Chapter 2: Structure and Function of Cells of the Nervous System

Total Assessment Guide (T.A.G.)

Topic	Question Type	Factual	Conceptual	Applied
Introduction	Multiple Choice	1,2		
	Fill-In			
	Essay			
Cells of the Nervous System	Multiple Choice	3-5,9-23,27,29-31, 34,37,38,40,41	6-8,24-26,28,32, 33,36,39,42-44	35,45
	Fill-In	110-117		
	Essay	130-131		
Communication Within a Neuron	Multiple Choice	46,52,53,58-67, 69,72,75,76,78	49-51,54-57,68,71, 73,74,77,79-84	47,48,70
	Fill-In	119-121	118	
	Essay	132,134	133,135	
Communication Between Neurons	Multiple Choice	85,86,91,92,97,100, 102,103, 105-109	87-90,95,96,98, 99,101,104	93,94
	Fill-In	122-129		
	Essay	137	136,138,139	

Multiple-Choice Questions

2-1. The primary symptom shown by Kathryn D. was

a. severe nausea.
b. inability to sleep.
c. muscle weakness.
d. distortions of memory.
e. difficulty in recognizing facial displays of emotion.

Difficulty: 1
Page Ref: 23
Topic: Opening Vignette
Skill: Factual
Answer: c. muscle weakness.

2-2. The official diagnosis that Kathryn D. received was

a. lupus.
b. multiple sclerosis.
c. myasthenia gravis.
d. muscular dystrophy.
e. Lambert-Eaton syndrome.

Difficulty: 1
Page Ref: 23
Topic: Opening Vignette
Skill: Factual
Answer: c. myasthenia gravis.

2-3. _____ neurons gather information from the environment related to light, odors, and contact of our skin with objects.

a. Sensory
b. Motor
c. Inter-
d. Relay inter-
e. Local inter-

Difficulty: 2
Page Ref: 24
Topic: The Nervous System: An Overview
Skill: Factual
LO 2.1 Contrast the location of the central and peripheral nervous systems.
Answer: a. Sensory

2-4. _____ neurons function to contract muscles.

a. Sensory
b. Motor
c. Inter-
d. Relay
e. Local

Difficulty: 1
Page Ref: 24
Topic: The Nervous System: An Overview
Skill: Factual
LO 2.1 Contrast the location of the central and peripheral nervous systems.
Answer: b. Motor

2-5. _____ are located only within the central nervous system.

a. Sensory
b. Motor
c. Relay interneurons
d. Projection neurons
e. Schwann cells

Difficulty: 2
Page Ref: 24
Topic: The Nervous System: An Overview
Skill: Factual
LO 2.1 Contrast the location of the central and peripheral nervous systems.
Answer: c. Relay interneurons

2-6. You reach out and touch a piece of cloth, feeling its texture. The cells that gather this sensory information are part of the _____ nervous system.

a. central
b. peripheral
c. autonomic
d. parasympathetic
e. sympathetic

Difficulty: 2
Page Ref: 24
Topic: The Nervous System: An Overview
Skill: Conceptual
LO 2.1 Contrast the location of the central and peripheral nervous systems.
Answer: b. peripheral

2-7. Sally's stomach begins to rumble, reminding her that she skipped breakfast this morning. This hunger signal is sent to the brain, which is part of the _____ nervous system.

a. peripheral
b. central
c. enteric
d. human
e. local circuit

Difficulty: 1
Page Ref: 23
Topic: The Nervous System: An Overview
Skill: Conceptual
LO 2.1 Contrast the location of the central and peripheral nervous systems.
Answer: b. central

2-8. The _____ system is that portion of the nervous system that lies outside of the brain and spinal cord.

a. extraspinal
b. central nervous
c. enteric nervous
d. human nervous
e. peripheral nervous

Difficulty: 1
Page Ref: 23-24
Topic: The Nervous System: An Overview
Skill: Conceptual
LO 2.1 Contrast the location of the central and peripheral nervous systems.
Answer: e. peripheral nervous

2-9. The nucleus of the nerve cell is located within the

a. soma.
b. axon.
c. axon terminals.
d. dendrites.
e. mitochondria.

Difficulty: 1
Page Ref: 25
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: a. soma.

2-10. The portion of a neuron that carries information toward the cell body is the

a. dendrite.
b. axon terminal.
c. presynaptic membrane.
d. soma.
e. glial membrane.

Difficulty: 1
Page Ref: 25
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: a. dendrite.

2-11. When an impulse enters a neuron, it is received by the _____ and passed to the next cell via the _____.

a. dendrite; axon
b. axon; dendrite
c. soma; axon
d. soma; dendrite
e. axon; soma

Difficulty: 1
Page Ref: 25
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: a. dendrite; axon

2-12. When substances are transported from the terminal buttons at the end of the axon back to the soma, this process is referred to as _____.

a. retrograde axoplasmic transport
b. systemic axoplasmic transport
c. anterograde axoplasmic transport
d. peripheral axoplasmic transport
e. anterograde somatoplasmic transport

Difficulty: 3
Page Ref: 26
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: a. retrograde axoplasmic transport

2-13. When substances are transported from the soma to the terminal buttons at the end of the axon, this process is referred to as _____.

a. retrograde axoplasmic transport
b. systemic axoplasmic transport
c. anterograde axoplasmic transport
d. peripheral axoplasmic transport
e. anterograde somatoplasmic transport

Difficulty: 3
Page Ref: 26
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: c. anterograde axoplasmic transport

2-14. In order to cross the synapse between two cells, a substance called _____ is released from the first cell (pre-synapse) to activate or inhibit the second cell (post-synapse).

a. a neurotransmitter
b. protein
c. kinesin
d. dynein
e. mitochondria

Difficulty: 2
Page Ref: 25
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: a. a neurotransmitter

2-15. The membrane of a nerve cell is comprised of

a. protein molecules.
b. vesicle remnants.
c. a double layer of lipid molecules.
d. cytoplasm.
e. a single layer of lipid molecules interfaced with a layer of protein molecules.

Difficulty: 1
Page Ref: 27
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: c. a double layer of lipid molecules.

2-16. Neurotransmitter molecules are most commonly secreted from the

a. glial cell.
b. dendrite.
c. axon terminal.
d. dendritic apposition.
e. soma.

Difficulty: 1
Page Ref: 25
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: c. axon terminal.

2-17. A key function of specialized lipid molecules located in the nerve cell is to

a. detect the presence of hormones outside the cell.
b. form the membrane.
c. form channels to carry ions in and out of the cell.
d. transport molecules into the cell.
e. transport vesicles within the neuron.

Difficulty: 1
Page Ref: 27
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: b. form the membrane.

2-18. Match up the internal cell structure with the function most closely associated with that structure.

a. nucleolus; production of cytoplasm
b. ribosomes; production of DNA
c. lipid bilayer; production of ribosomes
d. nucleolus; production of ribosomes
e. mRNA; production of cytoplasm

Difficulty: 2
Page Ref: 27
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: d. nucleolus; production of ribosomes

2-19. Which of the following structures is the site of production of proteins?

a. vesicles
b. ribosomes
c. genes
d. myeline
e. the nucleolus

Difficulty: 2
Page Ref: 27
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: b. ribosomes

2-20. Which of the following represents a correct match between a neuronal organelle and its function?

a. mitochondria; extraction of energy
b. Golgi apparatus; extraction of energy
c. endoplasmic reticulum; breakdown of proteins
d. microtubules; transport of chemicals through the cell membrane
e. mitochondria; formation of vesicles

Difficulty: 2
Page Ref: 28
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: a. mitochondria; extraction of energy

2-21. Match the correct function with the neuronal organelle.

a. mitochondria; production of fat-like molecules
b. mitochondria; formation of vesicles
c. endoplasmic reticulum; breakdown of proteins
d. microtubules; transport of molecules between the soma and the axon terminals
e. Golgi apparatus; extraction of energy for cell use

Difficulty: 1
Page Ref: 27
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: d. microtubules; transport of molecules between the soma and the axon terminals

2-22. Proteins are produced within the neuron cytoplasm by

a. mitochondria.
b. ribosomes.
c. lysosomes.
d. the cytoskeleton.
e. nucleoli.

Difficulty: 1
Page Ref: 27
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: b. ribosomes.

2-23. Surplus substances within the cytoplasm are degraded by

a. mitochondria.
b. ribosomes.
c. lysosomes.
d. the cytoskeleton.
e. cytoskeletal proteins.

Difficulty: 1
Page Ref: 28
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: c. lysosomes.

2-24. A key function of lysosomes is to

a. move vesicles from the soma to the axon terminal.
b. produce proteins.
c. degrade surplus cellular materials.
d. provide energy to the neuron.
e. transport vesicles within the neuron.

Difficulty: 1
Page Ref: 28
Topic: Neurons
Skill: Conceptual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: c. degrade surplus cellular materials.

2-25. Which of the following is correct regarding axoplasmic transport?

a. The dynein molecule is involved in anterograde axoplasmic transport.
b. Retrograde axoplasmic transport involves moving substances from the soma to the axon terminals.
c. The kinesin molecule is involved in retrograde axoplasmic transport.
d. Retrograde transport is half as fast as anterograde axoplasmic transport.
e. Transport of materials occurs only in one direction.

Difficulty: 3
Page Ref: 26
Topic: Neurons
Skill: Conceptual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: d. Retrograde transport is half as fast as anterograde axoplasmic transport.

2-26. Which of the following is correct regarding axoplasmic transport?

a. Dendrograde transport involves moving substances from the dendrites to the soma.
b. Retrograde transport involves moving substances from the soma to the axon terminals.
c. The kinesin molecule is involved in anterograde transport.
d. Retrograde transport is twice as fast as anterograde transport.
e. The dynein molecule is involved in anterograde transport.

Difficulty: 3
Page Ref: 26
Topic: Neurons
Skill: Conceptual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: c. The kinesin molecule is involved in anterograde transport.

2-27. Movement of cargo from one end of the axon to the other involves _____ along the _____.

a. axoplasmic transport; myelin sheath
b. facilitated diffusion; exterior of the cell membrane
c. facilitated diffusion; neurofilaments
d. protein synthesis; microtubules
e. axoplasmic transport; microtubules

Difficulty: 2
Page Ref: 26
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: e. axoplasmic transport; microtubules

2-28. What is true about axons?

a. They receive information from other neurons.
b. Axons can only be two inches long.
c. Axons house the Golgi apparatus.
d. Axons generate the energy of the cell.
e. The longest axon in a human stretches from the foot to a region located in the base of the brain.

Difficulty: 2
Page Ref: 26
Topic: Neurons
Skill: Conceptual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: e. The longest axon in a human stretches from the foot to a region located in the base of the brain.

2-29. Neurons of the central nervous system are provided nutrients, oxygen, and physical support by _____ cells.

a. Schwann
b. glial or neuroglial
c. Golgi
d. stem
e. microtubule

Difficulty: 1
Page Ref: 29
Topic: Supporting Cells
Skill: Factual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: b. glial or neuroglial

2-30. _____ are supporting cells that can provide myelination to multiple axons at once.

a. Schwann
b. Astrocytes
c. Microglia
d. Oligodendrocytes
e. Microtubules

Difficulty: 1
Page Ref: 30
Topic: Supporting Cells
Skill: Factual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: d. Oligodendrocytes

2-31. _____ are multi-function glial cells that participate in phagocytosis, provide lactate for cells, and structurally support neurons in the brain.

a. Schwann
b. Astrocytes
c. Microglia
d. Oligodendrocytes
e. Microtubules

Difficulty: 1
Page Ref: 30
Topic: Supporting Cells
Skill: Factual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: b. Astrocytes

2-32. Which of the following is a key a function of the glial cells?

a. protection of the outer surface of the brain
b. removal of physical debris from the brain
c. secretion of CSF in the brain
d. movement of vesicles along the axon
e. the conduction of action potentials

Difficulty: 2
Page Ref: 29
Topic: Supporting Cells
Skill: Conceptual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: b: removal of physical debris from the brain

2-33. Nerve cells are able to rapidly metabolize fuel because

a. of their capacity to store glucose in the cytoplasm.
b. neurons receive lactate from astrocytes.
c. glial cells can transfer ATP into neurons.
d. brain blood vessels can convert glucose into lactate for neuron use.
e. glial cell mitochondria process fuel for the neuron.

Difficulty: 2
Page Ref: 29
Topic: Supporting Cells
Skill: Conceptual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: b. neurons receive lactate from astrocytes.

2-34. The _____ are the key supply source of energy for neurons.

a. phagocytes
b. Schwann cells
c. dendrocytes
d. astrocytes
e. microtubules

Difficulty: 1
Page Ref: 29
Topic: Supporting Cells
Skill: Factual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: d. astrocytes

2-35. A drug that specifically killed the _____ cells would be expected to alter the physical and nutritional support of brain cells.

a. phagocyte
b. Schwann
c. microglia
d. astrocyte
e. microtubule

Difficulty: 1
Page Ref: 29
Topic: Supporting Cells
Skill: Applied
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: d. astrocyte

2-36. The process of phagocytosis involves

a. the removal of neuronal debris.
b. the transfer of lactate from a glial cell to a neuron.
c. the wrapping of fatty material around an axon membrane.
d. structural support of a nerve cell.
e. the degradation of transmitter molecules within the synapse.

Difficulty: 1
Page Ref: 29
Topic: Supporting Cells
Skill: Conceptual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: a. the removal of neuronal debris.

2-37. The scar tissue generated in the brain by _____ cells acts to impede the regrowth of nerve cells.

a. astrocytes
b. microglia
c. Schwann cells
d. axon terminals
e. phagocytes

Difficulty: 2
Page Ref: 30
Topic: Supporting Cells
Skill: Factual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: a. astrocytes

2-38. Myelination of brain nerve axon membranes is accomplished by

a. oligodendrocytes.
b. microglia.
c. astrocytes.
d. neurocytes.
e. Schwann cells.

Difficulty: 1
Page Ref: 30
Topic: Supporting Cells
Skill: Factual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: a. oligodendrocytes

2-39. A key feature for the diagnosis of multiple sclerosis in Dr. C. was

a. focal damage to a single brain region evident in a CT scan.
b. diverse neurological symptoms that appeared at different times.
c. the excess production of myelin in the nervous system.
d. the occurrence of small strokes that impair brain function.
e. an autoimmune disease that attacks the myelin found in the peripheral nervous system.

Difficulty: 1
Page Ref: 31-32
Topic: Supporting Cells
Skill: Conceptual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: b. diverse neurological symptoms that appeared at different times.

2-40. The _____ mediates the inflammatory reaction that follows brain damage.

a. Schwann cell
b. phagocyte
c. dendrocyte
d. astrocyte
e. microglia

Difficulty: 1
Page Ref: 30
Topic: Supporting Cells
Skill: Factual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: e. microglia

2-41. Which of the following is true of Schwann cells?

a. Schwann cells provide myelin for peripheral nerve cells.
b. Schwann cells are found within the brain.
c. A single Schwann cell wraps multiple segments around a peripheral nerve cell.
d. A single Schwann cell can myelinate up to 50 segments of axon membrane.
e. Schwann cells remove the cellular debris left by dead neurons in brain.

Difficulty: 3
Page Ref: 31-32
Topic: Supporting Cells
Skill: Factual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: a. Schwann cells provide myelin for peripheral nerve cells.

2-42. Regrowth of a damaged axon can occur more readily in the peripheral nervous system than in the brain because

a. Schwann cells form barriers to axon regrowth.
b. Schwann cells form cylinders through which new axons can grow and reinnervate a target cell nerve cell.
c. Schwann cells generate a chemical signal that instructs nerve cells to die.
d. Astrocytes form cylinders through which new axons can grow and reinnervate a target cell nerve cell.
e. Oligodendroglia form barriers to axon regrowth.

Difficulty: 2
Page Ref: 31
Topic: Supporting Cells
Skill: Conceptual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: b. Schwann cells form cylinders through which new axons can grow and reinnervate a target cell nerve cell.

2-43. A scan shows that a particular substance has spread throughout the body via the bloodstream but has not entered the brain. This finding demonstrates the existence of

a. the blood-brain barrier.
b. blood efficacy.
c. medicine effects.
d. the lipid bilayer.
e. the doctrine of specific nerve energies.

Difficulty: 3
Page Ref: 32
Topic: The Blood-Brain Barrier
Skill: Conceptual
LO 2.4 Discuss the features and importance of the blood-brain barrier.
Answer: a. the blood-brain barrier.

2-44. Which of the following is true of the blood-brain barrier?

a. The barrier is uniform, protecting all brain structures.
b. The barrier pumps glucose out of the brain into the bloodstream.
c. The barrier functions to regulate the chemical composition of the extracellular fluid surrounding the brain cells.
d. The barrier is formed by cells that line the capillaries of the brain.
e. The ventricles have a blood-brain barrier.

Difficulty: 2
Page Ref: 32
Topic: The Blood-Brain Barrier
Skill: Conceptual
LO 2.4 Discuss the features and importance of the blood-brain barrier.
Answer: c. The barrier functions to regulate the chemical composition of the extracellular fluid surrounding the brain cells.

2-45. Activation of cells within the _____ by a poison in the blood would be predicted to produce _____.

a. nucleus accumbens; visual hallucinations
b. hippocampus; locomotion
c. hypothalamus; vomiting
d. area postrema; vomiting
e. hippocampus; vomiting

Difficulty: 2
Page Ref: 32
Topic: The Blood-Brain Barrier
Skill: Applied
LO 2.4 Discuss the features and importance of the blood-brain barrier.
Answer: d. area postrema; vomiting

2-46. The normal order of activation during neuronal transmission is

a. axon –> dendrite –> cell body –> axon terminals.
b. axon terminals –> cell body –> axon –> dendrite.
c. dendrite –> cell body –> axon –> terminal button.
d. cell body –> axon –> dendrite –> axon terminal.
e. dendrite –> axon terminal –> cell body –> axon.

Difficulty: 2
Page Ref: 33
Topic: Neural Communication: An Overview
Skill: Factual
LO 2.5 Compare neural communication in a withdrawal reflex with and without inhibition of the reflex.
Answer: c. dendrite –> cell body –> axon –> terminal button.

2-47. Susie takes a huge drink of her coffee, assuming that it is tolerable, and the heat sears her mouth. Although the pain is so great that her reflex is to spit out the coffee, she does not do so. The reflex to spit out the coffee is inhibited at the

a. sensory neuron.
b. interneuron.
c. motor neuron.
d. glial cell.
e. astrocyte.

Difficulty: 1
Page Ref: 33-34
Topic: Neural Communication: An Overview
Skill: Applied
LO 2.5 Compare neural communication in a withdrawal reflex with and without inhibition of the reflex.
Answer: c. motor neuron.

2-48. As you study for your neuroscience exam, you feel a tickle on your arm. You look and see a large spider and you jerk your arm automatically. What might be the neural path for this action?

a. sensory neuron –> interneuron –> motor neuron –> muscle
b. interneuron –> sensory neuron –> motor neuron –> muscle
c. motor neuron –> sensory neuron –> interneuron –> muscle
d. sensory neuron –> motor neuron –> interneuron –> muscle
e. motor neuron –> interneuron –> sensory neuron –> muscle

Difficulty: 1
Page Ref: 33-34
Topic: Neural Communication: An Overview
Skill: Applied
LO 2.5 Compare neural communication in a withdrawal reflex with and without inhibition of the reflex.
Answer: sensory neuron –> interneuron –> motor neuron –> muscle

2-49. A key function of the giant squid axon is the

a. integration of sensory messages regarding the environment.
b. planning of feeding-related movements.
c. contraction of the squid mantle, which propels the squid away from danger.
d. coordination of general sensory-motor function.
e. contraction of the oral region to produce chewing movements.

Difficulty: 2
Page Ref: 35
Topic: Measuring Electrical Potentials of Axons
Skill: Conceptual
LO 2.6 Contrast the changes in electrical potential within a neuron when it is experiencing resting potential, hyperpolarization, depolarization, and action potential.
Answer: c. contraction of the squid mantle, which propels the squid away from danger.

2-50. The function of a _____ in a giant squid physiology experiment is to _____.

a. microelectrode; inject potassium ions into the axon
b. voltmeter; stimulate the interior of the axon
c. microelectrode; compare the electric charge of the interior with that of the exterior
d. voltmeter; compare the electric charge of the interior with that of the exterior
e. microelectrode; dampen the electric charge within the axon

Difficulty: 2
Page Ref: 35
Topic: Measuring Electrical Potentials of Axons
Skill: Conceptual
LO 2.6 Contrast the changes in electrical potential within a neuron when it is experiencing resting potential, hyperpolarization, depolarization, and action potential.
Answer: d: voltmeter; compare the electric charge of the interior with that of the exterior

2-51. The interior of a neuron at rest

a. has the same ionic concentrations as the outside.
b. is at the same voltage potential as the outside.
c. has a higher sodium concentration than outside.
d. is negatively charged relative to the outside.
e. has a lower potassium concentration than outside.

Difficulty: 2
Page Ref: 35
Topic: Measuring Electrical Potentials of Axons
Skill: Conceptual
LO 2.6 Contrast the changes in electrical potential within a neuron when it is experiencing resting potential, hyperpolarization, depolarization, and action potential.
Answer: d. is negatively charged relative to the outside.

2-52. The difference in electrical charge between the inside and the outside of the axon membrane is defined as the _____ potential.

a. membrane
b. local
c. glial
d. action
e. axon

Difficulty: 1
Page Ref: 34
Topic: Measuring Electrical Potentials of Axons
Skill: Factual
LO 2.6 Contrast the changes in electrical potential within a neuron when it is experiencing resting potential, hyperpolarization, depolarization, and action potential.
Answer: a. membrane

2-53. The _____ potential is defined as the difference in electrical charge between the inside and the outside of an undisturbed axon membrane.

a. resting membrane
b. local
c. resting
d. action
e. axon

Difficulty: 2
Page Ref: 34
Topic: Measuring Electrical Potentials of Axons
Skill: Factual
LO 2.6 Contrast the changes in electrical potential within a neuron when it is experiencing resting potential, hyperpolarization, depolarization, and action potential.
Answer: a. resting membrane

2-54. A change in the axon membrane potential from -70 mV to -90 mV would be termed a(n)

a. depolarization.
b. threshold potential.
c. action potential.
d. hyperpolarization.
e. excitatory local potential.

Difficulty: 1
Page Ref: 34
Topic: Measuring Electrical Potentials of Axons
Skill: Conceptual
LO 2.6 Contrast the changes in electrical potential within a neuron when it is experiencing resting potential, hyperpolarization, depolarization, and action potential.
Answer: d. hyperpolarization.

2-55. A neuron membrane potential moves from -90 mV to -80 mV in response to a brief stimulation. We would term this change in potential as a(n)

a. depolarization.
b. resting potential.
c. action potential.
d. hyperpolarization.
e. inhibitory local potential.

Difficulty: 1
Page Ref: 34
Topic: Measuring Electrical Potentials of Axons
Skill: Conceptual
LO 2.6 Contrast the changes in electrical potential within a neuron when it is experiencing resting potential, hyperpolarization, depolarization, and action potential.
Answer: a. depolarization.

2-56. If the inner voltage of a cell is -70 mV and application of stimulation results in a -95 mV charge, the stimulation had a _____ effect. On the other hand, a resultant charge of +40 mV would be a _____ effect.

a. hyperpolarizing; depolarizing
b. depolarizing; hyperpolarizing
c. repolarizing; depolarizing
d. repolarizing; hyperpolarizing
e. hyperpolarizing; repolarizing

Difficulty: 1
Page Ref: 34
Topic: Measuring Electrical Potentials of Axons
Skill: Conceptual
LO 2.6 Contrast the changes in electrical potential within a neuron when it is experiencing resting potential, hyperpolarization, depolarization, and action potential.
Answer: a. hyperpolarizing; depolarizing

2-57. A(n) _____ will be recorded from a nerve cell whose membrane potential rises above threshold.

a. action potential
b. local potential
c. downward shift of the threshold of excitation
d. upward shift of the membrane threshold
e. long-term change in the membrane potential

Difficulty: 1
Page Ref: 34
Topic: Measuring Electrical Potentials of Axons
Skill: Conceptual
LO 2.6 Contrast the changes in electrical potential within a neuron when it is experiencing resting potential, hyperpolarization, depolarization, and action potential.
Answer: a. action potential

2-58. The _____ is the voltage level at which an action potential is triggered in a patch of axon membrane.

a. resting membrane potential
b. hyperpolarization event
c. threshold of excitation
d. rate level
e. refractory period

Difficulty: 1
Page Ref: 34
Topic: Measuring Electrical Potentials of Axons
Skill: Factual
LO 2.6 Contrast the changes in electrical potential within a neuron when it is experiencing resting potential, hyperpolarization, depolarization, and action potential.
Answer: c. threshold of excitation

2-59. A cup of sugar is dumped into a gallon of hot water. After 30 minutes, we will expect that the process of _____ will ensure that the sugar molecules are evenly distributed throughout the water.

a. retrograde transport
b. diffusion
c. anterograde transport
d. electrostatic pressure
e. salinity

Difficulty: 1
Page Ref: 36
Topic: The Membrane Potential
Skill: Factual
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: b. diffusion

2-60. A substance that forms oppositely charged particles when dissolved into water would be termed a(n)

a. ion.
b. molecule.
c. electrolyte.
d. cation.
e. anion.

Difficulty: 1
Page Ref: 36
Topic: The Membrane Potential
Skill: Factual
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: c. electrolyte.

2-61. _____ are charged particles formed when an electrolyte dissolves in water.

a. Ions
b. Solvents
c. Transmitters
d. Electrons
e. Solutes

Difficulty: 1
Page Ref: 36
Topic: The Membrane Potential
Skill: Factual
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: a. Ions

2-62. A cation would be attracted to

a. another cation.
b. an anion.
c. a sodium ion.
d. a potassium ion.
e. a calcium ion.

Difficulty: 1
Page Ref: 36
Topic: The Membrane Potential
Skill: Factual
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: b. an anion.

2-63. _____ are negatively charged particles.

a. Transmitters
b. Solvents
c. Electrolytes
d. Cations
e. Anions

Difficulty: 1
Page Ref: 36
Topic: The Membrane Potential
Skill: Factual
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: e. Anions

2-64. The process by which similarly charged particles repel each other and are thus moved within a medium is termed

a. diffusion.
b. carrier-mediated transport.
c. refraction.
d. electrostatic pressure.
e. diffraction.

Difficulty: 2
Page Ref: 36
Topic: The Membrane Potential
Skill: Factual
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: d. electrostatic pressure.

2-65. Which of the following is true of ion distribution across the axon membrane?

a. Chloride ions are more concentrated inside the axon membrane.
b. Potassium ions are more concentrated outside the cell membrane.
c. The action potential is the balance point between diffusion and electrostatic pressure.
d. Sodium ions are more concentrated outside the axon membrane.
e. Sodium ions are more concentrated inside the axon membrane.

Difficulty: 1
Page Ref: 36
Topic: The Membrane Potential
Skill: Factual
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: d. Sodium ions are more concentrated outside the axon membrane.

2-66. Movement of _____ ions _____ the axon would be induced by the force of diffusion.

a. chloride; out of
b. sodium; into
c. potassium; into
d. organic; into
e. sodium; out of

Difficulty: 1
Page Ref: 36
Topic: The Membrane Potential
Skill: Factual
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: b. sodium; into

2-67. Sodium ions move out of the axon because of

a. the opening of sodium channels.
b. the opening of voltage-gated channels.
c. kinesin.
d. electrostatic pressure.
e. the sodium-potassium transporter.

Difficulty: 2
Page Ref: 38
Topic: The Membrane Potential
Skill: Factual
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: e. the sodium-potassium transporter.

2-68. As a consequence of the activity of the sodium-potassium transporters,

a. extracellular sodium concentrations are kept low.
b. intracellular sodium concentrations are kept very high.
c. extracellular potassium concentrations are kept very high.
d. intracellular sodium concentrations are kept low.
e. very little energy is required to maintain ionic differences across the membrane.

Difficulty: 2
Page Ref: 38
Topic: The Membrane Potential
Skill: Conceptual
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: d. intracellular sodium concentrations are kept low.

2-69. The Na+/K+ pump removes _____ Na+ ions and adds _____ K+ ions.

a. 3; 2
b. 2; 3
c. 3; 4
d. 2; 4
e. 4; 3

Difficulty: 3
Page Ref: 38
Topic: The Membrane Potential
Skill: Factual
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: a. 3; 2

2-70. When students enter a class, they tend to spread themselves out (provided there are enough desks to do so). In biological terms, this effect would be

a. electrostatic pressure.
b. ionic movement.
c. diffusion.
d. antisocialism.
e. ionic static.

Difficulty: 2
Page Ref: 36
Topic: The Membrane Potential
Skill: Applied
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: c. diffusion.

2-71. Which of the following is true regarding the action potential (AP)?

a. The AP is conducted along the dendrite.
b. The AP is conducted faster in unmyelinated nerve cells.
c. The AP is an all-or-none electrical event.
d. The AP amplitude is higher for an intense signal.
e. The AP amplitude depends on its location along the axon.

Difficulty: 2
Page Ref: 38-40
Topic: The Action Potential
Skill: Conceptual
LO 2.8 Summarize the series of ion movements during the action potential.
Answer: c. The AP is an all-or-none electrical event.

2-72. The specialized protein molecules located in the axon membrane that can open or close are termed

a. receptors.
b. voltage transporters.
c. autoreceptors.
d. ion channels.
e. sodium-potassium transporters.

Difficulty: 2
Page Ref: 38
Topic: The Action Potential
Skill: Factual
LO 2.8 Summarize the series of ion movements during the action potential.
Answer: d. ion channels.

2-73. Which of the following is true of the action potential?

a. More sodium channels are opened at a lower voltage level than are the potassium channels.
b. The action potential requires 10 msec for completion.
c. The action potential requires the activity of the sodium-potassium transporters during the rising phase.
d. More potassium channels are opened at a lower voltage than are sodium channels.
e. The overshoot is due to a prolonged change in sodium conductance.

Difficulty: 2
Page Ref: 39
Topic: The Action Potential
Skill: Conceptual
LO 2.8 Summarize the series of ion movements during the action potential.
Answer: a. More sodium channels are opened at a lower voltage level than are the potassium channels.

2-74. Sodium ions will be pushed into a resting neuron by the forces of

a. inactivation of potassium channels; diffusion.
b. electrostatic pressure; sodium-potassium pump activation.
c. sodium-potassium pump activation; diffusion.
d. ion channel inactivation; diffusion.
e. diffusion; electrostatic pressure.

Difficulty: 2
Page Ref: 38
Topic: The Membrane Potential
Skill: Conceptual
LO 2.8 Summarize the series of ion movements during the action potential.
Answer: e. diffusion; electrostatic pressure.

2-75. Match the ion channel action with its resulting change in membrane potential.

a. entry of a negative ion; hyperpolarization
b. entry of a positive ion; hyperpolarization
c. exit of a positive ion; depolarization
d. exit of a negative ion; hyperpolarization
e. inactivation of sodium-potassium transporters; depolarization

Difficulty: 3
Page Ref: 39
Topic: The Action Potential
Skill: Factual
LO 2.8 Summarize the series of ion movements during the action potential.
Answer: a. entry of a negative ion; hyperpolarization

2-76. Which of the following events restores the membrane potential from the peak of the action potential back down to the resting level?

a. Sodium ions move into the cell.
b. Potassium ions move out of the cell.
c. Potassium ions move into the cell.
d. Chloride ions move into the cell.
e. Protein anions move out of the cell.

Difficulty: 2
Page Ref: 40
Topic: The Action Potential
Skill: Factual
LO 2.8 Summarize the series of ion movements during the action potential.
Answer: b. Potassium ions move out of the cell.

2-77. Which of the following sets of terms do NOT belong together?

a. saltatory conduction; faster conduction speeds in smaller neurons
b. open sodium channels; membrane depolarization
c. saltatory conduction; slower conduction speeds in smaller neurons
d. open potassium channels; membrane repolarization
e. sodium-potassium pump; restoration of the normal concentrations of these ions

Difficulty: 3
Page Ref: 42
Topic: Conduction of the Action Potential
Skill: Conceptual
LO 2.9 Describe the propagation of an action potential.
Answer: c. saltatory conduction; slower conduction speeds in smaller neurons

2-78. Which of the following is consistent with the “all-or-none” law?

a. The action potential will diminish to near 0 mV when transmitted down a long axon.
b. The action potential fires at the same rate regardless of the inputs to the neuron.
c. The action potential is conducted more rapidly down the axon as it reaches the axon terminal.
d. The action potential is produced whenever the membrane potential reaches threshold.
e. The action potential travels only in one direction.

Difficulty: 2
Page Ref: 41
Topic: Conduction of the Action Potential
Skill: Factual
LO 2.9 Describe the propagation of an action potential.
Answer: d. The action potential is produced whenever the membrane potential reaches threshold.

2-79. The nervous system codes for variation in the intensity of incoming sensory stimuli by variations in the _____ of a neuron.

a. repolarization rate
b. resting membrane potential
c. speed of conduction of action potentials
d. total amplitude of the action potential
e. firing rate

Difficulty: 2
Page Ref: 42
Topic: Conduction of the Action Potential
Skill: Conceptual
LO 2.9 Describe the propagation of an action potential.
Answer: e. firing rate

2-80. If a bowling ball fell on your foot, the action potentials would differ from a feather falling on your foot. The action potentials for the bowling ball would be

a. larger in size and faster in occurrence.
b. the same size as for the feather but they would be slower in occurrence.
c. the same size as for the feather but they would be faster in occurrence.
d. larger in size and slower in occurrence.
e. smaller in size and faster in occurrence.

Difficulty: 2
Page Ref: 42
Topic: Conduction of the Action Potential
Skill: Conceptual
LO 2.9 Describe the propagation of an action potential.
Answer: c. the same size as for the feather but they would be faster in occurrence.

2-81. In a myelinated axon, ions can enter and leave the axonal membrane only at

a. the terminal buttons.
b. the soma.
c. the nodes of Ranvier.
d. the segment of membrane under the Schwann cell wrapping.
e. every point along the axonal membrane.

Difficulty: 2
Page Ref: 42
Topic: Conduction of the Action Potential
Skill: Conceptual
LO 2.9 Describe the propagation of an action potential.
Answer: c. the nodes of Ranvier.

2-82. Which of the following is an important advantage associated with saltatory conduction?

a. More sodium ions have to be pumped out of the cell after an action potential.
b. Myelin allows the nerve cell to recycle neurotransmitter molecules.
c. Less transmitter is required to send a message across the next synapse.
d. Myelin speeds up the velocity at which an axon can conduct an action potential.
e. Myelin requires that nerve cell axons be larger in order to conduct a signal rapidly.

Difficulty: 3
Page Ref: 42
Topic: Conduction of the Action Potential
Skill: Conceptual
LO 2.9 Describe the propagation of an action potential.
Answer: d. Myelin speeds up the velocity at which an axon can conduct an action potential.

2-83. Which of the following was suggested as an advantage associated with myelination?

a. Myelin changes the height of the action potential.
b. Myelin increases the energy requirements of the nerve cell.
c. Myelin slows down conduction speed.
d. Myelin reduces the threshold for induction of an action potential.
e. Myelin speeds up axon conduction speed.

Difficulty: 2
Page Ref: 42
Topic: Conduction of the Action Potential
Skill: Conceptual
LO 2.9 Describe the propagation of an action potential.
Answer: e. Myelin speeds up axon conduction speed.

2-84. Saltatory conduction is rapid because

a. cable properties carry the signal under the myelin sheath.
b. myelinated cells have more leakage through the membrane.
c. myelinated axons are larger in diameter.
d. myelinated cells have more ion channels per unit area than do non-myelinated cells.
e. myelinated fibers have a lower threshold of activation.

Difficulty: 2
Page Ref: 42
Topic: Conduction of the Action Potential
Skill: Conceptual
LO 2.9 Describe the propagation of an action potential.
Answer: a. cable properties carry the signal under the myelin sheath.

2-85. The term _____ is derived from the word meaning “little bladder.”

a. vesicle
b. neurite
c. cisternae
d. mitochondria
e. storage pool

Difficulty: 1
Page Ref: 44
Topic: Structure of Synapses
Skill: Factual
LO 2.10 Describe the structures and functions of presynaptic cells that are involved in synaptic communication.
Answer: a. vesicle

2-86. Small synaptic vesicles contain _____, whereas large synaptic vesicles contain _____.

a. neurotransmitters; peptides
b. peptides; neurotransmitters
c. proteins; peptides
d. peptides; proteins
e. neurotransmitters; proteins

Difficulty: 2
Page Ref: 45
Topic: Structure of Synapses
Skill: Factual
LO 2.10 Describe the structures and functions of presynaptic cells that are involved in synaptic communication.
Answer: a. neurotransmitters; peptides

2-87. Signals are carried across the synapse by

a. direct electrical connections between the two cells.
b. the secretion of transmitter molecules into the synapse.
c. the transfer of ions from one cell to another.
d. carrier molecules.
e. the sodium-potassium pump.

Difficulty: 2
Page Ref: 45
Topic: Release of Neurotransmitter
Skill: Conceptual
LO 2.11 Describe the process of neurotransmitter release.
Answer: b. the secretion of transmitter molecules into the synapse.

2-88. Communication of neural signals across the synapse involves

a. the opening of transmitter-gated channels in the axon terminal.
b. voltage changes that open chloride channels in the presynaptic membrane.
c. vesicles that take up transmitter molecules into the axon terminal.
d. the binding of transmitter at postsynaptic receptors triggering membrane potentials.
e. direct electrical contact of the pre- and post-synaptic membranes.

Difficulty: 2
Page Ref: 45
Topic: Release of Neurotransmitter
Skill: Conceptual
LO 2.11 Describe the process of neurotransmitter release.
Answer: d. the binding of transmitter at postsynaptic receptors triggering membrane potentials.

2-89. The largest number of small vesicles would be expected to be located within the _____ of a neuron.

a. dendritic spines
b. soma
c. postsynaptic membrane
d. release zone
e. axon hillock

Difficulty: 1
Page Ref: 45
Topic: Structure of Synapses
Skill: Conceptual
LO 2.10 Describe the structures and functions of presynaptic cells that are involved in synaptic communication.
Answer: d. release zone

2-90. A large, dense-core vesicle found in the axon terminal is likely to contain

a. peptide neurotransmitters
b. neurotransmitter receptors.
c. enzymes that degrade transmitter molecules.
d. synthesis peptides.
e. nonpeptide transmitter molecules.

Difficulty: 2
Page Ref: 45
Topic: Structure of Synapses
Skill: Conceptual
LO 2.10 Describe the structures and functions of presynaptic cells that are involved in synaptic communication.
Answer: a. peptide neurotransmitters.

2-91. Synaptic vesicles are produced in the _____.

a. neuron soma
b. dendrites
c. glial cells
d. neuron lysosomes
e. astrocytes

Difficulty: 2
Page Ref: 44
Topic: Structure of Synapses
Skill: Factual
LO 2.10 Describe the structures and functions of presynaptic cells that are involved in synaptic communication.
Answer: a. neuron soma

2-92. Ca++ enters the cell when an action potential is generated. Diffision and electrostatic pressures push Ca++ into the cell. Ca++ channels are

a. passive.
b. chemically-gated.
c. voltage-gated.
d. always open.
e. chemically-gated and voltage-gated.

Difficulty: 2
Page Ref: 46
Topic: Release of Neurotransmitter
Skill: Factual
LO 2.11 Describe the process of neurotransmitter release.
Answer: e. chemically-gated and voltage-gated.

2-93. Placing neurons and their synaptic contacts into a medium containing no calcium ions would be expected to

a. decrease the time required to move sodium ions out of the axon terminal.
b. enhance the voltage changes associated with the action potential.
c. increase the number of transmitter molecules released from the axon terminal.
d. prolong the refractory period of the action potential.
e. prevent the release of neurotransmitter into the synapse.

Difficulty: 3
Page Ref: 46
Topic: Release of Neurotransmitter
Skill: Applied
LO 2.11 Describe the process of neurotransmitter release.
Answer: e. prevent the release of neurotransmitter into the synapse.

2-94. If Ca++ was blocked,

a. Na+ would be stuck inside of the cell.
b. neurotransmitters could not be released from the cell.
c. voltage-gated ion channels would remain closed.
d. passive channels would close.
e. passive channels would open.

Difficulty: 3
Page Ref: 46
Topic: Release of Neurotransmitter
Skill: Applied
LO 2.11 Describe the process of neurotransmitter release.
Answer: b. neurotransmitters could not be released from the cell.

2-95. Which of the following is true of receptors?

a. The effects of hormones do not involve receptor activation.
b. Neurotransmitters act on binding sites on receptors to exert their effects.
c. Receptors are insensitive to drugs.
d. Neuromodulators are ligands that come from outside the body.
e. Hormone receptors are found in all tissues except brain.

Difficulty: 3
Page Ref: 47
Topic: Activation of Receptors
Skill: Conceptual
LO 2.12 Contrast ionotropic and metabotropic receptors.
Answer: b. Neurotransmitters act on binding sites on receptors to exert their effects.

2-96. In order to produce a depolarization or hyperpolarization of the postsynaptic membrane, neurotransmitters

a. diffuse widely in the brain to exert changes in metabolism.
b. act through ionotropic receptors to activate a second-messenger.
c. are released into the synapse from the cisternae.
d. open ion channels in the postsynaptic membrane.
e. alter ion channel activity for minutes.

Difficulty: 1
Page Ref: 47
Topic: Activation of Receptors
Skill: Conceptual
LO 2.12 Contrast ionotropic and metabotropic receptors.
Answer: d. open ion channels in the postsynaptic membrane.

2-97. After a vesicle fuses with the presynaptic membrane and releases its contents into the synaptic cleft, the membrane is

a. destroyed by astrocytes.
b. incorporated into the postsynaptic membrane.
c. recycled to form new vesicles.
d. degraded and the debris removed from the axon terminal.
e. incorporated into the mitochondria.

Difficulty: 1
Page Ref: 47
Topic: Release of Neurotransmitter
Skill: Factual
LO 2.11 Describe the process of neurotransmitter release.
Answer: c. recycled to form new vesicles.

2-98. Match up the correct receptor type and effect.

a. metabotropic; direct opening of an ion channel
b. ionotropic; more time required to open an ion channel
c. metabotropic; G protein activation leads to activation of a second-messenger
d. metabotropic; rapid opening of a single ion channel
e. metabotropic; rapid short-lived effects on ion channels

Difficulty: 3
Page Ref: 47
Topic: Activation of Receptors
Skill: Conceptual
LO 2.12 Contrast ionotropic and metabotropic receptors.
Answer: c. metabotropic; G protein activation leads to activation of a second-messenger

2-99. In comparison to ionotropic receptors, metabotropic receptors

a. have effects that occur quicker.
b. have effects that occur slower.
c. have effects that last an instant.
d. have effects that last for a limited duration.
e. act directly on ion channels.

Difficulty: 3
Page Ref: 47
Topic: Activation of Receptors
Skill: Conceptual
LO 2.12 Contrast ionotropic and metabotropic receptors.
Answer: b. have effects that occur slower.

2-100. With regard to release of neurotransmitter in the brain, “kiss and run” refers to the situation in which the vesicle

a. releases most of its contents into the cleft and the vesicle remains attached to the presynaptic membrane.
b. closes before releasing any molecules and then moves to the cell interior.
c. remains open until the next action potential.
d. releases most of its contents into the cleft, after which the vesicle breaks away from the presynaptic membrane and is refilled.
e. merges completely with the presynaptic membrane.

Difficulty: 2
Page Ref: 47
Topic: Release of Neurotransmitter
Skill: Factual
LO 2.11 Describe the process of neurotransmitter release.
Answer: d. releases most of its contents into the cleft, after which the vesicle breaks away from the presynaptic membrane and is refilled.

2-101. Match up the correct receptor type and effect.

a. ionotropic; direct opening of an ion channel
b. ionotropic; more time required to open an ion channel
c. ionotropic; G protein activation leads to activation of a second-messenger
d. metabotropic; second-messenger effects are specific to neuronal communication
e. metabotropic; rapid short-lived effects on ion channels

Difficulty: 3
Page Ref: 47
Topic: Activation of Receptors
Skill: Conceptual
LO 2.12 Contrast ionotropic and metabotropic receptors.
Answer: a. ionotropic; direct opening of an ion channel

2-102. Influx of ____ or _____ ions result in EPSPs.

a. Na+; Ca++
b. Cl-; Na+
c. Ca++; Cl-
d. Cl-; K+
e. A-; K+

Difficulty: 2
Page Ref: 48
Topic: Postsynaptic Potentials
Skill: Factual
LO 2.13 Compare the functions of EPSPs and IPSPs in postsynaptic cells.
Answer: a. Na+; Ca++

2-103. An IPSP will be produced when a ligand

a. closes a sodium channel.
b. opens a sodium channel.
c. opens a potassium channel.
d. closes a calcium channel.
e. opens a calcium channel.

Difficulty: 2
Page Ref: 48
Topic: Postsynaptic Potentials
Skill: Factual
LO 2.13 Compare the functions of EPSPs and IPSPs in postsynaptic cells.
Answer: c. opens a potassium channel.

2-104. The postsynaptic potentials induced by most neurotransmitters are ended by

a. disruption of the postsynaptic receptor.
b. enzymatic degradation of the transmitter molecule.
c. inhibition of transmitter synthesis.
d. facilitation of transmitter release.
e. reuptake of the molecule into the axon terminal.

Difficulty: 2
Page Ref: 49
Topic: Termination of Postsynaptic Potentials
Skill: Conceptual
LO 2.14 Explain the roles of reuptake and enzymatic deactivation in terminating postsynaptic potentials.
Answer: e. reuptake of the molecule into the axon terminal.

2-105. The postsynaptic potentials induced by acetylcholine are ended via

a. disruption of the nicotinic postsynaptic receptor.
b. enzymatic degradation via acetylcholinesterase.
c. inhibition of acetylcholine synthesis.
d. facilitation of acetylcholine release.
e. reuptake of acetylcholine.

Difficulty: 2
Page Ref: 49
Topic: Termination of Postsynaptic Potentials
Skill: Factual
LO 2.14 Explain the roles of reuptake and enzymatic deactivation in terminating postsynaptic potentials.
Answer: b. enzymatic degradation via acetylcholinesterase.

2-106. Autoreceptors are located on the _____.

a. Golgi apparatus
b. presynaptic membrane
c. endoplasmic reticulum
d. postsynaptic membrane
e. mitochondria

Difficulty: 2
Page Ref: 52
Topic: Autoreceptors
Skill: Factual
LO 2.16 Differentiate between the locations and functions of autoreceptors and postsynaptic receptors.
Answer: b. presynaptic membrane

2-107. Action potentials are generated at the _____ and are conducted along the _____.

a. axon hillock; axon
b. axon; dendrite
c. terminal buttons; dendrite
d. dendrite; glial membrane
e. axon button; glial membrane

Difficulty: 2
Page Ref: 51
Topic: Effects of Postsynaptic Potentials: Neural Integration
Skill: Factual
LO 2.15 Summarize the process of neural integration of EPSPs and IPSPs.
Answer: a. axon hillock; axon

2-108. Neuromodulators are

a. rarely of a peptide form.
b. secreted from neurons, but dispersed widely in the brain.
c. inevitably inhibitory.
d. secreted from a neuron and only affect an adjacent neuron.
e. typically secreted in very small amounts compared to neurotransmitters.

Difficulty: 1
Page Ref: 53
Topic: Other Forms of Chemical Communication
Skill: Factual
LO 2.18 Describe examples of nonsynaptic communication.
Answer: b. secreted from neurons, but dispersed widely in the brain.

2-109. Most _____ are secreted into the extracellular fluid from endocrine glands or tissues.

a. neurotransmitters
b. neuropeptides
c. modulators
d. hormones
e. pheromones

Difficulty: 1
Page Ref: 53
Topic: Other Forms of Chemical Communication
Skill: Factual
LO 2.18 Describe examples of nonsynaptic communication.
Answer: d. hormones

Fill-in-the-Blank Questions

2-110. Motor neurons control the activity of the _____.

Difficulty: 1
Page Ref: 24
Topic: The Nervous System: An Overview
Skill: Factual
LO 2.1 Contrast the location of the central and peripheral nervous systems.
Answer: muscles

2-111. The central nervous system consists of the _____ and the _____.

Difficulty: 1
Page Ref: 23
Topic: The Nervous System: An Overview
Skill: Factual
LO 2.1 Contrast the location of the central and peripheral nervous systems.
Answer: brain; spinal cord

2-112. When substances are transported from the terminal buttons at the end of the axon back to the soma, this process is referred to as _____.

Difficulty: 3
Page Ref: 23
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: c. retrograde axoplasmic transport

2-113. The cell membrane is formed by a dual layer of _____ molecules.

Difficulty: 2
Page Ref: 27
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: lipid

2-114. _____ are bead-like structures that extract energy from nutrients.

Difficulty: 2
Page Ref: 28
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: Mitochondria

2-115. The myelin sheath surrounding axons in brain is formed by _____.

Difficulty: 3
Page Ref: 30
Topic: Supporting Cells
Skill: Factual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: oligodendrocytes or oligodendroglia

2-116. Some chemicals are excluded from the brain due to selective permeability of the _____ barrier.

Difficulty: 2
Page Ref: 32
Topic: The Blood-Brain Barrier
Skill: Factual
LO 2.4 Discuss the features and importance of the blood-brain barrier.
Answer: blood-brain

2-117. The _____ is a part of the brain that controls vomiting. The blood-brain barrier is much weaker there, permitting neurons in this region to detect the presence of toxic substances in the blood.

Difficulty: 1
Page Ref: 32
Topic: The Blood-Brain Barrier
Skill: Factual
LO 2.4 Discuss the features and importance of the blood-brain barrier.
Answer: area postrema

2-118. In a neuron at rest, the interior of the cell is more _____ charged than is the exterior of the cell.

Difficulty: 1
Page Ref: 35
Topic: Measuring Electrical Potentials of Axons
Skill: Conceptual
LO 2.6 Contrast the changes in electrical potential within a neuron when it is experiencing resting potential, hyperpolarization, depolarization, and action potential.
Answer: negatively

2-119. The process of _____ ensures that ions will distribute themselves evenly through a solvent.

Difficulty: 2
Page Ref: 36
Topic: The Membrane Potential
Skill: Factual
LO 2.7 Summarize the contributions of diffusion, electrostatic pressure, and the sodium–potassium pump to establishing membrane potential.
Answer: diffusion

2-120. The pressure on a cation to enter into the cell, where there is a negative charge, is referred to as _____.

Difficulty: 2
Page Ref: 36
Topic: The Membrane Potential
Skill: Factual
LO 2.6 Contrast the changes in electrical potential within a neuron when it is experiencing resting potential, hyperpolarization, depolarization, and action potential.
Answer: electrostatic pressure

2-121. In a myelinated axon, ions enter or leave the axon membrane only at the _____.

Difficulty: 2
Page Ref: 42
Topic: Conduction of the Action Potential
Skill: Factual
LO 2.9 Describe the propagation of an action potential.
Answer: nodes of Ranvier

2-122. The term _____ is derived from the word meaning “little bladder.”

Difficulty: 1
Page Ref: 44
Topic: Structure of Synapses
Skill: Factual
LO 2.9 Describe the propagation of an action potential.
Answer: vesicle

2-123. _____ fill vesicles with the neurotransmitter, and _____ are involved in the release of neurotransmitters and recycling of the vesicles.

Difficulty: 2
Page Ref: 45
Topic: Structure of Synapses
Skill: Factual
LO 2.10 Describe the structures and functions of presynaptic cells that are involved in synaptic communication.
Answer: Transport proteins; trafficking proteins

2-124. The ion _____ is required for the release of neurotransmitter from the presynaptic terminal.

Difficulty: 1
Page Ref: 46
Topic: Release of Neurotransmitter
Skill: Factual
LO 2.11 Describe the process of neurotransmitter release.
Answer: calcium

2-125. _____ receptors involve the direct opening of an ion channel, whereas metabotropic receptors involve the action of second messenger molecules inside the postsynaptic cell.

Difficulty: 2
Page Ref: 47
Topic: Activation of Receptors
Skill: Factual
LO 2.12 Contrast ionotropic and metabotropic receptors.
Answer: Ionotropic

2-126. A _____ myelinated fiber will conduct action potentials more rapidly than will a thin myelinated fiber.

Difficulty: 2
Page Ref: 42
Topic: Conduction of the Action Potential
Skill: Factual
LO 2.9 Describe the propagation of an action potential.
Answer: large

2-127. The effects of acetylcholine are prolonged by drugs that inactivate the enzyme _____.

Difficulty: 3
Page Ref: 49
Topic: Termination of Postsynaptic Potentials
Skill: Factual
LO 2.14 Explain the roles of reuptake and enzymatic deactivation in terminating postsynaptic potentials.
Answer: ACHe or acetylcholinesterase

2-128. _____ are metabotropic receptors located in the presynaptic membrane that provide negative feedback onto transmitter release.

Difficulty: 2
Page Ref: 52
Topic: Autoreceptors
Skill: Factual
LO 2.16 Differentiate between the locations and functions of autoreceptors and postsynaptic receptors.
Answer: Autoreceptors

2-129. _____ refers to the process of EPSPs and IPSPs interacting to have either an end result of excitation or inhibition.

Difficulty: 1
Page Ref: 50
Topic: Effects of Postsynaptic Potentials: Neural Integration
Skill: Factual
LO 2.15 Summarize the process of neural integration of EPSPs and IPSPs.
Answer: Neural integration

Essay Questions

2.130. Describe the organelles that comprise the neuron soma.

Difficulty: 2
Page Ref: 27-28
Topic: Neurons
Skill: Factual
LO 2.2 Describe the structures of a neuron, including their general function.
Answer: The organelles lie within the cytoplasm of the neuron. The soma organelles include:

- Ribosomes: produce proteins.
- Endoplasmic reticulum: rough ER contains the ribosomes (produces proteins). Smooth ER synthesizes lipids.
- Microtubules: responsible for transport around the interior of the neuron.
- Mitochondria: provide energy to the neuron.
- Lysosomes: degrade surplus cellular materials.
- Golgi apparatus: package the products of a secretory cell.

2-131. Compare and contrast the general functions of the three glial cell types in the brain.

Difficulty: 2
Page Ref: 29-31
Topic: Supporting Cells
Skill: Factual
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.
Answer: Oligodendrocytes form CNS myelin, which speeds up neural conduction speed. Astroglia provide support and nutrition for neurons. Microglia are involved in brain immune function.

2-132. Explain how changes in ion movements can result in an action potential.

Difficulty: 2
Page Ref: 38-40
Topic: The Action Potential
Skill: Factual
LO 2.8 Summarize the series of ion movements during the action potential.
Answer: At rest, the interior of the axon membrane has more negative charges relative to the exterior. Movement of positive charges (sodium) into the axon results in the action potential (a rapid reversal of the membrane potential).

2-133. What property of the neuron membrane produces the “all-or-none” law?

Difficulty: 3
Page Ref: 41
Topic: Conduction of the Action Potential
Skill: Conceptual
LO 2.9 Describe the propagation of an action potential.
Answer: Voltage-gated ion channels of the axon membrane remain closed until the membrane potential reaches threshold (a fixed voltage). If the membrane potential reaches threshold, an action potential occurs; if not, no action potential occurs.

2-134. Explain what is meant by decremental conduction.

Difficulty: 2
Page Ref: 42
Topic: Conduction of the Action Potential
Skill: Factual
LO 2.9 Describe the propagation of an action potential.
Answer: A subthreshold local potential degrades in size as it sweeps along the axon membrane (non-myelinated).

2-135. Explain how the presence of myelin on an axon speeds up conduction velocity.

Difficulty: 3
Page Ref: 42
Topic: Conduction of the Action Potential
Skill: Conceptual
LO 2.9 Describe the propagation of an action potential.
Answer: In saltatory conduction, the axon is wrapped in a fatty membrane called myelin, which insulates the membrane from the extracellular fluid. In this case, the action potential does not have to depolarize every segment of membrane, only those at the widely separated nodes of Ranvier (gaps between the myelin segments).

2-136. Contrast ionotropic and metabotropic receptors.

Difficulty: 1
Page Ref: 47
Topic: Activation of Receptors
Skill: Conceptual
LO 2.12 Contrast ionotropic and metabotropic receptors.
Answer: Ionotropic receptors directly control ion channels, whereas metabotropic receptors use a series of intermediate steps, involving G-proteins, to modulate distant ion channels.

2-137. What would you expect to happen if the enzyme AChE were to be disabled in your body?

Difficulty: 2
Page Ref: 49
Topic: Termination of Postsynaptic Potentials
Skill: Factual
LO 2.14 Explain the roles of reuptake and enzymatic deactivation in terminating postsynaptic potentials.
Answer: The ACh activity in your body would greatly increase, because AChE normally serves to degrade ACh. Later, this would lead to overstimulation of cholinergic receptors.

2-138. Explain why the termination step of the neural communication process is a key target for therapeutic drugs.

Difficulty: 3
Page Ref: 49-50
Topic: Termination of Postsynaptic Potentials
Skill: Conceptual
LO 2.14 Explain the roles of reuptake and enzymatic deactivation in terminating postsynaptic potentials.
Answer: The postsynaptic action of many neurotransmitters is terminated via reuptake of the molecule through the membrane transporter or through enzymatic inactivation. A drug that blocks such a transporter would be expected to raise the synaptic levels of that neurotransmitter, as would a drug that blocks the enzymatic degradation step. For a disease or disorder that is thought to result from a low synaptic activity of that transmitter, blockade of the reuptake or enzymatic process would generate a beneficial effect.

2-139. Explain how autoreceptors dampen neuronal activity.

Difficulty: 2
Page Ref: 52
Topic: Autoreceptors
Skill: Conceptual
LO 2.16 Differentiate between the locations and functions of autoreceptors and postsynaptic receptors.
Answer: Autoreceptors are sensitive to the transmitter released by a particular neuron. Activation of the autoreceptor produces negative feedback—either reduced cell firing or reduced synthesis/release of the transmitter. The net effect is to modulate the amount of transmitter in the synapse (and at the postsynaptic receptors).

REVEL QUIZ QUESTIONS

EOM Quiz Question 2.1.1

You reach out and touch a piece of cloth, feeling its texture. The cells that gather this sensory information are part of the _____.

a. parasympathetic nervous system
b. autonomic nervous system
c. central nervous system
d. peripheral nervous system

Answer: D
Difficulty: 1
Topic: The Nervous System: An Overview
Skill: Remember
LO 2.1 Contrast the location of the central and peripheral nervous systems.

EOM Quiz Question 2.1.2

A neuron first receives a message in a _____ and passes the message along a long, thin portion of the cell called the _____.

a. dendrite; axon
b. soma; axon
c. axon; dendrite
d. dendrite; soma

Answer: A
Difficulty: 1
Topic: Neurons
Skill: Remember
LO 2.2 Describe the structures of a neuron, including their general function.

EOM Quiz Question 2.1.3

_____ are supporting cells that can provide myelination to multiple axons at once.

a. Microglia
b. Astrocytes
c. Oligodendrocytes
d. Schwann cells

Answer: C
Difficulty: 1
Topic: Supporting Cells
Skill: Remember
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.

EOM Quiz Question 2.1.4

_____ are multi-function glial cells that participate in phagocytosis, provide lactate for cells, and structurally support neurons in the brain.

a. Microglia
b. Astrocytes
c. Oligodendrocytes
d. Schwann cells

Answer: B
Difficulty: 2
Topic: Supporting Cells
Skill: Understand
LO 2.3 Differentiate functions of supporting cells of the central and peripheral nervous systems.

EOM Quiz Question 2.1.5

The purpose of the blood-brain barrier is to:

a. protect the brain from accidental impacts.
b. block the entrance of some substances into the brain.
c. block neurotransmitters from being released.
d. provide a cushion for the brain.

Answer: B
Difficulty: 2
Topic: The Blood–Brain Barrier
Skill: Understand
LO 2.4 Discuss the features and importance of the blood brain barrier.

EOM Quiz Question 2.2.1

As you study for your neuroscience exam, you feel a tickle on your arm. You look and see a large spider and you jerk your arm automatically. What might be the neural path for this action?

a. sensory neuron – interneuron – motor neuron - muscle
b. interneuron - sensory neuron – motor neuron - muscle
c. motor neuron – sensory neuron – interneuron - muscle
d. sensory neuron – motor neuron – interneuron - muscle

Answer: A
Difficulty: 1
Topic: Neural Communication: An Overview
Skill: Remember
LO 2.5 Compare neural communication in a withdrawal reflex with and without inhibition of the reflex.

EOM Quiz Question 2.2.2

The resting membrane potential is:

a. –70 mV.
b. –80 mV.
c. 10 mV.
d. 55 mV.

Answer: A
Difficulty: 1
Topic: Measuring Electrical Potentials of Axons
Skill: Remember
LO 2.6 Contrast the changes in electrical potential within a neuron that is experiencing resting potential, hyperpolarization, depolarization and action potential.

EOM Quiz Question 2.2.3

When students enter a class, they tend to spread themselves out (provided there are enough desks to do so). In biological terms, this effect would be:

a. electrostatic pressure.
b. ionic movement.
c. diffusion.
d. antisocialism.

Answer: C
Difficulty: 2
Topic: The Membrane Potential
Skill: Applied
LO 2.7 Summarize the contributions of diffusion, electrostatic force, and the sodium= potassium pump to establishing membrane potential.

EOM Quiz Question 2.2.4

For Na+ ions, _____ pushes them into a cell.

a. electrostatic pressure
b. diffusion
c. neither electrostatic pressure or diffusion
d. both electrostatic pressure and diffusion

Answer: D
Difficulty: 2
Topic: The Membrane Potential
Skill: Understand
LO 2.7 Summarize the contributions of diffusion, electrostatic force, and the sodium= potassium pump to establishing membrane potential.

EOM Quiz Question 2.2.5

Na+ channels open when the threshold of excitation is reached. Therefore these channels are considered:

a. passive.
b. voltage-gated.
c. chemically-gated.
d. passive, voltage-gated, and chemically-gated.

Answer: B
Difficulty: 2
Topic: The Action Potential
Skill: Applied
LO 2.8 Summarize the series of ion movements during the action potential.

EOM Quiz Question 2.3.1

Small synaptic vesicles contain _____, whereas large synaptic vesicles contain _____.

a. neurotransmitters; peptides
b. peptides; neurotransmitters
c. proteins; peptides
d. peptides; proteins

Answer: A
Difficulty: 2
Topic: Structure of Synapses
Skill: Understand
LO 2.10 Describe the structures and functions of presynaptic cells that are involved in synaptic communication.

EOM Quiz Question 2.3.2

If a cell fires at an extremely high rate, the cell will release neurotransmitter from the _____ vesicles.

a. release-ready, recycling pool, and reserve pool
b. release-ready
c. recycling pool
d. reserve pool

Answer: A
Difficulty: 3
Topic: Release of Neurotransmitter
Skill: Analyze
LO 2.11 Describe the process of neurotransmitter release.

EOM Quiz Question 2.3.3

In comparison to ionotropic receptors, metabotropic receptors:

a. have effects that occur quicker.
b. have effects that occur slower.
c. have effects that last for a limited duration.
d. act directly on ion channels.

Answer: B
Difficulty: 3
Topic: Activation of Receptors
Skill: Analyze
LO 2.12 Contrast ionotropic and metabotropic receptors.

EOM Quiz Question 2.3.4

Influx of ____ or _____ ions result in EPSPs.

a. Na+; Ca2+
b. Cl-; Na+
c. Ca2+; Cl-
d. Ca+; K+

Answer: A
Difficulty: 2
Topic: Postsynaptic Potentials
Skill: Applied
LO 2.13 Compare the functions of EPSPs and IPSPs in postsynaptic cells.

EOM Quiz Question 2.3.5

After release of the neurotransmitter serotonin, the neurotransmitter is transported back into the cell to be reused. This process is called:

a. degradation.
b. reuptake.
c. exocytosis.
d. release-ready.

Answer: B
Difficulty: 1
Topic: Termination of Postsynaptic Potentials
Skill: Remember
LO 2.14 Explain the roles of reuptake and enzymatic degradation in terminating postsynaptic potentials.

EOC Quiz Question 2.1

Sally's stomach begins to rumble, reminding her that she skipped breakfast this morning. This hunger signal is sent to the brain, which is part of the _____ nervous system.

a. peripheral
b. central
c. autonomic
d. sympathetic

Answer: B
Difficulty: 1
Topic: The Nervous System: An Overview
Skill: Remember
LO 2.1 Contrast the location of the central and peripheral nervous systems.

EOC Quiz Question 2.2

When substances are transported from the terminal buttons at the end of the axon back to the soma, this process is referred to as:

a. retrograde axoplasmic transport.
b. systemic axoplasmic transport.
c. anterograde axoplasmic transport.
d. peripheral axoplasmic transport.

Answer: A
Difficulty: 3
Topic: Neurons
Skill: Applied
LO 2.2 Describe the structures of a neuron, including their general function.

EOC Quiz Question 2.3

In order to cross the synapse between two cells, a substance called _____ is released from the first cell (pre-synapse) to activate or inhibit the second cell (post-synapse).

a. neurotransmitter
b. protein
c. kinesin
d. dynein

Answer: A
Difficulty: 1
Topic: Neurons
Skill: Remember
LO 2.2 Describe the structures of a neuron, including their general function.

EOC Quiz Question 2.4

Experiencing hunger or seeing color in the environment are possible via the:

a. sensory neurons.
b. interneurons.
c. motor neurons.
d. glial cells.

Answer: A
Difficulty: 1
Topic: The Nervous System: An Overview
Skill: Remember
LO 2.1 Contrast the location of the central and peripheral nervous systems.

EOC Quiz Question 2.5

A scan shows that a particular substance has spread throughout the body via the bloodstream but has not entered the brain. This finding demonstrates the existence of:

a. the blood-brain barrier.
b. the doctrine of specific nerve energies.
c. blood efficacy.
d. medicine effects.

Answer: A
Difficulty: 1
Topic: The Blood-Brain Barrier
Skill: Understand
LO 2.4 Discuss the features and importance of the blood brain barrier.

EOC Quiz Question 2.6

Susie takes a huge drink of her coffee, assuming that it is tolerable and the heat sears her mouth. Although the pain is so great that her reflex is to spit out the coffee, she does not do so. The reflex to spit out the coffee is inhibited at the:

a. sensory neuron.
b. interneuron.
c. motor neuron.
d. glial cell.

Answer: C
Difficulty: 2
Topic: Neural Communication: An Overview
Skill: Applied
LO 2.5 Compare neural communication in a withdrawal reflex with and without inhibition of the reflex.

EOC Quiz Question 2.7

If the inner voltage of a cell is -70 mV and application of stimulation results in a -95 mV charge, the stimulation had a _____ effect. On the other hand, a resultant charge of +40 mV would be a _____ effect.

a. hyperpolarizing; depolarizing
b. depolarizing; hyperpolarizing
c. repolarizing; depolarizing
d. repolarizing; hyperpolarizing

Answer: A
Difficulty: 2
Topic: Measuring Electrical Potentials of Axons
Skill: Applied
LO 2.6 Contrast the changes in electrical potential within a neuron that is experiencing resting potential, hyperpolarization, depolarization and action potential.

EOC Quiz Question 2.8

A cation would be attracted to:

a. another cation.
b. an anion.
c. a sodium ion.
d. a potassium ion.

Answer: B
Difficulty: 3
Topic: The Membrane Potential
Skill: Analyze
LO 2.7 Summarize the contributions of diffusion, electrostatic force and the sodium potassium pump to establishing membrane potential.

EOC Quiz Question 2.9

The Na+/K+ pump removes _____ Na+ ions and adds _____ K+ ions.

a. 3; 2
b. 2; 3
c. 3; 4
d. 2; 4

Answer: A
Difficulty: 1
Topic: The Membrane Potential
Skill: Remember
LO 2.7 Summarize the contributions of diffusion, electrostatic force and the sodium potassium pump to establishing membrane potential.

EOC Quiz Question 2.10

If a bowling ball fell on your foot, the action potentials would differ from a feather falling on your foot. The action potentials for the bowling ball would be:

a. larger in size and faster in occurrence.
b. the same size as for the feather but they would be slower in occurrence.
c. the same size as for the feather but they would be faster in occurrence.
d. larger in size and slower in occurrence.

Answer: C
Difficulty: 3
Topic: Conduction of the Action Potential
Skill: Analyze
LO 2.9 Describe the propagation of an action potential.

EOC Quiz Question 2.11

If Ca2+ was blocked:

a. Na+ would be stuck inside of the cell.
b. neurotransmitters could not be released from the cell.
c. voltage-gated ion channels would remain closed.
d. passive channels would close.

Answer: B
Difficulty: 3
Topic: Release of Neurotransmitter
Skill: Analyze
LO 2.11 Describe the process of neurotransmitter release.

EOC Quiz Question 2.12

Ca2+ enters the cell when an action potential is generated. Diffusion and electrostatic pressures push Ca2+ into the cell. Ca2+ channels are:

a. passive.
b. chemically-gated.
c. voltage-gated.
d. chemically-gated and voltage-gated.

Answer: C
Difficulty: 3
Topic: Release of Neurotransmitter
Skill: Analyze
LO 2.11 Describe the process of neurotransmitter release.

EOC Quiz Question 2.13

Autoreceptors are located on the _____.

a. post-synaptic cell
b. golgi apparatus
c. endoplasmic reticulum
d. pre-synaptic cell

Answer: D
Difficulty: 1
Topic: Autoreceptors
Skill: Remember
LO 2.16 Differentiate between the locations and functions of autoreceptors and postsynaptic receptors.

EOC Quiz Question 2.14

_____ refers to the process of EPSPs and IPSPs interacting to have either an end result of excitation or inhibition.

a. Immigration
b. Innervation
c. Importation
d. Integration

Answer: D
Difficulty: 1
Topic: Effects of Postsynaptic Potentials: Neural Integration
Skill: Remember
LO 2.15 Summarize the process of neural integration of EPSPs and IPSPs.

EOC Quiz Question 2.15

Hormones and neuromodulators differ from neurotransmitters in that:

a. they are chemicals and neurotransmitters are not.
b. they disperse more narrowly than neurotransmitters.
c. they disperse more widely than neurotransmitters.
d. they are fast acting compared to neurotransmitters.

Answer: C
Difficulty: 2
Topic: Other Forms of Chemical Communication
Skill: Applied
LO 2.18 Describe examples of non-synaptic communication.