

CHAPTER 12 Review

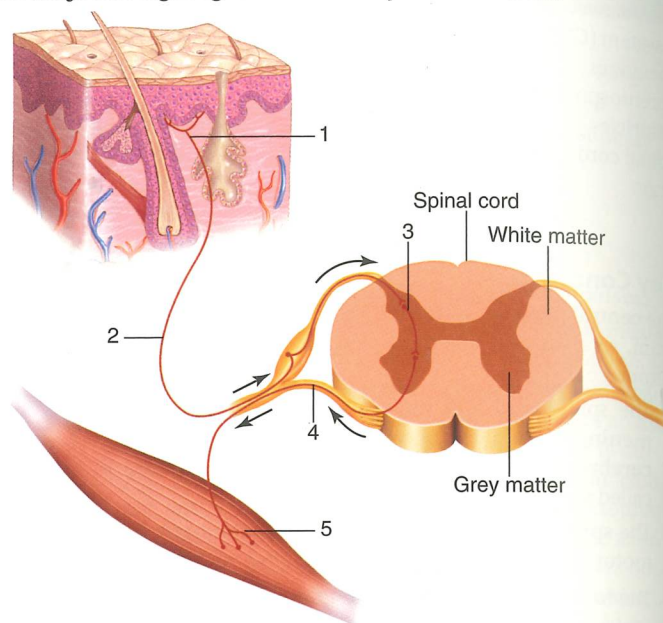
Reviewing and Understanding Key Concepts

- Effectors are
 - tissues that detect stimuli.
 - organs that interpret stimuli.
 - structures that generate the stimuli.
 - muscles or glands that respond to stimuli.
- An interneuron relays nerve impulses from a
 - motor neuron to an effector.
 - sensory neuron to a motor neuron.
 - motor neuron to a sensory neuron.
 - sensory receptor to a sensory neuron.
- If a motor neuron is damaged in an accident, which of the following would be least likely to occur?
 - a gland releasing a hormone
 - the depolarization of a sensory neuron
 - the sensory receptor detecting the stimulus
 - the interneuron secreting a neurotransmitter
- Which of the following sets correctly pairs a part of a neuron with its function?
 - node of Ranvier—the gaps that nourishes the neuron
 - Schwann cell—a neuroglial cell that produces grey matter
 - myelin sheath—the fatty protective layer covering the axon
 - dendrite—the part that conducts a nerve impulse away from a neuron
- Multiple sclerosis is a degenerative disease where the myelin sheaths of the neurons are progressively destroyed by inflammation and scarring. What would be a direct effect of this disease?
 - Nerve impulses will slow down or stop.
 - The process of myelination will increase.
 - The release of neurotransmitters is inhibited.
 - The stimulus is not detected by the sensory receptor.
- You prick your finger on a needle and pull your hand back before you even feel the pain. What is the correct reflex arc pathway involved in this response?
 - stimulus → motor neuron → interneuron → effector → sensory neuron
 - sensory neuron → stimulus → motor neuron → interneuron → effector
 - interneuron → stimulus → sensory neuron → effector → motor neuron
 - stimulus → sensory neuron → interneuron → motor neuron → effector
- Which of the following descriptors are characteristics of a resting potential?

I	a net negative charge on the inside of the axon
II	concentration of sodium is greater on the inside than on the outside of the axon
III	unequal distribution of sodium and potassium ions is maintained by active transport

- I and II only
- II and III only
- I and III only
- I, II, and III

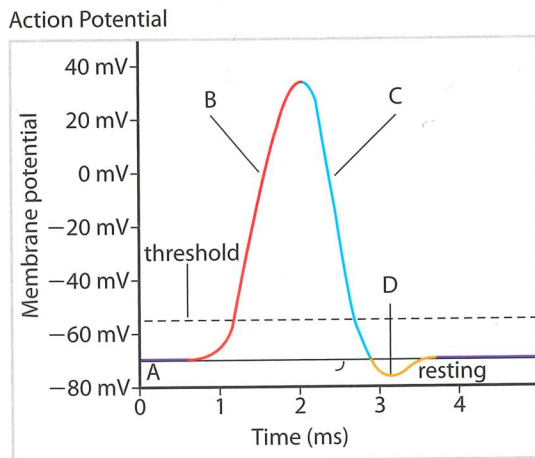
Use the following diagram to answer questions 8 to 16.



- What is the advantage of the pathway shown above?
 - It bypasses the spinal cord.
 - It decreases the pain detected by the brain.
 - It allows quick response to environmental stimuli.
 - It allows the brain to decide what to do in response to environmental stimuli.
- The function of structure 1 is to
 - stimulate an effector.
 - release neurotransmitters.
 - detect changes in the environment.
 - carry messages away from the central nervous system.
- What happens when a stimulus reaches a threshold level in the dendrite of structure 2?
 - Sodium gates open.
 - Repolarization occurs.
 - Resting potential is restored.
 - Acetylcholine is released into the synapse.
- In order for a nerve impulse to travel along structure 2,
 - calcium ions are transported out of the axon and sodium ions into the axon.
 - calcium ions are transported out of the axon and potassium ions into the axon.
 - sodium ions are transported out of the axon and potassium ions into the axon.
 - sodium ions are transported into of the axon and potassium ions out the axon.
- The space between structure 2 and structure 3 is called the
 - synaptic cleft.
 - Schwann cell.
 - node of Ranvier.
 - presynaptic membrane.
- Which part of the reflex arc allows the sensory neuron to communicate with the motor neuron?
 - structure 1
 - structure 2
 - structure 3
 - structure 4

14. What is found in the grey matter of the spinal cord?
- axon of motor neuron
 - dendrite of an interneuron
 - dendrite of a sensory neuron
 - cell body of a sensory neuron
15. What part of structure 2 transmits nerve impulses from structure 1 to the cell body?
- axon
 - dendrite
 - synaptic cleft
 - Schwann cell
16. After leaving the axon of structure 3, the nerve impulse travels to the
- effector.
 - motor neuron.
 - sensory neuron.
 - sensory receptor.

Use the following action potential graph to answer questions 17 to 22.

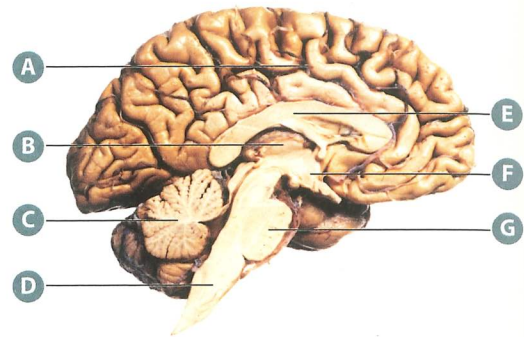


17. Which of the following part of the graph represents repolarization?
- A
 - B
 - C
 - D
18. What maintains the membrane potential during phase A?
- hyperpolarization
 - sodium-potassium pump
 - stimulus reaching a threshold
 - diffusion of potassium across the membrane
19. Which of the following statements describes what occurs at phase A?
- Sodium gates are closed, but potassium gates are opened.
 - The gates on the sodium and potassium channels are closed.
 - Depolarization reaches threshold and triggers an action potential.
 - A stimulus opens the gates of the sodium channels and sodium ions move into the axon.
20. The permeability of the axon's membrane to sodium ions is increasing during phase
- A.
 - B.
 - C.
 - D.
21. At the top of the curve on the graph, the action potential
- is resetting to 0 mV.
 - is reaching threshold.
 - has stopped conducting electrical impulses.
 - is in a brief reversal of polarity of the membrane potential.
22. What is causing the change within the axon during the phase D?
- Sodium gates open. Sodium ions flow out of the axon.
 - Calcium gates open. Calcium ions flow out of the axon.
 - Potassium gates open. Potassium ions flow out of the axon.
 - All voltage-gated channels are closed. No ions move across the axon.
23. An intense stimulus can cause an axon to
- increase the strength of the action potential.
 - start an action potential more often in a given time interval.
 - produce action potentials that travel down the neuron faster.
 - open more potassium gates to allow more ions to cross the membrane.
24. The binding of a neurotransmitter to receptors on the postsynaptic membrane in an inhibitory synapse results in
- repolarization.
 - depolarization.
 - hyperpolarization.
 - an action potential.
25. What determines whether a synapse is excitatory or inhibitory?
- the length of synapse
 - the number of calcium ions present
 - the type of postsynaptic neurotransmitter receptors
 - the concentration of neurotransmitters on the presynaptic membrane
26. The opening of the sodium gates plays an important role during
- recovery.
 - repolarization.
 - depolarization.
 - resting potential.
27. Polarity changes from positive to negative due to the movement of
- sodium ions.
 - calcium ions.
 - potassium ions.
 - neurotransmitters.
28. A greater concentration of potassium ions is maintained inside the axon relative to the outside of the axon by
- osmosis.
 - diffusion.
 - active transport.
 - facilitated transport.
29. The time during which a neuron cannot immediately be restimulated to fire another action potential is called the
- threshold.
 - refractory period.
 - resting membrane potential.
 - saltatory conduction of the action potential.
30. At a synapse, impulse conduction goes from the
- synaptic cleft to the presynaptic membrane.
 - postsynaptic membrane to the synaptic cleft.
 - postsynaptic membrane to the presynaptic membrane.
 - presynaptic membrane to the postsynaptic membrane.
31. Which of the following substances moves across the axonal membrane and causes the microfilaments to contract and pull the synaptic vesicles to the presynaptic membrane?
- sodium ions
 - calcium ions
 - potassium ions
 - bicarbonate ions
32. What are the contents of synaptic vesicles?
- calcium ions
 - sodium ions
 - myelin sheath
 - neurotransmitters

33. What is the function of acetylcholinesterase in the synaptic cleft?
- to break down acetylcholine
 - to produce more acetylcholine
 - to package acetylcholine into vesicles
 - to help acetylcholine bind to the presynaptic membrane
34. Acetylcholine is known as
- a neuron.
 - an enzyme.
 - a phospholipid.
 - a neurotransmitter.
35. What part of the brain serves as a link between the nervous system and the endocrine system?
- cerebrum
 - hypothalamus
 - corpus callosum
 - medulla oblongata
36. Which of the following parts of the brain is incorrectly paired with its function?
- thalamus—smell
 - medulla oblongata—vomiting
 - hypothalamus—water balance
 - pineal gland—sleep-wake cycle
37. The medulla oblongata regulates
- sleep.
 - posture.
 - voluntary activity.
 - involuntary activity.
38. Which of the following neurons would be found in the autonomic nervous system?
- sensory neurons in the fingers
 - interneurons in the spinal cord
 - motor neurons ending in the mouth
 - motor neurons ending in the cardiac muscles
39. Atropine is a poison that blocks the receptors for acetylcholine on the postsynaptic membrane. Which of the following events would most likely be affected by this poison?
- the depolarization of an effector
 - the exocytosis of the potassium ions
 - the movement of calcium ions across the synapse
 - the diffusion of acetylcholine from the post-synaptic membrane to the pre-synaptic membrane
40. The autonomic nervous system regulates activities that are
- voluntary.
 - involuntary.
 - under conscious control.
 - under control of the spinal cord.
41. After a “fight or flight” response, stimulation by the parasympathetic nervous system would
- dilate the pupils.
 - inhibit salivation.
 - increase heart rate.
 - increase intestinal activity.
42. Stimulation of the sympathetic nervous system would
- stimulate tears.
 - inhibit urination.
 - constrict the bronchioles.
 - stimulate the gall bladder to release bile.

43. What part of the brain helps maintain a body temperature of 37°C?
- thalamus
 - pineal gland
 - hypothalamus
 - medulla oblongata
44. The sound of a kitchen timer can awaken the
- cerebellum.
 - hypothalamus.
 - medulla oblongata.
 - reticular activating system.

Use the following photograph of the brain to answer questions 45 to 49.



45. What is structure G?
- pons
 - hypothalamus
 - pituitary gland
 - medulla oblongata
46. What part of the brain allows the left side to communicate with the right side?
- structure A
 - structure D
 - structure E
 - structure C
47. What is the function of structure A?
- walking on a tight rope
 - reasoning through a problem
 - blinking as an insect flies close to your face
 - shivering to keep the body warm on a cold day
48. Structure C allows you to
- wake up to the phone ringing.
 - multiply numbers in your head.
 - smell freshly baked cinnamon buns.
 - hit a tennis ball with a smooth, coordinated swing.
49. What part of the brain responds to high levels of carbon dioxide in the blood and causes breathing rate to increase?
- structure A
 - structure B
 - structure C
 - structure D
50. The increased secretion of what neurotransmitter would cause the liver to release glucose?
51. Explain the all-or-none phenomenon as it applies to action potential.

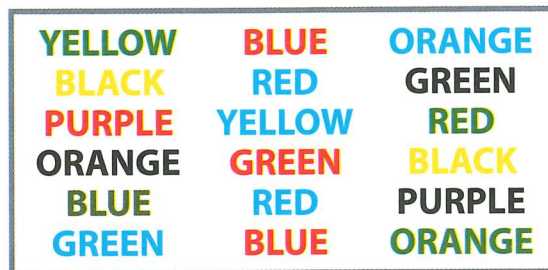
52. In the knee-jerk reflex, when the patellar ligament right below the kneecap is hit, the leg jerks forward. Explain what occurs during this reflex.
53. What are two advantages that salutatory conduction has over nerve propagation in unmyelinated neurons?
54. Describe the propagation of an action potential.
55. Compare and contrast the conduction of a nerve impulse along a myelinated axon and an unmyelinated axon.
56. Match the function with the part of the brain that is associated with it. Some parts of the brain are used more than once.

Function	Part of the brain
a. blinking	1. thalamus
b. hiccuping	2. cerebrum
c. hitting a baseball	3. cerebellum
d. solving some math problems	4. hypothalamus
e. smelling a bouquet of flowers	5. corpus callosum
f. breathing faster during exercise	6. medulla oblongata
g. sneezing after smelling some pepper	
h. wanting to eat because you are hungry	
i. walking on a balance beam in gymnastics	
j. increasing your heart rate when you are running	
k. having the urge to drink because you are thirsty	
l. regulating sleep, body temperature, and water balance	
m. allowing the right hemisphere to communicate with the left hemisphere	

57. What division of the autonomic nervous system is responsible for each of the following events?
- increase in heart rate
 - constriction of pupils
 - inhibition of urination
 - decrease in peristalsis
 - dilation of bronchioles
 - stimulation of salivation
 - stimulation of adrenal secretion
 - stimulation of gall bladder to release bile
58. Compare the autonomic and somatic nervous systems.
59. Construct a Venn diagram to compare and contrast the sympathetic and parasympathetic nervous systems.
60. A person suffers a concussion during a hockey game. Over the next several weeks, he develops loss of appetite and thirst. What part of the brain may have been affected?

Engage

Use the following diagram of colourful words to answer question 61.



61. **Making Connections** The Stroop effect illustrates the processing difference between the right brain and the left brain. One theory suggests that one side of the brain dominates in colour recognition, while the other side dominates in word recognition. Try to say the actual colours shown in the diagram. Do you find this difficult to do? Explain the reason for this.
62. **Predicting** A person is taking a drug and suffers side effects that include dryness of the mouth, decreased frequency of urination, and increased heart rate. There is no impairment of the ability to use the skeletal muscles. What type of receptor does this drug most likely block?
63. **Predicting** When a nerve impulse reaches the end of a motor neuron, the motor neuron releases acetylcholine into the synapse. Acetylcholine diffuses across the synaptic cleft and binds to the receptor sites on the postsynaptic membrane of an effector. This causes the effector to contract. Once this is done, the neurotransmitter is then broken down by the enzyme acetylcholinesterase. The breakdown of the acetylcholine allows the effector to relax. Nerve gases inhibit the action of acetylcholinesterase by preventing it from breaking down acetylcholine. As a result, acetylcholine remains in the synapse.
- What is the substrate for acetylcholinesterase?
 - What would happen to the level of acetylcholine in the synapse as a result of the presence of the nerve gas?
 - Predict the effects on the nervous system if acetylcholine remains in the synapse.
 - Hypothesize what would happen to the diaphragm as a result of exposure to nerve gases.
64. **Predicting** During a viral infection, a person suffers from lack of sleep and alternating chills and fever. Which part of the brain is most likely affected?
65. **Evaluating** Under stress, a person's heart rate increases from 70 bpm to 140 bpm and the breathing rate goes from 15 breaths per minute to 30 breaths per minute. Identify the neurotransmitter that could be responsible for the increase in heart and breathing rates. What nervous system division would be involved?
66. **Formulating a Hypothesis** Sleep deprivation can affect a person both physically and psychologically. Research information about the importance of sleep on homeostasis and explain why we need to sleep. Formulate a hypothesis about the effect of sleep.