c. axons; dendrite
    d. nodes of Ranvier; synaptic vesicle

ANSWER: a

20. What is the function of a neuron's axon?
    a. receive messages from other cells in the body
    b. carry messages to other cells in the body
    c. create energy for the cell
    d. generate new cells

ANSWER: b

21. Along with neurons, the human nervous system is made up of _____ cells.
    a. glial
    b. Ranvier
    c. dendritic
    d. polarized

ANSWER: a

22. _____ are one of two types of glial cells that help to form the myelin sheath around axons.
    a. Microglia
    b. Astrocytes
    c. Oligodendrocytes
    d. Dendrites

ANSWER: c

23. Which of the following is TRUE of glial cells?
    a. They assist neurons by providing nutrition and structural support, and by removing waste products.
    b. They are neurons that specifically signal muscles to relax or contract.
    c. They are neurons that are specialized for conveying information to the brain from receptor cells in the sense organs and internal organs.
    d. They are a type of neuron whose primary function is to communicate information from one neuron to

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the next.

ANSWER: a

24. Which statement most accurately describes the length of axons?
    a. Most axons are several feet long.
    b. Most axons are approximately one-tenth of an inch long.
    c. The length of axons can range from a few thousandths of an inch to 3 or 4 feet.
    d. The length of any particular axon changes depending on whether muscles are stretched or clenched.

ANSWER: c

25. Which phrase accurately describes the nodes of Ranvier?
    a. a type of neuron that communicates information from one neuron to another
    b. the synaptic vesicles that contain neurotransmitters
    c. the ion channels in the membrane of a neuron's axon that open and close during an action potential
    d. small gaps in the myelin sheaths that cover some axons

ANSWER: d

26. The myelin sheath is an important part of the neuron because it:
    a. reduces the speed of neurotransmitters crossing the synaptic gap.
    b. insulates the axon and increases the speed at which neurons convey their messages.
    c. provides support and nutrition to the dendrites.
    d. inhibits the opening and closing of ion channels on the axon's membrane.

ANSWER: b

27. When compared with neurons that do not have myelin, neurons with myelin:
    a. are unable to communicate with other neurons.
    b. can communicate up to 50 times faster.
    c. use much more energy.
    d. do not have an axon.

ANSWER: b

28. Oligodendrocytes and Schwann cells form the _____, which is a fatty covering that is wrapped around the axons of some neurons.
    a. dendrites
    b. astrocytes
    c. myelin sheath
    d. microglia

ANSWER: c

29. As a general rule, communication within a neuron progresses from the:
    a. axon to the dendrites to the cell body.

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b. dendrites to the cell body to the axon.
c. dendrites to the axon to the axon terminals and then to the cell body.
d. cell body to the axon to the nucleus.

ANSWER: b

30. Multiple sclerosis is a disease that involves:
a. the degeneration of the myelin sheath, which slows or interrupts the transmission of neural messages.
b. an abnormal increase in the thickness of the myelin sheath, blocking the release of neurotransmitters.
c. the gradual decline in the ability of neurons to produce neurotransmitters.
d. dendrites becoming brittle and breaking.

ANSWER: a

31. Information is transmitted along the axon:
a. by glial cells.
b. at the speed of light, or 186,000 miles per second.
c. in the form of a brief electrical impulse.
d. by chemical substances called "neurotransmitters."

ANSWER: c

32. The action potential is best defined as:
a. the amount of serotonin that can cross the axon's membrane.
b. the +3- to +7-volt capacity of a typical motor neuron.
c. the ability of a motor neuron to either contract or relax a muscle group.
d. a brief electrical impulse that transmits information along the axon of a neuron.

ANSWER: d

33. The analogy used in the book referred to the axon membrane as a "gatekeeper." This means that the membrane:
a. determines whether an action potential will "pass" through the axon.
b. controls the balance of positive and negative ions in the interior and the exterior of the axon.
c. operates in an "all-or-none" fashion, either opening to allow neurotransmitters to pass or not.
d. uses the nodes of Ranvier to allow some ions to move out of the axon and neurotransmitters to move into the axon.

ANSWER: b

34. The stimulus threshold of the neuron refers to the:
a. minimum level of stimulation required to activate a particular neuron.
b. 3-to-1 ratio of positive-to-negative ions required for the neuron to transmit information to the next neuron.
c. positive electrical charge on the neuron's interior just prior to neuron activation.
d. minimum level of stimulation required to inhibit a neuron from firing.

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ANSWER: a

35. What occurs when a neuron is polarized?
    a. The exterior fluid surrounding the neuron is more negatively charged than the interior of the neuron.
    b. An action potential will travel down the dendrites, causing the release of neurotransmitters.
    c. The electrical charge across the neuron's membrane is balanced with the same charge outside as inside.
    d. The interior of the neuron is more negatively charged than the exterior fluid surrounding the neuron.

ANSWER: d

36. A neuron's resting potential is due to the greater concentration of:
    a. potassium and sodium ions outside the neuron.
    b. potassium and sodium ions inside the neuron.
    c. potassium ions inside the neuron and the greater concentration of sodium ions outside the neuron.
    d. sodium ions inside the neuron and the greater concentration of potassium ions outside the neuron.

ANSWER: c

37. When a neuron is in the resting potential state:
    a. it is unable to activate.
    b. it has an electrical charge of about –7 volts.
    c. the fluid within the axon has a larger concentration of potassium ions than the fluid surrounding the axon.
    d. the ion channels are open.

ANSWER: c

38. The electrical charge of a neuron when it is in the resting potential state is about:
    a. +30 millivolts.
    b. –70 millivolts.
    c. +2 volts.
    d. –10 volts.

ANSWER: b

39. When sodium ions enter the axon's interior, causing a brief positive electrical impulse:
    a. an action potential occurs.
    b. potassium ions are electrically transformed into sodium ions.
    c. the nodes of Ranvier are polarized.
    d. the axon is depolarized.

ANSWER: a

40. What creates the action potential?
    a. movement of neurotransmitters across the ion channels

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b. opening and closing of the nodes in the myelin sheath
c. reuptake of the neurotransmitters into the vesicles
d. movement of ions across the membrane of the axon

ANSWER: d

41. Which of the following represents the sequence of ion movements that causes an action potential?
a. Sodium ions move into the axon and then potassium ions move out of the axon.
b. Sodium ions move out of the axon and then potassium ions move into the dendrite.
c. Potassium ions move out of the dendrite and then sodium ions move into the axon.
d. Sodium ions move out of the axon and then potassium ions move into the axon.

ANSWER: a

42. What is the result of sodium ions moving across the axon's membrane during an action potential?
a. The inside of the axon changes to a negative electrical charge.
b. The outside of the axon changes to a positive electrical charge.
c. The inside of the axon changes to a positive electrical charge.
d. The nodes of Ranvier close.

ANSWER: c

43. What keeps an action potential continuing down an axon?
a. At each successive segment of the axon, the action potential is regenerated by depolarization and the movement of ions across the axon's membrane.
b. Neurotransmitters are constantly being released to generate the action potential at each successive segment of the axon.
c. Action potentials are conducted down the axon just as electricity is conducted through a wire.
d. Ion channels open and close at the nodes of Ranvier, allowing neurotransmitters to enter the axon and regenerate an action potential at each node.

ANSWER: a

44. The all-or-none law refers to the fact that:
a. the myelin sheath either completely covers an axon or it does not.
b. the resting potential occurs only when the neuron is completely depolarized.
c. either the neuron is sufficiently stimulated and an action potential occurs or it is not sufficiently stimulated and the action potential does not occur.
d. a neurotransmitter is completely reabsorbed by the presynaptic neuron or it is dissolved in the synaptic gap.

ANSWER: c

45. What occurs during the refractory period?
a. The neuron depolarizes.
b. Neurotransmitters are released by the dendrites.
c. The charge of the neuron's interior increases to about +60 millivolts.

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d. The neuron reestablishes the negative-inside/positive-outside condition.

ANSWER: d

46. The fastest neurons in the human body communicate their messages at:
    a. the speed of light, or 186,000 miles per second.
    b. speeds up to 270 miles per hour.
    c. the speed of sound, or about 770 miles per hour.
    d. only about 10 miles per hour.

ANSWER: b

47. Which two factors affect the speed at which the action potential is conducted along a neuron's axon?
    a. the diameter of the axon and whether the axon is wrapped with a myelin sheath
    b. the number of dendrites and the size of the cell body
    c. the type and number of axons projecting from the neuron
    d. the size of the positive electrical charge just before an action potential occurs and the number of adjacent neurons

ANSWER: a

48. How are action potentials different in a myelinated axon and an unmyelinated axon?
    a. Action potentials are slower in myelinated axons because the myelin sheath interferes with the transfer of ions across the membrane.
    b. Action potentials "jump" from node to node in myelinated axons rather than progressing down the entire length of the axon.
    c. Action potentials have greater electrical charges in myelinated axons.
    d. Action potentials in myelinated axons operate according to the "all-or-none law" but action potentials in unmyelinated axons do not.

ANSWER: b

49. The presynaptic neuron and the postsynaptic neuron are separated by a tiny, fluid-filled space called the:
    a. myelin sheath.
    b. synaptic gap.
    c. node of Ranvier.
    d. ion channel.

ANSWER: b

50. Communication between two neurons occurs at the:
    a. nucleus.
    b. node of Ranvier.
    c. ion channel.
    d. synapse.

ANSWER: d

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51. Presynaptic neuron is to postsynaptic neuron as:
    a. synapse is to neurotransmitters.
    b. receptors are to neurotransmitters.
    c. electrical communication is to chemical communication.
    d. message-sending neuron is to message-receiving neuron.

ANSWER: d

52. The most common form of communication between neurons is:
    a. chemical.
    b. electrical.
    c. magnetic.
    d. hormonal.

ANSWER: a

53. Which of the following best defines a neurotransmitter?
    a. a chemical messenger that crosses the synaptic gap between neurons
    b. an electrical impulse that crosses the synaptic gap between neurons
    c. a chemical communicator manufactured by glial cells
    d. a microscopic channel through which sodium and potassium ions pass

ANSWER: a

54. Synaptic vesicles contain:
    a. hormones.
    b. ions.
    c. neurotransmitters.
    d. receptors.

ANSWER: c

55. In synaptic transmission, the action potential stimulates the release of:
    a. potassium ions by the glial cells.
    b. neurotransmitters by the synaptic vesicles.
    c. myelin by the glial cells.
    d. sodium ions by the dendrites.

ANSWER: b

56. What happens to the neurotransmitters that fail to attach to a receptor site?
    a. In a process called "reuptake," they are reabsorbed by the sending neuron and recycled.
    b. They bind with potassium ions.
    c. They are destroyed by glial cells.
    d. In a process called "depolarization," they are neutralized by negative ions.

ANSWER: a

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57. Like a key in a lock, the shape of the _____ must fit the _____ to affect the postsynaptic neuron.
    a. dendrite; axon terminal
    b. cell body; axon terminal
    c. neurotransmitter; receptor site
    d. synaptic vesicle; receptor site

ANSWER: c

58. When neurotransmitters communicate an excitatory message to the postsynaptic neuron:
    a. the postsynaptic neuron is more likely to generate an action potential.
    b. the presynaptic neuron is more likely to generate an action potential.
    c. the action potential is canceled out.
    d. reuptake is inhibited.

ANSWER: a

59. When a neurotransmitter communicates an inhibitory message to a postsynaptic neuron, the _____ likely to have an action potential.
    a. postsynaptic neuron is more
    b. postsynaptic neuron is less
    c. presynaptic neuron is more
    d. presynaptic neuron is less

ANSWER: b

60. On average, each neuron in the brain communicates directly with _____ other neurons.
    a. 100
    b. 100 billion
    c. 100 trillion
    d. 1,000

ANSWER: d

61. A particular neurotransmitter:
    a. always communicates either an excitatory or inhibitory effect.
    b. can have different effects, depending on the receptor site to which it attaches.
    c. can be located in the central nervous system or the peripheral nervous system but not both.
    d. can attach to any available receptor site on adjacent neurons.

ANSWER: b

62. The neurotransmitter acetylcholine:
    a. is found in all sensory neurons.
    b. is involved in muscle contractions and memory.
    c. can cause hallucinations when present in abnormally excessive amounts.

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d. is chemically identical to heroin.

ANSWER: b

63. All motor neurons manufacture:
a. acetylcholine.
b. dopamine.
c. serotonin.
d. L-dopa.

ANSWER: a

64. Which of the following neurotransmitters is implicated in Alzheimer's disease?
a. serotonin
b. dopamine
c. acetylcholine
d. GABA

ANSWER: c

65. Bernardo's grandmother has begun to experience memory loss and an inability to control muscle contractions. She also has significant decreases in intellectual functioning. Bernardo's grandmother is exhibiting the effects of reduced brain levels of the neurotransmitter:
a. GABA.
b. serotonin.
c. dopamine.
d. acetylcholine.

ANSWER: d

66. _____ is to Alzheimer's disease as _____ is to Parkinson's disease.
a. Dopamine; serotonin
b. Acetylcholine; dopamine
c. Serotonin; norepinephrine
d. Norepinephrine; serotonin

ANSWER: b

67. Which of the following neurotransmitters is involved in physical arousal, learning, memory, and regulation of sleep?
a. acetylcholine
b. dopamine
c. serotonin
d. norepinephrine

ANSWER: d

68. For the past year, 30-year-old Cecily has experienced difficulty falling and staying asleep, and has struggled

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with low mood. Cecily says she's stressed and was recently diagnosed with depression. Cecily probably has a deficiency in the neurotransmitter:

a. dopamine.
b. serotonin.
c. GABA.
d. glutamate.

ANSWER: b

69. The neurotransmitter _____ is responsible for sending excitatory messages and is related to seizures and Alzheimer's disease.

a. dopamine.
b. norepinephrine.
c. GABA.
d. glutamate.

ANSWER: d

70. Kadeem has been diagnosed with generalized anxiety disorder and obsessive–compulsive disorder. Due to a low level of _____, Kadeem may have a hard time inhibiting an overload of excitatory messages.

a. dopamine
b. norepinephrine
c. GABA
d. glutamate

ANSWER: c

71. Edwin enjoys smoking nicotine. The increase in pleasure he experiences when smoking is related to increases in the activity of which neurotransmitter?

a. dopamine
b. serotonin
c. acetylcholine
d. GABA

ANSWER: a

72. Rico experiences poor balance and muscle tremors. He has been diagnosed with Parkinson's disease, a disease caused by the degeneration of neurons that produce:

a. GABA.
b. norepinephrine.
c. dopamine.
d. acetylcholine.

ANSWER: c

73. A person with Parkinson's disease may sometimes experience muscle tremors and difficulty initiating movements or speech. To help reduce these symptoms, a person may take L-dopa, which converts to _____ to

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treat symptoms.

a. serotonin
b. acetylcholine
c. dopamine
d. endorphins

ANSWER: c

74. People afflicted with Parkinson's disease have degradation of neurons that produce dopamine. Symptoms can include:

a. inhibited pain perception.
b. altered sleep patterns.
c. excessive physical arousal
d. difficulty initiating movement.

ANSWER: d

75. Over the course of several months and for no apparent reason, Jennifer became progressively more despondent, withdrawn, and listless. Her doctor accurately diagnosed the problem as major depressive disorder and started Jennifer on an antidepressant drug called Prozac. Three weeks later, Jennifer was much improved. Like some other antidepressant drugs, Prozac works by _____ the availability of _____ in the brain.

a. increasing; serotonin
b. decreasing; dopamine
c. increasing; endorphins
d. decreasing; acetylcholine

ANSWER: a

76. Which of the following drugs is chemically similar to endorphins?

a. curare
b. morphine
c. L-dopa
d. botox

ANSWER: b

77. After surgery, physicians may prescribe a medication to relieve pain. Such a medication would most likely mimic the effects of:

a. dopamine.
b. endorphins.
c. serotonin.
d. GABA.

ANSWER: b

78. Miguel jogs about five miles a day. At roughly the three-mile point, Miguel usually experiences a rush of positive feelings due to _____ levels of _____.

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a. decreased; norepinephrine
b. increased; serotonin
c. increased; endorphins
d. decreased; GABA

ANSWER: c

79. The rush of euphoria that many people experience after sustained exercise, especially running or cycling, is called:
a. "neurogenesis."
b. the "synaptic rush."
c. the "split-brain" high.
d. the "runner's high."

ANSWER: d

80. Randy exercises more than most people and continues to train even when he has a cold or an injury. His friends joke that Randy seems addicted to exercise. Randy's compulsive exercising:
a. may be due to the involvement of his brain's opioid system and the production of endorphins.
b. is an indicator of decreased levels of dopamine and an increased risk of Parkinson's disease.
c. may be due to the involvement of his limbic system and the production of acetylcholine.
d. is an indicator of the overproduction of dopamine and an increased risk of schizophrenia.

ANSWER: a

81. Researchers using PET scans to study the opioid system in long-distance runners are likely to find increased brain levels of _____ following a long run.
a. acetylcholine
b. endorphins
c. GABA
d. cerebrospinal fluid

ANSWER: b

82. During a rest stop while hiking, Phil was bitten by a black widow spider. Shortly after being bitten, he started having breathing difficulties, then experienced muscle spasms. The symptoms he experienced occurred because the black widow spider's venom:
a. blocked acetylcholine receptor sites on motor neurons.
b. blocked the release of serotonin from sending neurons.
c. shut down the functioning of the substantia nigra in Phil's brain.
d. caused acetylcholine to be continuously released by the motor neurons.

ANSWER: d

83. How does cocaine achieve its effects?
a. It mimics dopamine.
b. It interferes with the reuptake of dopamine.

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c. It mimics serotonin.
d. It blocks the reuptake of endorphins.

ANSWER: b

84. An _____ is a drug or other chemical that binds to a receptor site and triggers a response in the cell.
a. antagonist
b. endorphin
c. agonist
d. opiate

ANSWER: c

85. Nicotine binds to acetylcholine receptor sites, stimulating skeletal muscles and causing the heart to beat more rapidly. Thus, nicotine is a(n):
a. endorphin.
b. SSRI.
c. agonist.
d. antagonist.

ANSWER: c

86. Prozac and cocaine are very different drugs, but they achieve their effects through the same mechanism of action. What is that mechanism?
a. Both drugs block GABA.
b. Both drugs mimic GABA.
c. Both drugs interfere with the reuptake of certain neurotransmitters.
d. Both drugs occupy the receptor sites for opiates.

ANSWER: c

87. Hunters use arrows dipped in the poison curare which blocks the acetylcholine receptor sites in the brains of animals. Such a reaction will cause the animal that is struck with this poison to:
a. perceive no pain.
b. fall into a deep sleep.
c. go limp and suffocate quickly.
d. experience a euphoric rush.

ANSWER: c

88. An _____ is a drug or other chemical that blocks a receptor site and inhibits or prevents a response in the receiving cell.
a. antagonist
b. endorphin
c. agonist
d. opiate

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ANSWER: a

89. The drug curare blocks acetylcholine receptor sites, causing virtually instantaneous paralysis. Thus, curare is an:
    a. endorphin.
    b. SSRI.
    c. agonist.
    d. antagonist.

ANSWER: d

90. The drug naloxone acts as an _____ at opioid receptor sites and eliminates the effects of both endorphins and opiates.
    a. endorphin
    b. SSRI
    c. agonist
    d. antagonist

ANSWER: d

91. Harold is overdosing on heroin. He should be given _____ to reverse the effects of the opioid he consumed.
    a. curare
    b. Zoloft
    c. Paxil
    d. naloxone

ANSWER: d

92. The two main divisions of the nervous system are the _____ and the _____.
    a. peripheral nervous system; central nervous system
    b. central nervous system; autonomic nervous system
    c. brain; spinal cord
    d. autonomic nervous system; somatic nervous system

ANSWER: a

93. Bundles of axons comprise:
    a. nerves.
    b. myelin.
    c. synapses.
    d. glial cells.

ANSWER: a

94. In combination, the brain and spinal cord make up the:
    a. peripheral nervous system.

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b. autonomic nervous system.
c. central nervous system.
d. somatic nervous system.

ANSWER: c

95. What is a function of cerebrospinal fluid?
a. It protects the central nervous system from being jarred.
b. It promotes the release of hormones in the brain.
c. It can function as a neurotransmitter in times of severe stress.
d. It is the communication link between the central nervous system and the peripheral nervous system.

ANSWER: a

96. There are four hollow cavities in the brain, called "_____," which are filled with cerebrospinal fluid and whose surfaces are lined with _____, specialized cells that produce neurons in the developing brain.
a. neural pathways; neurogenetic cells
b. ventricles; neural stem cells
c. synaptic vesicles; myelin
d. axon terminals; GABA

ANSWER: b

97. In the _____, information is communicated along nerves.
a. central nervous system
b. peripheral nervous system
c. limbic system
d. endocrine system

ANSWER: b

98. Thomas was distracted as he was cooking, and he inadvertently touched a very hot dish. Instantaneously, he jerked his hand back, a reflexive action that was processed:
a. in his spinal cord.
b. simultaneously in his spinal cord and brain.
c. first in his brain, then a moment later in his spinal cord.
d. with no involvement of the central nervous system.

ANSWER: a

99. When Elisa goes to the doctor for her annual physical, the doctor taps directly below her kneecap, which causes her leg to jerk forward. Elisa's doctor is testing her:
a. overall central nervous system.
b. somatic nervous system.
c. bone health.
d. spinal reflexes.

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Chapter 02: Multiple Choice

ANSWER: d

100. Professor Romero discovered that the overhead projector in her classroom had a short in the wiring system. When she touched the metal edge of the projector, she got an electric shock and instantly jerked her hand back. This instantaneous reaction is an example of:

a. aphasia.
b. hemispheric specialization.
c. the brain's structural plasticity.
d. a spinal reflex.

ANSWER: d

101. _____ is the most common, mildest form of traumatic brain injury.

a. A concussion
b. Whiplash
c. Chronic traumatic encephalopathy
d. Losing consciousness

ANSWER: a

102. _____ people every year in the United States experience at least one concussion.

a. About 50,000
b. Less than 200,000
c. More than 1,000,000
d. Around 2,000,000

ANSWER: c

103. While running for a touchdown, Dex was hit hard by a player of the other team. He was unconscious for about 30 seconds and walked off the field with help. That evening, Dex complained of dizziness and blurred vision, and his speech was slightly slurred. Dex experienced:

a. aphasia.
b. chronic traumatic encephalopathy.
c. a sprained neck.
d. a concussion.

ANSWER: d

104. New research on the impact of concussions on cognitive functioning and behavior indicates that:

a. 90 percent of high school football players have CTE.
b. CTE is most often diagnosed in gymnasts and polo players.
c. it may be the cumulative impact of repeated blows to the head, rather than concussions alone, that lead to CTE.
d. most Alzheimer's patients suffer from CTE.

ANSWER: c

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Chapter 02: Multiple Choice

105. The peripheral nervous system is made up of:
a. the brain.
b. the brain and the spinal cord.
c. all the nerves lying outside the central nervous system.
d. motor neurons.
ANSWER: c

106. The two main subdivisions of the peripheral nervous system are the _____ nervous system and the _____ nervous system.
a. sympathetic; parasympathetic
b. somatic; autonomic
c. autonomic; sympathetic
d. parasympathetic; somatic
ANSWER: b

107. As you are taking a test, you inadvertently drop your pencil, reach down, pick it up, and put it back on the desk. This voluntary action involved motor signals that were communicated out to your muscles via the _____ nervous system.
a. autonomic
b. sympathetic
c. parasympathetic
d. somatic
ANSWER: d

108. As you are walking on a beach, you pick up an odd-looking seashell that has a very rough texture. As you rub your fingers over the shell, the sensory messages are communicated via the _____ nervous system to the central nervous system.
a. somatic
b. autonomic
c. sympathetic
d. parasympathetic
ANSWER: a

109. While taking this test, you have probably paid little attention to ongoing body functions, such as breathing, heartbeat, and digestion. Such involuntary bodily functions are governed by the:
a. somatic nervous system.
b. cerebrospinal fluid.
c. spinal reflexes.
d. autonomic nervous system.
ANSWER: d

110. JoonBo is in a deep sleep when his fire alarm begins to sound loudly. He becomes terrified and jumps out

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of bed instantly, his heart racing. After determining that there is no smoke in the house and that nothing is on fire, he researches his brand of fire alarm and discovers that it also alerts when the battery is low. Relieved, JoonBo feels his heart slow down. Which subdivision of the nervous system helped JoonBo's body function to return to normal?

a. parasympathetic
b. endocrine
c. sympathetic
d. somatic

ANSWER: a

111. The heightened physical arousal that characterizes the fight-or-flight response involves the _____ branch of the nervous system.

a. spinal
b. somatic
c. sympathetic
d. parasympathetic

ANSWER: c

112. Maria heard a strange banging noise just outside her bedroom window in the middle of the night. She froze in fear, and her heart began to pound. Maria's heightened physical arousal involved the activation of which subdivision of the nervous system?

a. endocrine
b. parasympathetic
c. sympathetic
d. reticular

ANSWER: c

113. The endocrine system involves communication by the chemical messengers _____, which circulate through the _____.

a. hormones; bloodstream
b. neurotransmitters; spinal cord
c. hormones; cerebrospinal fluid
d. endorphins; nervous system

ANSWER: a

114. Which of the following help regulate blood pressure, metabolism, and reproduction?

a. myelin
b. endorphins
c. glial cells
d. hormones

ANSWER: d

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Chapter 02: Multiple Choice

115. How does communication in the endocrine system differ from communication in the nervous system?
   a. Communication in the nervous system is slower than communication in the endocrine system.
   b. Communication in the endocrine system is slower than communication in the nervous system.
   c. Endocrine system cells can receive messages but cannot transmit messages.
   d. While both inhibitory and excitatory messages can be transmitted by cells in the nervous system, endocrine system cells can transmit only excitatory messages.

ANSWER: b

116. The main link between the nervous system and the endocrine system is the:
   a. adrenal cortex.
   b. hypothalamus.
   c. pineal gland.
   d. pancreas.

ANSWER: b

117. Which gland produces melatonin, a hormone that helps to regulate our sleep–wake cycle?
   a. the pineal gland
   b. the pituitary gland
   c. the pancreas
   d. the thyroid gland

ANSWER: a

118. Which gland directly regulates the production of hormones in other endocrine glands?
   a. the reproductive adrenal gland
   b. the thyroid gland
   c. the pituitary gland
   d. the pancreas

ANSWER: c

119. Growth hormone, prolactin, and oxytocin are all secreted by the:
   a. pineal gland.
   b. amygdala.
   c. pituitary gland.
   d. hypothalamus.

ANSWER: c

120. The adrenal glands produce hormones that are involved in:
   a. reproduction.
   b. stress.
   c. metabolism.
   d. sleep.

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Chapter 02: Multiple Choice

ANSWER: b

121. Another word for epinephrine is:
a. adrenaline.
b. progesterone.
c. glutamate.
d. testosterone.

ANSWER: a

122. The physical arousal that accompanies the fight-or-flight response involves the activation of which of the following endocrine glands?
a. the testes in males and the ovaries in females
b. the pineal gland
c. the thyroid gland
d. the adrenal gland

ANSWER: d

123. In males, the gonads are the _____, which secrete _____.
a. ovaries; androgens, including testosterone
b. testes; androgens, including testosterone
c. ovaries; estrogen and progesterone
d. testes; estrogen and progesterone

ANSWER: b

124. In females, the gonads are the _____, which secrete _____.
a. ovaries; testosterone
b. testes; testosterone
c. ovaries; estrogen and progesterone
d. testes; estrogen and progesterone

ANSWER: c

125. In nursing mothers, nerve impulses from sensory receptors in the skin are sent to the hypothalamus, which signals the release of:
a. testosterone
b. adrenaline
c. oxytocin
d. progesterone

ANSWER: c

126. Which of the following hormones is thought to promote bonding in reproductive partners?
a. testosterone

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Chapter 02: Multiple Choice

b. estrogen
c. epinephrine
d. oxytocin

ANSWER: d

127. Which of the following is FALSE regarding the psychological effect of oxytocin?
a. It promotes bonding between romantic partners.
b. It promotes bonding between parent and infant.
c. In some circumstances, it can promote aggression.
d. It plays a key role in the fight-or-flight response.

ANSWER: d

128. _____ is based on the fact that increased activity in a particular brain region is associated with increased blood flow and energy consumption in a region.
a. Functional MRI
b. Diffusion MRI
c. An MRI
d. PET

ANSWER: d

129. _____ scans produce digital images showing a detailed "slice" of the brain's structures.
a. MRI
b. fMRI
c. dMRI
d. PET

ANSWER: a

130. Which of the following techniques or instruments generates color-coded images of the brain's activity by tracking a small amount of radioactively tagged glucose that is injected into the person's bloodstream?
a. transcranial magnetic stimulation (TMS)
b. electroconvulsive therapy (ECT)
c. magnetic resonance imaging (MRI)
d. positron-emission tomography (PET)

ANSWER: d

131. Which of these combines the ability to produce a detailed image of the brain's structures with the capacity to track the brain's activity and functioning?
a. functional magnetic resonance imaging (fMRI)
b. electroconvulsive therapy (ECT)
c. magnetic resonance imaging (MRI)
d. positron-emission tomography (PET)

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Chapter 02: Multiple Choice

ANSWER: a

132. To identify which brain areas are most active when a person suffering from schizophrenia has hallucinations, researchers could use a(n) _____ scan to track the use of radioactively tagged glucose throughout the brain.

a. MRI
b. PET
c. fMRI
d. ECT

ANSWER: b

133. Dr. Gomez wanted to investigate the effects of nicotine on the activity of the brain. Because she did not want to expose people to radioactivity or use any invasive procedures to measure brain activity, Dr. Gomez chose to use _____ for her measures of brain activity.

a. the double-blind technique (DBT)
b. PET scans
c. transcranial magnetic stimulation (TMS)
d. functional MRI (fMRI) scans

ANSWER: d

134. When comparing fMRIs to PET scans, you can see that:

a. PET scans provide a much sharper picture than fMRIs.
b. PET scans use less radioactive glucose than fMRIs.
c. fMRIs provide a picture of brain activity averaged over seconds rather than the several minutes that PET scans require.
d. PET scans can be used to study the details of much smaller brain structures than fMRIs.

ANSWER: c

135. Which of the following statements was NOT discussed in the Chapter 2 "Focus on Neuroscience" feature as a potential limitation of brain imaging studies?

a. Because the participants in brain imaging studies usually have some type of brain damage, it is difficult to draw conclusions about the functioning of the healthy, intact human brain.
b. Because brain imaging research tends to involve small groups of participants, caution must be exercised in generalizing results to a wider population.
c. If a psychological process is complex, it is much less likely that brain imaging will identify a specific brain region uniquely associated with that psychological process.
d. Knowing that a particular psychological process activates a particular brain area does not necessarily further the explanation or understanding of the psychological process.

ANSWER: a

136. According to the Focus on Neuroscience "Imaging the Brain," which of the following statements is a potential limitation of brain imaging?

a. It is now considered unethical to use these techniques on humans; only animal studies are permitted.

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Chapter 02: Multiple Choice

b. Brain imaging studies usually involve a small number of participants and tend to focus on simple aspects of behavior.
c. All brain imaging studies use invasive procedures and radioactive substances and are potentially harmful to participants.
d. Because brain imagining techniques use correlational methods, they cannot be used to determine precise associations between brain activity and psychological functions.

ANSWER: b

137. The brain-scanning technique _____ allows neuroscientists to produce three-dimensional images of the neural pathways that connect one part of the brain to another.
a. functional magnetic resonance imaging
b. positron-emission tomography
c. diffusion spectrum imaging
d. X-ray computerized tomography

ANSWER: c

138. Diffusion spectrum imaging tracks the:
a. changes in blood flow due to neural activity.
b. electrical activity of neurons produced by postsynaptic potentials.
c. magnetic fields produced by action potentials of neurons.
d. movement of water molecules in brain tissue along the axons.

ANSWER: d

139. As you're eating lunch with a friend, you reach for your glass of water with your right hand, lift it to your lips, take a sip, and then set it down. This simple task involved:
a. only the primary motor cortex in the brain.
b. neuroplasticity.
c. multiple brain structures and regions communicating via neural pathways.
d. just the right hemisphere of the brain.

ANSWER: c

140. Many brain functions involve the activation of _____ that link different brain regions.
a. hormones
b. reflexes
c. neural pathways
d. nerves

ANSWER: c

141. Launched in 2009 by the National Institutes of Health, the Human Connectome Project aims to:
a. sequence the human genome.
b. determine how each human is genetically related.
c. connect human research to animal research.

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d. combine brain imaging data from hundreds of participants.

ANSWER: d

142. The brain's ability to change function and structure is referred to as:

a. synaptic transmission.

b. neurogenesis.

c. neuroplasticity.

d. cortical localization.

ANSWER: c

143. Jake received a severe brain injury in a motorcycle accident and was partially paralyzed on the left side of his body. After several months of intensive physical therapy, he gradually regained the use of his left leg and arm. This example best illustrates the principle of:

a. aphasia.

b. cortical localization.

c. functional plasticity.

d. neurogenesis.

ANSWER: c

144. The brain's ability to physically change in response to environmental stimulation is called:

a. aphasia.

b. neurogenesis.

c. structural plasticity.

d. functional plasticity.

ANSWER: c

145. The brain's ability to shift functions from damaged to undamaged areas is called:

a. aphasia.

b. neurogenesis.

c. structural plasticity.

d. functional plasticity.

ANSWER: d

146. Juliana began taking violin lessons as a young child. As a teenager, she participated in a research study in which MRI scans of teenagers who had played the violin for several years were compared to MRI scans of teenagers who had never played a musical instrument. The MRI scans of the teenage violinists showed that brain regions devoted to control of the fine muscles of the hands and fingers were larger in the teenage musicians than in the nonmusicians. This example illustrates the important phenomenon of:

a. functional plasticity.

b. structural plasticity.

c. lateralization of function.

d. myelin regrowth.

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Chapter 02: Multiple Choice

ANSWER: b

147. At 70 years old, Alice decided to take up juggling. According to research described in the chapter, what kind of brain changes might result from Alice's new hobby?

a. increased complexity in the corpus callosum
b. gray matter increases in brain regions involved in perceiving and anticipating complex visual motions
c. damage to the cerebellum
d. No changes would result; plasticity has not been demonstrated in the aging brain.

ANSWER: b

148. The chapter described a research study involving participants who learned how to juggle. What was the main conclusion of the research?

a. that learning and practicing a new skill had distinct physical effects on specific brain structures
b. that jugglers were more likely than nonjugglers to show evidence of neurogenesis in the corpus callosum
c. that learning how to juggle helped the participants become more creative by enhancing their right-brain abilities
d. that jugglers, as compared to nonjugglers, had higher levels of endorphins

ANSWER: a

149. Which of the following best defines neurogenesis?

a. the development of new neurons
b. the first neuron to generate an action potential
c. the influence of neurons on the formation of new genes
d. the influence of genes on the firing rate of neurons

ANSWER: a

150. Which of the following is TRUE regarding the development and growth of new neurons in the human brain?

a. Animals such as primates, birds, and rodents do not experience neurogenesis.
b. Glial cells of human brains continue to reproduce and grow in number through adulthood but neurons do not.
c. The human brain has the capacity to generate new neurons throughout the lifespan.
d. There is no evidence that the human brain continues to develop new neurons after birth.

ANSWER: c

151. In what area of the adult primate brain have researchers found evidence of the growth of new neurons?

a. the pons
b. the hippocampus
c. the medulla
d. the thalamus

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Chapter 02: Multiple Choice

ANSWER: b

152. Stress, exercise, and environmental complexity have been shown to affect the rate of _____ in the brains of monkeys, rodents, and birds.

a. neurogenesis
b. cortical localization
c. lateralization
d. neuroplasticity

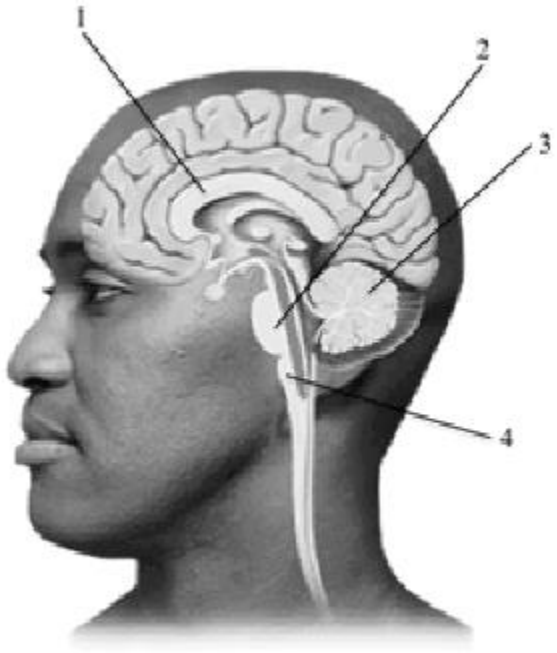
ANSWER: a

153. The brainstem is made up of the _____ and the _____.

a. forebrain; midbrain
b. cerebellum; medulla
c. reticular formation; pons
d. midbrain; hindbrain

ANSWER: d

154. This cross section of the human brain depicts several key structures. Which of the following correctly labels the structures in the drawing?



a. 1 = hypothalamus, 2 = nucleus, 3 = axon, 4 = myelin sheath
b. 1 = corpus callosum, 2 = pons, 3 = cerebellum, 4 = medulla
c. 1 = hippocampus, 2 = reticular formation, 3 = medulla, 4 = spinal cord
d. 1 = thalamus, 2 = hypothalamus, 3 = pons, 4 = brain stem

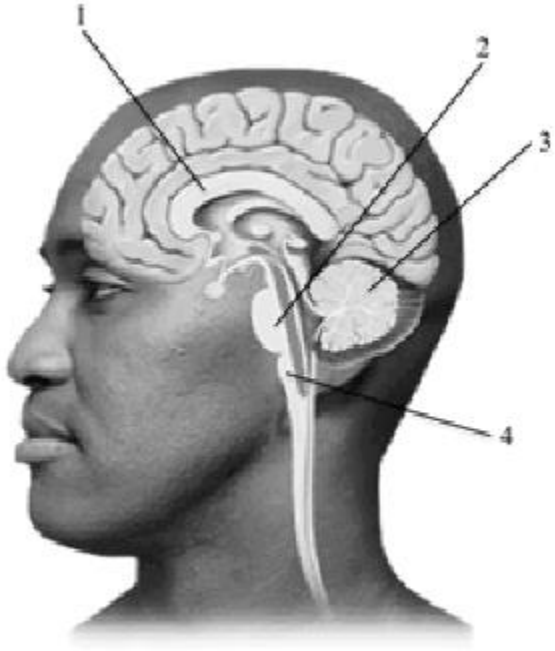
ANSWER: b

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Chapter 02: Multiple Choice

155. Which number points to the brain structure that controls vital life functions, such as breathing, heartbeat, and digestion?



a. 1
b. 2
c. 3
d. 4

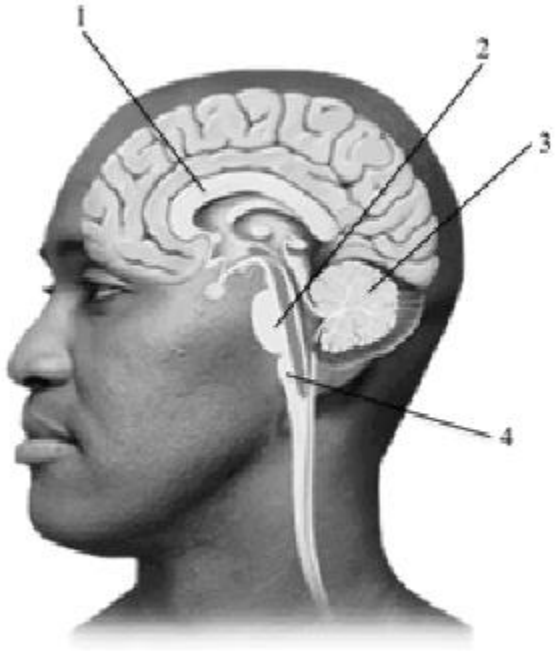
ANSWER: d

156. Which number points to the brain structure that plays a key role in controlling balance, muscle tone, and coordinated movements?

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Chapter 02: Multiple Choice



a. 1
b. 2
c. 3
d. 4

ANSWER: c

157. The right side of the brain controls movements on the left side of the body, such as the ability to kick your left leg. Where do the outgoing motor messages cross over?
a. at the forebrain level
b. at the midbrain level
c. in the spinal cord
d. at the hindbrain level

ANSWER: d

158. Which of the following is NOT a hindbrain structure?
a. hypothalamus
b. pons
c. medulla
d. cerebellum

ANSWER: a

159. The chapter prologue described the story of a young university professor named Asha, who suffered a stroke. Because Asha experienced some damage to the motor areas on the left side of her brain, she experienced:
a. muscle weakness on the left and right sides of her body.

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Chapter 02: Multiple Choice

b. muscle weakness only on the right side of her body.
c. no muscle impairment.
d. muscle weakness only on the left side of her body.

ANSWER: b

160. As you are listening to a lecture, workers are repairing a wall just outside your classroom. Throughout the class, you find yourself coughing and sneezing because of the dust and fumes in the air. Which brain structure controls such vital reflexes as sneezing, coughing, and swallowing?

a. the corpus callosum
b. the cerebellum
c. the medulla
d. the thalamus

ANSWER: c

161. As you take this test, you do not have to focus on taking your next breath or making your heart beat. This is because the _____ is involved in the control of vital life functions, such as breathing, heart rate, and digestion.

a. medulla
b. pons
c. thalamus
d. parietal lobe

ANSWER: a

162. The _____ is a network of neurons at the base of the brain that projects signals up to higher brain regions and down to the spinal cord, and regulates attention and sleep.

a. cerebellum
b. hypothalamus
c. reticular formation
d. substantia nigra

ANSWER: c

163. When President John F. Kennedy was hit by a sniper's bullet in the back of his head, he died almost instantly because the bullet destroyed the part of his brain called the _____, which controls breathing, heartbeat, and other vital body functions.

a. hippocampus
b. medulla
c. amygdala
d. thalamus

ANSWER: b

164. Which structure helps relay information from higher brain regions to the cerebellum and helps coordinate and integrate movements on each side of the body?

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Chapter 02: Multiple Choice

a. the substantia nigra
b. the corpus callosum
c. the amygdala
d. the pons

ANSWER: d

165. Your pencil starts to roll off the desk and in a smooth, coordinated fashion you grab it just before it rolls off the edge. Your ability to perform this action involved which brain area?

a. the cerebellum
b. the hippocampus
c. the amygdala
d. Broca's area

ANSWER: a

166. After too many drinks at a party, your friend awkwardly stumbles into a table, almost knocking it over. Your friend's coordination for simple actions, such as walking between two tables, is reduced because the alcohol has affected his:

a. medulla.
b. cerebellum.
c. thalamus.
d. somatosensory cortex.

ANSWER: b

167. As you are walking in a crowded hallway, someone calls your name. Almost instantly, you sense that the person is on your left. Your brain's ability to detect the direction of a sound is initially processed in the:

a. medulla.
b. frontal lobe.
c. midbrain region.
d. occipital lobe.

ANSWER: c

168. The substantia nigra is:

a. located in the midbrain.
b. where the greatest level of neurogenesis occurs.
c. the primary communication link between the two hemispheres of the cerebral cortex.
d. the point at which motor signals cross over from one side of the brain to the opposite side of the body.

ANSWER: a

169. Which statement describes the substantia nigra?

a. It contains dopamine-producing neurons and is involved in motor control.
b. This is the region that has shown the greatest degree of neurogenesis in humans.

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Chapter 02: Multiple Choice

c. This is the primary communication link between the left and right cerebral hemispheres.
d. It does not fully develop until late adolescence.

ANSWER: a

170. Which of the following represents the largest region of the brain?
a. the forebrain
b. the hindbrain
c. the cerebellum
d. the midbrain

ANSWER: a

171. Comparing the structure of the human brain to that of other animals reveals that:
a. human brain organization bears little or no resemblance to that of lower animals, such as birds and fish.
b. all animals have a cerebellum, but only humans and other primates have a cortex.
c. the human cortex is much more complex than that of lower animals, which makes up for the absence of a cerebellum in the human brain.
d. the basic structure of the human brain is similar to that of many other animals, but a higher proportion of the human brain is devoted to the cortex.

ANSWER: d

172. The primary communication link between the left and right cerebral hemispheres is called:
a. the hypothalamus.
b. Wernicke's area.
c. Broca's area.
d. the corpus callosum.

ANSWER: d

173. The phrase "white matter" in the brain refers to:
a. myelinated axons.
b. the large spaces on the interior of the brain called "ventricles."
c. unmyelinated axons, glial cells, and cell bodies.
d. neurons that manufacture endorphins.

ANSWER: a

174. White matter is to gray matter as _____ is/are to _____.
a. cell bodies and glial cells; myelinated axons
b. myelinated axons; cell bodies and glial cells
c. dendrites; glial cells and axons
d. midbrain; hindbrain

ANSWER: b

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Chapter 02: Multiple Choice

175. Which best describes the surface of the cerebral cortex?
a. smooth, pinkish tissue, well-endowed with blood vessels
b. a rounded, semicircular mass of white matter
c. darkly pigmented tissue bisected by a single deep fissure
d. numerous folds, wrinkles, bulges, ridges, and valleys
ANSWER: d

176. During the middle of a test, your instructor announces that there's a typographical error on one of the questions. As you listen, the auditory information is being processed in your:
a. occipital lobe.
b. frontal lobe.
c. temporal lobe.
d. parietal lobe.
ANSWER: c

177. Each cerebral hemisphere can be roughly divided into four lobes. Which lobe processes auditory information?
a. frontal lobe
b. parietal lobe
c. temporal lobe
d. occipital lobe
ANSWER: c

178. The occipital lobe is to _____ as the temporal lobe is to _____.
a. vision; somatosensory processing
b. audition; vision
c. somatosensory processing; audition
d. vision; audition
ANSWER: d

179. Waiting for your friend at the airport, you scan the faces of the passengers as they exit the terminal. This visual information is being processed in your:
a. occipital lobe.
b. parietal lobe.
c. frontal lobe.
d. temporal lobe.
ANSWER: a

180. Samuel suffered damage to his temporal lobes during an operation to remove tumors from his brain. This will likely cause him to have difficulty with his:
a. vision.
b. ability to smell and taste.

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Chapter 02: Multiple Choice

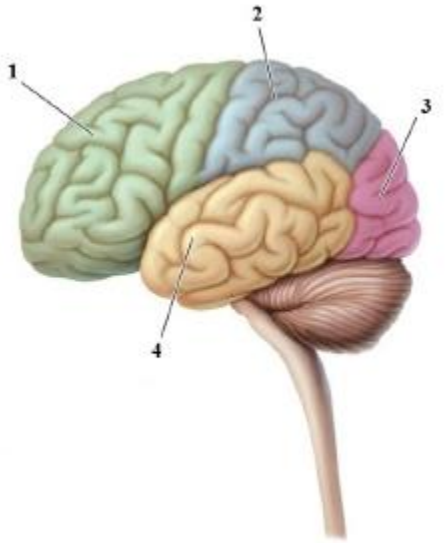
c. hearing.
d. ability to process somatosensory information.

ANSWER: c

181. A gymnast knows where his arms and legs are as he does his tumbling routine because information from his muscles and joints is relayed to his:
a. temporal lobe.
b. frontal lobe.
c. occipital lobe.
d. parietal lobe.

ANSWER: d

182. This image depicts the left hemisphere of the cerebral cortex. Which of the following correctly labels the structures in the drawing?



a. 1 = parietal lobe, 2 = gray matter, 3 = association areas, 4 = white matter
b. 1 = frontal lobe, 2 = parietal lobe, 3 = occipital lobe, 4 = temporal lobe
c. 1 = frontal lobe, 2 = temporal lobe, 3 = parietal lobe, 4 = occipital lobe
d. 1 = temporal lobe, 2 = midbrain lobe, 3 = occipital lobe, 4 = frontal lobe

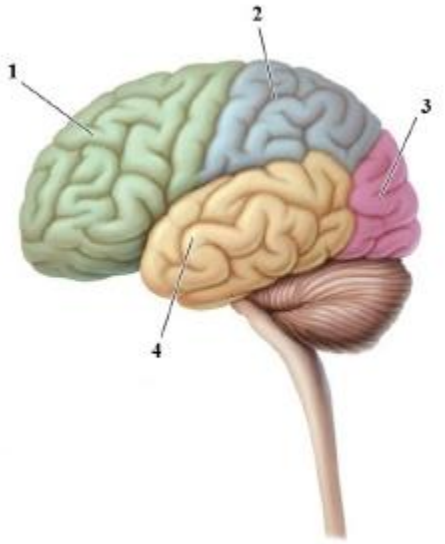
ANSWER: b

183. This image depicts the left hemisphere of the cerebral cortex. Which area contains the primary auditory cortex and processes auditory information?

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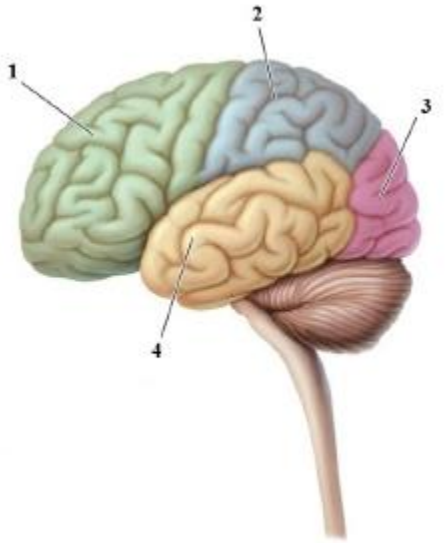
Chapter 02: Multiple Choice



a. 1. frontal lobe
b. 2. parietal lobe
c. 3. occipital lobe
d. 4. temporal lobe

ANSWER: d

184. This image depicts the left hemisphere of the cerebral cortex. Which area processes information about body sensations and contains the somatosensory cortex?



a. 1. frontal lobe
b. 2. parietal lobe
c. 3. occipital lobe
d. 4. temporal lobe

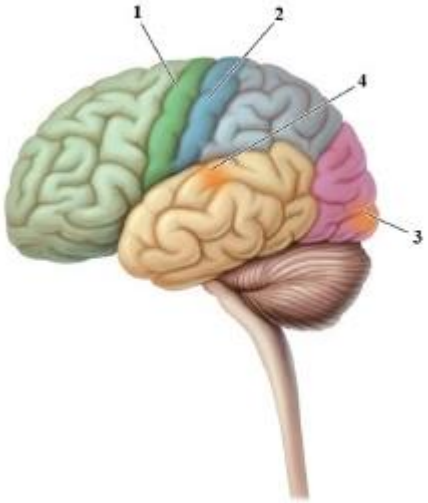
ANSWER: b

185. This drawing depicts the left hemisphere of the cerebral cortex. Which of the following correctly labels the

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Chapter 02: Multiple Choice

drawing?



a. 1 = parietal lobe, 2 = temporal lobe, 3 = occipital lobe, 4 = midbrain
b. 1 = primary motor cortex, 2 = somatosensory cortex, 3 = primary visual cortex, 4 = primary auditory cortex
c. 1 = gray matter, 2 = white matter, 3 = cerebellum, 4 = midbrain
d. 1 = corpus callosum, 2 = lateral fissure, 3 = occipital lobe, 4 = Broca's area

ANSWER: b

186. Your nephew's eyes suddenly light up and he reaches out, executes a double-jump of your checker pieces, then smiles at you triumphantly. The brain signals for these voluntary actions originated in the _____ of your nephew's brain.

a. somatosensory cortex
b. primary motor cortex
c. temporal lobe
d. hippocampus

ANSWER: b

187. The signals for voluntary muscle movements originate in a band of tissue called the _____, which is located on the _____ lobe.

a. primary motor cortex; parietal
b. somatosensory cortex; parietal
c. primary motor cortex; frontal
d. association area; occipital

ANSWER: c

188. How is each part of the body represented on the somatosensory cortex?

a. in proportion to each body part's potential for movement
b. in proportion to the degree of neurogenesis that has occurred in each segment of the region

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Chapter 02: Multiple Choice

c. in proportion to the size of each body part
d. in proportion to each body part's sensitivity to somatic sensations

ANSWER: d

189. Which parts of the body have the greatest representation on the primary motor cortex?
a. hand and facial muscles
b. leg and arm muscles
c. head and neck muscles
d. chest and back muscles

ANSWER: a

190. A large bulk of the cerebral cortex is not devoted to any particular sensory or motor function. Rather, these areas, known as _____, are generally thought to be involved in processing and integrating sensory and motor information.
a. secondary cortex areas
b. association areas
c. the limbic system
d. Broca's and Wernicke's areas

ANSWER: b

191. The "limbic system" refers to the:
a. hypothalamus, pituitary gland, and reproductive adrenal glands.
b. hippocampus, thalamus, amygdala, and hypothalamus.
c. thalamus, cerebellum, pons, medulla, and hypothalamus.
d. parietal, occipital, frontal, and temporal lobes.

ANSWER: b

192. The hippocampus plays a key role in which functions?
a. regulating sleep and wakefulness
b. survival behaviors, including eating and drinking
c. forming new memories
d. emotional responses, including fear, anger, and disgust

ANSWER: c

193. After an automobile accident, Randy experienced a series of severe seizures. After the seizures stopped, Randy's ability to form new memories was greatly impaired. Which brain structure was most likely damaged by the severe seizures?
a. the hypothalamus
b. the hippocampus
c. the somatosensory cortex
d. the thalamus

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Chapter 02: Multiple Choice

ANSWER: b

194. According to your textbook, there is good evidence to show that neurogenesis takes place in which region(s) of the adult human brain?

a. the amygdala
b. the thalamus and the hypothalamus
c. throughout the limbic system
d. the hippocampus

ANSWER: d

195. Almost all of the sensory and motor information going to and from the cerebral cortex is processed through the:

a. thalamus.
b. hypothalamus.
c. hippocampus.
d. pituitary gland.

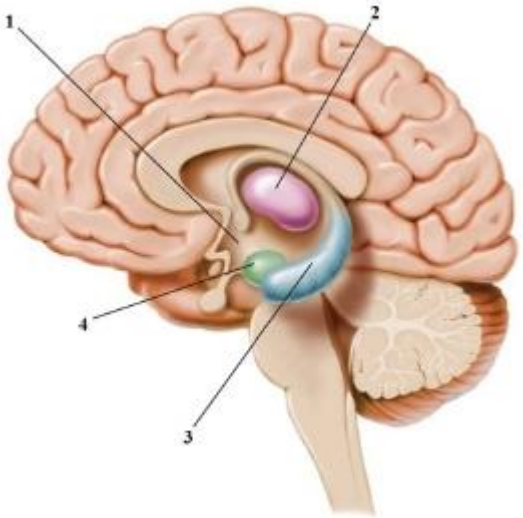
ANSWER: a

196. Which two limbic system structures are especially associated with forming new memories?

a. the hypothalamus and the substantia nigra
b. the thalamus and the hypothalamus
c. the hippocampus and amygdala
d. the thalamus and cerebellum

ANSWER: c

197. This cross-sectional drawing of the human brain depicts four structures that are key components of the limbic system. Which of the following correctly labels the structures in the drawing?



a. 1 = hypothalamus, 2 = thalamus, 3 = hippocampus, 4 = amygdala
b. 1 = pituitary gland, 2 = corpus callosum, 3 = reticular formation, 4 = hypothalamus

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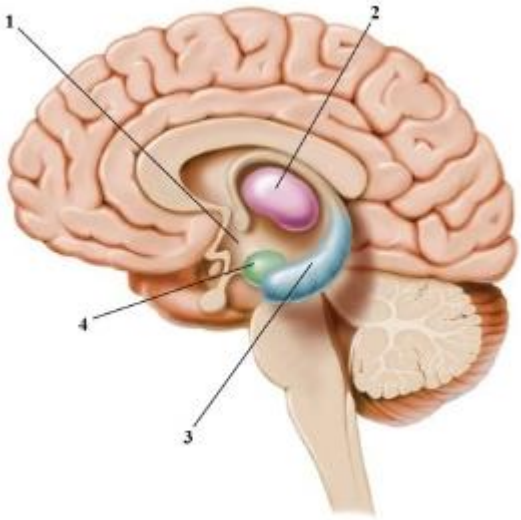
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Chapter 02: Multiple Choice

c. 1 = thalamus, 2 = hypothalamus, 3 = amygdala, 4 = hippocampus
d. 1 = suprachiasmatic nucleus, 2 = association area, 3 = cerebellum, 4 = hippocampus

ANSWER: a

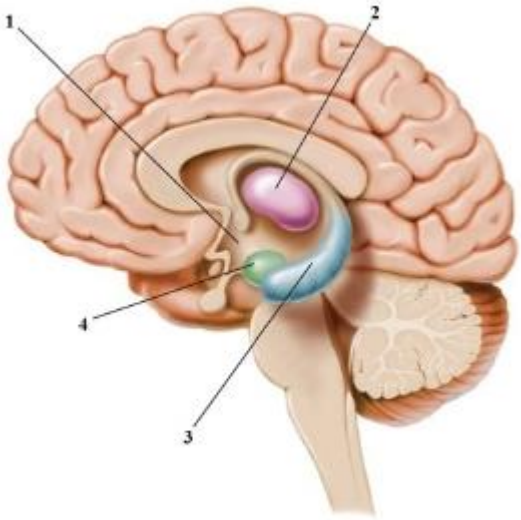
198. This cross-sectional drawing of the human brain depicts four structures that are key components of the limbic system. Which brain structure regulates survival behaviors, such as eating, drinking, fear, aggression, and sleep–wake cycles?



a. 1. hypothalamus
b. 2. thalamus
c. 3. hippocampus
d. 4. amygdala

ANSWER: a

199. This cross-sectional drawing of the human brain depicts four structures that are key components of the limbic system. Which brain structure plays a critical role in forming new memories?



a. 1. hypothalamus

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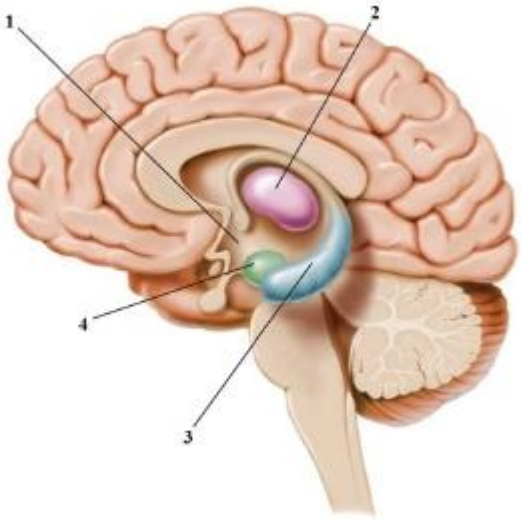
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Chapter 02: Multiple Choice

b. 2. thalamus
c. 3. hippocampus
d. 4. amygdala

ANSWER: c

200. This cross-sectional drawing of the human brain depicts four structures that are key components of the limbic system. Which brain structure processes and integrates information from all the senses, except smell?



a. 1. hypothalamus
b. 2. thalamus
c. 3. hippocampus
d. 4. amygdala

ANSWER: b

201. Recent evidence suggests that _____ is more than just a sensory relay station and plays a key role in regulating levels of awareness.

a. the pituitary gland
b. the thalamus
c. Broca's area
d. the primary motor cortex

ANSWER: b

202. You've been studying biology in the library for the past couple of hours when you realize that you're getting really hungry and thirsty. Which brain structure played a key role in triggering feelings of hunger and thirst?

a. the pituitary gland
b. the corpus callosum
c. the hypothalamus
d. the hippocampus

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Chapter 02: Multiple Choice

ANSWER: c

203. Which brain structure regulates the sympathetic and parasympathetic branches of the autonomic nervous system?

a. the amygdala
b. the hippocampus
c. the thalamus
d. the hypothalamus

ANSWER: d

204. Daily rhythms of sleep and wakefulness are regulated by the _____, which is found in the _____.

a. suprachiasmatic nucleus (SCN); hypothalamus
b. reticular formation; frontal lobe
c. hippocampus; hypothalamus
d. cerebellum; midbrain

ANSWER: a

205. The hypothalamus exerts control over the endocrine system by directly triggering activity in the:

a. amygdala.
b. thyroid.
c. pituitary gland.
d. hippocampus.

ANSWER: c

206. Which brain structure exerts considerable influence over the secretion of hormones throughout the body?

a. the hypothalamus
b. the amygdala
c. the hippocampus
d. the thalamus

ANSWER: a

207. The almond-shaped clump of neuron cell bodies at the base of the temporal lobe that is involved in a variety of emotional responses is called the:

a. amygdala.
b. hippocampus.
c. thalamus.
d. frontal cortex.

ANSWER: a

208. Padma witnesses a group of tourists litter and throw soda cans in the ocean. She feels angry and is disgusted by their behavior. Which area of the brain is associated with her emotional responses?

a. the hypothalamus

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Chapter 02: Multiple Choice

b. the amygdala
c. the thalamus
d. Broca's area

ANSWER: b

209. In animals, electrical stimulation of the amygdala produces:
a. an almost instantaneous onset of sleep.
b. awkward, clumsy behavior.
c. grooming or mating behavior.
d. behaviors associated with fear.

ANSWER: d

210. "Cortical localization" refers to the idea that:
a. specific areas of the cerebral cortex are associated with specific behaviors or psychological processes.
b. specific behaviors or psychological processes can shift from damaged brain areas to undamaged areas.
c. brain organization is fundamentally different for left-handed versus right-handed people.
d. specific psychological or cognitive functions are processed primarily in one side of the brain.

ANSWER: a

211. "Phrenology" refers to:
a. the study of brain/endocrine system interactions.
b. a pseudoscience that related personality characteristics to bumps on the skull.
c. the historical method of drilling holes in the skull as a treatment for brain disease and mental illness.
d. the scientific study of "phrens" or "phrenetics."

ANSWER: b

212. Although disproved, phrenology was valuable in:
a. generating interest in the idea of cortical localization.
b. stressing the role of nutrition in endocrine and brain disorders.
c. emphasizing the importance of hormones in human behavior.
d. inspiring modern methods of treating brain disease and mental disorders.

ANSWER: a

213. The popularity of phrenology triggered scientific interest in which of the following?
a. the idea that the brain's left hemisphere might be specialized for language functions
b. the development of medications to treat severe mental disorders
c. cutting the corpus callosum to reduce epileptic seizures
d. the idea that specific psychological and mental functions are located in specific brain areas

ANSWER: d

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Chapter 02: Multiple Choice

214. According to the Critical Thinking box, "'His' and 'Her' Brains?":
a. neuroscientists have found no structural differences between male and female brains.
b. physiological gender differences are innate, biological, permanent, and hardwired in the brain.
c. not all structural differences found in male and female brains lead to differences in measurable behavior or abilities.
d. research findings on differences in male and female brains conclusively support the belief that men and women think and reason differently.

ANSWER: c

215. Biological factors interact with _____ to contribute to brain development.
a. sex
b. environmental influences
c. ethnicity
d. personality

ANSWER: b

216. According to the Critical Thinking box, "'His' and 'Her' Brains?," which of the following is TRUE?
a. Women's brains tend to be larger than men's brains.
b. Women and men differ in the concentration of neural connections within or between the two hemispheres.
c. In general, the male brain is more symmetrical and functions are less lateralized than in the female brain.
d. Female brains possess a much higher proportion of white matter than male brains meaning they can process information much faster.

ANSWER: b

217. Phrenology was founded by:
a. Pierre Paul Broca.
b. Roger Sperry.
c. Karl Wernicke.
d. Franz Gall.

ANSWER: d

218. What is a psychograph?
a. a device worn on the head that measures the bumps on a person's skull
b. an instrument that is used to ensure the precise placement of electrodes in the brain
c. a device used to ensure precision when surgeons sever the corpus callosum during the split-brain operation
d. a sophisticated imaging instrument that helps identify the cortical localization of certain cognitive and perceptual abilities

ANSWER: a

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Chapter 02: Multiple Choice

219. Carlos had a stroke and although he has recovered many of his motor skills, he still has considerable difficulty with language. It is almost impossible for Carlos to produce speech, although he comprehends both written and spoken language quite well. Carlos is demonstrating characteristics of _____ aphasia.

a. left-hemisphere
b. Broca's
c. Wernicke's
d. right-hemisphere

ANSWER: b

220. Phrenology helped introduce the idea of brain _____, while the split-brain research demonstrated the principle of brain _____.

a. localization; lateralization
b. lateralization; localization
c. specialization; plasticity
d. plasticity; specialization

ANSWER: a

221. A German neurologist named _____ identified an area on the left temporal lobe that, when damaged, disrupted the ability to understand written or spoken language.

a. Paul Broca
b. Karl Wernicke
c. Roger Sperry
d. Franz Gall

ANSWER: b

222. When brain damage causes the loss of the ability to speak, write, or understand spoken or written language, it is a condition called:

a. aphasia.
b. Parkinson's disease.
c. epilepsy.
d. Alzheimer's disease.

ANSWER: a

223. Damage to Wernicke's area in the brain:

a. produces disruptions in the sense of balance as well as numbness in the arms and legs.
b. produces difficulty speaking but does not disrupt the ability to comprehend verbal or written words.
c. disrupts or destroys the ability to form new memories.
d. produces difficulty in comprehending written or spoken communication.

ANSWER: d

224. The chapter prologue described a young university professor named Asha who suffered a stroke.

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Chapter 02: Multiple Choice

Following her stroke, Asha's ability to speak was not impaired, but she was unable to read and often had difficulty understanding what was said to her. Asha showed many of the symptoms that characterize:

a. right-hemisphere damage.
b. Broca's aphasia.
c. Parkinson's disease.
d. Wernicke's aphasia.

ANSWER: d

225. Following her stroke, Fernando's grandmother could understand what she read or what was being said to her. However, she had great difficulty speaking. Based on these observations, Fernando suspected that his grandmother's stroke had produced damage in:

a. Wernicke's area.
b. Broca's area.
c. the corpus callosum.
d. the hippocampus.

ANSWER: b

226. The discoveries of Pierre Paul Broca and Karl Wernicke:

a. provided compelling evidence that language and speech functions are lateralized on the right hemisphere.
b. discredited the idea of cortical localization.
c. provided compelling evidence that language and speech functions are lateralized on the left hemisphere.
d. were later discredited by the work of psychologist Roger Sperry and his colleagues.

ANSWER: c

227. The idea that specific psychological or cognitive functions are processed primarily on one side of the brain is called:

a. cortical localization.
b. lateralization of function.
c. functional plasticity.
d. structural plasticity.

ANSWER: b

228. Why was the split-brain operation first performed?

a. to study the specialized abilities of the left and right hemispheres
b. to help control recurring epileptic seizures
c. to identify the location of motor centers in the brain
d. to treat people suffering from severe forms of aphasia

ANSWER: b

229. Psychologist Roger Sperry is best known for his:

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Chapter 02: Multiple Choice

a. discovery of neurogenesis in the brains of rats.
b. case studies of stroke patients with language difficulties.
c. studies of rats that were raised in "impoverished" versus "enriched" environments.
d. studies of split-brain patients.

ANSWER: d

230. Tracy is a split-brain patient seated in front of a screen. As she focuses on the middle of the screen, the image of a fork is briefly flashed on the RIGHT side of the screen. Tracy will:
a. be able to verbally name the object.
b. be able to use her left hand to reach under the screen and pick up the correct object.
c. verbally deny that any image appeared on the screen.
d. probably have an epileptic seizure.

ANSWER: a

231. Based on research with split-brain patients, we know that the _____ hemisphere is specialized for _____.
a. left; emotional and nonverbal aspects of communication
b. right; visual perception tasks
c. right; language abilities
d. left; artistic and musical appreciation

ANSWER: b

232. Recognizing a person but blanking on his or her name is a common experience. For most people, facial recognition is a _____ hemisphere task, while being able to name the person is a _____ hemisphere verbal memory task.
a. left; left
b. right; right
c. right; left
d. left; right

ANSWER: c

233. In reading these test questions, you are primarily using your _____ to understand what you are reading.
a. left hemisphere
b. right hemisphere
c. amygdala
d. medulla

ANSWER: a

234. The chapter prologue described the story of a young university professor named Asha who suffered a stroke. Even though some of Asha's language abilities were disrupted by the stroke, she was still able to appreciate music because her _____ was not damaged.
a. corpus callosum
b. left hemisphere

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Chapter 02: Multiple Choice

c. right hemisphere
d. amygdala

ANSWER: c

235. In the college cafeteria, your friend Larry, who is an art major, loudly proclaims that because he is an artist he is right-brained and it's no wonder he's having trouble with his college algebra class. Because you have read this chapter, you are able to tell him that:
a. with special training, he should be able to better educate his left brain, so that he will at least pass algebra even if he'll never be very good at it.
b. he should drop algebra and take geometry, which takes a more right-brain approach to mathematics.
c. his problems with algebra cannot be blamed on either his right or left hemispheres; it is a myth that people are either "right-brained" or "left-brained."
d. given the right degree of environmental stimulation, he should be able to increase his left-hemisphere abilities, but doing so will undoubtedly lessen his artistic creativity.

ANSWER: c

236. Kolu is left-handed. She is most likely:
a. left-hemisphere-dominant for language.
b. right-hemisphere-dominant for language.
c. bilateral, using both hemispheres for language functions.
d. left-hemisphere-dominant sometimes and right-hemisphere-dominant other times, depending upon the nature of the speech or language task.

ANSWER: a

237. Which one of the following statements is TRUE?
a. Despite the fact that some people write with their left hand, all humans show left-hemisphere-dominance for language functions.
b. The vast majority of people are strongly right-handed, using their right hands for virtually all tasks requiring dexterity.
c. The fact that it is very easy to teach infants and young children to be left-handed strongly suggests that handedness is determined by environmental conditions, not genetics.
d. The percentage of the population that is strongly left-handed is approximately 15 to 20 percent.

ANSWER: b

238. Research has shown that neurogenesis in adult rats can be enhanced by:
a. taking drugs that increase the production of dopamine.
b. living in an enriched environment.
c. constant exposure to bright lights.
d. taking drugs that increase the production of endorphins.

ANSWER: b

239. Compared with young rats that have been raised in an "impoverished" environment, young rats that have

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Chapter 02: Multiple Choice

been raised in an "enriched" environment have:

a. more dendritic branches and more synaptic connections in the cerebral cortex.
b. a much stronger tendency to favor their left paws.
c. an enlarged medulla and reticular formation.
d. about half as many glial cells but almost double the number of neurons in their brain.

ANSWER: a

240. Based on studies with rats, it is clear that the exposure to environmental enrichment:

a. has no detectable effect on the brain.
b. can have an impact on brain development during early life but not in later life.
c. enhances right-hemisphere abilities but not left-hemisphere abilities.
d. produces significant brain changes regardless of the age of the rats.

ANSWER: d

241. According to the Psych for Your Life feature, one study found that the greater the level of aerobic fitness participants engaged in, the:

a. greater the increase in hippocampal volume.
b. worse people's memories became.
c. lower the level of endorphins in the brain.
d. greater the likelihood of developing aphasia.

ANSWER: a

242. The implication of research on exercise and neurogenesis, discussed in the Psych for Your Life feature, was that:

a. exercise has little or no effect on brain functions or structures.
b. exercising regularly retarded the release of endorphins in the brain.
c. neurogenesis was directly correlated with addiction to exercise.
d. exercise promotes the growth of new neurons in the human brain just as it does in other mammals.

ANSWER: d

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Name:_____ Class:_____ Date:_____

Chapter 02: True/False

1. The human brain contains approximately 1 billion neurons.
   a. True
   b. False

ANSWER: False

2. Interneurons communicate information from one neuron to the next.
   a. True
   b. False

ANSWER: True

3. Sensory neurons communicate information to muscles to help muscles better respond to environmental events.
   a. True
   b. False

ANSWER: False

4. The neuron's genetic material (DNA) is found in the nucleus of the neuron's cell body.
   a. True
   b. False

ANSWER: True

5. Dendrites receive information from other neurons.
   a. True
   b. False

ANSWER: True

6. Glial cells provide structural support and nutrition for neurons and remove waste products.
   a. True
   b. False

ANSWER: True

7. Oligodendrocytes and Schwann cells form the axon, which is a fatty covering that is wrapped around the axons of some neurons.
   a. True
   b. False

ANSWER: False

8. The myelin sheath covering an axon insulates that axon from other axons and increases its communication speed.
   a. True
   b. False

ANSWER: True

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Chapter 02: True/False

9. The action potential is the brief electrical impulse that is transmitted along the axon.
   a. True
   b. False

ANSWER: True

10. When a neuron is in the resting state, it is polarized so that the axon's interior is more positively charged than the exterior fluid surrounding the axon.
   a. True
   b. False

ANSWER: False

11. The all-or-none law refers to a neuron's ability to either release all or none of its neurotransmitter when an action potential occurs in its axon.
   a. True
   b. False

ANSWER: False

12. The neuron fires during the refractory period.
   a. True
   b. False

ANSWER: False

13. The action potential is slower in myelinated neurons, because it has to travel the entire length of the axon rather than being able to jump from one node of Ranvier to the next.
   a. True
   b. False

ANSWER: False

14. The synapses are tiny pouches that store neurotransmitters.
   a. True
   b. False

ANSWER: False

15. During the process of reuptake, glial cells absorb unused neurotransmitters and then transfer the neurotransmitters to the appropriate neuron.
   a. True
   b. False

ANSWER: False

16. Each neuron produces only one type of neurotransmitter.
   a. True
   b. False

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Chapter 02: True/False

ANSWER: False

17. An excitatory message communicated to a postsynaptic neuron increases the likelihood that the postsynaptic neuron will generate an action potential.
    a. True
    b. False
ANSWER: True

18. The neurotransmitter acetylcholine plays a key role in sleep, moods, and emotional states, including the symptoms of major depressive disorder.
    a. True
    b. False
ANSWER: False

19. Dopamine is the neurotransmitter that has been found to be most depleted in Alzheimer's patients.
    a. True
    b. False
ANSWER: False

20. Alcohol makes people feel relaxed by enhancing glutamate release.
    a. True
    b. False
ANSWER: False

21. Researchers have found that endorphins have pain-reducing effects.
    a. True
    b. False
ANSWER: True

22. Acupuncture seems to reduce pain by reducing the availability of serotonin and dopamine in the brain.
    a. True
    b. False
ANSWER: False

23. One of the key ways that drugs affect synaptic transmission is by changing an excitatory neurotransmitter to an inhibitory neurotransmitter, and vice versa.
    a. True
    b. False
ANSWER: False

24. Research has shown that the runners experience higher levels of happiness when the brain has a lower level of endorphin activity.
    a. True

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Chapter 02: True/False

b. False

ANSWER: False

25. Prozac and many other antidepressant medications increase the availability of serotonin in certain brain areas.

a. True

b. False

ANSWER: True

26. The drug curare blocks acetylcholine receptor sites, causing virtually instantaneous paralysis. Thus, curare is an agonist.

a. True

b. False

ANSWER: False

27. An agonist is a drug or other chemical that blocks a receptor site and inhibits or prevents a response in the receiving cell.

a. True

b. False

ANSWER: False

28. An antagonist is a drug that facilitates the binding of a neurotransmitter to a receptor.

a. True

b. False

ANSWER: False

29. One way in which drugs can prolong the effects of a neurotransmitter is through blocking the reuptake of the neurotransmitter by the sending neuron.

a. True

b. False

ANSWER: True

30. Because the drug naloxone is chemically similar to endorphins and opiates, it prolongs and intensifies their effects.

a. True

b. False

ANSWER: False

31. An antagonist is a drug or other chemical that binds to a receptor site and triggers a response in the cell.

a. True

b. False

ANSWER: False

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Chapter 02: True/False

32. In the central nervous system, communication occurs along nerves.
    a. True
    b. False
ANSWER: False

33. The central nervous system and the peripheral nervous system act independently of one another.
    a. True
    b. False
ANSWER: False

34. There are four hollow cavities in the brain, called "ventricles," which are filled with cerebrospinal fluid and whose inner surfaces are lined with neural stem cells.
    a. True
    b. False
ANSWER: True

35. Spinal reflexes require the brain to send rapid signals to sensory organs.
    a. True
    b. False
ANSWER: False

36. The two subdivisions of the peripheral nervous system are the somatic nervous system and the autonomic nervous system.
    a. True
    b. False
ANSWER: True

37. As your body's emergency system, the sympathetic nervous system rapidly triggers the fight-or-flight response when a threat or danger is perceived.
    a. True
    b. False
ANSWER: True

38. The sympathetic nervous system conserves and maintains your body's energy resources, whereas the parasympathetic nervous system activates your body and prepares the body for action.
    a. True
    b. False
ANSWER: False

39. Hormones do not greatly influence the nervous system because they are incapable of generating nerve impulses.
    a. True
    b. False

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Chapter 02: True/False

ANSWER: False

40. Melatonin is a hormone secreted by the thyroid gland, and it plays an important role in the let-down of milk in nursing mothers.

a. True

b. False

ANSWER: False

41. Pituitary hormones regulate the production of other hormones by many of the glands in the endocrine system.

a. True

b. False

ANSWER: True

42. The hypothalamus is largely controlled by the pituitary gland.

a. True

b. False

ANSWER: False

43. The adrenal glands play a key role in the fight-or-flight response through their production of epinephrine and norepinephrine.

a. True

b. False

ANSWER: True

44. In males, the gonads are the testes, which produce hormones called androgens, the most important of which is testosterone.

a. True

b. False

ANSWER: True

45. Diffusion spectrum imaging can produce three-dimensional images of the neural pathways that connect one part of the brain to another.

a. True

b. False

ANSWER: True

46. Diffusion spectrum imaging can produce three-dimensional images of the neural pathways that connect one part of the brain to another. These pathways, sometimes called "tracts," are made up of cell bodies of neurons.

a. True

b. False

ANSWER: False

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Chapter 02: True/False

47. Positron-emission tomography (PET) is an invasive imaging technique that provides color-coded images of brain activity by tracking the brain's use of a radioactively tagged compound, such as glucose, oxygen, or other substances.

a. True

b. False

ANSWER: True

48. Invasive imaging procedures include magnetic resonance imaging (MRI) and diffusion MRI (dMRI).

a. True

b. False

ANSWER: False

49. Magnetic resonance imaging (MRI) is an invasive imaging technique that provides color-coded images of brain activity by tracking the brain's use of a radioactively tagged compound, such as glucose, oxygen, or other substances.

a. True

b. False

ANSWER: False

50. Brain imaging techniques, such as PET scans, MRI, and fMRI, provide extremely accurate and detailed images of the brain and have virtually no known limitations.

a. True

b. False

ANSWER: False

51. Some limitations of brain imaging studies discussed in the *Focus on Neuroscience* section include the fact that they typically involve a small number of participants and that they tend to focus on simple aspects of behavior.

a. True

b. False

ANSWER: True

52. The Human Connectome Project's goal is to map the millions of miles of neural connections among the 90 billion neurons in the human brain.

a. True

b. False

ANSWER: True

53. The Human Connectome Project's goal is to sequence the human genome.

a. True

b. False

ANSWER: False

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Chapter 02: True/False

54. The brain's ability to change function and structure is referred to as "neurogenesis."
    a. True
    b. False
ANSWER: False

55. *Functional plasticity* refers to the notion that different brain functions are located or localized in different areas of the brain.
    a. True
    b. False
ANSWER: False

56. Current research shows that structural plasticity is limited to regions in the hindbrain and midbrain; there is no evidence supporting structural plasticity in forebrain structures, including the cerebral cortex.
    a. True
    b. False
ANSWER: False

57. Humans and nonhuman primates are born with all the brain neurons they will ever have, and there is no evidence that new neurons grow and develop after birth.
    a. True
    b. False
ANSWER: False

58. According to one research study that involved participants who learned how to juggle, learning a new motor skill produces physical changes in specific brain structures related to the skill.
    a. True
    b. False
ANSWER: True

59. Research with adult mammals has shown that some regions of the brain have the capacity to develop new neurons throughout the lifespan.
    a. True
    b. False
ANSWER: True

60. Neuroscientists have found newly generated neurons in the hippocampus of the adult human brain.
    a. True
    b. False
ANSWER: True

61. In combination, the structures of the hindbrain and the midbrain are referred to as the "brainstem."
    a. True
    b. False

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Chapter 02: True/False

ANSWER: True

62. The corpus callosum is an important midbrain structure that contains many dopamine-producing neurons.
    a. True
    b. False
ANSWER: False

63. Because the human brain is characterized by contralateral organization, the left side of the brain controls movement on the right side of the body, and vice versa.
    a. True
    b. False
ANSWER: True

64. The cerebellum plays a critical role in the control of vital life functions, such as breathing, heart rate, swallowing, and coughing.
    a. True
    b. False
ANSWER: False

65. The pons serves as a bridge and helps contribute to breathing regulation.
    a. True
    b. False
ANSWER: True

66. A midbrain area called the "substantia nigra" contains a large concentration of dopamine-producing neurons and is involved in motor control.
    a. True
    b. False
ANSWER: True

67. The structural organization of the human brain is unique and different from all other animal species, including primates.
    a. True
    b. False
ANSWER: False

68. Each hemisphere of the cerebral cortex can be divided into the occipital, frontal, parietal, and temporal lobes.
    a. True
    b. False
ANSWER: True

69. The temporal lobe contains the primary auditory cortex, which receives auditory information.

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Chapter 02: True/False

a. True
b. False

ANSWER: True

70. The parietal lobe is involved in planning, initiating, and executing voluntary movements.
a. True
b. False

ANSWER: False

71. Key structures of the limbic system include the amygdala, hippocampus, thalamus, and hypothalamus.
a. True
b. False

ANSWER: True

72. The hands and the face have the greatest degree of representation on both the somatosensory cortex and the primary motor cortex.
a. True
b. False

ANSWER: True

73. The brain structure called the "hippocampus" represents the main link between the endocrine system and nervous system.
a. True
b. False

ANSWER: False

74. A key function of the hypothalamus is to process and distribute sensory and motor information going to and from the cerebral cortex.
a. True
b. False

ANSWER: False

75. The amygdala is involved in a variety of emotional responses, including fear, anger, and disgust.
a. True
b. False

ANSWER: True

76. Although the basic premise of phrenology was disproved, phrenology helped trigger scientific interest in the idea of cortical localization.
a. True
b. False

ANSWER: True

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Chapter 02: True/False

77. The notion that different psychological and mental functions are located or localized in different areas of the brain is called "localization of function" or "cortical localization."

a. True

b. False

ANSWER: True

78. Although Franz Gall and the phrenologists were wrong about the significance of bumps on the skull, they were correct about the idea that different psychological functions are localized in different brain areas.

a. True

b. False

ANSWER: True

79. According to the "Critical Thinking: 'His' and 'Her' Brains?" men's brains tend to be larger than women's brains and have more neural connections within the two hemispheres.

a. True

b. False

ANSWER: True

80. According to the "Critical Thinking: 'His' and 'Her' Brains?" there are no functional or structural differences between male and female brains.

a. True

b. False

ANSWER: False

81. A Viennese physician named Franz Gall originated phrenology, which is the theory that certain personality and character traits were physically represented in the skull shape of humans.

a. True

b. False

ANSWER: True

82. Phrenology was a renowned scientific theory of brain development in the 1800s.

a. True

b. False

ANSWER: False

83. Pierre Broca and Karl Wernicke helped demonstrate that speech and language functions are lateralized.

a. True

b. False

ANSWER: True

84. For the vast majority of people, Broca's area is located on the right frontal lobe and Wernicke's area is located on the right temporal lobe.

a. True

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Chapter 02: True/False

b. False

ANSWER: False

85. People with Wernicke's aphasia have trouble speaking clearly and understanding what others say.

a. True

b. False

ANSWER: False

86. People with Broca's aphasia find it difficult or impossible to produce speech.

a. True

b. False

ANSWER: True

87. Humans are the only species that display a preference for handedness.

a. True

b. False

ANSWER: False

88. The split-brain operation was developed as a cure for epilepsy and aphasia.

a. True

b. False

ANSWER: True

89. Roger Sperry's split-brain research in the twentieth century illustrated the independent functions of the two hemispheres.

a. True

b. False

ANSWER: True

90. Studies with split-brain patients have demonstrated that the corpus callosum serves no particular purpose in the brain.

a. True

b. False

ANSWER: False

91. For most people, the left hemisphere is superior at language tasks and the right hemisphere is superior at visual perception tasks.

a. True

b. False

ANSWER: True

92. In the normal intact brain, the left and right cerebral hemispheres function in an integrated fashion.

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Chapter 02: True/False

a. True
b. False

ANSWER: True

93. There is now strong evidence that it is possible to "educate" one side of your brain in isolation from the other side, so with proper training you can become more "right-brained" or more "left-brained."
a. True
b. False

ANSWER: False

94. Because virtually all left-handed people are right-brain-dominant, they are generally more creative and artistic than right-handed people, who are left-brain-dominant.
a. True
b. False

ANSWER: False

95. The central nervous system is highly specialized for information integration.
a. True
b. False

ANSWER: True

96. Studies with rats have confirmed that exposure to "enriched" environments produces structural changes in the brains of young rats but not in the brains of fully mature or older rats.
a. True
b. False

ANSWER: False

97. A mentally stimulating, intellectually challenging environment is associated with enhanced cognitive functioning.
a. True
b. False

ANSWER: True

98. Research has shown that living in an enriched environment can affect the brain, but only in very young mammals.
a. True
b. False

ANSWER: False

99. Experience has little or no effect on brain functioning or structures.
a. True
b. False

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Chapter 02: True/False

ANSWER: False

100. The implication of research on exercise and neurogenesis was that exercise promotes the growth of new neurons in the human brain just as it does in other mammals.

a. True

b. False

ANSWER: True

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Chapter 02: Essay

1. What is biological psychology and neuroscience, and why are they important areas of study?

ANSWER: The answer should include the following information: Biological psychology is the scientific study of the biological bases of behavior and mental processes. It is one of many scientific disciplines that makes important contributions to neuroscience—the scientific study of the nervous system. Neuroscience has become increasingly important in the field of psychology, impacting virtually every area of research. Neuroscience helps people develop an understanding of the nervous system and its relationship to behavior.

2. How are sensory neurons, motor neurons, and interneurons alike and how do they differ?

ANSWER: The answer should include the following information: Communication throughout the nervous system takes place via neurons, including sensory neurons, motor neurons, and interneurons. These cells are highly specialized to receive and transmit information from one part of the body to another. They differ in terms of the information each type of neuron communicates. Sensory neurons receive information from the environment via specialized receptors cells that detect light, sound, touch, taste, and smell. These cells provide input to the central nervous system and convey information to neurons and then ultimately the brain. Motor neurons represent the output of the central nervous system conveying information to muscles and glands. Interneurons are the most numerous cells in the central nervous system; they allow the communication of information among neurons in the brain.

3. What are the three basic components of a neuron, and what function does each component perform?

ANSWER: The answer should include the following information: The three basic components of a neuron include the cell body, the dendrites, and the axon. The cell body, also called the "soma," contains structures that provide energy for the neuron, sites for processing of nutrients, as well as the manufacture of proteins. The soma also contains the nucleus of the cell, which contains the genetic material or chromosomes of the neuron. The dendrites represent the input to the neuron receiving information from other neurons or specialized receptor cells. Dendrites branch extensively, producing a tree-like appearance; *dendrite* derives from a Greek word that means "tree." Some cells have thousands of dendrites, greatly increasing the amount of information that cells can receive. Finally, the axon is a single elongated tube that extends from the cell body of most neurons. The axon may branch at the tip to form multiple terminals with other cells. Thus, axons convey information from the neuron to other cells, such as neurons, glands, or muscles.

4. Describe the functions of glial cells, as well as oligodendrocytes and Schwann cells.

ANSWER: The answer should include the following information: Glial cells are abundant in the brain. The primary role of these cells is to provide structural support for the neurons throughout the nervous system. There are several different kinds of glial cells, each with its own specialized function: Oligodendrocytes are found in the central nervous system and Schwann cells are found in the peripheral nervous system. These cells produce the myelin sheath that wraps around the axons of neurons and speeds up the conduction process of information to and from the nervous system by about 50 times. There are small gaps in the covering of the cells' nodes of Ranvier that allow ions to enter and leave the cell through the membrane of the neuron.

5. What takes place during the refractory period?

ANSWER: The answer should include the following information: After conducting an action potential, the neuron enters a refractory period, a period of time in which the neuron is unresponsive to

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stimulation. While this period may be for a thousandth of a second or less, the neuron cannot fire because it is in the process of repolarizing. This process involves reestablishing the negative-inside/positive-outside condition so that the neuron is able to fire again. Repolarization is a progressive process that occurs at each segment down the axon, much like depolarization.

6. Describe the sequence of events that occurs when one neuron communicates with another neuron.

ANSWER: The answer should include the following information: Activation of a presynaptic neuron will generate an action potential that travels to the end of the axon. The action potential will travel to the axon terminals and stimulate the release of neurotransmitters from synaptic vesicles. The action potential causes the synaptic vesicles to "dock" on the axon terminal membrane and release the neurotransmitters into the synaptic gap (space between the neurons). Thus, communication between/among neurons involves electrochemical conduction such that the electrical signal (action potential) is converted into a chemical signal. The neurotransmitters cross the synaptic gap and attach to receptor sites on the dendrites of the receiving, or postsynaptic, neuron. This synaptic transmission process takes only milliseconds and stimulates an electrical potential in the postsynaptic cell. After making contact with the postsynaptic receptors, the neurotransmitter molecules detach from the receptor and are reabsorbed by the presynaptic neuron so they can be recycled and used again. This process is called "reuptake" or "transport," and it occurs for neurotransmitters that bond to a receptor as well as for those that failed to do so. Neurotransmitter molecules that are not reabsorbed or that remain attached to the receptor site are broken down or destroyed by enzymes.

7. Doris has Alzheimer's disease. She reports not feeling mentally sharp and often forgets her keys and the names of her friends. What role does the neurotransmitter acetylcholine play in her disease?

ANSWER: The answer should include the following information: Acetylcholine, a neurotransmitter, is involved in learning, memory, and general intellectual functioning. Deficits in this neurotransmitter have been linked to Alzheimer's disease. Doris is likely experiencing memory loss and deterioration of intellectual functioning because of a severe depletion of acetylcholine.

8. What are endorphins, and what are their functions?

ANSWER: The answer should include the following information: Endorphins are an important class of neurotransmitter that are chemically similar to morphine, heroin, and other opioid drugs (although they are more potent). Endorphins are released in stressful circumstances, following trauma, and during painful stimulation. They have been implicated in the pain-reducing effects of acupuncture and are also associated with positive mood.

9. Li is an avid runner. Despite her busy lifestyle, Li runs at least 50 miles a week, even in the winter months. When asked why running is such a high priority, Li explains that she loves running and experiencing a "runner's high." Explain what this concept means.

ANSWER: The answer should include the following information: Li experiences a "runner's high," a rush of euphoria that comes after intense aerobic exercise. She prioritizes long runs despite her busy schedule because it makes her feel great. Research shows that after two hours of endurance running, PET scans reveal high levels of natural endorphin production in brain regions involved in positive emotions. The scans also show that endorphin activity is positively correlated with subjective experience: The more intense the euphoria experienced by the individual runner, the higher the level of endorphin activity in the brain.

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Chapter 02: Essay

10. Contrast the effects of agonist and antagonist drugs.

ANSWER: The answer should include the following information: Drugs may increase or decrease the amounts of neurotransmitters released by neurons. An agonist is a drug or other chemical that binds to a receptor and facilitates synaptic transmission. Often, agonist drugs are chemically similar to a specific neurotransmitter and produce the same effect. For example, nicotine is a stimulant because it is chemically similar to acetylcholine. It occupies acetylcholine receptor sites, stimulating skeletal muscles and causing the heart to beat more rapidly. Alternatively, a drug can act as an antagonist by blocking the effect of neurotransmitters. A drug may fit into receptor sites and prevent neurotransmitters from acting. The drug naloxone is an opioid antagonist. By blocking endorphin receptors, it can quickly reverse the effects of heroin, oxycodone, or other opioid drugs.

11. Kendra abuses oxycodone, an opioid drug, because it gives her feelings of euphoria. One night, Kendra appeared to have overdosed on oxycodone, so a bystander brought her to the emergency room of a local hospital. Explain what drug was likely given to Kendra and how the drug works.

ANSWER: The answer should include the following information: At the hospital, Kendra will likely be given the drug naloxone. It is an opioid antagonist that blocks endorphin receptors, thereby quickly reversing the effects of heroin, oxycodone, and other opioid drugs.

12. What is a spinal reflex, and why is it important?

ANSWER: The answer should include the following information: A spinal reflex is a simple, automatic behavior that occurs without significant brain involvement. An example of this reflex is the withdrawal reflex, which occurs when a person touches a hot or sharp object. The reflex involves rapid communication among sensory neurons, interneurons in the spinal cord, and motor neurons that signal the muscles to react. These reflexes are crucial for survival, since additional time to respond to a stimulus that involved the brain might cause serious injury. Spinal reflexes are also important indicators of the health of neural pathways in the spinal cord; the knee-jerk spinal reflex is an important indicator of how well the nervous system is functioning.

13. What is chronic traumatic encephalopathy (CTE), and what are the symptoms? Who is most likely to be affected by CTE?

ANSWER: Chronic traumatic encephalopathy, or CTE, is a progressive, degenerative brain disease that can be diagnosed only after death. Symptoms include depression and anxiety, poor judgment and lack of impulse control, and problems with memory, concentration, and attention. It ultimately leads to dementia and death. To date, CTE has been diagnosed primarily in professional athletes, especially football and hockey players, who were known to have suffered multiple brain concussions.

14. Briefly describe the functions of the different subdivisions of the peripheral nervous system.

ANSWER: The answer should include the following information: There are two primary subdivisions of the peripheral nervous system: the somatic nervous system and the autonomic nervous system. The somatic nervous system plays an important role in communication throughout the entire body by relaying sensory information received by sensory receptors in the periphery along sensory nerves to the central nervous system. This system also carries messages from the central nervous system along motor nerves to perform voluntary muscle movements. On the other hand, the autonomic nervous system regulates involuntary functions that require little conscious thought, such as heartbeat, blood pressure, breathing, and digestion.

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Chapter 02: Essay

15. What are the functions of the sympathetic nervous system and the parasympathetic nervous system?

ANSWER: The answer should include the following information: The involuntary functions regulated by the autonomic nervous system are controlled by two different branches of the system: the sympathetic and parasympathetic nervous systems. These systems offer opposing control of many of the same organs in your body. In general, the sympathetic nervous system arouses the body to expend energy (for "fight or flight") while the parasympathetic nervous system is involved in energy conservation. The sympathetic nervous system represents the body's emergency system that allows rapid activation of bodily systems in response to emergencies or threats in the environment. This system stimulates rapid heart rate, breathing, and bronchial dilation in the lungs; digestion and salivation are slowed or stopped, the pupils dilate and oxygen to the muscles and brain increases. On the other hand, the parasympathetic nervous system conserves bodily resources allowing one to "rest and digest." It calms the nervous system down following some type of emergency. The system causes a decline in heart rate, breathing, and blood pressure, pupils constrict back to a more normal size, and salivation and digestion begin to increase.

16. Explain the link between the hypothalamus, endocrine system, and nervous system. How does the hypothalamus contribute to the functioning of the endocrine glands?

ANSWER: The answer should include the following information: The hypothalamus serves as the main link between the endocrine system and the nervous system. The hypothalamus directly regulates the release of hormones by the pituitary gland, a pea-sized gland just under the brain. The pituitary hormones, in turn, regulate the production of other hormones by many of the glands in the endocrine system. Under the control of the hypothalamus, the pituitary gland manages hormone production in other endocrine glands. Oxytocin is another important hormone that is produced by the hypothalamus and released into the bloodstream by the pituitary gland. Oxytocin is related to breast-feeding and promotes bonding between reproductive partners and between parent and infant. In some instances, oxytocin may promote aggression or antisocial behavior.

17. What are the limitations of brain imaging studies?

ANSWER: Exact answers may vary. Correct answers may note that brain imaging studies usually only involve a small number of participants. This is due to the high cost of using the technology. Smaller groups of participants may skew the results, resulting in overgeneralization. Another limitation of brain imaging studies is that they may tend to focus on simple aspects of behavior, rather than mapping complex psychological or behavioral function. Also, brain imaging studies may point to the involvement of certain brain structures in functioning, but do not actually increase our understanding of certain psychological processes. Lastly, although such studies may be costly or involve large machines, brain imaging studies do not necessarily provide more "scientific" explanations for psychological processes.

18. Describe four commonly used brain imaging techniques in psychological research.

ANSWER: The answer should include the following information: (1) Positron-emission tomography (PET) is based on the fact that increased activity in a particular brain region is associated with increased blood flow and energy consumption. A small amount of radioactively tagged glucose, oxygen, or other substance is injected into the person's bloodstream. While performing a mental task, the PET scanner tracks the amounts of radioactive substances used in thousands of different brain regions. A computer analyzes the data, producing color-coded images of the brain's activity. (2) Magnetic resonance imaging (MRI) does not involve invasive procedures such as injections of radioactive

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substances. Instead, the individual lies inside a magnetic tube as powerful but harmless magnetic fields bombard the brain. A computer analyzes the signals generated by brain-tissue molecules in response to the magnetic fields. The result is a series of digital images, each a detailed "slice" of the brain's structures. (3) Functional MRI (fMRI) combines the ability to produce a detailed image of the brain's structures with the capacity to track the brain's activity or functioning. While the individual lies in the MRI scanner, a powerful computer tracks the electromagnetic signals that are generated by changes in the brain's metabolic activity, such as increased blood flow to a particular brain region. By measuring the ebb and flow of oxygenated blood in the brain, an fMRI produces a series of scans that show detailed moment-by-moment "movies" of the brain's changing activity in specific structures or regions. (4) Diffusion MRI (dMRI) tracks the movement of water through brain tissue. In doing this, dMRI provides detailed, three-dimensional images of the brain's neural pathways. It is a relatively new scanning method that is noninvasive. The most commonly used methods are diffusion tensor imaging (DTI) and diffusion spectrum imaging (DSI).

19. What are neural pathways, and why are they important?

ANSWER: The answer should include the following information: Groups of neuronal cell bodies from one area of the brain will send axons to another area of the brain to form neural pathways between nuclei in the brain. These pathways produce communication networks and circuits that link brain areas.

20. Explain the difference between structural plasticity and functional plasticity, and give an example of each.

ANSWER: The answer should include the following information: The word *neuroplasticity* represents the notion that the brain is able to change function and structure in response to experience. There are two forms of plasticity. The first is called "functional plasticity." This type of plasticity refers to the brain's ability to recover from brain damage by shifting these functions to undamaged areas of the brain. This process may require "relearning" common behaviors like walking, speaking, or reading. If the recovery process is successful, undamaged areas of the brain will allow recovery of these functions. The second type of plasticity is referred to as structural plasticity. This process involves physical changes in the structure of the brain following learning, environmental stimulation, and active engagement in activities. Even minor changes in the environment or one's behavior can induce structural changes in the brain.

21. What are the key structures of the midbrain, and what roles do they play?

ANSWER: The answer should include the following information: The midbrain is an important relay station that contains centers involved in the processing of auditory and visual sensory information. Auditory sensations from the left and right ears are processed through the midbrain, helping you orient toward the direction of a sound. The midbrain is also involved in processing visual information, including eye movements, helping you to visually locate objects and track their movements. After passing through the midbrain level, auditory information and visual information are relayed to sensory processing centers farther up in the forebrain region. A midbrain area called the "substantia nigra" is involved in motor control and contains a large concentration of dopamine-producing neurons. *Substantia nigra* means "dark substance," and as the name suggests, this area is darkly pigmented. The substantia nigra is part of a larger neural pathway that helps prepare other brain regions to initiate organized movements or actions. In the section on neurotransmitters, the book noted that Parkinson's disease involves symptoms of abnormal movement, including difficulty initiating, or starting, a particular movement. Many of those movement-related symptoms are associated with the degeneration of dopamine-producing neurons in the substantia nigra.

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Chapter 02: Essay

22. Identify the four lobes of each cerebral hemisphere and the function associated with each.

ANSWER: The answer should include the following information: Each cerebral hemisphere can be roughly divided into four regions, or lobes; these lobes are referred to as the temporal, occipital, parietal, and frontal lobes. The lobes are associated with specific functions. At the back of the brain, the occipital lobe contains the primary visual cortex and processes visual information. Near the temples, the temporal lobe contains the primary auditory cortex. This area is responsible for receiving and processing auditory information. At the top of the brain, the parietal lobe processes information from the body, or somatosensory information. These sensations include touch, pressure, information from receptors in the muscles and joints, as well as temperature information. At the foremost portion of the lobe is the somatosensory cortex. This band of tissue receives information from touch receptors in the skin. The hands and the face receive proportionally more representation in the cortex while other areas receive less. Finally, the frontal lobe is the largest lobe of the brain and carries out important functions such as the production of motor behavior including speech as well as "executive" functions, like planning, initiating, and executing voluntary movements. Like the somatosensory cortex, the primary motor cortex is a strip of tissue at the back of the frontal lobe, just in front of the somatosensory cortex. This area also has unequal representation. There are more neurons dedicated to movement of the face and hands than other areas of the body.

23. What are the key structures of the limbic system?

ANSWER: The answer should include the following information: The key structures of the limbic system include the following: hippocampus, amygdala, thalamus, and hypothalamus. The hippocampus is found in the temporal lobe. It plays an important role in the formation of new memories. The amygdala is important for processing emotional information such as fear and anger. The thalamus is an important relay station for all motor information and sensory information, with the exception of smell, that goes to and leaves the cerebral cortex. The thalamus is also thought to be important for regulating levels of awareness, attention, motivation, and emotional aspects of sensations. Finally, the hypothalamus is involved in many different functions regulating the autonomic nervous system, heart rate, as well as blood pressure. It is also involved in the regulation of behaviors related to survival, like eating, drinking, frequency of sexual activity, fear, and aggression. It is also important for the regulation of sleep–wake cycles and other circadian rhythms of the body.

24. Describe phrenology, and explain the contribution it has made to the understanding of the brain.

ANSWER: The answer should include the following information: Phrenology was born in Germany in the 1790s from the mind of a physician, Franz Joseph Gall. After studying the anatomy of human and animal brains, Gall thought that the size and shape of the cortex were important variables. He believed that variations in terms of size and shape of the cortex would be reflected on the skull as bumps. He took many measurements to examine this perceived association between personal characteristics and any distinctive bulges or bumps on the person's skull. Over time, Gall developed elaborate maps showing the location of these personality characteristics (which he termed "faculties") that he believed were reflected in a person's skull. Although pseudoscientific in nature, phrenology stimulated the notion of localization of function. The idea here was that specific psychological and mental functions might be localized to specific brain regions. Nowadays, we use brain imaging techniques like PET scans and functional MRI to show that some cognitive and perceptual functions are associated with specific areas of the brain.

25. Distinguish between the ideas of cortical localization and lateralization.

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Chapter 02: Essay

ANSWER: The answer should include the following information: Cortical localization is the idea that there are regions of the brain that are specialized to perform specific functions. Evidence suggests that areas of the brain are specialized for the reception and production of language. This evidence also suggests another phenomenon—that of lateralization of function. In other words, not only is information processing localized in the brain, there is also lateralization of these functions such that language is processed in the left hemisphere.

26. At dinner, your uncle proclaims "On TV today, I saw research showing that men have bigger brains than women. Therefore, men are clearly smarter." Respond to your uncle by addressing the differences in male and female brains, and discuss what conclusions can be drawn from research on gender differences and the brain.

ANSWER: The answer should include the following information: Research has found that, in general, male brains tend to be larger than female brains, but this is probably because their skulls are also larger. Females tend to have a higher proportion of gray matter compared to males. Males tend to have more neural connections within the two hemispheres, whereas females have more neural connections between the two hemispheres. There is also evidence that contradicts some of these results. However, it's important to think critically about media claims. Unlike reporters, scientists are usually careful to qualify their conclusions and describe the limitations of their research. These limitations are rarely mentioned in media reports. Second, most sex differences amount to minor variations in the size of a particular brain region or to statistical differences in the average level of activation of particular brain regions. Brain structures and functioning are essentially the same in men and women. Finally, it's important to remember that even differences that are biological in origin are not necessarily fixed, permanent, or inevitable.

27. What contributions did Pierre Paul Broca and Karl Wernicke make to the understanding of the brain?

ANSWER: The answer should include the following information: In the 1860s, Pierre Paul Broca, a French surgeon and neuroanatomist, treated patients with difficulty speaking but had no trouble with comprehension of spoken or written language. Autopsies of the patients showed consistent brain damage to the lower left frontal lobe. This area became known as Broca's area. Similarly, Karl Wernicke, a German neurologist, reported that damage in another area in the left hemisphere produced a difficulty in understanding spoken or written communications. These patients could speak quickly and easily; however, their speech was nonsensical, consisting of meaningless words and/or nonsense syllables. Autopsies of these patients' brains showed consistent damage to the left temporal lobe. This area became known as Wernicke's area. These clinical cases provided compelling evidence that language and speech functions are localized to the left cerebral hemisphere. Similar lesions in the right hemisphere have no impact on language and speech.

28. Who was Roger Sperry, and what contributions did he make to the understanding of the brain?

ANSWER: The answer should include the following information: Roger Sperry**,** a psychologist and neuroscientist, along with his colleagues examined the abilities of split-brain patients to perceive words and images briefly displayed on a computer screen. A word or picture was shown to the left or right of the midpoint of the screen. Visual information to the right of the midpoint projects to the person's left hemisphere while similar presentation to the left of the midpoint results in information projected to the right hemisphere. Participants could then pick from several objects that were hidden behind the screen; they could feel the objects, but not see them. The image of a banana projected to the left of the midpoint could not be verbally identified since it went to the right, nonverbal hemisphere. If allowed to select from the objects behind the screen with their left hand, split-brain

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subjects would correctly select a banana since the left hand is controlled by the right hemisphere. This is the hemisphere that originally saw the image of the banana. These experiments by Sperry and colleagues reconfirmed the specialized nature of the left hemisphere in processing language that had originally been reported by Broca and Wernicke in the 1800s.

29. LeBron is left-handed and asks you if this means he is right-hemisphere-dominant. How do you respond?

ANSWER: The answer should include the following information: Only about 10 to 13 percent of the population identify themselves as left-handed. It's a myth that left-handers have a fundamentally different brain organization from right-handers. About 75 percent of left-handers are left-hemisphere-dominant for language, just like right-handers. The remaining 25 percent are either right-hemisphere-dominant for language or bilateral, using both hemispheres for speech and language functions.

30. Compare the effects on rats of being raised in an enriched versus an impoverished environment.

ANSWER: The answer should include the following information: Extensive research has shown that enrichment has a positive effect on the brain; these environmental changes increase the number and length of dendrites and dendritic branches, as well as enlarge neurons and increase the number of glial cells. Synaptic connections between brain neurons are also enhanced. Conversely, impoverished environments have been shown to decrease synaptic connections. Enrichment has been reported to increase the number of synapses in the cortex by as much as 20 percent in young rats. Similar environmental changes have been shown to have a positive impact on the brains of older rats as well. Further, enrichment has been shown to increase neurogenesis. The number of new neurons and the survival time of these cells have been positively impacted by enrichment. On the other hand, social isolation and stressful environments negatively impact neurogenesis. Overall, the changes observed in a brain raised in an enriched environment result in increased processing and communication among neurons enhancing performance on learning and memory tasks.

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