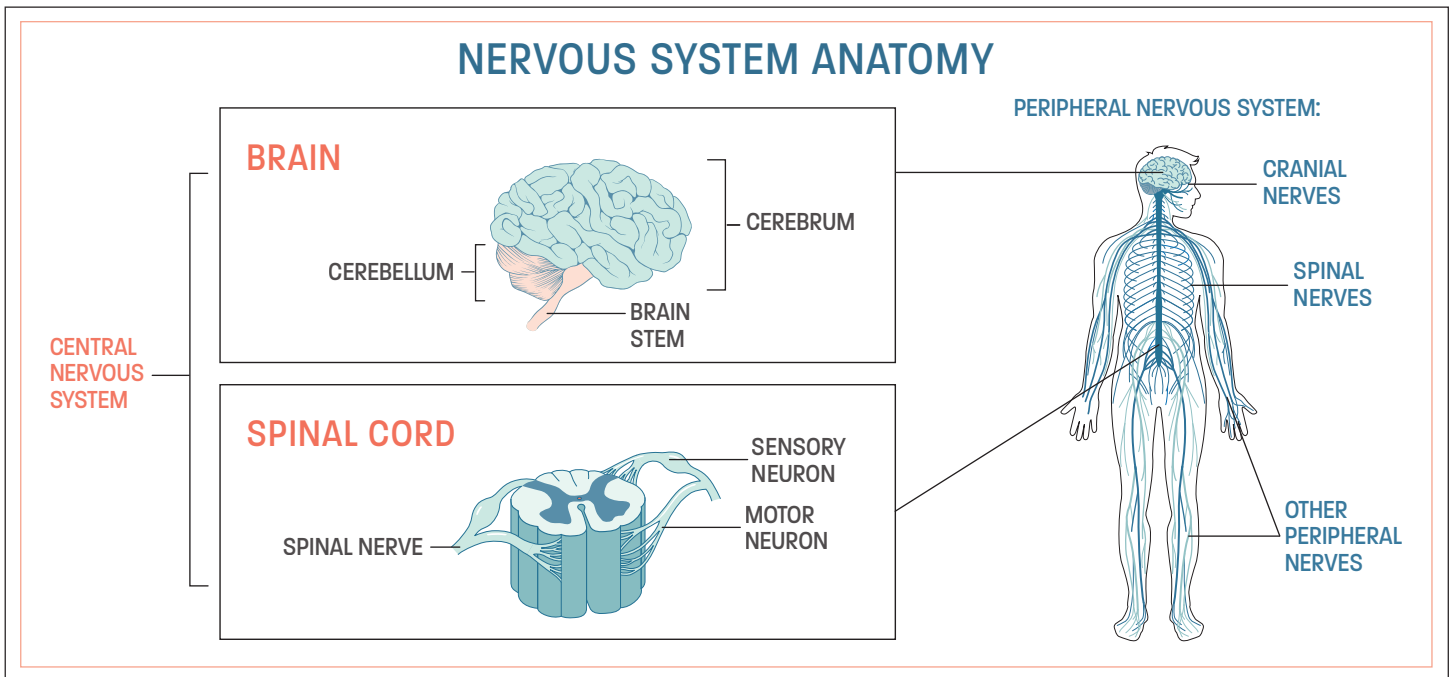


THE NERVOUS SYSTEM PART 2

Read the text below. Then, answer the questions on pages 2 and 3.

Have you ever accidentally touched a hot pot on a stove? If you have, you may remember the pain of burning your hand! You probably also learned to be careful around hot objects. Your reactions and memories are examples of your **nervous system** at work. The nervous system coordinates everything you do, including processing stimuli from your internal and external environment. Processing these stimuli may result in an immediate response. It may also result in the storage of new memories. In order to understand how the nervous system works, let's explore the brain, spinal cord, and the peripheral nervous system in more detail.

The **brain** and **spinal cord** are both part of the central nervous system. The human brain has about 100 billion neurons. Working together in networks, these neurons handle thousands of messages every day. The spinal cord relays messages between the brain and the rest of the body.



There are three major components of the brain: the cerebrum, the cerebellum, and the brain stem. The **cerebrum** is the largest region of the brain. It processes input from the five senses and includes regions for communication and learning. The **cerebellum** coordinates your muscle actions and helps maintain your balance. The **brain stem** controls involuntary actions like breathing and digestion. These actions are known as **autonomic functions**, or functions that you don't have to think about.

The **peripheral nervous system** includes all of the nerves outside of the central nervous system. This includes 31 pairs of symmetrical nerves, called **spinal nerves**, that extend from the spinal cord to the two sides of the body. It also includes 12 pairs of nerves extending from the brain called **cranial nerves** that send signals between the face, neck, torso, and brain. The peripheral nervous system has two major divisions: the **somatic** and **autonomic** systems. The autonomic nervous system transmits messages from the brain stem to control autonomic functions, like increasing your heart rate when you run. The somatic nervous system transmits messages to control all conscious movement, like wiggling your toes or using a fork to eat a meal.

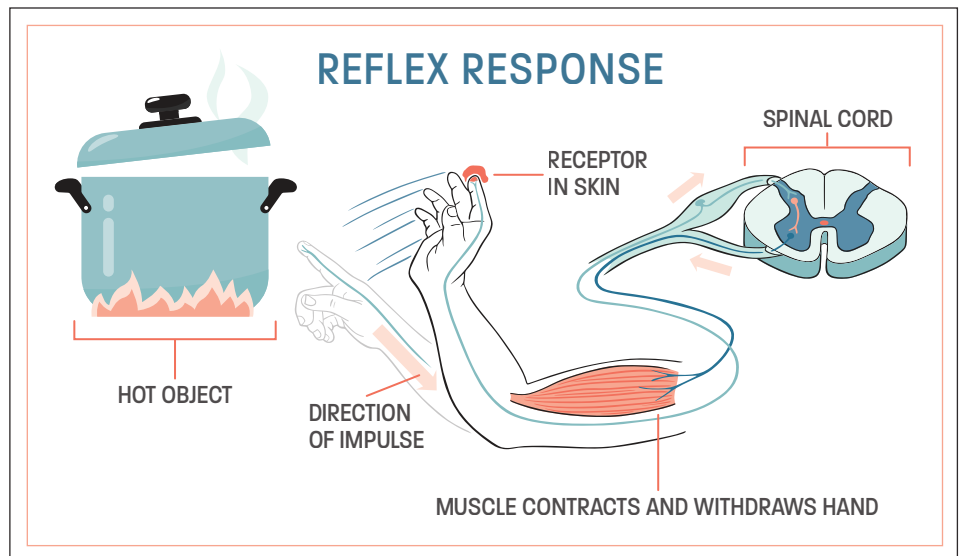
THE NERVOUS SYSTEM PART 2

Keep going! Use the reading to answer the questions below.

Some messages from sensory receptors are processed directly by the spinal cord. Let's consider the example of touching a hot pot on a stove. Ouch! Immediately you pull your hand back. This whole process happens very fast. This is known as a **reflex**. A reflex response doesn't require the brain at all. Instead, when your spinal cord receives nerve impulses from your fingers, your spinal cord sends an impulse directly back. This nerve impulse tells the motor neurons in your hand to pull your hand away from the pot. Reflexes are useful because they allow the body to respond without having to think about what action to take.

Reflex actions are paired with other nervous impulses which travel to the brain for interpretation. This is why your feeling of pain is often delayed. The reflex response happens first, and then the brain registers pain. After the unpleasant experience of touching a hot pot on a stove, most people learn to be careful around hot objects. How do you learn this information? Sensory experiences can generate an

immediate response, like the reflex of pulling your hand away coupled with the feeling of pain. These immediate responses are processed into stored information, or memories, in the brain. So, the next time you encounter a hot pot on the stove, you will be less likely to touch it.



Show what you know! Use the reading to answer the questions below.

1. Match the part of the nervous system with its function in the list below.

- | | |
|------------------------------|---|
| a. Peripheral nervous system | I. Region of the brain that processes smell |
| b. Cranial nerve | II. Controls involuntary actions like your heartbeat |
| c. Spinal cord | III. Helps maintain your balance |
| d. Cerebellum | IV. Includes all of the nerves outside of the brain and spinal cord |
| e. Cerebrum | V. Is made up of the brain and spinal cord |
| f. Brain stem | VI. Sends signals between the brain and the face, neck, and torso |
| g. Central nervous system | VII. Controls reflexes |

THE NERVOUS SYSTEM PART 2

Show what you know! Use the reading to answer the questions below.

2. Why is it useful for humans to have both an autonomic and a somatic system?

3. Jay is walking past the basketball court. His friend Taylor attempts a three-point shot and misses. Taylor yells, "Watch out!" Jay hears Taylor and turns to see the ball flying toward him. Jay instinctively raises his arms to block the ball. Number the nervous system response steps below into the correct order.

- | | |
|---|--|
| _____ Jay's eyes see the ball. | _____ Jay's muscles move to block the ball. |
| _____ Jay's ears hear his friend yelling. | _____ Jay's brain interprets the yell from his friend. |

4. What part of Jay's experience was a reflex? Explain how this reflex was useful for Jay.

5. Explain how memories of this experience would be useful for Jay in the future.

6. Bridget is threading a fishing lure on some fishing line. Her finger accidentally touches one of the sharp hooks on the lure. Bridget immediately pulls her finger away. That hurt! Bridget examines her skin to see if she needs a bandage. Number the nervous system response steps below into the correct order.

- | | |
|--|---|
| _____ Bridget's finger touches the hook. | _____ Bridget's muscles move her finger away. |
| _____ Bridget feels pain in her finger. | _____ Bridget's brain directs her eyes to look at her finger. |

7. What part of Bridget's experience was a reflex? Explain how this reflex was useful for Bridget.

8. Explain how memories of this experience would be useful for Bridget in the future.
