Name:_____ Class:_____ Date:_____

Chapter 02

1. Transmission of information between neurons occurs in the same way as transmission along an axon.
    a. True
    b. False

ANSWER: False

2. A reflex arc contains specialized motor neurons that detect and execute the reflex.
    a. True
    b. False

ANSWER: False

3. At synapses, the cell that receives the message is called the presynaptic neuron.
    a. True
    b. False

ANSWER: False

4. Neurons communicate with both electrical and chemical signals. Scientists have shown that chemical communication is the preferred form as it is faster.
    a. True
    b. False

ANSWER: False

5. The amount of temporal summation depends on the rate of stimulation.
    a. True
    b. False

ANSWER: True

6. Spatial summation is the result of synaptic inputs from different locations arriving at the same time.
    a. True
    b. False

ANSWER: True

7. Inhibitory synapses actively suppress excitatory responses.
    a. True
    b. False

ANSWER: False

8. Nitric oxide (NO) can function as a hormone.
    a. True
    b. False

ANSWER: False

Name:_____ Class:_____ Date:_____

Chapter 02

9. Dr. Lattimer studies how the neurotransmitter dopamine is synthesized from tryptophan from the diet.
   a. True
   b. False

ANSWER: False

10. Most of the known neurotransmitters are synthesized from amino acids.
   a. True
   b. False

ANSWER: True

11. Professor Wick is teaching about neurotransmitter release and told his class that each neuron releases one kind of hormone.
   a. True
   b. False

ANSWER: False

12. Generally speaking, a neuron will release a greater number of neurotransmitters than what it will respond to with its own receptors.
   a. True
   b. False

ANSWER: False

13. Whether or not a neurotransmitter is excitatory depends on the response of the postsynaptic receptor.
   a. True
   b. False

ANSWER: True

14. Most of the brain's excitatory ionotropic synapses use the neurotransmitter glutamate.
   a. True
   b. False

ANSWER: True

15. Metabotropic synapses use a large variety of transmitters.
   a. True
   b. False

ANSWER: True

16. Charles S. Sherrington was the first to infer the properties of ____.
   a. synapses
   b. the refractory period
   c. the sodium-potassium pump
   d. dendrites and axons

ANSWER: a

Name:_____ Class:_____ Date:_____

Chapter 02

17. Sherrington studied ____, which are automatic muscular responses to stimuli.
    a. instincts
    b. reflexes
    c. inhibitions
    d. aversions

ANSWER: b

18. Winnifred is in the lab drawing illustrations of neurons in her lab notebook. She labeled the specialized area between two neurons as the _____.
    a. synapse
    b. axon hillock
    c. node of Ranvier
    d. vesicle

ANSWER: a

19. On the basis of what evidence were the properties of synapses first inferred?
    a. The electron microscope
    b. Single-neuron recordings
    c. Behavioral observations
    d. PET scans

ANSWER: c

20. The circuit from sensory neuron to muscle response is called ____.
    a. a reflex arc
    b. a synapse
    c. flexion
    d. extension

ANSWER: a

21. Maryanna is studying the reflex arc for a quiz. In her notes, she wrote down that the proper order is _____.
    a. motor neuron, sensory neuron, interneuron
    b. sensory neuron, motor neuron, interneuron
    c. motor neuron, interneuron, sensory neuron
    d. sensory neuron, interneuron, motor neuron

ANSWER: d

Name:_____ Class:_____ Date:_____

Chapter 02

22. Why is the speed of conduction through a reflex arc slower than the speed of conduction of an action potential along an axon?

a. Transmission between neurons at synapses is slower than along axons.
b. The longer an axon, the slower its velocity.
c. Interneurons have thicker axons than other neurons.
d. There are greater amounts of myelin involved in the reflex arc.

ANSWER: a

23. Sherrington deduced that transmission at a synapse must be slower than conduction along an axon. This was based on what kind of evidence?

a. Temporal summation
b. Drugs that increase or inhibit activity at synapses
c. The speed of reflexive responses
d. Differences in diameter between axons and dendrites

ANSWER: c

24. Dr. Andrus studies reflexes and has demonstrated that a certain reflex doesn't occur if there is a single stimulus. He found that there needs to be _____ (several, rapidly produced stimuli) for the reflex to occur.

a. IPSPs
b. synaptic delay
c. temporal summation
d. spatial summation

ANSWER: c

25. Sherrington found that repeated stimuli within a brief time have a cumulative effect. He referred to this phenomenon as ____.

a. temporal summation
b. spatial summation
c. synaptic summation
d. saltatory summation

ANSWER: a

26. Temporal summation most likely occurs with ____.

a. infrequent, subthreshold excitation
b. rapid succession of stimuli that each exceed threshold
c. infrequent, inhibitory stimuli
d. rapid succession of subthreshold excitation

ANSWER: d

Name:_____ Class:_____ Date:_____

Chapter 02

27. Charles Sherrington would most likely agree with which statement about reflexes?
    a. The overall speed of conduction through a reflex arc is faster than conduction along an axon.
    b. Repeated stimuli occurring within a brief time can have a cumulative effect.
    c. Each neuron physically merges with the next one during a reflexive response.
    d. Excitatory synapses are more important than inhibitory synapses.

ANSWER: b

28. To measure temporal summation in single cells, researchers ____.
    a. attach electrodes to the scalp
    b. insert an microelectrode into the scalp
    c. collect sodium and potassium ions from nearby glial cells
    d. record depolarizations of the postsynaptic neuron

ANSWER: d

29. Latoya is working in the lab to generate an EPSP, which is a _____.
    a. graded depolarization
    b. graded hyperpolarization
    c. reflex
    d. specialized hormone

ANSWER: a

30. Which statement is true of EPSPs?
    a. They work in pairs to produce an action potential.
    b. They decay over time and space.
    c. They can be either excitatory or inhibitory.
    d. They occur because potassium gates open.

ANSWER: b

31. The neuron that receives the message is called the _____ neuron.
    a. postsynaptic
    b. presynaptic
    c. polarized
    d. reflexive

ANSWER: a

32. Professor Kinsley is lecturing on EPSPs and action potentials. She tells the class that _____.
    a. EPSPs are stronger than action potentials
    b. sodium is required for an action potential but not for an EPSP
    c. they are the same thing
    d. EPSPs are decremental and action potentials are not

ANSWER: d

Name:_____ Class:_____ Date:_____

Chapter 02

33. Depolarization is to ____ as hyperpolarization is to ____.
    a. excitation; inhibition
    b. inhibition; excitation
    c. increasing the threshold; decreasing the threshold
    d. decreasing the threshold; increasing the threshold

ANSWER: a

34. Brock is working in the lab and has been able to demonstrate that _____.
    a. the opening of sodium channels causes an EPSP
    b. the opening of potassium channels causes an EPSP
    c. the opening of sodium channels cases an IPSP
    d. the opening of potassium channels causes an action potential

ANSWER: a

35. Which process indicates spatial summation?
    a. Present two or more weak stimuli at the same time.
    b. Start action potentials at both ends of one axon at the same time.
    c. Do not allow a flexor muscle to relax before stimulating it again.
    d. Present a rapid sequence of weak stimuli.

ANSWER: a

36. Spatial summation refers to ____.
    a. multiple weak stimulations that occur in rapid succession
    b. a decrease in responsiveness after repeated stimulation
    c. multiple weak stimulations that occur at the same time
    d. an increase in the strength of action potentials after repeated stimulation

ANSWER: c

37. What is the primary difference between temporal summation and spatial summation?
    a. Only spatial summation can produce an action potential.
    b. Spatial summation depends on contributions from more than one sensory neuron.
    c. Temporal summation produces a hyperpolarization instead of a depolarization.
    d. Spatial summation alters the response of more than one postsynaptic cell.

ANSWER: b

38. Karissa is in the lab working and was able to produce a reflexive response by stimulating several different locations all at one time. She successfully demonstrated _____ summation.
    a. spatial
    b. reflexive
    c. temporal
    d. neuronal

ANSWER: a

Name:_____ Class:_____ Date:_____

Chapter 02

39. What do temporal summation and spatial summation have in common?
    a. Both involve the activity of only two neurons.
    b. Both require a response from the brain.
    c. Both depend on a combination of visual and auditory stimuli.
    d. Both enable a reflex to occur in response to weak stimuli.

ANSWER: d

40. Temporal summation is to ____ as spatial summation is to ____.
    a. time; location
    b. EPSP; IPSP
    c. location; time
    d. depolarization; hyperpolarization

ANSWER: a

41. Yasmine is in the lab trying to produce action potentials in her cultured neurons. What is most likely to work?
    a. Using a chemical substance that will produce a large number of IPSPs.
    b. Using electrical stimulation that will produce a large number of IPSPs.
    c. Using electrical stimulation to produce a rapid sequence of EPSPs.
    d. Using a chemical substance that will produce both EPSPs and IPSPs.

ANSWER: c

42. When a vertebrate animal contracts the flexor muscles of a leg, it relaxes the extensor muscles of the same leg. Sherrington considered this evidence for the existence of ____.
    a. spatial summation
    b. temporal summation
    c. inhibitory messages
    d. the delay in transmission at synapses

ANSWER: c

43. What ordinarily prevents extensor muscles from contracting at the same time as flexor muscles?
    a. The ligaments and tendons that bind them together
    b. Learned patterns of coordination in the cerebral cortex
    c. Inhibitory synapses in the spinal cord
    d. Control of both muscles by different branches of the same axon

ANSWER: c

Name:_____ Class:_____ Date:_____

Chapter 02

44. Professor Pholman is lecturing about the reflex arc. He tells his students that _____ in the _____ help coordinate contraction of certain muscles and relaxation of others.

a. motor neurons; spinal cord
b. interneurons; spinal cord
c. motor neurons; peripheral nervous system
d. sensory neurons; peripheral nervous system

ANSWER: c

45. A normal, healthy animal never contracts the flexor muscles and the extensor muscles of the same leg at the same time. Why not?

a. When the interneuron sends excitatory messages to one, inhibitory messages go to the other.
b. Both muscles are mechanically connected in a way that makes it impossible for both to contract at the same time.
c. Such coordination is learned through prenatal movement.
d. Both muscles are controlled by branches of the same axon.

ANSWER: a

46. Inhibitory synapses on a neuron ____.

a. hyperpolarize the postsynaptic cell
b. weaken the cell's polarization
c. increase the probability of an action potential
d. move the potential closer to the cell's threshold

ANSWER: a

47. A temporary hyperpolarization is known as an ____.

a. EPSP
b. IPSP
c. ISPS
d. EPIP

ANSWER: b

48. Toshia is working in the lab trying to produce an IPSP in her cultured neurons. What should she do?

a. Encourage sodium ions to enter the cell.
b. Encourage potassium ions to enter the cell.
c. Encourage chloride ions to leave the cell.
d. Encourage chloride ions to enter the cell.

ANSWER: d

Name:_____ Class:_____ Date:_____

Chapter 02

49. Increased permeability to which type of ion would most likely result in an IPSP?
    a. Sodium
    b. Potassium
    c. Calcium
    d. Bicarbonate

ANSWER: b

50. An IPSP represents ____.
    a. the location where a dendrite branches
    b. a gap in a myelin sheath
    c. a subthreshold depolarization
    d. a temporary hyperpolarization

ANSWER: d

51. Professor Deshon is lecturing about ESPSs and IPSPs. He tells the class that in order to produce an IPSP, there needs to be an increase is permeability for _____.
    a. chloride
    b. calcium
    c. sodium
    d. carbon

ANSWER: a

52. An EPSP is to ____ as an IPSP is to ____.
    a. hyperpolarization; depolarization
    b. depolarization; hyperpolarization
    c. spatial summation; temporal summation
    d. temporal summation; spatial summation

ANSWER: b

53. Even at rest, most neurons have periodic production of action potentials, known as the ____.
    a. spontaneous firing rate
    b. excitatory firing rate
    c. all-or-none law
    d. law of compensation

ANSWER: a

54. The “decision” for a neuron to fire is determined by the ____.
    a. number of EPSPs only
    b. spontaneous firing rate
    c. number of IPSPs only
    d. ratio of EPSPs to IPSPs

ANSWER: d

Name:_____ Class:_____ Date:_____

Chapter 02

55. The "spontaneous firing rate" of a neuron refers to ____.

a. its resting potential
b. its rate of energy consumption
c. its rate of producing action potentials even when it is not stimulated
d. the velocity of its action potentials under normal conditions

ANSWER: c

56. Dr. Benzing is working in the lab. He has been able to demonstrate that _____ increases the frequency of the spontaneous firing rate.

a. EPSPs
b. IPSPs
c. EPSPs followed by IPSPs
d. simultaneous EPSPs and IPSPs

ANSWER: a

57. What determines whether a neuron has an action potential?

a. Only the number of EPSPs impinging on an axon
b. Only the number of IPSPs impinging on the dendrites
c. The combined effects of EPSPs and IPSPs
d. Summation effects of IPSPs

ANSWER: c

58. Which one of Sherrington's inferences about the synapse was wrong?

a. Transmission at a synapse is slower than transmission of impulses along an axon.
b. Transmission at the synapse is primarily an electrical process.
c. Synapses can be either excitatory or inhibitory.
d. Synapses make spatial summation and temporal summation possible.

ANSWER: b

59. Herb is watching a documentary on Dr. Loewi. He learned that neuroscientists first understood that synapses use chemicals to communicate because Dr. Loewi _____.

a. decreased a dog's heart rate and then used adrenaline to speed it up
b. stimulated a frog's heart that was in a fluid bath and then used just the fluid to simulate a second heart
c. measured the reflex speeds in dogs
d. applied adrenaline directly onto a heart muscle

ANSWER: b

Name:_____ Class:_____ Date:_____

Chapter 02

60. The research that firmly established synaptic communication as chemical was ____.
   a. Elliot's adrenaline mimicking sympathetic activation
   b. Loewi's transfer of fluid from stimulated frog hearts
   c. Sherrington's study of reflexes
   d. Eccles's measurement of IPSPs

ANSWER: b

61. After one frog's heart has been stimulated, an extract of fluid from that heart can make a second frog's heart beat faster. What conclusion did Otto Loewi draw from these results?
   a. Transmission at synapses is a chemical event.
   b. The sympathetic and parasympathetic nervous systems are antagonistic.
   c. Transmission at heart muscle synapses is electrical.
   d. Hormones facilitate the actions of the nervous system.

ANSWER: a

62. Which category of chemicals includes adenosine and several of its derivatives?
   a. Neuropeptides
   b. Acetylcholine
   c. Monoamines
   d. Purines

ANSWER: d

63. On advantage of nitric oxide is that it ____.
   a. can be made by neurons efficiently
   b. is easily synthesized in a laboratory
   c. increases the growth of microglia
   d. safe for human cells in large quantities

ANSWER: a

64. If Vonnie's body needed to dilate her blood vessels, it would release _____.
   a. glutamate
   b. nitric oxide
   c. GABA
   d. glycine

ANSWER: b

65. In addition to influencing other neurons, ____ increases blood flow to a specific area of the brain.
   a. endorphins
   b. glycine
   c. nitric oxide
   d. acetylcholine

ANSWER: c

Name:_____ Class:_____ Date:_____

Chapter 02

66. What provides the building blocks for synthesizing nearly all neurotransmitters?
    a. Proteins found in the diet
    b. Breakdown products of DNA
    c. Breakdown products formed from other transmitters
    d. Methane and ethanol

ANSWER: a

67. Professor Russom is giving a talk about neurotransmitters. She tells the class that most neurotransmitters are synthesized from _____.
    a. hormones
    b. fatty acids
    c. glucose
    d. amino acids

ANSWER: d

68. Paris is studying for a quiz on neurotransmitters. She should remember that all of the following are catecholamines except _____.
    a. epinephrine
    b. dopamine
    c. norepinephrine
    d. serotonin

ANSWER: d

69. What makes nitric oxide unique among neurotransmitters?
    a. It is released before the action potential occurs.
    b. It is taken back up into the presynaptic neuron.
    c. It is a gas.
    d. It is an organelle.

ANSWER: c

70. What do dopamine, norepinephrine, and epinephrine share in common?
    a. They all affect the same receptors.
    b. They are all synthesized from the same amino acids.
    c. They are all released by the same neurons.
    d. They all are gases.

ANSWER: b

Name:_____ Class:_____ Date:_____

Chapter 02

71. Riva is unable to eat eggs, milk, and peanuts. She might have altered levels of _____ as a result.
    a. nitric oxide
    b. dopamine
    c. glutamate
    d. acetylcholine

ANSWER: d

72. The amino acid tryptophan is the precursor to which neurotransmitter?
    a. Dopamine
    b. Endorphin
    c. Serotonin
    d. Nitric oxide

ANSWER: c

73. Lita has just eaten a lot of soy, which contains tryptophan. What should she try to consume less of to potentially increase tryptophan's entry to the brain?
    a. Phenylalanine
    b. Glucose
    c. Insulin
    d. Thiamine

ANSWER: a

74. Dopamine and norepinephrine are classified as ____.
    a. second messengers
    b. purines
    c. proteins
    d. catecholamines

ANSWER: d

75. Insulin increases the entry of tryptophan into the brain by ____.
    a. weakening the blood-brain barrier
    b. converting tryptophan into a compound that more easily enters the brain
    c. increasing metabolic activity only in those areas of the brain that use tryptophan
    d. causing certain competing amino acids to enter other cells, outside the brain

ANSWER: d

Name:_____ Class:_____ Date:_____

Chapter 02

76. Luis is studying for a quiz on neurotransmission. He wrote in his notes that neurotransmitters are typically stored in _____ in the _____ neuron.

a. vesicles; presynaptic
b. dendrites; presynaptic
c. vesicles; postsynaptic
d. axons; presynaptic

ANSWER: a

77. Neuropeptides are synthesized in the ____.

a. postsynaptic terminal
b. presynaptic terminal
c. cell body
d. dendrites

ANSWER: c

78. Although slower than an action potential, synaptic transmission is still relatively fast because ____.

a. the synaptic cleft is very narrow
b. sodium ions are transported quickly
c. neurotransmitters diffuse faster than electricity
d. EPSPs travel faster than IPSPs

ANSWER: a

79. Vesicles are located ____.

a. in postsynaptic terminals
b. in dendrites
c. in presynaptic terminals
d. outside of the neuron in the extracellular fluid

ANSWER: c

80. Leeann is studying for a test on neurotransmission. She wrote in her notes that neurotransmitters are released from the presynaptic neuron when the action potential reaches the terminal and opens _____ channels.

a. sodium
b. potassium
c. chloride
d. calcium

ANSWER: d

Name:_____ Class:_____ Date:_____

Chapter 02

81. When an action potential reaches the end of an axon, the depolarization causes what ionic movement in the presynaptic cell?

a. Sodium out of the cell
b. Lithium out of the cell
c. Iron into the cell
d. Calcium into the cell

ANSWER: d

82. An action potential causes the release of neurotransmitters by ____.

a. blocking potassium pores in the membrane
b. opening chloride pores in the membrane
c. blocking iron pores in the membrane
d. opening calcium pores in the membrane

ANSWER: d

83. A neuron excretes neurotransmitters through its membrane by a process called ____.

a. reuptake
b. exocytosis
c. endocytosis
d. synaptic diffusion

ANSWER: b

84. Exocytosis is the process by which neurotransmitters are ____.

a. released from the presynaptic neuron
b. synthesized
c. destroyed
d. secreted into synaptic vesicles

ANSWER: a

85. What is the synaptic cleft?

a. The gap between the presynaptic neuron and the postsynaptic neuron
b. A packet that stores neurotransmitter molecules for release
c. A subthreshold depolarization mechanism
d. The long-term storage location for calcium ions

ANSWER: a

86. What happens when a neurotransmitter is released by a presynaptic cell?

a. It causes calcium to rush into the presynaptic neuron.
b. It causes calcium to rush into the postsynaptic neuron.
c. The neurotransmitter passively spreads across the synaptic cleft.
d. The neurotransmitter is actively transported across the synaptic cleft.

ANSWER: c

Name:_____ Class:_____ Date:_____

Chapter 02

87. In general, a single neuron releases ____ neurotransmitter(s) and can respond to ____ neurotransmitter(s).
   a. one; many
   b. dozens of; only one
   c. several; only one
   d. several; many

ANSWER: d

88. The main advantage of a neuron releasing more than one neurotransmitter is that:
   a. if it runs out of one, it has others
   b. it can release different transmitters on different occasions
   c. it can send more complex messages
   d. it can release one from the axon's terminal and one from another location along the axon

ANSWER: c

89. The effect of a neurotransmitter on a postsynaptic neuron is determined by the ____.
   a. speed the action potential traveled down the axon
   b. number of branches of the presynaptic axon
   c. receptors on the postsynaptic membrane
   d. distance between the synapse and the cell body

ANSWER: c

90. A receptor can directly open a channel and thereby exert a(n) ____ effect, or it can produce slower but longer ____ effect.
   a. gated; metabotropic
   b. ionotropic; gated
   c. metabotropic; ionotropic
   d. ionotropic; metabotropic

ANSWER: d

91. Most of the brain's excitatory ionotropic synapses release ____ while the inhibitory ionotropic synapses release ____.
   a. glutamate; GABA
   b. GABA; glutamate
   c. acetylcholine; GABA
   d. acetylcholine; dopamine

ANSWER: a

Name:_____ Class:_____ Date:_____

Chapter 02

92. Glutamate opens sodium gates, enabling sodium ions to enter the postsynaptic cell. What type of effect is this?
   a. Metabotropic
   b. Ionotropic
   c. Modulatory
   d. Orthodromic

ANSWER: b

93. Ionotropic effects ____.
   a. depolarize the postsynaptic membrane
   b. hyperpolarize the postsynaptic membrane
   c. may depolarize or hyperpolarize the postsynaptic membrane
   d. enhance the reabsorption of neurotransmitters

ANSWER: c

94. Ionotropic effects are characterized by ____.
   a. rapid and short-lived effects
   b. rapid and long lasting effects
   c. excitatory effects only
   d. inhibitory effects only

ANSWER: a

95. Which terms refers to a chemical that binds to another chemical?
   a. Ligand
   b. Electrolyte
   c. Vesicle
   d. Autoreceptor

ANSWER: a

96. Raylene is studying for an exam on neurotransmission. She wrote in her notes that one difference between ionotropic and metabotropic effects is that _____.
   a. metabotropic effects are quicker and briefer
   b. ionotropic effects are slower and briefer
   c. ionotropic effects are quicker and longer lasting
   d. metabotropic effects are slower and longer lasting

ANSWER: d

97. Which process is more typical of a metabotropic effect than an ionotropic effect?
   a. Producing inhibitory effects on the postsynaptic cell
   b. Influencing the speed of conduction by the postsynaptic cell
   c. Producing long-lasting effects on the post-synaptic cell
   d. Controlling sensory processes

ANSWER: c

Name:_____ Class:_____ Date:_____

Chapter 02

98. Receptor molecules for neurotransmitters that exert metabotropic effects are proteins that bind to ____ outside the membrane, and attach to ____ inside the membrane.

a. calcium; potassium
b. neurotransmitters; nicotine
c. neurotransmitters; G-proteins
d. adenosine; nitric oxide

ANSWER: c

99. "Second messengers" carry their messages to ____.

a. the presynaptic membrane
b. areas within the postsynaptic cell
c. areas within the presynaptic cell
d. the surrounding glia

ANSWER: b

100. A metabotropic synapse, by way of its second messenger, ____.

a. has effects localized to one point on the membrane
b. can influence activity in much of the presynaptic cell
c. can influence activity in much or all of the postsynaptic cell
d. has minimal effect on the postsynaptic cell

ANSWER: c

101. Many neurons release neuropeptides mostly from the ____.

a. vesicles
b. nodes
c. axons
d. dendrites

ANSWER: d

102. A hormone is a chemical that is ____.

a. secreted by a gland to the outside world
b. conveyed by the blood to other organs, whose activity it influences
c. capable of activating or inhibiting muscle fibers
d. a feedback message from the postsynaptic neuron to the presynaptic neuron

ANSWER: b

Name:_____ Class:_____ Date:_____

Chapter 02

103. Hormones exert their effects ____.
   a. similarly to metabotropic neurotransmitters
   b. similarly to ionotropic neurotransmitters
   c. by attaching to special receptors on muscle fibers
   d. by being metabolized and converted via presynaptic cells

ANSWER: a

104. The anterior pituitary is composed of ____ and the posterior pituitary is composed of ____.
   a. glandular tissue; neural tissue
   b. neural tissue; glandular tissue
   c. neural tissue; neural tissue
   d. glandular tissue; glandular tissue

ANSWER: a

105. Releasing hormones are synthesized in the ____ and released in the ____.
   a. anterior pituitary; bloodstream
   b. hypothalamus; anterior pituitary
   c. hypothalamus; posterior pituitary
   d. posterior pituitary; hypothalamus

ANSWER: b

106. Adrenocorticotropic hormone (ACTH) controls secretions of the ____.
   a. gonads
   b. mammary glands
   c. thyroid gland
   d. adrenal gland

ANSWER: d

107. What is the function of the enzyme acetylcholinesterase?
   a. It synthesizes acetylcholine from the diet.
   b. It increases the sensitivity of the postsynaptic cell to acetylcholine.
   c. It blocks further release of the transmitter acetylcholine.
   d. It breaks acetylcholine down into components for recycling.

ANSWER: d

108. What happens to acetylcholine after it attaches to a receptor on the postsynaptic cell?
   a. It is broken down into two components.
   b. It is reabsorbed intact by the presynaptic cell.
   c. It is metabolized by the postsynaptic cell as a source of energy.
   d. It continues to stimulate the postsynaptic neuron until replaced by another neurotransmitter.

ANSWER: a

Name:_____ Class:_____ Date:_____

Chapter 02

109. Dr. Edmonson is working in the lab with cultured neurons. He applies a drug that inhibits acetylcholinesterase. What does he expect to have occur?

a. Acetylcholine will remain active in the synapse longer.
b. Acetylcholine will be removed from the synapse faster.
c. More acetylcholine will be released from the presynaptic cell.
d. Acetylcholine will no longer be able to bind to post-synaptic receptors.

ANSWER: a

110. Reuptake is an alternative to which other process?

a. Recycling of neurotransmitters
b. Breaking down neurotransmitters via an enzymatic process
c. Absorbing neurotransmitters by postsynaptic neurons
d. Re-releasing neurotransmitters from postsynaptic neurons

ANSWER: b

111. "Transporter" proteins transport neurotransmitters ____.

a. back into the presynaptic neuron
b. across the synapse to the postsynaptic neuron
c. across the synapse back to the presynaptic neuron
d. to the appropriate receptor sites

ANSWER: a

112. COMT and MAO are ____.

a. enzymes that convert catecholamines into inactive chemicals
b. enzymes that make catecholamines
c. neurotransmitters in the same group as serotonin
d. the inactive fragments of catecholamines

ANSWER: a

113. The primary method for disposal of peptide neurotransmitters is ____.

a. inactivation
b. reuptake by the presynaptic neuron
c. diffusion
d. reuptake by the postsynaptic neuron

ANSWER: c

114. Professor Leclair is giving a lecture on autoreceptors. She tells the class that _____.

a. the activity of autoreceptors results in GABA being released into the synapse
b. autoreceptors increase the amount of calcium that enters the axon terminal
c. activated autoreceptors decrease neurotransmitter release
d. the activity of autoreceptors results in glutamate being released into the synapse

ANSWER: c

Name:_____ Class:_____ Date:_____

Chapter 02

115. Autoreceptors monitor the ____.

a. number of action potentials
b. extracellular sodium concentration
c. amount of neurotransmitter released
d. amount of reuptake

ANSWER: c

116. Describe the sequence of events that occurs in synaptic transmission.

ANSWER: The sequence of events involves synthesis, storage, release, diffusion, activation of receptor, and inactivation/reuptake.

117. Briefly compare the differences between ionotropic and metabotropic receptors. Include their mechanisms of action and how they explain the difference in the effects on the postsynaptic cell.

ANSWER: Ionotropic receptors are ion channels that open as soon as the neurotransmitter attaches and close when the neurotransmitter is removed, making the effects rapid and short-lived.
Metabotropic receptors use a second messenger system to affect many different activities in the cell, which are slower but longer lasting.

118. Briefly describe spatial summation.

ANSWER: Sherrington found that synapses have the property of spatial summation—that is, summation over space. Synaptic inputs from separate locations combine their effects on a neuron. Sherrington again began with a pinch too weak to elicit a reflex. This time, instead of pinching one point twice, he pinched two points at once. Although neither pinch alone produced a reflex, together they did. Sherrington concluded that pinching two points activated separate sensory neurons, whose axons converged onto one neuron in the spinal cord. Excitation from either sensory axon excited that spinal neuron, but not enough to reach the threshold. A combination of excitations exceeded the threshold and produced an action potential. Again, Eccles confirmed Sherrington's inference, demonstrating that EPSPs from several axons summate their effects on a postsynaptic cell. Spatial summation is critical to brain functioning. Sensory input to the brain arrives at synapses that individually produce weak effects. However, each neuron receives many incoming axons that might produce synchronized responses. Spatial summation assures that those synchronized inputs excite a neuron enough to activate it.

119. Describe the main chemical events at a synapse.

ANSWER: Understanding the chemical events at a synapse is fundamental to understanding the nervous system. Every year, researchers discover more and more details about synapses, their structure, and how those structures relate to function. Here are the major events:
1. The neuron synthesizes chemicals that serve as neurotransmitters. It synthesizes the smaller neurotransmitters in the axon terminals and synthesizes neuropeptides in the cell body.
2. Action potentials travel down the axon. At the presynaptic terminal, an action potential enables calcium to enter the cell. Calcium releases neurotransmitters from the terminals and into the synaptic cleft, the space between the presynaptic and postsynaptic neurons.
3. The released molecules diffuse across the cleft, attach to receptors, and alter the activity of the postsynaptic neuron.
4. The neurotransmitter molecules separate from their receptors.
5. The neurotransmitter molecules may be taken back into the presynaptic neuron for recycling or they may diffuse away.
6. Some postsynaptic cells send reverse messages to control the further release of neurotransmitter by presynaptic cells.

Name:_____ Class:_____ Date:_____

Chapter 02

120. Describe the main properties of neuropeptides (neuromodulators).

ANSWER: Researchers often refer to the neuropeptides as neuromodulators, because they have several properties that set them apart from other transmitters. Whereas the neuron synthesizes most other neurotransmitters in the presynaptic terminal, it synthesizes neuropeptides in the cell body and then slowly transports them to other parts of the cell. Whereas other neurotransmitters are released at the axon terminal, the neuropeptides are released mainly by dendrites, and also by the cell body and the sides of the axon. A single action potential can release other neurotransmitters, but neuropeptide release requires repeated stimulation. However, after a few dendrites release a neuropeptide, the released chemical primes other nearby dendrites to release the same neuropeptide also, including dendrites of other cells. Thus, neurons containing neuropeptides do not release them often, but when they do, they release substantial amounts. Furthermore, unlike other transmitters that are released immediately adjacent to their receptors, neuropeptides diffuse widely, slowly affecting many neurons in their region of the brain. In that way they resemble hormones. Because many of them exert their effects by altering gene activity, their effects are long-lasting, in the range of 20 minutes or more. Neuropeptides are important for hunger, thirst, and other long-term changes in behavior and experience.

121. Discuss how Dr. Loewi was able to determine that communication between neurons involved a chemical messenger.

ANSWER: Dr. Loewi performed an experiment where he stimulated a frog heart. As a result, the heart beat would slow down. He collected the fluid that the first heart was sitting in and applied it to a second heart. The second heart also began to have a slower heart beat. He repeated this experiment but increased the heart rate of the first heart. He found that the second heart also increased the rate. He concluded that chemical must have been released into the fluid that was subsequently stimulating the second heart.

122. Elwood is studying the difference between EPSPs and IPSPs. What should he write in his notes?

ANSWER: EPSP stands for excitatory postsynaptic potential and is a brief depolarization of the neuron. IPSPS stands for inhibitory postsynaptic potential and is a brief hyperpolarization of the neuron. Both EPSPs and IPSPs are decremental. However, added together, enough EPSPs can trigger an action potential if the result is that the neuron reaches threshold.

123. Tennille wants to know what eating proteins, which are rich in tyrosine, might do to neurotransmitter levels. What would you tell her?

ANSWER: Proteins are rich in tyrosine, which is the precursor to several neurotransmitters called the catecholamines. Dopamine is made from tyrosine and norepinephrine and epinephrine are made from dopamine. So, eating lots of proteins is likely to increase levels of the catecholamines.

124. How are neurotransmitters removed from the synapse?

ANSWER: Some neurotransmitters like acetylcholine are broken down by enzymes into inactive components. Other neurotransmitters are taken back up through specialized membrane proteins called transporters. Finally, other neurotransmitters like the neuropeptides diffuse away from the synapse.

125. What is the difference between a hormone and a neurotransmitter?

ANSWER: Neurotransmitters are chemicals used by the nervous system that allow individual neurons to send messages. Hormones are secreted by the endocrine system and travel (usually via the bloodstream) to other parts of the body to exert their effects.