

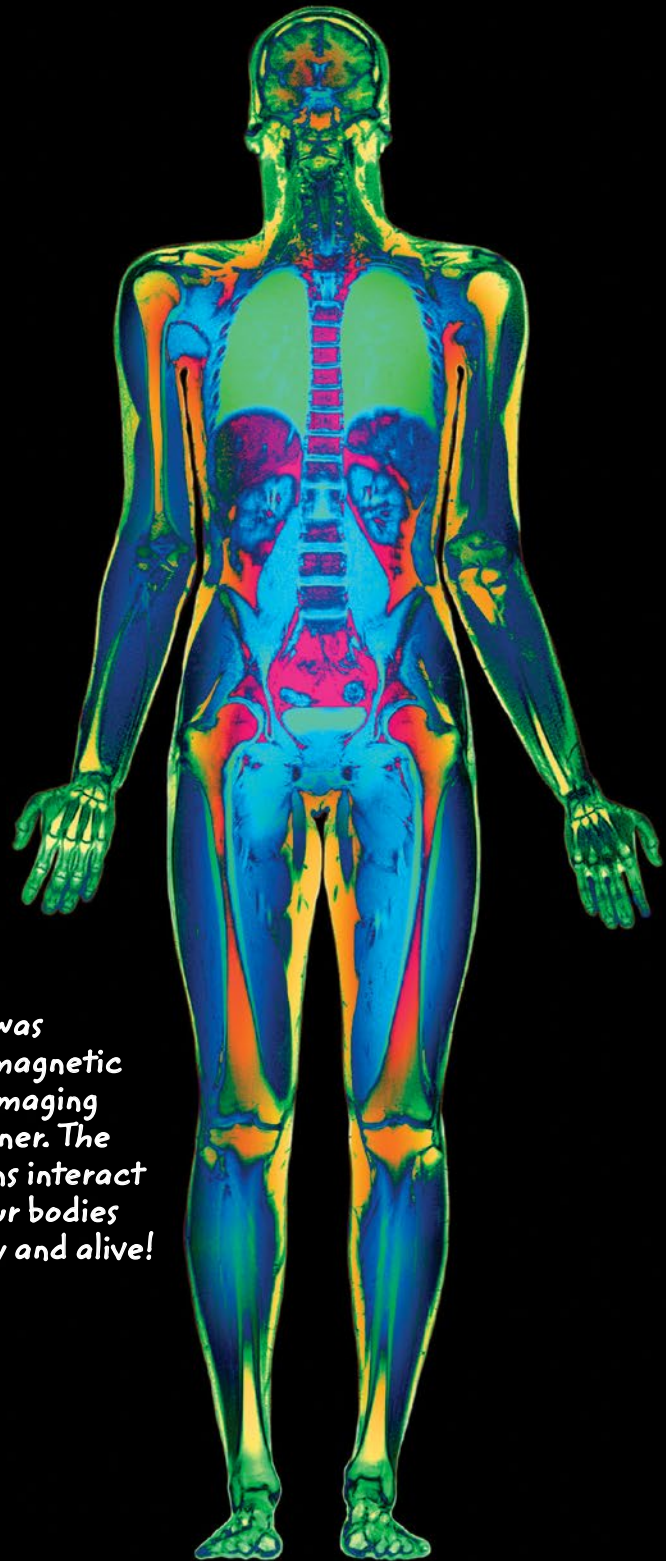


Introduction to Body Systems

ESSENTIAL QUESTION

How do the body systems interact to maintain homeostasis?

By the end of this lesson, you should be able to describe the functions of the human body systems, including how they interact to maintain homeostasis.



This image was made by a magnetic resonance imaging (MRI) scanner. The body's organs interact to ensure our bodies stay healthy and alive!

S7L2.c Body systems interactions



Quick Labs

- Balancing Act
- Body Systems: Their Structures and Functions



Engage Your Brain

1 Predict Check T or F to show whether you think each statement is true or false.

- | | | |
|--------------------------|--------------------------|------------------------------------------------------------------------|
| T | F | |
| <input type="checkbox"/> | <input type="checkbox"/> | Your muscles provide a framework that supports and protects your body. |
| <input type="checkbox"/> | <input type="checkbox"/> | When you breathe in and out, you're using your lungs. |
| <input type="checkbox"/> | <input type="checkbox"/> | Your nervous system gets rid of wastes from your body. |
| <input type="checkbox"/> | <input type="checkbox"/> | When you eat food, it enters your digestive system. |

2 Identify Draw a diagram of your body showing at least four organs. As you read the lesson, write down the organ system that each organ is a part of.



Active Reading

3 Synthesize You can often define an unknown word if you know the meaning of its word parts. Use the word parts and sentence below to make an educated guess about the meaning of the word *homeostasis*.

Greek word	Meaning
<i>homoios</i>	same
<i>stasis</i>	standing

Example sentence

In order to maintain homeostasis, the cardiovascular system and the respiratory system interact to move oxygen-carrying blood around the body.

homeostasis:

Vocabulary Term


- **homeostasis**

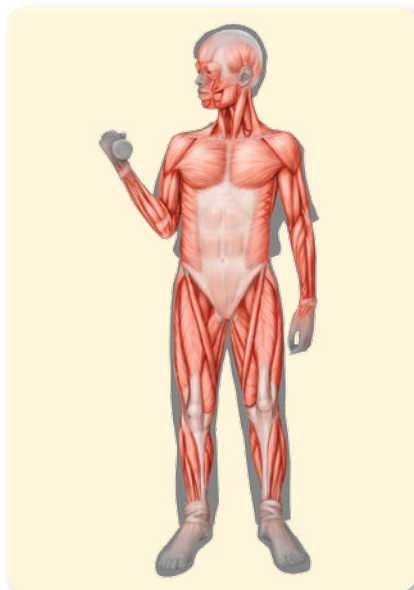
4 Apply As you learn the definition of the vocabulary term in this lesson, make a sketch that shows the meaning of the term or an example of that term. Next to your drawing, write your own definition of the term.

What do the body systems do?

Humans and other organisms need to get energy. They need to use energy to run their bodies and move. They need to reproduce. They need to get rid of waste and protect their bodies. Body systems, also called *organ systems*, help organisms do all of these things. They interact to carry out life processes, and they also coordinate all the functions of a body.

Groups of organs that interact form body systems. Nerves detect a stimulus in the environment and send a signal through the spinal cord to the brain. The brain sends a signal to respond. Without all the parts, the system would not work. Some organs work in more than one organ system.

 **Active Reading 5 Identify** As you read about body systems on these pages, underline the main function of each body system.



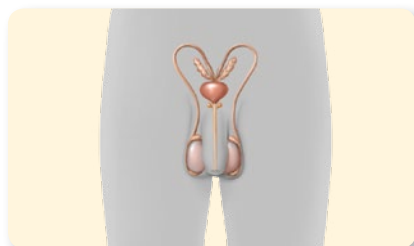
The muscular system allows movement of body parts. It interacts with the skeletal system to help you move.



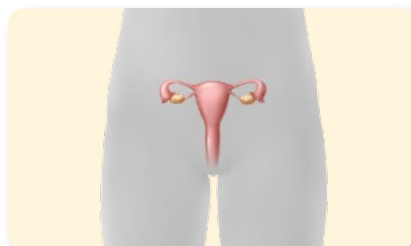
The skeletal system is made up of bones, ligaments, and cartilage. It supports the body and protects important organs. It also makes blood cells.



The respiratory system gathers oxygen from the environment and gets rid of carbon dioxide from the body. The exchange occurs in the lungs.



The male reproductive system produces sperm and delivers it to the female reproductive system.



The female reproductive system produces eggs and nourishes a developing fetus.



The cardiovascular system moves blood through the body. The heart is the pump for this system. Blood flows through blood vessels.

Visualize It!

6 Analyze Look closely at the body systems shown on these pages. Then circle the two parts that make up the immune system and explain how this system of the body interacts with other systems.



The lymphatic system returns leaked fluid back to the blood. As a major part of the immune system, it has cells that help get rid of invading bacteria and viruses.



The endocrine system makes chemical messages. These messages help to regulate conditions inside the body. They also influence growth and development.



The integumentary system is the protective covering of the body. It includes the skin, hair, and nails. As part of the immune system, the skin acts as a barrier that protects the body from infection.



The excretory system gets rid of the body's wastes. The urinary system, shown here, removes wastes from blood. The skin, lungs, and digestive system also remove wastes from the body.



The digestive system breaks down food into nutrients that can be used by the body. The stomach breaks down food into tiny pieces. Nutrients are absorbed in the small intestine.



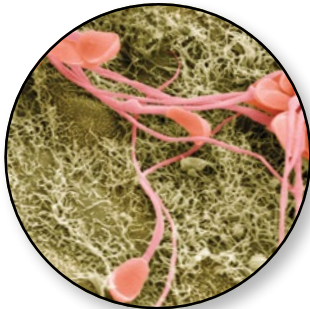
The nervous system collects information and responds to it by sending electrical messages. This information may come from outside or inside the body. The brain is the center of the nervous system.

A Closer Look

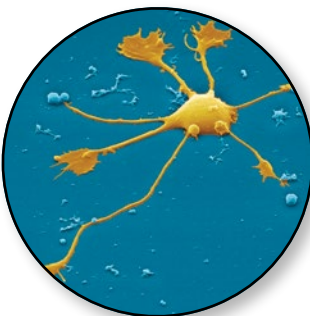
How are structure and function linked?

Even though animals may look very different on the outside, on the inside, their cells, tissues, and organs look very similar. This is because these structures do the same basic job. For example, a frog's heart, a bird's heart, and a human's heart all have the same function, to pump blood around the body. They are all made of the same type of muscle tissue, which is made up of the same type of muscle cells. The structure of the hearts is similar, too. Though their shape may be a little different from each other, they are all muscular pumps that push blood around the body.

The shapes and sizes of cells are related to their function. For example, sperm cells have long tails that are used to move. Nerve cells are long and thin to send messages long distances. Surface skin cells are broad and flat. The diagram below shows how skin cells form the skin, which covers and protects the body.

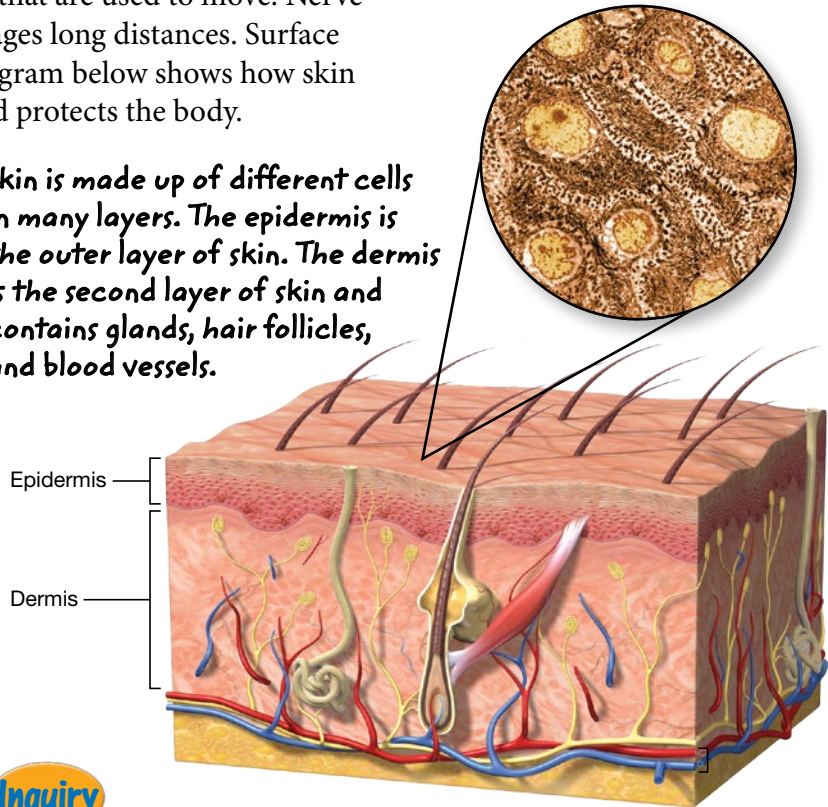


Sperm cells can "swim." They have long tails that whip around to move the cells.



Nerve cells have long, thin branches to send electrical messages between the brain and far-away body parts.

Skin is made up of different cells in many layers. The epidermis is the outer layer of skin. The dermis is the second layer of skin and contains glands, hair follicles, and blood vessels.



Inquiry

7 Infer Muscle cells can get longer and shorter. How does this ability fit in with their job in the body? State your claim. Give examples to support your reasoning.



Watching the pitcher

- The endocrine system releases hormones to prepare the body for action.
- The eyes, part of the nervous system, see the ball coming. They send electrical messages to the brain.

Swinging the bat

- The brain sends electrical messages to the muscles.
- The bones and muscles grip the bat tightly.
- The eyes stay focused on the pitcher.
- The muscles contract to swing the arms.

Running the bases

- The muscles and bones help the legs move quickly.
- The heart of the cardiovascular system pumps quickly to move blood from the lungs to the body.
- The muscles use oxygen from the blood to keep moving.

How do body systems interact?

Our body systems can do a lot, but they can't work alone! Almost everything we need for our bodies to work properly requires many body systems to interact. For example, the nervous system may sense danger. The endocrine system releases hormones that cause the heart to beat faster to deliver more oxygen through the circulatory system to muscles. The muscular system and skeletal system interact to run away from danger.

Active Reading 8 Identify As you read the captions on the left, underline examples of body systems interacting.

Body Systems Share Organs

Many organs are part of several body systems. Reproductive organs are part of the reproductive system and part of the endocrine system. The liver works in the digestive system, but it is also part of the excretory system. The heart is part of the muscular system and the cardiovascular system. Blood vessels, too, are shared. For example, blood vessels transport chemical messages from the endocrine system and cells from the lymphatic and cardiovascular systems.

Body Systems Communicate

There are two basic ways cells communicate: by electrical messages and by chemical messages. Nerve cells transfer information between the body and the spinal cord and brain. Nerves pass electrical messages from one cell to the next along the line. The endocrine system sends chemical messages through the bloodstream to certain cells.

9 Apply When you are finished running the bases, you are sweating and you feel thirsty. What body systems are interacting in this case?

Keeping the Balance

What is homeostasis?

Cells need certain conditions to work properly. They need food and oxygen and to have their wastes taken away. If body conditions were to change too much, cells would not be able to do their jobs. **Homeostasis** (hoh•mee•oh•STAY•sis) is the maintenance of a constant internal environment when outside conditions change. Responding to change allows all systems to work properly.

Responding to Change

If the external environment changes, body systems interact to keep conditions stable within the body. For example, if body cells were to get too cold, they would not work properly and they could die. So, if the brain senses the body temperature is getting too low, it tells the muscles to shiver. Shivering muscles release energy as heat, which warms the body. Your brain will also tell you to put on a sweater!

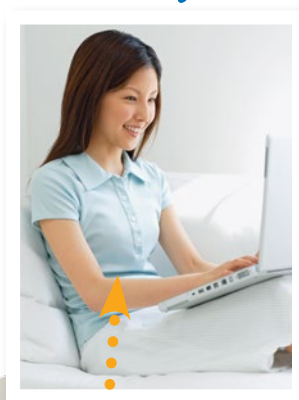
Maintaining a Balance

To maintain homeostasis, the body has to recognize that conditions are changing and then respond in the right way. In order to work, organ systems need to communicate properly. The electrical messages of the nervous system and chemical signals of the endocrine system tell the body what changes to make. If the body cannot respond properly to the internal messages or to an external change, a disease may develop.

Too cold



Just right



Too hot



A thermostat keeps an even temperature in a room by turning the heater off when it gets too warm, and on when it gets too cold. Your body does the same thing, but in a different way.



Visualize It!

10 Relate How does the body react when the outside temperature gets too hot?

What can go wrong with homeostasis?

If one body system does not work properly, other systems of the body can be affected. For example, body cells that do not get enough energy or nutrients cannot work properly. A lack of food harms many systems and may cause disease or even death. The presence of toxins or pathogens also can disrupt homeostasis. Toxins can prevent cells from carrying out life processes and pathogens can break down cells. Problems also occur if the body's messages do not work, or they are not sent when or where they are needed. Many diseases which affect homeostasis are hereditary.

Active Reading

11 Identify As you read this page, underline what can happen if homeostasis is disrupted.

Structure or Function Diseases

Problems with the structure or function of cells, tissues, or organs can affect the body. For example, diabetes is a disease that affects cell function. Certain changes in body cells stop them from taking glucose in from the blood as they normally do. If cells cannot get energy in the form of glucose, they cannot work properly.

Pathogens and Disease

When the body cannot maintain homeostasis, it is easier for pathogens to invade the body. Pathogens can also cause a disruption in homeostasis. For example, tuberculosis is a lung disease caused by bacteria. It weakens the lungs and body. Weakened lungs cannot take in oxygen well. Low oxygen levels affect the whole body.

12 Apply Alcoholism is a disease that disrupts homeostasis. Below are three body systems that are affected by alcohol. The effects on the nervous system are filled in. In the space provided, predict what might happen when the function of the two remaining systems is affected.

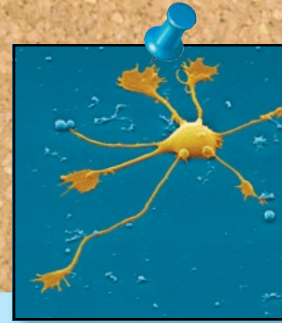
Body systems affected	What are the effects?
Nervous system	Disrupts proper functioning of the brain. The brain cannot respond properly to internal or external messages.
Digestive system	
Reproductive system	

Alcoholism can damage the structure and function of the liver and reduce its ability to remove toxins from the blood.



Visual Summary

To complete this summary, fill in the blanks with the correct word or phrase. Then use the key below to check your answers. You can use this page to review the main concepts of the lesson.



Body systems each have specific jobs.

13 The _____ system brings oxygen into the blood and releases carbon dioxide from the body.



The structure of cells, tissues, and organs are linked to their functions.

14 The long, thin cells of the _____ system help transmit electrical messages around the body.
The muscular heart pushes _____ around the body.

Body Systems and Homeostasis

Body systems interact, which allows the body to work properly.

15 The _____ and _____ systems interact to allow the player to swing the bat.



The body maintains homeostasis by adjusting to change.

16 If body temperature goes up, the _____ senses the change and will work to reduce the body temperature to normal.



Answers: 13 respiratory; 14 nervous, blood; 15 nervous, muscular (either order); 16 brain

17 Claims • Evidence • Reasoning How might disruption of the respiratory system affect homeostasis of the body? State your claim. Summarize evidence to support your claim and explain your reasoning.

Lesson Review

Vocabulary

Use a term from the lesson to complete each sentence below.

- _____ is maintaining stable conditions inside the body.
- A group of organs that interact is called a(n) _____.

Key Concepts

- Compare** How are the functions of the skeletal and muscular systems related?

- Identify** What body system receives information from inside and outside the body and responds to that information?

- Explain** How is skin part of the integumentary system and the excretory system?

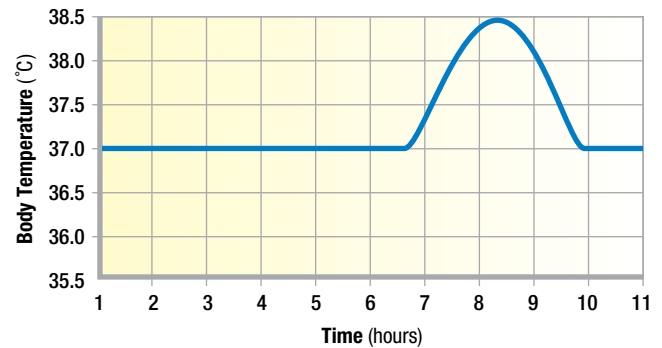
- Describe** What are the basic needs of all cells in the body?

- Relate** Give an example of how a cell's structure relates to its function in the body.

Critical Thinking

Use the graph to answer the following questions.

Body Temperature over Time



- Analyze** Is the body in homeostasis during the entire time shown in the graph? Explain.

- Predict** What would happen to the body if the body temperature continued to decrease during the tenth hour instead of leveling off?

- Apply** Make a claim about how drinking large volumes of plain water after exercising may affect the salt balance in the body. Summarize evidence and explain your reasoning.

- Infer** Reflect on how the failure of a specific body system to function properly would affect other body systems. Build an argument for why all body systems must interact to carry out life processes based on your example. Provide evidence and give details.

My Notes

