



What Is This Module About?

Every day, you use your body to do a lot of things. Because of your body, you can think, move, play and generally go about your daily activities. But have you ever wondered how your body works? Without your being aware of it, there are a lot of things happening inside your body that make life possible. You are alive because of the many wonderful systems of organs that work together perfectly through very complex processes. These organ systems keep in touch with one another, exchanging information and working together to keep you alive and enable you to do a lot of activities. Your body is a fine example of how cooperation works!

In this module, you will learn what structures make up the human body and how these structures are arranged into systems that constantly interact with one another. You will also find out some of the injuries and diseases that can affect the organ systems of the body.

This module is divided into five lessons. These are:

Lesson 1 – *The General Structure of the Human Body*

Lesson 2 – *The Nervous, Skeletal, Respiratory and Muscular Systems*

Lesson 3 – *The Digestive, Reproductive and Urinary Systems*

Lesson 4 – *The Sensory, Circulatory, Endocrine, Lymphatic and Integumentary Systems*

Lesson 5 – *The Human Machine*



What Will You Learn From This Module?

After studying this module, you should be able to:

1. describe the general structure of the human body;
2. describe the parts of the organ systems of the body;
3. identify the functions associated with each organ system; and
4. explain how these organ systems interact with one another.



Let's See What You Already Know

Before you start studying this module, take the following test first to find out how much you already know about the topics to be discussed. Write your answers on the lines.

A. Enumerate the twelve organ systems of the human body.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____

B. State the general functions associated with each of the 12 organ systems.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____

C. What will happen to the body if one organ system malfunctions?

Well, how was it? Do you think you fared well? Compare your answers with those in the *Answer Key* on pages 38 and 39 to find out.

If all your answers are correct, very good! This shows that you already know much about the topics in this module. You may still study the module to review what you already know. Who knows, you might learn a few more new things as well.

If you got a low score, don't feel bad. This means that this module is for you. It will help you to understand some important concepts that you can apply in your daily life. If you study this module carefully, you will learn the answers to all the items in the test and a lot more! Are you ready?

You may go now to the next page to begin Lesson 1.

The General Structure of the Human Body

In this lesson, you will find out about the different organ systems of the human body. You will know about these systems and their specific functions as well as how they work together to help keep you alive and functioning well. Are you ready to know more about your body? Use your muscles to open the pages of this module. Let your brain think and learn. And after reading this lesson, you will also understand that although the other organ systems of your body may not be actively participating in what you are doing right now, they are working very hard in their own way to help keep you alive.



Let's Try This

Can you name the parts of your body? Get a pen and a piece of paper. List at least ten parts of your body. After completing your list, study your answers. What do you notice about them?

You probably named those parts of your body that you can readily see such as your head, eyes, arms and legs. You are correct. They are indeed parts of your body. But there are more parts inside your body that you cannot see. These are organs that perform their own specific tasks to help keep you alive and functioning well.

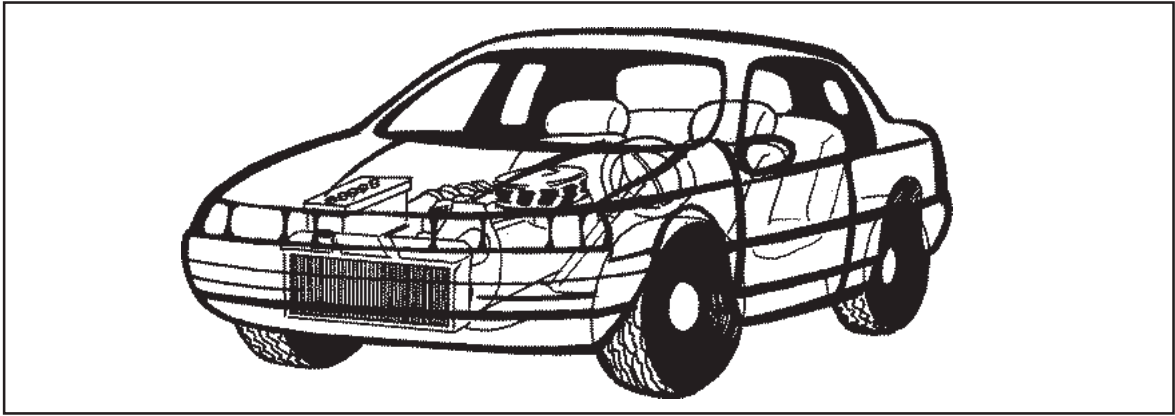
Are you ready to know more about these organ systems? You will find out as you proceed to the lesson below.



Let's Learn

The human body is like a well-organized machine capable of performing different tasks. The ability of the body to do all the things it can do is due to the special structures both inside and outside that work together in an orderly manner.

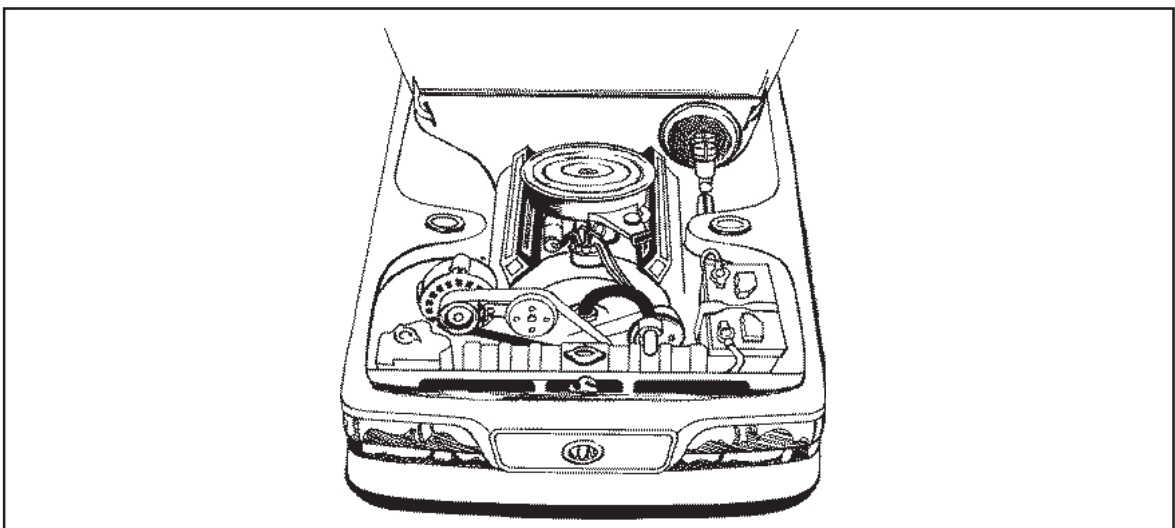
Your body is like a perfectly functioning car. It is composed of several parts that are needed to make it complete. A car would not run without its engine. But the engine alone is not enough. There must be a system of cables that control how the car works. The car must also have a steering wheel to make it go where it is supposed to go. A car must also have seats, windshields, metal frames and wheels. Indeed, a car is composed of several thousands of pieces that are perfectly structured and organized to make sure that it works!



A car works because of its many parts that function together.

You will also notice that these thousands of parts can be divided into groups according to similarities in functions. For example, hundreds of small parts that make up the car engine work together to produce power to make the car move. There is a system of cables that you might not notice but is present inside the car that makes sure all the parts work together very well. Can you think of other groups of the parts of a car? There are a lot of them. These groups are called systems because they work together to perform a specific but similar function to make the car run.

For example, the engine of the car functions to provide power to the car and make it move. Therefore, a car engine is a system of the car concerned with energy production. The steering wheel is also a part of another system in a car. This is the system that gives direction to the car's motion. Therefore, the steering wheel and other parts of the car that perform similar functions belong to the steering system of the car.

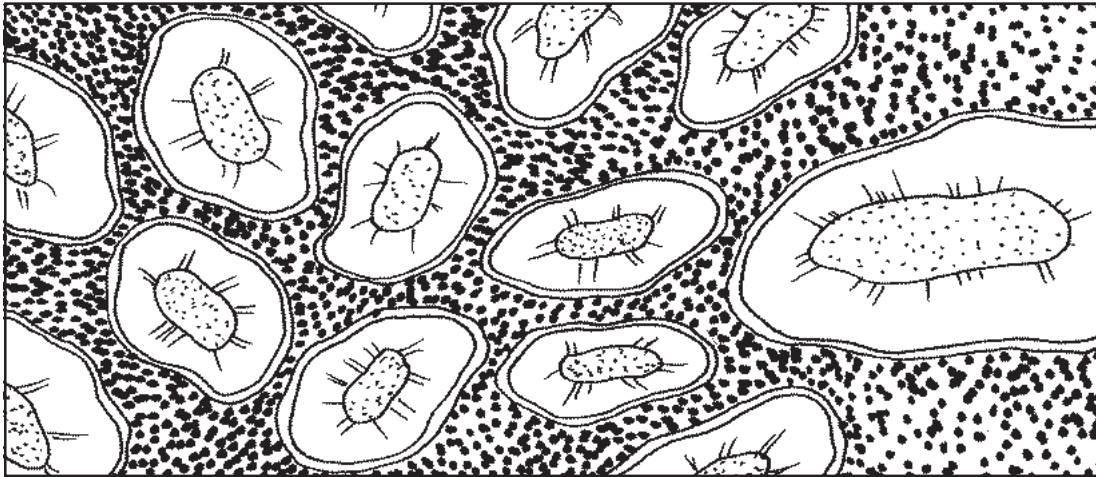


The parts of a car are grouped into systems.

There are systems in the human body too. Instead of metallic parts, the systems of the body are made up of **groups of similar tissues**. These groups of tissues are called **organs**. Organs of the body that perform similar functions are called **organ systems**.

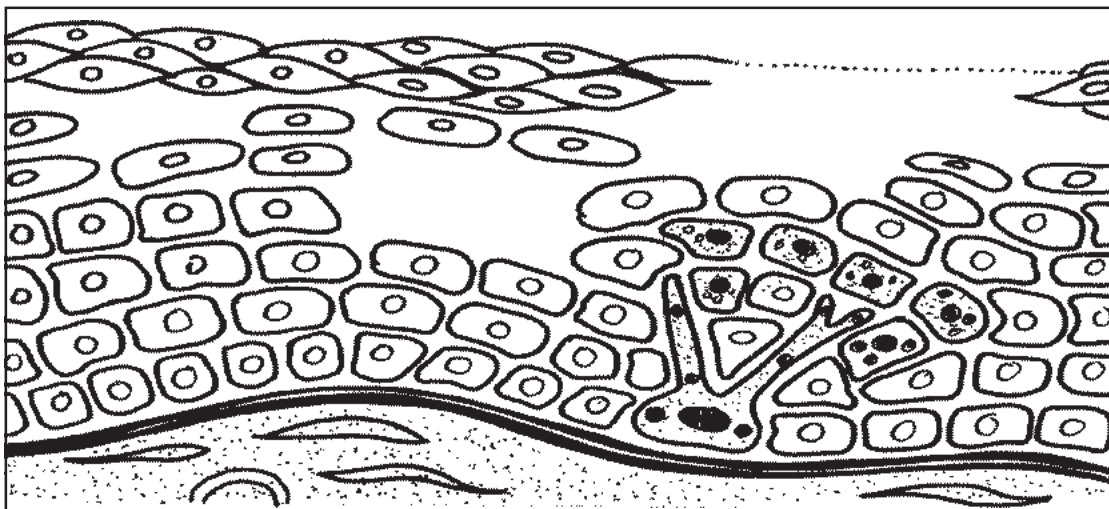
The parts of the body are organized in such a manner that small parts are grouped together to form bigger parts.

The smallest unit of life is the **cell**. Cells are microscopic structures. This means that they cannot be seen by the naked eye. You need to use an instrument called a **microscope** in order to see cells. A microscope magnifies the appearance of cells so you can see them clearly. Below is an example of what a group of cells look like under the microscope.



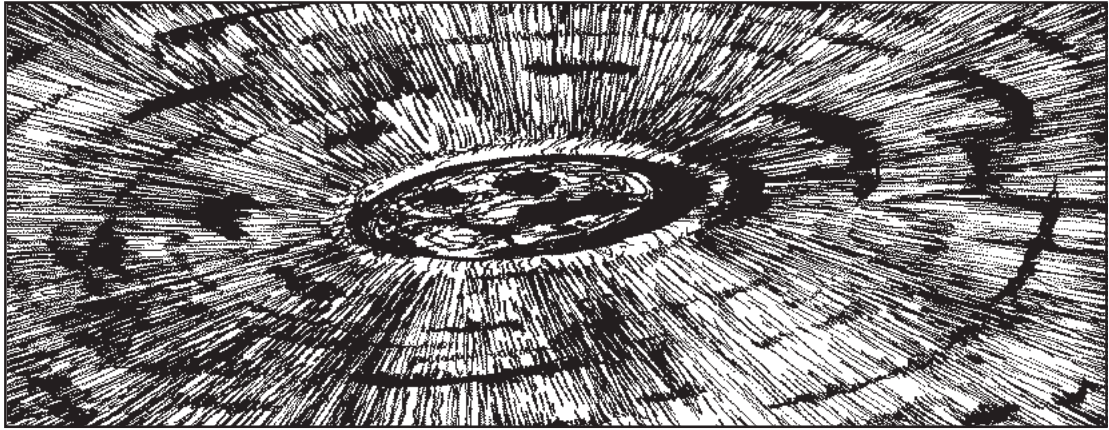
Cells as seen from a microscope

Groups of similar cells that perform a specific function are called **tissues**.



Tissues in the skin

Tissues that make up the human body are not alike. Only tissues that have similar functions, such as the bone tissue on the next page, look alike.



A bone tissue

Tissues that perform specific functions join together to form an **organ**. For example, your heart is composed of blood tissue, muscle tissue, nerve tissue, and connective tissue. Your stomach, on the other hand, is made up of muscle and nervous tissues.



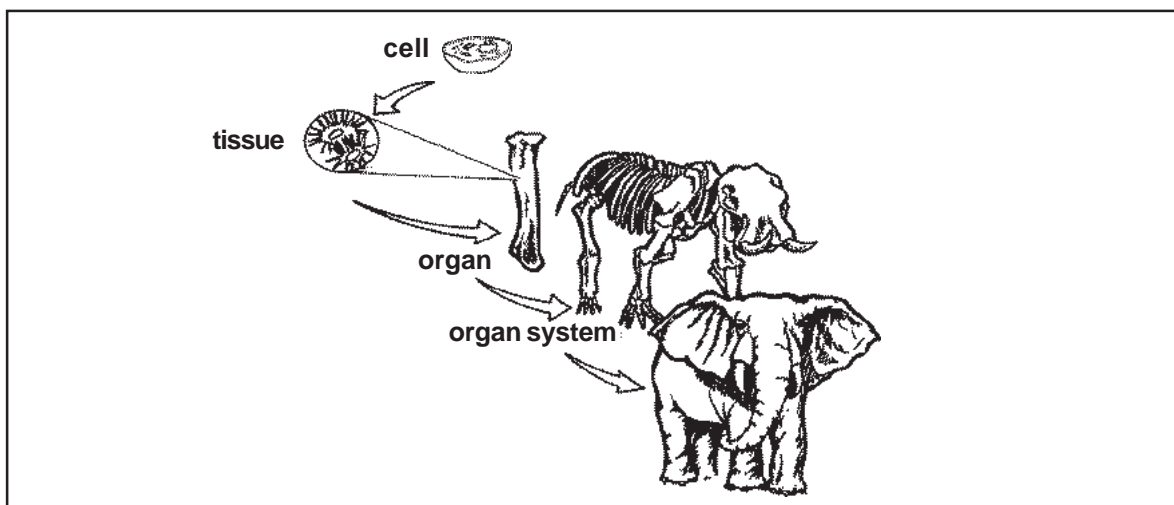
Let's Try This

Can you think of other organs inside your body? On a separate sheet of paper, write down 10 organs of the body that you can identify. You may check your answers against the organs that are to be identified in the lessons that will follow.



Let's Learn

Organs that work together to perform a specific function form an **organ system**. Organ systems work together to give life to an individual. This individual is called an **organism**.



The hierarchy of organization in an organism



Let's See What You Have Learned

Check if you have learned the general organization of the structures of the human body. Arrange the following structures from the smallest to the biggest unit by numbering them from 1 to 5.

organism

cell

organ system

organ

tissue

Compare your answers with those in the *Answer Key* on page 39. If you got a perfect score, that's very good! You have understood the basic organization of the human body.

If you were not able to get everything right, that's okay. Review the parts you missed then proceed to the next lesson.



Let's Remember

- ◆ An **organ** is a group of tissues.
- ◆ An **organ system** is a group of tissues that perform similar functions.
- ◆ The smallest unit of life is the **cell**.
- ◆ A **microscope** is an instrument used to see cells.

The Nervous, Skeletal, Respiratory and Muscular Systems

You have learned from the previous lesson that the human body is composed of cells, which make up tissues, which in turn form organs that are organized into organ systems. Organ systems make up an organism. You are an organism. All living things are organisms. Plants and animals are composed of organ systems that work together to give them life.

The human body is composed of twelve organ systems. Each organ system is composed of structures that perform a specific task. In this lesson, you shall learn more about the skeletal system, the respiratory system, the muscular system and the nervous system. You will discover the parts of each organ system, their structure and how they function. Are you ready to learn about the first four organ systems of the human body? Read on.



Let's Think About This

What do you think are the functions that are absolutely necessary for life? To answer this question, think of ways by which you can tell if an organism is dead. What are the functions that it cannot perform?

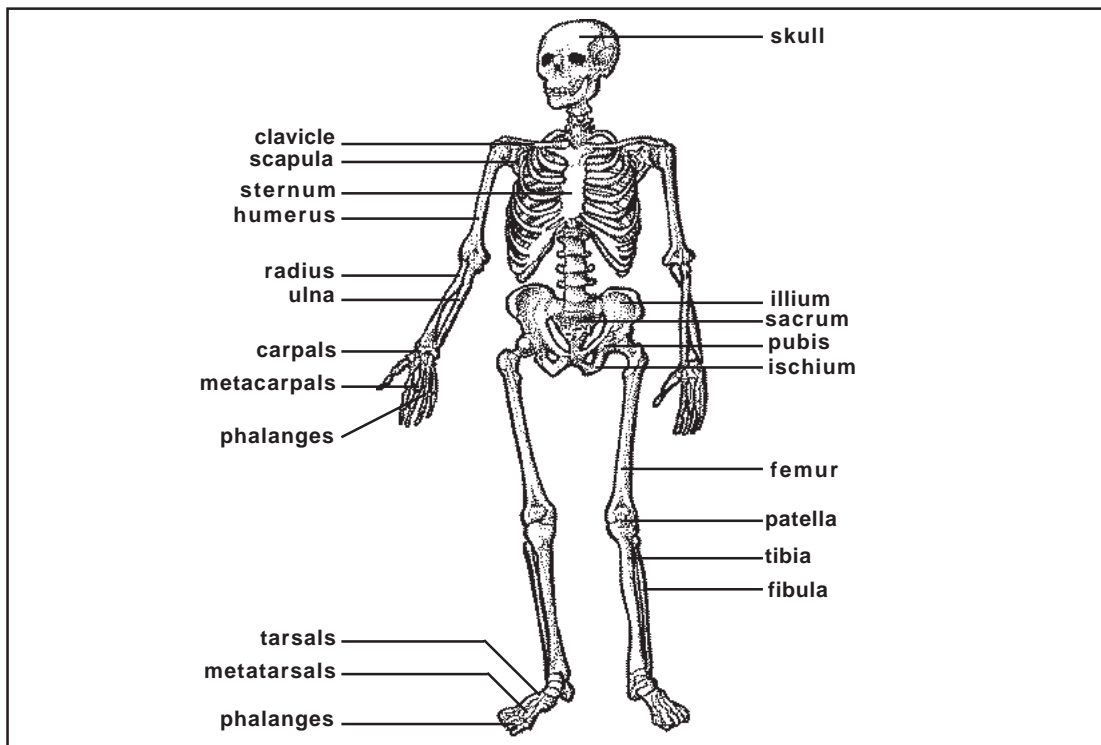
An organism is considered dead if it fails to breathe, its heart stops and it doesn't move. In medical terms, a person is dead if he/she is brain-dead. This means that the brain does not show any activity anymore. The first four organ systems to be discussed are absolutely necessary for life. Without these systems, life would not be possible.



Let's Learn

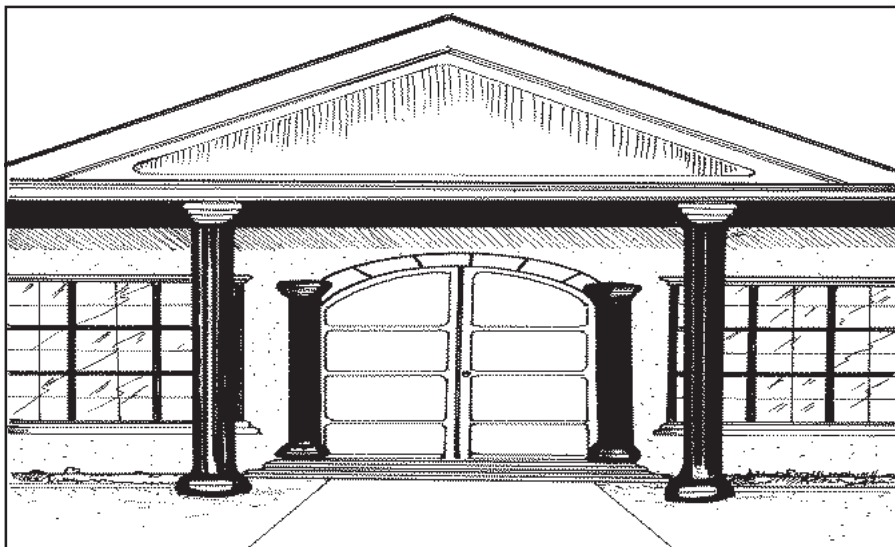
The Skeletal System

The skeletal system is made up of bones. This system functions as a framework for your body and gives it support and shape. Without the skeletal system, you would not be able to stand and walk. Study the illustration of the skeletal system below.



The skeletal system

To understand how important the bones of the skeletal system are to the human body, think of them as the posts that keep a house standing. Without these posts that support the weight of the house, what would happen to the house?



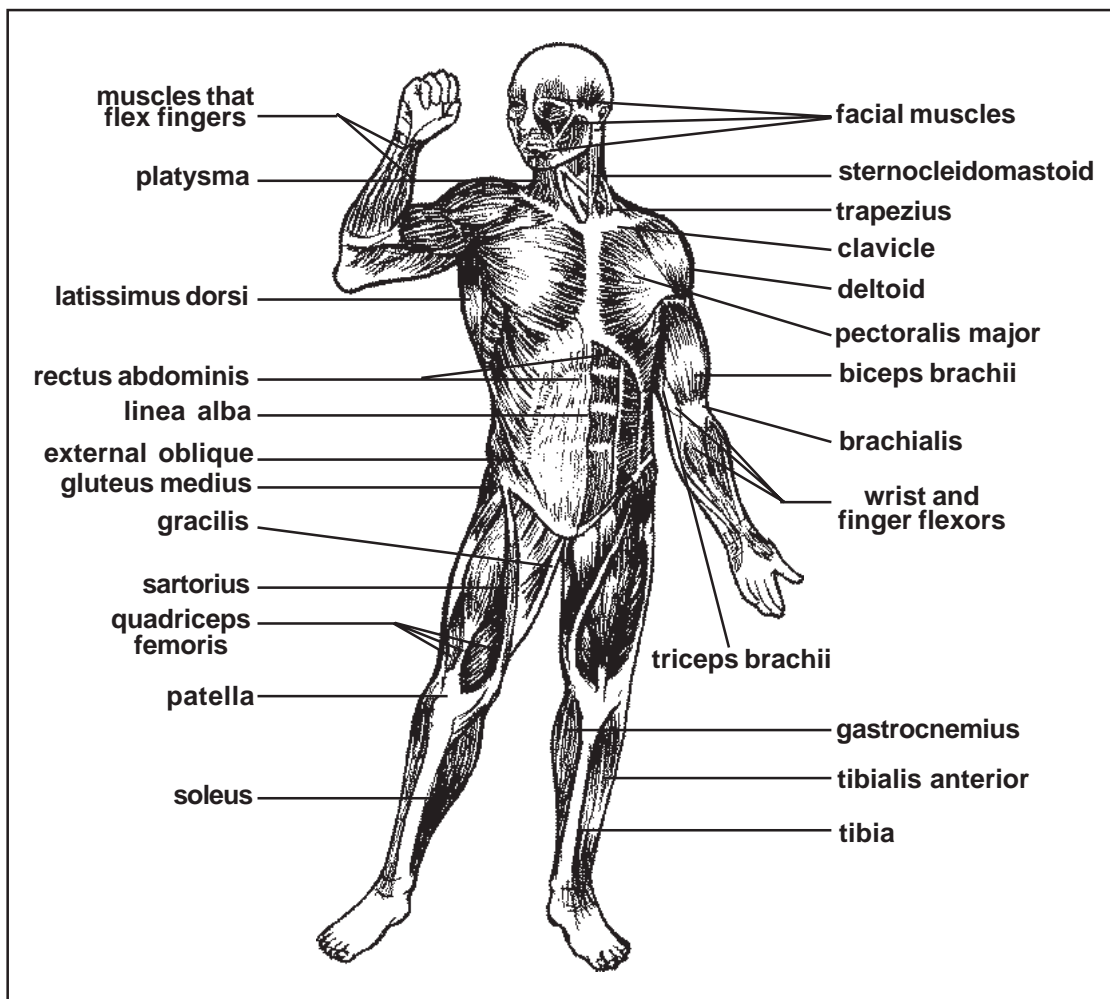
The skeletal system also has other important functions. Aside from protecting the other organs inside your body, bones also serve as attachments of muscles to make the body move. Without the skeletal system, you would not be able to jump, run and stand. Bones also store calcium in the body and help in the production of blood. Isn't the skeletal system wonderful?

The Muscular System

Movement is very important for your daily activities. Without movement, you would not be able to perform the actions you do every day. Movement is also very important for your internal organs to be able to function.

The muscular system is made up of muscles that allow movement to be performed. Aside from the skeletal muscles which mediate bodily movements, there are smooth muscles which allow internal organs to perform their individual functions.

Study the muscles that make up the skeletal muscles below.



The skeletal muscles



Let's Think About This

What would happen if you woke up and realized that you could not move? What things could you do or not do? How would this change affect your life? The muscular system makes your limbs, as well as your internal organs such as your heart, and intestines, move. What would life be without the muscular system?

Write your reflection on these questions on a separate sheet of paper.

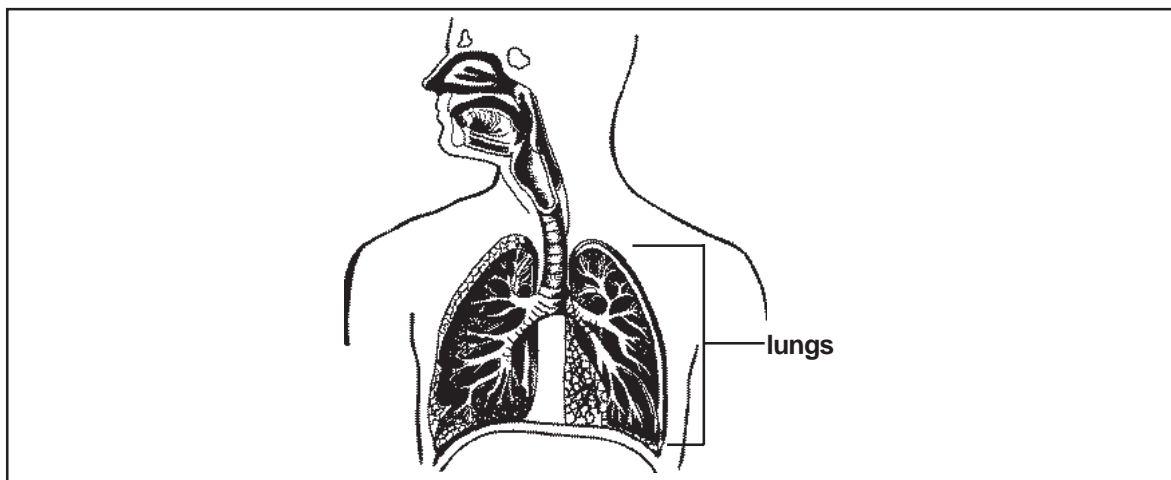


Let's Learn

The Respiratory System

All human beings need to breathe. Breathing allows air to enter and leave the body. Air contains oxygen that the body needs to utilize the energy from food. Without oxygen, human life would not be possible.

The respiratory system is made up of the lungs and the airways which facilitate the exchange of gases with the environment and within the body. The lungs take in the much-needed oxygen and give off carbon dioxide through the process of breathing or respiration.



The respiratory system



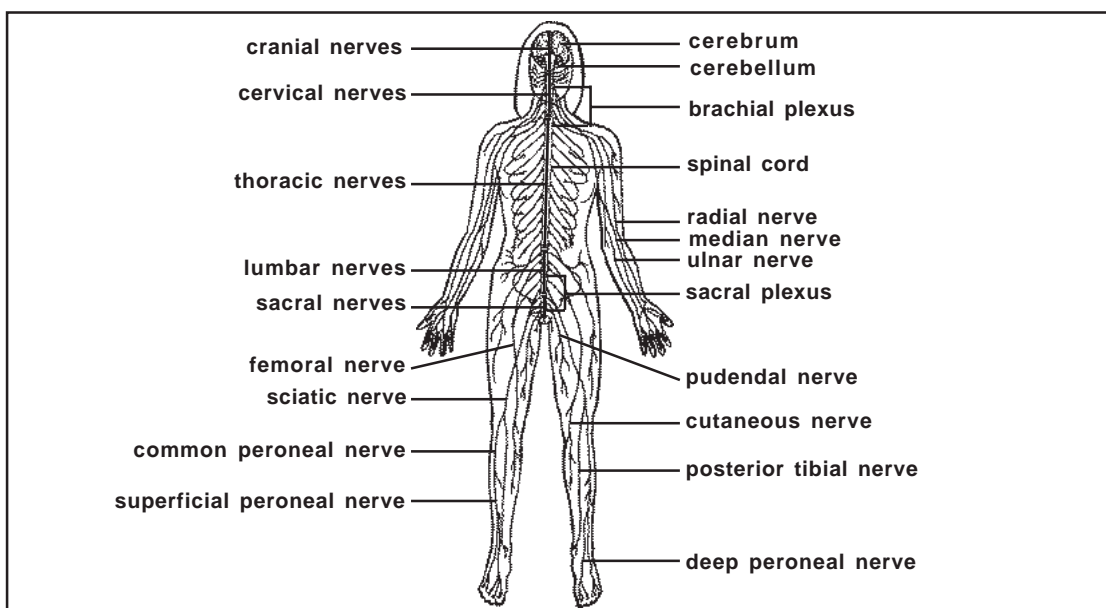
Let's Try This

To appreciate the importance of oxygen to your body, try this activity. Pinch your nose without opening your mouth. Note the time it takes for your body to automatically sense that you need to breathe again. Generally, human beings can delay breathing for only about 2 minutes. The body then automatically sends signals to enable you to make actions that would start the process of breathing again.

The Nervous System

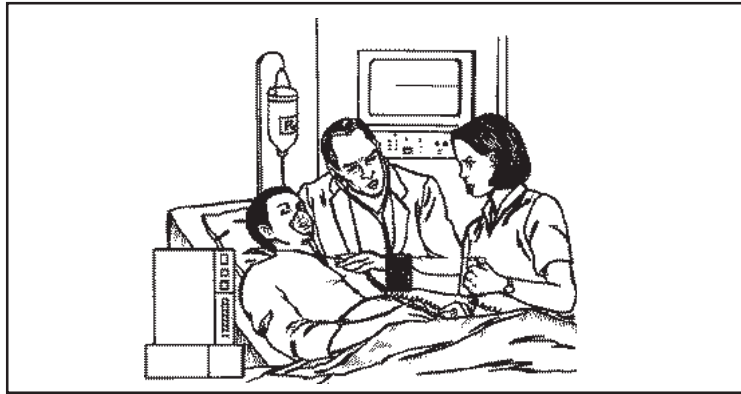
In the previous activity, you were not able to hold your breath for a very long time because your brain automatically sent signals to your body to breathe. Communication and control inside your body is important. This function is performed by your nervous system.

The **nervous system** is composed of the brain, spinal cord and peripheral nerves. This system functions as the master control system of the body. It receives and sends signals, which are like pulses of electricity that travel through wires, to make various parts of the body respond to the stimuli from within and outside the body.



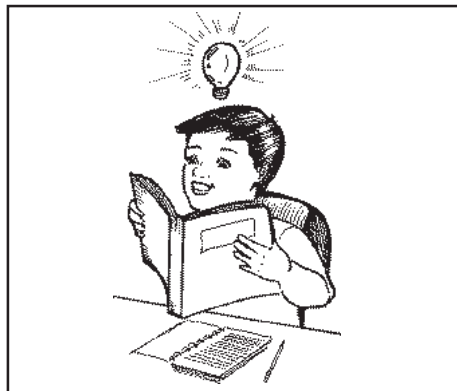
The nervous system

The nervous system is composed of nerves. **Nerves** are special structures that work together to bring electrical impulses or signals to make your body feel and respond to sensations. These signals are also needed to make you move. You can think of the nervous system as a network of electrical wires within your body that allows signals to be processed and transmitted. When you tried to stop breathing for a long time, the nervous system bypassed or took over your will and did what it is supposed to do to keep you alive. In fact, the activity of the nervous system is very important for life, hence a person is considered dead if he/she is brain-dead. This means that the nervous system that sends signals throughout the body has already stopped functioning.



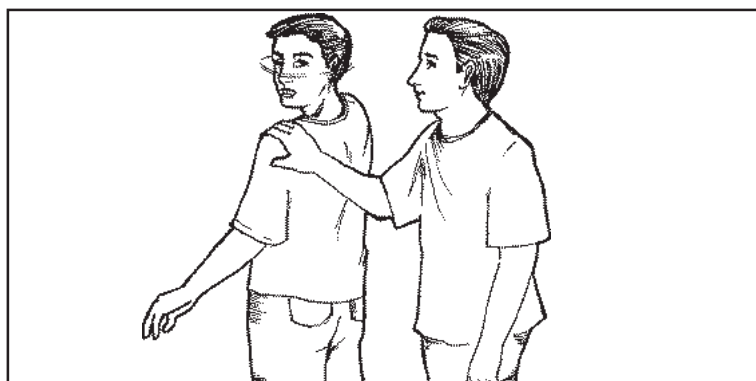
A brain-dead person is considered dead.

Your nervous system is also very important because it makes you remember, think and decide. Without your nervous system, you would not be able to learn anything from this lesson!



Let's Try This

To understand how the nervous system functions, try doing this activity. Tap a friend on the shoulder without him/her seeing you. What will your friend do? Observe his/her reaction.



Your friend probably turned to see who tapped him/her. Without your friend's nervous system, he/she would not have felt your touch. It is also the nervous system that sent signals to the muscles of his/her neck to turn around. And all of this happened so fast! Isn't the nervous system wonderful?



Let's See What You Have Learned

Write **True** before each correct statement and **False** before each incorrect statement.

- _____ 1. The human body has ten organ systems.
- _____ 2. Each organ system has a specific set of functions.
- _____ 3. The nervous system primarily pumps blood throughout the body.
- _____ 4. The skeletal system provides framework and shape to the body.
- _____ 5. The muscular system makes movement possible.
- _____ 6. The skeletal system is made up of bones.
- _____ 7. Life as we know it would be possible without the organ systems functioning well.
- _____ 8. Organ systems are important for life.
- _____ 9. The respiratory system is involved in bringing oxygen into the body.
- _____ 10. The respiratory system is needed for thinking and remembering.

Compare your answers with those in the *Answer Key* on page 39. If you got everything right, that's very good! That means you understood this lesson well. You may proceed to the next lesson. If you did not get everything right, just review the items you missed. Afterward, you may proceed to lesson 3.



Let's Remember

- ◆ The skeletal system is composed of bones. It provides framework and shape to the human body. It also functions as attachment of muscles and gives protection to the internal organs such as the heart and the lungs, stores calcium and participates in blood production.
- ◆ The muscular system is made up of muscles. Skeletal muscles allow the body to move. Smooth muscles of the internal organs such as the intestines provide movement for the proper functioning of these organs.
- ◆ The respiratory system is made up of the lungs and the airways. It functions to bring oxygen into and carbon dioxide out of the body.
- ◆ The nervous system is made up of nerves, the brain and the spinal cord. It is the master control system of the body. Like a network of wires throughout the body, the nervous system receives sensations from the body and sends back signals to make the body move. The nervous system is also important for learning, memory and decision making.

The Digestive, Reproductive and Urinary Systems

You learned about the skeletal, muscular, respiratory and nervous systems in Lesson 2. These systems are necessary for life and the proper functioning of the body. However, there are other organ systems in the body that work just as hard to keep you alive.

In this lesson, you will learn about the digestive, excretory and reproductive systems. You will also discover the parts of each of these organ systems as well as their structure and functions. The organ systems to be described in this lesson are found in the torso of the body, near the abdomen. Are you ready to learn about these organ systems? Read on.



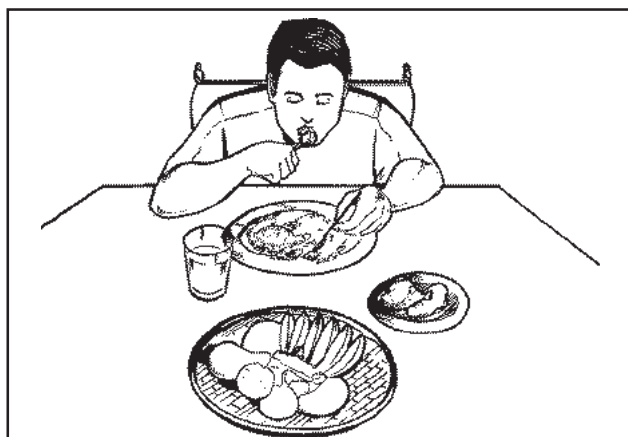
Let's Think About This

Why do you eat? What do you think happens to the food that you eat? How does it enter your body and how does it get out? What happens along the way? Eating is a pleasant activity for most of us. But have you ever thought about how food is processed inside your body?



Let's Learn

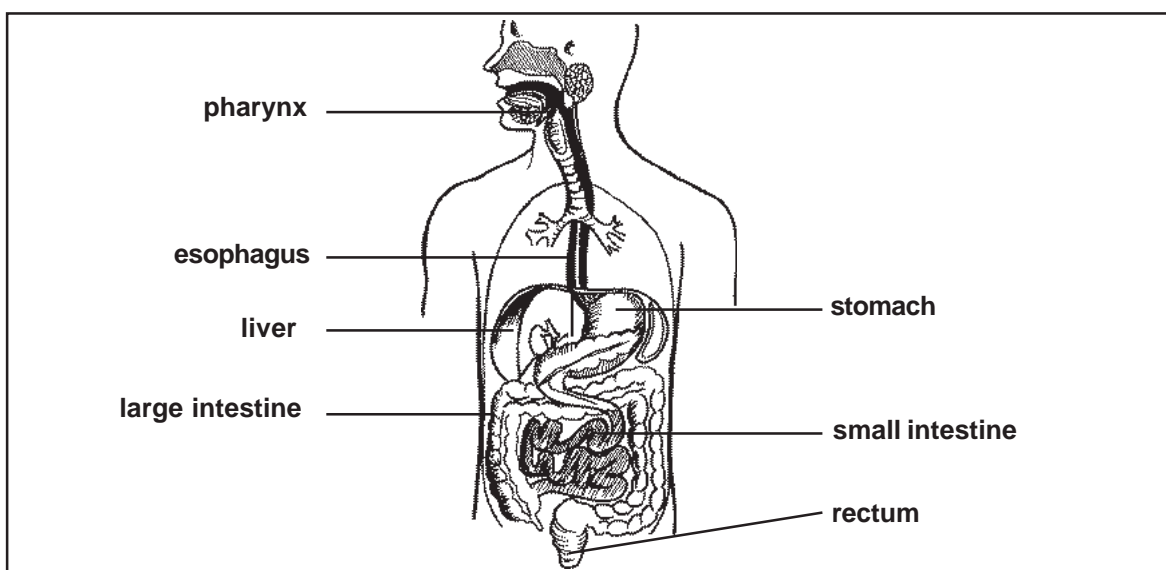
Food is needed by your body as a source of energy. The plants and animals that you eat were able to produce energy from their own environment. The transfer of energy continues as you eat. When you eat, the energy contained by your food is utilized by your body to make it function well.



Your body needs food to give you energy.

The Digestive System

The food that you eat enters your body through your mouth, the first segment of the digestive system. The digestive or gastrointestinal tract is composed of the mouth, esophagus, stomach, intestines and anus. The tract is a long continuous tube that serves as the primary site of energy extraction in the body. This system enables the body to extract energy from food through the process of digestion. The digestive system is shown below.



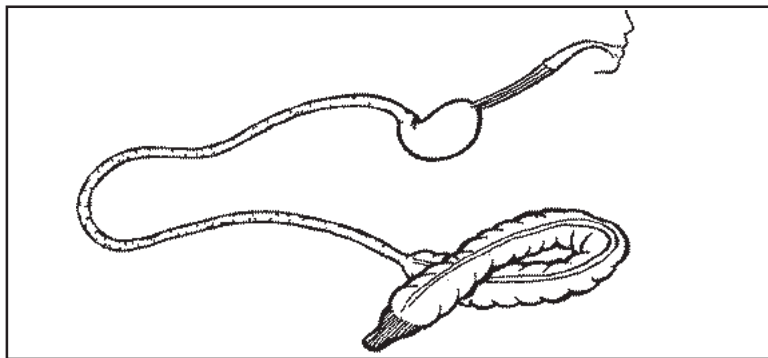
The digestive system

The tissues of the digestive system are capable of breaking down the food you eat into simple materials that can be absorbed by your body. This process of digestion starts in the mouth which contains chemicals that start the process of digestion. **Digestion** means “breaking down.” The saliva in your mouth contains the enzyme **ptyalin** that breaks down food. This is why it is best to use a serving spoon for your dishes. This prevents the ptyalin in your saliva from breaking down food that is still to be eaten by other members of your family. Broken-down food tastes bad!



Why do you need to use a serving spoon?

The food enters your mouth, passes through the esophagus and stays for a while in your stomach. Here, strong acids break down the food into smaller materials. The food then travels through the small intestine and the large intestine. The intestines are very long; they can be as long as 15 feet in adults when stretched from end to end. This provides a big area for absorption!



Your intestines are long enough to absorb food.

Food that is broken down is absorbed through the intestines and delivered via the blood to the different cells of the body. These cells need the energy from food to maintain life.

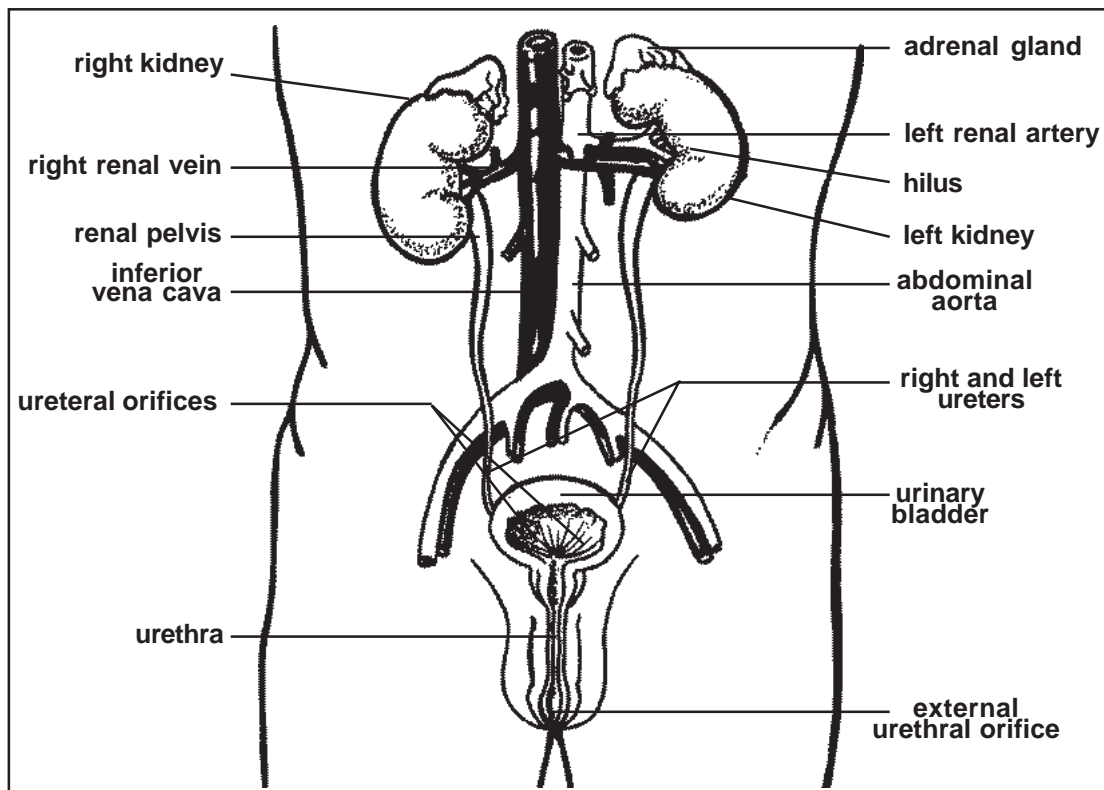
Food that is not digested or cannot be broken down into simpler components and absorbed leave the body through the anus as **roughage**.

The digestive system works tirelessly even while you are asleep. The process of digestion is automatic, that is, you do not have to worry about it because your body knows what it is supposed to do!

The Urinary System

The urinary system is involved in the production of urine that contains harmful substances that can harm the body.

The urinary system is composed of the kidneys, ureters, bladder and urethra that function together to form urine. Urine is made up of waste materials and extra fluid extracted from the blood. The urinary system makes sure that the body is “clean” to enable it to always perform well.



The urinary system

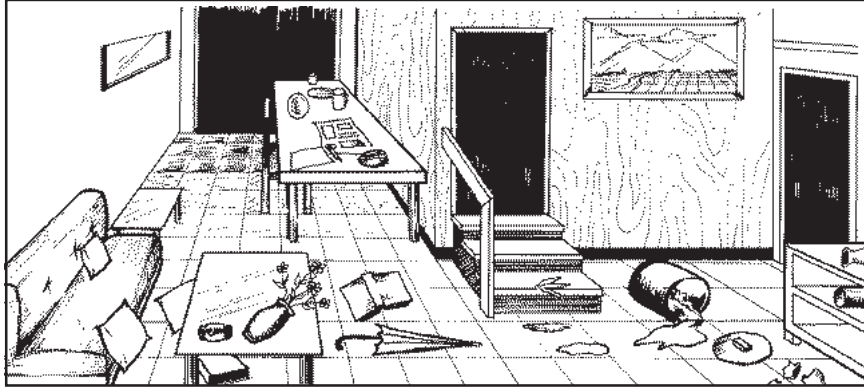
Think of the urinary system as the system that strains and drains blood to take away the harmful substances it contains. One such substance is **urea**, a nitrogen-containing compound that gives urine its distinct smell.

Without the urinary system, waste products would accumulate in the blood and harm the body. The urinary system therefore acts like the janitor of the human body that cleans it tirelessly and regularly each day.



Let's Think About This

What do you think would happen if you did not clean your house for several days? How would it smell? What harm could result from an unclean environment?



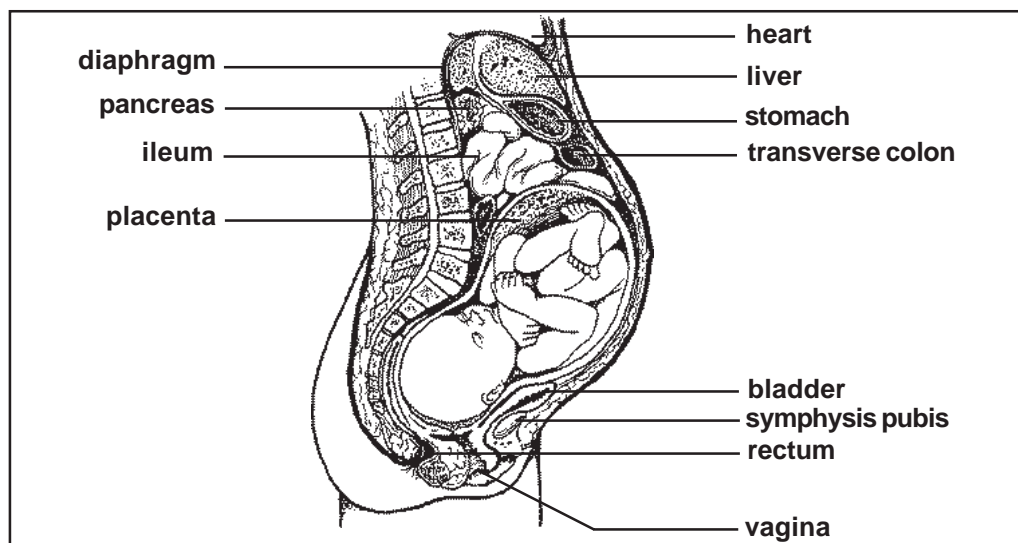
Imagine that your body is as unclean as the house in the picture above. How would your body's functions be affected?

The Reproductive System

Urine ultimately exits the body from the **urethra**, a structure found in the genitals of both males and females. Aside from being an exit point for wastes, the genitals are also very important to the reproductive system.

The reproductive system is composed of the ovary, fallopian tubes, uterus and vagina in females. In males, it is composed of the penis (which contains the urethra), testicles, scrotum and prostate gland.

The reproductive system allows reproduction of new human beings. The reproductive system makes sure that children will be born to continue the cycle of life. This is called the propagation of the human species.

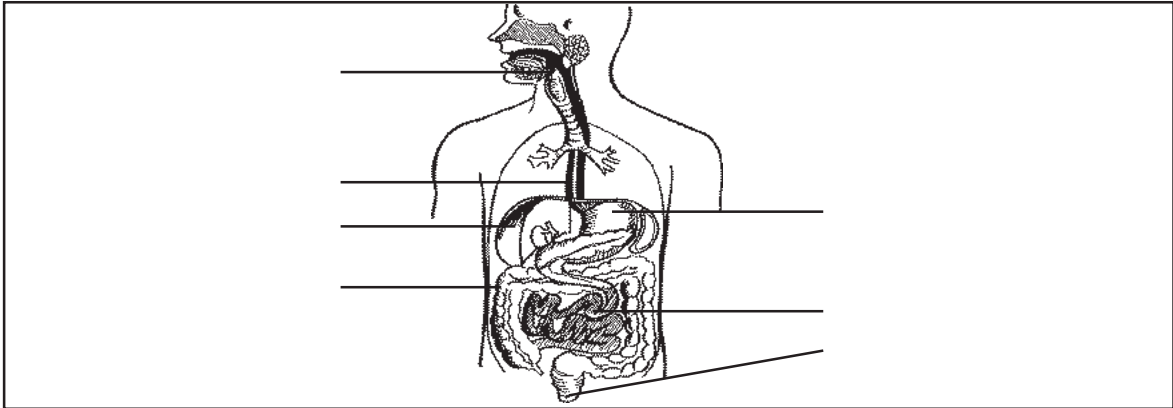


The reproductive system

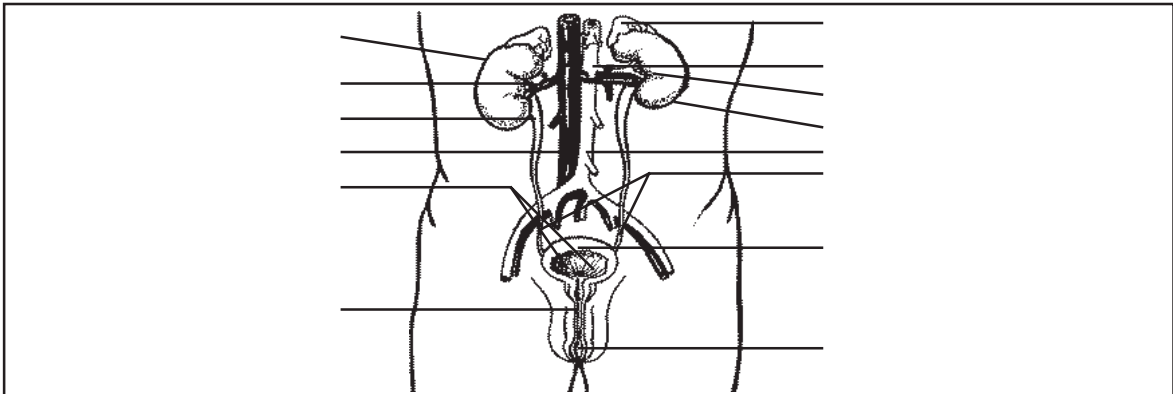


Let's See What You Have Learned

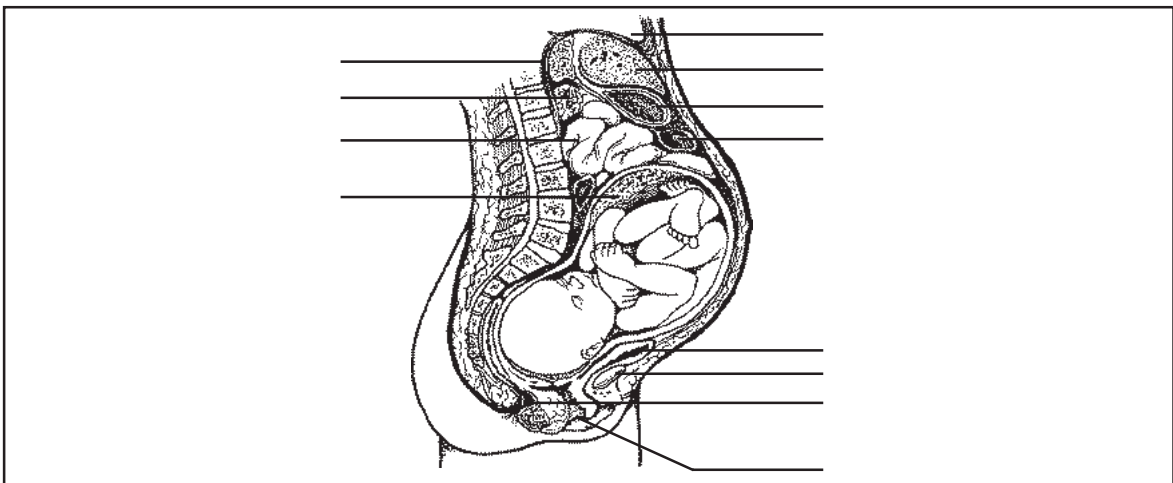
Label the parts of the digestive, urinary and reproductive systems in the following diagrams.



Digestive system



Urinary system



Reproductive system

Compare your answers with those in the *Answer Key* on page 40. If you got a perfect score, congratulations! You may now move on to Lesson 4. If you did not get everything right, that's okay. Review the parts you did not understand then proceed to the next lesson.



Let's Remember

- ◆ The digestive system is composed of a long continuous tube starting from the mouth and ending in the anus. This system functions for the extraction of energy from the food you eat in a process called digestion.
- ◆ The urinary system is the cleaning machine of the human body. It strains and drains blood to remove the waste materials it contains. These materials leave the body as urine. The excretory system is composed of the kidneys, ureters, bladder and urethra.
- ◆ The reproductive system is a group of organs that are needed to propagate life.

The Sensory, Circulatory, Endocrine, Lymphatic and Integumentary Systems

From the previous lesson, you learned about the digestive, urinary and reproductive systems. These systems are necessary for absorbing energy from food, removing waste products from the body and the propagation of the human population.

In this lesson, you shall learn more about the sensory, integumentary, circulatory, endocrine and lymphatic systems. You will also discover the parts of each of these organ systems, as well as their structures and functions. Are you ready to learn about these five organ systems? Read on.



Let's Think About This

How do you think your life would be if you could not see? What would happen if you lost your hearing and sense of smell?

When you touch a hot pot accidentally, what happens? If you accidentally step on a nail, how does your body respond? Think about this as you prepare to study the sensory and the integumentary systems.



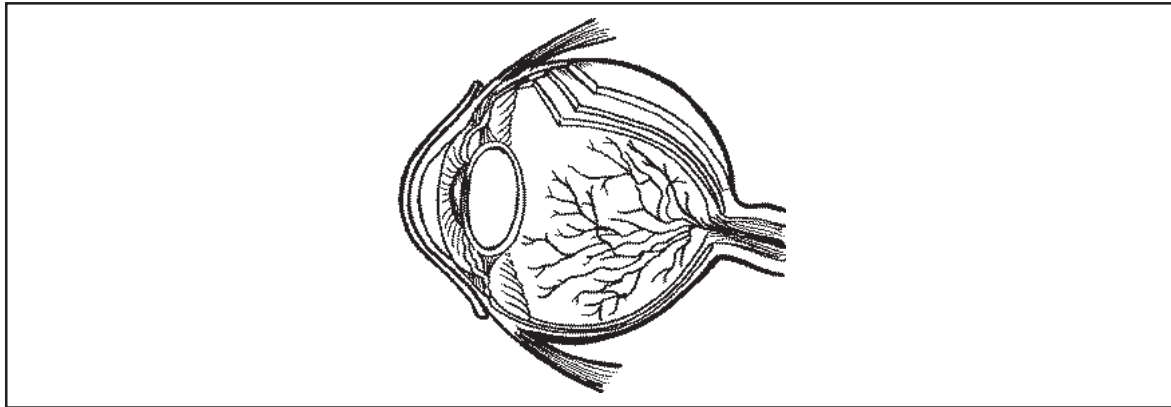
Let's Learn

Your body is in constant communication with itself and with its environment. The work involved in keeping an organism alive is very complex and must be properly maintained. Two organ systems are actively involved in communicating with the outside environment. These are the **sensory system** and the **integumentary system**.

The Sensory System

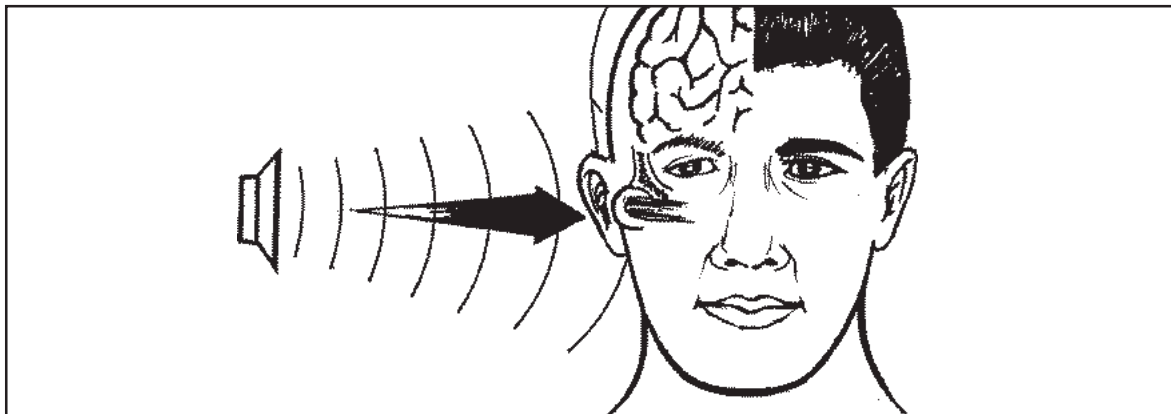
What is a sensation? A **sensation** is a feeling. It is stimulated by a signal received by the specialized organs of the body.

The sensory system is composed of sense organs that are sensitive to the signals from the environment. The human body has five major senses, mediated by five major sense organs. **Vision** is governed by the eye. The eye is an organ that is sensitive to the light from the environment. Your eyes make you see because light signals from the environment pass through the eyes and reach the brain where they are processed and recognized.



The structure of the eye

Hearing is another sensory experience. It is mediated by the ears. Sound waves travel in the air and hit the special structures inside your ears. This sensation is interpreted as sound by the brain.



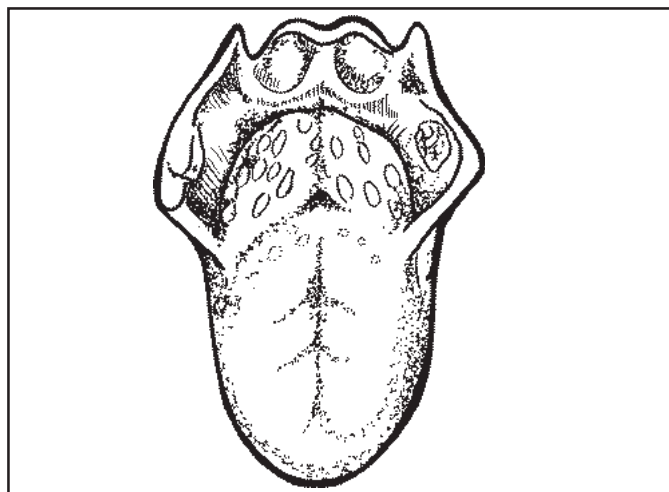
The ears receive sound waves from the environment.

The sense of **smell** or **olfaction** is governed by the nose. You can smell flowers and food because of the special structures in your nose that can pick up odor chemicals floating in the air. These sensations are sent to the brain and interpreted as odors.



Your nose is your organ for smelling.

The tongue governs the sensation of **taste**. It tells whether the food you eat tastes sweet, sour, salty or bitter.



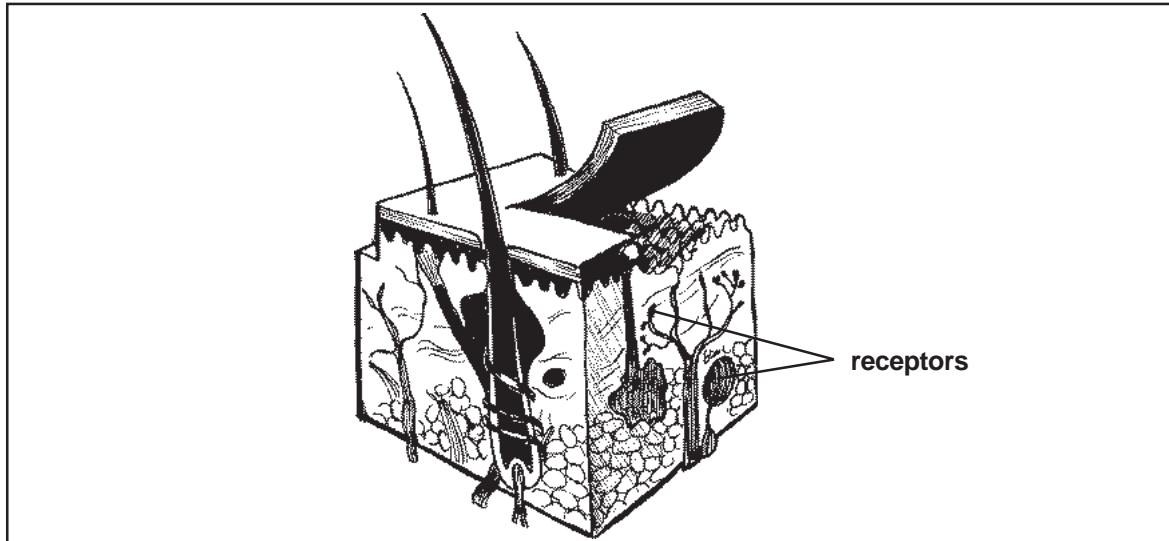
Your tongue contains sensors that tell how food tastes.

The sense of touch is governed by the skin. This topic shall be discussed in the next section.

The sensory system is composed of several organs that generally function as acceptors of signals from the environment. These signals are sent to the brain to be processed. The sensory system protects and maintains the functions of the human body by making sure that the body is actively interacting with its environment.

The Integumentary System

The **integumentary system** is made up of the skin, its glands and outgrowths. The skin defends the body against physical injury, loss of fluids, entry of chemicals and invasion of bacteria. Aside from this, the skin also functions for temperature regulation and secretion of substances. Study the structure of the skin below.



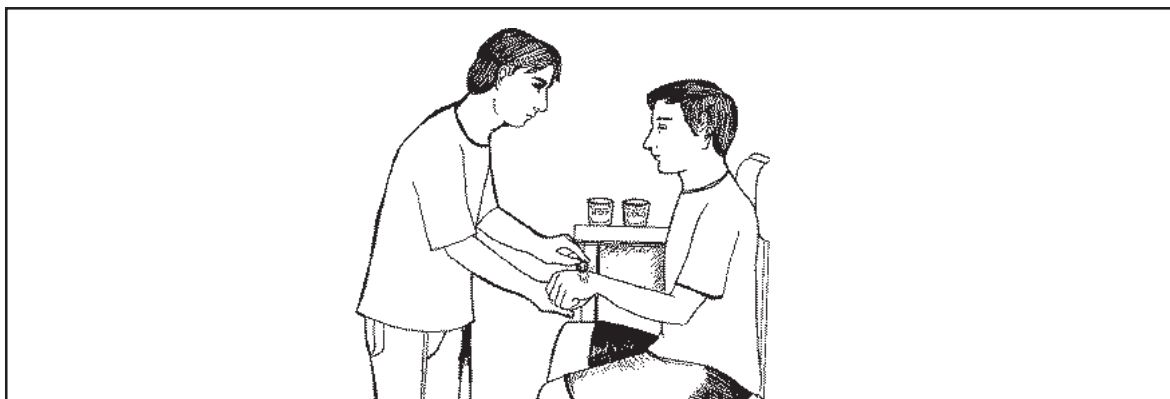
The structure of the skin

The skin can detect changes in temperature, pain, pressure, vibration and touch from the environment. It is able to do this because it contains **receptors**. Receptors inside the skin respond when stimulated by changes in the environment.



Let's Try This

Ask a friend to sit in front of you with his/her eyes closed. Tell your friend that you are going to put something on his/her skin and that he/she is to tell you what it is. Place a drop of warm water then a drop of cold water on the back of your friend's hand. Ask him/her what it is. Pinch him/her a little bit. Ask him/her what he/she felt. Dab a piece of cotton on your friend's hand. How did he/she respond? What did you learn about the skin from this activity?



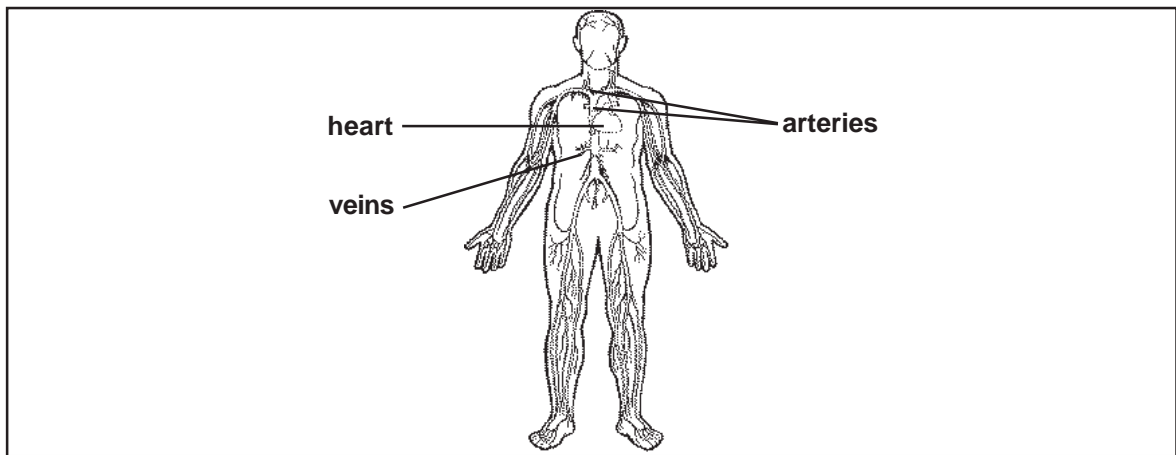


Let's Learn

The next three organ systems that you will learn about are special because they are involved in internal communication. These systems make sure that the functions of the body are properly coordinated to achieve and maintain a normal, steady state of function. In the human body, this steady state is called **homeostasis**.

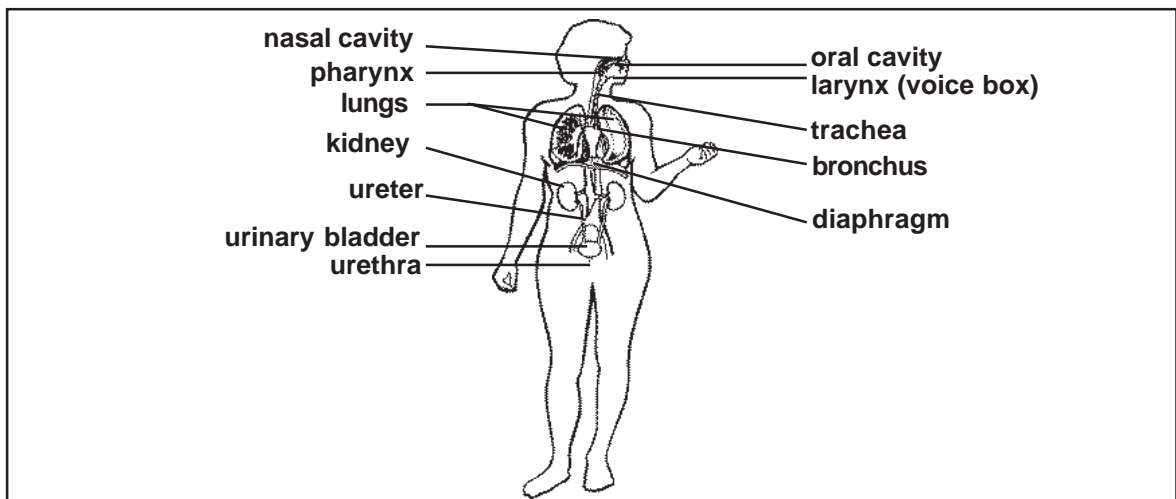
The Circulatory System

The primary function of the **circulatory system** is to circulate blood throughout the body. At the center of this system is the **heart**, which works tirelessly to pump blood throughout the body through blood vessels. Blood vessels are like pipes which supply blood to the different parts of the body.



The main parts of the circulatory system

We say that the circulatory system is involved in internal communication because blood acts as a carrier of substances throughout the body. Nutrients and oxygen supplied by the respiratory system travel via the blood to reach the many cells and tissues. Waste products also travel via the blood to be ultimately eliminated as urine by the urinary system.



The circulatory system works hand in hand with the respiratory and urinary systems.



Let's Try This

Do you know where your heart is? The major organ of the circulatory system is inside your chest. Place the palm of your hand over the left side of your chest. Can you feel your heart beating? Approach a friend and listen to his/her heartbeat. Press your ear against his/her chest. Can you hear your friend's heartbeat?

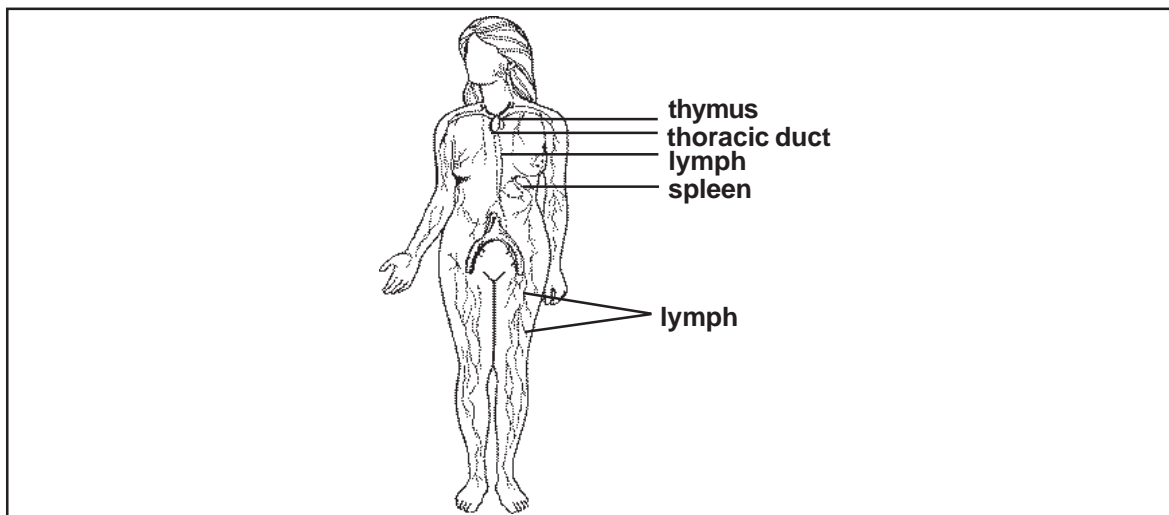
The beating of the heart is a signal that it is functioning. The sounds that you hear are produced by the valves of the heart that act like gates that open and close to allow a more effective delivery of the blood. The circulatory system is controlled by the nervous system. This ensures that blood will always reach the tissues and cells of your body.



Let's Learn

The Lymphatic System

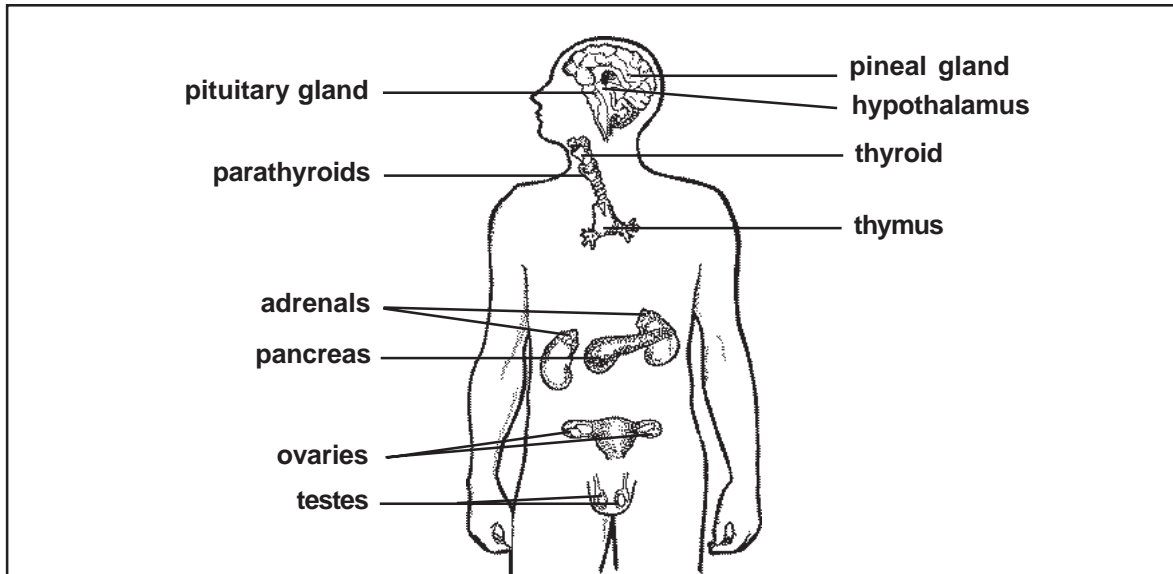
Another system of the body involved in internal communication is the lymphatic system. The **lymphatic system** is composed of lymph vessels, lymph nodes and lymphatic organs which collect, move and drain lymph or interstitial fluid. The lymphatic system also performs a very important role in maintaining the immunity of the body from bacteria and other foreign substances. Study the illustration of the lymphatic system in the figure below.



The lymphatic system

The Endocrine System

The **endocrine system** is composed of different organs located throughout the body, which produce hormones. **Hormones** are chemicals that act as signals and travel via the blood. These chemicals control your growth, energy use and reproduction. When a hormone reaches another organ in the body, it causes changes in that organ. Study the structure of the endocrine system below.



The endocrine system

An example of how hormones work would be the action of the estrogen hormone in females. This chemical is produced in the ovaries. When organs that are sensitive to estrogen, such as the breasts, receive this chemical signal, changes occur. Estrogen causes breast enlargement among females, especially during puberty.



Let's Think About This

Have you heard of diabetes? This is a disease which affects an endocrine organ, the pancreas. Diabetes is characterized by a deficiency of the hormone insulin. When insulin levels in the body are very low, glucose, which serves as the source of energy of the body, cannot enter the body's cells. Hence, people with diabetes have very high sugar or glucose levels in the blood. These abnormal levels cause a lot of problems such as impaired healing of wounds and abnormalities of the eyes, heart and kidneys. The only way to treat diabetes is to supply insulin to the body from outside sources. Patients with diabetes inject insulin into their bodies to make the glucose enter their body's cells.



Let's See What You Have Learned

Fill in the blanks with the correct words.

1. The steady state of the body is called_____.
2. The_____system receives and responds to inputs from the environment.
3. Signals from the sensory organs go to the _____ to be processed.
4. Vision is mediated by the _____.
5. The _____ distributes blood throughout the body.
6. The circulatory system is made up of the heart and _____.
7. The endocrine system produces chemicals called_____.
8. The lymphatic system has an important role in maintaining the body's _____ found in the body.
9. Diabetes is characterized by a deficiency of _____.
10. Estrogen is produced in the _____.

Compare your answers with the *Answer Key* on page 41. If you got all the items right, that's very good! That means you are ready to proceed to the next lesson. If you did not get a perfect score, that's alright. Review the parts you missed then proceed to Lesson 5.



Let's Remember

- ◆ The sensory system is composed of the eyes, ears, nose, tongue and skin. It is responsible for responding to changes in the environment. Signals from the environment are received by this system to make the body respond to changing external conditions.
- ◆ The integumentary system serves to protect the body against potential danger from the external environment.
- ◆ The circulatory system is composed of the heart and blood vessels. Its primary role is to circulate blood in the body. Nutrients and waste products are also carried by the blood to their proper destinations.
- ◆ The lymphatic system is made up of the lymph vessels, lymph nodes and lymphatic organs. The lymphatic system works to mobilize lymph fluid (a pale liquid that bathes the tissues, passes through lymphatic channels and is discharged into the blood) and keep the body safe from invasion of foreign substances.
- ◆ The endocrine system controls the production and release of hormones, which in turn control growth, use of energy and reproduction.

The Human Machine

In Lesson 1, you learned how the human body resembles a car in terms of organization. You found out that similar cells make up tissues and groups of tissues make up organs, which in turn comprise organ systems. Organ systems make up an organism. In Lessons 2 to 4, you learned more about the structure and functions of each of these organ systems and how they contribute to helping keep the human body functioning.

It is important for you to remember that although each organ system performs a specific function, all organ systems are intimately related with one another. No organ system can function independently. What makes the study of the human body very interesting is that the organ systems are able to coordinate their activities in a way that benefits the whole body. The human body epitomizes how cooperation works.

In this lesson, you will study how cooperation is achieved among the many organ systems of the body. You will learn how different parts of your body communicate with one another to enable your body to function well.



Let's Try This

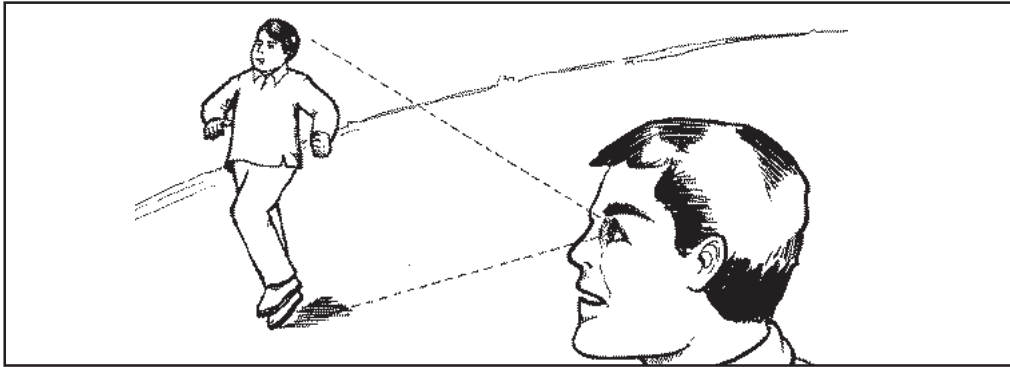
You have probably heard the saying “no man is an island.” This saying means that each person depends on others for many reasons. Inside the human body, this is also true. When you look at an object, what organ systems are involved in your action? When you do something, what organ systems are making your action possible? Make a list of the organ systems involved when you eat, sleep and run.



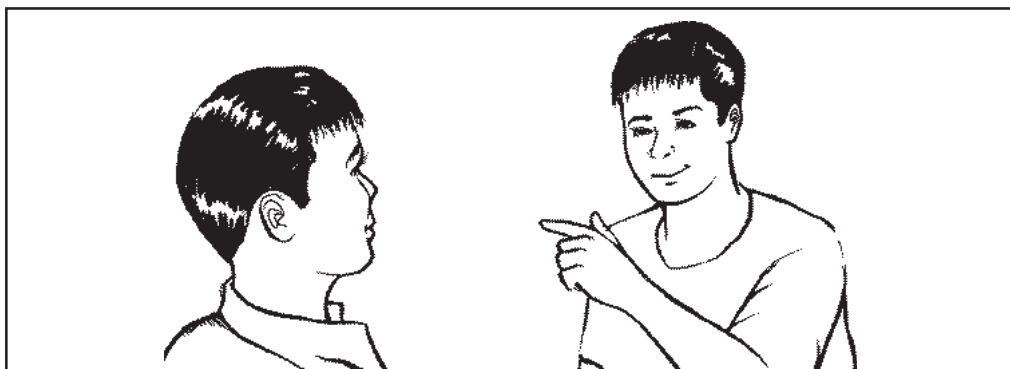
Let's Learn

To understand how the organ systems of the human machine work together, study the following situations.

When you see a person, your eyes, a part of your sensory system, receive light signals from the environment.



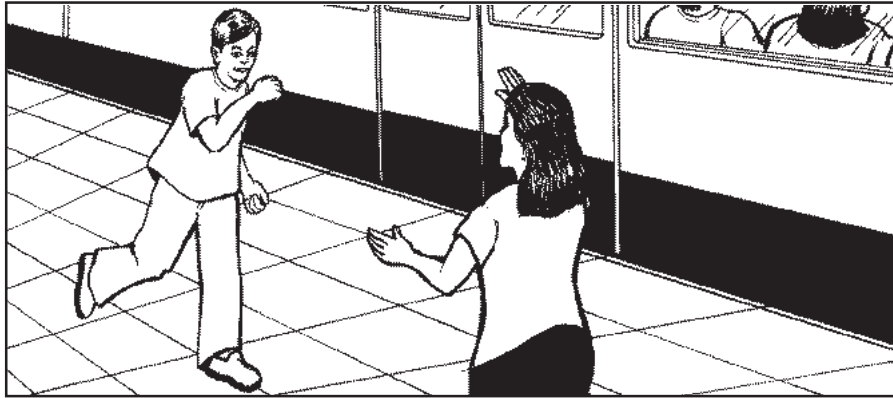
The signals enter your eyes and are sent to your brain, a part of the nervous system. You remember the name of the person, then you smile and wave at the person. Smiling and waving involve contractions of your muscles, a part of your muscular system.



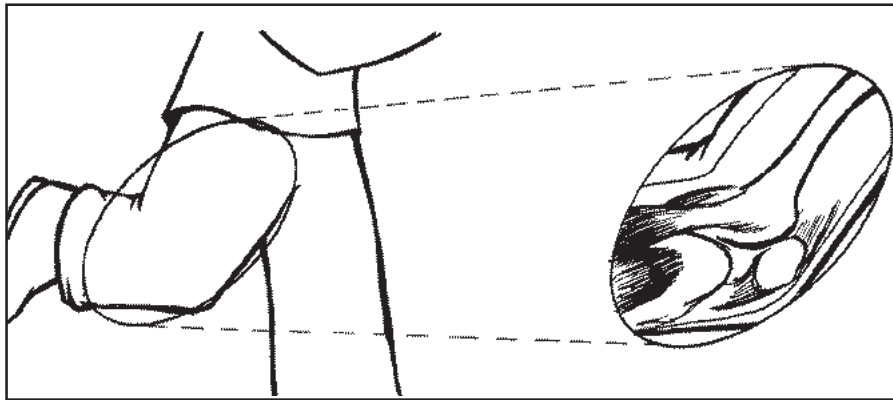
You are walking along an MRT station. You see someone approaching you. You remember that this person is very special. Your brain signals your heart to beat faster. Hence, your sensory, nervous and circulatory systems are involved in this case.



You get excited and you notice yourself breathing so fast as you run toward your friend to hug her. The respiratory system is now also involved.

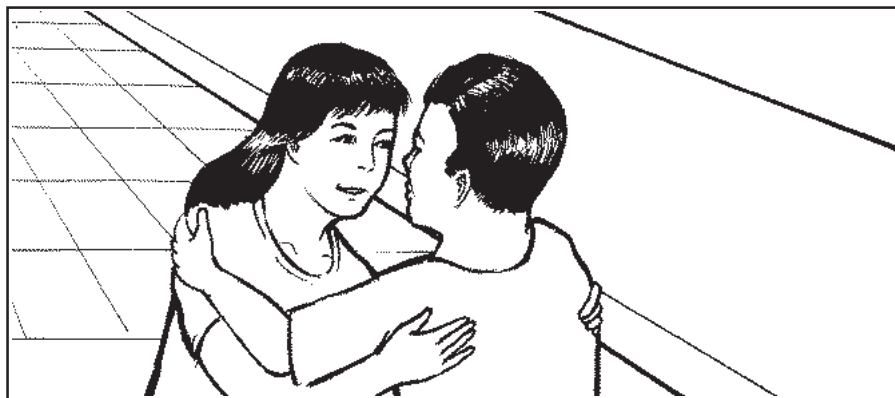


Running needs the action of the bones of the skeletal system and the muscles of the muscular system.



Without you knowing it, a hormone called **adrenaline** is being released by your endocrine system. This makes your movements more forceful and faster.

As you hug your friend, you feel your skin tingling. The skin is both a part of the integumentary and the sensory systems.



Here's another familiar situation: Your friends ask you out to lunch. You have lunch together. Eating and digestion of food is the domain of the digestive system. While you are digesting your food, the other organ systems are still working.



From the situations presented, you found out that the organ systems are constantly coordinating with one another. This ensures that the body functions very well in every situation. Can you think of other examples of how cooperation occurs in the human body?



Let's See What You Have Learned

Study the following situation. For each event, write the corresponding organ system that is involved. Use two columns, Column 1 for the event and Column 2 for the organ system involved.

Ana was walking home from school when she suddenly smelled something burning. She noticed that fire was coming out of the roof of one of the houses along the street. Her heart started beating fast and she breathed heavier because she felt afraid. She shouted "Fire, fire!" at the top of her voice and ran toward the nearest house to alert her neighbors.

Column 1

Column 2

Compare your answers with the *Answer Key* on page 41.



Let's Remember

- ◆ The twelve organ systems work together in a well-coordinated way to maintain life.

You have now reached the end of the module. Congratulations! Did you enjoy studying it? The following is a summary of its main points to help you remember them better.



Let's Sum Up

- ◆ The human body is composed of twelve major organ systems. Organ systems are composed of organs that are interrelated and work together to keep the body alive and help it function well. The organ systems of the human body and their main functions are the following:
 - ◆ Nervous system — serves as the master controller of the body's functions
 - ◆ Circulatory system — distributes blood throughout the body
 - ◆ Respiratory system — allows respiration or gas exchange to occur inside the body
 - ◆ Digestive system — helps in the extraction of nutrients from food taken in by the body
 - ◆ Integumentary system — serves as the primary protection of the body from the external environment
 - ◆ Urinary system — helps remove waste products from the body through the production of urine
 - ◆ Reproductive system — allows procreation
 - ◆ Skeletal system — maintains shape of body and provides framework for the attachment of muscles
 - ◆ Muscular system — allows movement of the external parts and internal organs of the body
 - ◆ Lymphatic system — works to mobilize lymph fluid and keeps the body safe by helping maintain its immunity
 - ◆ Sensory system — receives and responds to signals from the environment
 - ◆ Endocrine system — produces and releases hormones that the body needs for growth, energy use and reproduction
- ◆ Different organ systems of the body are always coordinating with one another. The organs of the body are interdependent and work in a very organized manner. The concerted efforts of all the parts of the human body are needed to maintain life and promote optimum function.



What Have You Learned?

To find out what you have learned from this module, answer the following test. Match the items in Column A with those in Column B.

A	B
_____ 1. skeletal system	a. procreation
_____ 2. muscular system	b. movement
_____ 3. nervous system	c. insulin deficiency
_____ 4. integumentary system	d. framework of the body
_____ 5. sensory system	e. eyes, nose, ears, tongue and skin
_____ 6. digestive system	f. takes in oxygen
_____ 7. respiratory system	g. gives the body immunity
_____ 8. circulatory system	h. basic unit of life
_____ 9. endocrine system	i. produces hormones
_____ 10. reproductive system	j. distributes blood
_____ 11. urinary system	k. production of urine
_____ 12. lymphatic system	l. master controller of the body
_____ 13. diabetes	m. made up of organ systems
_____ 14. cell	n. extracts nutrients from food
_____ 15. organism	o. skin

Compare your answers with those in the *Answer Key* on page 42.

If you got a score of:

- 12 – 15 Congratulations! You learned a lot from this module. You are now ready to move on to the next modules and study each organ system in detail.
- 7 – 11 Very good! Just review the parts of the module that you did not understand.
- 0 – 6 You should study the whole module again.



Answer Key

A. Let's See What You Already Know (*pages 2–3*)

A. (Learners' answers may be in any order.)

1. nervous system
2. circulatory system
3. respiratory system
4. digestive system
5. integumentary system
6. urinary system
7. reproductive system
8. skeletal system
9. muscular system
10. lymphatic system
11. sensory system
12. endocrine system

B. (Learners' answers may differ from how the answers are stated below.)

1. Nervous system — serves as the master controller of the body's functions
2. Circulatory system — distributes blood throughout the body
3. Respiratory system — allows respiration or gas exchange to occur inside the body
4. Digestive system — helps in the extraction of nutrients from food taken in by the body
5. Integumentary system — serves as the primary protection of the body from the external environment
6. Urinary system — helps remove waste products from the body through the production of urine
7. Reproductive system — makes procreation possible
8. Skeletal system — maintains the shape of the body and provides a framework for the attachment of muscles

9. Muscular system — allows movement of the external parts and internal organs of the body
 10. Lymphatic system — works to mobilize lymph fluid and keeps the body safe by maintaining its immunity
 11. Sensory system — receives and responds to signals from the external environment
 12. Endocrine system — produces and releases hormones that the body needs for growth, energy use and reproduction
- C. The general function of the human body will be affected. Each organ system is intimately connected with another. A disease that affects one organ system will affect the well-being and proper functioning of the other organ systems.

B. Lesson 1

Let's See What You Have Learned (page 8)

organism	cell	organ system	organ	tissue
5	1	4	3	2

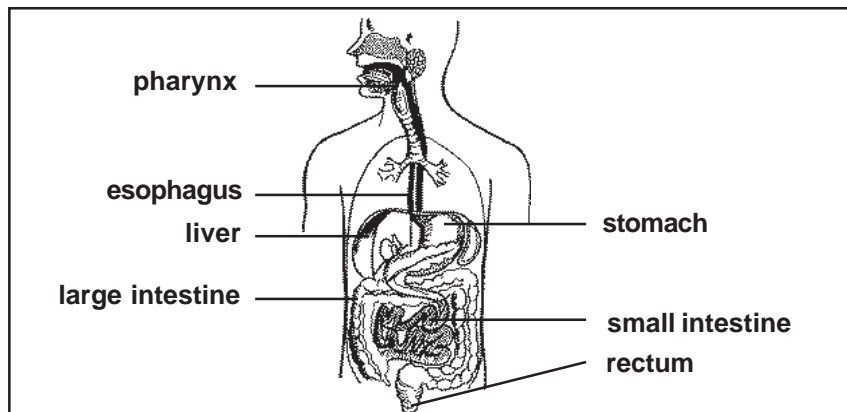
C. Lesson 2

Let's See What You Have Learned (page 15)

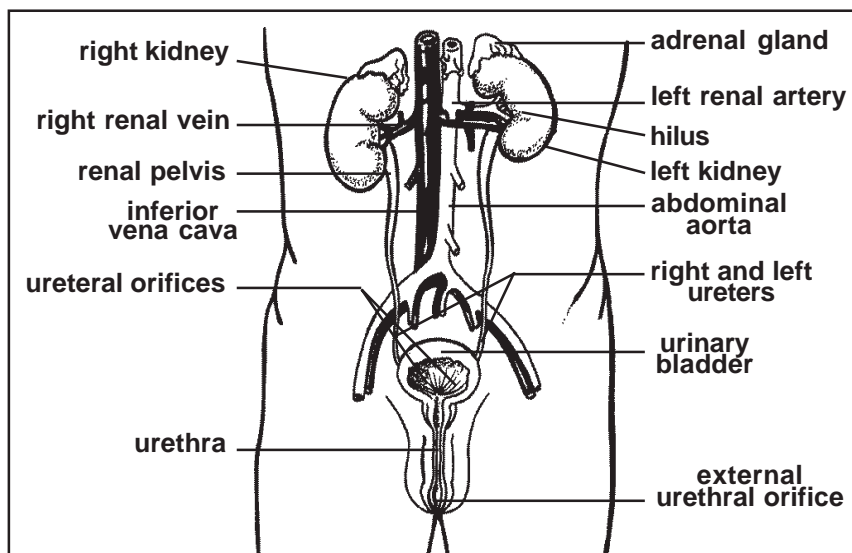
1. False. The human body has twelve organ systems.
2. True
3. False. The circulatory system, not the nervous system, primarily pumps blood throughout the body.
4. True
5. True
6. True
7. False. Life as we know it would be impossible without the organ systems functioning well.
8. True
9. True
10. False. The nervous system, not the respiratory system, is needed for thinking and remembering.

D. Lesson 3

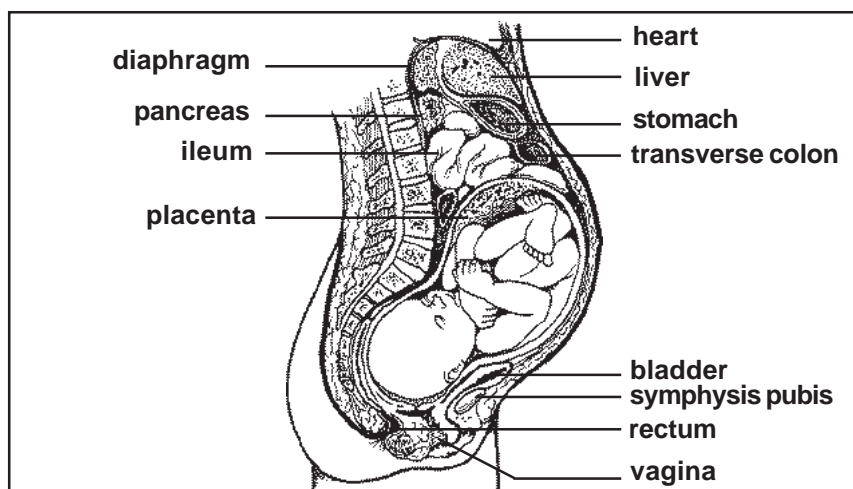
Let's See What You Have Learned (page 21)



Digestive system



Urinary system



Reproductive system

E. Lesson 4

Let's See What You Have Learned (page 30)

1. homeostasis
2. sensory
3. brain
4. eyes
5. circulatory system
6. blood vessels
7. hormones
8. immunity
9. insulin
10. ovaries

F. Lesson 5

Let's See What You Have Learned (page 35)

Column 1

walking
smelling something
noticing fire
heart beating fast
heavier breathing
feeling afraid
shouting
running

Column 2

muscular, nervous and skeletal systems
sensory and nervous systems
sensory and nervous systems
circulatory and nervous systems
respiratory and nervous systems
nervous and endocrine systems
respiratory and nervous systems
muscular, skeletal and nervous systems

G. What Have You Learned? (*page 37*)

1. d
2. b
3. l
4. o
5. e
6. n
7. f
8. j
9. i
10. a
11. k
12. g
13. c
14. h
15. m



Glossary

Adrenaline A hormone produced by the adrenal glands.

Bones Calcium-containing structures that make up the skeletal system.

Brain-dead Said of a person who has stopped breathing, does not respond to stimuli and shows no muscle activity.

Circulatory system The system of organs that distribute blood throughout the body.

Diabetes A disease characterized by insulin deficiency.

Digestive system A system of organs that digest food and absorb nutrients from food.

Endocrine system A system of organs that produce and release hormones.

Excretory system A system of organs that help remove waste products from the body through urine formation.

Calcium A mineral important for hardness and strength of bones and teeth.

Cell The basic unit of life.

Homeostasis The state of internal balance or steady state of the body.

Hormones Chemicals released by the endocrine system in the blood.

Insulin A hormone produced by the pancreas necessary for the absorption of glucose in the body.

Integumentary system A system made up of the skin and its glands and outgrowths; the body's primary defense against potential harm from the external environment.

Lymphatic system A system of organs that circulate lymph fluid and maintain the body's immunity from diseases.

Muscular system Composed of muscles that make body movements possible.

Nervous system The master control system of the body.

Organ A structural unit composed of a group of tissues.

Organism A distinct individual composed of organ systems.

Organ system A group of organs performing a similar function.

Ptyalin An enzyme found in saliva; capable of breaking down food.

Receptor An element of the nervous system adapted to the reception of stimuli.

Reproductive system A system of organs for reproduction.

Respiration The process of producing energy in the presence of oxygen.

Respiratory system The system of organs that allows gas exchange to take place in the body.

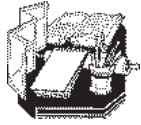
Roughage Unabsorbed food.

Sensory system Composed of organs that detect stimuli from the environment.

Skeletal system Composed of bones that give structural support to the body.

Tissue A group of similar cells performing a specific function.

Urea Waste product found in blood and excreted in urine.



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