SAMPLE PAGES FOR

THE READY EOG ASSESSMENT

THE COMPETITIVE EDGE

FIFTH GRADE SCIENCE

with NORTH CAROLINA ESSENTIAL STANDARDS

2012 EDITION

JANE HEREFORD

CONTEMPORARY PUBLISHING COMPANY OF RALEIGH, INC.

CPC

5849 Lease Lane, Raleigh, NC 27617 • (919) 851-8221
www.contemporarypublishing.com

Table of Contents

CHAPTER 5

LIVING ORGANISMS

PLANT AND ANIMAL CELLS

Just as an atom is the fundamental unit of all matter, there is a fundamental unit of living things, the **cell**. Discovered in 1665 by the English scientist **Robert Hooke**, the cell represents the basic unit of life. Hooke used the name cell because, when he first saw them under a microscope, they reminded him of the cubicles, or cells, that monks lived in. With the improvement of the microscope, other scientists were able to expand on Hooke's discovery and later develop the **cell theory**. Cell theory includes the following concepts:

The microscope was used to develop cell theory.

Cell Theory

- All living things contain at least one cell.
- Cells are the basic units of structure and function of life processes.
- Cells come from other cells of the same kind.

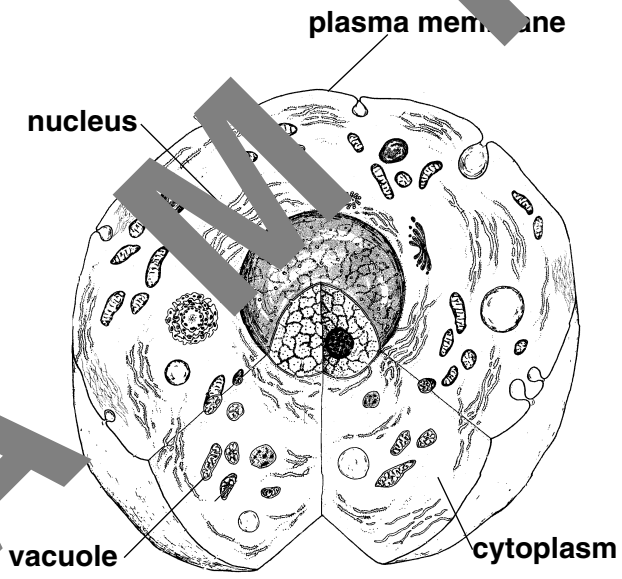
All organisms are composed of cells. Most organisms are **unicellular**, or made up of single cells. This includes entire kingdoms, like Protista, as well as part of the kingdom Archaebacteria, Eubacteria and Fungi. By far, single-celled organisms comprise the greatest biomass of life on Earth. Bacteria and amoebae are examples of single-celled organisms. Other organisms, like wolves, flies, trees, and humans, are **multicellular**, or made up of millions of cells working together.

Although cells are the fundamental units of life, they are composed of many different structures that work together to carry out the jobs required of the cell. Even though there are many different types of cells within most organisms, all of them have the basic function of producing **proteins** that are needed by either the whole organism or the cell itself. To carry out its requirements, the cell contains structures, called **organelles**, which are responsible for different activities.

The structure and function of a cell can be compared to a manufacturing company. As with a company, many different departments perform different tasks with the overall effect of contributing to the main goal, the manufacture of a product. In the cell, the products are mostly proteins.

Animal Cells

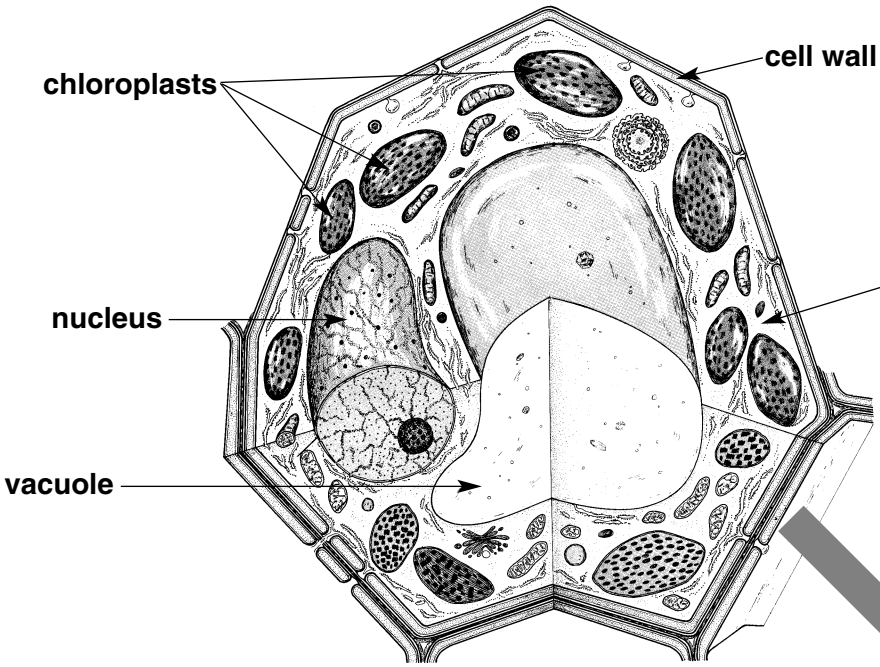
An animal cell is surrounded by a flexible, double-layered coat called a **plasma membrane**. The plasma membrane controls the transport of materials into and out of the cell. **Vacuoles** are storage bubbles inside the cytoplasm that hold food until it can be digested. Water, oxygen, nutrients, and waste all must pass through the cell membrane.



THE ANIMAL CELL

The large, round structure inside the cell is called the **nucleus**. The nucleus is the command center of the cell. It contains all the information needed to direct the cell's behavior, including information about how to grow and divide. The nucleus floats in a jelly-like substance called the **cytoplasm**. The cytoplasm and the cell membrane help to maintain the shape of the cell.

Plant Cells



THE PLANT CE

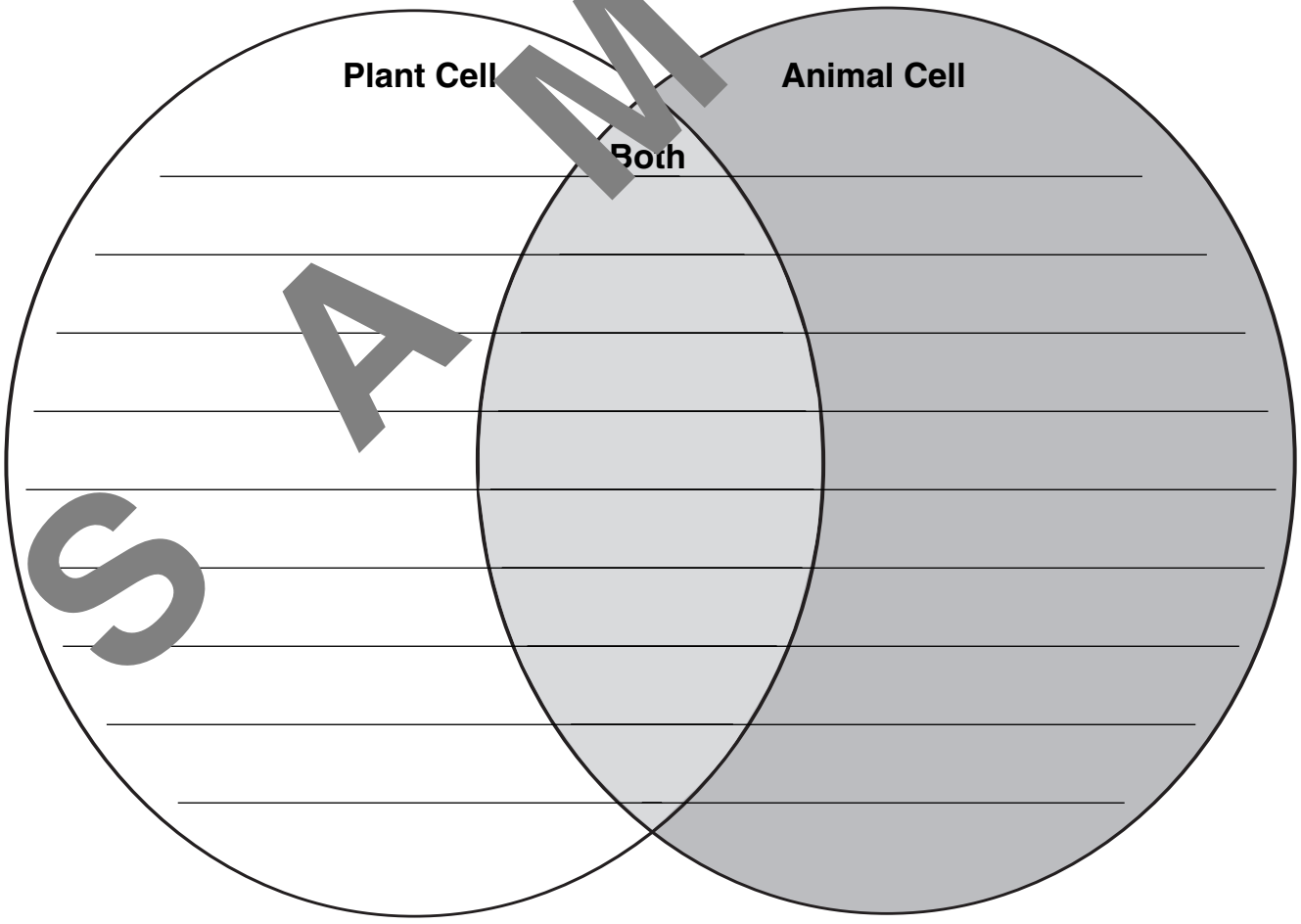
Like the animal cell, the plant cell has an o**r** overing called the **cell wall**. However, this covering is not flexible like the animal cell membrane, it is a rigid, protective covering. These rigid cell walls, lined up tightly together, help plants stand up. Like the animal cell, the plant cell has a **nucleus** which controls cell functions and floats in the **cytoplasm**. Plant cell **vacuoles** do more than store important substances. The water in these vacuoles puts pressure on the cell wall and causes the cell to become rigid. This gives the wall enough strength to help fairly large green plants. Think about this; plants use their rigid cell walls to stand up, while animals have muscles and bones for their support.

The plant cell is very different from the animal cell in that it contains structures called **chloroplasts**. Chloroplasts are a type of plastid, a sac that contains pigments that are used to convert the sun's energy into food for the cell. The chloroplast is the site of **photosynthesis**. Photosynthesis is the process whereby plants trap the energy of sunlight. This energy is combined with water and carbon dioxide and converted into sugar. The plant uses this chemical form of energy to build new plant tissue and to make seeds.

PRACTICE

Check the box of the cell type that matches the description.

1. Has a cell wall
   ❑ animal ❑ plant ❑ both
2. Has a nucleus
   ❑ animal ❑ plant ❑ both
3. Has a cytoplasm
   ❑ animal ❑ plant ❑ both
4. Has a chloroplast
   ❑ animal ❑ plant ❑ both
5. Has a cell membrane
   ❑ animal ❑ plant ❑ both
6. Performs photosynthesis
   ❑ animal ❑ plant ❑ both
7. Has a vacuole
   ❑ animal ❑ plant ❑ both
8. Think about plant and animal cells. Use the Venn diagram below to show how they are similar and how they are different.



9. Define the term cell.

10. What happens during photosynthesis?

11. Use the chart below to explain the job of each cell part.

nucleus	
cytoplasm	
vacuole	
plasma membrane	
chloroplasts	

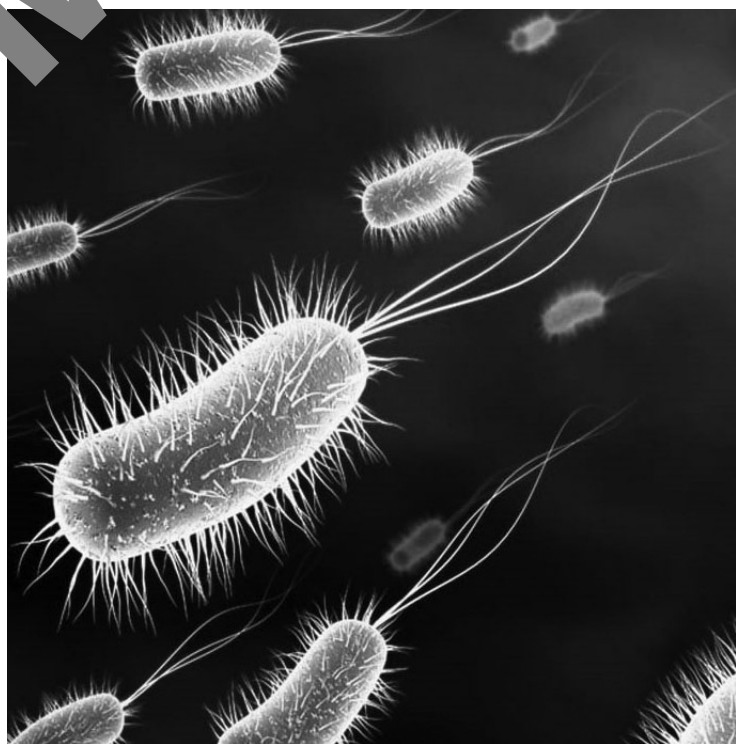
12. What is the purpose of organelles?

13. How could you distinguish a plant cell from an animal cell?

UNICELLULAR LIFE

The Kingdoms **Archaebacteria** and **Eubacteria** include the smallest and most primitive forms of life. Bacteria are microscopic organisms whose single cells have no membrane-enclosed nuclei. Bacteria can cause disease but some can be very beneficial. Some bacteria form a tough protective covering that allows for a sleeping period when conditions are not favorable. Bacteria have adapted to almost every environment on Earth.

Bacteria are also environmentally essential since they are **decomposers**. These bacteria feed on dead organic material and break it down into simpler forms that can be used by other organisms. Other ways bacteria are beneficial are in their uses in medicine and foods. We use bacteria cultures to make yogurt, cheese and pickles. Bacteria are used to develop medicines such as erythromycin that help us kill bacterial illnesses. Bacteria are used in sewage treatment plants and septic tanks to help us break down our waste products. You can see that bacteria helps you in many ways.

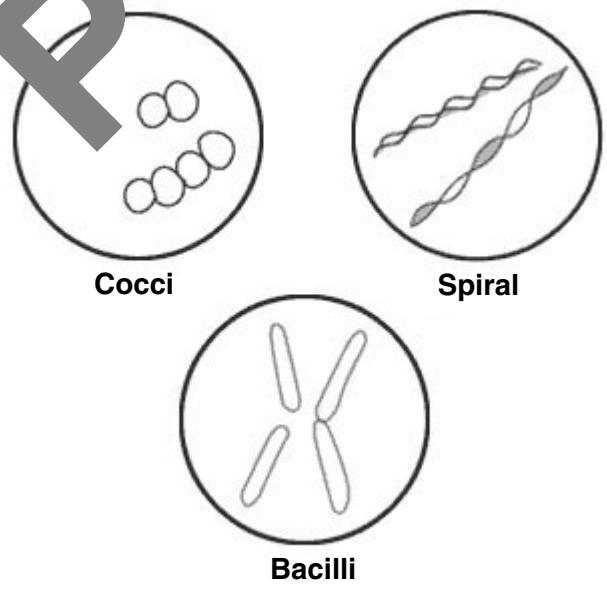


Bacteria can be used to break down our waste products.

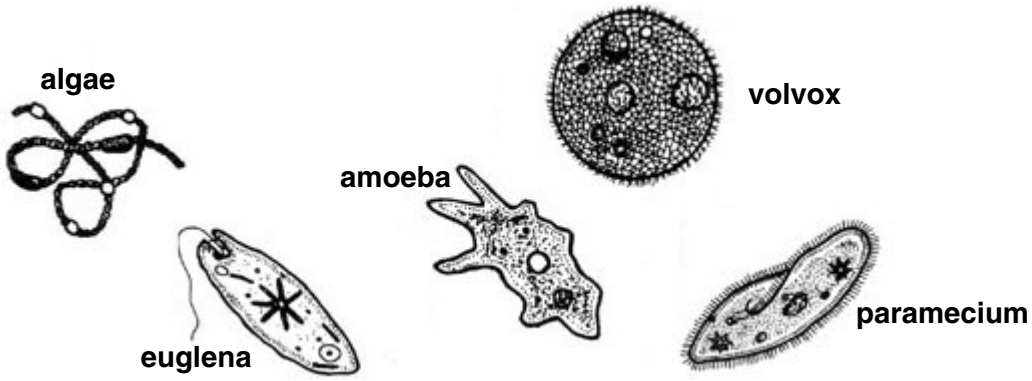
Keeping foods frozen or refrigerated enables us to keep foods fresh for longer periods of time because it reduces the chance that bacteria can reproduce. Other ways to control bacteria growth in foods include **pasteurization**, to increase the temperature, and **fermentation**, to lower the pH. On nonliving surfaces, **disinfectants** are used to kill bacteria. Bacterial growth is controlled on living surfaces, like skin, by the use of **antiseptics**.

Antibiotics are used to kill bacterial infections in animals and humans. However, because of improper use, bacteria can develop resistance to antibiotics. When the antibiotic is given, most of the bacteria die but some may survive. In order to kill all the bacteria, antibiotics need to be taken for the full time prescribed and only for non-viral illnesses. Bacteria cause diseases such as strep throat, tuberculosis, meningitis, bubonic plague, diphtheria, tetanus, and food poisoning.

Bacteria are grouped together by their cell shapes. There are three common shapes of bacteria. Some bacteria (***coccus***) are shaped like tiny **spheres**. *Streptococcus pyogenesis* is a coccus shaped bacteria that causes strep throat. Bacteria with **rod** shapes (***bacillus***), such as *Bacillus cereus*, inhabits the soil and is a common cause of food poisoning. **Spiral** shaped bacteria (***spirillum***) are able to move with assistance from structures called flagella on their ends. An example of a spiral bacteria are the *H. pylori*, which cause gastritis.



Other types of unicellular organisms come from the kingdom **Protista**. Examples of protists include **algae, amoebae, paramecia, volvox,** and **euglena**. **Algae** are plantlike protists. They contain chlorophyll that enables them to produce their own food by **photosynthesis**. They are important to the environment because they are the first link in most aquatic food chains. They also produce the oxygen necessary for cellular respiration in animals. Movement of small organisms is very interesting. Many bacteria and



some protists move by using a **flagellum**. Flagella are thread-like structures that whip around to move these small organisms. The euglena and volvox picture have flagella. A paramecium moves by **cilia** located all around it. See the hair-like structures in the picture above. An amoeba moves by projecting out its cytoplasm. Those projections are called **pseudopodia**, which means false feet. Pseudopodia, cilia and flagella are used to bring food into the cell as well as for locomotion.

PRACTICE

1. How do we benefit from bacteria?

2. What are some diseases caused by bacteria?

3. Describe the method of locomotion for the amoeba, paramecium, and euglena.

MULTICELLULAR LIFE

Multicellular organisms are organisms that are made up of many different cells. Most multicellular organisms come from two kingdoms. Multicellular organisms have cells which contain a nucleus that is surrounded by a nuclear membrane and separated from the rest of the cell. The **Plant** kingdom includes more than 350,000 species. The plant cell contains a nucleus and other organelles including chloroplasts, which allow the plant to make use of the sun's energy by the process of photosynthesis. Examples of typical plants include **ferns, conifers** (evergreens), and the more numerous **flowering plants**, which include grasses, cereal grains, decorative flowers, and broadleaf trees such as oaks and maples. Plants belong to the category of **autotrophs**, meaning self-feeders. This means that plants make their own food using energy from the sun.

The kingdom **Animalia** includes more than one million species of organisms. Roughly 97% of these species are **invertebrate**, meaning without a backbone. There are sixteen divisions of animals varying by degree of complexity and specialization. Examples (simplest to most complex) include sponges, jellyfish, worms, spiders, insects, fish, lizards, birds, and mammals. These animals must ingest nutrients to survive. Most animals are **heterotrophs**, meaning other feeders. Heterotrophs obtain energy from other organisms.

CELLULAR PROCESSES

Even to a child there is a distinct difference between living and non-living things. What criteria must an object meet in order to be called "alive"? There are certain characteristics that all living things have. They may be recognized by their ability to perform all of the following cellular processes:

1. **Absorption** is the process by which an organism takes in nutrients, oxygen, and water from its surroundings. These materials must pass through the cell membrane by means of passive transport.
2. **Excretion** is the movement of waste materials out of the cell.
3. **Digestion** is the breakdown of food particles into molecules that can be used by the cell.
4. **Reproduction** is the process of transferring genetic information from parent to offspring in order to assure future generations of that type of organism.
5. **Response** describes the reaction of an organism to an outside stimulus. All organisms respond to stimuli in their environment in some form or another.

6. **Energy** is required by all organisms to carry out life processes. The intake of food, absorption of food molecules and excretion of waste are requirements for all types of life. Without these three processes, living things would not be able to obtain nutrients needed for growth and reproduction.

PRACTICE

1. What are multicellular organisms?

2. Compare and contrast the major characteristics of the Plant and Animal kingdoms.

3. Identify the following cellular processes.
   a. Starch is broken down into sugars by enzymes in saliva.

   b. Carbon dioxide is removed from a cell.

   c. An amoeba divides in two.

   d. A cell undergoes photosynthesis.

   e. Ducklings crouch when predatory birds fly overhead.

   f. An amoeba encircles smaller bacteria and closes around them.

HUMAN BODY SYSTEMS

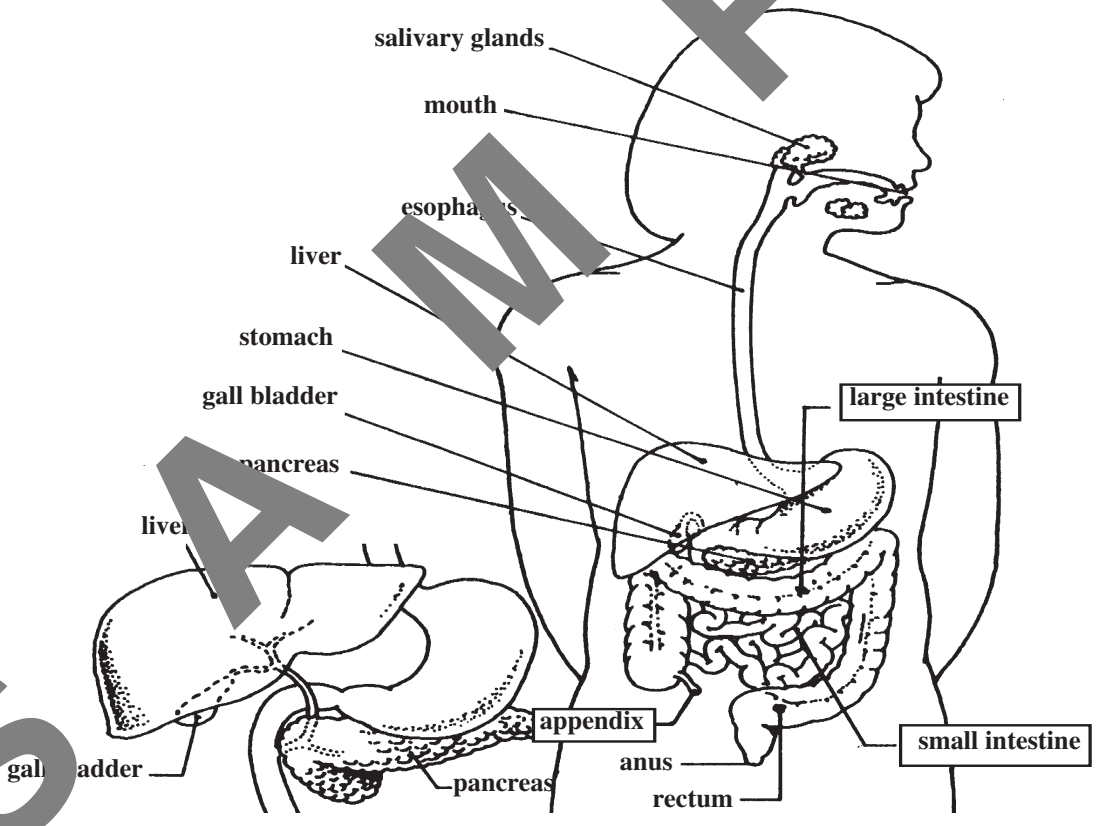
One-celled organisms are able to take in materials directly from their surroundings. Only surface cells can take in nutrients and give off wastes in plants and animals. Both plants and animals have **systems**, groups of parts working together for moving materials throughout their bodies. For example, blood cells in human bodies carry nutrients and oxygen through blood vessels. Tubes carry water and nutrients in some plants.

Many animals have body systems that are similar to humans. These systems carry information and materials from one part of the body to another part.

Take a look at the systems of the human body.

The Digestive System

The food that you eat is not in a form that your body can use instantly. Therefore, your body must change the food into a usable form. This process is called **digestion**. Large pieces of food are broken down into smaller pieces which are then chemically changed. This is how your body is able to get the necessary nutrients from the food.



The Human Digestive System

The digestive system is made up of the **digestive tract**, which contains all of the digestive organs and is about 10 meters long. Some parts of it are narrow and other parts are wide. The food you eat travels along the digestive tract until it reaches its final destination and is eliminated by the body. By that time, the body has taken all the nutrients provided by the food.

The **mouth** chews, grinds, and swallows the food. Next, the food enters the **esophagus**, a long tube which leads to the **stomach**. A thin flap of tissue, the **epiglottis**, prevents food from entering your windpipe, which is near the esophagus. If food were to get into your windpipe, it could choke you. After leaving the stomach, the food goes into a narrow, coiled tube called the **small intestine**, then enters the **large intestine** to prepare for excretion through the **rectum**.

The stomach plays an important role in digestion. The **stomach** is a bag-like organ which breaks down food through physical and chemical means. The walls of the stomach squeeze together, breaking food into small pieces. Then, the stomach uses chemicals called **gastric juices**, which break down the foods into a form that can be absorbed by the body. **Pepsin** is a mucus-like substance which helps to digest protein. **Hydrochloric acid** is a strong acid that kills bacteria and breaks food down into simpler chemical forms.

Most of the chemical digestion of food takes place in the **small intestine.** Special chemicals called **enzymes** continue to break the food down into usable forms. Pepsin, found in the stomach, is an example of an enzyme. **Lipase** is an enzyme found in the small intestine which breaks down fats. After the food has been chemically processed, it is ready to be absorbed by the body. **Absorption** refers to the movement of food from the digestive tract to the blood. Once the nutrients are absorbed by the blood, they are taken to the cells for growth and energy.

The small intestine sends undigested food, minerals, and water on to the **large intestine**, sometimes called the **colon**. Here, water and minerals are absorbed into the bloodstream. Undigested foods, such as fiber, and leftover waste is passed along the large intestine where they finally exit the body at the rectum. The body benefits from fiber in the diet. **Fiber** is a substance found in many foods, like whole wheat breads, that cannot be digested by humans. But the fiber can help the body in several ways. Some fiber is believed to lower the absorption of excess fat. Fiber can also help to lower cholesterol levels. Finally, fiber helps to keep your large intestine running smoothly and is believed to prevent cancer of the colon.

Three other organs aid in digestion, even though they are not directly part of the digestive tract. The **pancreas** lies below the stomach and releases digestive juices containing enzymes, which break down food chemically. The **liver** is the body's largest internal organ. It produces bile, which is stored in the **gall bladder**, a small organ underneath the liver. Bile breaks down fat into smaller droplets. This process, called **emulsification**, occurs in the small intestine.

PRACTICE

1. Why must food be broken down into smaller pieces?

2. Why is the stomach such an important part of the digestive system?

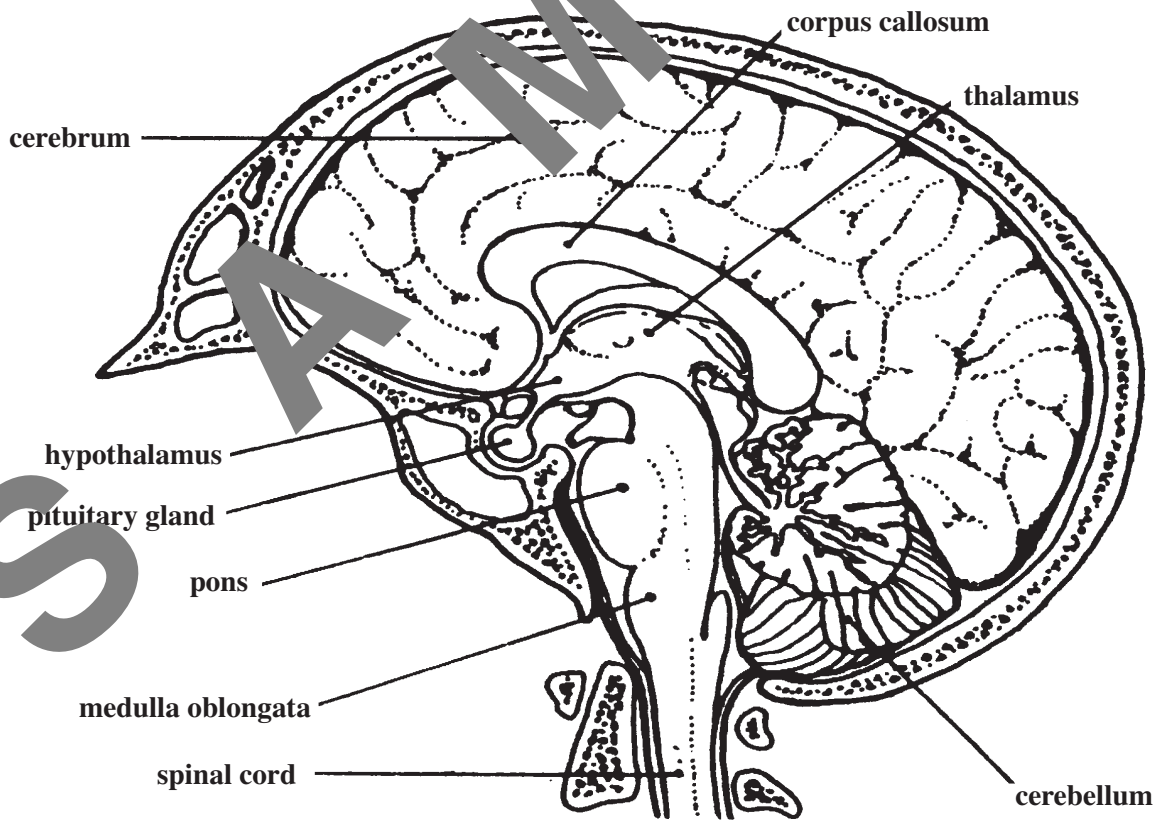
3. What happens to undigested food?

4. How does food reach the cells of the body?

5. Make a flowchart which shows the passage of food along the digestive tract, from the mouth to the rectum. Describe the processes that occur at each point along the way.

The Nervous System

The **nervous system** controls all of your body's activities. It consists of the brain, the spinal cord, and the network of nerves that run throughout the body. The nervous system directs your muscles and glands and is your body's way of controlling itself.

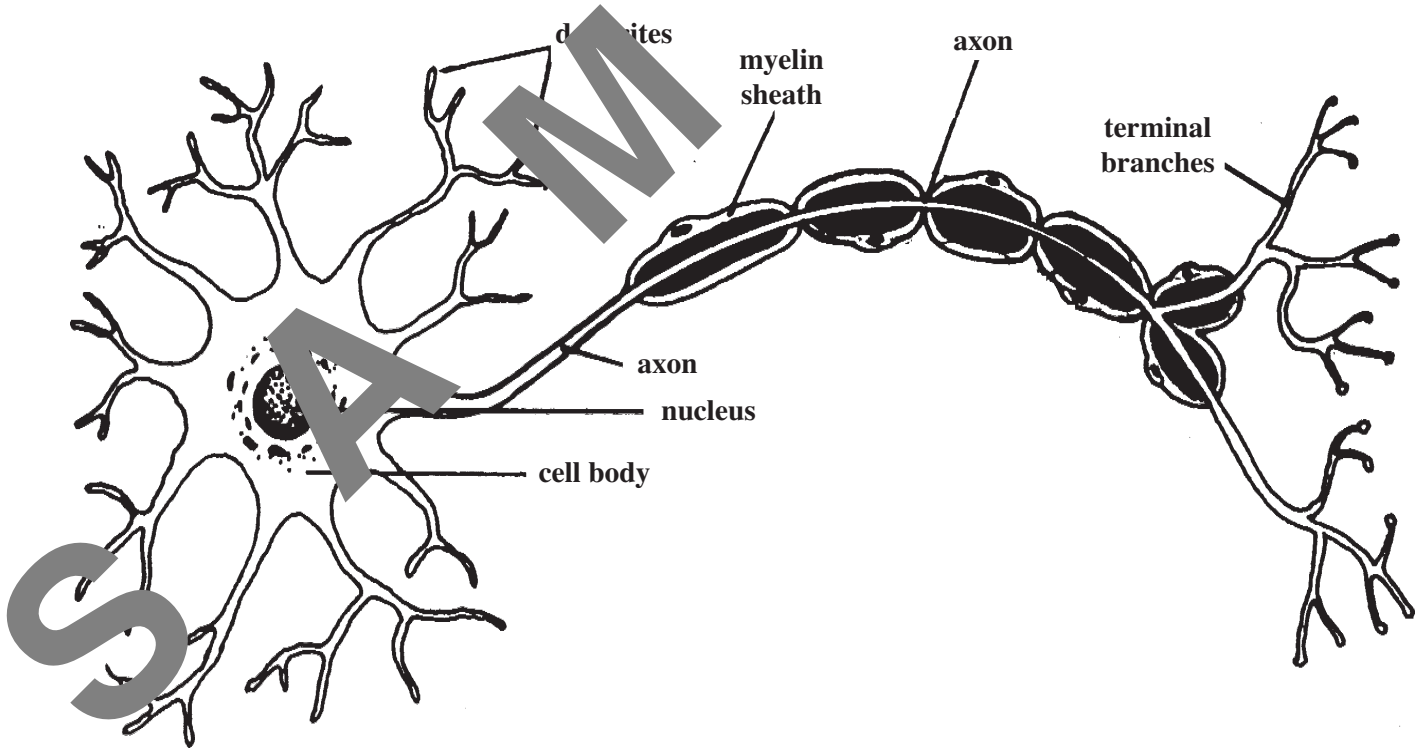


The Human Brain

The **brain** is the place where most of this control begins. The brain is underneath your skull. It is made up of nerve tissue. Its job is to receive and send messages. The messages may come from inside or outside your body. Some basic functions that are controlled by your brain include breathing, movement, thinking, and sleeping.

The brain is made up of three main parts. The **cerebrum** is what most people think of when they get an image of a brain. It is the largest part, and consisted of many creases, wrinkles, and folds. These increase the surface area of the cerebrum, allowing it to perform even more functions. The cerebrum receives and interprets information from your **sense organs**, such as your eyes, ears, nose, tongue, and skin. The cerebrum also aids in thinking, remembering, and making decisions. The cerebrum is divided into two halves or hemispheres. These two hemispheres are responsible for different functions in the body but they are joined by a thick connection called the **corpus callosum.**

The **cerebellum** is at the back of the brain. This part of the brain controls all body movements and maintains balance. Athletes depend on the cerebellum to help them coordinate fine motor movements of their bodies. These activities are called **voluntary responses** because they involve purposeful movement. The **medulla** rests at the base of the brain. The medulla connects the brain to the spinal cord. It controls basic processes such as heartbeat, digestion, and breathing. These activities are called **involuntary responses** because they occur on their own and do not require any thought. Without the medulla, we would not be able to survive. It controls the most basic of all biological functions.



A Neuron

Neurons are special cells that carry impulses from the nervous system to different parts of your body. Your brain consists of millions of neurons. Without these cells, the brain's ability to send and receive messages would disappear. **Dendrites** carry nerve impulses from neighboring cells *toward* the cell body of the neuron. **Axons** carry nerve impulses *away* from the cell body to other neurons. Axons act as a long cable connection. Some axons, like the ones running down your legs, can be as long as three feet! The axon is covered by a layer of fatty material called the myelin sheath. The **myelin sheath** acts as insulation so that nerve impulses don't stray off course. Once the neural message reaches the end of the axon, at the **terminal branches**, it is carried across a tiny space, called the **synapse**, and is picked up by the dendrites of another neuron. This process occurs in just a fraction of a second, and millions of neural impulses occur in your body each day.

PRACTICE

1. What is the job of the nervous system?

2. What is the job of the cerebrum?

3. Why do organisms need the medulla in order to survive?

4. Why would athletes need to have a highly developed cerebellum?

5. Design a flow chart to show how a message is sent from one neuron to another.

6. Surgeons today are able to transplant, or exchange, many different types of organs from one human body to another. Considering the complexity of the human nervous system, do you think that it will ever be possible to have brain transplants? Why or why not?