Cognitive Neuroscience 4th Edition Gazzaniga Test Bank
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Chapter 1: A Brief History of Cognitive Neuroscience

MULTIPLE CHOICE

LEARNING OBJECTIVES

1. Explain the origins of the field of cognitive neuroscience
2. Describe the roots of the debate over localization of function
3. Explain the ways in which brain structure was studied
4. Understand the philosophical origins of cognitive psychology
5. Discuss behaviorism and its principal tenets
6. Explain how and why cognitive psychology came to the forefront of psychological fields
7. Identify the different methods that are used to measure brain function and structure

1. The case of Anne Green was remarkable in that after being falsely convicted of murdering her newborn child,
   a. she survived an attempted electrocution.
   b. she escaped and later married Thomas Willis, a famous neurologist.
   c. she survived an attempted hanging.
   d. she escaped and later became a famous neurologist.

   ANS: C DIF: Easy REF: Historical Perspective
   OBJ: LO 1 MSC: Remembering

2. Aside from saving Anne Green's life, Thomas Willis and Christopher Wren also
   a. created very accurate drawings of the brain.
   b. came up with the names of a number of brain structures.
   c. took the first steps that led to cognitive neuroscience.
   d. all of the above.

   ANS: D DIF: Medium REF: Historical Perspective
   OBJ: LO 1 MSC: Understanding

3. Which of the following is NOT one of the principal reasons that Willis is considered one of the early figures in cognitive neuroscience?
   a. he named many brain parts.
   b. he dissected the brains of criminals within 21 miles of Oxford.
   c. he was among the first to link behavioral deficits to brain damage.
   d. he created very accurate brain images.

   ANS: B DIF: Difficult REF: Historical Perspective
   OBJ: LO 1 MSC: Evaluating

4. A central issue of modern cognitive neuroscience is whether specific human cognitive abilities
   a. can be localized to particular parts of the brain.
   b. are determined by the shape and size of the human skull.
   c. are best studied using introspection or the scientific method.
   d. can be identified using the Golgi silver method of staining.

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ANS: A DIF: Medium REF: The Brain Story
OBJ: LO 2 MSC: Understanding

5. The discipline of phrenology was founded by
   a. Broca and Wernicke.
   b. Fritsch and Hitzig.
   c. Ramón y Cajal and Sherrington.
   d. Gall and Spurzheim.

   ANS: D DIF: Easy REF: The Brain Story
   OBJ: LO 2 MSC: Remembering

6. Phrenologists believed that the contour of the skull could provide valuable information about an individual's cognitive capacities and personality traits. This approach was based on the assumption that
   a. skull protrusions are caused by disproportionate development of the brain areas beneath them, which are responsible for different specific functions.
   b. certain traits such as aggressiveness lead to life experiences and injuries that alter the shape of the skull in specific ways.
   c. life experiences and injuries that alter the shape of the skull in specific ways lead to certain traits, such as aggressiveness.
   d. the development of the skull bones directly influences the configuration of the soft brain areas beneath them, which are responsible for different specific functions.

   ANS: A DIF: Difficult REF: The Brain Story
   OBJ: LO 2 MSC: Evaluating

7. Localizationist is to _____ as holistic is to _____.
   a. Wernicke ; Gall
   b. Gall ; Flourens
   c. Flourens ; Broca
   d. Broca ; Wernicke

   ANS: B DIF: Medium REF: The Brain Story
   OBJ: LO 2 MSC: Understanding

8. Gall's method for investigating phrenology was flawed because
   a. he used the wrong language to explain the characteristics he observed.
   b. he did not tell Napoleon Bonaparte that he possessed noble characteristics.
   c. he ought only to confirm, not disprove, the correlations he observed.
   d. he used his own skull as the base model.

   ANS: C DIF: Easy REF: The Brain Story
   OBJ: LO 2 MSC: Remembering

9. The view known as *aggregate field theory*, which stated that the whole brain participates in behavior, is most associated with
   a. Broca.
   b. Hughlings Jackson.
   c. Brodmann.
   d. Flourens.

   ANS: D DIF: Easy REF: The Brain Story
   OBJ: LO 2 MSC: Remembering

10. Willis is to _____ as _____ is to Broca.
    a. Flourens ; Spurzheim.
    b. Spurzheim ; Flourens.
    c. Gall ; Dax.
    d. Dax ; Gall.

    ANS: C DIF: Difficult REF: The Brain Story
    OBJ: LO 2 MSC: Analyzing

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11. In developing phrenology, Gall's main failure was that
    a. he did not seek disconfirming evidence.
    b. he was not a scientist.
    c. his method was correlational.
    d. all of the above.

    ANS: D DIF: Difficult REF: The Brain Story
    OBJ: LO 2 MSC: Analyzing

12. Giovanni visits his local phrenologist. What is this person likely to tell him?
    a. You are a domineering person.
    b. Your father was a very domineering person.
    c. Your brother is a domineering person.
    d. Your mother was a very domineering person.

    ANS: A DIF: Medium REF: The Brain Story
    OBJ: LO 2 MSC: Applying

13. The view developed by Marie-Jean-Pierre Flourens, based on the idea that processes like language and memory cannot be localized within circumscribed brain regions, was known as
    a. the neuron doctrine.
    b. aggregate field theory.
    c. rationalism.
    d. the law of effect.

    ANS: B DIF: Easy REF: The Brain Story
    OBJ: LO 2 MSC: Remembering

14. John Hughlings Jackson proposed a _____organization in the cerebral cortex, based on his work with people with _____.
    a. holistic ; aphasia
    b. topographic ; aphasia
    c. topographic ; epilepsy
    d. holistic ; epilepsy

    ANS: C DIF: Medium REF: The Brain Story
    OBJ: LO 2 MSC: Understanding

15. _____ was one of the first brain scientists to realize that specific cognitive functions can be localized to specific parts of the brain and that many different functional regions can take part in a given behavior.
    a. Broca
    b. Hughlings Jackson
    c. Flourens
    d. Brodmann

    ANS: B DIF: Medium REF: The Brain Story
    OBJ: LO 2 MSC: Remembering

16. Which nineteenth-century scientist suggested that the frontal lobe contributes to language and speech production?
    a. Flourens
    b. Wernicke
    c. Broca
    d. Brodmann

    ANS: C DIF: Medium REF: The Brain Story
    OBJ: LO 2 MSC: Remembering

17. Paul Broca's first patient Leborgne was able to produce which of the following words?
    a. merci
    b. tan
    c. trois
    d. Paris

    ANS: B DIF: Easy REF: The Brain Story

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OBJ: LO 2 MSC: Remembering

18. Which of the following things would have been the most difficult for the famous individual studied by Paul Broca, compared to before his stroke?
    a. listening to a piano recital
    b. appreciating a painting
    c. reading a book aloud
    d. playing a game of cards

    ANS: C DIF: Medium REF: The Brain Story
    OBJ: LO 2 MSC: Applying

19. Which of the following things would have been the most difficult for the famous individual described by Carl Wernicke, compared to before his stroke?
    a. understanding a speech
    b. painting a picture
    c. singing a song
    d. riding a horse

    ANS: A DIF: Medium REF: The Brain Story
    OBJ: LO 2 MSC: Applying

20. Wernicke was an early researcher who suggested that the _____ contributes to language comprehension.
    a. right frontotemporal area
    b. left frontotemporal area
    c. right temporoparietal area
    d. left temporoparietal area

    ANS: D DIF: Medium REF: The Brain Story
    OBJ: LO 2 MSC: Applying

21. Wernicke is to _____ as Broca is to _____.
    a. understanding speech ; speaking
    b. speaking ; understanding speech
    c. aggregate field theory ; topographic organization
    d. aggregate field theory ; aggregate field theory

    ANS: A DIF: Easy REF: The Brain Story
    OBJ: LO 2 MSC: Remembering

22. As a first approximation, individuals with damage to the left inferior frontal lobe tend to have more difficulty with _____, whereas individuals with damage to the left posterior temporal lobe tend to have more difficulty with _____.
    a. fine motor control ; the sense of touch
    b. the sense of touch ; fine motor control
    c. the production of language ; the perception of language
    d. the perception of language ; the production of language

    ANS: C DIF: Easy REF: The Brain Story
    OBJ: LO 2 MSC: Remembering

23. One reason that early research on specific human cognitive capacities and the brain areas that are responsible for them developed rather slowly before the twentieth century is that
    a. most early investigators were limited to postmortem studies to localize lesions.
    b. investigators did not know the brain was separated into two hemispheres until the twentieth century.
    c. most early investigators focused on studying the brain–behavior relationship in animals rather than in humans.
    d. there was little interest in this field until the twentieth century.

    ANS: A DIF: Medium REF: The Brain Story

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OBJ: LO 3 MSC: Understanding

24. Korbinian Brodmann used _____ techniques to document fifty-two regions of the brain that differed in _____.
    a. phrenological ; cytoarchitectonics
    b. phrenological ; chronometrics
    c. tissue staining ; cytoarchitectonics
    d. tissue staining ; chronometrics

    ANS: C DIF: Easy REF: The Brain Story
    OBJ: LO 3 MSC: Remembering

25. Which of the following individuals was NOT associated with a major histological discovery in neuroscience?
    a. Edward L. Thorndike
    b. Korbinian Brodmann
    c. Camillo Golgi
    d. Jan Evangelista Purkinje

    ANS: A DIF: Medium REF: The Brain Story
    OBJ: LO 3 MSC: Understanding

26. Researchers Fritsch and Hitzig found support for the idea that specific functions are localized to discrete parts of the cortex in an experiment using electrical stimulation of a dog's brain. More specifically, they found
    a. a systematic relationship between the portion of cortex stimulated and specific movements.
    b. a systematic relationship between the portion of cortex stimulated and specific vocalizations.
    c. no systematic relationship between the portion of cortex stimulated and specific movements.
    d. no systematic relationship between the portion of cortex stimulated and specific vocalizations.

    ANS: A DIF: Medium REF: The Brain Story
    OBJ: LO 3 MSC: Understanding

27. Cytoarchitectonic maps distinguish different cortical regions by
    a. the structure of their surface convolutions.
    b. their structure at the cellular level.
    c. the complex functions they perform.
    d. the basic functions they perform.

    ANS: B DIF: Easy REF: The Brain Story
    OBJ: LO 3 MSC: Remembering

28. Yvette wants to figure out whether cells in two different layers of the occipital lobe have different functions. What would she have done if she had been a scientist in the early twentieth century?
    a. look at a CAT scan
    b. observe the tracts that connect each layer
    c. look at patients with damage to those cells
    d. look at the layers under a microscope

    ANS: D DIF: Medium REF: The Brain Story
    OBJ: LO 3 MSC: Applying

29. The neuroanatomist who described fifty-two distinct cortical areas based on cell structure and arrangement, and whose classification scheme is often used today, was
    a. Purkinje.
    c. Brodmann.

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b. Helmholtz.
d. Hyde.

ANS: C DIF: Easy REF: The Brain Story
OBJ: LO 3 MSC: Remembering

30. Which of the following terms refers to the idea of a continuous mass of tissue that shares a common cytoplasm?
a. synapse
b. syncytium
c. striatum
d. claustrum

ANS: B DIF: Easy REF: The Brain Story
OBJ: LO 3 MSC: Remembering

31. *La reazione nera*, or "the black reaction," refers to
a. a cell stain developed by Golgi.
b. a perceptual phenomenon described by the Gestalt psychologists.
c. a ganglion preparation developed by Arvanitaki.
d. a type of reinforcement-based learning described by the behaviorists.

ANS: A DIF: Easy REF: The Brain Story
OBJ: LO 3 MSC: Remembering

32. Which of the following scientists contributed to modern neuroscience in the nineteenth century?
a. Paul Broca
b. Sir Charles Sherrington
c. Gustav Theodor Fritsch
d. Santiago Ramón y Cajal

ANS: A DIF: Medium REF: The Brain Story
OBJ: LO 3 MSC: Remembering

33. Which of the following statements best describes the "neuron doctrine"?
a. The nervous system consists of a fused network of interconnected fibers.
b. The brain can be subdivided into regions that are distinct in cytoarchitectonics yet functionally interactive.
c. The nervous system consists of physically distinct cells that are functionally interactive.
d. The brain can be subdivided into functionally autonomous modules.

ANS: C DIF: Medium REF: The Brain Story
OBJ: LO 3 MSC: Understanding

34. The neuron doctrine is usually credited to _____, who used a staining technique pioneered by _____.
a. Purkinje ; Brodmann
b. Brodmann ; Purkinje
c. Golgi ; Ramón y Cajal
d. Ramón y Cajal ; Golgi

ANS: D DIF: Easy REF: The Brain Story
OBJ: LO 3 MSC: Remembering

35. The primary contribution of Golgi to the field of cognitive neuroscience was that he
a. developed a staining technique that permitted full visualization of individual neurons.
b. showed experimentally that the nervous system is composed of a net of physically interconnected neuronal units.
c. discovered that cells in different regions of the cortex also differ in shape and size.
d. demonstrated that nerves can release chemicals that have an activating effect on nearby muscle cells.

ANS: A DIF: Medium REF: The Brain Story

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OBJ: LO 3 MSC: Understanding

36. The term *synapse,* coined by Sherrington, refers to the junction between
    a. a blood vessel and surrounding neurons.
    b. two different cytoarchitectonic regions in the brain.
    c. two adjacent neurons.
    d. an axon and the cell body of a neuron.

    ANS: C DIF: Easy REF: The Brain Story
    OBJ: LO 3 MSC: Remembering

37. *Rationalism* is the philosophical position that knowledge
    a. originates from sensory experience.
    b. must be experimentally tested.
    c. must be deduced and justified through reason.
    d. is globally distributed in the cortex.

    ANS: C DIF: Easy REF: The Psychological Story
    OBJ: LO 4 MSC: Remembering

38. *Empiricism* is the philosophical position that all knowledge
    a. must be deduced and justified through reason.
    b. originates from sensory experience.
    c. must be experimentally tested.
    d. is globally distributed in the cortex.

    ANS: B DIF: Easy REF: The Psychological Story
    OBJ: LO 4 MSC: Remembering

39. Which of the following is NOT true of empiricism?
    a. It is primarily associated with the British philosophers Hobbes, Hume, and Mill.
    b. It was a foundation for the associationist–behaviorist school of psychology.
    c. It postulates a special role for reason and induction in human thought.
    d. It emphasizes sensory experience in the development of knowledge.

    ANS: C DIF: Medium REF: The Psychological Story
    OBJ: LO 4 MSC: Understanding

40. Ebbinghaus, who is considered the father of modern memory research, was among the first to demonstrate that
    a. different types of brain lesions can produce different types of memory deficits.
    b. in terms of cognition, the whole is greater than the sum of its parts.
    c. behavior is best understood in terms of stimulus–response relationships.
    d. internal mental processes can be measured in rigorous and reproducible ways.

    ANS: D DIF: Difficult REF: The Psychological Story
    OBJ: LO 4 MSC: Analyzing

41. All of the following are representative of the emergence of the field of cognitive science in the second half of the 20th century EXCEPT
    a. new developments in computer technology and artificial intelligence.
    b. a philosophical shift in the field toward empiricism and associationism.
    c. Chomsky's work arguing that behaviorist theories cannot explain language acquisition.
    d. Miller's work showing that internal processes like short-term memory can be quantified.

    ANS: B DIF: Difficult REF: The Psychological Story

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OBJ: LO 4 MSC: Evaluating

42. Thorndike's law of effect
    a. stated that much knowledge is innately specified due to natural selection.
    b. was written to oppose Darwin's theory of natural selection.
    c. stated that a behavior that is followed by a reward is likely to occur again.
    d. was written to oppose the behaviorists.

    ANS: C DIF: Easy REF: The Psychological Story
    OBJ: LO 5 MSC: Remembering

43. Empiricism is to _____ as rationalism is to _____.
    a. Locke and Hume ; Descartes and Kant
    b. Locke and Descartes ; Hume and Kant
    c. Descartes and Kant ; Locke and Hume
    d. Hume and Kant ; Locke and Descartes

    ANS: A DIF: Medium REF: The Psychological Story
    OBJ: LO 5 MSC: Understanding

44. John Watson famously argued that newborn babies
    a. are incapable of forming memories.
    b. have an intelligence comparable to our nearest primate cousins.
    c. can be raised to become anything.
    d. will develop different intellectual abilities according to innate differences.

    ANS: C DIF: Difficult REF: The Psychological Story
    OBJ: LO 5 MSC: Analyzing

45. According to associationist Herman Ebbinghaus, complex processes such as memory
    a. can be understood by combining different pieces of information.
    b. are best understood in terms of a stimulus's emergent properties.
    c. cannot be measured because they are not behaviors.
    d. can be measured in an analytic fashion.

    ANS: D DIF: Difficult REF: The Psychological Story
    OBJ: LO 5 MSC: Evaluating

46. According to Edward Thorndike, which of the following is NOT true about rewards?
    a. They indicate which creatures have malleable structures in the brain.
    b. They help to stamp things into the mind.
    c. They lead to adaptive learning.
    d. They are part of the law of effect.

    ANS: A DIF: Difficult REF: The Psychological Story
    OBJ: LO 5 MSC: Evaluating

47. "Cells that fire together, wire together" was first proposed by Donald Hebb as an explanation for
    a. epileptic seizures and their effects.
    b. associations made by the law of effect.
    c. the way in which the brain codes new learning.
    d. amnesia caused by brain damage.

    ANS: C DIF: Medium REF: The Psychological Story
    OBJ: LO 5 MSC: Understanding

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48. Noam Chomsky argued that the structure of human languages is _____, in contrast to B. F. Skinner's assertion that languages are _____.
    a. innate ; learned
    b. learned ; universal
    c. universal ; rational
    d. rational ; innate

    ANS: A DIF: Easy REF: The Psychological Story
    OBJ: LO 6 MSC: Remembering

49. Which of the following people did NOT play a strong role in the theoretical shift in psychology in the latter part of the twentieth century?
    a. Noam Chomsky
    b. Sir Charles Sherrington
    c. George A. Miller
    d. Claude Shannon

    ANS: B DIF: Easy REF: The Psychological Story
    OBJ: LO 6 MSC: Remembering

50. Which of the following people played the LEAST direct role in the development of the electroencephalogram?
    a. Hans Berger
    b. Willem Einthoven
    c. Richard Canton
    d. Hermann von Helmholtz

    ANS: D DIF: Difficult REF: Instruments of Neuroscience
    OBJ: LO 7 MSC: Analyzing

51. You decide that you want to measure blood flow of the brain. Which of the following methods could you use?
    a. listen to the blood flow across veins
    b. look at red blood cells under a microscope
    c. measure the amount of iron in the blood
    d. none of the above

    ANS: D DIF: Medium REF: Instruments of Neuroscience
    OBJ: LO 7 MSC: Applying

52. Computer axial tomography is to MRI as _____ is to _____.
    a. x-ray ; radio frequencies
    b. structure ; function
    c. blood oxygenation ; x-ray
    d. radiation ; dipoles

    ANS: C DIF: Medium REF: Instruments of Neuroscience
    OBJ: LO 7 MSC: Analyzing

53. Which of the following methods measures the BOLD signal?
    a. magnetic resonance imaging
    b. functional Magnetic resonance imaging
    c. computerized axial tomography
    d. electroencephalogram

    ANS: B DIF: Medium REF: Instruments of Neuroscience
    OBJ: LO 7 MSC: Understanding

SHORT ANSWER

1. Localizationists argued that higher cognitive functions were the product of brain activity in specific areas. Give evidence that they used to support their claims.

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ANS:
Answers will vary

DIF: Easy REF: The Brain Story OBJ: LO 1
MSC: Remembering

2. Paul Broca and Carl Wernicke discovered two different forms of aphasia. Compare and contrast them.

ANS:
Answers will vary

DIF: Medium REF: The Brain Story OBJ: LO 2
MSC: Understanding

3. Describe the main tenets of the Neuron Doctrine.

ANS:
Answers will vary

DIF: Easy REF: The Brain Story OBJ: LO 2
MSC: Remembering

4. Marie-Jean-Pierre Flourens, an early neuroscientist, is believed to have been the first to make what claims about the brain?

ANS:
Answers will vary

DIF: Easy REF: The Brain Story OBJ: LO 2
MSC: Remembering

5. A major question in cognitive neuroscience is the extent to which regions of the brain are independent or integrated. Which of these two viewpoints is most valid? Present evidence to support your view.

ANS:
Answers will vary

DIF: Difficult REF: The Brain Story OBJ: LO 2
MSC: Evaluating

6. Associationism and empiricism are two main philosophical positions. Pick the one you think best describes how humans come to know things and explain why you think this.

ANS:
Answers will vary

DIF: Medium REF: The Psychological Story OBJ: LO 4
MSC: Remembering

7. Describe the transition from behaviorist to cognitive approaches in psychology.

ANS:
Answers will vary

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DIF: Easy REF: The Psychological Story OBJ: LO 4
MSC: Understanding

8. Why is Noam Chomsky seen as having a major influence on cognitive psychology?

ANS:
Answers will vary

DIF: Medium REF: The Psychological Story OBJ: LO 4
MSC: Remembering

9. Describe two principal methods used to measure brain structure.

ANS:
Answers will vary

DIF: Easy REF: Instruments of Neuroscience OBJ: LO 7
MSC: Remembering

10. Describe how and why the term *cognitive neuroscience* was chosen for this field. Be sure to mention the two fields that combined to create this new field of study.

ANS:
Answers will vary

DIF: Easy REF: A Historical Perspective OBJ: LO 4
MSC: Remembering

11. You would like to understand at what point in time an event took place in the brain. What neuroimaging method would you choose? Explain why you would choose this method and what information you would be missing.

ANS:
Answers will vary

DIF: Easy REF: Instruments of Neuroscience OBJ: LO 7
MSC: Understanding

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Chapter 2: Structure and Function of the Nervous System

MULTIPLE CHOICE

LEARNING OUTCOMES

1. Understand the structure of neurons and synapses
2. Explain the role of ion channels in changing neuronal membrane potential
3. Describe the impact of depolarization on the resting potential, and on the likelihood of subsequent action potentials
4. Describe the influence of myelin and voltage-gated ion channels on action potentials
5. Understand electrical and chemical transmission at the synapse, including the use and removal of neurotransmitters after binding
6. Explain the roles of different types of glial cells, including astrocytes, oligodendrocytes, Schwann cells, and microglial cells
7. Define and recognize differences between the central nervous system, peripheral nervous system, sympathetic system, parasympathetic system, cerebral cortex, gray and white matter, and corpus callosum
8. Understand the functions of the spinal cord, brainstem, and cerebellum
9. Understand the functions of the thalamus, hypothalamus, and pituitary gland
10. Understand the functions of the limbic system and basal ganglia
11. Define and describe anatomical structures and principles that include gyri, sulci, Brodmann areas, lobes, topography, and association cortices
12. Explain the developmental process of the nervous system and the mechanisms behind neurogenesis

1. The two main classes of cell in the nervous system are
   a. dendrites and axons.
   b. axons and neurons.
   c. neurons and glial cells.
   d. glial cells and dendrites.

   ANS: C DIF: Easy REF: The Structure of Neurons
   OBJ: LO 1 MSC: Remembering

2. In the nervous system, these cells provide structural support and insulation for neurons.
   a. glia
   b. dendrites
   c. mitochondria
   d. Purkinje cells

   ANS: A DIF: Easy REF: The Structure of Neurons
   OBJ: LO 1 MSC: Remembering

3. Two main types of projections extend from the cell body of a neuron. _____ receive inputs from other neurons, while _____ send information to other neurons.
   a. synapses ; glia
   c. glia ; synapses

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b. axons ; dendrites
d. dendrites ; axons

ANS: D DIF: Easy REF: The Structure of Neurons
OBJ: LO 1 MSC: Remembering

4. Within a neuron, the transmission of information is usually _____. Between neurons, the transmission of information is usually _____.
a. chemical ; chemical
b. electrical ; electrical
c. electrical ; chemical
d. chemical ; electrical

ANS: C DIF: Medium REF: The Structure of Neurons
OBJ: LO 1 MSC: Remembering

5. The _____, which is comprised of astrocytes, protects the brain from chemical compounds circulating in the body that might otherwise interfere with neuronal activity.
a. sodium–potassium pump
b. blood–brain barrier
c. myelin sheath
d. lipid bilayer

ANS: B DIF: Easy REF: The Role of Glial Cells
OBJ: LO 6 MSC: Remembering

6. Demyelinating diseases such as multiple sclerosis disrupt normal neural communication by
a. destroying receptors on postsynaptic cells so that neurotransmitters cannot bind normally.
b. creating lesions in the blood–brain barrier that allow toxic substances to enter the brain from the bloodstream.
c. causing deterioration of the fatty substance that normally coats and insulates axons.
d. diminishing the activity of the sodium–potassium pumps that usually maintain the resting potential of neurons.

ANS: C DIF: Medium REF: Neuronal Signaling
OBJ: LO 4 MSC: Remembering

7. Which of the following cells produce myelin in the peripheral nervous system?
a. astrocytes
b. microglia
c. oligodendrocytes
d. Schwann cells

ANS: D DIF: Easy REF: The Role of Glial Cells
OBJ: LO 6 MSC: Remembering

8. Which of the following cells devour and remove damaged brain cells?
a. astrocytes
b. microglia
c. oligodendrocytes
d. Schwann cells

ANS: B DIF: Easy REF: The Role of Glial Cells
OBJ: LO 6 MSC: Remembering

9. If you were to insert a microelectrode through the cell membrane of a neuron, you would be able to demonstrate that
a. the region inside the cell membrane contains more positive ions than the region outside the membrane.
b. the region inside the cell membrane contains more negative ions than the region outside the membrane.
c. there is a greater concentration of potassium ions outside the cell membrane than inside the membrane.
d. there is a greater concentration of potassium ions inside the cell membrane than outside the membrane.

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ANS: B DIF: Medium REF: Neuronal Signaling
OBJ: LO 1 | LO 2 MSC: Applying

10. The nodes of Ranvier are
    a. vesicles of neurotransmitters, stored in presynaptic neurons.
    b. points along axons where sodium–potassium pumps are found.
    c. vesicles of calcium ions, stored in postsynaptic neurons.
    d. points along axons that are not surrounded by myelin.

    ANS: D DIF: Easy REF: Neuronal Signaling
    OBJ: LO 4 MSC: Remembering

11. The ease with which a cell membrane will permit ions to cross it is referred to as
    a. the concentration gradient.
    b. permeability.
    c. the action potential.
    d. conductivity.

    ANS: B DIF: Easy REF: Neuronal Signaling
    OBJ: LO 2 MSC: Remembering

12. If you inserted a micropipette into a neuron without harming the cell, and pumped in a small quantity of calcium ions, each of which carried two positive charges, how would this affect the membrane potential?
    a. The membrane potential would become depolarized relative to the resting potential.
    b. The membrane potential would become hyperpolarized relative to the resting potential.
    c. There would be no change because calcium does not contribute to the resting potential.
    d. There would be no change because the sodium–potassium pump would remove excess calcium from the cell.

    ANS: A DIF: Medium REF: Neuronal Signaling
    OBJ: LO 2 | LO 3 | LO 4 MSC: Applying

13. Ouabain is a toxin that works by permanently inhibiting the activity of sodium–potassium pumps embedded in neuronal membranes. How would ouabain administration affect the resting potential of a neuron?
    a. The magnitude of the resting potential would shift toward zero.
    b. The resting potential would hyperpolarize toward a more negative value.
    c. The resting potential would reverse to a positive, rather than a negative, value.
    d. Application of ouabain would not affect the resting potential.

    ANS: A DIF: Difficult REF: Neuronal Signaling
    OBJ: LO 2 MSC: Applying

14. The term *concentration gradient* refers to a difference in the
    a. number of two different ion types within the neuron.
    b. number of ions found on opposite sides of the cell membrane.
    c. permeability of the membrane to one kind of ion compared to another.
    d. permeability of the membrane at rest compared to during an action potential.

    ANS: B DIF: Medium REF: Neuronal Signaling
    OBJ: LO 1 | LO 2 MSC: Remembering

15. At the resting state, a higher concentration of _____ is found outside a neuron and a higher concentration of _____ is found inside a neuron.
    a. K^+ ; Na^+
    b. Na^+ ; K^+
    c. dopamine ; serotonin
    d. serotonin ; dopamine

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ANS: B DIF: Easy REF: Neuronal Signaling
OBJ: LO 1 | LO 2 MSC: Remembering

16. The value of the membrane potential to which an axon must be depolarized to initiate an action potential is called the _____ potential for that neuron.
    a. graded
    b. resting
    c. threshold
    d. refractory

ANS: C DIF: Easy REF: Neuronal Signaling
OBJ: LO 3 MSC: Remembering

17. The poison tetraethylammonium (TEA) interferes with normal neural communication. The toxin binds to and blocks voltage-gated potassium channels in the neuron cell membrane. Which of the following best describes the effects of TEA on the action potential?
    a. The depolarization phase of the action potential fails to occur.
    b. The repolarization phase of the action potential is blocked.
    c. The refractory period of the action potential is shortened.
    d. The action potential fails to be regenerated at the nodes of Ranvier.

ANS: B DIF: Difficult REF: Neuronal Signaling
OBJ: LO 4 MSC: Applying

18. The Hodgkin–Huxley cycle describes how the depolarization of the membrane causes voltage-gated sodium channels to _____, allowing _____ sodium ions to enter the cell. This change in sodium concentration then causes _____ of the cell.
    a. close ; fewer ; further depolarization
    b. close ; fewer ; repolarization
    c. open ; more ; further depolarization
    d. open ; more ; repolarization

ANS: C DIF: Medium REF: Neuronal Signaling
OBJ: LO 2 | LO 3 | LO 4 MSC: Understanding

19. The primary reason why neurons are refractory for a short period after firing action potentials, and the reason underlying the absolute refractory period, is that the
    a. voltage-gated sodium channels are inactivated.
    b. voltage-gated potassium channels are inactivated.
    c. sodium–potassium pump has to remove sodium ions from inside the cell.
    d. sodium–potassium pump has to retrieve potassium ions from outside the cell.

ANS: A DIF: Easy REF: Neuronal Signaling
OBJ: LO 4 MSC: Remembering

20. In myelinated axons, action potentials are generated
    a. at the nodes of Ranvier only.
    b. along the entire length of the axons.
    c. underneath the myelinated portions of the axons only.
    d. only at the axon hillocks and axon terminals.

ANS: A DIF: Medium REF: Neuronal Signaling
OBJ: LO 4 MSC: Understanding

21. The term *saltatory conduction* refers to the fact that
    a. action potentials travel faster when extracellular salt concentration is high.
    b. action potentials evoked by strong stimuli travel faster than those evoked by weaker stimuli.
    c. action potentials occur only at the nodes of Ranvier of axons.

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d. action potentials are generated only by myelinated portions of axons.

ANS: C DIF: Easy REF: Neuronal Signaling
OBJ: LO 4 MSC: Remembering

22. The most important function of myelin in the nervous system is to
    a. form the blood–brain barrier.
    b. trigger the release of neurotransmitters from axon terminals.
    c. produce cerebrospinal fluid in the cerebral ventricles.
    d. facilitate conduction of action potentials in axons.

ANS: D DIF: Easy REF: Neuronal Signaling
OBJ: LO 4 MSC: Remembering

23. The primary benefit that the nervous system gains from myelination is
    a. generation of currents actively (action potentials) rather than passively (electrotonic conduction).
    b. decreased membrane resistance.
    c. increased resting potentials.
    d. faster neural communication.

ANS: D DIF: Easy REF: Neuronal Signaling
OBJ: LO 4 MSC: Remembering

24. Which of the following statements best describes the immediate consequence of neurotransmitter molecules binding to postsynaptic receptors?
    a. Voltage-gated channels in the cell membrane open and permit ion flow through the membrane.
    b. The activity of the sodium–potassium pumps increases.
    c. Calcium absorption into the axon terminal cell is triggered.
    d. Neurotransmitter-containing vesicles bind to the inside of the axon terminal membrane.

ANS: A DIF: Medium REF: Synaptic Transmission
OBJ: LO 2 | LO 5 MSC: Understanding

25. The role of calcium ions (Ca^{2+}) in synaptic transmission is to
    a. bind neurotransmitter molecules to the postsynaptic membrane.
    b. mediate the release of neurotransmitter molecules from the presynaptic neuron.
    c. repolarize the postsynaptic cell after transmission has been completed.
    d. increase the activity of the sodium–potassium pumps in the presynaptic cell.

ANS: B DIF: Easy REF: Synaptic Transmission
OBJ: LO 5 MSC: Remembering

26. Which of the following sequences of steps best represents the order of events that occur during synaptic transmission?
    a. binding of neurotransmitter at the postsynaptic membrane -> diffusion of neurotransmitter across the synapse -> release of neurotransmitter from the presynaptic cell
    b. diffusion of neurotransmitter across the synapse -> binding of neurotransmitter at the postsynaptic membrane -> release of neurotransmitter from the presynaptic cell
    c. release of neurotransmitter from the presynaptic cell -> binding of neurotransmitter at the postsynaptic membrane -> diffusion of neurotransmitter across the synapse
    d. release of neurotransmitter from the presynaptic cell -> diffusion of neurotransmitter across the synapse -> binding of neurotransmitter at the postsynaptic membrane

ANS: D DIF: Medium REF: Synaptic Transmission

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OBJ: LO 5 MSC: Understanding

27. Consider the synapse shown schematically here. If neuron A causes neuron B to become hyperpolarized relative to B's resting state,

a. neuron B is more likely to fire its own action potential.
b. neuron B is less likely to release neurotransmitter molecules from its own axon terminal.
c. neuron B is more likely to absorb extracellular potassium through voltage-gated channels.
d. neuron B is less likely to absorb extracellular sodium through the sodium–potassium pump.

ANS: B DIF: Medium REF: Synaptic Transmission
OBJ: LO 5 MSC: Understanding

28. A gap junction is
a. the point where a neurotransmitter vesicle binds to the presynaptic membrane.
b. a connection between two sections of a G protein that plays a role in second-messenger cascades.
c. a transmembrane channel that connects the cytoplasm of two cells at an electrical synapse.
d. more likely to be found on the amino acids than on the biogenic amines.

ANS: C DIF: Easy REF: Synaptic Transmission
OBJ: LO 5 MSC: Remembering

29. Which of the following is a catecholamine?
a. gamma-aminobutyric acid (GABA)
b. glutamate
c. serotonin
d. norepinephrine

ANS: D DIF: Medium REF: Synaptic Transmission
OBJ: LO 5 MSC: Remembering

30. The effect of a particular neurotransmitter on postsynaptic neurons
a. is always either excitatory or inhibitory.
b. depends on the properties of the postsynaptic neuron.
c. may be modulated by the presence or absence of another neurotransmitter.
d. Both *b* and *c* are true.

ANS: D DIF: Medium REF: Synaptic Transmission
OBJ: LO 5 MSC: Understanding

31. Which of the following is NOT a mechanism for removing a neurotransmitter from the synaptic cleft?
a. diffusion of the neurotransmitter away from the synapse
b. active reuptake of the neurotransmitter back into the presynaptic terminal
c. enzymatic breakdown of the neurotransmitter in the synaptic cleft
d. transport of the neurotransmitter by ion channels into neighboring glial cells

ANS: D DIF: Medium REF: Synaptic Transmission
OBJ: LO 5 MSC: Understanding

32. Many drugs produce their effects by facilitating or interfering with neurotransmitters at synapses. Which of the following drugs would most likely increase the effect of serotonin?

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a. a drug that binds to directly coupled serotonin receptors but does not change membrane permeability
b. a drug that prevents the activity of an enzyme that breaks down serotonin molecules in the synaptic cleft
c. a drug that blocks the effect of Ca^{2+} ions
d. a drug that blocks the effect of a conditional neurotransmitter that normally facilitates the effect of serotonin

ANS: B DIF: Difficult REF: Synaptic Transmission
OBJ: LO 5 MSC: Applying

33. The morphology of the brain of Albert Einstein revealed an unusual Sylvian fissure—the division that separates the _____ lobe from the _____ lobes.
a. occipital ; frontal and parietal
b. temporal ; frontal and parietal
c. frontal ; temporal and occipital
d. parietal ; temporal and occipital

ANS: B DIF: Easy REF: The Cerebral Cortex
OBJ: LO 11 MSC: Remembering

34. The thick outer membrane that encloses the brain within the skull is the
a. gray matter.
b. white matter.
c. myelin sheath.
d. dura mater.

ANS: D DIF: Easy REF: Overview of Nervous System Structure
OBJ: LO 7 MSC: Remembering

35. The difference between gray matter and white matter is that *gray matter* refers to _____, whereas *white matter* refers to _____.
a. protruding rounded surfaces ; fissures and invaginations
b. fissures and invaginations ; protruding rounded surfaces
c. cell bodies ; axons and glial cells
d. axons and glial cells ; cell bodies

ANS: C DIF: Easy REF: Overview of Nervous System Structure
OBJ: LO 7 MSC: Remembering

36. Gray matter is to white matter as _____ are to _____.
a. gyri ; sulci
b. glial cells ; neurons
c. cell bodies ; axon tracts
d. oligodendrocytes ; Schwann cells

ANS: C DIF: Medium REF: Overview of Nervous System Structure
OBJ: LO 7 MSC: Understanding

37. Neurons in two different regions of Brodmann's cytoarchitectonic map always
a. use different types of neurotransmitters to communicate.
b. differ in cell morphology and organization.
c. lie inside different lobes of the cerebral cortex.
d. are separated by fissures in the cortex.

ANS: B DIF: Easy REF: The Cerebral Cortex
OBJ: LO 11 MSC: Remembering

38. The two main divisions of the central nervous system are the
a. forebrain and brainstem.
b. white matter and gray matter.
c. brain and spinal cord.
d. cerebral hemispheres and cerebellum.

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ANS: C DIF: Easy REF: Overview of Nervous System Structure
OBJ: LO 7 MSC: Remembering

39. All of the following are advantages of a folded cerebral cortex EXCEPT
    a. the need for blood vasculature in the cortex is eliminated.
    b. neural conduction time between areas is reduced.
    c. neurons are brought into closer three-dimensional relationships.
    d. more cortical surface can be packed into the skull.

ANS: A DIF: Medium REF: The Cerebral Cortex
OBJ: LO 7 MSC: Understanding

40. The most caudal lobe of the cerebral cortex is the _____ lobe.
    a. frontal
    b. temporal
    c. occipital
    d. parietal

ANS: C DIF: Medium REF: A Guided Tour of the Brain
OBJ: LO 7 | LO 11 MSC: Understanding

41. The temporal lobe likely bears this name because
    a. it is the brain's center for temporal processing.
    b. its functions are particularly susceptible to the effects of aging.
    c. it lies beneath the area of the scalp where hair grays with age.
    d. its neurons fire more quickly than neurons in other brain regions.

ANS: C DIF: Easy REF: The Cerebral Cortex
OBJ: LO 11 MSC: Remembering

42. The central sulcus is an anatomical landmark that separates the _____ lobe from the _____ lobe.
    a. temporal ; frontal
    b. frontal ; parietal
    c. parietal ; occipital
    d. occipital ; temporal

ANS: B DIF: Easy REF: The Cerebral Cortex
OBJ: LO 11 MSC: Remembering

43. The term *cytoarchitectonics* refers to
    a. how cells in one brain region appear morphologically and how they are arranged with respect to each other.
    b. how assemblies of neurons function together and how they communicate with neighboring ganglia.
    c. how different brain regions differ in volume and how they interact to produce complex cognitive phenomena.
    d. how the brains of different animals differ from each other in gross anatomy and the evolutionary bases of these differences.

ANS: A DIF: Medium REF: The Cerebral Cortex
OBJ: LO 11 MSC: Remembering

44. Of the following choices, the most anterior portion of the frontal lobes—the prefrontal cortex—is most critical to
    a. processing information about pain, touch, and temperature.
    b. executive functions.
    c. the "what" visual pathway.
    d. the "where" visual pathway.

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ANS: B DIF: Easy REF: The Cerebral Cortex
OBJ: LO 11 MSC: Remembering

45. Communication between the two hemispheres of the brain occurs mainly through the
a. basal ganglia.
b. cingulate gyrus.
c. corpus callosum.
d. limbic system.

ANS: C DIF: Easy REF: Overview of Nervous System Structure
OBJ: LO 7 MSC: Remembering

46. The corpus callosum
a. permits communication between the two cerebral hemispheres.
b. is the area of the cortex in which information about touch, pain, temperature, and limb position is processed.
c. separates the temporal lobe from the frontal and parietal lobes.
d. is a fluid-filled chamber that cushions and supports the brain.

ANS: A DIF: Easy REF: Overview of Nervous System Structure
OBJ: LO 7 MSC: Remembering

47. The primary visual cortex, or V1, is located in
a. the striate cortex.
b. Brodmann area 17.
c. the calcarine fissure.
d. all of the above.

ANS: D DIF: Easy REF: The Cerebral Cortex
OBJ: LO 11 MSC: Remembering

48. The neocortex typically contains _____ cortical layers, with _____ typically being the input layer.
a. 10 ; layer IV
b. 10 ; layer I
c. 6 ; layer IV
d. 6 ; layer I

ANS: C DIF: Easy REF: The Cerebral Cortex
OBJ: LO 11 MSC: Remembering

49. The frontal lobe is _____ to the occipital lobe, whereas the temporal lobe is _____ to the parietal lobe.
a. posterior ; superior
b. anterior ; inferior
c. superior ; caudal
d. inferior ; rostral

ANS: B DIF: Easy REF: The Cerebral Cortex
OBJ: LO 11 MSC: Remembering

50. All of the following terms refer to the same cortical region that processes visual input EXCEPT
a. striate cortex.
b. area V1.
c. Heschl's gyrus.
d. Brodmann area 17.

ANS: C DIF: Medium REF: The Cerebral Cortex
OBJ: LO 11 MSC: Remembering

51. Cerebrospinal fluid (CSF) is produced in the lateral and third ventricles by the
a. dura mater.
b. substantia nigra.
c. globus pallidus.
d. choroid plexus.

ANS: D DIF: Easy REF: A Guided Tour of the Brain
OBJ: LO 7 MSC: Remembering

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52. A patient reports that she is functionally blind after a focal brain injury, even though her eyes and optic nerves are completely intact. Of the structures listed here, the most probable location for the brain injury is the
    a. inferior colliculus.
    b. lateral geniculate nucleus.
    c. superior temporal lobe.
    d. postcentral gyrus.

    ANS: B DIF: Difficult REF: A Guided Tour of the Brain
    OBJ: LO 9 MSC: Applying

53. The part of the thalamus that is most important in relaying information to the primary visual cortex is the
    a. lateral geniculate nucleus.
    b. superior colliculus.
    c. medial geniculate nucleus.
    d. inferior colliculus.

    ANS: A DIF: Easy REF: A Guided Tour of the Brain
    OBJ: LO 9 MSC: Remembering

54. The primary auditory cortex is organized using a tonotopic map, which means that there is an orderly representation of
    a. loudness.
    b. frequency.
    c. duration.
    d. spatial location.

    ANS: B DIF: Easy REF: The Cerebral Cortex
    OBJ: LO 11 MSC: Remembering

55. Following a focal brain injury, a patient shows great difficulty in discriminating tones that differ in frequency. Which area of the cortex is most likely affected?
    a. the superior temporal lobe
    b. the inferior temporal lobe
    c. the anterior parietal lobe
    d. the posterior parietal lobe

    ANS: A DIF: Medium REF: The Cerebral Cortex
    OBJ: LO 11 MSC: Applying

56. The volume of cortex that is not sensory or motor has traditionally been termed _____ cortex.
    a. extrastriate
    b. cognitive
    c. association
    d. equipotential

    ANS: C DIF: Easy REF: The Cerebral Cortex
    OBJ: LO 11 MSC: Remembering

57. All of the structures listed here are major components of the basal ganglia EXCEPT the
    a. globus pallidus.
    b. amygdala.
    c. caudate nucleus.
    d. putamen.

    ANS: B DIF: Easy REF: A Guided Tour of the Brain
    OBJ: LO 10 MSC: Remembering

58. As a result of a brain injury to the medial temporal lobes and neighboring subcortical structures, a patient exhibits a number of cognitive and behavioral changes. Of the options here, which is the LEAST likely to be affected?
    a. memory
    b. emotional processing
    c. learning
    d. somatosensation

    ANS: D DIF: Medium REF: A Guided Tour of the Brain
    OBJ: LO 10 MSC: Applying

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59. This brain structure is often called the gateway to the cortex because almost all sensory inputs synapse here before continuing to their primary cortical sensory areas.
a. hypothalamus
b. hippocampus
c. thalamus
d. amygdala

ANS: C DIF: Easy REF: A Guided Tour of the Brain
OBJ: LO 9 MSC: Remembering

60. Which of the following functions is NOT mediated primarily by the hypothalamus?
a. endocrine system regulation
b. maintenance of homeostatic states in the body
c. relay of sensory information from the body to the cortex
d. hormone control

ANS: C DIF: Medium REF: A Guided Tour of the Brain
OBJ: LO 9 MSC: Understanding

61. As a result of a brain injury to this diencephalic structure, a patient is experiencing disruptions in maintaining homeostasis of bodily states and endocrine control.
a. thalamus
b. hypothalamus
c. hippocampus
d. cingulate gyrus

ANS: B DIF: Medium REF: A Guided Tour of the Brain
OBJ: LO 9 MSC: Applying

62. Injury to the hypothalamus would most likely interfere with
a. hormone regulation.
b. motor control.
c. memory.
d. olfactory sensation.

ANS: A DIF: Medium REF: A Guided Tour of the Brain
OBJ: LO 9 MSC: Understanding

63. The brainstem includes all of the following components EXCEPT the
a. medulla.
b. midbrain.
c. hypothalamus.
d. pons.

ANS: C DIF: Easy REF: A Guided Tour of the Brain
OBJ: LO 8 MSC: Remembering

64. The specialized structures that comprise the midbrain control functions such as
a. hormone regulation.
b. visual reflexes.
c. memory.
d. emotional processing.

ANS: B DIF: Easy REF: A Guided Tour of the Brain
OBJ: LO 8 MSC: Remembering

65. A patient has great difficulty in maintaining his posture, walking, and coordinating his movements. His brain injuries probably involve the
a. cerebellum.
b. corpus callosum.
c. superior colliculus.
d. third ventricle.

ANS: A DIF: Medium REF: A Guided Tour of the Brain
OBJ: LO 8 MSC: Applying

66. Parts of the brain where metabolic activity is relatively high are characterized by

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a. elevated regional blood flow.
b. increased cerebrospinal fluid production.
c. a high degree of myelination.
d. greater concentrations of calcium ions.

ANS: A DIF: Easy REF: The Cerebral Cortex
OBJ: LO 11 MSC: Remembering

67. The dorsal portions of the gray matter in the spinal cord carry
a. motor information.
b. sensory information.
c. motor and sensory information from the dorsal surface of the body.
d. sensory and motor information to the cerebellum.

ANS: B DIF: Easy REF: A Guided Tour of the Brain
OBJ: LO 8 MSC: Remembering

68. This type of early cell line is the precursor to the cells that will compose the nervous system.
a. blastula
b. gastrula
c. endoderm
d. ectoderm

ANS: D DIF: Medium REF: Development of the Nervous System
OBJ: LO 12 MSC: Remembering

69. Which of the following statements regarding the prenatal development of the human nervous system is correct?
a. The brain develops from ectoderm cells, whereas the spinal cord develops from mesoderm cells.
b. Ectoderm cells are the precursors of the entire nervous system.
c. Glial cells are derived from endoderm cells, whereas neurons are derived from ectoderm cells.
d. Mesoderm cells are the precursors for all parts of the human nervous system.

ANS: B DIF: Difficult REF: Development of the Nervous System
OBJ: LO 12 MSC: Understanding

70. The ^{3}H-thymidine labeling method is especially useful in determining when particular cells in the nervous system emerge because
a. only cells that are fully myelinated at the time of injection are radioactively labeled.
b. only glial cells absorb the marker and are radioactively labeled.
c. only cells that are fully mature at the time of injection are radioactively labeled.
d. only cells that are undergoing cell division at the time of injection are radioactively labeled.

ANS: D DIF: Easy REF: Development of the Nervous System
OBJ: LO 12 MSC: Understanding

71. _____ refers to the process of rapid cell division that occurs early in development of the nervous system.
a. Neurulation
b. Neuronal proliferation
c. Neuronal migration
d. Neural determination

ANS: B DIF: Easy REF: Development of the Nervous System
OBJ: LO 12 MSC: Remembering

72. The cells in the brain that guide migrating neurons to their final locations are called

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a. microglia.
b. radial glia.
c. oligodendrocytes.
d. ventricular cells.

ANS: B DIF: Easy REF: Development of the Nervous System
OBJ: LO 12 MSC: Remembering

73. _____ is the idea that the columnar organization in the adult cortex is derived during development from the cells dividing in the ventricular region.
a. Topographic mapping
b. The sensory homunculus
c. The radial unit hypothesis
d. The ventricular zone hypothesis

ANS: C DIF: Easy REF: Development of the Nervous System
OBJ: LO 12 MSC: Remembering

TRUE/FALSE

1. The cell body of a neuron contains the same machinery found in most cells, including a nucleus, ribosomes, and mitochondria.

ANS: T DIF: Easy REF: The Structure of Neurons
OBJ: LO 1 MSC: Remembering

2. Dendrites, which are large treelike processes extending from a neuron, are said to be presynaptic.

ANS: F DIF: Easy REF: Neuronal Signaling
OBJ: LO 1 MSC: Remembering

3. Action potentials are electrical signals that are conducted down the axon of a neuron.

ANS: T DIF: Easy REF: Neuronal Signaling
OBJ: LO 1 | LO 3 MSC: Remembering

4. The term *selective permeability* refers to the fact that a cell membrane will allow some ions to pass through more readily than others.

ANS: T DIF: Easy REF: Neuronal Signaling
OBJ: LO 1 | LO 2 MSC: Remembering

5. The resting potential of a neuron is typically +40 to +90 millivolts (mV).

ANS: F DIF: Easy REF: Neuronal Signaling
OBJ: LO 1 | LO 3 MSC: Remembering

6. The *equilibrium potential* is the membrane voltage at which there is no net flow of ions in or out.

ANS: T DIF: Easy REF: Neuronal Signaling
OBJ: LO 1 | LO 2 | LO 3 MSC: Remembering

7. Hyperpolarization makes the inside of a cell more positive and more likely to generate an action potential.

ANS: F DIF: Easy REF: Neuronal Signaling
OBJ: LO 2 | LO 3 | LO 4 MSC: Remembering

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8. The amplitude of an action potential is directly proportional to the size of the initial depolarization that produced it.

   ANS: F DIF: Easy REF: Neuronal Signaling
   OBJ: LO 2 | LO 3 MSC: Remembering

9. If the sum of the excitatory postsynaptic potentials (EPSPs) causes a postsynaptic neuron to reach its threshold, then the postsynaptic neuron will generate an action potential.

   ANS: T DIF: Easy REF: Neuronal Signaling
   OBJ: LO 3 MSC: Understanding

10. Communication between two neurons is always achieved through chemical, and not electrical, mechanisms.

    ANS: F DIF: Easy REF: Synaptic Transmission
    OBJ: LO 5 MSC: Remembering

11. Neural inputs that target the cortex and originate in the thalamus are referred to as *corticothalamic*.

    ANS: F DIF: Easy REF: The Bigger Picture
    OBJ: LO 11 MSC: Remembering

12. Sulci are the protruding rounded surfaces of the cortex, and gyri are the fissures and invaginations between the sulci.

    ANS: F DIF: Easy REF: The Cerebral Cortex
    OBJ: LO 11 MSC: Remembering

13. The term *commissure* refers to the white matter tracts that connect the brain and spinal cord.

    ANS: F DIF: Easy REF: Overview of Nervous System Structure
    OBJ: LO 7 MSC: Remembering

14. The hippocampus is considered part of the neocortex.

    ANS: F DIF: Easy REF: A Guided Tour of the Brain
    OBJ: LO 10 MSC: Remembering

15. During development, a structure called the *blastula* begins to form when the neural plate invaginates via neural folds being pushed up at its border.

    ANS: F DIF: Easy REF: Development of the Nervous System
    OBJ: LO 12 MSC: Remembering

SHORT ANSWER

1. Describe the structure of a prototypical neuron. In your answer, provide definitions for the following terms: *soma, axon, dendrite, myelin,* and *synapse.*

   ANS:
   Answers will vary.

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DIF: Medium REF: The Structure of Neurons OBJ: LO 1
MSC: Analyzing

2. Describe the chemical and electrical properties of an action potential. In your answer, describe the movement of Na^+ ions and K^+ ions across the cell membrane and the resulting changes in electrical potential.

   ANS:
   Answers will vary.

   DIF: Difficult REF: Neuronal Signaling OBJ: LO 2 | LO 3 | LO 4
   MSC: Analyzing

3. Explain the concept of electrochemical equilibrium. How does this concept allow us to understand the transmembrane potentials in neurons?

   ANS:
   Answers will vary.

   DIF: Medium REF: Neuronal Signaling OBJ: LO 2 | LO 3
   MSC: Analyzing

4. What are the major differences between electrotonic conduction and the action potential? Describe how these two processes play out in neural transmission.

   ANS:
   Answers will vary.

   DIF: Medium REF: Neuronal Signaling OBJ: LO 2 | LO 3
   MSC: Analyzing

5. How do two neurons communicate with each other? Describe the process of synaptic transmission, including both chemical and electrical synapses.

   ANS:
   Answers will vary.

   DIF: Medium REF: Synaptic Transmission OBJ: LO 5
   MSC: Analyzing

6. Describe the structure, and explain the function, of three types of glial cells.

   ANS:
   Answers will vary.

   DIF: Medium REF: The Role of Glial Cells OBJ: LO 6
   MSC: Analyzing

7. Histological methods have been used to classify the cerebral cortex into different cytoarchitectonic divisions, such as the Brodmann areas. Can we predict the function of a brain region based on cytoarchitectonics? Why or why not?

   ANS:
   Answers will vary.

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DIF: Difficult REF: The Cerebral Cortex OBJ: LO 11
MSC: Evaluating

8. Choose six of the following eight brain regions. For each region, briefly describe its location in the brain and one of its functions. Draw a picture to accompany your answer.
   - frontal lobe
   - parietal lobe
   - temporal lobe
   - occipital lobe
   - basal ganglia
   - hypothalamus
   - thalamus
   - cerebellum

   ANS:
   Answers will vary.

   DIF: Medium REF: A Guided Tour of the Brain
   OBJ: LO 8 | LO 9 | LO 10 | LO 11 MSC: Analyzing

9. What are the advantages of a cerebral cortex with gyri and sulci? Why might the human cerebral cortex be more heavily folded than those of other mammals?

   ANS:
   Answers will vary.

   DIF: Difficult REF: A Guided Tour of the Brain OBJ: LO 11
   MSC: Evaluating

10. Describe the events following the fertilization of an egg that pertain to the development of the nervous system. In your answer, name the three main types of cell lines found in the blastula and describe what parts of the organism these cells become.

    ANS:
    Answers will vary.

    DIF: Medium REF: Development of the Nervous System
    OBJ: LO 12 MSC: Analyzing

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Chapter 3: Methods of Cognitive Neuroscience

MULTIPLE CHOICE

LEARNING OBJECTIVES

1. Identify the goals and focuses of cognitive psychology
2. Explain mental representations and transformations, and give examples of each
3. Describe how naturally occurring and experimentally derived lesions can increase our understanding of the functional roles of brain regions
4. Describe and distinguish among the causes and symptoms of different types of brain damage, including strokes, tumors, degenerative disorders, neurological trauma, and epilepsy
5. Distinguish between single and double dissociations, and understand why they are important for elucidating brain structure–function relationships
6. Understand the advantages and disadvantages of investigations that perturb brain function through drugs, magnetic or electrical stimulation, and genetic manipulation
7. Explain how computed tomography is used to image the structure of the brain
8. Describe what MRI and DTI can, and cannot, reveal about brain structure
9. Understand the uses and advantages of single-cell and multiunit recordings
10. Explain how EEG, ERP, and ECoG signals reflect electrical activity of the brain
11. Identify the advantages of using MEG to measure electrical activity of neuronal populations
12. Explain how radioactive tracers are used in PET to measure metabolic brain activity, and give examples of popular tracers
13. Describe how fMRI uses the hemodynamic response to identify changes in neuronal activity
14. Discuss the uses and advantages of employing computer models to understand cognitive processes

1. The field of _____ is based on the idea that perception and thought employ mental representations that undergo transformations as they are used.
   a. neuropsychology
   b. computer modeling
   c. cognitive psychology
   d. neuroimaging

   ANS: C DIF: Easy REF: Cognitive Psychology and Behavioral Methods
   OBJ: LO 1 | LO 2 MSC: Understanding

2. Posner and his colleagues had participants view two letters and respond according to whether these letters were both vowels, both consonants, or one of each. Participants were fastest when viewing two physically identical letters, somewhat slower when viewing the same letter in two different fonts, and slowest in the case where two different consonants were presented. This finding shows that
   a. we form multiple representations of stimuli.
   b. we form representations of stimuli based only on their physical attributes.

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