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.

<table>
<thead>
<tr>
<th>Organ System</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>c. Nervous system</td>
<td>a. Stores mineral reserves and provides a site for blood cell formation</td>
</tr>
<tr>
<td>a. Skeletal system</td>
<td>b. Provides oxygen and removes carbon dioxide</td>
</tr>
<tr>
<td>g. Integumentary system</td>
<td>c. Coordinates the body’s response to changes in its internal and external environments</td>
</tr>
<tr>
<td>e. Endocrine system</td>
<td>d. Helps produce voluntary movement, circulate blood, and move food</td>
</tr>
<tr>
<td>i. Lymphatic system</td>
<td>e. Controls growth, development, metabolism, and reproduction</td>
</tr>
<tr>
<td>d. Muscular system</td>
<td>f. Eliminates wastes and maintains homeostasis</td>
</tr>
<tr>
<td>j. Reproductive system</td>
<td>g. Serves as a barrier against infection and injury</td>
</tr>
<tr>
<td>b. Respiratory system</td>
<td>h. Converts food so it can be used by cells</td>
</tr>
<tr>
<td>f. Excretory system</td>
<td>i. Helps protect the body from disease</td>
</tr>
<tr>
<td>k. Circulatory system</td>
<td>j. Produces reproductive cells</td>
</tr>
<tr>
<td>h. Digestive system</td>
<td>k. Brings materials to cells, fights infection, and regulates body temperature</td>
</tr>
</tbody>
</table>

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  
   b. connective  
   c. epithelial  
   d. muscle
Chapter 35, Nervous System (continued)

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.
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.

   Cell body
   Dendrites
   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.
Chapter 35, Nervous System (continued)

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 its 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.
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.

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

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 _______.

Guided Reading and Study Workbook/Chapter 35
Chapter 35, Nervous System  (continued)

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  c. ganglia
   b. spinal nerves  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  c. Wiggling the toes
   b. Lifting a finger  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.
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.
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. ______ true ______ 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.
Chapter 35, Nervous System  (continued)

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.

<table>
<thead>
<tr>
<th>Drug or Type of Drug</th>
<th>Effect on the Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>e</td>
<td>a. Acts on pleasure centers of brain</td>
</tr>
<tr>
<td>d</td>
<td>b. Destroys liver cells</td>
</tr>
<tr>
<td>a</td>
<td>c. Reduces pain</td>
</tr>
<tr>
<td>c</td>
<td>d. Decreases heart rate</td>
</tr>
<tr>
<td>f</td>
<td>e. Increases blood pressure</td>
</tr>
<tr>
<td>b</td>
<td>f. Causes lung damage</td>
</tr>
</tbody>
</table>

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       b. morphine      c. tranquilizer   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.
15. Complete the Venn diagram.

Cocaine

<table>
<thead>
<tr>
<th>Causes release of dopamine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affects neurotransmitters</td>
</tr>
<tr>
<td>Mimics endorphins</td>
</tr>
</tbody>
</table>

Opiate

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