The Minds Machine - Foundations of Brain and Behavior 4th edition Watson Test Bank

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Test Bank
to accompany
The Mind's Machine, Fourth Edition
Watson • Breedlove

Chapter 2: Neurophysiology: The Generation, Transmission, and Integration of Neural Signals

Multiple Choice Questions

1. Which statement regarding ions is true?
a. Positively charged cations are attracted to the intracellular fluid.
b. Positively charged anions are attracted to the intracellular fluid.
c. Negatively charged anions are drawn to the intracellular fluid.
d. Negatively charged anions are balanced across the cell membrane.
Answer: a
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.1 Identify the two physical forces that make neurons more negatively charged inside than outside.
Bloom's Level: 2. Understanding

2. Electrostatic pressure derives from
a. the force that causes molecules to diffuse from high concentration to low concentration.
b. the distribution of electrical charges.
c. the distribution of molecules.
d. selective permeability.
Answer: b
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.1 Identify the two physical forces that make neurons more negatively charged inside than outside.
Bloom's Level: 2. Understanding

3. Inside the neuron there is a high concentration of _____ ions, while outside the cell there is a high concentration of _____ ions.
a. potassium; sodium
b. sodium; potassium
c. calcium; sodium
d. calcium; chloride
Answer: a
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System

Learning Objective: 2.1.1 Identify the two physical forces that make neurons more negatively charged inside than outside.

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Bloom's Level: 1. Remembering

4. The sodium-potassium pump is responsible for
a. exchanging three sodium ions for every two potassium ions from the intracellular environment.
b. initiating the action potential.
c. maintaining the equilibrium potential.
d. exchanging three potassium ions for every two sodium ions from the intracellular environment.
Answer: a
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.1 Identify the two physical forces that make neurons more negatively charged inside than outside.
Bloom's Level: 4. Analyzing

5. The resting membrane potential is maintained by electrostatic pressure and _____ acting on the cation _____.
a. permeability; sodium
b. local potential; calcium
c. afterpotential; chloride
d. diffusion; potassium
Answer: d
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.1 Identify the two physical forces that make neurons more negatively charged inside than outside.
Bloom's Level: 2. Understanding

6. The equilibrium potential corresponds to
a. the rising phase of the action potential.
b. the afterpotential.
c. the membrane potential at which the movement of ions across the membrane is balanced.
d. temporally summated graded potentials.
Answer: c
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.1 Identify the two physical forces that make neurons more negatively charged inside than outside.
Bloom's Level: 3. Applying

7. In general, the action potential is initiated at the
a. synapse.
b. outer reaches of the dendrite.
c. axon hillock.
d. node of Ranvier.
Answer: c
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System

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Learning Objective: 2.1.2 Understand the changes in a neuron's membrane that produce a large electrical signal called an *action potential*.
Bloom's Level: 2. Understanding

8. The overall amplitude of the action potential is about
a. 50 mV.
b. –60 mV.
c. 100 mV.
d. 1 V.
Answer: c
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.2 Understand the changes in a neuron's membrane that produce a large electrical signal called an *action potential*.
Bloom's Level: 3. Applying

9. An action potential can be likened to the action of what common household fixture?
a. Microwave
b. Water heater
c. Dishwasher
d. Toilet
Answer: d
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.2 Understand the changes in a neuron's membrane that produce a large electrical signal called an *action potential*.
Bloom's Level: 2. Understanding

10. Hyperpolarizing stimuli
a. decrease the likelihood the neuron will fire an action potential.
b. increase the likelihood the neuron will fire an action potential.
c. increase movement of sodium ions into the neuron.
d. decrease the membrane potential.
Answer: a
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System *Learning Objective:* 2.1.2 Understand the changes in a neuron's membrane that produce a large electrical signal called an *action potential*.
Bloom's Level: 3. Applying

11. Action potentials are all-or-none phenomena. This means that
a. they must fire a certain number of times a second to communicate information accurately.
b. they require a certain amount of stimulus to fire.
c. the amplitude of the action potential is independent of the size of the stimulus.
d. the amplitude of the action potential changes based on the intensity of the stimulus.
Answer: c

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Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System *Learning Objective:* 2.1.2 Understand the changes in a neuron's membrane that produce a large electrical signal called an *action potential*.
Bloom's Level: 2. Understanding

12. The size of the action potential is independent of stimulus magnitude. This is referred to as the _____ property of action potentials.
a. ionic
b. resting
c. all-or-none
d. threshold
Answer: c
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.2 Understand the changes in a neuron's membrane that produce a large electrical signal called an *action potential*.
Bloom's Level: 2. Understanding

13. After the spike of an action potential, axons may exhibit small potential changes, called
a. the threshold.
b. afterpotentials.
c. micropotentials.
d. the refractory phase.
Answer: b
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.2 Understand the changes in a neuron's membrane that produce a large electrical signal called an *action potential*.
Bloom's Level: 1. Remembering

14. The peak of the action potential is caused by the _____ of _____ channels.
a. opening; potassium
b. closing; potassium
c. opening; sodium
d. closing; sodium
Answer: c
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.3 Explain the changes in channels and movement of ions that underlie the action potential.
Bloom's Level: 3. Applying

15. During the relative refractory phase,
a. voltage-gated sodium channels are open.
b. all gated channels are closed.
c. no amount of stimulation can induce another action potential.
d. the neuron is briefly hyperpolarized.
Answer: d

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Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.3 Explain the changes in channels and movement of ions that underlie the action potential.
Bloom's Level: 3. Applying

16. The generation of the action potential depends on _____ channels, which are opened through a process of regenerative _____.
a. potassium; hyperpolarization
b. potassium; depolarization
c. sodium; hyperpolarization
d. sodium; depolarization
Answer: d
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.3 Explain the changes in channels and movement of ions that underlie the action potential.
Bloom's Level: 3. Applying

17. The _____ are regularly spaced along the length of myelinated axons.
a. nodes of Ranvier
b. dendrites
c. ion channels
d. sodium-potassium pumps
Answer: a
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.4 Understand how the action potential spreads along the length of an axon.
Bloom's Level: 1. Remembering

18. The conduction velocity of an action potential
a. is always the same, no matter how large the axon is.
b. varies, depending on where it is taking place in the brain.
c. varies, depending on the diameter of the axon.
d. is dependent upon the water content in the myelin of each specific neuron.
Answer: c
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.4 Understand how the action potential spreads along the length of an axon.
Bloom's Level: 1. Remembering

19. Action potentials generally are *not* propagated along dendrites because dendrites usually have few
a. voltage-gated ion channels.
b. sodium channels.
c. myelin.
d. cell membranes.
Answer: a

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Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.4 Understand how the action potential spreads along the length of an axon.
Bloom's Level: 2. Understanding

20. Myelin increases the speed of conduction because it
a. offers little resistance to the flow of ionic current.
b. releases special chemicals that aid conduction.
c. increases ionic transfer across the membrane.
d. offers considerable resistance to the flow of ionic current.
Answer: d
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.4 Understand how the action potential spreads along the length of an axon.
Bloom's Level: 2. Understanding

21. The form of conduction that is characteristic of myelinated axons is called
a. Ranvier diffusion.
b. saltatory conduction.
c. progressive conduction.
d. insulated diffusion.
Answer: b
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.4 Understand how the action potential spreads along the length of an axon.
Bloom's Level: 1. Remembering

22. The speed with which the largest-diameter myelinated axons in mammals conduct action potentials is
a. 150 mm/s.
b. 150 m/s.
c. 1 m/s.
d. 1000 m/s.
Answer: b
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.4 Understand how the action potential spreads along the length of an axon.
Bloom's Level: 1. Remembering

23. Which statement about multiple sclerosis is *false*?
a. It damages myelin.
b. It interferes with saltatory conduction.
c. It causes complex partial seizures.
d. Currently there is no cure.
Answer: c
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System

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Learning Objective: 2.1.5 Understand how each neuron uses these electrical signals to integrate information from other neurons.
Bloom's Level: 3. Applying

24. Inhibitory postsynaptic potentials differ from excitatory postsynaptic potentials most significantly in their
a. direction of membrane polarization.
b. degree of effect.
c. ease of elicitation.
d. overall speed.
Answer: a
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.5 Understand how each neuron uses these electrical signals to integrate information from other neurons.
Bloom's Level: 4. Analyzing

25. Most IPSPs are attributable to the
a. opening of sodium channels.
b. closing of potassium channels.
c. opening of chloride channels.
d. concurrent opening of sodium, potassium, and chloride channels.
Answer: c
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.5 Understand how each neuron uses these electrical signals to integrate information from other neurons.
Bloom's Level: 2. Understanding

26. A neuron can be pushed to threshold if many EPSPs arrive at the axon hillock in quick succession. This process is referred to as
a. active propagation.
b. spatial summation.
c. temporal summation.
d. threshold afterpotential.
Answer: c
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.5 Understand how each neuron uses these electrical signals to integrate information from other neurons.
Bloom's Level: 2. Understanding

27. A neuron can be pushed to threshold if many EPSPs arrive at the axon hillock at the same time, but from different locations across the cell body. This process is referred to as
a. active propagation.
b. spatial summation.
c. temporal summation.
d. threshold afterpotential.
Answer: b

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Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.5 Understand how each neuron uses these electrical signals to integrate information from other neurons.
Bloom's Level: 2. Understanding

28. Inhibitory postsynaptic potentials are characterized by _____ the postsynaptic membrane.
a. depolarization of
b. hyperpolarization of
c. decreased threshold of
d. no change in
Answer: b
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.5 Understand how each neuron uses these electrical signals to integrate information from other neurons.
Bloom's Level: 2. Understanding

29. Neurophysiology is the study of
a. the electrical activity of neurons.
b. neurons and neurotransmitters.
c. the life processes of neurons.
d. the nervous system.
Answer: c
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: Not aligned
Bloom's Level: 1. Remembering

30. Ions are molecules that carry an electric charge due to the gain or loss of
a. protons.
b. electrons.
c. neutrons.
d. positrons.
Answer: b
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: Not aligned
Bloom's Level: 1. Remembering

31. A key causal event in the release of neurotransmitter molecules from vesicles into the synaptic cleft is the
a. influx of sodium ions in response to the arrival of an action potential at the terminal.
b. influx of calcium ions in response to the arrival of an action potential at the terminal.
c. efflux of sodium ions in response to the arrival of an action potential at the terminal.
d. efflux of calcium ions at the axon hillock.
Answer: b
Section: 2.2 Synaptic Transmission Requires a Sequence of Events

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Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 3. Applying

32. Whether a synapse is excitatory or inhibitory is determined by the
a. number of action potentials arriving at the presynaptic axon terminal.
b. size of the calcium current flowing into the presynaptic axon terminal.
c. type of transmitter receptor in the postsynaptic neuron.
d. sensitivity of the presynaptic membrane.
Answer: c
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 4. Analyzing

33. The "lock-and-key" analogy relates to the
a. action of transmitter molecules on receptor proteins.
b. activation of the nerve impulse.
c. degradation of transmitter molecules by enzymes.
d. binding of G proteins to transmitter receptors.
Answer: a
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 2. Understanding

34. A ligand is a
a. type of drug.
b. type of electrical stimulus.
c. cholinergic synapse.
d. substance that binds to receptor molecules.
Answer: d
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 1. Remembering

35. The specialized presynaptic membrane receptors that remove molecules of transmitter from the synapse are called
a. translators.
b. transponders.
c. transporters.
d. agonists.
Answer: c
Section: 2.2 Synaptic Transmission Requires a Sequence of Events

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Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 1. Remembering

36. Any substance that binds to a receptor is known as a(n)
a. agonist.
b. antagonist.
c. ligand.
d. ion.
Answer: c
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 1. Remembering

37. The toxins bungarotoxin and curare both block _____ receptors, preventing _____.
a. GABA; postsynaptic IPSPs
b. ACh; muscle contractions
c. glycine; event-related potentials
d. glutamate; postsynaptic EPSPs
Answer: b
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 2. Understanding

38. The enzyme _____ breaks down molecules of the neurotransmitter acetylcholine, stopping its action at synapses.
a. curare
b. bungarotoxin
c. monoamine oxidase
d. acetylcholinesterase
Answer: d
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 1. Remembering

39. Transporter molecules are involved in the _____ of neurotransmitter at the synapse.
a. reuptake
b. degradation
c. activation
d. diffusion
Answer: a
Section: 2.2 Synaptic Transmission Requires a Sequence of Events

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Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 2. Understanding

40. After release, neurotransmitters are deactivated in the synapse by
a. afterpotentials.
b. the process of enzymatic degradation.
c. postsynaptic receptors.
d. reverse transmitters.
Answer: b
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 2. Understanding

41. Which molecule is a cholinergic antagonist?
a. Bungarotoxin
b. Nicotine
c. Dopamine
d. Acetylcholine
Answer: a
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 1. Remembering

42. The numbers of some receptors found in the brain may vary during the day by
a. 1 to 2%.
b. 10%.
c. 50%.
d. 100%.
Answer: c
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 1. Remembering

43. The neurotransmitter acetylcholine (ACh) acts on at least _____ different types of receptors.
a. 2
b. 3
c. 4
d. 10
Answer: c
Section: 2.2 Synaptic Transmission Requires a Sequence of Events

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Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 1. Remembering

44. The nicotinic ACh receptor has _____ ligand-binding site(s).
a. 1
b. 2
c. 3
d. 4
Answer: b
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 1. Remembering

45. Bungarotoxin is derived from a type of
a. mushroom.
b. snake.
c. spider.
d. plant.
Answer: b
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 1. Remembering

46. The active ingredient in tobacco products _____ the action of _____.
a. inhibits; acetylcholine
b. inhibits; GABA
c. mimics; acetylcholine
d. mimics; GABA
Answer: c
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 3. Applying

47. The substance curare, which is used by native South Americans for poisoning the tip of arrowheads,
a. selectively blocks sodium channels.
b. selectively blocks potassium channels.
c. increases levels of acetylcholinesterase.
d. blocks acetylcholine receptors.
Answer: d
Section: 2.2 Synaptic Transmission Requires a Sequence of Events

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Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 2. Understanding

48. Cholinergic receptors use _____ as their synaptic transmitter.
a. ACh
b. dopamine
c. AChE
d. nicotine
Answer: a
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 2. Understanding

49. Axo-axonic synapses
a. do not exist in mammalian species.
b. often terminate near the axon terminal.
c. often terminate on the dendritic spine.
d. are always inhibitory.
Answer: b
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 2. Understanding

50. Which type of synaptic connection allows the presynaptic neuron to strongly facilitate or inhibit the activity of the postsynaptic neuron?
a. Axo-axonic
b. Axo-dendritic
c. Axo-somatic
d. Dendro-dendritic
Answer: a
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 2. Understanding

51. Which characteristic is *not* a factor in the speed of the knee-jerk reflex?
a. Myelination
b. Fast synapses
c. IPSPs
d. Axon diameter
Answer: c
Section: 2.2 Synaptic Transmission Requires a Sequence of Events

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Learning Objective: 2.2.3 Identify the interactions between neurons and muscles that underlie a simple reflex.
Bloom's Level: 4. Analyzing

52. A tap on the patellar tendon activates
a. the knee jerk reflex.
b. an oscillator circuit.
c. the flexion reflex.
d. the yawning reflex.
Answer: a
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.3 Identify the interactions between neurons and muscles that underlie a simple reflex.
Bloom's Level: 2. Understanding

53. In the knee jerk reflex, the total time between the stimulus and the initiation of the response is about _____ ms.
a. 10
b. 40
c. 100
d. 400
Answer: b
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.3 Identify the interactions between neurons and muscles that underlie a simple reflex.
Bloom's Level: 1. Remembering

54. Spontaneous electrical rhythms that can be recorded from the surface of the scalp are
a. a pathological condition that signals epilepsy.
b. a reflection of the constant movement of neurons.
c. generated by the activity of populations of neurons.
d. a measure of the brain's reaction to sensory stimuli.
Answer: c
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.1 Understand how electroencephalograms (EEGs) work.
Bloom's Level: 4. Analyzing

55. To determine if someone is legally dead many countries employ the use of an
a. ERP.
b. EKG.
c. MRI.
d. EEG.
Answer: d
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.1 Understand how electroencephalograms (EEGs) work.
Bloom's Level: 2. Understanding

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56. One of the benefits of ERPs is they
a. can reliably detect seizure activity.
b. average out background cortical noise.
c. have an unpredictable wave shape.
d. can isolate damage in deep brain structures.
Answer: b
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.2 Explain the logic of event-related potentials.
Bloom's Level: 3. Applying

57. The early components of event-related potentials are associated primarily with
a. cognitive processing.
b. endogenous factors.
c. cortical responses.
d. brainstem activity.
Answer: d
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.2 Explain the logic of event-related potentials.
Bloom's Level: 2. Understanding

58. Event-related potentials are particularly useful for diagnosing problems with _____ at birth.
a. breathing
b. muscle contraction
c. hearing
d. vision
Answer: c
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.2 Explain the logic of event-related potentials.
Bloom's Level: 3. Applying

59. Complex partial seizures are often preceded by an unusual sensation referred to as
a. psychomotor retardation.
b. a predrome.
c. an aura.
d. proxy.
Answer: c
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.3 Understand the electrical activity underlying the brain disorder called epilepsy.
Bloom's Level: 1. Remembering

60. Spike-and-wave EEG activity is evident for _____ seconds during a simple partial seizure.
a. 1–5

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b. 5–15
c. 15–30
d. 30–45
Answer: b
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.3 Understand the electrical activity underlying the brain disorder called epilepsy.
Bloom's Level: 1. Remembering

61. Desynchronized electrical activity is seen
a. during a seizure.
b. only in brainstem structures.
c. in a normal active brain.
d. only in children.
Answer: c
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.3 Understand the electrical activity underlying the brain disorder called epilepsy.
Bloom's Level: 3. Applying

62. _____ seizures are most often accompanied by an unusual sensation called an aura and may not necessarily involve the entire brain.
a. Tonic-clonic
b. Complex partial
c. Simple partial
d. Clonic
Answer: b
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.3 Understand the electrical activity underlying the brain disorder called epilepsy.
Bloom's Level: 2. Understanding

63. Loss of consciousness and intense bursts of synchronized EEG are characteristic of _____ seizures.
a. tonic-clonic
b. complex partial
c. simple partial
d. focal
Answer: a
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.3 Understand the electrical activity underlying the brain disorder called epilepsy.
Bloom's Level: 1. Remembering

64. Which statement about complex partial seizures is true?
a. They do not involve the entire brain.

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b. They produce a set of characteristic behaviors.
c. They are more common in the elderly.
d. During an episode, a person will stop moving and stare into space.
Answer: a
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.3 Understand the electrical activity underlying the brain disorder called epilepsy.
Bloom's Level: 3. Applying

65. If you were to record EEG from six parts of the brain during a tonic-clonic seizure, you would see
a. different gradations of spiking activity.
b. the same relative intensity of spiking from each part of the brain.
c. variable intensity of spiking depending on the locus of seizure onset.
d. no activity in brainstem structures during the seizure.
Answer: b
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.3 Understand the electrical activity underlying the brain disorder called epilepsy.
Bloom's Level: 3. Applying

66. Research is currently underway into _____ as a potential treatment for seizures.
a. curare
b. glutamate
c. caffeine
d. cannabidiol
Answer: d
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.3 Understand the electrical activity underlying the brain disorder called epilepsy.
Bloom's Level: 1. Remembering

67. _____ was a pioneer in mapping the brain through electric stimulation.
a. John Hughlings Jackson
b. Marco Delgado
c. Wilder Penfield
d. Eric Kandel
Answer: c
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.4 Appreciate how neurosurgeons discovered important "maps" by electrically stimulating the brain.
Bloom's Level: 1. Remembering

68. Stimulation of the precentral and postcentral gyrus helped determine the location of _____ and _____ cortex, respectively.
a. sensory; motor

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b. motor; sensory
c. language; emotion
d. emotion; language
Answer: b
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.4 Appreciate how neurosurgeons discovered important "maps" by electrically stimulating the brain.
Bloom's Level: 3. Applying

69. Stimulation studies were able to create "maps" of how the various parts of the body are laid out on the cortex. These maps provided the basis for the cartoon depiction of areas of greatest representation in the brain. This cartoon depiction is referred to as the
a. homunculus.
b. petite fille.
c. grand homme.
d. mini-self.
Answer: a
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.4 Appreciate how neurosurgeons discovered important "maps" by electrically stimulating the brain.
Bloom's Level: 1. Remembering

70. The term still used to depict Penfield's maps of the brain is the
a. sulcus.
b. electric mind maps.
c. aura.
d. homunculus.
Answer: d
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.4 Appreciate how neurosurgeons discovered important "maps" by electrically stimulating the brain.
Bloom's Level: 1. Remembering

Fill–in-the-Blank Questions

71. During the _____ phase, an action potential cannot be initiated because Na^+ channels are unresponsive.
Answer: absolute refractory
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.3 Explain the changes in channels and movement of ions that underlie the action potential.
Bloom's Level: 2. Understanding

72. During an action potential, the small potential change after a spike is called the _____.
Answer: afterpotential

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Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2. 1.4 Understand how the action potential spreads along the length of an axon.
Bloom's Level: 1. Remembering

73. Application of a _____ stimulus to a neuron makes it less likely to fire.
Answer: hyperpolarizing
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2. 1.4 Understand how the action potential spreads along the length of an axon.
Bloom's Level: 2. Understanding

74. _____velocity refers to the speed at which an action potential travels down the axon.
Answer: Conduction
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2. 1.4 Understand how the action potential spreads along the length of an axon.
Bloom's Level: 1. Remembering

75. In saltatory conduction, the action potential jumps from one _____ to the next.
Answer: node of Ranvier
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2. 1.4 Understand how the action potential spreads along the length of an axon.
Bloom's Level: 1. Remembering

76. During the process of _____, transmitter molecules are reabsorbed by the same axon terminal that originally released them.
Answer: reuptake
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 2. Understanding

77. The enzyme acetylcholinesterase terminates the activity of the transmitter acetylcholine through the process of_____.
Answer: degradation
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 3. Applying

78. Following an action potential at the presynaptic membrane, the presynaptic terminal is depolarized, and there is an influx of _____ ions.
Answer: calcium

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Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 3. Applying

79. The plant poison, _____ is an antagonist that blocks ACh receptors.
Answer: curare
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 3. Applying

80. Nicotine, which acts like a transmitter at a receptor, is referred to as an _____ of that receptor.
Answer: agonist
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 3. Applying

Short Answer Questions

91. What accounts for and maintains the resting potential?
Answer: The concentrations of potassium and sodium ions inside and outside the cell are different, and the neuronal membrane is selectively permeable to potassium but not to sodium. The flow of potassium ions across the membrane along with the barriers to the movement of sodium ions causes the resting potential, which is maintained by electrostatic pressure pulling K^+ ions into the neuron and the concentration gradient pushing them out. When electrostatic pressure balances the concentration gradient, at the equilibrium potential this point corresponds to the resting potential of about –60 mV.
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.1 Identify the two physical forces that make neurons more negatively charged inside than outside.
Bloom's Level: 3. Applying

82. What are sodium-potassium pumps and what is their function?
Answer: Sodium-potassium pumps are cell membrane-bound proteins that push three sodium ions out of the intracellular environment for every two potassium ions pumped in. They are energetically expensive but essential for maintaining the resting potential.
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.1 Identify the two physical forces that make neurons more negatively charged inside than outside.
Bloom's Level: 2. Understanding

83. Explain the events that occur at the axon hillock to trigger an action potential.
Answer: Action potentials are initiated at the axon hillock when the excess of EPSPs

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exceeds IPSPs and the neuron reaches threshold. Summation can be either temporal (EPSPs arriving at nearly the same time) or spatial (EPSPs from different locations).
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.2 Understand the changes in a neuron's membrane that produce a large electrical signal called an *action potential*.
Bloom's Level: 4. Analyzing

84. How is the absolute refractory period different from the relative refractory period?
Answer: Immediately following the production of an action potential, no amount of stimulus can induce another action potential because the voltage-gated sodium channels cannot respond. This is the absolute refractory period. This phase is followed by a period of reduced sensitivity during which only strong stimulation can produce another action potential. This is the relative refractory period, and the neuron is temporarily hyperpolarized.
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.3 Explain the changes in channels and movement of ions that underlie the action potential.
Bloom's Level: 2. Understanding

85. How do excitatory postsynaptic potentials (EPSPs) differ from inhibitory postsynaptic potentials (IPSPs)?
Answer: EPSPs are depolarizing; they decrease the resting potential and increase the likelihood that the neuron will fire an action potential. IPSPs are hyperpolarizing; they decrease the likelihood that the neuron will fire an action potential. Hyperpolarizations increase the membrane potential (farther from 0) and depolarizations decrease it (closer to 0).
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.5 Understand how each neuron uses these electrical signals to integrate information from other neurons.
Bloom's Level: 3. Applying

86. Outline the sequence of synaptic events that take place during chemical synaptic transmission.
Answer:
1. An action potential arrives at the presynaptic axon terminal.
2. The arrival of the depolarizing action potential triggers the opening of voltage-gated calcium channels and the influx of calcium.
3. Ca^{2+} causes the vesicles to fuse with the presynaptic membrane and release transmitters into the synaptic cleft.
4. Some transmitter molecules bind to special receptor molecules in the postsynaptic membrane and ion channels in the postsynaptic membrane open. This creates a local EPSP or IPSP in the postsynaptic neuron.
5. The EPSPs or IPSPs spread passively over the dendrites and cell body to the axon hillock.
6. Synaptic transmission stops.

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7. Synaptic transmitter may also activate presynaptic receptors, resulting in a decrease in transmitter release.
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 2. Understanding

87. Create a short paragraph using the following terms: Transporters, reuptake, degradation, acetylcholinesterase, acetylcholine, dopamine
Answer: (Sample answer.) Transmitters must be cleared from the synaptic cleft to prevent ongoing activation of postsynaptic receptors. The synaptic cleft is cleared by two different mechanisms. In reuptake, presynaptic transporters bring the transmitter back inside the axon terminal. Dopamine activity is terminated mainly by reuptake. In degradation, enzymes present in the synaptic cleft rapidly break down and inactivate the transmitter. Acetylcholine is deactivated this way by the enzyme acetylcholinesterase.
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 3. Applying

88. Explain the difference between agonists and antagonists, and provide an example of each.
Answer: An agonist is a molecule that acts like a transmitter at a receptor. Nicotine is an example of an acetylcholine agonist. An antagonist is a substance the blocks or inhibits a transmitter. Curare and bungarotoxin are examples of acetylcholine antagonists.
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.2 Understand how a variety of chemical signals enables a diversity of neuronal responses to other neurons.
Bloom's Level: 4. Analyzing

89. What is the electroencephalogram (EEG) and what does it detect?
Answer: In the electroencephalogram (EEG), electrodes are places on the scalp and detect the gross electrical activity of the cortex. EEG can provide useful information about the activity of brain regions during behavioral processes, as well as pathological brain states such as epilepsy.
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.1 Understand how electroencephalograms (EEGs) work.
Bloom's Level: 2. Understanding

90. What are complex partial seizures?
Answer: Complex partial seizures are a form of epilepsy characterized by pathological brain activity that does not involve the entire brain. They are often preceded by an aura and present with symptoms that reflect the function of the particular brain region affected. In some individuals, complex partial seizures can be provoked by stimuli such as loud noises or flashing lights.
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain

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Learning Objective: 2.3.3 Understand the electrical activity underlying the brain disorder called epilepsy.
Bloom's Level: 2. Understanding

Discussion Questions

91. Give a detailed explanation of how the resting membrane potential is established and how it is maintained.
Answer: Answers and discussion will vary.
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.1 Identify the two physical forces that make neurons more negatively charged inside than outside.
Bloom's Level: 2. Understanding

92. Discuss how an action potential can be likened to a toilet. Highlight each component of the action potential and the aspects of flushing to which each corresponds.
Answer: Answers and discussion will vary.
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.2 Understand the changes in a neuron's membrane that produce a large electrical signal called an *action potential*.
Bloom's Level: 4. Analyzing

93. Summarize the various mechanisms by which ion channels may change their shape, thereby altering ion flow through the cell membrane.
Answer: Answers and discussion will vary.
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.3 Explain the changes in channels and movement of ions that underlie the action potential.
Bloom's Level: 3. Applying

94. Describe the refractory phase and its physiological basis. What is its significance for neuronal activity?
Answer: Answers and discussion will vary.
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.3 Explain the changes in channels and movement of ions that underlie the action potential.
Bloom's Level: 2. Understanding

95. Give a step-by-step description of the generation of an action potential and its transmission along an axon. Describe how the presence or absence of myelin affects this process.
Answer: Answers and discussion will vary.
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.4 Understand how the action potential spreads along the length of an axon.
Bloom's Level: 3. Applying

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96. Describe the characteristics of temporal and spatial summation in single nerve cells. In what ways are these processes important for information processing by the nervous system?
Answer: Answers and discussion will vary.
Section: 2.1 Electrical Signals Are the Vocabulary of the Nervous System
Learning Objective: 2.1.5 Understand how each neuron uses these electrical signals to integrate information from other neurons.
Bloom's Level: 4. Analyzing

97. Describe some of the mechanisms by which the actions of neurotransmitters are stopped rapidly. Why is this process important?
Answer: Answers and discussion will vary.
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.1 Identify the sequence of steps that take place when one neuron releases a chemical signal to affect another.
Bloom's Level: 3. Applying

98. Discuss three factors that account for the rapidity of the knee-jerk reflex.
Answer: Answers and discussion will vary.
Section: 2.2 Synaptic Transmission Requires a Sequence of Events
Learning Objective: 2.2.3 Identify the interactions between neurons and muscles that underlie a simple reflex.
Bloom's Level: 3. Applying

99. What are event-related potentials, and how are they useful in studying the workings of the normal brain?
Answer: Answers and discussion will vary.
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.2 Explain the logic of event-related potentials.
Bloom's Level: 2. Understanding

100. Describe at least two major classes of seizure disorder, highlighting their behavioral and electrophysiological differences.
Answer: Answers and discussion will vary.
Section: 2.3 EEGs Measure Gross Electrical Activity of the Human Brain
Learning Objective: 2.3.3 Understand the electrical activity underlying the brain disorder called epilepsy.
Bloom's Level: 3. Applying

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