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Chapter 35

Nervous System

Section 35–1 Human Body Systems (pages 891–896)

This section describes human organ systems and explains how the body maintains homeostasis.

Organization of the Body (pages 891–894)

1. List the levels of organization in a multicellular organism, from smallest to largest.

a. Cells

b. Tissues

c. Organs

d. Organ systems

Match the organ system with its function.

	Organ System
c	**2.** Nervous system
a	**3.** Skeletal system
g	**4.** Integumentary system
e	**5.** Endocrine system
i	**6.** Lymphatic system
d	**7.** Muscular system
j	**8.** Reproductive system
b	**9.** Respiratory system
f	**10.** Excretory system
k	**11.** Circulatory system
h	**12.** Digestive system

Function

a. Stores mineral reserves and provides a site for blood cell formation

b. Provides oxygen and removes carbon dioxide

c. Coordinates the body's response to changes in its internal and external environments

d. Helps produce voluntary movement, circulate blood, and move food

e. Controls growth, development, metabolism, and reproduction

f. Eliminates wastes and maintains homeostasis

g. Serves as a barrier against infection and injury

h. Converts food so it can be used by cells

i. Helps protect the body from disease

j. Produces reproductive cells

k. Brings materials to cells, fights infection, and regulates body temperature

13. What are four types of tissues found in the human body? The four types of tissues are muscle tissue, epithelial tissue, connective tissue, and nervous tissue.

14. The most abundant tissue in most animals is muscle tissue.

15. Circle the letter of the type of tissue that covers the surface of the body and lines internal organs.

a. nervous **c.** epithelial

b. connective **d.** muscle

16. What is a gland? A gland is a structure that makes and secretes, or releases, a particular product such as saliva, sweat, or milk.

17. Circle the letter of the type of tissue that connects bones to muscles.

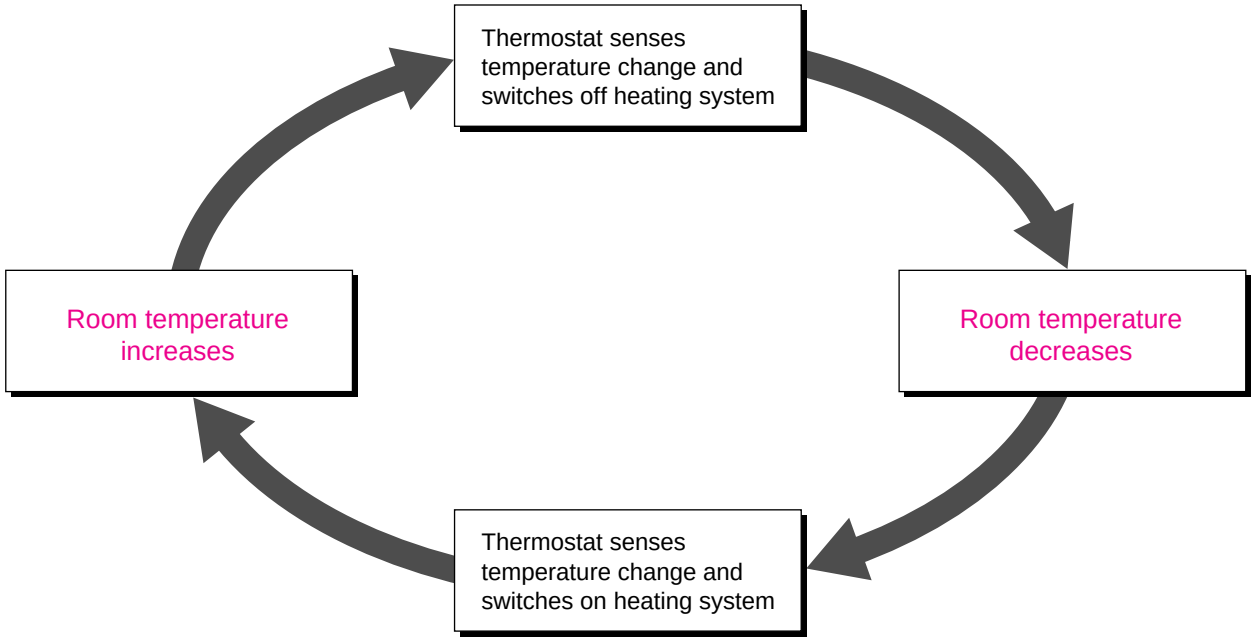
a. nervous
c. epithelial
b. connective
d. integumentary

Maintaining Homeostasis (pages 895–896)

18. The process of maintaining a controlled, stable internal environment is called homeostasis.

19. The process by which the product of a system shuts down the system or limits its operation is referred to as feedback inhibition.

20. Fill in the missing labels in the diagram to show how a thermostat uses feedback inhibition to maintain a stable temperature in a house.



21. Is the following sentence true or false? The part of the brain that monitors and controls body temperature is the hypothalamus.
true

22. What happens if nerve cells sense that the core body temperature has dropped below 37°C? The hypothalamus produces chemicals that signal cells throughout the body to speed up their activities, which causes a gradual rise in body temperature.

23. What happens if the body temperature rises too far above 37°C? The hypothalamus slows down cellular activities, minimizing the production of heat.

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Section 35–2 The Nervous System (pages 897–900)

This section describes the nervous system and explains how a nerve impulse is transmitted.

Introduction (page 897)

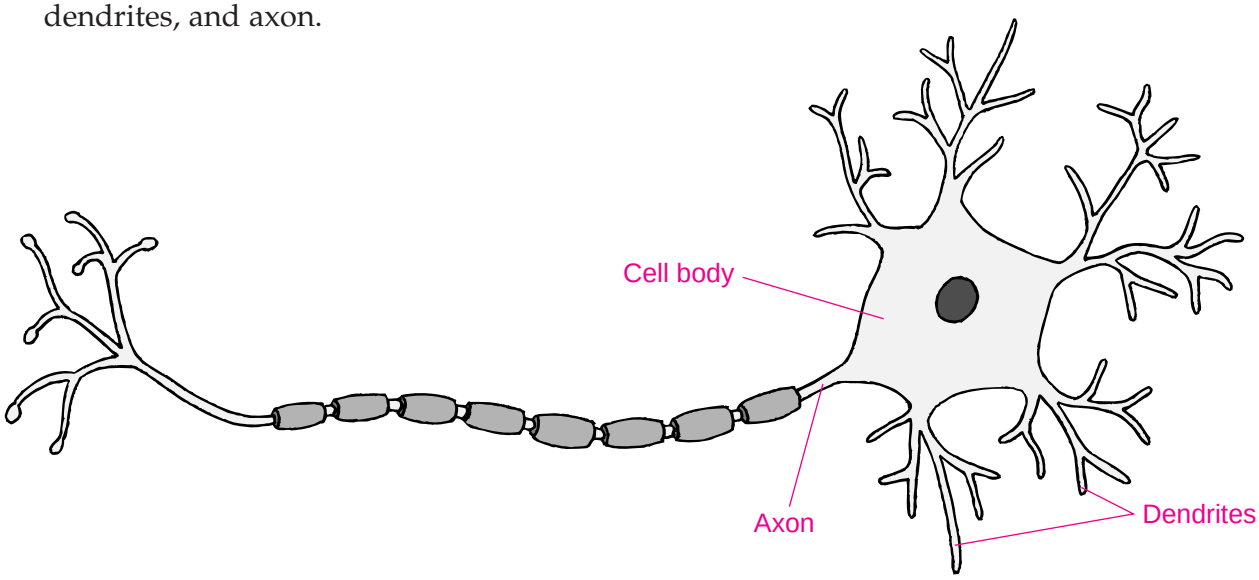
1. What is the function of the nervous system? The nervous system controls and coordinates functions throughout the body and responds to internal and external changes.

2. What are three types of neurons?
   a. Sensory neurons
   b. Motor neurons
   c. Interneurons

Neurons (pages 897–898)

3. Is the following sentence true or false? Sensory neurons carry impulses from the brain and the spinal cord to muscles and glands.
   false

4. Label the following features in the drawing of a neuron: cell body, dendrites, and axon.



5. What is the function of the myelin sheath? The myelin sheath increases the speed at which nerve impulses can travel.

The Nerve Impulse (pages 898–899)

6. Is the following sentence true or false? There are more sodium ions in the cytoplasm than in the fluid outside the cell.
   false

7. The difference in electrical charge across the cell membrane of a resting neuron is called its resting potential.

8. How does a nerve impulse begin? A nerve impulse begins when a neuron is stimulated by another neuron or by its environment.

9. Circle the letter of the choice that describes an action potential.
   - (a.) Reversal of charges due to the flow of positive ions into a neuron
   - **b.** Increase in negative ions in a neuron due to the flow of potassium out of the cell
   - **c.** Change to a negative charge due to the flow of sodium ions out of a neuron
   - **d.** Reversal of charges due to the flow of negative ions into a neuron

10. The minimum level of a stimulus that is required to activate a neuron is called the threshold.

11. How does a nerve impulse follow the all-or-nothing principle? Either a stimulus will produce an impulse, or it won't, depending on it's strength.

The Synapse (page 900)

12. Circle the letter of the term that refers to the location at which a neuron can transfer an impulse to another cell.
   a. axon **b.** dendrite (c.) synapse **d.** node

13. What are neurotransmitters? Neurotransmitters are chemicals that are used by a neuron to transmit an impulse across a synapse to another cell.

14. Describe what happens when an action potential arrives at an axon terminal. The sacs release neurotransmitters into the gap between the two cells. The neurotransmitters diffuse across the gap and attach to receptors on the membrane of the neighboring cell, causing positive ions to rush across the cell membrane and stimulate the second cell.

Reading Skill Practice

When you read about a complex process, representing the process with a diagram can help you understand it better. Make a diagram to show how a nerve impulse is transmitted from one cell to another. Do your work on a separate sheet of paper.

Students' diagrams should be similar to Figure 35–8. Their diagrams should be labeled to show the relevant parts of the cells and the direction of the nerve impulse.

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Section 35–3 Divisions of the Nervous System (pages 901–905)

This section describes the major divisions of the nervous system and explains their functions.

Introduction (page 901)

1. What is the function of the central nervous system? The central nervous system relays messages, processes information, and analyzes information.

The Central Nervous System (page 901)

2. The central nervous system consists of the brain and the spinal cord.

3. Is the following sentence true or false? Three layers of connective tissue known as meninges protect the brain and spinal cord.
true

4. The brain and spinal cord are bathed and protected by cerebrospinal fluid.

The Brain (pages 902–903)

Match the part of the brain with its function.

	Part of Brain	Function
c	5. Cerebrum	**a.** Coordinates and balances the actions of the muscles
a	6. Cerebellum	**b.** Regulates the flow of information between the brain and the rest of the body
b	7. Brain stem	**c.** Controls voluntary activities of the body
e	8. Thalamus	**d.** Controls hunger, thirst, fatigue, anger, and body temperature
d	9. Hypothalamus	**e.** Receives and relays messages from the sense organs

10. The two hemispheres of the brain are connected by a band of tissue called the corpus callosum.

11. Identify the four lobes of the brain.
    a. Frontal lobe
    b. Parietal lobe
    c. Temporal lobe
    d. Occipital lobe

12. Is the following sentence true or false? The left hemisphere of the cerebrum controls the body's left side. false

13. Is the following sentence true or false? The outer surface of the cerebrum is called the cerebral cortex. true

14. What is gray matter, and where is it found? Gray matter is densely packed nerve cell bodies and is found in the cerebral cortex of the cerebrum.

15. The two regions of the brain stem are the medulla oblongata and the pons.

The Spinal Cord (page 903)

16. Name two examples of a reflex. Two examples are sneezing and blinking.

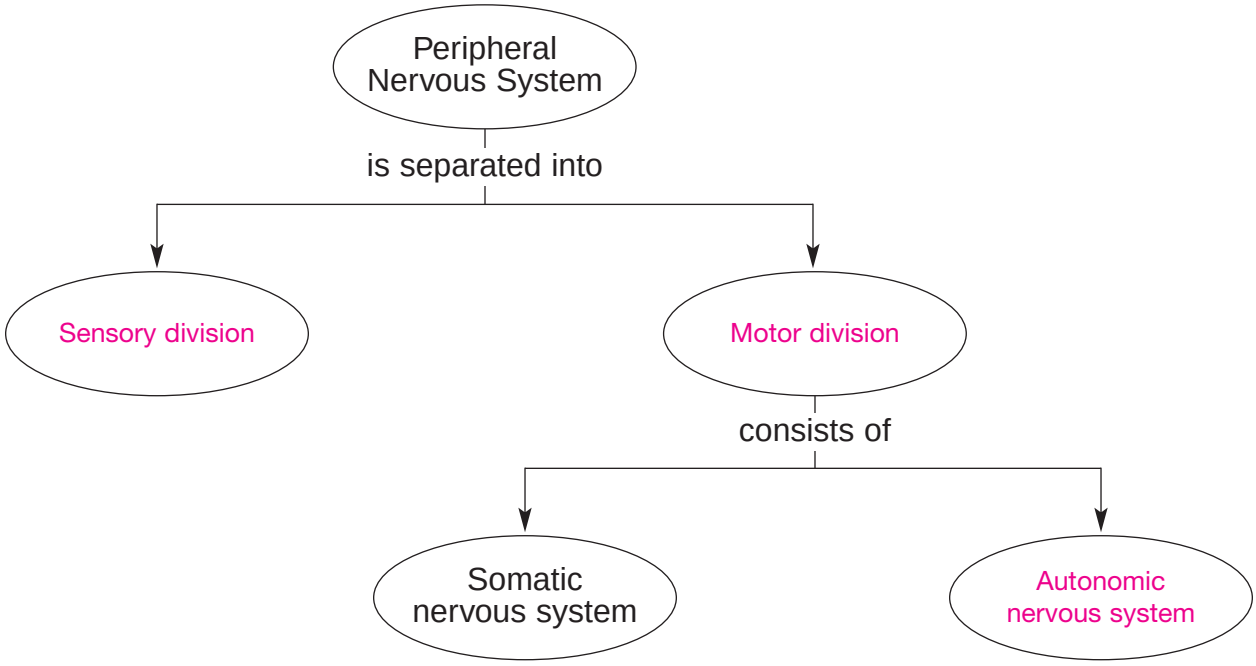
17. What is the advantage of a reflex? It allows your body to respond to danger immediately, without spending time thinking about a response.

The Peripheral Nervous System (pages 903–904)

18. Circle the letter of each choice that is part of the peripheral nervous system.

a. cranial nerves
b. spinal nerves
c. ganglia
d. spinal cord

19. Complete the concept map.



20. Circle the letter of each activity that is controlled by the somatic nervous system.

a. Beating of the heart
b. Lifting a finger
c. Wiggling the toes
d. Pulling foot away from tack

21. What does the autonomic nervous system regulate? It regulates activities that are automatic, or involuntary, such as the heartbeat.

22. Why is it important to have two systems that control the same organs? One system speeds up the activities of the organs, and the other system slows down the activities of the organs.

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Section 35–4 The Senses (pages 906–909)

This section explains how each of the five senses responds to stimuli from the environment.

Introduction (page 906)

1. What are sensory receptors? They are neurons that react directly to stimuli from the environment.

2. List the five general categories of sensory receptors.
   a. Pain receptors
   b. Thermoreceptors
   c. Mechanoreceptors
   d. Chemoreceptors
   e. Photoreceptors

3. Which category of sensory receptors are sensitive to touch, sound, and motion? Mechanoreceptors are sensitive to touch, sound, and motion.

Vision (pages 906–907)

4. Circle the letter of each sentence that is true about the structures of the eye.
   (a.) Light enters the eye through the cornea.
   b. The anterior chamber is filled with vitreous humor.
   (c.) The pupil changes in size to let more or less light enter the eye.
   (d.) The lens focuses light on the retina.

5. Is the following sentence true or false? The function of the iris is to adjust the size of the pupil. true

6. Where are the photoreceptors located in the eye? They are located in the retina.

7. What do photoreceptors do? They convert light into nerve impulses that are carried to the central nervous system.

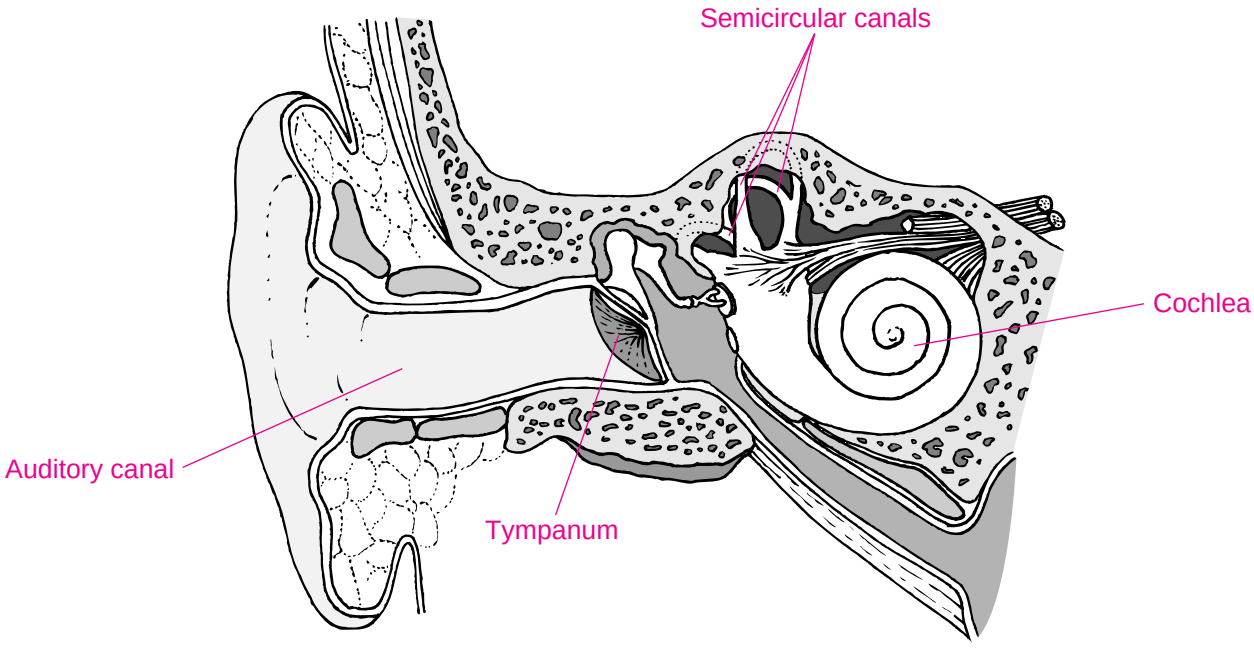
8. Is the following sentence true or false? Cones are extremely sensitive to light, but they do not distinguish different colors. false

9. How do impulses travel from the eyes to the brain? They are carried by the optic nerves.

Hearing and Balance (pages 908–909)

10. List the two sensory functions of the ear.
    a. Hearing
    b. Maintaining balance

11. Label each of the following structures in the drawing of the ear: auditory canal, tympanum, semicircular canals, and cochlea.



12. Is the following sentence true or false? The tympanum sends nerve impulses to the brain. _____false_____

13. Complete the flowchart.

Vibrations enter the ear through the _____auditory canal_____.

↓

The vibrations cause the _____tympanum_____ to vibrate.

↓

These vibrations are picked up by three tiny bones, called the _____hammer_____, _____anvil_____, and _____stirrup_____.

↓

The last bone transmits the vibrations to the _____oval window_____, creating pressure waves in the _____cochlea_____.

↓

Tiny hair cells inside the _____cochlea_____ produce nerve impulses that are sent to the brain through the _____cochlear_____ nerve.

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14. What is the role of hair cells in the cochlea? In response to pressure waves in the cochlea, the hair cells produce nerve impulses that are sent to the brain through the cochlear nerve.

15. How do the semicircular canals help maintain balance? They monitor the position of the body, especially the head, in relation to gravity.

Smell and Taste (page 909)

16. Is the following sentence true or false? Your sense of smell is actually an ability to detect pressure. false

17. How does the body detect smell? Chemoreceptors in the lining of the nasal passageway respond to specific chemicals and send impulses to the brain through sensory nerves.

18. Is the following sentence true or false? Much of what we commonly call the "taste" of food and drink is actually smell.
true

19. The sense organs that detect taste are the taste buds.

20. List the four different categories of tastes.

a. Salty

b. Bitter

c. Sweet

d. Sour

Touch and Related Senses (page 909)

21. What is the largest sense organ? The skin is the largest sense organ.

22. Is the following sentence true or false? The skin contains sensory receptors that respond to temperature, touch, and pain.
true

23. Circle the letter of each choice that is true about the sense of touch.

(a.) Unlike the other senses, the sense of touch is not found in one particular place.

b. All parts of the body are equally sensitive to touch.

c. The greatest density of touch receptors is found on the arms and legs.

(d.) Touch is detected by mechanoreceptors.

24. Where is the greatest density of touch receptors found on the body? The greatest density is found on fingers, toes, and the face.

Section 35–5 Drugs and the Nervous System (pages 910–914)

This section describes how different types of drugs affect the nervous system.

Introduction (page 910)

1. Is the following sentence true or false? A drug is any illegal substance that changes the structure or function of the body.
   false
2. Is the following sentence true or false? Among the most powerful drugs are the ones that cause changes in the nervous system, especially to the brain and the synapses between neurons.
   true
3. How can drugs disrupt the functioning of the nervous system? They can disrupt it by interfering with the action of neurotransmitters.

Drugs That Affect the Synapse (pages 910–914)

Match the drug or type of drug with one way that it can affect the body.

	Drug or Type of Drug	Effect on the Body
e	4. Stimulant	**a.** Acts on pleasure centers of brain
d	5. Depressant	**b.** Destroys liver cells
a	6. Cocaine	**c.** Reduces pain
c	7. Opiate	**d.** Decreases heart rate
f	8. Marijuana	**e.** Increases blood pressure
b	9. Alcohol	**f.** Causes lung damage

10. Circle the letter of each choice that is a stimulant drug.
    a. nicotine **b.** cocaine **c.** amphetamine **d.** codeine
11. Circle the letter of each choice that is a depressant drug.
    a. alcohol **c.** tranquilizer
    b. morphine **d.** barbiturate
12. An uncontrollable craving for more of a drug is known as addiction.
13. Cocaine causes the sudden release in the brain of a neurotransmitter called dopamine.
14. How does drug use increase the transmission of HIV, the virus that causes AIDS? Many users inject drugs for maximum effect. HIV can be spread rapidly from person to person when drug users share contaminated needles.

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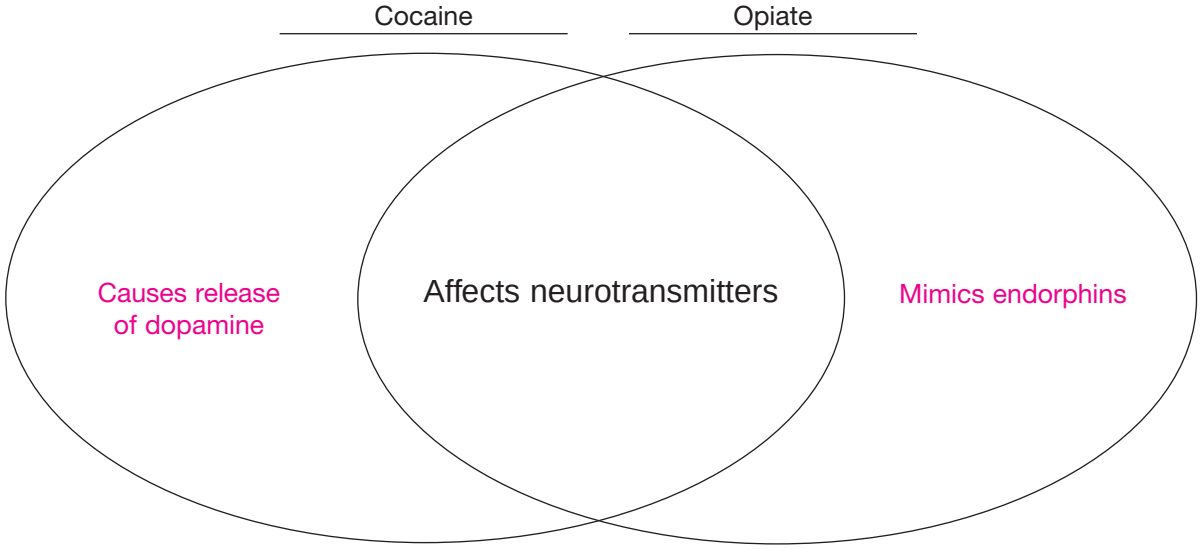
15. Complete the Venn diagram.



16. Is the following sentence true or false? The most widely abused illegal drug is marijuana. true

17. Circle the letter of each choice that is a result of long-term use of marijuana.

a. Loss of memory
b. Inability to concentrate
c. Increase in testosterone
d. Cirrhosis of the liver

18. Is the following sentence true or false? Alcohol is the drug most commonly abused by teenagers. true

19. What is fetal alcohol syndrome, or FAS? FAS is a group of birth defects caused by the effects of alcohol on the fetus.

20. People who have become addicted to alcohol suffer from a disease called alcoholism.

21. How does long-term alcohol use affect the body? It destroys cells in the liver and can lead to cirrhosis of the liver and liver failure.

Drug Abuse (page 914)

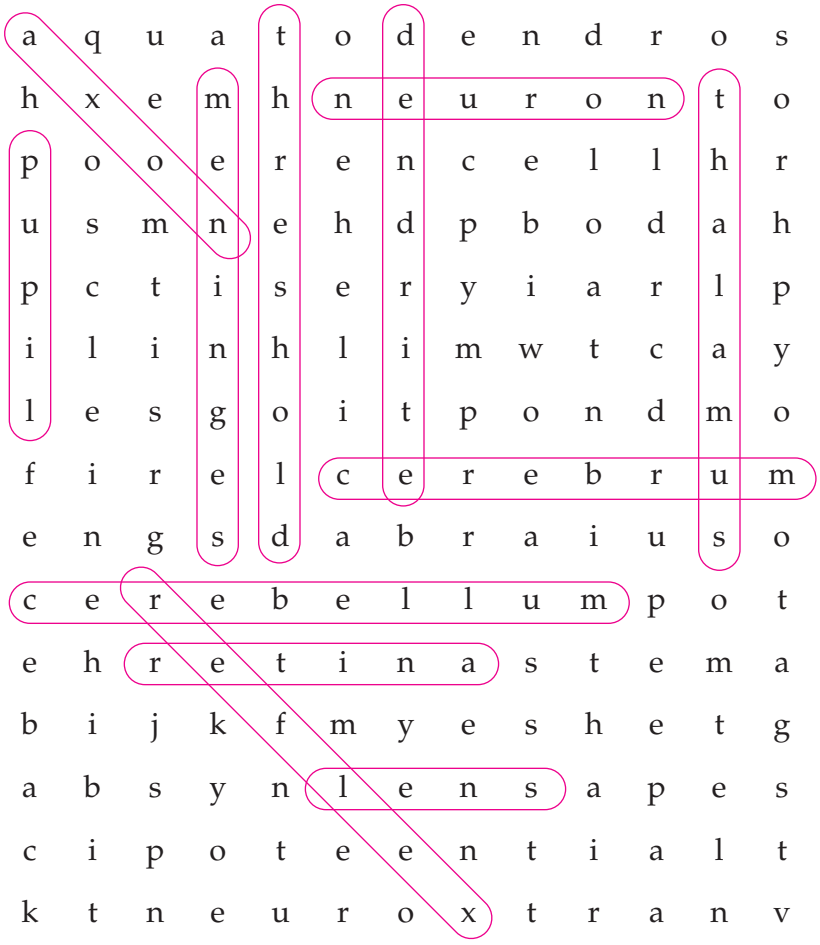
22. Using any drug in a way that most doctors could not approve is referred to as drug abuse.

23. What is psychological dependence on a drug? It is a mental craving, or need, for the drug.

24. When does physical dependence on a drug occur? It occurs when the body cannot function without a constant supply of the drug.

WordWise

Solve the clues to determine which vocabulary terms from Chapter 35 are hidden in the puzzle. Then find and circle the terms in the puzzle. The terms may occur vertically, horizontally, or diagonally.



Clues

Type of cell that carries messages throughout the nervous system

Part of a neuron that carries impulses toward the cell body

Part of a neuron that carries impulses away from the cell body

Minimum level of a stimulus required to activate a neuron

Three layers of tissue in which the brain and spinal cord are wrapped

Area of the brain responsible for voluntary activities of the body

Area of the brain that coordinates body movements

Brain structure that receives messages from the sense organs

Quick automatic response to a stimulus

Part of the eye that focuses light on the retina

Small opening in the iris of the eye

Lining inside the eye that contains photoreceptors

Hidden Words

neuron

dendrite

axon

threshold

meninges

cerebrum

cerebellum

thalamus

reflex

lens

pupil

retina