True / False

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

ANSWER: False
DIFFICULTY: Bloom's: Analyze
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

2. Only sensory neurons are found in a reflex arc.
   a. True
   b. False

ANSWER: False
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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

ANSWER: False
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

4. Electrical communication between neurons is faster than chemical communication within neurons.
   a. True
   b. False

ANSWER: True
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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

ANSWER: True
DIFFICULTY: Bloom's: Understand

REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

6. Spatial summation is the result of synaptic inputs from different locations arriving at the same time.
   a. True
   b. False
ANSWER: True
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

7. Inhibitory synapses actively suppress excitatory responses.
   a. True
   b. False
ANSWER: False
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

8. Gases can be used as neurotransmitters.
   a. True
   b. False
ANSWER: True
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

9. Neurotransmitter levels in the brain can be affected by changes in diet.
   a. True
   b. False
ANSWER: True
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

10. Most of the known neurotransmitters are synthesized from amino acids.

a. True

b. False

ANSWER: True

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

11. Most neurons release more than one kind of neurotransmitter.

a. True

b. False

ANSWER: True

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

a. True

b. False

ANSWER: True

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

14. Most of the brain's excitatory ionotropic synapses use the neurotransmitter glutamate.

a. True

b. False

ANSWER: True
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

15. Metabotropic synapses use a large variety of transmitters.
    a. True
    b. False
ANSWER: True
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

Multiple Choice

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.01 - Describe how Charles Sherrington used behavioral observations to infer the major properties of synapses.
TOPICS: 2.1 The Concept of the Synapse

17. Sherrington studied ____, which are automatic muscular responses to stimuli.
    a. instincts
    b. reflexes
    c. inhibitions
    d. aversions
ANSWER: b
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

18. Specialized junctions between neurons are called ____.
    a. nodes of Ranvier

b. spines
c. dendrites
d. synapses

ANSWER: d
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.01 - Describe how Charles Sherrington used behavioral observations to infer the major properties of synapses.
TOPICS: 2.1 The Concept of the Synapse

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

ANSWER: a
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

21. What is the proper ordering of a reflex arc?
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
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: Properties of Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: Properties of Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.01 - Describe how Charles Sherrington used behavioral observations to infer the major properties of synapses.

TOPICS: 2.1 The Concept of the Synapse

24. A certain weak stimulus produces no reflexive response, but a rapid repetition of that stimulus may produce such a response. What is this phenomenon called?

a. spatial summation

b. temporal summation

c. saltatory conduction

d. synaptic combination

ANSWER: b

DIFFICULTY: Bloom's: Understand

REFERENCES: Properties of Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: Properties of Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.01 - Describe how Charles Sherrington used behavioral observations to infer the major properties of synapses.

TOPICS: 2.1 The Concept of the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: Properties of Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: Properties of Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.01 - Describe how Charles Sherrington used behavioral observations to infer the major properties of synapses.

TOPICS: 2.1 The Concept of the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: Properties of Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

29. A graded depolarization is known as an ____.

a. EPIP

b. IPSP

c. ESPN

d. EPSP

ANSWER: d

DIFFICULTY: Bloom's: Understand

REFERENCES: Relationship among EPSP, IPSP, and Action Potentials

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

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

DIFFICULTY: 51

REFERENCES: Relationship among EPSP, IPSP, and Action Potentials

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

31. An EPSP is a(n) ____.

a. graded depolarization

b. depolarization with a rebounding hyperpolarization

c. graded hyperpolarization

d. action potential in a reflex arc

ANSWER: a

DIFFICULTY: Bloom's: Understand

REFERENCES: Relationship among EPSP, IPSP, and Action Potentials

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

32. The primary difference between an EPSP and an action potential is that ____.

a. the magnitude of an action potential decreases as it travels along the membrane

b. EPSPs occur without sodium ions entering the cell

c. action potentials are always hyperpolarizations

d. EPSPs are subthreshold events that decay over time and space

ANSWER: d

DIFFICULTY: Bloom's: Analyze

REFERENCES: Relationship among EPSP, IPSP, and Action Potentials

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

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

DIFFICULTY: Bloom's: Understand
REFERENCES: Relationship among EPSP, IPSP, and Action Potentials
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

34. What causes an EPSP?
    a. the deactivation of cytoplasmic enzymes
    b. the opening of sodium channels
    c. the opening of potassium channels
    d. the deactivation of stress response pathways

ANSWER: b
DIFFICULTY: Bloom's: Understand
REFERENCES: Relationship among EPSP, IPSP, and Action Potentials
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Analyze
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

38. Simultaneous weak stimuli at different locations produce a greater reflexive response than one of the stimuli by itself. What is this phenomenon called?
a. Sherrington's law
b. temporal summation
c. spatial summation
d. the all-or-none law
ANSWER: c
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Analyze
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

40. Temporal summation is to ____ as spatial summation is to ____.
a. time; location
b. EPSP; IPSP
c. location; time
d. depolarization; hyperpolarization
ANSWER: a
DIFFICULTY: Bloom's: Analyze
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

41. Which pattern of post-synaptic excitation will most likely result in an action potential?
a. rapid sequence of EPSPs
b. rapid sequence of IPSPs

c. large number of simultaneous IPSPs

d. large number of simultaneous IPSPs and EPSPs

ANSWER: a

DIFFICULTY: Bloom's: Analyze

REFERENCES: Relationship among EPSP, IPSP, and Action Potentials

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: Properties of Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: Properties of Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

44. In a reflex arc, the coordination between contraction of certain muscles and relaxation of others is mediated by ____.

a. glial cells

b. motor neurons

c. sensory neurons

d. interneurons

ANSWER: d

DIFFICULTY: Bloom's: Understand

REFERENCES: Properties of Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Analyze
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Properties of Synapses
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

47. A temporary hyperpolarization is known as an ____.

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

ANSWER: b
DIFFICULTY: Bloom's: Understand
REFERENCES: Relationship among EPSP, IPSP, and Action Potentials
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

48. Which process will most likely result in an IPSP?

a. potassium ions entering the cell
b. sodium ions entering the cell
c. chloride ions entering the cell
d. chloride ions leaving the cell

ANSWER: c
DIFFICULTY: Bloom's: Analyze
REFERENCES: Relationship among EPSP, IPSP, and Synapses 95 Action Potentials
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Relationship among EPSP, IPSP, and Action Potentials
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Relationship among EPSP, IPSP, and Action Potentials
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

51. Increased permeability to ____ would most likely result in an IPSP.
    a. sodium
    b. potassium
    c. calcium
    d. bicarbonate

ANSWER: b
DIFFICULTY: Bloom's: Understand
REFERENCES: Relationship among EPSP, IPSP, and Action Potentials
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Relationship among EPSP, IPSP, and Action Potentials

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Relationship among EPSP, IPSP, and Action Potentials
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Relationship among EPSP, IPSP, and Action Potentials
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Relationship among EPSP, IPSP, and Action Potentials
LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.
TOPICS: 2.1 The Concept of the Synapse

56. Which statement is TRUE about the spontaneous firing rates of neurons?
a. EPSPs increase the frequency.
b. EPSPs decrease the frequency.
c. IPSPs increase the frequency.
d. One EPSP equals the effect of two IPSPs.
ANSWER: a
DIFFICULTY: Bloom's: Understand

REFERENCES: Relationship among EPSP, IPSP, and Action Potentials

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 Synapses

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

DIFFICULTY: summation effects of IPSPs

REFERENCES: Relationship among EPSP, IPSP, and Action Potentials

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will produce an action potential.

TOPICS: 2.1 Synapses

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

DIFFICULTY: Bloom’s: Understand

REFERENCES: Discovery of Chemical Transmission at Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.01 - Describe how Charles Sherrington used behavioral observations to infer the major properties of synapses.

TOPICS: 2.2 Chemical Events at the Synapse

59. Loewi demonstrated that synapses operate by the release of chemicals by ____.
    a. applying adrenaline directly to the heart muscle
    b. collecting fluid from a stimulated frog's heart, transferring it to another frog's heart, and measuring that heart rate
    c. measuring the speed of a dog's reflexes while the dog was under the influence of various drugs
    d. applying an extract of marijuana in eye drops and discovering that it dilated the pupils

ANSWER: b

DIFFICULTY: Bloom’s: Understand

REFERENCES: The Discovery of Chemical Transmission at Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Discovery of Chemical Transmission at Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Discovery of Chemical Transmission at Synapses

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

62. Which category of chemicals includes adenosine and several of its derivatives?

a. neuropeptides

b. acetylcholine

c. monoamines

d. purines

ANSWER: d

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

64. Which neurotransmitter is released by stimulated neurons to dilate the blood vessels?
    a. endorphins
    b. glycine
    c. nitric oxide
    d. acetylcholine

ANSWER: c
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

66. What provides the building blocks for synthesizing 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
DIFFICULTY: Bloom's: Analyze
REFERENCES: Chemical Events at the Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Synapses

67. The basic building blocks for the majority of neurotransmitters are ____.
    a. amino acids
    b. nitric oxide
    c. sugars
    d. carbohydrates

ANSWER: a

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

68. The catecholamines include ____.

a. epinephrine, norepinephrine, dopamine, and serotonin

b. epinephrine, serotonin, and dopamine

c. dopamine, serotonin, and acetylcholine

d. epinephrine, norepinephrine, and dopamine

ANSWER: d

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

71. Avoiding foods with lecithin, such as eggs and peanuts, would affect the levels of which neurotransmitter the most?

a. acetylcholine
b. serotonin
c. GABA
d. endorphin

ANSWER: a
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

72. The amino acid tryptophan is the precursor to which neurotransmitter?
a. dopamine
b. endorphin
c. serotonin
d. nitric oxide

ANSWER: c
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

73. You are eating a food containing tryptophan. What can you consume with it to increase its entry to the brain?
a. phenylalanine
b. carbohydrates
c. fats
d. thiamine

ANSWER: b
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

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

ANSWER: d
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis

of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

76. The presynaptic terminal stores high concentrations of neurotransmitter molecules in ____.

a. axons

b. vesicles

c. peptides

d. dendrites

ANSWER: b

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

77. Neuropeptides are synthesized in the ____.

a. postsynaptic terminal

b. presynaptic terminal

c. cell body

d. dendrites

ANSWER: c

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

80. When an action potential reaches the end of an axon, it evokes the release of neurotransmitters by opening ____ channels in the axon terminal.

a. chloride

b. bicarbonate

c. calcium

d. oxygen

ANSWER: c

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

83. A neuron excretes neurotransmitters through its membrane by a process called ____.
    a. reuptake
    b. exocytosis
    c. endocytosis
    d. synaptic diffusion

ANSWER: b
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

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

ANSWER: d
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

91. Which event is most likely to be dependent on ionotropic effects?
a. drowsiness
b. hormone release
c. hunger
d. rapid muscle contraction

ANSWER: d
DIFFICULTY: Bloom's: Analyze
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Analyze
REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

95. Which terms refers to a chemical that binds to another chemical?

a. ligand

b. electrolyte

c. vesicle

d. autoreceptor

ANSWER: a

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

96. Compared to ionotropic effects, metabotropic effects are ____.

a. quicker and briefer

b. slower and briefer

c. quicker and longer lasting

d. slower and longer lasting

ANSWER: d

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the

transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

101. Many neurons release neuropeptides mostly from the ____.

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

ANSWER: d
DIFFICULTY: Bloom's: Analyze
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.05 - Contrast neurotransmitters, neuropeptides, and hormones.
TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Hormones
LEARNING OBJECTIVES: KALA.BIOP.16.02.05 - Contrast neurotransmitters, neuropeptides, and hormones.
TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Hormones

LEARNING OBJECTIVES: KALA.BIOP.16.02.05 - Contrast neurotransmitters, neuropeptides, and hormones.
TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Hormones
LEARNING OBJECTIVES: KALA.BIOP.16.02.05 - Contrast neurotransmitters, neuropeptides, and hormones.
TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: Hormones
LEARNING OBJECTIVES: KALA.BIOP.16.02.05 - Contrast neurotransmitters, neuropeptides, and hormones.
TOPICS: 2.2 Chemical Events at the Synapse

106. Adrenocorticotropic hormone (ACTH) controls secretions of the ____.
a. gonads
b. mammary glands
c. thyroid gland
d. adrenal cortex
ANSWER: d
DIFFICULTY: Bloom's: Understand
REFERENCES: Hormones
LEARNING OBJECTIVES: KALA.BIOP.16.02.05 - Contrast neurotransmitters, neuropeptides, and hormones.
TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.05 - Contrast neurotransmitters, neuropeptides, and hormones.
TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.05 - Contrast neurotransmitters, neuropeptides, and hormones.

TOPICS: 3.2 Chemical Events at the Synapse

109. A drug that inhibits the action of the enzyme acetylcholinesterase will have the effect of ____.

a. prolonging the action of acetylcholine at its synapses

b. decreasing the duration of action of acetylcholine at its synapses

c. decreasing the synthesis of acetylcholine by the presynaptic cell

d. increasing the synthesis of acetylcholine by the presynaptic cell

ANSWER: a

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.04 - Discuss how certain drugs affect behavior by altering events at synapses.

TOPICS: 3.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Analyze

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the

transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.05 - Contrast neurotransmitters, neuropeptides, and hormones.
TOPICS: 2.2 Chemical Events at the Synapse

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
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.05 - Contrast neurotransmitters, neuropeptides, and hormones.
TOPICS: 2.2 Chemical Events at the Synapse

114. Activation of autoreceptors tends to ____.

a. increase further neurotransmitter release
b. stimulate GABA release
c. increase sodium-potassium pump activity
d. decrease further neurotransmitter release

ANSWER: d
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse
LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.
TOPICS: 2.2 Chemical Events at the Synapse

115. Autoreceptors monitor the ____.

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

ANSWER: c
DIFFICULTY: Bloom's: Understand
REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

Essay

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.

DIFFICULTY: Bloom's: Analyze

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

117. Briefly compare the differences between ionotropic and metabotropic receptors. Include their mechanisms of action and how they explains 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.

DIFFICULTY: Bloom's: Analyze

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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.

DIFFICULTY: Bloom's: Understand

REFERENCES: The Properties of the Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.02 - Relate the activities at a synapse to the probability that a neuron will

produce an action potential.

TOPICS: 2.1 The Concept of the Synapse

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.

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.03 - List and explain the sequence of events at a synapse, from synthesis of neurotransmitters, through stimulation of receptors, to the later disposition of the transmitter molecules.

TOPICS: 2.2 Chemical Events at the Synapse

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

ANSWER: Researchers often refer to the neuropeptides as neuromodulators, because they have several Synapses 111 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.

DIFFICULTY: Bloom's: Understand

REFERENCES: The Sequence of Chemical Events at a Synapse

LEARNING OBJECTIVES: KALA.BIOP.16.02.05 - Contrast neurotransmitters, neuropeptides, and hormones.

TOPICS: 2.2 Chemical Events at the Synapse