Organ Systems and Homeostasis

Key Concepts

- What are the levels of organization in the body?
- What systems are in the human body, and what are their functions?
- What is homeostasis?

The levels of organization in the human body consist of cells, tissues, organs, and organ systems. A cell is the basic unit of structure and function in a living thing. Cells perform the basic processes that keep organisms alive.

A tissue is a group of specialized cells that perform the same function. The human body contains four basic types of tissue: muscle tissue, nerve tissue, connective tissue, and epithelial tissue. Muscle tissue can contract, or shorten. This tissue is what makes parts of your body move. Nervous tissue carries messages back and forth between the brain and every other part of the body. It directs and controls the body. Connective tissue provides support for your body and connects all its parts. Bone, fat, and blood are all connective tissues. Epithelial tissue covers the surfaces of your body. The skin and the lining of the digestive system are examples of epithelial tissue.

An organ is a structure that is composed of different kinds of tissue and does a specific job. Each organ in your body is part of an organ system. An organ system is a group of organs that work together to perform a major function. The human body has 11 organ systems. The integumentary, skeletal, and muscular systems provide structure and allow movement. The circulatory, respiratory, digestive, excretory, immune, and reproductive systems carry out the processes of life. The nervous and endocrine systems provide control over body processes. For each system to function, its organs and tissues must work together. And so must its cells.

The integumentary system is made up of skin, hair, and nails. Your skin creates a barrier that protects your body from injury and disease. It also helps regulate body temperature, remove wastes, and keep cells from drying out.

Your skeletal system includes your bones and other connective tissue. The skeleton supports the body and gives it structure. It also protects your body’s organs, produces blood cells, and stores calcium and other minerals.

Most muscles in your body are attached to bones. These muscles work by pulling on bones. Muscle cells that move your bones form bundles of fibers that work together. Fiber bundles work in muscle groups, such as the biceps.

The circulatory system transports food and oxygen to body cells and collects wastes. The heart pumps blood through the body by way of tubelike vessels called arteries, veins, and capillaries. Blood is a mix of fluid and cells.

The lungs are the main organs of your respiratory system. Air moves into and out of your lungs when you breathe. Your air passages end in tiny clusters of tissues where oxygen and carbon dioxide are exchanged between the air and the blood.
Digestion is the breakdown of food into small molecules the body can use. Food enters the digestive system through the mouth and moves through the stomach and small intestine. Enzymes from these organs and from the liver and pancreas help digest the food. In the small intestine, specialized cells absorb the nutrients into the bloodstream. Leftover material moves to the large intestine where water is removed. The solid waste passes out of the body.

The excretory system removes wastes from the blood that have been produced by cell activities. The kidneys are the major organs of the excretory system. Each kidney contains millions of nephrons that filter wastes from the blood. These wastes are mixed with water to make urine. The urinary bladder stores urine until it passes out of the body through the urethra.

Your immune system protects you from infection caused by pathogens—disease-causing bacteria and viruses. Specialized cells target and destroy pathogens. Other cells make antibodies, which are proteins that help destroy pathogens. Your immune system can produce more antibodies very quickly if you are exposed to the same pathogens again. This ability to fight off pathogens before they can cause disease is called immunity.

The reproductive system produces sex cells. When the DNA from a male sex cell and a female sex cell combine, a new individual can form. The organs of the reproductive system also produce chemicals that regulate the physical development of the maturing body.

The nervous system takes in information from your environment and your body and allows you to respond in some way. Your brain, spinal cord, and specialized nerve cells make up the nervous system. Nerve cells transmit information between the parts of your body and the spinal cord and brain.

The endocrine system consists of specialized glands scattered throughout the body. These glands produce hormones that are released into the blood. Hormones help regulate the activities of organs and organ systems. Hormone levels can go up or down, depending on signals from other glands or from your brain.

All the systems of the body work together to maintain homeostasis, the body’s tendency to keep an internal balance. Homeostasis is the process by which an organism’s internal environment is kept stable in spite of changes in the external environment. Sometimes, things can happen to throw off homeostasis. As a result, your heart may beat more rapidly or your breathing may quicken. These are signs of stress, the reaction of your body to potentially threatening, challenging, or disturbing events. When the stress is over, homeostasis is restored, and the body returns to its normal state.
Organ Systems and Homeostasis (pp. 508–517)

This section tells how the body is organized and describes the systems in the human body and their functions.

Use Target Reading Skills

As you read, take notes on the main ideas and important details. Consider the Key Concepts and Key Terms. Use the graphic organizer below to take notes.

<table>
<thead>
<tr>
<th>Recall Clues and Questions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the levels of organization in the body?</td>
<td></td>
</tr>
</tbody>
</table>
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Introduction (p. 508)

1. List the levels of organization in the human body, starting with the smallest unit.
   a. ____________________  b. ____________________
   c. ____________________  d. ____________________

Cells (p. 509)

2. The basic unit of structure and function in a living thing is a(n) ____________________.

3. Circle the letter of the outside boundary of an animal cell.
   a. cytoplasm
   b. nucleus
   c. tissue
   d. cell membrane

4. The control center that directs the cell’s activities and contains information that determines the cell’s form and function is the ____________________.

5. What is the cytoplasm?

   ____________________

   ____________________

   ____________________

   ____________________

6. Is the following sentence true or false? Cells carry on the processes that keep organisms alive. ____________________

Tissues (p. 510)

7. What is a tissue?

   ____________________

   ____________________

   ____________________

   ____________________
8. Complete the table to show the functions and examples of the tissues in the human body.

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Function</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nervous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epithelial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Organs and Organ Systems** (pp. 510–515)

9. A structure that is made up of different kinds of tissues and does specific jobs is a(n) _____________________.

10. Circle the letter of the unit of organization that represents an organ.
    a. muscle cell
    b. blood
    c. heart
    d. digestive system
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11. Is the following sentence true or false? An organ has a specific job that is more complex than that of a tissue. ____________________

12. What is an organ system?

Match the organ system with its function.

<table>
<thead>
<tr>
<th>Organ Systems</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. endocrine</td>
<td>a. Takes oxygen into the body</td>
</tr>
<tr>
<td>14. circulatory</td>
<td>b. Supports and protects the body</td>
</tr>
<tr>
<td>15. excretory</td>
<td>c. Removes wastes</td>
</tr>
<tr>
<td>16. respiratory</td>
<td>d. Controls body process by means of chemicals</td>
</tr>
<tr>
<td>17. digestive</td>
<td>e. Takes food into the body and breaks it down</td>
</tr>
<tr>
<td>18. skeletal</td>
<td>f. Transports materials to and from body cells</td>
</tr>
<tr>
<td>19. muscular</td>
<td>g. Takes in information from the environment and from within the body and commands the body to respond</td>
</tr>
<tr>
<td>20. integumentary</td>
<td>h. Protects the body from disease-causing bacteria and viruses</td>
</tr>
<tr>
<td>21. immune</td>
<td>i. Protects the body from injury and disease and helps regulate body temperature</td>
</tr>
<tr>
<td>22. reproductive</td>
<td>j. Contains organs that produce sex cells</td>
</tr>
<tr>
<td>23. nervous</td>
<td>k. Works to move the body by pulling on the skeleton</td>
</tr>
</tbody>
</table>

Homeostasis (pp. 516–517)

24. The process by which an organism’s internal environment is kept stable in spite of changes in the external environment is called ____________________

25. How does your body maintain a constant temperature on a hot day?

26. What is stress?
Understanding Main Ideas

The illustration below shows the units of organization in a reptile. The units are numbered 1–4. Label the numbered units of organization in the spaces provided.

1. 
2. 
3. 
4. 

Building Vocabulary

Fill in the blank to complete each statement.

5. _____________ is the body’s tendency to keep an internal balance.

6. _____________ tissue makes up organs that are able to contract, or shorten. _____________ tissue makes up the organs that send messages to control the body.

7. The inside of the digestive system is lined with _____________ tissue.

8. The kidney is a(n) ___________. The excretory system is a(n) ___________.

9. The major organs of the excretory system are the ___________.

10. _____________ tissue provides support for your body and connects all its parts.

11. Disease-causing bacteria or viruses are known as ___________.

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When a doctor performs a transplant operation, he or she replaces a diseased or damaged organ or tissue. Sometimes a tissue is moved from one place to another on the same person. This procedure is called an autograft. (Auto- means “self,” and -graft means “transplant.”) A burn victim may have an autograft in which a section of his or her healthy skin is transplanted to cover the bum.

Sometimes a person receives an organ or tissue from another person. This is called an allograft. (Allo- means “different.”) An example of an allograft is the transplantation of a kidney from the body of one person into that of another person. One problem with allografts is rejection. Rejection occurs when the patient's body recognizes the transplanted organ or tissues as foreign, similar to the way in which a mother cat recognizes a kitten from another litter as not belonging to her. Rejection is a serious problem because the body begins to attack the transplanted organ or tissue. One way of preventing rejection is by giving the patient certain drugs.

Transplants are performed to save a patient's life or to correct a serious medical condition. For example, a person with severe liver disease might need a new liver in order to survive. Transplanting a part of the eye called the cornea can help some blind people to see. The illustration shows some of the many organs and tissues that doctors can transplant.

Answer the following questions on a separate sheet of paper.

1. Autografts are never rejected. Why do you think this is true?
2. Why do you think doctors try to use autografts rather than allografts on burn patients?
3. A patient's body is less likely to reject an allograft if it comes from a close relative. Why do you think this is true?
4. Do you think doctors would have more difficulty transplanting an organ system than transplanting an organ? Think of an example to explain your answer.