31.1 The Neuron

Lesson Objectives

- Identify the functions of the nervous system.
- Describe the function of neurons.
- Describe how a nerve impulse is transmitted.

BUILD Vocabulary

A. The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action potential</td>
<td></td>
</tr>
<tr>
<td>Axon</td>
<td></td>
</tr>
<tr>
<td>Myelin sheath</td>
<td></td>
</tr>
</tbody>
</table>

The largest part of the neuron, containing the nucleus and much of the cytoplasm

A system made up of the brain and spinal cord that processes information about the body and creates an appropriate response

A short, branched projection of a neuron that receives and carries impulses

A chemical that transmits an impulse across a synapse to another cell

Continued on next page
<table>
<thead>
<tr>
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<th>Definition</th>
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</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
</tbody>
</table>

BUILD Understanding

Flowchart  A flowchart is a way to show the steps in a process. Complete the flowchart below by labeling the boxes either “Central Nervous System” or “Peripheral Nervous System.” The first one has been done for you.

```
Peripheral Nervous System
Gathers information and sends it to the central nervous system

Input

Processes the information and forms a response

Output

Carries the response of the central nervous system to glands and muscles
```
Functions of the Nervous System

The Neuron  Neurons are the basic units of the nervous system. They transmit electrical signals called impulses.

Follow the directions.

1. Color the structures that receive signals from the environment or another neuron red.
2. Color the structure that carries an impulse away orange.
3. Color the cell body blue.

Answer the questions.

1. What is the structure that insulates some neurons? Circle the correct answer.
   - Synapse
   - myelin sheath

2. Use your answer to question 1 to label the insulating material on the neuron above.

3. What structures carry impulses to the cell body? Circle the correct answer.
   - Dendrites
   - axons

4. How is the structure and function of a neuron similar to a telephone wire?
   - ________________________________
   - ________________________________
   - ________________________________

5. What are neurotransmitters, and how do they function?
   - ________________________________
   - ________________________________
   - ________________________________
   - ________________________________
Lesson Objectives

- Discuss the functions of the brain and spinal cord.
- Describe the effects of drugs on the brain.

BUILD Vocabulary

The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain stem</td>
<td>Part of the brain that coordinates body movements</td>
</tr>
<tr>
<td></td>
<td>Area of the brain responsible for all voluntary activities</td>
</tr>
<tr>
<td>Dopamine</td>
<td>Control center for feelings of hunger, thirst, fatigue, anger, and body temperature</td>
</tr>
</tbody>
</table>

BUILD Understanding

Concept Map A concept map can help you organize information and show how ideas are connected. As you read Lesson 2, fill in the missing information.
The Brain and Spinal Cord

The Brain

The brain is a part of the central nervous system. It helps send messages. It also processes and analyzes information. Different body functions are controlled by different parts of the brain.

Follow the directions.

1. Color the cerebrum brown.
2. Color the cerebellum yellow.
3. Color the spinal cord green.
4. Color the brain stem blue.
5. Color the thalamus and hypothalamus red.

Answer the questions. Circle the correct answer.

6. Which is the largest part of the brain?
   - cerebellum
   - brainstem
   - cerebrum

7. Which part of the brain is located in the back of the head?
   - cerebellum
   - brain stem
   - cerebrum

8. Which part of the brain is found inside the cerebrum?
   - brain stem
   - hypothalamus
   - cerebellum
The Brain and Spinal Cord

Cerebral Cortex Folding  The cerebral cortex is the outer layer of the cerebrum. It is made up of tightly packed nerve cells. These form folds and grooves that give the brain more surface area.

Follow the directions.

1. Study the lines below.

2. Label the lines from 1 (least surface area) to 5 (most surface area).

<table>
<thead>
<tr>
<th>Line</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td></td>
</tr>
<tr>
<td>B.</td>
<td></td>
</tr>
<tr>
<td>C.</td>
<td></td>
</tr>
<tr>
<td>D.</td>
<td></td>
</tr>
<tr>
<td>E.</td>
<td></td>
</tr>
</tbody>
</table>

Use the chart to answer Question 3.

3. Which line has the most surface area? Explain your answer.

Answer the questions.

4. Why is surface area important to the brain?

5. Which other organ also has folds that increase its surface area? Circle the correct answer.
   - Esophagus
   - small intestine
   - liver

6. What is the importance of the large surface area of the cerebral cortex?

BUILD Connections

The Brain  A visual summary allows you to read about a topic and to see it in context. The brain is made up of several parts. Some parts control voluntary actions, or those you have to think about. Others control involuntary actions.

Complete the table below.
<table>
<thead>
<tr>
<th>Part of Brain</th>
<th>Function</th>
<th>How It Affects Your Everyday Life</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Connects the brain and spinal cord and controls involuntary body functions</td>
<td>Regulating heart rate and breathing while you sleep</td>
</tr>
<tr>
<td></td>
<td>Coordinates muscle and joint movements</td>
<td></td>
</tr>
<tr>
<td><strong>Cerebrum</strong></td>
<td>Controls voluntary activities, intelligence, learning, and judgment</td>
<td>Completing your homework and studying for a test</td>
</tr>
<tr>
<td></td>
<td>Recognizes and responds to hunger, thirst, body temperature, and fatigue</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Center for emotion, behavior, and memory</td>
<td>Feeling anxious or stressed when meeting new people</td>
</tr>
<tr>
<td></td>
<td>Receives and processes sensory messages</td>
<td>Sending the sensation of a loud noise to your cerebrum</td>
</tr>
</tbody>
</table>

**Answer the questions.**

1. Which part of the brain is involved in fear and anxiety? ____________________

2. What are four functions of the hypothalamus? ____________________________

3. Which part of the brain controls involuntary actions? Circle the correct answer.
   - brain stem
   - cerebrum

4. A student wants to learn to play the piano.
   a. What part of the brain will help her learn the movements needed to play the piano? ____________________
   b. What part of the brain will help her learn to read music? ____________________

**Addiction and the Brain**

5. What parts of the brain are changed by drug use? ________________________

6. What is dopamine? ____________________________________________

7. How do drugs cause addiction? ____________________________________
8. Complete the table.

### Effects of Drugs on the Body

<table>
<thead>
<tr>
<th>Drug</th>
<th>Effects on the Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heroin</td>
<td>Releases a flood of dopamine, produces an instant high</td>
</tr>
<tr>
<td>Nicotine and alcohol</td>
<td>Keeps dopamine in the synaptic region longer, intensifying pleasure and suppressing pain</td>
</tr>
</tbody>
</table>

31.3 The Peripheral Nervous System

Lesson Objectives

- Describe the functions of the sensory division of the peripheral nervous system.
- Describe the functions of the motor division of the peripheral nervous system.

#### BUILD Vocabulary

A. The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomic nervous system</td>
<td>A pathway a reflex impulse takes to and from the spinal cord during a quick response</td>
</tr>
<tr>
<td></td>
<td>A system that regulates body activities that are under conscious control, such as skeletal muscle movement</td>
</tr>
</tbody>
</table>

The Motor Division

*For Questions 10–12, write True or False on the line provided.*

1. The motor division of the peripheral nervous system transmits impulses directly from the sensory receptors to muscles or glands.
2. The somatic nervous system regulates body activities that are under conscious control.
3. Brain impulses are carried to motor neurons and then to muscles.

4. Complete a flowchart showing the reflex arc that occurs when you step on a sharp object.

5. Complete the concept map.
6. What is the function of the autonomic nervous system?

7. How might the autonomic nervous system prepare your body during rigorous exercise?

8. What is the function of the parasympathetic nervous system?


**BUILD Understanding**

**Venn Diagram** Use the Venn diagram to compare and contrast the somatic and autonomic nervous systems.

- **Somatic Nervous System**
  - voluntary actions
  - reflex arc

- **Autonomic Nervous System**
  - relay messages
  - heart rate

- **Both**
  - not under conscious control
The sensory division is one of two parts of the peripheral nervous system. Its job is to send impulses from the sense organs and other parts of the body to the brain.

*Use the terms to complete the concept maps below.*

<table>
<thead>
<tr>
<th>photoreceptors</th>
<th>chemoreceptors</th>
<th>thermoreceptors</th>
<th>mechanoreceptors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pain receptors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel a splinter.</td>
<td>I bite my tongue.</td>
<td>I taste something very sour.</td>
<td>I smell cookies baking in the oven.</td>
</tr>
<tr>
<td>I feel cold air on my skin while skiing.</td>
<td>I feel warm sitting next to a camp fire.</td>
<td>I see red, orange, and yellow leaves in the fall.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I squint when walking out of a movie theater.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My feet feel squeezed when I wear tight shoes.</td>
<td>My body vibrates when I ride on a bumpy train.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. Suppose someone was playing softball and trying to catch a pop fly ball. Explain how the different parts of the nervous system would respond in this situation.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________