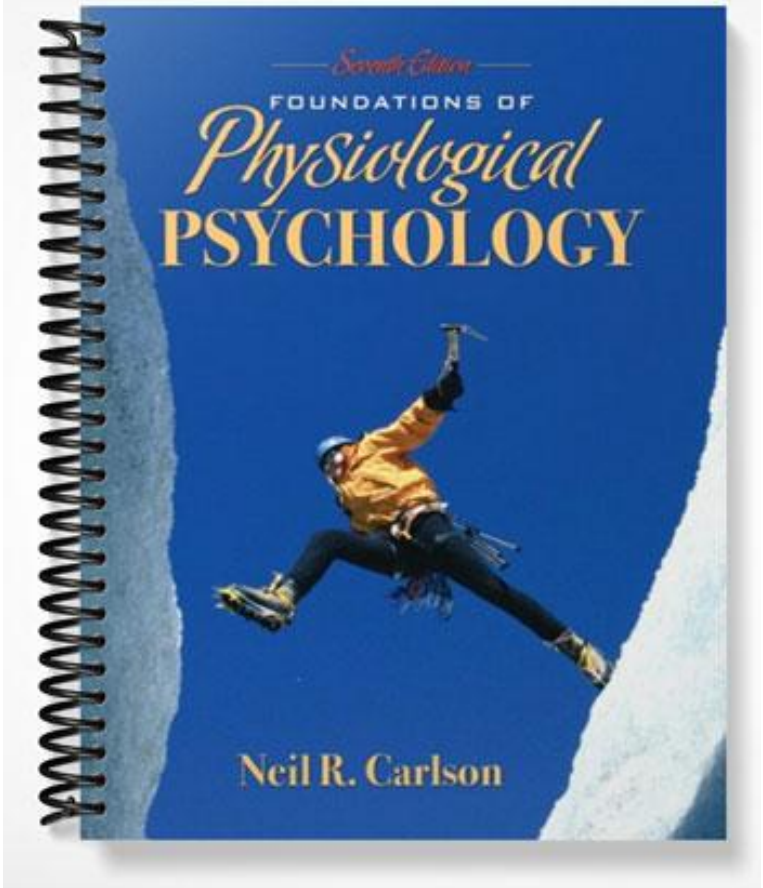
TEST BANK


Seventh Edition
FOUNDATIONS OF
Physiological
PSYCHOLOGY
Neil R. Carlson

Chapter 2 Structure and Function of Cells of the Nervous System

2.1 Multiple Choice

1) The major symptom experienced by Katharyn D. in the chapter prologue was
   A) manic symptoms while at her job.
   B) taking a long time to get to sleep at night..
   C) excessive tiredness.
   D) seizure–like activity just prior to a meal.
   E) the recurrence of thoughts of dread and doom.

   Answer: C
   Diff: 1 Page Ref: 28
   Objective: Factual

2) _____ neurons gather information from the environment related to light, odors, and bodily contact with objects.
   A) Sensory
   B) Motor
   C) Inter–
   D) Relay inter–
   E) Efferent

   Answer: A
   Diff: 1 Page Ref: 28
   Objective: Factual

3) _____ neurons function to contract muscles.
   A) Sensory
   B) Motor
   C) Inter–
   D) Afferent
   E) Local inter–

   Answer: B
   Diff: 1 Page Ref: 28
   Objective: Factual

4) Which of the following is correct regarding neurons?
   A) Interneurons are located outside the brain and spinal cord.
   B) Motor neurons gather information from the environment.
   C) The number of neurons in the human nervous system is estimated at more than 100 billion.
   D) Neurons are found only inside the brain and spinal cord.
   E) The number of neurons in the human nervous system is estimated at less than 10 billion.

   Answer: C
   Diff: 3 Page Ref: 29
   Objective: Factual

5) The _____ is comprised of the brain and spinal cord.
A) peripheral nervous system
B) central nervous system
C) enteric nervous system
D) brainstem
E) forebrain

Answer: B
Diff: 2 Page Ref: 29
Objective: Conceptual

6) _____ are located entirely within the central nervous system.
A) Sensory
B) Motor
C) Relay interneurons
D) Local interneurons
E) C and D are correct.

Answer: E
Diff: 2 Page Ref: 29
Objective: Factual

7) The _____ is comprised of the nervous system outside of the brain and spinal cord.
A) peripheral nervous system
B) central nervous system
C) enteric nervous system
D) corticospinal system
E) forebrain

Answer: A
Diff: 2 Page Ref: 29
Objective: Conceptual

8) The common structures or regions that form a neuron include the
A) soma.
B) axon.
C) dendrites.
D) terminal buttons.
E) All of the above are correct.

Answer: E
Diff: 2 Page Ref: 29
Objective: Conceptual

9) The _____ contain(s) the nerve cell nucleus.
A) soma
B) axon
C) axon terminals
D) dendrites
E) mitochondria

Answer: A
Diff: 1 Page Ref: 29
Objective: Factual

10) In the electron micrograph illustration of the animation on Neurons and Supporting Cells,
A) a vesicle is shown in the process of being transported along a microtubule.
B) neurotransmitter is shown being released from the axon terminal.
C) the formation of myelin is shown in the peripheral nervous system.
D) the anatomy of the hippocampus is shown in a horizontal view.
E) B and D are correct.

Answer: A
Diff: 2 Page Ref: CD–ROM, Ch. 2
Objective: Animation

11) The portion of a neuron that carries a signal toward the cell body is the
A) soma.
B) axon terminal.
C) presynaptic membrane.
D) dendrite.
E) glial membrane.

Answer: D
Diff: 1 Page Ref: 29
Objective: Factual

12) The physical gap between two nerve cells across which messages are transmitted is the
A) glial junction.
B) axon contact.
C) synapse.
D) dendritic apposition.
E) neural gap.

Answer: C
Diff: 1 Page Ref: 29
Objective: Factual

13) The membranes that most commonly form synapses are the _____ and the _____.
A) axon terminals; dendrites
B) dendrites; soma
C) soma; glial
D) axon terminals; soma
E) A and D are correct.

Answer: E
Diff: 3 Page Ref: 29
Objective: Conceptual

14) 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 double layer of protein molecules.

Answer: C
Diff: 1 Page Ref: 31
Objective: Animation

15) Which of the following are true regarding the action potential (AP)?
A) The AP is carried along the axon membrane.
B) The AP is always of the same amplitude and duration in a given cell..
C) The AP is an all–or–none signal.
D) The AP is a brief electrical signal.
E) All of the above are correct.

Answer: E
Diff: 2 Page Ref: 29–30
Objective: Conceptual

16) The _____ neuron is the most common nerve cell type in the central nervous system.
A) apolar
B) multiglial
C) unipolar
D) bipolar
E) multipolar

Answer: E
Diff: 1 Page Ref: 30
Objective: Factual

17) Which type of nerve cells usually transmit sensory information?
A) Bipolar.
B) Multipolar.
C) Unipolar.
D) Apolar
E) A and C are correct.

Answer: E
Diff: 2 Page Ref: 30
Objective: Conceptual

18) An impaired ability to sense temperature and touch might be expected after damage to which type of nerve cell?
A) Glial cells.
B) Multipolar neurons.
C) Unipolar neurons.
D) Schwann cells.
E) Microglial cells.

Answer: C
Diff: 3 Page Ref: 30
Objective: Applied

19) Neurotransmitter molecules are secreted from a(n) _____ in response to the arrival of an action potential.
A) glial cell
B) dendrite
C) axon terminal
D) mitochondrion
E) soma

Answer: C
Diff: 1 Page Ref: 31
Objective: Factual

20) A key function of specialized lipid molecules located in a nerve cell is to
A) detect the presence of hormones outside the cell.
B) form the cell membrane.
C) form channels to carry ions into and out of the cell.
D) transport glucose molecules into the cell.
E) All of the above are correct.

Answer: B
Diff: 1 Page Ref: 31
Objective: Factual

21) Match up the correct pairing of each cell structure with its function.
A) mitochondria; production of cytoplasm
B) cytoskeleton; production of DNA
C) lipid bi–layer; formation of the cell membrane
D) synapse; production of ribosomes
E) microtubules; production of cytoplasm

Answer: C
Diff: 2 Page Ref: 31
Objective: Conceptual

22) The recipes for generating individual proteins are contained within the
A) mitochondria.
B) cytoskeleton.
C) genes.
D) terminal buttons.
E) dendrites.

Answer: C
Diff: 2 Page Ref: 33
Objective: Conceptual

23) Enzymes
A) are proteins.
B) are molecules that control chemical reactions.
C) can break other molecules apart.
D) can promote the formation of new molecules.
E) All of the above are correct.

Answer: E
Diff: 1 Page Ref: 33
Objective: Conceptual

24) Match the correct function with the appropriate neuronal organelle.
A) mitochondria; extraction of energy
B) mitochondria; formation of vesicles
C) microtubules; breakdown of proteins
D) microtubules; transport of chemicals across the synapse
E) cytoskeleton; extraction of energy

Answer: A
Diff: 2 Page Ref: 31
Objective: Factual

25) 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 kynesin molecule is involved in retrograde transport.
D) Retrograde transport is half as fast as anterograde transport.
E) The dynein molecule is involved in anterograde transport.

Answer: D
Diff: 3 Page Ref: 33
Objective: Conceptual

26) _____ is made up of thirteen filaments arranged around a hollow core and is involved in axoplasmic transport.
A) The myelin sheath
B) The terminal button
C) A neurofilament
D) A nanotubule
E) A microtubule

Answer: E
Diff: 1 Page Ref: 33
Objective: Factual

27) Match the correct function with the appropriate neuronal organelle.
A) cell membrane; production of fat–like molecules
B) mitochondria; formation of vesicles
C) DNA; breakdown of proteins
D) microtubules; transport of molecules between the soma and the axon terminals
E) cytoskeleton; extraction of energy for cell use

Answer: D
Diff: 1 Page Ref: 33
Objective: Factual

28) The _____ cells are the most important support cells of the central nervous system.
A) Schwann
B) glial
C) Golgi
D) platelet
E) microtubule

Answer: B
Diff: 1 Page Ref: 33
Objective: Factual

29) Which of the following is NOT a function of glial cells?
A) Provision of nutrition to the brain.
B) Removal of physical debris from the brain.
C) Physical support of neurons.
D) Insulation of a nerve cell from other nerve cells.
E) The conduction of action potentials.

Answer: E
Diff: 3 Page Ref: 33
Objective: Conceptual

30) Which of the following is true of neurons?
A) Neurons have a high metabolic rate.
B) The dendrites store nutrients and oxygen for later use by the soma of the neuron.
C) Dead neurons are consumed by other neurons.
D) Neurons make up 89% of the volume of the brain.
E) Dead glial cells are replaced by newly formed neurons.

Answer: A
Diff: 2 Page Ref: 33
Objective: Conceptual

31) Astrocytes perform which of the following functions?
A) Physical support of nerve cells.
B) Provision of nourishment to neurons.
C) Clean up of debris within the brain.
D) Regulation of the chemical environment in the fluid surrounding neurons.
E) All of the above are correct.

Answer: E
Diff: 2 Page Ref: 33–34
Objective: Factual

32) Which of the following glial cells are important for the supply of energy for neurons?
A) Schwann cells.
B) Phagocytes.
C) Dendrocytes.
D) Astrocytes.
E) Nanotubules.

Answer: D
Diff: 1 Page Ref: 33–34
Objective: Factual

33) 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 layers of fatty material around an axon membrane.
D) structural support of a nerve cell.
E) The conversion of glycogen to glucose.

Answer: A
Diff: 1 Page Ref: 34
Objective: Factual

34) Which of the following cells are important for the removal of nerve cell debris?
A) Schwann cells.
B) Phagocytes.
C) Dendrocytes.
D) Astrocytes.
E) Nanotubules.

Answer: D
Diff: 1 Page Ref: 34
Objective: Factual

35) The _____ are important for the process of myelination of nerve axon membranes in brain.
A) oligodendrocytes
B) microglia
C) astrocytes
D) neurocytes
E) ultraglia

Answer: A
Diff: 1 Page Ref: 34
Objective: Factual

36) Which of the following cells are important for the immune system reaction to brain damage?
A) Schwann cells.
B) Phagocytes.
C) Dendrocytes.
D) Astrocytes.
E) Microglia.

Answer: E
Diff: 1 Page Ref: 35
Objective: Factual

37) Which of the following is true of oligodendrocytes and Schwann cells?
A) Oligodendrocytes are found within the brain.
B) Schwann cells provide myelin for peripheral nerve cells.
C) A single Schwann cell wraps a single segment of a peripheral nerve cell.
D) A single oligodendrocyte can myelinate up to 50 segments of axon membrane.
E) All of the above are correct.

Answer: E
Diff: 3 Page Ref: 34–36
Objective: Conceptual

38) The presence of a barrier between the blood stream and the brain is suggested by the observation that
A) all cells of the body are stained by a dye injected into the bloodstream.
B) injection of dye into the bloodstream stains all cells but those of the brain and spinal cord.
C) the gut is stained by a dye injected into the brain ventricles.
D) injection of dye into the ventricles stains all cells of the body.
E) B and D are correct.

Answer: B
Diff: 3 Page Ref: 36
Objective: Conceptual

39) Which of the following is true of the blood–brain barrier?
A) The barrier is not uniform throughout the brain.
B) The barrier is not permeable to glucose.
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) All of the above are correct.

Answer: E
Diff: 2 Page Ref: 36–37
Objective: Conceptual

40) Activation of cells within the area postrema would be predicted to produce
A) stimulation of locomotion.
B) the experience of a visual hallucination.
C) consumption of a palatable food.
D) feelings of nausea and vomiting.
E) auditory hallucinations.

Answer: D
Diff: 2 Page Ref: 37
Objective: Applied

41) Which of the following was NOT a feature of the animation on action potentials?
A) The movements of chloride ions during the action potential.
B) Depiction of the voltage–dependent sodium channels.
C) Depiction of the voltage–dependent potassium channels.
D) The movements of sodium and potassium ions during the action potential.
E) B and C are correct.

Answer: A
Diff: 3 Page Ref: CD–ROM, Ch 2
Objective: Animation

42) Which of the following represents the normal order of activation in neuronal transmission?
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

Answer: C
Diff: 2 Page Ref: 38
Objective: Factual

43) The simplest version of a withdrawal reflex involves
A) a pain receptor synapsing onto a motor neuron in the spinal cord.
B) a pain receptor that projects to the thalamus, which then projects to motor cortex and then down to the spinal cord.
C) a motor neuron within the spinal cord that is spontaneously active.
D) a sensory neuron in visual cortex that synapses onto a motor neuron in the spinal cord
E) C and D are correct.

Answer: A
Diff: 1 Page Ref: 38–39
Objective: Conceptual

44) The giant squid axon is specialized for which of the following?
A) Integration of sensory messages regarding the environment.
B) Planning of feeding–related movements.
C) Rapid contraction of the squid mantle which propels the squid away from danger.
D) Coordination of general sensory–motor function.
E) Contraction of the mouth of the squid to produce chewing movements.

Answer: C
Diff: 2 Page Ref: 40
Objective: Conceptual

45) Which of the following is used to record the electrical potentials generated in an axon?
A) A single reference wire placed in the fluid surrounding the axon.
B) A microelectrode inserted into the axon interior.
C) An oscilloscope.
D) A giant squid axon.
E) All of the above are used in these recordings.

Answer: E
Diff: 3 Page Ref: 40
Objective: Factual

46) The interior of a neuron at rest
A) is positively charged relative to the outside.
B) is at the same voltage potential as the outside.
C) has the same ionic concentrations as the outside.
D) is negatively charged relative to the outside.
E) B and C are correct.

Answer: D
Diff: 2 Page Ref: 40
Objective: Conceptual

47) The _____ is defined as the difference in electrical charge between the inside and the outside of the axon membrane.
A) membrane potential
B) local potential
C) glial potential
D) action potential
E) axon potential

Answer: A
Diff: 2 Page Ref: 40
Objective: Factual

48) The _____ is defined as the difference in electrical charge between the inside and the outside of an undisturbed axon membrane.
A) membrane potential
B) local potential
C) resting potential
D) action potential
E) axon potential

Answer: C
Diff: 2 Page Ref: 40
Objective: Factual

49) Movement of the axon membrane potential from –70 mV to –90 mV would be termed a(n)
A) action potential.
B) threshold potential.
C) depolarization.
D) hyperpolarization.
E) excitatory local potential.

Answer: D
Diff: 1 Page Ref: 41
Objective: Conceptual

50) Movement of the axon membrane potential from –90 mV to –80 mV would be termed a(n)
A) depolarization.
B) threshold potential.
C) action potential.
D) hyperpolarization.
E) inhibitory local potential.

Answer: A
Diff: 1 Page Ref: 41
Objective: Conceptual

51) The membrane voltage level at which an action potential is triggered is termed the
A) refractory period.
B) hyperpolarization event.
C) threshold of excitation.
D) rate level.
E) equilibrium point.

Answer: C
Diff: 1 Page Ref: 42
Objective: Factual

52) An electrical charge applied to an axon that moves the membrane potential from –70 mV to –45 mV will result in a(n)
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.

Answer: A
Diff: 1 Page Ref: 41
Objective: Factual

53) The process by which molecules are evenly distributed throughout a medium is
A) retrograde transport.
B) diffusion.
C) anterograde transport.
D) electrostatic pressure.
E) carrier–mediated transport.

Answer: B
Diff: 1 Page Ref: 42
Objective: Factual

54) _____ are substances that form charged particles when dissolved in water.
A) Ions
B) Molecules
C) Electrolytes
D) Cations
E) Anions

Answer: C
Diff: 1 Page Ref: 42
Objective: Factual

55) _____ are charged particles formed when certain molecules dissolves in water.
A) Ions
B) Solvents
C) Electrolytes
D) Electrons
E) All of the above are correct.

Answer: A
Diff: 1 Page Ref: 42
Objective: Factual

56) _____ are positively charged particles.
A) Transmitters
B) Solvents
C) Electrolytes
D) Cations
E) Anions

Answer: D
Diff: 1 Page Ref: 42
Objective: Factual

57) _____ are negatively charged particles.
A) Transmitters
B) Solvents
C) Electrolytes
D) Cations
E) Anions

Answer: E
Diff: 1 Page Ref: 42
Objective: Factual

58) Cation is to anion as
A) transport is to diffusion.
B) positive is to negative.
C) diffusion is to transport.
D) negative is to positive.
E) intracellular is to extracellular.

Answer: B
Diff: 3 Page Ref: 42
Objective: Conceptual

59) The process by which similarly charged particles repel each other and are thus distributed throughout a medium is termed
A) diffusion.
B) carrier–mediated transport.
C) refraction.
D) electrostatic pressure.
E) diffraction.

Answer: D
Diff: 2 Page Ref: 42
Objective: Factual

60) Which of the following is true of ion distribution across the axon membrane?
A) Sodium ions are concentrated outside the axon membrane.
B) Potassium ions are concentrated outside the axon membrane.
C) The action potential is the balance point between diffusion and electrostatic pressure.
D) Chloride ions are concentrated inside the axon membrane.
E) Sodium ions are concentrated inside the axon membrane.

Answer: A
Diff: 1 Page Ref: 43
Objective: Factual

61) The force of diffusion would tend to move _____ ions _____ the axon.
A) chloride; out of
B) sodium; into
C) potassium; into
D) organic; into
E) sodium; out of

Answer: B
Diff: 1 Page Ref: 44
Objective: Factual

62) The force of _____ moves sodium ions _____ the axon
A) diffusion; into
B) retrograde transport; out of
C) diffusion; out of
D) electrostatic pressure; out of
E) sodium–potassium pump; into

Answer: A
Diff: 2 Page Ref: 44
Objective: Factual

63) Which of the following is 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) Little energy is required to maintain ionic differences across the membrane.

Answer: D
Diff: 2 Page Ref: 44
Objective: Conceptual

64) In a resting nerve cell, which of the forces listed below will act to push sodium ions into the cell?
A) Diffusion.
B) Electrostatic pressure.
C) Sodium–potassium pump.
D) Ion channel inactivation.
E) A and B are correct.

Answer: E
Diff: 2 Page Ref: 44
Objective: Conceptual

65) The specialized pores located in the axon membrane that open or close are termed
A) receptors.
B) voltage transporters.
C) autoreceptors.
D) ion channels.
E) sodium–potassium transporters.

Answer: D
Diff: 2 Page Ref: 45
Objective: Factual

66) Which of the following is true of an action potential?
A) The sodium channels are opened at a lower voltage than are potassium channels.
B) An action potential requires 5 msec for completion.
C) During an action potential, the interior becomes even more negative.
D) The potassium channels are opened at a lower voltage than are sodium channels.
E) The overshoot is due to a prolonged change in sodium conductance.

Answer: A
Diff: 2 Page Ref: 45–46
Objective: Conceptual

67) Match the correct PSP effect with each ion channel action.
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) B and D are correct.

Answer: A
Diff: 2 Page Ref: CD–ROM, Ch. 2
Objective: Animation

68) Which of the following events restores the membrane potential from the peak of the action potential back 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) A and C are correct.

Answer: B
Diff: 2 Page Ref: 45–46
Objective: Conceptual

69) The "all–or–none law" refers to the observation that an action potential
A) will diminish to near zero when transmitted down a long axon.
B) fires at the same rate regardless of the inputs to the neuron.
C) is conducted more rapidly down the axon as it reaches the axon terminal.
D) is produced whenever the membrane potential reaches threshold.
E) travels only in one direction.

Answer: D
Diff: 2 Page Ref: 47
Objective: Factual

70) Sensory stimuli that vary in intensity are coded by variations in the _____ of a neuron.
A) firing rate
B) resting membrane potential
C) speed of conduction of action potentials
D) total amplitude of the action potential
E) repolarization rate

Answer: A
Diff: 2 Page Ref: 47
Objective: Conceptual

71) Subthreshold depolarizations of the axon membrane
A) are not conducted along the membrane.
B) remain the same size at each point along the membrane.
C) are just smaller versions of the action potential.
D) decrease in amplitude as they sweep along the membrane.
E) involve the closing of ion channels.

Answer: D
Diff: 2 Page Ref: 47
Objective: Conceptual

72) Ions enter and leave the membrane of a myelinated axon at the
A) terminal buttons.
B) axon hillock.
C) nodes of Ranvier.
D) segment of membrane under the Schwann cell wrapping.
E) release zone.

Answer: C
Diff: 2 Page Ref: 47
Objective: Conceptual

73) A key advantage of saltatory conduction is that
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 rapidly conduct a signal.

Answer: D
Diff: 3 Page Ref: 48
Objective: Conceptual

74) Which of the following was suggested as an advantage associated with myelination?
A) Myelin slows down conduction speed.
B) Myelin increases the energy requirements of the nerve cell.
C) Myelin changes the height of the action potential.
D) Myelin reduces the threshold for induction of an action potential.
E) Myelin prevents cross–talk between adjacent neurons.

Answer: E
Diff: 2 Page Ref: CD–ROM, Ch. 2
Objective: Animation

75) Saltatory conduction is rapid because
A) the action potential does not have to depolarize every segment of the axon membrane.
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.

Answer: A
Diff: 3 Page Ref: 48–49
Objective: Conceptual

76) Neuronal 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) an inhibitory effect of a transmitter molecule on the postsynaptic membrane.
E) Both B and D are correct.

Answer: E
Diff: 2 Page Ref: 49
Objective: Conceptual

77) In the animation entitled Synapses,
A) action potentials open chloride channels to release neurotransmitter.
B) presynaptic voltage changes open calcium channels which then triggers the release of neurotransmitter.
C) the interior of the nerve cell becomes more negative during the action potential.
D) the exterior of the nerve cell becomes more positive during the action potential.
E) glia are shown to slow down the release of transmitter substances from the axon.

Answer: B
Diff: 2 Page Ref: CD–ROM, Ch.2
Objective: Animation

78) A synapse can involve a junction between an axon terminal and a(n) _____.
A) dendrite
B) soma
C) axon
D) glial cell
E) A, B, and C are correct.

Answer: E
Diff: 1 Page Ref: 49
Objective: Factual

79) Which of the following is true of receptors?
A) Hormones do not require receptor activation for their effects.
B) Neurotransmitters bind to and activate receptors to exert their effects.
C) Receptors are insensitive to exogenous chemicals.
D) Neuromodulators are exogenous ligands.
E) Hormone receptors are found in all tissues except the brain.

Answer: B
Diff: 3 Page Ref: 50–52
Objective: Conceptual

80) The term _____ means "little bladder."
A) vesicle
B) neurite
C) cisternae
D) mitochondria
E) storage pool

Answer: A
Diff: 1 Page Ref: 50
Objective: Factual

81) Synaptic vesicles are produced in the _____ and transported to the _____.
A) soma; axon terminal
B) dendrites; soma
C) terminal buttons; dendrites
D) dendritic spines; axon terminals
E) neuroglia; dendrites

Answer: A
Diff: 2 Page Ref: 50
Objective: Factual

82) A key event for the release of neurotransmitter from the presynaptic membrane is the
A) hyperpolarization of the axon membrane.
B) arrival of an action potential at the axon terminal.
C) influx of potassium ions into the axon terminal.
D) activation of the sodium–potassium pumps.
E) opening of ion channels within the microtubules.

Answer: B
Diff: 2 Page Ref: 50–51
Objective: Factual

83) In which portion of a neuron would you expect to find the largest number of vesicles?
A) The dendritic spines.
B) The soma.
C) Near the nuclear membrane.
D) The release zone.
E) The axon hillock.

Answer: D
Diff: 1 Page Ref: 50–51
Objective: Conceptual

84) Which of the following is true of neurotransmitter function?
A) Neurotransmitters diffuse widely in brain to exert changes in metabolism.
B) Neurotransmitters directly alter ion channels using a second–messenger chemical.
C) Neurotransmitters are released into the synapse from the cistaerna.
D) Neurotransmitters open ion channels in the postsynaptic membrane.
E) Neurotransmitters alter ion channel activity for minutes.

Answer: D
Diff: 3 Page Ref: 51
Objective: Conceptual

85) Match up the receptor type with its action.
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 2nd messenger
D) metabotropic; 2nd messenger effects are specific to opening ion channels
E) metabotropic; rapid and short–lived effects on ion channels

Answer: C
Diff: 3 Page Ref: 52
Objective: Conceptual

86) Match up the receptor type with its action.
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 2nd messenger
D) metabotropic; 2nd messenger effects that are specific to neuronal communication
E) metabotropic; rapid and short–lived effects on ion channels

Answer: A
Diff: 3 Page Ref: 52
Objective: Conceptual

87) Which of the following will produce an EPSP?
A) Opening a sodium channel.
B) Closing a sodium channel.
C) Opening a potassium channel.
D) Opening a manganese channel.
E) Closing a calcium channel.

Answer: A
Diff: 2 Page Ref: 52
Objective: Factual

88) An autoreceptor is located on the _____ and is sensitive to _____.
A) presynaptic membrane; the transmitter released by that neuron
B) presynaptic membrane; a different transmitter released by another neuron
C) presynaptic membrane; calcium ions located in the synapse
D) postsynaptic membrane; calcium ions located in the synapse
E) presynaptic membrane; the amount of second messenger activity in the postsynaptic cell

Answer: A
Diff: 1 Page Ref: 55
Objective: Factual

89) Which of the following will "neutralize" the effect of an EPSP?
A) Further opening a sodium channel.
B) Allowing intracellular anions to leave the cell.
C) Closing a potassium channel.
D) Opening a chloride channel.
E) B and D are correct.

Answer: D
Diff: 3 Page Ref: 53
Objective: Conceptual

90) Which of the following will reliably produce an IPSP regardless of the current level of the membrane potential?
A) Opening a sodium channel.
B) Closing a potassium channel.
C) Opening a potassium channel.
D) Opening a chloride channel.
E) Opening a channel to admit calcium ions into the axon.

Answer: C
Diff: 3 Page Ref: 53
Objective: Conceptual

91) The process which terminates the postsynaptic potentials induced by most neurotransmitters is
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.

Answer: E
Diff: 2 Page Ref: 53
Objective: Conceptual

92) The process which terminates the postsynaptic potentials induced by acetylcholine is
A) disruption of the postsynaptic receptor.
B) enzymatic degradation via AChE.
C) inhibition of ACh synthesis.
D) facilitation of ACh release.
E) reuptake.

Answer: B
Diff: 2 Page Ref: 54
Objective: Conceptual

93) A drug that inactivates AChE would be expected to
A) prolong the effects of ACh in the synapse.
B) terminate the effects of ACh in the synapse.
C) speed up the synthesis of ACh.
D) impair the synthesis of ACh.
E) activate the presynaptic autoreceptor for ACh.

Answer: A
Diff: 3 Page Ref: 54–55
Objective: Applied

94) In the animation titled Postsynaptic Potentials, integration was evident in that
A) IPSPs were shown to involve the same ion channels as EPSPs.
B) an IPSP produced in the axon membrane just prior to an EPSP was sufficient to prevent the action potential.
C) IPSPs were shown to involve the closing of potassium channels.
D) EPSPs were shown to have prolonged effects in the postsynaptic membrane which did not summate with other potentials.
E) an IPSP produced long–lasting inhibition of the cell.

Answer: B
Diff: 3 Page Ref: CD–ROM, Ch. 2
Objective: Animation

95) Autoreceptors
A) are sensitive to the presence of neuropeptides in the synapse.
B) control the release of calcium ions from the axon terminal.
C) mostly facilitate neuron function.
D) are metabotropic in nature.
E) control the formation of new dendritic spines.

Answer: D
Diff: 2 Page Ref: 55–56
Objective: Conceptual

96) Neuromodulators
A) have a peptide structure.
B) do not directly elicit postsynaptic potentials.
C) are usually found in large dense–core vesicles in terminal buttons.
D) diffuse widely to effect many neurons.
E) All of the above are correct.

Answer: E
Diff: 2 Page Ref: 56
Objective: Factual

97) Neuromodulators
A) are rarely of a peptide form.
B) are secreted from a neuron and only affect an adjacent neuron.
C) are inevitably inhibitory.
D) are secreted from neurons, but dispersed widely in brain.
E) are typically secreted in very small amounts compared to neurotransmitters.

Answer: D
Diff: 3 Page Ref: 56
Objective: Factual

98) Most _____ are secreted into the extracellular fluid from endocrine glands or tissues.
A) neurotransmitters
B) neuropeptides
C) modulators
D) hormones
E) pheromones

Answer: D
Diff: 1 Page Ref: 56
Objective: Factual

99) The key symptom of myasthenia gravis is
A) fatigability.
B) mania and excitation.
C) depression and sleep disturbance.
D) inability to make coordinated movements.
E) impaired autoreceptor function.

Answer: A
Diff: 2 Page Ref: 58
Objective: Factual

2.2 True–False

1) Motor neurons gather information from the environment.

Answer: FALSE
Diff: 1 *Page Ref: 28*

2) The cell membrane is formed by a single layer of lipid molecules.

Answer: FALSE
Diff: 1 *Page Ref: 31*

3) The myelin sheath around an axon in the brain is formed by oligodendrocytes.

Answer: TRUE
Diff: 2 *Page Ref: 34*

4) In a neuron at rest, the inside of the cell is more negative than the cell exterior.

Answer: TRUE
Diff: 1 *Page Ref: 40*

5) A hyperpolarizing stimulus makes the interior of the neuron even more negatively charged.

Answer: TRUE
Diff: 2 *Page Ref: 41*

6) Both electrostatic and diffusion forces affect the concentration of ions in the extracellular and intracellular fluids.

Answer: TRUE
Diff: 1 *Page Ref: 42–43*

7) An anion is positively charged ion.

Answer: FALSE
Diff: 1 *Page Ref: 42*

8) The sodium–potassium pump keeps the intracellular concentration of sodium ions low by pushing them out of the axon.

Answer: TRUE
Diff: 1 *Page Ref: 44*

9) An action potential decreases in size as it moves along the axon toward the terminal buttons.

Answer: FALSE
Diff: 1 *Page Ref: 47*

10) A thick myelinated axon fiber will conduct an action potential more rapidly than will a thin unmyelinated fiber.

Answer: TRUE
Diff: 3 *Page Ref: 48*

11) Transmitter substances are secreted from the terminal buttons of a neuron.

Answer: TRUE
Diff: 1 *Page Ref: 50–51*

12) The most important source of EPSPs is the neurotransmitter–dependent sodium channel.

Answer: TRUE
Diff: 1 *Page Ref: 52*

13) Enzymatic inactivation allows for the rapid reuse of a transmitter molecule.

Answer: FALSE
Diff: 1 *Page Ref: 54*

14) Opening a chloride channel will neutralize an EPSP.

Answer: TRUE
Diff: 2 *Page Ref: 53*

15) The transmitter acetylcholine is primarily inactivated by reuptake of the molecule into the axon terminal.

Answer: FALSE
Diff: 2 *Page Ref: 54*

16) Autoreceptors are metabotropic receptors.

Answer: TRUE
Diff: 2 *Page Ref: 55–56*

2.3 Short–Answer Essay

1) Name and discuss the general functions of the three glial cell types in the brain.

Answer: Oligodendrocytes form CNS myelin. Astroglia provide support and nutrition for neurons. Microglia are involved in brain immune function.
Diff: 3 *Page Ref: 33–34*

2) Explain how the area postrema may play a role in minimizing poison toxicity.

Answer: Because the blood–brain barrier is weak near this structure, toxins in blood can stimulate this brain region to cause emesis, which would void the stomach and in turn may reduce the total amount of toxicity to the organism.
Diff: 2 *Page Ref: 37*

3) What would be the effect of opening potassium channels in the axon membrane?

Answer: Potassium ions would leave the cell, making the interior even more negative. This in turn would limit the excitability of the nerve cell.
Diff: 2 *Page Ref: 43–45*

4) What would you expect the impact to be on an organism treated with a drug that blocks neuronal sodium channels?

Answer: Rapid death owing to the cessation of action potentials.
Diff: 1 *Page Ref: 45–46*

5) Explain why saltatory conduction speeds up the velocity of action potentials.

Answer: In saltatory conduction, the action potential does not have to depolarize every segment of membrane, only those at the widely separated nodes of Ranvier.
Diff: 3 *Page Ref: 47–48*

6) What would you expect to happen if the enzyme AChE were to be disabled in your body?

Answer: My ACh activity would greatly increase, because AChE normally serves to degrade ACh. Later, this would lead to overstimulation of cholinergic receptors.
Diff: 3 *Page Ref: 53–54*

7) What is the general function of autoreceptors?

Answer: To modulate the internal biochemical activity of the presynaptic cell.
Diff: 1 *Page Ref: 55–56*

2.4 Essay

1) Discuss the general support functions of glial cells for the nervous system.

Answer: Glial cells: provide physical or structural support for individual neurons; provide energy to neurons; take away waste products; buffer the environment of a nerve cell; provide insulation in the form of myelin; digest dead or dying nerve cells; are involved in immune function.

Diff: 2 *Page Ref: 33–35*

2) Explain how ion channels alter the electrical properties of a nerve cell membrane.

Answer: Ions are charged particles that are inequally distributed across the cell membrane. When ion channels open, diffusion and electrostatic pressure push sodium ions into the cell or potassium ions out of the cell. These movements result in changes in voltage across the membrane.

Diff: 2 *Page Ref: 42–45*

3) Explain why the reuptake process has become a critical target for therapeutic drugs.

Answer: The postsynaptic action of many neurotransmitters is terminated via reuptake of the molecule through the membrane transporter. A drug that blocks such a transporter would be expected to raise the synaptic levels of that neurotransmitter. For a disease or disorder that is thought to result from a low synaptic activity of that transmitter, blockade of the reuptake process would generate a beneficial effect.

Diff: 3 *Page Ref: 53–55*

4) Explain how the nerve cell membrane acts as an integrator of incoming inputs.

Answer: Neurotransmitter–gated receptors can open separate ion channels. Opening a sodium channel would result in an EPSP, while opening a potassium channel would result in an IPSP. The critical event which produces an action potential is reaching the threshold value for the membrane. EPSPs move the potential closer to that value, IPSPs move it further away. The PSPs can add together spatially and temporally, because of the residual nature of these potentials.

Diff: 2 *Page Ref: 54–55*