1. The two main divisions of the human nervous system are the:
   A) central and peripheral.
   B) central nervous system and diencephalon.
   C) diencephalon and telencephalon.
   D) myelencephalon and metencephalon.

2. What component of the human nervous system is known as the “information highway of the body”?
   A) midbrain
   B) spinal cord
   C) central nervous system
   D) peripheral nervous system

3. All of the following are functions of the spinal cord EXCEPT to:
   A) organize motor outflow to muscles.
   B) carry sensory information from the skin.
   C) provide autonomic control of vital body functions.
   D) regulate sleep and wake states.

4. Which of the following statements is NOT a function of the spinal cord as it relates to the body, that is, skin, muscles, joints, and internal organs?
   A) The spinal cord carries sensory information from the body to the brain.
   B) The spinal cord carries motor information from the brain to the body.
   C) The spinal cord modulates sensory information en route from the body to the brain.
   D) The spinal cord initiates motor commands to the body.

5. All of the following are considered primary divisions of the brain EXCEPT the:
   A) hindbrain.
   B) mesencephalon.
   C) diencephalon.
   D) forebrain.

6. The two subdivisions of the hindbrain are the:
   A) myelencephalon and diencephalon.
   B) myelencephalon and metencephalon.
   C) diencephalon and telencephalon.
   D) telencephalon and metencephalon.

7. The two subdivisions of the forebrain are the:
   A) myelencephalon and diencephalon.
   B) myelencephalon and metencephalon.
   C) diencephalon and telencephalon.
   D) telencephalon and metencephalon.

8. The brainstem consists of the following nuclei EXCEPT the:
   A) midbrain.
   B) cerebellum.
   C) pons.
   D) medulla.

9. The brain stem is involved in all of the following functions EXCEPT:
   A) attention.
   B) filtering.
   C) arousal.
   D) behavioral alerting (vigilance).

10. The diencephalon includes all of the following EXCEPT:
    A) hypothalamus.
    B) pituitary gland.
    C) subthalamus.
    D) cerebrum.

11. The cerebellum is important for:
    A) blood pressure.
    B) respiration.
    C) movement and posture.
    D) sleep and wake states.

12. The term *ataxia* refers to:
    A) increased fatigue.
    B) increased respiration.
    C) decreased respiration.
    D) decreased coordination.

13. Danika was recently in a car accident and received a blow to the back of the head. She now exhibits ataxia when she walks, which suggests that there has been further damage to her:
    A) hypothalamus.
    B) cerebellum.
    C) amygdala.
    D) tectum.

14. The two nuclei within the midbrain are the:
    A) tectum and tegmentum.
    B) tectum and ventral tegmental area.
    C) substantia nigra and ventral tegmental area.
    D) tegmentum and substantia nigra.

15. The "roof" of the midbrain is known as the:
    A) cerebellum.
    B) tegmentum.
    C) substantia nigra.
    D) tectum.

16. The _____ is part of the limbic system and contains dopamine.
    A) tectum
    B) tegmentum
    C) substantia nigra
    D) ventral tegmental area

17. The "reward circuit" in the brain is the:
    A) tectum.
    B) tegmentum.
    C) substantia nigra.
    D) ventral tegmental area.

18. The thalamus and hypothalamus are the two subdivisions of the:
    A) myelencephalon.
    B) metencephalon.
    C) diencephalon.
    D) telencephalon.

19. All of the following are hypothalamic functions EXCEPT:
    A) motor control.
    B) body temperature regulation.
    C) drinking regulation.
    D) sexual behavior.

20. Releasing factors are produced by the:
    A) substantia nigra.
    B) ventral tegmental area.
    C) cerebellum.
    D) hypothalamus.

21. The _____ relays sensory signals to the cortex.
    A) thalamus
    B) hypothalamus
    C) spinal cord
    D) cerebellum

22. The relay station between multiple subcortical areas and the cerebral cortex is the:
    A) hypothalamus.
    B) thalamus.
    C) amygdala.
    D) basal ganglia.

23. The basal ganglia and the limbic system are the two subdivisions of the:
    A) myelencephalon.
    B) metencephalon.
    C) diencephalon.
    D) telencephalon.

24. All of the following are the major structures of the basal ganglia EXCEPT for the:
    A) globus pallidus.
    B) thalamus.
    C) putamen.
    D) caudate nucleus.

25. The main function of the basal ganglia is:
    A) regulating sleep and wake states.
    B) gating of sensory information.
    C) integration of movement.
    D) modulating emotions.

26. The major structures of the basal ganglia are sometimes collectively referred to as the:
    A) corpus callosum.
    B) corpus striatum.
    C) corpus christi.
    D) motor nuclei.

27. Which brain region is involved in emotional processing?
    A) amygdala
    B) thalamus
    C) hypothalamus
    D) hippocampus

28. The hypothalamus controls the following functions EXCEPT:
    A) eating.
    B) drinking.
    C) body temperature.
    D) sensation.

29. The hypothalamus is a motivating force behind all the following behaviors, EXCEPT:
    A) the drive to eat.
    B) the drive to drink.
    C) the drive for sex.
    D) the rage response.

30. The second major subdivision of the telencephalon is the:
    A) limbic system.
    B) pons.
    C) cerebellum.
    D) medulla.

31. Which of the following is NOT a member of the limbic system*?*
    A) hypothalamus
    B) amygdala
    C) hippocampus
    D) dopamine-rich reward centers

32. The cingulate cortex is responsible for:
    A) integrating sensory, motor, and emotional information.
    B) regulating heart rate, blood pressure, and respiration.
    C) motivating learning and facing challenges.
    D) monitoring empathy, fairness, and social context.

33. The anterior cingulate cortex is responsible for:
    A) integrating sensory, motor, and emotional information.
    B) regulating heart rate, blood pressure, and respiration.
    C) motivating learning and facing challenges.
    D) monitoring empathy, fairness, and social context.

34. The posterior cingulate cortex is responsible for:
    A) integrating sensory, motor, and emotional information.
    B) regulating heart rate, blood pressure, and respiration.
    C) motivating learning and facing challenges.
    D) monitoring empathy, fairness, and social context.

35. All of the following are the four major lobes of the cerebral cortex EXCEPT:
    A) frontal.
    B) temporal.
    C) parietal.
    D) orbital.

36. The occipital cortex is responsible for:
    A) hearing
    B) vision
    C) working memory
    D) sensory perception

37. The parietal cortex is responsible for:
    A) hearing.
    B) vision.
    C) working memory.
    D) sensory perception.

38. The temporal cortex is responsible for:
    A) hearing.
    B) vision.
    C) working memory.
    D) sensory perception.

39. The frontal cortex is responsible for:
    A) hearing.
    B) vision.
    C) working memory.
    D) sensory perception.

40. All of the following are tasks related to the dorsal-lateral prefrontal cortex EXCEPT:
    A) planning.
    B) executive functions.
    C) working memory.
    D) sensory perception.

41. All of the following are tasks related to the dorsal-lateral prefrontal cortex EXCEPT:
    A) decision making.
    B) emotion regulation.
    C) working memory.
    D) cognitive flexibility.

42. The ventral-lateral prefrontal cortex is responsible for:
    A) motor control.
    B) evaluating rewards.
    C) working memory.
    D) motivation and emotions.

43. The insular cortex is known to process the sense of:
    A) ventral-lateral prefrontal cortex.
    B) dorsal-lateral prefrontal cortex.
    C) insular cortex.
    D) temporal cortex.

44. Von Economo neurons are located in the:
    A) ventral-lateral prefrontal cortex.
    B) dorsal-lateral prefrontal cortex.
    C) insular cortex.
    D) temporal cortex.

45. The Human Connectome Project is an investigation of the connections between:
    A) romantic relationships.
    B) social groups.
    C) memory and language.
    D) various brain regions.

46. The basic cellular unit of the central nervous system is the:
    A) nerve.
    B) tract.
    C) axon.
    D) neuron.

47. The two main cell types in the central nervous system are:
    A) astrocytes and oligodendrocytes.
    B) neurons and glial cells.
    C) glial cells and microglial cells.
    D) ependymal and microglial cells.

48. Which of the following roles best describes glial cells?
    A) support and protection
    B) relay sensory signals
    C) emotional processing
    D) memory processing

49. Which glial cell provides structural support to the central nervous system?
    A) astrocytes
    B) oligodendrocytes
    C) ependymal cells
    D) microglial cells

50. Which glial cell forms the myelin sheath in the central nervous system?
    A) astrocytes
    B) oligodendrocytes
    C) ependymal cells
    D) microglial cells

51. All of the following are roles of astrocytes EXCEPT for those that:
    A) provide nutrients.
    B) maintain the extracellular environment.
    C) regulate neurotransmitter reuptake.
    D) clean up waste products.

52. All of the following are roles of astrocytes EXCEPT:
    A) modulate signal transmission
    B) form the myelin sheath
    C) synapse formation
    D) promote recovery after injury

53. All of the following are roles of microglia EXCEPT for:
    A) pruning neurons.
    B) forming the myelin sheath.
    C) cleaning up damaged cells.
    D) cleaning up debris.

54. Extensive pruning of neurons is characteristic of disorders, such as schizophrenia and Alzheimer's disease. This is likely to involve:
    A) astrocytes.
    B) oligodendrocytes.
    C) ependymal cells.
    D) microglial cells.

55. The nucleus of a neural cell is found in the:
    A) soma.
    B) dendrite.
    C) axon.
    D) presynaptic terminal.

56. The organelles of a neuron is found in the:
    A) soma.
    B) dendrite.
    C) axon.
    D) presynaptic terminal.

57. In a neuron, the dendrites _____ signals, while the axon _____ signals.
    A) delay; amplifies
    B) amplify; delays
    C) receive; transmits
    D) transmit receives

58. Which of the following indicates the correct order of information traveling through a neuron?
    A) Axon; soma; dendrites
    B) Soma; dendrites; axon
    C) Soma; axon; dendrites
    D) Dendrites; soma; axon

59. The myelin sheath _____ signals.
    A) delays
    B) speeds up
    C) blocks
    D) amplifies

60. The myelin sheath covers the:
    A) soma.
    B) dendrites.
    C) axon.
    D) axon terminal.

61. A single neuron may have many _____ and only one _____.
    A) axons; dendrite
    B) dendrites; axon
    C) myelin sheaths; soma
    D) somas; myelin sheath

62. *Neurogenesis* refers to:
    A) formation of new neurons.
    B) rejuvenation of old neurons
    C) coating of the myelin sheath
    D) formation of a new axon

63. The conduction velocity of two neurons was compared. The action potential was conducted much faster in Neuron A than in Neuron B. These data suggest that:
    A) Neuron A is shorter than Neuron B.
    B) Neuron B must possess a myelin sheath.
    C) Neuron B is found in the spinal cord.
    D) Neuron A possesses a myelin sheath.

64. Synaptic vesicles contain:
    A) organelles.
    B) microglia.
    C) neurotransmitters.
    D) enzymes

65. In neurophysiology, exocytosis applies to:
    A) the neural cell body.
    B) the presynaptic terminal of the neural cell.
    C) the vesicles of the neural cell.
    D) both the presynaptic terminal and the vesicles of the neural cell.

66. Exocytosis is initially triggered by:
    A) the synapse.
    B) enzymes.
    C) neurotransmitters.
    D) the action potential.

67. When vesicles fuse with the presynaptic membrane, _____ occurs, that is, the release of the neurotransmitter into the synapse.
    A) endocytosis
    B) exocytosis
    C) synaptic transmission
    D) transport

68. Neurotransmitters are stored in the:
    A) presynaptic terminal.
    B) postsynaptic terminal.
    C) soma.
    D) dendrites.

69. Which of the following indicates the correct order of information traveling between two neurons?
    A) Synaptic cleft, dendrite terminal, axon terminal
    B) Synaptic cleft, axon terminal, dendrite terminal
    C) Axon terminal, synaptic cleft, dendrite terminal
    D) Dendrite terminal, synaptic cleft, axon terminal

70. Which of the following indicates the correct order of information traveling between two neurons?
    A) Receptor attachment, diffuse across synapse, exocytosis
    B) Exocytosis, diffuse across synapse, receptor attachment
    C) Exocytosis, receptor attachment, diffuse across synapse
    D) Diffuse across synapse, receptor attachment, exocytosis

71. Synaptic transmission is a(n) _____ process, and the action potential is a(n) _____ process.
    A) diffusion; enzymatic
    B) enzymatic; diffusion
    C) electrical; chemical
    D) chemical; electrical

72. One of the important roles that autoreceptors have in synaptic transmission is to:
    A) reduce neurotransmitters.
    B) increase neurotransmitters.
    C) slow the action potential.
    D) speed up the action potential.

73. Autoreceptors are located:
    A) inside the presynaptic terminal.
    B) outside the presynaptic terminal.
    C) inside the postsynaptic terminal.
    D) outside the postsynaptic terminal.

74. Autoreceptors also function to:
    A) enhance synthesis and release of neurotransmitter.
    B) reduce the synthesis and additional release of neurotransmitter.
    C) reduce binding at the postsynaptic receptor and produce inhibition at the synapse.
    D) augment synaptic transmission.

75. If an antagonist blocks an autoreceptor, neurotransmitters are:
    A) increased.
    B) blocked.
    C) metabolized.
    D) reuptaked.

76. If an antagonist blocks an autoreceptor, neurotransmitters are:
    A) increased.
    B) blocked.
    C) metabolized.
    D) reuptaked.

77. During synaptic transmission, _____ would cause the ion channels to open, and _____ would cause the synaptic vesicles to fuse with the terminal membrane.
    A) an action potential; neurotransmitters
    B) enzymes; an action potential
    C) an action potential; calcium
    D) calcium; enzymes

78. When ion channels open along the presynaptic terminal, _____ tends to _____.
    A) neurotransmitters; enter the cell.
    B) neurotransmitters; exit the cell.
    C) calcium; enter the cell.
    D) calcium; exit the cell.

79. The two main categories of monoamines are:
    A) acetylcholine and catecholamines.
    B) enkephalins and endorphins.
    C) indoleamines and catecholamines.
    D) acetylcholine and indoleamines.

80. Catecholamines and indoleamines are subtypes of:
    A) purines.
    B) opioids.
    C) monoamines.
    D) indoleamines.

81. Serotonin, dopamine, and epinephrine are types of:
    A) purines.
    B) opioids.
    C) monoamines.
    D) indoleamines.

82. The enkephalins, endorphins, and dynorphins are subcategories of:
    A) purines.
    B) opioids.
    C) monoamines.
    D) indoleamines.

83. The endocannabinoids are known as:
    A) purines.
    B) opioids.
    C) gases.
    D) lipids.

84. All of the following are modulated by acetylcholine EXCEPT:
    A) language.
    B) emotional.
    C) memory.
    D) sensory.

85. Administration of the psychedelic drug scopolamine results in the:
    A) blockade of postsynaptic ACh receptors.
    B) increased degradation of ACh.
    C) decreased synthesis of ACh.
    D) increased levels of ACh.

86. Acetylcholine esterase (AChE) is known to _____ acetylcholine.
    A) metabolize
    B) enhance
    C) synthesize
    D) store

87. Acetylcholine esterase (AChE) is located in the:
    A) presynaptic terminal.
    B) postsynaptic terminal.
    C) soma.
    D) synaptic cleft.

88. Serotonin is a(n) _____, but it is also considered a(n) _____.
    A) indoleamine; monoamine
    B) quaternary amine; monoamine
    C) amino acid; neuropeptide
    D) indoleamine; amino acid

89. Inhibition of acetylcholine esterase (AChE) results in the:
    A) blockade of postsynaptic ACh receptors.
    B) increased degradation of ACh.
    C) decreased synthesis of ACh.
    D) increased levels of ACh.

90. Insecticides produce their effects by:
    A) blocking postsynaptic ACh receptors.
    B) increasing degradation of ACh.
    C) decreasing synthesis of ACh.
    D) increasing levels of ACh.

91. Nerve gas, such as Sarin, produces its effects by:
    A) blocking postsynaptic ACh receptors.
    B) increasing degradation of ACh.
    C) decreasing synthesis of ACh.
    D) increasing levels of ACh.

92. Reversible acetylcholine esterase (AChE) inhibitors are used clinically to treat:
    A) Parkinson's disease.
    B) multiple sclerosis.
    C) muscular dystrophy.
    D) Alzheimer's disease.

93. Muscarinic receptors are:
    A) ionotropic.
    B) metabotropic.
    C) “fast.”
    D) presynaptic.

94. Nicotinic receptors are:
    A) ionotropic.
    B) metabotropic.
    C) “fast.”
    D) presynaptic.

95. Nicotinic receptors are _____, and muscarinic receptors are _____.
    A) metabotropic; ionotropic
    B) ionotropic; metabotropic
    C) “slow”; “fast”
    D) presynaptic; postsynaptic

96. Nicotinic receptors are _____, and muscarinic receptors are _____.
    A) metabotropic; ionotropic
    B) “fast”; “slow”
    C) “slow”; “fast”
    D) presynaptic; postsynaptic

97. Charlena has developed Alzheimer's disease. Current research suggests that she would benefit from drugs that activate the _____ muscarinic receptor.
    A) M_2
    B) M_3
    C) M_4
    D) N_1

98. An experimental lesion is performed in a mouse resulting in a dramatic change in the amount of REM sleep displayed by the animal. Based on what you know about neurotransmitters, the most reasonable conclusion is that the circuit involved must use:
    A) dopamine.
    B) acetylcholine.
    C) glutamate.
    D) GABA.

99. Monoamine oxidase (MAO) is a(n) _____, and acts by _____.
    A) amino acid; degrading
    B) gas; synthesizing
    C) enzyme; degrading
    D) drug; enhancing

100. The catecholamines include all of the following neurotransmitters EXCEPT:
    A) norepinephrine (NE).
    B) dopamine (DA).
    C) serotonin (5-HT).
    D) epinephrine (E).

101. The mechanism of action of the MAO inhibitor antidepressants is to:
    A) blockade of receptors (antagonist action).
    B) blockade of neurotransmitter reuptake (reuptake inhibitor).
    C) blockade of enzymatic breakdown of neurotransmitter.
    D) increase in release of neurotransmitter.

102. The D_1 receptor family includes the _____ receptor subtype.
    A) D_{2A}
    B) D_3
    C) D_4
    D) D_5

103. A new drug has been developed that improves psychotic symptoms in schizophrenics. Based on current knowledge in behavioral pharmacology, the _____ receptor is a possible site of action.
    A) D_1
    B) D_5
    C) D_{2A}
    D) D_{6B}

104. Tyrosine is a precursor to:
    A) acetylcholine.
    B) catecholamines.
    C) indoleamines.
    D) endocannabinoids.

105. Which of the following sequences is in the correct order for the biosynthesis pathway of the catecholamines?
    A) Tyrosine, dopa, dopamine
    B) Dopamine, epinephrine, norepinephrine
    C) Norepinephrine, epinephrine, dopamine
    D) Tyrosine, norepinephrine, dopamine

106. Which of the following sequences is in the correct order for the biosynthesis pathway of the catecholamines?
    A) Dopa , tyrosine, dopamine
    B) Dopamine, norepinephrine, epinephrine
    C) Norepinephrine, epinephrine, dopamine
    D) Tyrosine, norepinephrine, dopamine

107. The brain site responsible for producing the majority of the neurotransmitter norepinephrine (NE) in the brain is the:
    A) raphe nuclei.
    B) substantia nigra.
    C) basal ganglia.
    D) locus coeruleus.

108. Cell bodies of the neurotransmitter norepinephrine (NE) originate from the _____; its precursor, the chemical from which it is directly converted, is _____.
    A) midbrain; l-DOPA
    B) midbrain; dopamine
    C) locus coeruleus; l-DOPA
    D) locus coeruleus; dopamine

109. Dopamine pathways originate in the:
    A) cortex.
    B) limbic system.
    C) brain stem.
    D) thalamus.

110. One dopamine pathway forms the "_____" circuit.
    A) motor
    B) memory
    C) emotion
    D) reward

111. Drugs that affect the neurotransmitter dopamine (DA) are used clinically to treat:
    A) bipolar disorder.
    B) schizophrenia.
    C) panic disorder.
    D) Alzheimer's disease.

112. Antipsychotic medications chiefly affect the neurotransmitter:
    A) NE.
    B) DA.
    C) 5-HT.
    D) E.

113. The neurotransmitters most clearly implicated in reward mechanisms and orienting responses, respectively, are:
    A) 5-HT and DA.
    B) DA and 5-HT.
    C) DA and NE.
    D) NE and DA.

114. Rex has developed an addiction to alcohol. One of the circuits in his brain that is likely to be affected is the pathway from the:
    A) hypothalamus to the pituitary gland.
    B) substantia nigra to the basal ganglia.
    C) ventral tegmental area to the limbic system.
    D) ventral tegmental area to the thalamus.

115. The brain site responsible for producing the majority of the neurotransmitter serotonin (5-HT) in the brain is the:
    A) raphe nuclei.
    B) substantia nigra.
    C) basal ganglia.
    D) locus coeruleus.

116. The neurotransmitter thought to be involved in a variety of processes including sleep, sex, affective disorders, and pain is:
    A) ACh.
    B) DA.
    C) 5-HT.
    D) NE.

117. Which of the following sequences is in the correct order for the biosynthesis pathway of the serotonin?
    A) Tyrosine, tryptophan, 5-hydroxytryptophan
    B) Tryptophan, tyrosine, 5-hydroxytryptamine
    C) Tryptophan, 5-hydroxytryptophan, 5-hydroxytryptamine
    D) 5-hydroxytryptamine, 5-hydroxytryptophan, tryptophan

118. The most common inhibitory and excitatory neurotransmitters in the brain are, respectively:
    A) NE and 5-HT.
    B) NE and GABA.
    C) glutamate and GABA.
    D) GABA and glutamate.

119. Glutamate is an _____ neurotransmitter, which is categorized as a _____.
    A) excitatory; amino acid
    B) excitatory; peptide
    C) inhibitory; amino acid
    D) inhibitory; peptide

120. Given their function, glutamate receptors are:
    A) only metabotropic.
    B) only ionotropic.
    C) either metabotropic or ionotropic.
    D) none of the above.

121. NMDA receptors:
    A) require the presence of glycine to function properly.
    B) involve magnesium ion activation.
    C) require the influx of magnesium ions into the postsynaptic cell.
    D) involve the influx of chloride into the cell.

122. The psychedelic drugs phencyclidine (PCP) and ketamine block receptors for the neurotransmitter:
    A) DA.
    B) NE.
    C) 5-HT.
    D) glutamate.

123. Blockade of the following receptor produces effects ranging from hallucinations to protection from excitotoxicity and head injury:
    A) NMDA.
    B) kainate.
    C) AMPA.
    D) quisqualate.

124. GABA is an _____ neurotransmitter, which is categorized as a _____.
    A) excitatory; amino acid
    B) excitatory; peptide
    C) inhibitory; amino acid
    D) inhibitory; peptide

125. GABA is found in high concentrations in the:
    A) brain
    B) spinal cord
    C) brain and spinal cord
    D) none of the above

126. _____ has been implicated in the pathogenesis, cognitive dysfunction, and negative symptoms of schizophrenia.
    A) GABA
    B) Glutamate
    C) Glycine
    D) Substance P

127. GABA receptors can be:
    A) only metabotropic.
    B) only ionotropic.
    C) either metabotropic or ionotropic.
    D) none of the above.

128. The benzodiazepine anxiolytics and barbiturate sedatives bind to the ligand-gated ion channel for the neurotransmitter:
    A) glutamate.
    B) GABA.
    C) 5-HT.
    D) NE.

129. The endogenous opoids including the enkephalins and endorphins are _____ neurotransmitters.
    A) amino acid
    B) classical
    C) catecholamine
    D) peptide

130. The analgesic and reinforcing properties of morphine is thought to involve the _____ opioid receptor.
    A) delta
    B) omega
    C) kappa
    D) mu

131. Morphine, codeine, and heroin are thought to affect the neurotransmitter called:
    A) glutamate.
    B) GABA.
    C) opioids.
    D) dopamine.

132. Substance P is a type of:
    A) peptide.
    B) enzyme.
    C) catecholamine.
    D) gas.

133. Substance P plays a role in transmitting sensory information, which affects:
    A) taste.
    B) hearing.
    C) vision.
    D) pain.

134. Adenosine plays a role in:
    A) learning.
    B) addiction.
    C) sleep.
    D) emotion.

Answer Key

1. A
2. B
3. D
4. D
5. C
6. B
7. B
8. B
9. B
10. D
11. C
12. D
13. B
14. C
15. D
16. D
17. A
18. C
19. A
20. D
21. A
22. B
23. D
24. B
25. C
26. B
27. A
28. D
29. D
30. A
31. A
32. A
33. D
34. C
35. D
36. B
37. D
38. A
39. C
40. C
41. B
42. A
43. C
44. C

45. D
46. D
47. C
48. A
49. A
50. A
51. D
52. B
53. B
54. D
55. A
56. A
57. C
58. D
59. C
60. C
61. B
62. A
63. D
64. C
65. D
66. D
67. B
68. A
69. C
70. B
71. D
72. D
73. B
74. B
75. A
76. A
77. C
78. C
79. C
80. C
81. C
82. B
83. A
84. C
85. A
86. A
87. A
88. A
89. D
90. A

91. A
92. D
93. B
94. A
95. B
96. B
97. C
98. B
99. C
100. C
101. C
102. D
103. C
104. D
105. A
106. B
107. D
108. D
109. C
110. C
111. B
112. B
113. C
114. C
115. A
116. C
117. A
118. D
119. A
120. C
121. A
122. D
123. A
124. C
125. C
126. B
127. C
128. B
129. D
130. D
131. C
132. A
133. D
134. C

1. Describe the components of each of the following: hindbrain, midbrain, and forebrain.

2. What are the major components of the brain stem and each of their functions?

3. Why is the spinal cord so important?

4. Which regions of the brain process sensory information?

5. Trace the circuitry of the basal ganglia. What are its main functions?

6. Which regions of the brain process motor information?

7. What are the four main lobes of the cerebral cortex? What are each of their functions?

8. Describe the purpose of the Human Connectome Project. What are its methods, and what has been the outcome thus far?

9. Describe all the components of a typical neuron.

10. Explain the different types of glial cells within the central nervous system.

11. Starting with the action potential arriving at the axon terminal, describe the rest of the steps of exocytosis.

12. Explain the role of autoreceptors.

13. Describe the various types of monoamines.

14. What is acetylcholinesterase (AChE)? What effects do the drugs, AChE inhibitors, have in the brain, and why were they developed?

15. Describe the biosynthesis of the catecholamines and identify the enzymes involved in this reaction.

16. Describe the biosynthesis of the serotonin and identify the enzymes involved in this reaction.

17. Explain how NMDA receptors are activated.

Answer Key

1. Hindbrain: myelencephalon, metencephalon; midbrain: mesencephalon; forebrain: diencephalon, telencephalon.
2. Medulla, pons, midbrain.
3. Mediates communication between the brain and PNS; provides autonomic functions.
4. All four cortical lobes: cingulate cortex, tectum, thalamus, pons.
5. Caudate nucleus, putamen, globus pallidus, subthalamic nucleus, substantia nigra.
6. Frontal lobe, basal ganglia, cerebellum
7. Frontal, temporal, parietal, occipital lobes
8. Purpose: determining how neurons are connected across brain regions; methods: human anatomical studies, subject history, complex data analyses; outcome: development of new brain map resulting in first major revision of cortex since 1907.
9. Soma, organelles, dendrite, axon, terminals, synapse, vesicles, receptors, neurotransmitters, myelin sheath.
10. Oligodendrocytes, astrocytes, ependymal and microglial cells.
11. 1) calcium channels open, 2) calcium enters presynaptic terminal, 3) synaptic vesicles fuse with terminal membrane, open, and release neurotransmitters into synapse.
12. Monitor neurotransmitter concentrations.
13. NE, epi, DA, 5-HT.
14. AChE metabolizes ACh; ACHE inhibitors increase ACh concentrations; applications: Alzheimer's, agriculture, military.
15. Tyrosine $\rightarrow$ dopa $\rightarrow$ dopamine $\rightarrow$ norepinephrine $\rightarrow$ epinephrine.
16. Tryptophan $\rightarrow$ 5-HTP $\rightarrow$ 5-HT.
17. 1) glutamate and another amino acid must bind to NMDA, 2) membrane depolarization pushes out Mg^{+} from channel.