Chapter 2: Cognitive Neuroscience and Cognitive Science

Multiple Choice Questions:

1. Neurologically, a dissociation is when _____.
   a. one component of mental functioning is disrupted, but others are not
   b. the activities of the mind can be separated from those of the body
   c. different neural processes operate separately
   d. neuroimaging can be isolated from neurophysiology

Page: 33
Type: factual
Answer: a

2. When there is a disruption of one mental process (but not others) due to brain damage, this is called a _____.
   a. association
   b. dissociation
   c. partonomy
   d. finding

Page: 33
Type: conceptual
Answer: b

3. If one patient has a neurological disruption of mental process A but not mental process B, and another patient has a neurological disruption of mental process B, but not mental process A, this is called _____.
   a. a double blind study
   b. transcranial activity
   c. a double dissociation
   d. morphological distinction

Page: 33
Type: conceptual
Answer: c

4. What are the basic building blocks of the nervous system?
   a. neurotransmitters
   b. neurons
   c. dendrites
   d. action potentials

Page: 34
Type: factual
Answer: b

5. _____ is the cell that is specialized for receiving and transmitting a neural impulse.
   a. Synapse
   b. Myelin
   c. Neuron
   d. Node

Page: 34
Type: factual
Answer: c

6. How many neurons does a typical person have in his or her brain?
    a. millions
    b. trillions
    c. thousands
    d. billions

Page: 34
Type: conceptual
Answer: d

7. How many neural connections exist in each person's brain?
    a. billions
    b. thousands
    c. millions
    d. trillions

Page: 34
Type: factual
Answer: d

8. Information comes into a neuron through the _____.
    a. axon
    b. dendrites
    c. myelin sheath
    d. nodes of Ranvier

Page: 34
Type: factual
Answer: b

9. A neuron's myelin (if it has any) is produced by _____.
    a. the axon
    b. dendrites
    c. other neurons
    d. glial cells

Page: 34
Type: factual
Answer: d

10. Unmyelinated neurons correspond to _____.
    a. dark matter
    b. dark energy
    c. gray matter
    d. white matter

Page: 36
Type: factual
Answer: c

11. What kinds of neurons are most commonly found in the brain?
    a. sensor neurons
    b. motor neurons
    c. dissociation neurons
    d. interneurons

Page: 36
Type: factual
Answer: d

12. What is it called when a neuron fires?
    a. synapsing
    b. excitation
    c. inhibition
    d. an action potential

Page: 36
Type: factual
Answer: d

13. A neuron has a resting potential of _____.
    a. – 70 mV
    b. 0 mV
    c. + 30 mV
    d. + 170 mV

Page: 36
Type: factual
Answer: a

14. A _____ is NOT a type of cell.
    a. synapse
    b. receptor
    c. effector
    d. interneuron

Page: 36
Type: factual
Answer: a

15. When an action potential moves down a neuron, the action potential is said to be _____.
    a. transmitted
    b. propagated
    c. activated
    d. motivated

Page: 37
Type: conceptual
Answer: b

16. Neuronal action potentials follow _____.
    a. temporal markers
    b. the all or none principle
    c. in sequence
    d. an encoding stage

Page: 37
Type: conceptual
Answer: b

17. The region where neurotransmitters cross from one neuron to another is called the _____.
    a. dendrite
    b. axon
    c. neurotransmitter
    d. synapse

Page: 37
Type: factual
Answer: d

18. The typical size of a synapse is _____.
    a. 100–200 millimeters
    b. 100–200 angstroms
    c. 5–10 picoleptors
    d. 25–35 picoleptors

Page: 37
Type: factual
Answer: b

19. Typical neurons in the cortex synapse with how many other neurons?
    a. 1–6
    b. 1,000,000–2,000,000
    c. 100–15,000
    d. 20–30

Page: 37
Type: factual
Answer: c

20. The synapsing of a give neuron with many other neurons is called _____.
    a. multiplicity
    b. magnification
    c. divergence
    d. diffusion

Page: 37
Type: factual
Answer: c

21. What is the name of chemicals that accentuate or diminish the effects of neurotransmitters?
    a. neuromodulators
    b. magnifiers
    c. diminishers
    d. proto-neurotransmitters

Page: 38
Type: factual
Answer: a

22. What is acetylcholine an important neurotransmitter for?
    a. creating new neurons
    b. memory enhancement
    c. slowing the spread of neural activity
    d. mammals

Page: 38
Type: factual
Answer: b

23. What of the following is an excitatory neurotransmitter that is important for memory formation?
    a. dendrition
    b. magnesium
    c. glutamate
    d. GABA

Page: 38
Type: factual
Answer: c

24. What of the following is an inhibitory neurotransmitter that is important for memory formation?
    a. carbon
    b. magnesium
    c. glutamate
    d. GABA

Page: 39
Type: factual
Answer: d

25. Which memory formation process is for the temporary retention of information?
    a. consolidation
    b. long-term potentiation
    c. reconsolidation
    d. short-term potentiation

Page: 39
Type: conceptual
Answer: b

26. Which type of memory process is most likely disrupted by a blow to the head?
    a. consolidation
    b. long-term potentiation
    c. reconsolidation
    d. short-term potentiation

Page: 39
Type: conceptual
Answer: b

27. What process does long-term potentiation (LTP) reflect?
    a. the creation of new AMPA receptors
    b. the creation of new NMDA receptors
    c. the expansion of axon terminals
    d. the high loading of neurotransmitters

Page: 39
Type: conceptual
Answer: a

28. What is the name of the process that creates durable memories?
    a. long-term potentiation
    b. neural plasticity
    c. pruning
    d. consolidation

Page: 40
Type: conceptual
Answer: d

29. How long is long-term potentiation (LTP)?
    a. angstroms
    b. millimeters
    c. days
    d. years

Page: 40
Type: conceptual
Answer: c

30. Memory consolidation in the nervous system is aided by _____.
    a. activity
    b. sleep
    c. inhibition
    d. stem cells

Page: 40
Type: factual
Answer: b

31. The top layer of the brain, responsible for higher-level mental processes, is _____.
    a. neocortex
    b. brainstem
    c. corpus callosum
    d. parietal lobe

Page: 41
Type: factual
Answer: a

32. The part of the brain responsible for governing functions such as digestion, heartbeat, and breathing is the _____.
    a. cerebellum
    b. parietal lobe
    c. corpus callosum
    d. brainstem

Page: 42
Type: factual
Answer: d

33. The structure known as the "gateway to the cortex" is the _____.
    a. thalamus
    b. brainstem
    c. hippocampus
    d. fissure of Rolando

Page: 42
Type: factual
Answer: a

34. The primary bridge across which messages pass between the left and right halves of the cortex is the _____.
    a. thalamus
    b. corpus callosum
    c. hippocampus
    d. hypothalamus

Page: 42
Type: factual
Answer: b

35. The subcortical structure important for memory is the _____.
    a. thalamus
    b. corpus callosum
    c. hippocampus
    d. hypothalamus

Page: 42
Type: factual
Answer: c

36. The hippocampus is important for _____.
    a. memory
    b. emotion
    c. vision
    d. hearing

Page: 42
Type: factual
Answer: a

37. The amygdala is important for _____.
    a. memory
    b. emotion
    c. vision
    d. hearing

Page: 42
Type: factual
Answer: b

38. The subcortical structure important for emotion is the _____.
    a. amygdala
    b. corpus callosum
    c. hippocampus
    d. hypothalamus

Page: 42
Type: factual
Answer: a

39. Which of the following is NOT a lobe of the brain?
    a. lateral
    b. parietal
    c. temporal
    d. occipital

Page: 43
Type: factual
Answer: a

40. Which of the following is NOT a lobe of the cortex?
    a. frontal
    b. parietal
    c. occipital
    d. amygdala

Page: 43
Type: factual
Answer: d

41. Which lobe of the cortex is most important for vision?
    a. frontal
    b. parietal
    c. occipital
    d. temporal

Page: 43
Type: factual
Answer: c

42. Which lobe of the cortex is most important for memory?
    a. frontal
    b. parietal
    c. occipital
    d. temporal

Page: 43
Type: factual
Answer: d

43. What is the name of the numbering system used to identify different locations in the cortex?
    a. Brodmann's areas
    b. The American Cortical Numeration (ACN)
    c. Freud's index
    d. Catalog of Cortical Areas

Page: 43
Type: factual
Answer: a

44. The receptive and control centers for one side of the body are in the opposite hemisphere of the brain. This is referred to as _____.
    a. double dissociation
    b. corpus callosum
    c. hemispheric specialization
    d. contralaterality

Page: 44
Type: factual
Answer: d

45. Contralateral connections refer to _____.
    a. the idea that the body is represented in an inverted form in the brain
    b. the ways in which one hemisphere of the brain is largely hooked up to the same side of the body
    c. signals crossing from one half of the brain to the other over the corpus callosum
    d. two theories that are in opposition to one another

Page: 44
Type: conceptual
Answer: b

46. The specialization of function between the left and right hemispheres is known as _____.
    a. dissociation
    b. corpus callosum
    c. hemispheric specialization
    d. hemispatial neglect

Page: 45
Type: factual
Answer: c

47. Cerebral lateralization is the idea that _____.
    a. different functions depend more on one hemisphere than the other in the brain
    b. brain states tend to drive people toward one political opinion or the other
    c. there is more cerebral activity on the sides of the brain than in the middle
    d. the brain has two halves

Page: 45
Type: conceptual
Answer: a

48. One form of surgical intervention to combat severe epilepsy is _____.
    a. appendectomy
    b. severing the corpus callosum
    c. hemispherectomy
    d. frontal lobotomy

Page: 46
Type: factual
Answer: b

49. Sperry (1964) examined patients who had their corpus callosum severed. He was interested in investigating _____.
    a. cerebral lateralization
    b. animus
    c. basic functions (e.g., breathing, heart rate, temperature regulation)
    d. Penfield stimulation

Page: 46
Type: factual
Answer: a

50. Penfield is famous for his work on _____.
    a. color vision
    b. sensory–motor reflex arc
    c. basic functions (breathing, heart rate, temperature regulation)
    d. direct stimulation

Page: 48
Type: factual
Answer: d

51. The _____ is the part of the brain responsible for processing touch information from throughout the body.
    a. occipital lobe
    b. cerebellum
    c. sensory cortex
    d. motor cortex

Page: 48
Type: factual
Answer: c

52. The _____ is the part of the brain responsible for processing voluntary movement information for throughout the body.
    a. occipital lobe
    b. cerebellum
    c. sensory cortex
    d. motor cortex

Page: 48
Type: factual
Answer: d

53. Mirror neurons are active when _____.
    a. a person performs an action
    b. a person watches another person doing an action
    c. a person plans a movement
    d. all of the above

Page: 49
Type: conceptual
Answer: d

54. The dorsal pathway in vision is responsible for processing _____ information.
    a. "where"
    b. "what"
    c. "who"
    d. "when"

Page: 49
Type: factual
Answer: a

55. Visual information about where something is located is processed by the _____ pathway.
    a. medial
    b. posterior
    c. forsal
    d. ventral

Page: 49
Type: factual
Answer: c

56. The ventral pathway in vision is responsible for processing _____ information.
    a. "where"
    b. "what"
    c. "who"
    d. "when"

Page: 49
Type: factual
Answer: b

57. Visual information about what something is gets processed by the _____ pathway.
    a. medial
    b. posterior
    c. dorsal
    d. ventral

Page: 49
Type: factual
Answer: c

58. What is an emergent property?
    a. an activity that occurs only when it is allowed to emerge
    b. a newly developing skill
    c. a property that emerges when several smaller units work together
    d. a newly developing feature

Page: 50
Type: factual
Answer: c

59. What is a process that occurs when several smaller units work together?
    a. mirror neurons
    b. emergent property
    c. embodied cognition
    d. cortical stimulation

Page: 50
Type: conceptual
Answer: b

60. What does a CT scan use x-rays to measure?
    a. brain structure
    b. blood flow
    c. electrical activity
    d. personality characteristics

Page: 51
Type: factual
Answer: a

61. Which neuroimaging technique uses x-rays to measure brain structure?
    a. CT scan
    b. MRI scan
    c. fMRI scan
    d. PET scan

Page: 51
Type: factual
Answer: a

62. What does an MRI scan use magnetic fields to measure?
    a. brain structure
    b. blood flow
    c. electrical activity
    d. personality characteristics

Page: 51
Type: factual
Answer: a

63. Which neuroimaging technique uses magnetic fields to measure brain structure?
    a. CT scan
    b. MRI scan
    c. fMRI scan
    d. PET scan

Page: 51
Type: factual
Answer: b

64. Which neuroimaging technique provides good "when" information but not very good "where" information?
    a. ERP
    b. CT scan
    c. fMRI
    d. the Penfield technique

Page: 52
Type: conceptual
Answer: a

65. Which of the following techniques would NOT provide information about brain structure?
    a. CT scan
    b. ERP recordings
    c. Neurosurgery
    d. MRI scan

Page: 52
Type: factual
Answer: b

66. What does a single cell recording measure?
    a. brain structure
    b. blood flow
    c. electrical activity
    d. personality characteristics

Page: 52
Type: factual
Answer: c

67. Which neuroimaging technique uses electrical charges to measure neural activity?
    a. CT scan
    b. MRI scan
    c. fMRI scan
    d. single cell recordings

Page: 52
Type: factual
Answer: d

68. What do event-related potentials (ERPs) measure?
    a. brain structure
    b. blood flow
    c. electrical activity
    d. neurogenesis

Page: 52
Type: factual
Answer: c

69. Which neuroimaging technique uses electrical activity to measure neural activity?
    a. CT scan
    b. MRI scan
    c. ERP recordings
    d. special populations

Page: 52
Type: factual
Answer: c

70. Which of the following does NOT use electrical charges to measure neural activity?
    a. single cell recordings
    b. MRI scan
    c. ERP recordings
    d. TMS

Page: 52
Type: factual
Answer: b

71. Which part of an ERP recording indicates surprise, incongruence, or unexpectedness?
    a. P600
    b. N400
    c. all of it
    d. none of it: ERPs record baseline activity only.

Page: 53
Type: factual
Answer: b

72. What is transcranial magnetic stimulation (TMS) used for?
    a. altering brain structure
    b. changing blood flow levels
    c. altering electrical activity
    d. reducing neurogenesis

Page: 54
Type: factual
Answer: c

73. Which neuroimaging technique uses magnetic fields to disrupt normal electrical activity in the brain?
    a. CT scan
    b. MRI scan
    c. ERP recordings
    d. TMS

Page: 54
Type: factual
Answer: d

74. Which of the following does NOT use metabolic charges to measure neural activity?
    a. PET scan
    b. MRI scan
    c. ERP recording
    d. none of the above

Page: 54
Type: factual
Answer: b

75. What is the name of the signal from an fMRI recording that indicates level of brain activity?
    a. BOLD
    b. N400
    c. neural spike
    d. brain waves

Page: 54
Type: factual
Answer: a

76. Which neuroimaging technique uses blood flow to measure neural activity?
    a. PET scan
    b. MRI scan
    c. ERP recording
    d. TMS

Page: 54
Type: factual
Answer: a

77. Which neuroimaging technique uses radioactive isotopes to measure blood flow in the brain?
    a. CT scan
    b. MRI scan
    c. fMRI scan
    d. PET scan

Page: 54
Type: factual
Answer: d

78. Which neuroimaging technique uses blood flow to measure neural activity?
    a. MRI scan
    b. fMRI scan
    c. ERP recording
    d. TMS

Page: 54
Type: factual
Answer: b

79. Which neuroimaging technique uses magnetic fields to measure blood flow in the brain?
    a. CT scan
    b. MRI scan
    c. fMRI scan
    d. PET scan

Page: 54
Type: factual
Answer: c

80. Which technique uses brain damage to make inferences about neural activity?
    a. direct stimulation
    b. lesioning
    c. PET scans
    d. neuroreduplication

Page: 56
Type: factual
Answer: b

81. Which technique uses electrical impulses to assess brain functionality?
    a. direct stimulation
    b. lesioning
    c. ERP induction
    d. the Penfield withdrawal technique

Page: 56
Type: factual
Answer: a

82. What is a way to study how different brain structures influence cognition without studying people with lesions or other kinds of brain damage?
    a. narcotics
    b. stimulants
    c. psychotropics
    d. special populations

Page: 56
Type: factual
Answer: d

83. _____ is a computer-based technique for modeling complex systems in which knowledge is represented by the strength of the excitatory or inhibitory connections between massively interconnected nodes.
    a. Coaxial modeling
    b. Computer-aided modeling
    c. Connectionist modeling
    d. Associationist modeling

Page: 57
Type: factual
Answer: c

84. Which of the following does NOT go with the others?
    a. connectionist models
    b. neural net models
    c. parallel distributed processing models
    d. mental models

Page: 57
Type: conceptual
Answer: d

True/False Questions:

85. If one mental process is disrupted by brain damage and others are not, this is called a dissociation. TRUE (p. 33)
86. Myelin sheaths are created by glial cells. TRUE (p. 34)
87. Every action potential is the same. TRUE (p. 37)
88. The action potential occurs at the synapse. FALSE (p. 37)
89. GABA is an excitatory neurotransmitter involved in memory and learning. FALSE (p. 39)
90. Long-term potentiation has a shorter duration than consolidation. TRUE (p. 40)
91. The cerebral cortex is wrinkled in order to increase the surface area in a small volume. TRUE (p. 42)
92. "Language on the left" refers to contralaterality. FALSE (p. 55)
93. The different areas of the cortex are specialized for different kinds of neural computation. TRUE (p. 45)
94. Each hemisphere of the brain is a single sheet of neural tissue; the lobes are merely separated by larger folds and convolutions of the cortex. TRUE (p. 44)
95. Hemispheric specialization refers to the fact that the receptive and control centers for one side of the body are in the opposite hemisphere of the brain. FALSE (p. 45)
96. All neuroimaging measures are focused on revealing structure. FALSE (p. 52)
97. PET scans involve the injection of a radioactive isotope into the bloodstream. TRUE (p. 55)
98. An advantage of computer modeling is that it forces theorists to be very explicit. TRUE (p. 57)
99. Connectionist models are inspired by the structure of the brain and neural communication. TRUE (p. 57)
100. Connectionist models have been verified using fMRI recordings. FALSE (p. 57)

Fill in the Blank/Short Answer:

101. A disruption of one mental process, but not others, as a result of brain damage is called a(n) _____. (DISSOCIATION)
102. What sort of effect is needed to show that two neurological processes are independent? (DOUBLE DISSOCIATION)
103. For a neuron, information may come in the _____ and out the _____. (DENDRITES; AXON)
104. Draw a picture of a neuron. Label at least five of the important components.
105. What is the name of the process generated when a neuron fires? (ACTION POTENTIAL)
106. What is the name of a neurotransmitter important for memory formation? (GLUTAMATE)
107. Long-term potentiation involves the creation of new _____ receptors. (AMPA)
108. The four major lobes of the brain are: FRONTAL, _____, _____, and _____. (TEMPORAL; PARIETAL; OCCIPITAL)
109. List three different types of data sources that cognitive psychologists have used to learn about hemispheric lateralization: _____, _____, and _____. (any of: LESION, DIRECT STIMULATION, ERP, fMRI, CT, PET, etc.)
110. Two neuroimaging techniques for assessing brain structure are _____ and_____. (CT scans; MRI scans)
111. The neuroimaging technique that uses EEG recordings to assess changes in brain activity as a function of some external stimulus occurs is called _____. (ERP RECORDING)
112. What is the name of the signal that is derived from an fMRI scan in order to assess the level of activity in a certain part of the brain? (BOLD)

113. How did Penfield assess the functional role of different brain areas? (DIRECT STIMULATION)

Essay Questions:

114. Why is the finding of a double dissociation more informative in cognitive neuroscience than the finding of a single dissociation?
115. What are the implications of long-term potentiation (LTP) and consolidation for how one should go about learning things to last a long time?
116. How can you tell if different areas of the brain are specialized for handling different types of cognition?
117. What are the advantages and limitations of neuroimaging methods to assess cognition?
118. Identify a problem in cognitive psychology and describe how you might use two different neuroimaging techniques to test address this problem.