

Chapter 2: Biology and Behavior

LEARNING OBJECTIVES

1. Define biological psychology.
2. Define and describe the functions of the nervous system.
3. Compare and contrast neurons and glial cells with other body cells.
4. Name and describe the features of neurons that allow them to communicate with one another.
5. Define and describe action potentials. Define refractory period. Discuss the effect of myelin on action potentials.
6. Define neurotransmitter and synapse and describe their roles in nervous system activity.
7. Describe the role of receptors in the process of neural communication. Explain the role of postsynaptic potentials in the creation of an action potential in the postsynaptic cell.
8. Name and describe the two major divisions of the nervous system.
9. Name the two subsystems of the peripheral nervous system and describe their functions.
10. Name the two subsystems of the autonomic nervous system and describe their functions.
11. Define and describe nuclei and fiber tracts.
12. Describe the spinal cord and its functions. Define reflex.
13. Describe the techniques that scientists use to study the brain.
14. Discuss what fMRI research has revealed about behavior and mental processes.
15. Define hindbrain. Name the structures of the hindbrain, and describe their functions.
16. Define midbrain. Describe the functions associated with the midbrain.
17. Define forebrain. Name the structures of the forebrain, and describe their functions.
18. Define and describe the cerebral cortex. Name the four lobes that make up the cortex and state their locations. Define corpus callosum.
19. Define and describe the functions and locations of the sensory cortex, motor cortex, and association cortex.
20. Explain the roles of Broca's area and Wernicke's area in language production and comprehension.
21. Explain how split-brain studies provide insight into the specialized functions of the brain's two hemispheres.
22. Define neural plasticity. Explain why the brain has difficulty repairing itself after it has been damaged. Describe the methods used to promote recovery from brain damage today.
23. Describe the changes that occur in the nervous system throughout development.
24. Describe the three main classes of neurotransmitters. Name the various neurotransmitters within each class and discuss the behaviors and mental processes associated with each.
25. Define endocrine system, glands, and hormones. Compare and contrast the communication processes of the nervous and endocrine systems.
26. Define the fight-or-flight response.

MULTIPLE CHOICE

1. Biological psychology is the study of the _____ factors that influence or cause behavior and mental processes.

- a. physical and chemical
- b. naturalistic
- c. social and physical
- d. cognitive

ANS: A REF: 48 OBJ: 1 KEY: F

2. A biological psychologist would be most likely to research

- a. how you learn a list of words.
- b. the developmental process that leads to your ability to learn.
- c. the physical and chemical changes that occur when you learn.
- d. why learning deficits occur.

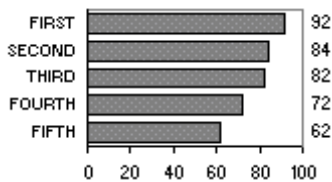
ANS: C REF: 48 OBJ: 1 KEY: F

3. What type of psychologist would *probably* have written a paper titled “Emotion and Chemical Change: The Relationship”?

- a. Quantitative
- b. Biological
- c. Clinical
- d. Personality

ANS: B REF: 48 OBJ: 1 KEY: C/A

Responses:



$r_{pb} = .27$ A. 6% B. 80% C. 9% D. 6%

4. Your nervous system is an information processing system with functions that include all of the following *except*

- a. processing.
- b. output.
- c. actualization.
- d. input.

ANS: C REF: 49 OBJ: 2 KEY: F

5. The nervous system is *directly* responsible for all of the following activities *except*

- a. receiving information from sensory systems.
- b. secreting hormones into the bloodstream.
- c. integrating new information with past experiences.
- d. directing the movement of muscles.

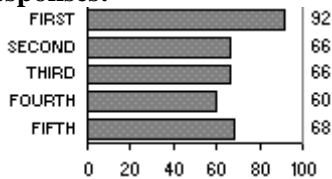
ANS: B REF: 49 OBJ: 2 KEY: F

6. Glial cells are responsible for all of the following functions *except*

- a. directing the growth of neurons.
- b. holding neurons together.
- c. sending out signals to other cells.
- d. cleaning up after brain damage.

ANS: C REF: 49 OBJ: 3 KEY: F

Responses:

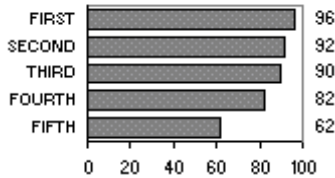


$r_{pb} = .16$ A. 1% B. 5% C. 71% D. 22%

7. "I'm very important," says Nathan. "I direct the growth of cells in the brain, and I secrete chemicals to repair damaged cells." Kate says, "Well, I'm special too. I receive messages from thousands of other cells, and my axon can conduct action potentials." Nathan is a _____ and Kate is a _____.
- a. dendrite; neuron
 b. dendrite; mitochondrion
 c. glial cell; neuron
 d. glial cell; mitochondrion

ANS: C REF: 49 OBJ: 3 KEY: C/A

Responses:

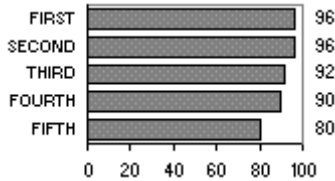


$r_{pb} = .36$ A. 12% B. 1% C. 86% D. 2%

8. Neurons have some similarities with other cells in the human body. Which of the following characteristics is seen in neurons, but *not* in most other cells?
- a. An outer membrane
 b. A cell body
 c. The ability to transmit signals to other cells
 d. Mitochondria

ANS: C REF: 49 OBJ: 3 KEY: F

Responses:



$r_{pb} = .23$ A. 2% B. 2% C. 92% D. 4%

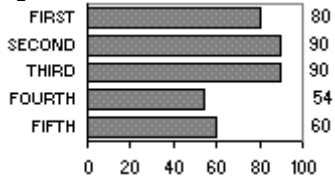
9. Which of the following is *not* a characteristic unique to nerve cells?
- a. Long thin fibers extending from the cell body
 b. Vesicles that release neurotransmitters
 c. Synapses that allow communication with other cells
 d. Mitochondria

ANS: D REF: 49 OBJ: 3 KEY: F

10. Doctor Simo is building a super-genius monster. He wants to make sure that his monster's neurons can turn oxygen and glucose into energy, so he gives the neurons plenty of
- a. dendrites.
 b. mitochondria.
 c. nuclei.
 d. axons.

ANS: B REF: 49 OBJ: 3 KEY: C/A

Responses:



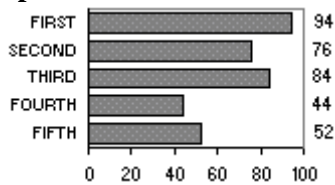
$r_{pb} = .29$ A. 6% B. 76% C. 6% D. 13%

11. Eyncine operated the telephone switchboard at a large company, answering calls and directing them to the appropriate extensions. Remembering her introductory psychology class, she decided that her situation was much like that of the _____ of neurons, because numerous people could call her at one time, but she could send out only one call at a time.

- a. hormones and target organs
 b. dendrites and axons
 c. myelin and mitochondria
 d. synapses and neurotransmitters

ANS: B REF: 50 OBJ: 4 KEY: C/A

Responses:



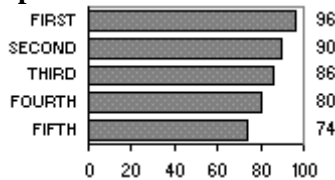
$r_{pb} = .32$ A. 1% B. 71% C. 1% D. 27%

12. Mimi is sitting in her biology lab, trying to figure out what kind of a cell she has on the slide under her microscope. "Aha," she cries. "It's a neuron!" One thing that *might* have tipped Mimi off is the fact that the cell has

- a. an outer membrane.
 b. an axon.
 c. mitochondria.
 d. sulci.

ANS: B REF: 50 OBJ: 4 KEY: C/A

Responses:



$r_{pb} = .25$ A. 9% B. 86% C. 4% D. 1%

13. Dr. Gedge is examining a cell under a microscope. He sees a long, fibrous strand of tissue extending from one end of the cell body. He immediately recognizes this as a(n) _____, which is responsible for _____.

- a. axon; carrying signals away from the cell body
 b. axon; receiving signals from other cells and carrying them toward the cell body
 c. dendrite; carrying signals away from the cell body
 d. dendrite; receiving signals from other cells and carrying them toward the cell body

ANS: A REF: 50 OBJ: 4 KEY: C/A

14. What is the usual route of information flow between neurons?

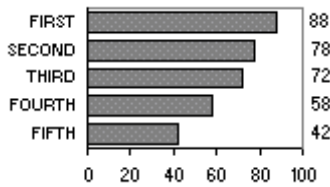
- a. Dendrite (neuron 1) to axon (neuron 2) to cell body (neuron 2)
 b. Axon (neuron 1) to dendrite (neuron 2) to cell body (neuron 2)
 c. Axon (neuron 1) to cell body (neuron 2) to dendrite (neuron 2)
 d. Cell body (neuron 1) to axon (neuron 2) to dendrite (neuron 2)

ANS: B REF: 50 OBJ: 4 KEY: F

15. As a signal travels from one neuron to another, it is received by the _____ and carried to the cell body; from here, the signal is carried through the _____.
- a. dendrites; axon
 - b. neurotransmitter; synapse
 - c. axon; dendrites
 - d. synapse; neurotransmitter

ANS: A REF: 50 OBJ: 4 KEY: F

Responses:



$r_{pb} = .36$ A. 69% B. 14% C. 15% D. 3%

16. The fastest action potentials, which travel at speeds of 260 miles per hour, are *most* likely to occur in axons that
- a. are wrapped in myelin.
 - b. fire continuously without rest.
 - c. are small in diameter.
 - d. lack vesicles.

ANS: A REF: 50 OBJ: 5 KEY: F

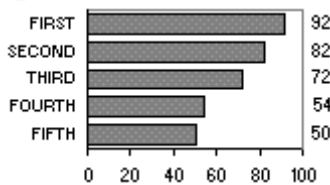
17. The speed with which a message travels from point A to point B along a neuron depends on all of the following factors *except*
- a. the distance between the two points.
 - b. the diameter of the axon.
 - c. a fatty substance surrounding the axon.
 - d. the intensity of the stimulus that initiated it.

ANS: D REF: 50 OBJ: 5 KEY: F

18. Multiple sclerosis is a disease in which the immune system mistakenly destroys some of the myelin wrapped around nerve cell fibers. Which nerve cell fibers are being attacked by this process?
- a. Synapses
 - b. Axons
 - c. Dendrites
 - d. Mitochondria

ANS: B REF: 53 OBJ: 5 KEY: F

Responses:



$r_{pb} = .43$ A. 9% B. 59% C. 16% D. 6%

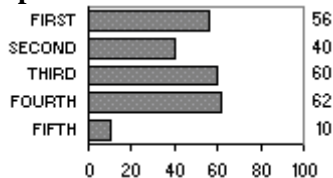
19. Nick the neuron is bragging to his friend Nell the neuron because he is able to send messages faster than Nell. Nick's axon is most likely
- small and myelinated.
 - small and unmyelinated.
 - large and myelinated.
 - large and unmyelinated.

ANS: C

REF: 50

OBJ: 5

KEY: C/A

Responses: $r_{pb} = .22$

A. 48% B. 6%

C. 46% D. 0%

20. The refractory period of a neuron is the
- time necessary for transmission across the synapse.
 - time necessary for a message to travel from the cell body to the end of the axon.
 - resting period between firings.
 - length of time a neuron can fire continuously.

ANS: C

REF: 50

OBJ: 5

KEY: F

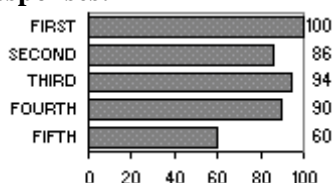
21. An action potential has just sped down one of your neurons in order to jerk your hand off a hot stove. Before an action potential will speed through this neuron again, the membrane of the neuron must first recover. The time between the action potentials is called the _____ period.
- refractory
 - polarization
 - self-propagating
 - repolarization

ANS: A

REF: 50

OBJ: 5

KEY: C/A

Responses: $r_{pb} = .42$

A. 87% B. 2%

C. 3%

D. 8%

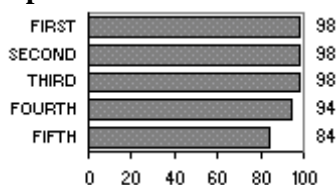
22. Nathan Neuron has just fired his axon, causing a release of chemicals into the synapse. "More! More!" shout the neurons that received Nathan's chemicals. Nathan replies, "I can't right now, I have to take a break known as a(n)
- refractory period."
 - postsynaptic potential."
 - action potential."
 - self-propagation."

ANS: A

REF: 50

OBJ: 5

KEY: C/A

Responses: $r_{pb} = .27$

A. 96% B. 2%

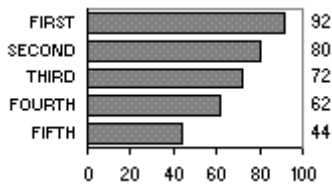
C. 1%

D. 1%

23. Neurotransmitters are _____ that travel across the _____ to another cell.
- a. electrical signals; receptors
 - b. electrical signals; synapse
 - c. chemicals; receptors
 - d. chemicals; synapse

ANS: D REF: 51 OBJ: 6 KEY: F

Responses:



$r_{pb} = .38$ A. 2% B. 24% C. 2% D. 71%

24. Before neurotransmitters are released into a synapse, they are held in containers known as
- a. glands.
 - b. vesicles.
 - c. cell bodies.
 - d. receptors.

ANS: B REF: 51 OBJ: 6 KEY: F

25. The *most* efficient way to prevent one neuron from communicating with other neurons would be to
- a. remove all myelin from the axon.
 - b. eliminate any refractory periods.
 - c. destroy all neurotransmitter vesicles.
 - d. shrink the size of synapses.

ANS: C REF: 51 OBJ: 6 KEY: C/A

26. The tiny gaps separating neurons from one another across which information must be transmitted are known as
- a. synapses.
 - b. axonic junctions.
 - c. synaptic vesicles.
 - d. postjunctional terminals.

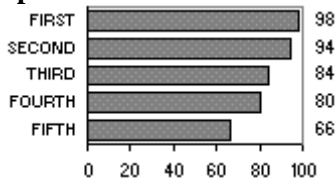
ANS: A REF: 51 OBJ: 6 KEY: F

27. When the electrochemical impulse reaches the end of a neuron, _____ are released into the _____.

- a. action potentials; membranes
- b. neurotransmitters; membranes
- c. action potentials; receptors
- d. neurotransmitters; synapse

ANS: D REF: 51 OBJ: 6 KEY: F

Responses:



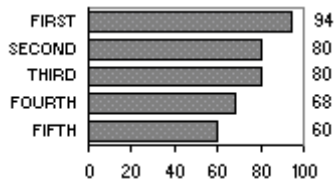
$r_{pb} = .34$ A. 3% B. 4% C. 7% D. 86%

28. Neurons communicate across the synapse by means of neurotransmitters, which bind to special proteins on the postsynaptic membrane like a key fitting into a lock. In this analogy, the neurotransmitter is the key and the _____ is the lock.

a. receptor
 b. axon
 c. postsynaptic potential
 d. dendrite

ANS: A REF: 51 OBJ: 7 KEY: C/A

Responses:



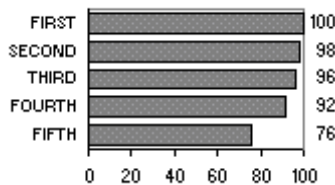
$r_{pb} = .26$ A. 78% B. 6% C. 5% D. 12%

29. A neuron evokes the action potential of another neuron by releasing _____ into the synapse that fit into the _____ of the other neuron.

a. mitochondria; neurotransmitters
 b. neurotransmitters; receptors
 c. dendrites; vesicles
 d. axons; neurotransmitters

ANS: B REF: 51 OBJ: 7 KEY: F

Responses:

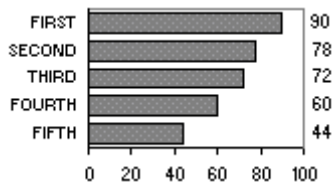


$r_{pb} = .37$ A. 2% B. 93% C. 2% D. 2%

30. Once a neurotransmitter is released into the synapse, it is *most* like a(n)
 a. accident waiting to happen.
 b. rolling stone.
 c. lock waiting for a key.
 d. size 10 foot looking for a size 10 shoe.

ANS: D REF: 51 OBJ: 7 KEY: C/A

Responses:



$r_{pb} = .36$ A. 3% B. 8% C. 20% D. 70%

31. A neurotransmitter is released into a synapse, but it has no effect on a neighboring neuron. Which of the following *best* accounts for the unresponsiveness of the neighboring neuron?

a. The neighboring neuron does not contain any neurotransmitters of its own.
 b. The neighboring neuron's vesicles are defective.
 c. The neighboring neuron has an outer membrane.
 d. The neighboring neuron's receptors do not accept this type of neurotransmitter.

ANS: D REF: 51 OBJ: 7 KEY: C/A

32. The two major divisions of the nervous system are the _____ and _____ nervous systems.

- a. somatic; autonomic
- b. central; somatic
- c. central; peripheral
- d. sympathetic; parasympathetic

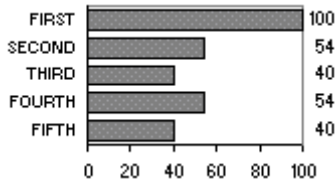
ANS: C REF: 53 OBJ: 8 KEY: F

33. Carlos was in a car accident and received a head injury that resulted in a decreased ability to produce speech. Carlos has more than likely damaged his _____ nervous system.

- a. sympathetic
- b. peripheral
- c. central
- d. sensory

ANS: C REF: 53 OBJ: 8 KEY: C/A

Responses:



$r_{pb} = .37$ A. 13% B. 16% C. 61% D. 11%

34. The division of the nervous system that is encased in bone and processes information is called the _____ nervous system.

- a. central
- b. peripheral
- c. somatic
- d. autonomic

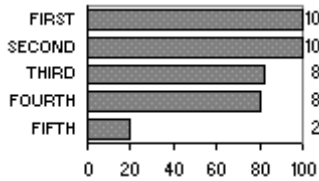
ANS: A REF: 53 OBJ: 8 KEY: F

35. The main divisions of the peripheral nervous system are the _____ and the _____.

- a. somatic; autonomic
- b. sympathetic; parasympathetic
- c. afferent; efferent
- d. reticular; limbic

ANS: A REF: 54 OBJ: 9 KEY: F

Responses:



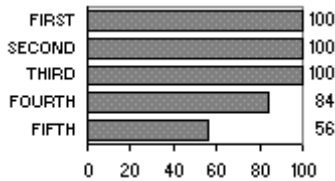
$r_{pb} = .58$ A. 77% B. 12% C. 8% D. 4%

36. Which of the following is *not* a part of the peripheral nervous system?

- a. The somatic nervous system
- b. The sympathetic nervous system
- c. The autonomic nervous system
- d. The spinal cord

ANS: D REF: 54-55 OBJ: 9 KEY: F

Responses:



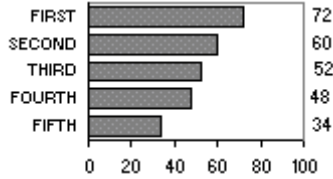
$r_{pb} = .40$ A. 3% B. 6% C. 3% D. 89%

37. When you are running to catch a bus, the _____ nervous system is directly responsible for making the muscles in your legs move.

- a. somatic
b. sympathetic
c. central
d. parasympathetic

ANS: A REF: 54 OBJ: 9 KEY: C/A

Responses:



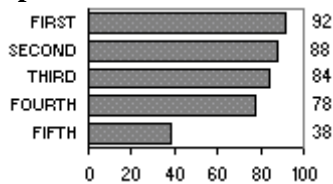
$r_{pb} = .26$ A. 54% B. 22% C. 19% D. 5%

38. The command Julie uses to raise her hand in class would travel through the _____ nervous system from the spinal cord to the muscles that control the movement.

- a. somatic
b. autonomic
c. sympathetic
d. parasympathetic

ANS: A REF: 54 OBJ: 9 KEY: C/A

Responses:



$r_{pb} = .43$ A. 77% B. 13% C. 3% D. 7%

39. If Frank accidentally ingests a chemical that affects the autonomic nervous system, he will *most* likely encounter problems with his

- a. senses.
b. muscles.
c. lungs.
d. pain receptors.

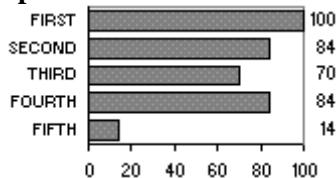
ANS: C REF: 54 OBJ: 9 KEY: C/A

40. If a person had a diseased autonomic nervous system, the kinds of functions most directly affected would be things such as _____ and _____.

- a. decision making; problem solving
b. getting dressed; driving a car
c. reflexive movements; receiving sensory input
d. digestion; breathing

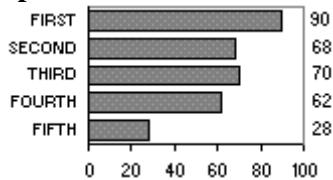
ANS: D REF: 54 OBJ: 9 KEY: C/A

Responses:



$r_{pb} = .56$ A. 0% B. 6% C. 22% D. 72%

45. Fiber tracts in the nervous system are *most* likely to contain bundles of
 a. axons. c. dendrites.
 b. nuclei. d. cell bodies.
 ANS: A REF: 54-55 OBJ: 11 KEY: F
46. If your central nervous system were a railroad, then the nuclei would be the _____ and the fiber tracts would be the _____.
 a. railroad tracks; train stations c. train stations; railroad tracks
 b. trains; passengers d. passengers; trains
 ANS: C REF: 54-55 OBJ: 11 KEY: C/A
47. Fiber tracts are
 a. sections of the limbic system involved in emotion.
 b. collections of cell bodies.
 c. collections of axons that travel together in bundles.
 d. collections of dendrites that travel together in bundles.
 ANS: C REF: 54-55 OBJ: 11 KEY: F
48. Reflexes are _____ responses to incoming sensory information.
 a. voluntary and presynaptic c. involuntary
 b. learned d. voluntary motor
 ANS: C REF: 55 OBJ: 12 KEY: F
49. John got up one morning after only a few hours of sleep and plugged in the iron to press his shirt. When he heard a ringing sound he grabbed the iron by the hot part, and before he could say “hello” (or “yeeeeooooow!”), he dropped it with a crash. The part of John's nervous system that directed him to drop the hot iron was his
 a. substantia nigra. c. cerebral cortex.
 b. spinal cord. d. amygdala.
 ANS: B REF: 55 OBJ: 12 KEY: C/A
50. If you rest your hand on a thumbtack, a reflex will occur and your arm will be quickly and automatically retracted. Reflexes such as this depend primarily on the
 a. brain. c. spinal cord.
 b. medulla. d. sympathetic nervous system.
 ANS: C REF: 55 OBJ: 12 KEY: C/A

Responses:

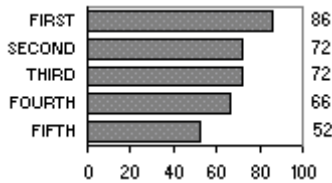
$r_{pb} = .42$ A. 4% B. 2% C. 65% D. 30%

51. Reflexes are _____ responses that occur _____ instructions from the brain.
 a. voluntary; with c. voluntary; without
 b. involuntary; with d. involuntary; without
 ANS: D REF: 55 OBJ: 12 KEY: F

52. Chirag's spinal cord was completely severed at the neck in an auto accident. He would still be able to
- wiggle his toes.
 - exhibit the "knee jerk" reflex in response to a tap on the knee.
 - feel the pain of a pinprick on his foot.
 - snap his fingers.

ANS: B REF: 55-56 OBJ: 12 KEY: C/A

Responses:

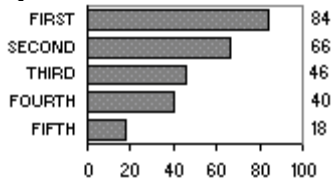


$r_{pb} = .26$ A. 3% B. 70% C. 16% D. 11%

53. Chris tripped and fell near the campfire. When he reflexively drew back his hand, which had touched a hot coal, the signal sent throughout his nervous system went from his hand to his
- spinal cord, then to his brain, then back to his hand.
 - brain, then to his spinal cord, then back to his hand.
 - spinal cord, then back to his hand, then to his brain.
 - brain, then simultaneously to his hand and spinal cord.

ANS: C REF: 55 OBJ: 12 KEY: C/A

Responses:



$r_{pb} = .45$ A. 38% B. 8% C. 51% D. 3%

54. Yao is participating in a study investigating sleep patterns. As part of the study, researchers paste electrodes to Yao's scalp. The electrodes are then hooked up to an electroencephalograph (EEG), which will provide information about the
- specific areas of the brain involved with sleep.
 - general electrical activity of the brain during sleep.
 - changes in blood flow that occur within the brain during sleep.
 - physical shape of the brain structures involved with sleep.

ANS: B REF: 56 OBJ: 13 KEY: C/A

55. Recordings of the collective activity of the brain's nerve cells are called
- electroencephalograms (EEGs).
 - single photon emission computed tomography (SPECT) scans.
 - positron emission tomography (PET) scans.
 - magnetic resonance imaging (MRI).

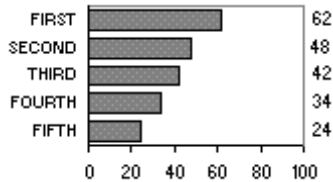
ANS: A REF: 56 OBJ: 13 KEY: F

56. Athea was a participant in a study in which the glucose in her brain was marked with a radioactive substance. Then radiation detectors identified especially active brain areas. Athea participated in a study that employed

- a. electroencephalograms (EEGs). c. psychophysical radiograms (PPRs).
 b. magnetic resonance imaging (MRI). d. positron emission tomography (PET).

ANS: D REF: 56 OBJ: 13 KEY: C/A

Responses:



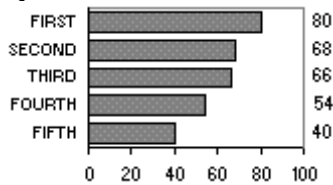
$r_{pb} = .27$ A. 19% B. 22% C. 16% D. 43%

57. Barney was in a car accident, and the doctor suspects that Barney may have suffered structural brain damage. Which of the following tests would be the most appropriate to find out whether there is structural damage?

- a. Electrical stimulation c. Positron emission tomography (PET)
 b. Electroencephalogram (EEG) d. Magnetic resonance imaging (MRI)

ANS: D REF: 56-57 OBJ: 13 KEY: C/A

Responses:



$r_{pb} = .29$ A. 3% B. 13% C. 21% D. 63%

58. According to your textbook, which of the following criticisms of the fMRI is valid:

- a. It has yet to contribute any useful information in the area of thoughts and emotions.
 b. It cannot pinpoint the location of blood flow and oxygen activity in the brain.
 c. It assumes that thoughts and emotions reside in particular brain structures or areas.
 d. While it does show how the brain produces thoughts and feelings, it is not precise enough yet to allow for accurate conclusions.

ANS: C REF: 58-59 OBJ: 14 KEY: C/A

59. Which of the following is true about fMRI technology:

- a. It directly measures brain activity.
 b. It can reveal the brain areas that are active when a person experiences an emotion.
 c. It can detect any neuronal activity, even if increases and decreases of activity in the same region cancel each other out.
 d. It is not very susceptible to experimenter bias because its images are difficult to misinterpret.

ANS: B REF: 58 OBJ: 14 KEY: F

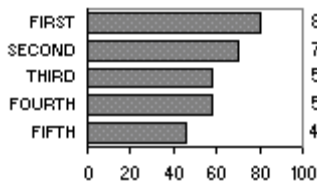
60. With the advent of fMRI, researchers have been able to explore mirror neuron mechanisms in the human brain. Based on this research, psychologists have discovered all of the following *except*:
- Mirror systems have been found in humans that correspond to the F5 region in monkeys.
 - Broca's area may be important in many skills that involve imitation.
 - Language development and empathy seem to operate independently from mirror neuron mechanisms.
 - Certain parts of the brain are activated similarly when a person witnesses an emotion as when he or she directly experiences that emotion.

ANS: C REF: 59-60 OBJ: 14 KEY: F

61. Marjorie stands up so quickly that she feels lightheaded. The part of Marjorie's nervous system that was unable to adjust for her sudden drop in blood pressure was her
- spinal cord.
 - hindbrain.
 - midbrain.
 - forebrain.

ANS: B REF: 61 OBJ: 15 KEY: C/A

Responses:

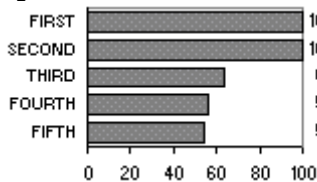


$r_{pb} = .26$ A. 4% B. 63% C. 17% D. 16%

62. While waiting to begin his college entrance exam, John was so nervous that he could hear his heart beating and feel himself breathing. Which part of John's brain is responsible for controlling his heart rate and breathing?
- Cerebellum
 - Medulla
 - Amygdala
 - Hypothalamus

ANS: B REF: 61 OBJ: 15 KEY: C/A

Responses:

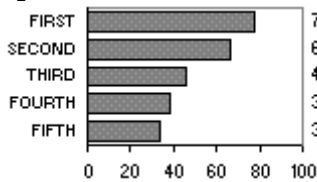


$r_{pb} = .41$ A. 9% B. 76% C. 1% D. 14%

63. Herman suffers a stroke that destroys the connections between the reticular formation and the rest of his brain. Herman will most likely
- be in a permanent coma.
 - show increased activity in the locus coeruleus.
 - lose automatic control of his heart rate, breathing, and blood pressure.
 - lose all reflexes.

ANS: A REF: 61 OBJ: 15 KEY: C/A

Responses:



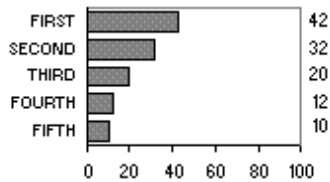
$r_{pb} = .31$ A. 53% B. 12% C. 14% D. 21%

64. Suppose you fall asleep on your arm in such a way that the blood flow to that arm is blocked. Which brain structure might wake you up and alert you to move your arm before it stops receiving blood?

a. Medulla
 b. Reticular formation
 c. Thalamus
 d. Hypothalamus

ANS: B REF: 61 OBJ: 15 KEY: C/A

Responses:



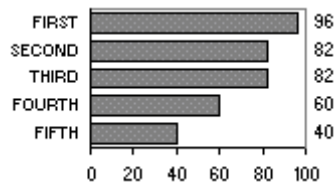
$r_{pb} = .28$ A. 54% B. 24% C. 15% D. 7%

65. After consuming a few alcoholic beverages, Sejal finds it hard to tie her shoes. This is most likely because the alcohol has affected her

a. corpus callosum.
 b. hypothalamus.
 c. cerebellum.
 d. hippocampus.

ANS: C REF: 62 OBJ: 15 KEY: C/A

Responses:



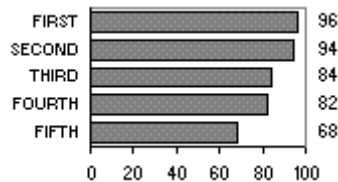
$r_{pb} = .43$ A. 8% B. 8% C. 73% D. 10%

66. Since Gordon sustained severe head trauma, he can no longer perform basic sewing tasks such as threading a needle. When he tries to play the piano, it is as if his fingers do not remember how to make the necessary movements, even for pieces he has known for years. Gordon *most* likely has damage to his

a. locus coeruleus.
 b. hypothalamus.
 c. thalamus.
 d. cerebellum.

ANS: D REF: 62 OBJ: 15 KEY: C/A

Responses:



$r_{pb} = .29$ A. 4% B. 4% C. 6% D. 85%

67. If your reticular formation were constantly stimulated, you would *most* likely experience

a. intense hunger.
 b. paralysis.
 c. sensitivity to light.
 d. difficulty sleeping.

ANS: D REF: 61 OBJ: 15 KEY: C/A

68. During a recent study session, your friend asks you to explain what the locus coeruleus does. You explain the locus coeruleus is part of the hindbrain responsible for

- a. emotional response.
- b. sexual arousal.
- c. balance.
- d. directing attention.

ANS: D REF: 61 OBJ: 16 KEY: C/A MSC: New

69. Damage to the locus coeruleus has been linked to all of the following *except*

- a. posttraumatic stress disorder.
- b. attention deficit hyperactivity disorder.
- c. memory loss.
- d. sleep disorders.

ANS: C REF: 61 OBJ: 16 KEY: F MSC: New

70. When a balloon pops near Tyler's head, the circuits in his _____ cause him to reflexively turn his head toward the source of the startling noise.

- a. hindbrain
- b. midbrain
- c. forebrain
- d. split-brain

ANS: B REF: 62-63 OBJ: 16 KEY: C/A

71. Nuclei in the midbrain are responsible for which of the following actions?

- a. Regulating hunger, thirst, and sex drives
- b. Forming new memories
- c. Regulating heart rate and blood pressure
- d. Producing movements smoothly

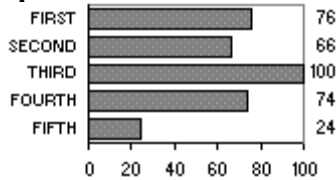
ANS: D REF: 62 OBJ: 16 KEY: F

72. Paul and Jamie took their dog, Murray, to the veterinarian because he would not stop eating and gained five pounds in two days. Murray *most* likely has a problem with his

- a. thalamus.
- b. hippocampus.
- c. hypothalamus.
- d. reticular formation.

ANS: C REF: 63 OBJ: 17 KEY: C/A

Responses:



$r_{pb} = .30$ A. 14% B. 14% C. 69% D. 2%

73. After an evil scientist destroys part of Richard's brain, Richard finds that he is constantly hungry, and he eats much more than he had before. The scientist destroyed his

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

ANS: B REF: 63 OBJ: 17 KEY: C/A

74. Damage to the hypothalamus would probably *not* cause which of the following symptoms?

- a. Decreased sex drive
- b. Increased hunger
- c. Diminished memory
- d. Insatiable thirst

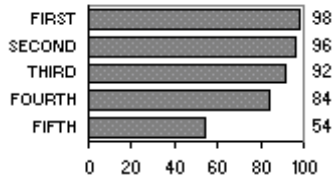
ANS: C REF: 63 OBJ: 17 KEY: F

75. Bert and Ernie have very different sleeping patterns. Bert always wakes up early in the morning, but he starts to get tired early in the evening. Ernie, on the other hand, prefers to stay up late and then sleep until noon. Bert and Ernie's different sleeping preferences might be due to differences in which brain structure?

a. Thalamus
 b. Amygdala
 c. Suprachiasmatic nuclei
 d. Corpus callosum

ANS: C REF: 63 OBJ: 17 KEY: C/A

Responses:



$r_{pb} = .46$ A. 7% B. 5% C. 86% D. 2%

76. After an unfortunate knitting accident, Stella was left with brain damage. Now she has trouble judging the emotions of others, even when she can see their facial expressions. Stella has *most* likely damaged her

a. cerebellum.
 b. amygdala.
 c. hypothalamus.
 d. hippocampus.

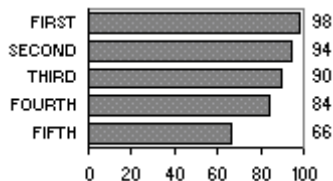
ANS: B REF: 63 OBJ: 17 KEY: C/A

77. After a freak boating accident, Arlo's hippocampus was lost at sea. Although he has recovered in all other respects, Arlo will have difficulty

a. forming new memories of events after the accident.
 b. speaking fluently in his native language.
 c. making controlled, purposeful movements.
 d. smiling.

ANS: A REF: 64 OBJ: 17 KEY: C/A

Responses:



$r_{pb} = .36$ A. 87% B. 3% C. 9% D. 1%

78. Pedro's hippocampus is about 40 percent smaller than an average person's hippocampus. Pedro *most* likely suffers from _____ disease.

a. Huntington's
 b. Parkinson's
 c. Alzheimer's
 d. Wernicke's

ANS: C REF: 64 OBJ: 17 KEY: C/A

79. Bobby, Peter, and Greg were working outside on their bikes when their father, Mike, accidentally slipped on some axle grease and pulled the trigger of the nail gun he was carrying several times as he fell. All four survived, but Bobby's hippocampus, Peter's amygdala, Greg's thalamus, and Mike's hypothalamus were destroyed. Who will no longer be able to connect emotion to sensation?

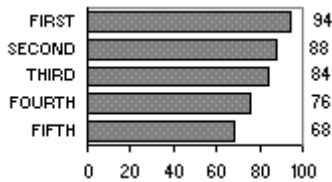
a. Bobby
 b. Peter
 c. Greg
 d. Mike

ANS: B REF: 63 OBJ: 17 KEY: C/A MSC: New

80. The human brain appears extremely wrinkled when closely examined. These wrinkles
- are purely cosmetic and have no actual purpose.
 - are a byproduct of old age; normal adults' brains are smooth.
 - act as a shock-absorption device, preventing neural damage.
 - allow a greater surface area of cortex to be included in the skull.

ANS: D REF: 64 OBJ: 18 KEY: F

Responses:



$r_{pb} = .26$ A. 2% B. 0% C. 14% D. 83%

81. The bundle of fibers that connects the two hemispheres of the brain is specifically known as the
- cerebral cortex.
 - cerebellum.
 - corpus callosum.
 - central nervous system.

ANS: C REF: 64 OBJ: 18 KEY: F

82. Patrick slipped on a banana peel and hit his head on the ground. He has had difficulty seeing since the accident. Patrick has *most* likely damaged his _____ lobe.

- occipital
- parietal
- temporal
- frontal

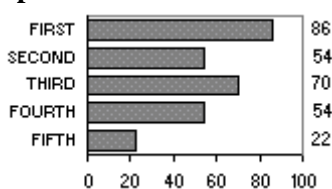
ANS: A REF: 65 OBJ: 18 KEY: C/A

83. While playing with their new “Do-It-Yourself-Home-Brain-Surgery-Kit,” which recently washed ashore, Skipper and the Professor stimulate an area of the cortex in Gilligan's temporal lobe. Gilligan will *most* likely report a conscious experience of

- smelling colors.
- hearing voices.
- tasting fruit punch.
- feeling off balance.

ANS: B REF: 65 OBJ: 18 KEY: C/A

Responses:



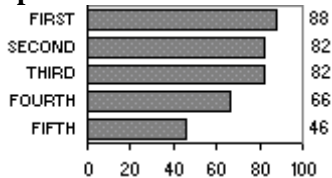
$r_{pb} = .37$ A. 2% B. 58% C. 9% D. 31%

84. When a mosquito bites your left arm, this will first activate the _____ lobe of your brain.

- left frontal
- left parietal
- right frontal
- right parietal

ANS: D REF: 65 OBJ: 18 KEY: C/A

Responses:



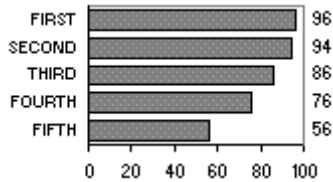
$r_{pb} = .35$ A. 1% B. 3% C. 22% D. 74%

85. A doctor is stimulating parts of a patient's brain in an attempt to map out its functional areas. When the doctor stimulates one particular area, the patient's right arm starts moving. The doctor has just stimulated the patient's _____ lobe.

- a. right frontal
b. left frontal
c. right parietal
d. left parietal

ANS: B REF: 65 OBJ: 18 KEY: C/A

Responses:



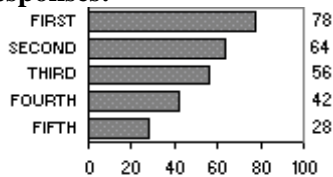
$r_{pb} = .41$ A. 5% B. 5% C. 82% D. 8%

86. A person not wearing a seat belt in a car accident is likely to hit his or her head on the car's windshield, damaging the frontal lobes of the brain. Such damage would *most* likely cause the person to have difficulty

- a. making voluntary movements, but the reflexes would be intact.
b. making both voluntary and reflexive movements.
c. hearing and understanding speech, but other types of hearing would be intact.
d. hearing any sounds of any kind.

ANS: A REF: 65 OBJ: 18 KEY: C/A

Responses:



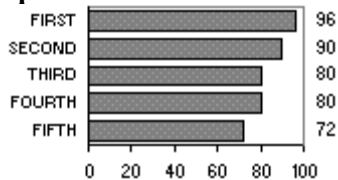
$r_{pb} = .36$ A. 54% B. 22% C. 20% D. 3%

87. If the person beside you were to tap your shoulder, neurons in _____ would become active in response to the tap.

- a. Wernicke's area
b. the occipital lobe
c. the motor cortex
d. the somatosensory cortex

ANS: D REF: 65 OBJ: 19 KEY: C/A

Responses:



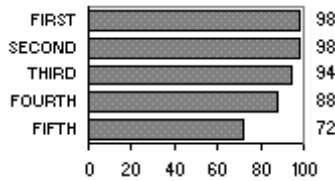
$r_{pb} = .20$ A. 1% B. 3% C. 12% D. 84%

88. If you were to prick yourself with a pin in the following sets of locations, which would cause neural firing closest together in your somatosensory cortex?

- a. Foot and ear
- b. Knee and scalp
- c. Shoulder and big toe
- d. Hand and forearm

ANS: D REF: 65 OBJ: 19 KEY: C/A

Responses:



$r_{pb} = .37$ A. 3% B. 3% C. 3% D. 91%

89. The motor cortex controls _____ movements. The region of the motor cortex responsible for moving the right hand is near the region of the _____ cortex that receives information from the right hand.

- a. voluntary; somatosensory
- b. voluntary; association
- c. involuntary; somatosensory
- d. involuntary; association

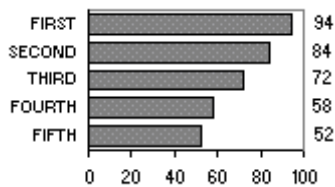
ANS: A REF: 65 OBJ: 19 KEY: F

90. Voshon is programming a computer to “think” like humans. His big challenge is to get the computer to integrate information from a variety of sources and relate this information (words and images) to abstract concepts. What area of the cerebral cortex accomplishes these tasks for humans?

- a. Association cortex
- b. Sensory cortex
- c. Somatosensory cortex
- d. Integrative cortex

ANS: A REF: 67 OBJ: 19 KEY: C/A

Responses:



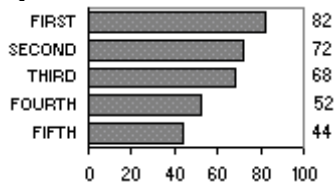
$r_{pb} = .37$ A. 73% B. 6% C. 13% D. 9%

91. Meghan has suffered a head injury in a car accident. However, because she is such a dedicated teacher, she returns to teach her psychology class just a few days later. When she gets up in front of the class to lecture on hormones, she says, “Hormones . . . substances . . . pituitary . . . secreting . . . growth . . .,” and her students look at her blankly. Meghan has *probably* suffered damage to which part of the brain?

- a. Broca's area
- b. The reticular formation
- c. Wernicke's area
- d. The parietal lobe

ANS: A REF: 67 OBJ: 20 KEY: C/A

Responses:



$r_{pb} = .30$ A. 65% B. 4% C. 26% D. 4%

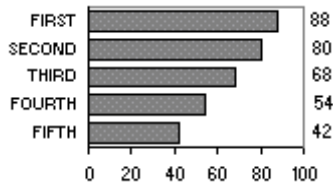
92. Janet has sustained a brain injury and now has great difficulty organizing her speech. Often she speaks in incomplete sentences with each word coming out very slowly. Janet has *most* likely suffered damage to
- Broca's area.
 - the parietal lobe.
 - the somatosensory cortex.
 - Wernicke's area.

ANS: A

REF: 67

OBJ: 20

KEY: C/A

Responses: $r_{pb} = .37$

A. 68% B. 12% C. 5%

D. 16%

93. Tyra has a brain tumor that affects her language capabilities. When Tyra's doctor asks her about a picture of a bird, Tyra responds, "Wings in the sky fly high. Soar through air with a suitcase." Tyra's fluent, but confused, response indicates that she *most* likely suffers from
- Broca's aphasia.
 - cerebellar mutism.
 - Wernicke's aphasia.
 - brain lateralization.

ANS: C

REF: 68

OBJ: 20

KEY: C/A

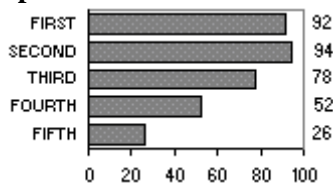
94. During the 1960s, a person with severe epilepsy that caused seizures in both hemispheres of the brain *most* likely had surgery on his or her
- corpus callosum.
 - cerebellum.
 - cerebrum.
 - cochlear membrane.

ANS: A

REF: 70

OBJ: 21

KEY: F

Responses: $r_{pb} = .52$

A. 69% B. 14% C. 13% D. 5%

95. Sometimes when Samantha gets dressed in the morning, her right hand will button a shirt, and then the left hand will immediately unbutton it. She also cannot verbally identify objects in her left hand when she is blindfolded. Which part of her brain is *most* likely destroyed?
- The corpus callosum
 - Wernicke's area
 - Broca's area
 - The right motor cortex

ANS: A

REF: 70

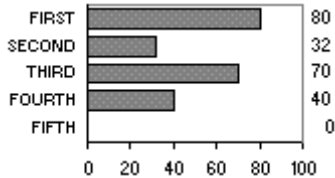
OBJ: 21

KEY: C/A

96. Elliot, a split-brain patient, is participating in a research study. If a picture of a comb is presented to the right hemisphere of Elliot's brain, he will *probably*
- be able to name the object.
 - suddenly have the urge to comb his hair.
 - be able to pick out a comb from a group of other objects by its shape.
 - describe the comb by its shape, color, and size.

ANS: C REF: 70 OBJ: 21 KEY: C/A

Responses:

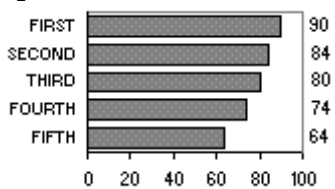


$r_{pb} = .44$ A. 16% B. 13% C. 44% D. 27%

97. Joan was in a psychology experiment in which the experimenter asked her to push a button when she saw a stimulus that was presented only to her left visual cortex. On some trials, Joan was asked to push the button with her right hand, and on other trials to push the button with her left hand. It took Joan longer to push the button with her left hand than with her right hand. The reason is that
- Joan has brain damage.
 - it takes time for information to travel across the corpus callosum.
 - information from the left visual field is harder to see.
 - Joan must be right-handed.

ANS: B REF: 70 OBJ: 21 KEY: C/A

Responses:



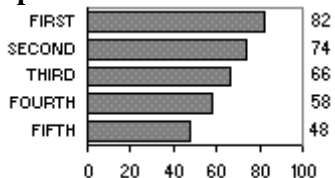
$r_{pb} = .2$ A. 2% B. 79% C. 4% D. 15%

98. The right hemisphere gets information from the _____ side of the body and has better _____ abilities than the left hemisphere.

- left; logical
- right; language
- left; spatial
- right; artistic

ANS: C REF: 69 OBJ: 21 KEY: F

Responses:

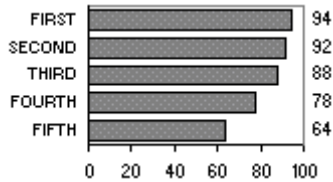


$r_{pb} = .26$ A. 28% B. 1% C. 67% D. 4%

99. Identifying certain types of brain functions (language skills, for instance) as *lateralized* means that
- areas responsible for these functions are located at a uniform depth throughout the cerebral cortex.
 - all human beings possess the ability to perform these functions.
 - the entire cerebrum is involved in performing these functions.
 - they are performed most efficiently by one or the other of the two cerebral hemispheres.

ANS: D REF: 69-70 OBJ: 21 KEY: F

Responses:



$r_{pb} = .32$ A. 7% B. 2% C. 7% D. 85%

100. Suppose that the left hemisphere of Ned's brain is damaged. Ned would *most* likely display the greatest impairment in
- recognizing family members.
 - conversing with friends.
 - reading maps.
 - washing dishes with his left hand.

ANS: B REF: 70 OBJ: 21 KEY: C/A

101. One of the main reasons why a damaged arm is able to heal itself whereas a damaged brain *usually* cannot is that
- neurons found in the brain cannot divide.
 - neural plasticity occurs only during early childhood.
 - glial cells suppress connections between newly sprouted axons and other neurons.
 - mitochondria attack new brain cells after they are formed.

ANS: C REF: 72 OBJ: 22 KEY: F

102. Adults have difficulty recovering from brain damage for all of the following reasons *except*:
- The brain produces few new neurons after birth.
 - Glial cells consume damaged neurons and form barriers to new connections.
 - Certain central nervous system proteins suppress new neural connections.
 - Adult brains do not demonstrate neural plasticity.

ANS: D REF: 72 OBJ: 22 KEY: F

103. Donovan had a stroke last year, and doctors were unsure whether or not he would ever fully recover. Donovan did very little physical exercise to help speed up his recovery, but the damaged cells in his nervous system still managed to regenerate and reestablish their network connections. Donovan's system has a naturally high level of

- neural plasticity.
- lateralization.
- autoimmune functioning.
- autonomic restructuring.

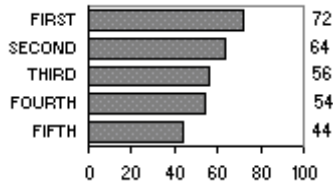
ANS: A REF: 71 OBJ: 22 KEY: C/A

104. Bob is nine months old. Carol is nine years old. Ted is twenty-nine years old. Alice is ninety years old. Whose brain is *most* likely overproducing synapses?

- a. Bob's
b. Carol's
c. Ted's
d. Alice's

ANS: A REF: 73 OBJ: 23 KEY: C/A

Responses:



$r_{pb} = .21$ A. 59% B. 22% C. 6% D. 12%

105. Which of the following developmental changes in the brain occurs after birth?

- a. The number of dendrites and synapses increases until adolescence, when they are reduced.
b. The number of axons increases and the number of dendrites decreases throughout adolescence and adulthood.
c. No developmental changes occur after birth because all the neurons the brain will ever have are present at birth.
d. New neurons grow until adolescence, when they begin to die.

ANS: A REF: 73 OBJ: 23 KEY: F

106. At which of the following ages will you show the greatest number of dendrites in neurons of your cerebral cortex?

- a. Sixteen years
b. Sixty-six years
c. Six months
d. Six years

ANS: D REF: 73 OBJ: 23 KEY: F

107. A study found that rats raised in stimulating environments have more dendrites and synapses than rats raised in boring environments. This study suggests that

- a. experience plays an important part in the structure and functioning of the brain.
b. plasticity occurs only during the first few years of life.
c. connections in the brain are determined by genetic factors.
d. the brains of rats are more lateralized than those of humans.

ANS: A REF: 73 OBJ: 23 KEY: C/A

108. Which of the following is *not* one of the three main classes of neurotransmitters used in the nervous system?

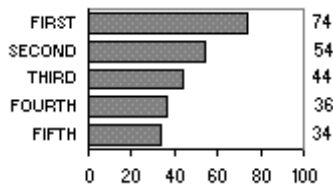
- a. Small molecules
b. Hormones
c. Peptides
d. Gases

ANS: B REF: 74 OBJ: 24 KEY: F

109. Donald is seventy years old. For the past few years, he has developed a memory loss that is getting worse, and his personality has become very erratic. His doctors say he has Alzheimer's disease, but you aren't sure. What finding should most convince you that the doctors are right?
- A loss of GABA neurons in Donald's brain
 - An absence of myelin in Donald's brain
 - A loss of acetylcholine neurons in Donald's brain
 - Below normal levels of norepinephrine in Donald's brain

ANS: C REF: 74 OBJ: 24 KEY: C/A

Responses:



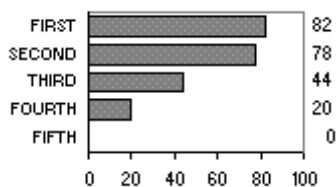
$r_{pb} = .26$ A. 15% B. 5% C. 50% D. 30%

110. Ricardo has been diagnosed with Alzheimer's disease. Ricardo *most* likely has a problem with his _____ neurotransmitter system.

- acetylcholine
- dopamine
- endorphin
- norepinephrine

ANS: A REF: 74 OBJ: 24 KEY: C/A

Responses:



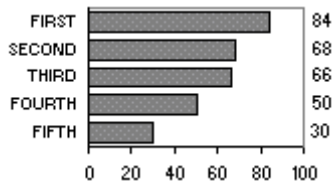
$r_{pb} = .64$ A. 44% B. 33% C. 4% D. 18%

111. Vasili experiences depression due to an abnormality in one of his neurotransmitter systems. Which of the following is *most* likely the neurotransmitter affecting Vasili's mood?

- Acetylcholine
- Dopamine
- GABA
- Norepinephrine

ANS: D REF: 74 OBJ: 24 KEY: C/A

Responses:



$r_{pb} = .3$ A. 11% B. 15% C. 14% D. 61%

112. Tom ate a huge plate of spaghetti for lunch, and now he is feeling very sleepy. Tom's lunch increased the level of _____ in his brain, making him tired.

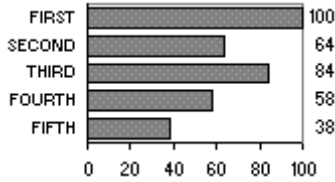
- acetylcholine
- serotonin
- glutamate
- dopamine

ANS: B REF: 74 OBJ: 24 KEY: C/A

113. Both schizophrenia and Parkinson's disease have been linked to the neurotransmitter
 a. dopamine. c. GABA.
 b. serotonin. d. acetylcholine.

ANS: A REF: 74 OBJ: 24 KEY: C/A

Responses:



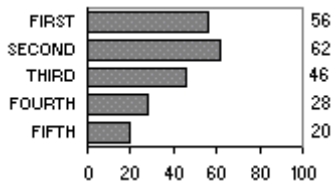
$r_{pb} = .41$ A. 69% B. 10% C. 14% D. 6%

114. Alcohol slows down the speed with which messages travel through the nervous system. This is best explained by the fact that alcohol increases the amount of _____ in the brain.

- a. GABA c. glutamate
 b. norepinephrine d. acetylcholine

ANS: A REF: 75 OBJ: 24 KEY: C/A

Responses:



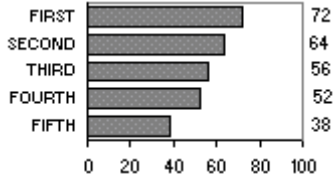
$r_{pb} = .28$ A. 43% B. 26% C. 11% D. 20%

115. Dave has been exhibiting symptoms similar to those of someone with Parkinson's disease. This may be due to a problem in pathways that use the neurotransmitter

- a. dopamine. c. serotonin.
 b. norepinephrine. d. acetylcholine.

ANS: A REF: 74 OBJ: 24 KEY: C/A

Responses:



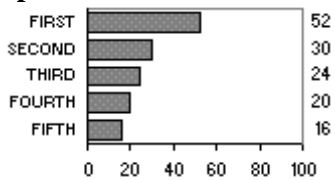
$r_{pb} = .24$ A. 57% B. 17% C. 11% D. 15%

116. Dr. Wiancek was on duty in the Emergency Room when a brain trauma patient arrived. To try to prevent permanent brain damage, Dr. Wiancek had to block the receptors of which neurotransmitter?

- a. Norepinephrine c. GABA
 b. Serotonin d. Glutamate

ANS: D REF: 75 OBJ: 24 KEY: C/A

Responses:

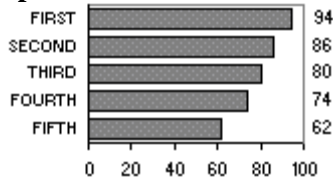


$r_{pb} = .25$ A. 29% B. 14% C. 34% D. 23%

117. Eleanor is trying to develop a drug that will alleviate pain. Based upon her knowledge of different neurotransmitters, she hopes to produce a drug that will bind with receptors for
- acetylcholine.
 - adrenaline.
 - norepinephrine.
 - endorphins.

ANS: D REF: 75 OBJ: 24 KEY: C/A

Responses:



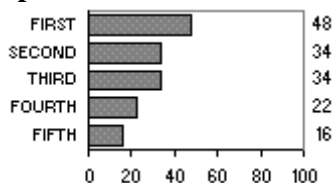
$r_{pb} = .27$ A. 5% B. 3% C. 11% D. 80%

118. Jacelyn is wandering through a national park when she sees a bear lumbering toward her. As her flight-or-fight response is triggered, what hormones are being released in her body in response to the perceived threat?

- Melatonin and progesterone
- ACTH and cortisol
- Estradiol and testosterone
- Insulin and corticosteroids

ANS: B REF: 78 OBJ: 25 KEY: C/A

Responses:



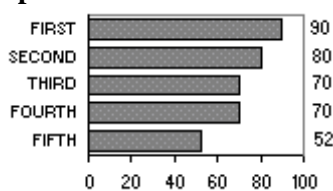
$r_{pb} = .24$ A. 22% B. 32% C. 33% D. 13%

119. Harry, the hormone, and Nadia, the neurotransmitter, can both exert physiological effects on their target organs. Which of the following is *true* about Harry and Nadia?

- Harry doesn't affect behavior, whereas Nadia does.
- Nadia acts at a site away from where she was released, whereas Harry acts locally.
- Harry acts at a site away from where he was released, whereas Nadia acts locally.
- Neither Harry nor Nadia affects behavior.

ANS: C REF: 77 OBJ: 25 KEY: C/A

Responses:

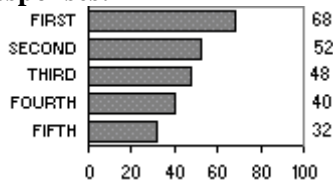


$r_{pb} = .30$ A. 2% B. 21% C. 73% D. 3%

120. Which of the following statements *best* characterizes differences between the nervous and endocrine systems?
- Hormones and neurotransmitters are two distinct groups of chemicals that do not overlap.
 - Neurons can stimulate cells with which they have no direct contact, whereas endocrine organs cannot.
 - The endocrine system transmits signals through the circulatory system, whereas the nervous system does not.
 - Receptors are not necessary for cells to respond to hormones, but receptors are necessary for neurons to respond to neurotransmitters.

ANS: C REF: 77 OBJ: 25 KEY: F

Responses:

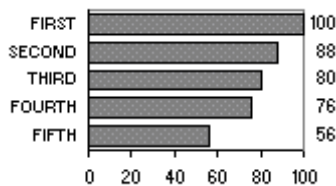


$r_{pb} = .25$ A. 11% B. 8% C. 49% D. 32%

121. Scientists have just discovered a new hormone that appears to have very specific effects. This specificity of effects is *most* likely due to
- a small distance between the gland and the target organs.
 - unique receptors on the target organ.
 - the hormone being secreted by the target organs.
 - the hormone being active in the bloodstream.

ANS: B REF: 77 OBJ: 25 KEY: C/A

Responses:

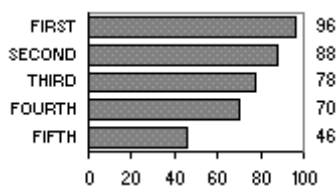


$r_{pb} = .41$ A. 0% B. 82% C. 11% D. 8%

122. Neurotransmitters are to the nervous system as _____ are to the endocrine system.
- target organs
 - endorphins
 - hormones
 - glands

ANS: C REF: 77 OBJ: 25 KEY: F

Responses:

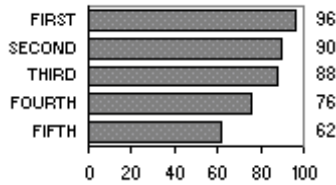


$r_{pb} = .40$ A. 1% B. 8% C. 77% D. 14%

123. You see a vicious-looking squirrel getting ready to attack you. What specific part of the nervous system would be activated to prepare you for this fight-or-flight response?
- Somatic
 - Sympathetic
 - Parasympathetic
 - Central

ANS: B REF: 78 OBJ: 26 KEY: C/A

Responses:



$r_{pb} = .36$ A. 2% B. 84% C. 13% D. 1%

124. Tasha is about to give a speech. As she heads to the podium, she notices that her heart is beating fast, she is starting to perspire, her mouth is dry, and her hands are shaking. Tasha is *most* likely experiencing
- the fight-or-flight response.
 - conversion disorder.
 - cerebellar mutism.
 - Broca's aphasia.

ANS: A REF: 78 OBJ: 26 KEY: C/A

125. All of the following are associated with the fight-or-flight response *except*
- an elevated heart rate.
 - increased levels of glucose in the bloodstream.
 - fuels that are mobilized from fat stores.
 - low levels of cortisol in the bloodstream.

ANS: C REF: 78 OBJ: 26 KEY: F

ESSAY

1. Compare and contrast neurons with other cells in the body.

ANS: Neurons share many features with other cells in the body. They have an outer membrane which allows only certain substances to enter or exit the cell. Neurons also contain a nucleus, which provides the genetic instructions for the cell. Finally, neurons contain mitochondria, which act as the powerhouse of the cell by converting oxygen and glucose into energy. Neurons differ from other cells in that they are specialized for communication. They have *dendrites*, which are long fibers that detect messages from other neurons. In addition, each neuron usually has one *axon*, which is a fiber responsible for sending messages to other neurons. Communication between neurons is made possible through electrochemical messages called *action potentials*, which travel down axons and cause chemicals called *neurotransmitters* to be released from containers called *vesicles*. These neurotransmitters bind to proteins called *receptors* located on the dendrites of nearby cells, and this binding creates electrochemical signals that influence whether those nearby neurons will fire.

2. Name the three structures of the hindbrain and four structures of the forebrain and discuss how damage to each structure could affect one's mental processes and behavior.

ANS: Medulla: damage could cause death, as the medulla regulates such vital functions as heart rate, blood pressure, and breathing.

Reticular formation: damage could cause a person to go into a coma, as the reticular formation is responsible for arousal and attention.

Cerebellum: damage could cause problems with balance, finely coordinated movements, and language.

Thalamus: damage could cause problems with vision, hearing, sense of taste, and skin sensations. The sense of smell would remain intact, however.

Hypothalamus: damage could affect one's appetite, thirst, and sexual behavior. In addition, if the part of the hypothalamus known as the *suprachiasmatic nuclei* were damaged, one's biological rhythms would be disrupted, and so sleep patterns and other biological cycles might become unpredictable.

Amygdala: damage could reduce one's ability to experience or display emotions or to recognize them in others.

Hippocampus: damage could cause memory problems, especially for events occurring after the brain injury.

3. Compare and contrast the functions and characteristics of the nervous system with those of the endocrine system.

ANS: There are several similarities between the nervous system and the endocrine system. Both systems direct activities in the body. Both secrete chemicals that are used for communication: neurons secrete neurotransmitters, and glands secrete hormones. Some chemicals, such as norepinephrine and endorphins, act as both neurotransmitters and hormones. Both neurotransmitters and hormones have their own receptor sites.

There are also several differences between neurons and the endocrine system. Neurons secrete neurotransmitters into synapses, whereas the endocrine system secretes hormones into the bloodstream. Glands in the endocrine system can stimulate remote cells with which they have no direct connection, whereas neurons can stimulate only other neurons with which they have direct connections. The endocrine system produces its effects through chains of several hormones that affect target organs. In contrast, a group of neurons using the same neurotransmitter communicate through a neurotransmitter system.

4. Name the six small molecule neurotransmitters. Describe the functions of each and what results if these neurotransmitters are disrupted.

ANS: Acetylcholine is involved in movement, making memories, slowing the heartbeat, and activating the digestive system. Disruption can lead to memory loss and eventually Alzheimer's disease.

Norepinephrine affects arousal, wakefulness, learning, and mood. Disruption to this system can lead to depression.

Serotonin affects sleep, mood, and the appearance of aggressive or impulsive behavior.

Malfunctions of this system may lead to mood and appetite problems, premenstrual tension, and depression.

Dopamine is important for movement and the experience of reward and pleasure. Disruptions of dopamine systems contribute to the movement disorder, Parkinson's disease. Dopamine is also suspected in certain perceptual, emotional, and thought disturbances associated with schizophrenia.

GABA reduces the likelihood of neurons firing, thereby slowing brain activity. It is therefore important for sleep. Malfunctions of the GABA system contribute to severe anxiety, Huntington's disease, and the experience of seizures and epilepsy.

Glutamate helps glial cells provide energy for neurons and assists the brain in strengthening its synaptic connections, which is necessary for both learning and memory. Overactivity of glutamate can cause neurons to die and contribute to brain cell loss in Alzheimer's disease.

MCS: New

5. Explain the two main parts of the nervous system and all of their corresponding subsystems.
 ANS: The nervous system is divided into the central nervous system (CNS) and the peripheral nervous system (PNS). The CNS is comprised of the brain and spinal cord, and it receives information, processes it, and determines what actions should result. The spinal cord receives signals such as pain and touch from the senses and passes those signals to the brain. Some simple behaviors, known as reflexes, can be directed from the spinal cord without instruction from the brain. The brain, the most complex part of the central nervous system, is comprised of three main structures: hindbrain, midbrain, and forebrain.
 The PNS sends sensory information from the eyes, ears, and other sense organs to the CNS. The PNS is comprised of the somatic nervous system and the autonomic nervous system. The somatic nervous system takes pieces of sensory information and sends them to the CNS for processing. The somatic nervous system also transmits information from the CNS to motor neurons. The autonomic nervous system carries messages back and forth between the CNS and the heart, lungs, and other organs and glands. The autonomic nervous system is comprised of two subsystems: the sympathetic and parasympathetic nervous systems. The sympathetic nervous system expends energy and prepares the body for action in the presence of stress. The parasympathetic nervous system acts to conserve energy, allowing the body to calm down when action is not needed.
 MCS: New

SHORT ANSWER

1. Identify and describe the two subsystems of the autonomic nervous system.
 ANS: The autonomic nervous system is divided into the sympathetic and parasympathetic nervous systems. The sympathetic nervous system expends energy, readying the body for action in the presence of stress. The parasympathetic nervous system preserves energy, calming the body down when a crisis has passed.
 MCS: New
2. Describe the primary function of the midbrain.
 ANS: The midbrain allows the body to perform movements smoothly, utilizing its connections to both the hindbrain and the forebrain.
 MCS: New
3. Define neural plasticity and explain briefly why it is important.
 ANS: Neural plasticity is the ability to strengthen neural connections at synapses, as well as to establish new connections. Glial cells are instrumental in this process. It is important because it provides the basis for learning and memory processes.
 MCS: New
4. Contrast the basic functions of dendrites and axons within a neuron.
 ANS: Dendrites detect and receive incoming signals from other neurons, whereas axons carry signals away from the cell body. A neuron may have many dendrites, but it usually has only one axon.
 MCS: New
5. Describe the primary functions of the association cortex.
 ANS: The association cortex integrates sensory and motor information and performs complex cognitive tasks. This cortex appears in all of the lobes and is important for a wide range of mental abilities (such as language and conscious thought).
 MCS: New