

BONES, MUSCLES AND SKIN

Human Body Is Organized into Systems

The human body works very smoothly carrying out its daily functions because it is organized. The human body has different levels of organization that consist of **cells** (the smallest), **tissues**, **organs**, and **organ systems** (the largest).

The cell is the basic building block of all living organisms. The adult human body contains trillions of cells. Tissues are the second level of organization.

Four Types of Tissue

Tissues are made of similar cells that serve a specific function. The human body is made up of four different types of tissue. They are **connective tissue**, **nerve tissue**, **muscle tissue**, and **epithelial tissue**.

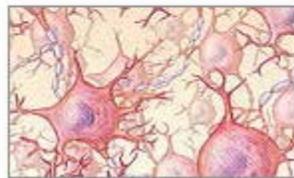
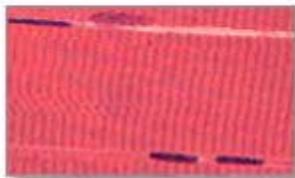


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Connective tissue

Epithelial tissue



Muscle tissue

Nervous tissue

Connective tissue: This type of tissue connects the different parts of the body together. Bone is an example of this tissue type. It supports the body and protects the internal structures.

Nerve tissue: This type of tissue brings information from all parts of the body to the brain. The brain then sends a message back out to the body.

Muscle tissue: This type of tissue controls all of the movement of the body. Muscle tissue contracts, stretches, and shortens, which allows the body to move.

Epithelial tissue: This tissue covers all of the surfaces of the body, both inside and outside.

Organs

As we learned in Topic 14, an organ is a group of tissues that come together to perform a specific job that is more complex than each individual tissue's specific job. An organ system is many organs that work together.

What is homeostasis?

The body's tendency to maintain a balance internally is called **homeostasis**. Despite what is happening in the environment outside the body, the internal environment is kept stable in the process of homeostasis. The body is constantly making internal changes to stabilize life.

If you were to perform a task that required a lot of energy, your heart rate would increase.

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What is stress?

Stress is a bodily response to dangerous, challenging, or upsetting situations. Within seconds of a stressful situation, your body releases a chemical into the bloodstream called adrenaline.

Adrenaline is a chemical that gives the body a sudden burst of energy and causes many other changes within the body. All of these changes combine to allow for quick action to the situation. The changes that are caused by adrenaline are called the "fight-or-flight" response. The name is given because your body will make the decision to either fight the stressor or take flight or run from the stressor.

Let's review several of your body's organ systems.

The Skeletal System

There are five major functions of the skeletal system:

- to enable you to move around your environment,
- to protect internal organs,
- to support and provide shape,
- to store materials, and
- to produce blood cells.



Your skeletal system is made up of the bones and cartilage (the soft tissue between the bones). The spine (the central column) is made of the vertebrae (the small bones of the spine). The skull is made of the cranial bones (the bones of the head) and the facial bones (the bones of the face). The ribs are made of the ribs and the costal cartilage (the soft tissue between the ribs). The bones are made of calcium and phosphorus.



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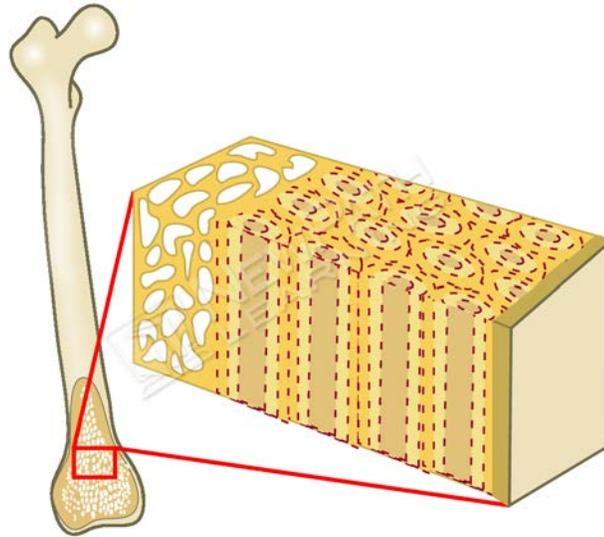
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Many people think that bones are dead cells, but they are very much alive. The bone cells produce bone tissue as you grow and when a person is done growing the bone cells continue to make new cells.

The structure of bone

The structure of a bone consists of an outer layer of hard connective tissue. Inside the outer layer is the compact bone, then the spongy bone. The spongy bone gives the bone its lightness and keeps the bone strong. The spaces within the bone are filled with **marrow**, a soft connective tissue within bones. The two types of marrow are yellow and red. The yellow marrow stores fat and other materials to use for energy when necessary. The red marrow produces blood cells for the body.



As we learned in Topic 17, cartilage is a connective tissue that is flexible and strong, but softer than bone. A newborn skeleton is made mostly of cartilage. Not all of the cartilage covers the ends of many bones from being damaged.



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Bones and Joints

Every place where two bones meet is called a **joint**. There are **movable joints** and **immovable joints** in your body which help the bones move in different ways.

Movable joints are the most numerous in the human body allowing for a wide range of movements.

The types of movable joints

The body has four kinds of movable joints -- **ball and socket**, **hinge**, **pivot**, and **gliding joints**. Connective tissues called **ligaments** hold together the bones in movable joints.

Immovable joints

Immovable joints are joints between bones that do not allow movement. Examples of immovable joints are the joints between the bones of the skull, which protect a part of the body that doesn't have movable parts.

Healthy bones

When a person becomes older, s/he begins to lose the minerals that are within the bones, a process known as **osteoporosis**. To keep your bones healthy and prevent osteoporosis, exercise regularly and eat a balanced diet.

The Muscular System

Have you ever waved good-bye to someone? Was the movement hard to control? The movement of waving good-bye is one that we have all completed numerous times. It is an easy movement to complete. Can you control how many times your heart beats per minute? This is an easy movement, but it is one that we cannot control.

Muscles that you are able to control are called **voluntary muscles**. Muscles that you are not able to control are called **involuntary muscles**.

Types of muscles

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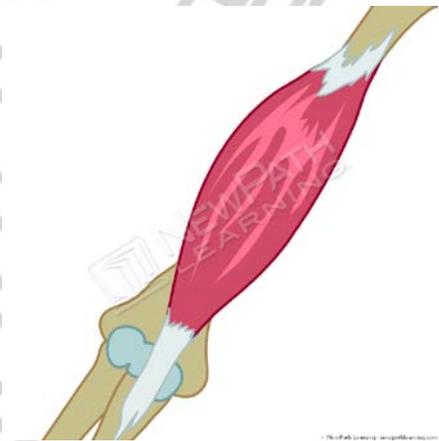


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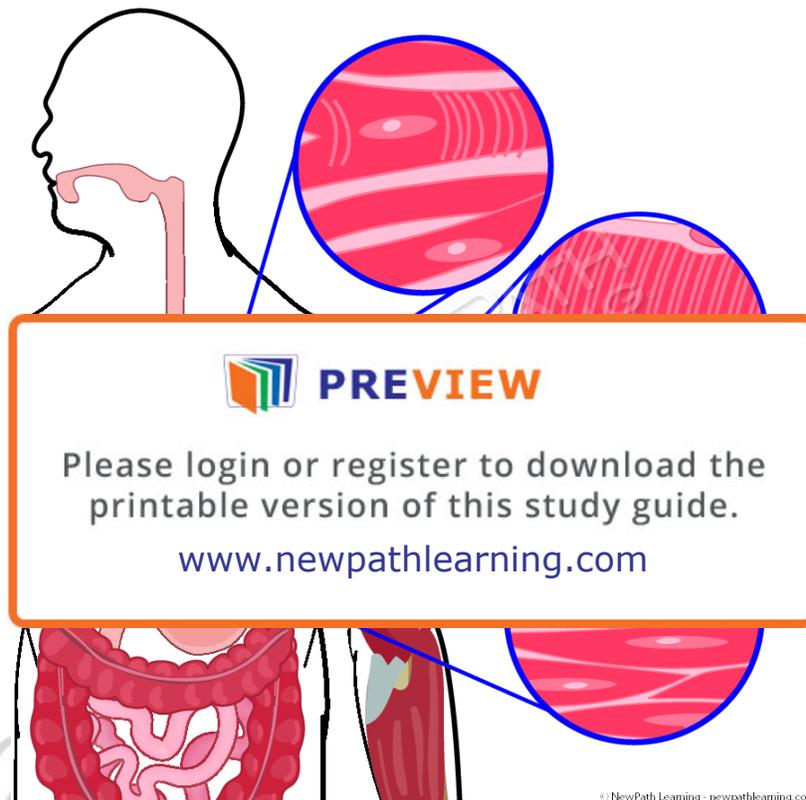
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Skeletal muscles appear to banded, which is another word for striated. Skeletal muscle is sometimes called striated muscle because of the appearance of the cells.

Smooth muscle: These involuntary muscles are on the insides of internal organs. These muscles work automatically to control many functions of the body. Smooth muscles are not striated like skeletal muscles.

Cardiac muscle: This type of muscle has characteristics in common with both skeletal and smooth muscles. Cardiac muscles are striated like skeletal muscles and are involuntary like smooth muscles. The heart muscle beats for the entire life of an organism.



If you have ever flexed your bicep muscle, then you have noticed that the muscle will bulge or contract.

A skeletal muscle will contract when it receives information from the brain. Muscles will contract, but they will not extend. This means that for every muscle there is a muscle that does the opposite. Muscles work in pairs so that when one muscle contracts, the other in the pair will go back to its original length.

The Skin

The skin completes many important functions for the body and is the largest organ of the body.

The skin provides these functions to your body:

- covers the body,
- prevents water loss,
- gathers information from the environment,
- eliminates waste,
- protects the body from injury and infection,
- produces vitamin d, and
- regulates the body's temperature.

There are two main layers of the skin. They are the **dermis** and the **epidermis**.

Dermis: The layer of fat, which contains sweat glands. Swallowing in response to a change in temperature.

Hair is grown from the skin to keep the skin moist.



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Epidermis: The outermost layer of skin that is thinner than the dermis and does not contain blood vessels or nerve cells.

The epidermis cells have this life cycle:

- They divide from other epidermis cells and mature for about two weeks.
- They will then die and become part of the surface layer of the skin.
- They will remain here for about two weeks until they are shed.

Keeping your skin healthy

The skin is a very important organ, so keeping it as healthy is very important. This can be done by:

- Keeping the skin clean and dry – **acne** is a bacterial infection of the skin that is very difficult to control.
- Wearing protection in the sun – without consistent protection from the sun's rays, it is possible to develop skin cancer. Cancer is a disease that causes cells to divide uncontrollably.
- Drinking plenty of water – replacing the liquid in your body while completing a demanding activity is important for sweating.
- Eating properly – a healthy diet is important for keeping the cells supplied without energy.



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