How the Nervous System Works (pages 596–600)

Functions of the Nervous System (pages 596–597)

Key Concept: The nervous system receives information about what is happening both inside and outside your body. It also directs the way in which your body responds to this information. In addition, your nervous system helps maintain homeostasis.

- The nervous system includes the brain, spinal cord, and nerves that run throughout the body. The nervous system also includes sense organs such as the eyes.

- The nervous system has three jobs:
  1. The nervous system receives information. For example, it tells you that a ball is zooming toward you.
  2. The nervous system responds to information. It makes you duck so the ball misses you.
  3. The nervous system also helps to keep the body in balance. For example, your nervous system makes you feel hungry when your body needs food.

Answer the following questions. Use your textbook and the ideas above.

1. Is the following sentence true or false? The nervous system includes the sense organs. __________

2. Circle the letter of each job of the nervous system.
   a. responds to information
   b. helps keep body in balance
   c. receives information
The Neuron  (page 598)

Key Concept: A neuron has a large cell body that contains the nucleus, threadlike extensions called dendrites, and an axon. Three kinds of neurons are found in the body—sensory neurons, interneurons, and motor neurons.

- The cells of your nervous system are called nerve cells, or neurons (NOO rahnz). Neurons carry messages, called nerve impulses. A bundle of many neurons is called a nerve. Nerves can be very long.

- The main part of a neuron is the cell body. Threads called dendrites stick out from the cell body. Dendrites carry messages from outside the neuron to the cell body. A longer thread, called the axon, also sticks out from the cell body. The axon carries messages from the cell body to other cells.

- Three kinds of neurons work together in the body. Sensory neurons pick up information and change it to messages. Interneurons pass messages from neuron to neuron. Some interneurons pass messages to motor neurons. Motor neurons send messages to muscles.

Answer the following questions. Use your textbook and the ideas above.

3. Draw a line from the kind of neuron to what it does.

<table>
<thead>
<tr>
<th>Neuron</th>
<th>What It Does</th>
</tr>
</thead>
<tbody>
<tr>
<td>sensory neuron</td>
<td>a. passes messages from neuron to neuron</td>
</tr>
<tr>
<td>interneuron</td>
<td>b. picks up information and changes it to messages</td>
</tr>
<tr>
<td>motor neuron</td>
<td>c. sends messages to muscles</td>
</tr>
</tbody>
</table>
The Nervous System

4. Is the following sentence true or false? Dendrites carry messages from the cell body to other cells. 

How a Nerve Impulse Travels (pages 598–600)

Key Concept: For a nerve impulse to be carried along at a synapse, it must cross the gap between the axon and the next structure. The axon tips release chemicals that carry the impulse across the gap.

- Nerve impulses travel from sensory neurons to interneurons and from interneurons to motor neurons.
- Suppose the phone rings. Sensory neurons in your ears send a message about the sound to interneurons in your brain. Your brain makes a decision about the sound and sends a message to motor neurons. Motor neurons pass the message to muscles. Muscles contract, and your hand picks up the phone.
- There is a space, or gap, between one neuron and the next. This gap is called a synapse (SIN aps). When messages reach a synapse, the axon produces certain chemicals. The chemicals carry messages across the gap, like a boat carries people across a river.

Answer the following questions. Use your textbook and the ideas above.

5. Fill in the blanks in the flowchart about how nerve impulses travel.

```
Sensory neuron → a. ______________ → b. ______________
```

6. A gap between two neurons is a(an) ________________.
Divisions of the Nervous System (pages 602–609)

Central Nervous System (page 603)

Key Concept: The central nervous system is the control center of the body. It includes the brain and spinal cord.

- The nervous system can be divided into two parts: the central nervous system and the peripheral nervous system.

- The central nervous system is made up of the brain and spinal cord. The peripheral nervous system (puh RIF uh rul) is made up of all the rest of the nerves in the body.

- The brain is inside the skull. The brain controls almost everything that goes on in the body. The spinal cord is a thick rope of nerves that runs down the center of the back. The spinal cord carries messages back and forth between the brain and peripheral nervous system.

Answer the following questions. Use your textbook and the ideas above.

1. Fill in the blanks in the concept map about the two parts of the nervous system.

```
Nervous system
   includes
   a. nervous system
   b. nervous system
```

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2. Is the following sentence true or false? The brain controls almost everything that goes on in the body.

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The Brain and Spinal Cord  (pages 604–606)

Key Concept: There are three main regions of the brain that receive and process information. These are the cerebrum, the cerebellum, and the brain stem. The spinal cord is the link between your brain and the peripheral nervous system.

- The largest part of the brain is the cerebrum. The **cerebrum** (suh REE brum) controls movement, the senses, speech, and thinking. For example, you use your cerebrum to read.

- The second largest part of the brain is the cerebellum. The **cerebellum** (sehr uh BEL um) controls balance and muscles working together. For example, your cerebellum helps you walk.

- The smallest part of the brain is the brain stem. The **brain stem** controls involuntary actions. These are actions, such as breathing and heartbeat, that you cannot control.

- The spinal cord connects the brain with the nerves of the body. The spinal cord is surrounded by the backbone. The backbone helps to keep the spinal cord from getting hurt.

*Answer the following questions. Use your textbook and the ideas above.*

3. Is the following sentence true or false? The brain connects the spinal cord with the nerves of the body.
4. Fill in the blanks in the table about parts of the brain.

<table>
<thead>
<tr>
<th>Parts of the Brain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part of Brain</td>
</tr>
<tr>
<td>Cerebrum</td>
</tr>
<tr>
<td>a. _______________</td>
</tr>
<tr>
<td>b. _______________</td>
</tr>
</tbody>
</table>

**Peripheral Nervous System** *(pages 606–607)*

*Key Concept:* The peripheral nervous system consists of a network of nerves that branch out from the central nervous system and connect it to the rest of the body. The peripheral nervous system is involved in both involuntary and voluntary actions.

- All of the nerves of the peripheral nervous system start either in the brain or in the spinal cord. From there, the peripheral nerves branch out through the rest of the body.

- The peripheral nervous system can be divided into two parts: the somatic nervous system and the autonomic nervous system.

- Nerves of the **somatic** *(soh MAT ik)* **nervous system** control voluntary actions. For example, you use somatic nerves to control your fingers when you tie your shoes.

- Nerves of the **autonomic** *(awt uh NAHM ik)* **nervous system** control involuntary actions. For example, autonomic nerves control muscles in the walls of blood vessels.
Answer the following question. Use your textbook and the ideas on page 278.

5. Fill in the blanks in the table about the peripheral nervous system.

<table>
<thead>
<tr>
<th>Parts of the Peripheral Nervous System</th>
<th>What It Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. _____________________________ nervous system</td>
<td>voluntary actions</td>
</tr>
<tr>
<td>b. _____________________________ nervous system</td>
<td>involuntary actions</td>
</tr>
</tbody>
</table>

Reflexes (pages 607–608)

Key Concept: A reflex is an automatic response that occurs very rapidly and without conscious control. Reflexes help to protect the body.

- A reflex is something you do automatically, without thinking about it. For example, if you touch a sharp object, you jerk your hand away from it. The rapid motion of your hand is a reflex. Like other reflexes, it helps to keep you from getting hurt.

- Remember, sensory neurons usually send messages that go to the brain. In some reflexes, sensory neurons send messages that go only as far as the spinal cord. These reflexes are very fast.

Answer the following questions. Use your textbook and the ideas above.

6. Something you do automatically is a(an) __________.
The Nervous System

7. Is the following sentence true or false? Reflexes help to keep you from getting hurt. 

Nervous System Injuries (page 609)

Key Concept: Concussions and spinal cord injuries are two ways in which the central nervous system can be damaged.

- A concussion is a bruise on the brain. It is caused by the brain knocking against the hard skull. This can happen when a person has an accident or plays a rough sport such as football.
- Concussions can cause headaches. Sometimes, people even pass out when they get a concussion. A concussion usually heals itself.
- Spinal cord injuries happen when the spinal cord is cut or crushed. Car crashes are the most common cause of spinal cord injuries.
- When the spinal cord is cut all the way through, messages cannot travel to and from the brain. Because the brain cannot send messages to muscles, parts of the body can no longer move.

Answer the following questions. Use your textbook and the ideas above.

8. A bruise on the brain is a(an) _________________.

9. Why might a spinal cord injury make parts of the body unable to move? Circle the letter of the correct answer.
   a. because the brain cannot send messages to the muscles
   b. because the muscles are usually injured too
   c. because the muscles cannot send messages to the spinal cord