

31.2 The Central Nervous System

Lesson Objectives

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

Lesson Summary

The Brain and Spinal Cord The central nervous system consists of the brain and spinal cord. Some kinds of information, including some reflexes, are processed directly in the spinal cord. A **reflex** is a quick, automatic response to a stimulus.

- ▶ The largest region of the human brain is the **cerebrum**, which controls learning, judgment, and voluntary actions of muscles.
 - The cerebrum is divided into right and left hemispheres. Each deals primarily with the opposite side of the body.
 - The outer layer of the cerebrum is the **cerebral cortex**. It processes information from the sense organs and controls body movements.
- ▶ The limbic system controls functions such as emotion, behavior, and memory.
- ▶ The **thalamus** receives messages from sensory receptors throughout the body and sends the information to the proper region of the cerebrum for processing.
- ▶ The **hypothalamus** controls the recognition and analysis of hunger, thirst, fatigue, anger, and body temperature. It helps coordinate the nervous and endocrine systems.
- ▶ The **cerebellum** is the second largest region of the brain. It receives information about muscle and joint position and coordinates the actions of these muscles.
- ▶ The **brain stem** connects the brain and spinal cord. It regulates the flow of information between the brain and the rest of the body.

Addiction and the Brain Almost all addictive substances affect brain synapses.

- ▶ Many drugs cause an increase in the release of the neurotransmitter **dopamine**. The brain reacts to high dopamine levels by reducing the number of receptors.
- ▶ With fewer dopamine receptors available, larger amounts of drugs are required to produce a high. This can result in an addiction.

The Brain and Spinal Cord

Write the letter of the correct answer on the line at the left.

- _____ 1. What is the main link between the brain and the rest of the body?
A. cerebrum B. spinal cord C. cerebellum D. brain stem
- _____ 2. Which of the following is the best example of a reflex?
A. jumping up and down
B. running in a race
C. slowly putting your foot into cool water
D. pulling your hand away from a hot pot

- _____ 3. Which part of the brain controls blood pressure, heart rate, breathing, and swallowing?
 A. brain stem
 B. limbic system
 C. cerebral cortex
 D. thalamus
- _____ 4. Which of the following is a function of the frontal lobe?
 A. making judgments
 B. hearing and smelling
 C. reading and speech
 D. vision
- _____ 5. Which part of the brain is the site of intelligence, learning, and judgment?
 A. brain stem
 B. cerebellum
 C. cerebrum
 D. limbic system

For Questions 6–10, match the part of the brain with its function.

Part of Brain	Function
_____ 6. cerebrum	A. Coordinates and balances the actions of the muscles
_____ 7. cerebellum	B. Regulates the flow of information between the brain and the rest of the body
_____ 8. brain stem	C. Controls voluntary activities of the body
_____ 9. thalamus	D. Controls hunger, thirst, fatigue, anger, and body temperature
_____ 10. hypothalamus	E. Receives and relays messages from the sense organs

11. What connects the two hemispheres of the brain?

12. Identify the four lobes of the brain and their functions.

13. What is the cerebral cortex and what is its function?

Addiction and the Brain

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

15. What is dopamine?

16. How do drugs cause addiction?

17. Complete the table.

Effects of Drugs on the Body	
Drug	Effects on the Body
	Releases a flood of dopamine, produces an instant high
	Keeps dopamine in the synaptic region longer, intensifying pleasure and suppressing pain
Heroin	
Nicotine and alcohol	

Apply the Big idea

18. What might be the effects on someone who seriously injured his or her cerebellum? Explain your answer.
