



The Digestive Process Begins



-  What Are the Functions of the Digestive System?
-  What Is the Role of the Mouth, the Esophagus, and the Stomach?



my planet DiARY

Watch Digestion Live

Often scientists make discoveries by accident. In 1822, Alexis St. Martin was wounded in the stomach. Dr. William Beaumont saved St. Martin's life but the surgery left him with a permanent opening in his stomach. By looking in this opening, Dr. Beaumont could observe food changing chemically! By analyzing liquid from St. Martin's stomach, Beaumont learned that the stomach liquid contains acid. He hypothesized that chemical reactions in the stomach broke down foods into very small particles. Today, scientists know Beaumont was right.




A healthy stomach lining

DISCOVERY

Write your answer to the question below.


What are some modern-day methods doctors use to see what happens inside the digestive system?

 **PLANET DIARY** Go to Planet Diary to learn more about digestion.



Do the Inquiry Warm-Up
Where Does Digestion Start?

What Are the Functions of the Digestive System?

Your digestive system is about 9 meters long from beginning to end. **Figure 1** shows the organs of the digestive system.  **The organs of the digestive system have three main functions: digestion, absorption, and elimination.** These functions occur one after the other in an efficient, continuous process.

Vocabulary

- digestion
- absorption
- saliva
- enzyme
- epiglottis
- esophagus
- mucus
- peristalsis
- stomach

Skills

- 🔍 Reading: Sequence
- 📌 Inquiry: Infer

Digestion The process by which your body breaks down food into small nutrient molecules is called **digestion**. Digestion can be mechanical or chemical. In mechanical digestion, bites of food are torn or ground into smaller pieces. This kind of digestion happens mostly in the mouth and stomach. In chemical digestion, chemicals break foods into their building blocks. Chemical digestion takes place in many parts of the digestive system. Substances made in the liver and pancreas help digestion occur.

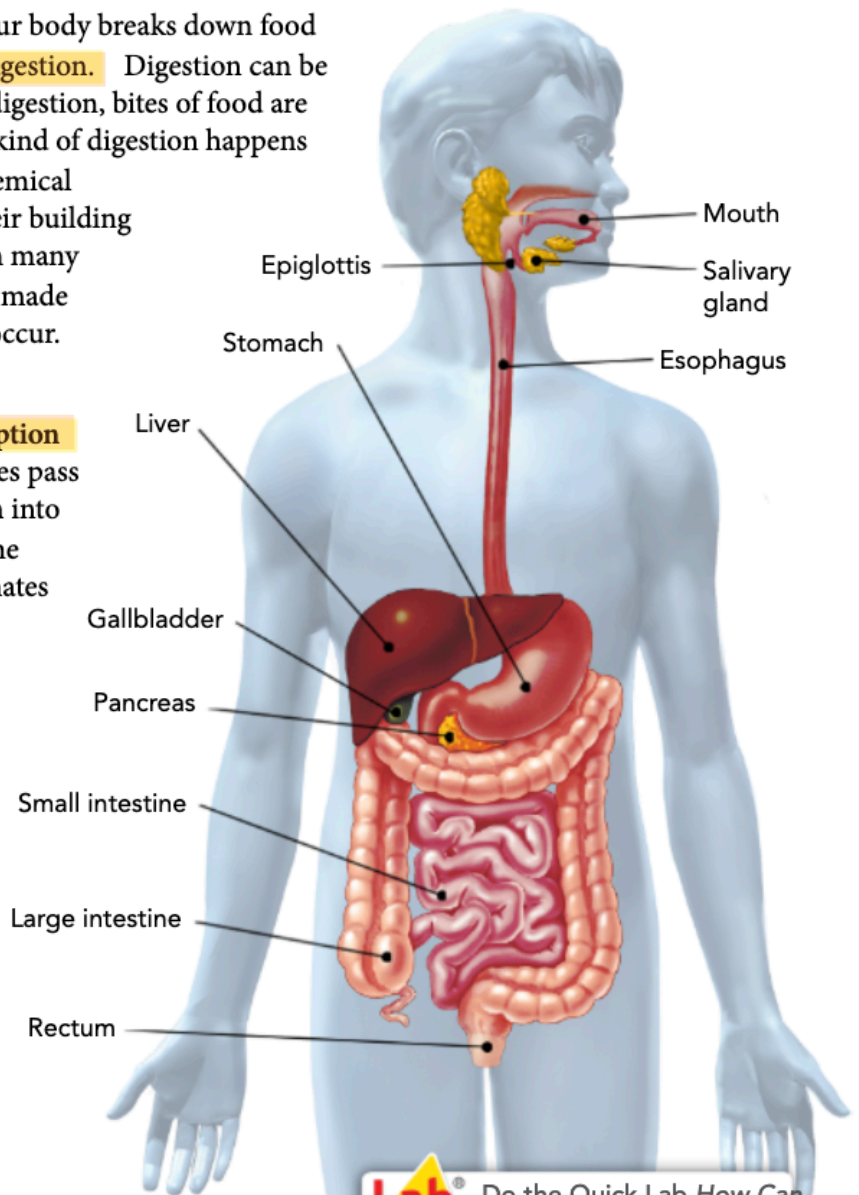
Absorption and Elimination

Absorption occurs after digestion. **Absorption** is the process by which nutrient molecules pass through the wall of your digestive system into your blood. Most absorption occurs in the small intestine. The large intestine eliminates materials that are not absorbed.

FIGURE 1
Digestive System Organs

Food passes directly through five of the organs of your digestive system.

Review Circle the name(s) of the organ(s) where mechanical digestion occurs. Check the name(s) of the organ(s) where most absorption occurs. Underline the name(s) of the organ(s) where elimination occurs.



Do the Quick Lab How Can You Speed Up Digestion?

Assess Your Understanding


got it?

- I get it! Now I know that the functions of the digestive system are _____
- I need extra help with _____

Go to **MY SCIENCE COACH** online for help with this subject.



What Is the Role of the Mouth, the Esophagus, and the Stomach?

Your upper digestive system consists of the mouth, the esophagus, and the stomach.  **Your mouth, esophagus, and stomach are the organs in which mechanical digestion is completed and chemical digestion of your food begins.**

The Mouth Have you noticed that smelling food can be enough to start your mouth watering? This response happens because your mouth is where digestion begins. **Figure 2** shows the parts of your mouth.


Digestion When you bite off a piece of food, both mechanical and chemical digestion begin inside your mouth. Your teeth and tongue carry out mechanical digestion. Your teeth cut, tear, crush, and grind food into small pieces. Your tongue pushes food toward your teeth.

As your teeth work, your saliva (suh LY vuh) moistens food into a slippery mass. **Saliva** is the fluid released by salivary glands when you eat. Saliva contains a chemical that can break down starches into sugars. This begins the chemical digestion of your food.

FIGURE 2

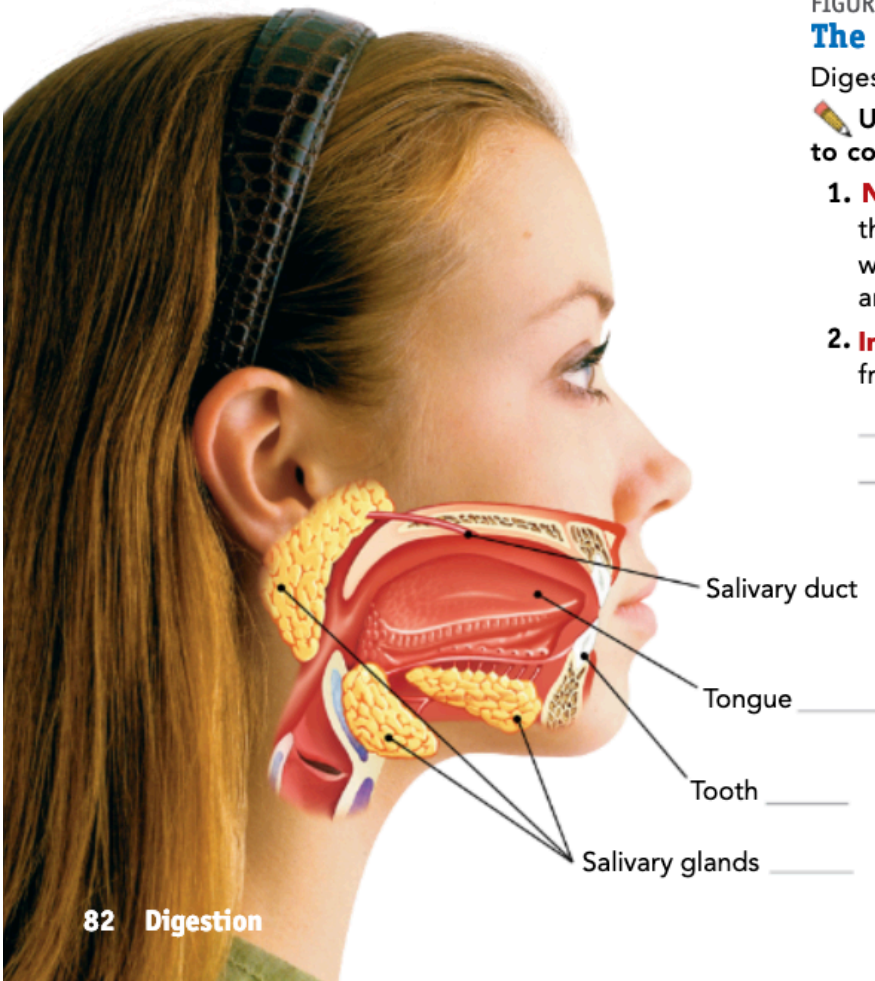
The Mouth

Digestion begins in your mouth.

 Use the diagram of the mouth to complete the activities.

- Name** Identify the type(s) of digestion that each part of your mouth is involved with. Write an **M** for mechanical digestion and a **C** for chemical digestion.
- Interpret Diagrams** How does saliva get from the salivary glands into the mouth?

- CHALLENGE** Identify two problems that a person without salivary glands might have.



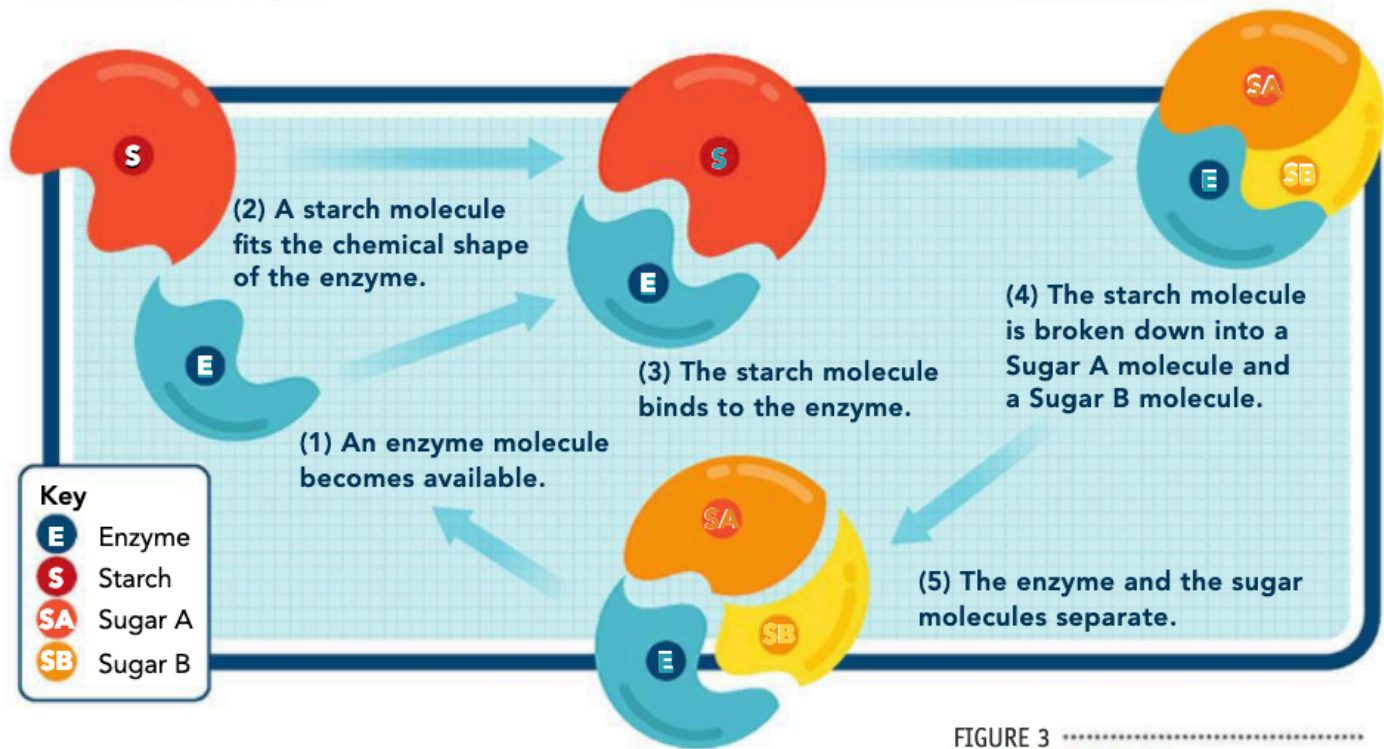


FIGURE 3

ART IN MOTION How

Enzymes Work

Enzymes help break down starches, proteins, and fats.

Observe Identify which molecule does not change.

Enzymes The chemical in saliva that digests starch is an enzyme. An **enzyme** is a protein that speeds up chemical reactions in the body. Your body produces many different enzymes. Each enzyme has a specific chemical shape that enables it to speed up only one kind of reaction. Different enzymes are needed to complete the process of digestion. **Figure 3** shows how enzymes work.

apply it!

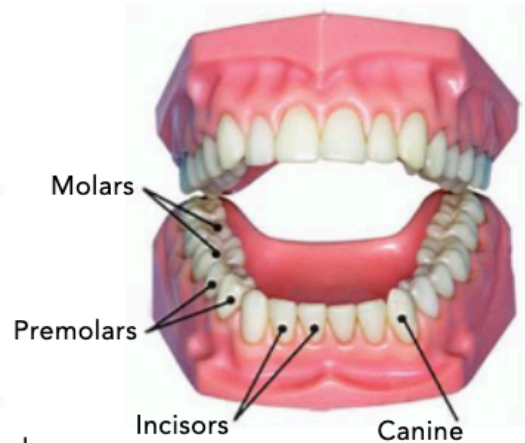
You have four types of teeth. Each type has a specific function.


1 Name Think about eating a carrot. Which type of teeth cuts the carrot into a bite-sized piece? _____

2 Identify Which teeth at the back of your mouth crush and grind the carrot piece? _____ and _____

3 Interpret Diagrams When people tear chicken off a bone, they use their pointed teeth called _____

4 Summarize Write about all the teeth people use to eat an apple.



 **Sequence** Write in order the names of the organs that food passes through at the beginning of digestion.

↓

↓

The Esophagus The back of your mouth has two openings. One opening leads to your windpipe, which carries air into your lungs. As you swallow food, the **epiglottis** (ep uh GLAHT is), a flap of tissue, seals off your windpipe and prevents food from entering the lungs. The food goes into the **esophagus** (ih SAHF uh gus), a muscular tube that connects the mouth to the stomach. The esophagus is lined with **mucus**, a thick, slippery substance produced by the body. Mucus makes food move easily. Waves of involuntary muscle contractions, called **peristalsis** (pehr ih STAWL sis), push food toward the stomach.


The Stomach When food leaves the esophagus, it enters the **stomach**, a J-shaped muscular pouch in the abdomen, shown in **Figure 4**. Most mechanical digestion and some chemical digestion occur in the stomach.


Mechanical Digestion Mechanical digestion is completed in the stomach. It occurs as layers of smooth muscle in the stomach wall contract to produce a churning motion. This action mixes the food with fluids in the stomach.

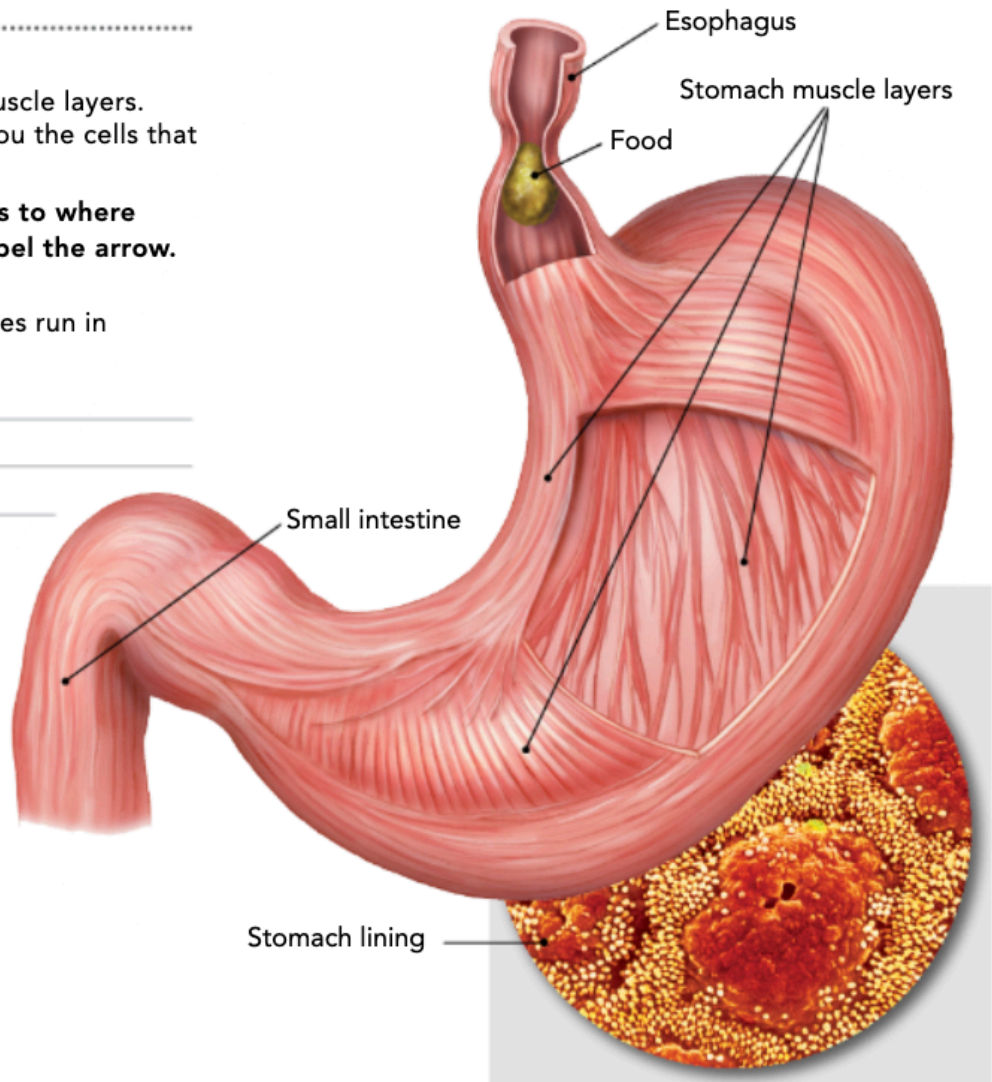
FIGURE 4

The Stomach

The stomach wall has three muscle layers. The microscopic view shows you the cells that line the inside of the stomach.

 Draw an arrow that points to where peristalsis is taking place. Label the arrow. Then answer the question.

 **Infer** Why do stomach muscles run in different directions?



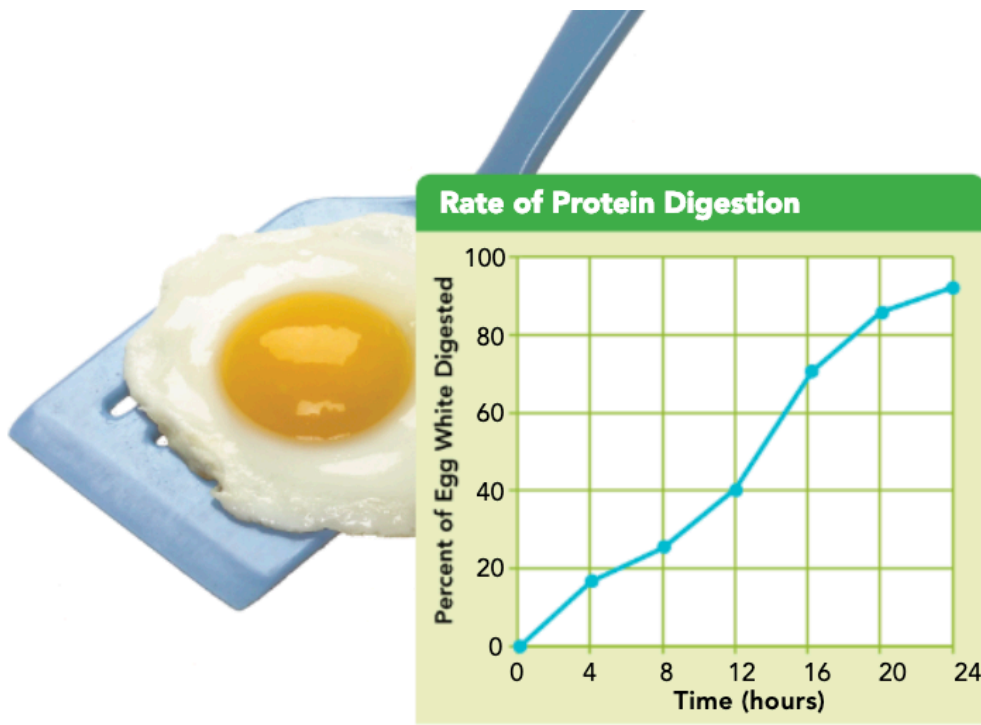


FIGURE 5

Protein Digestion

The graph shows the results of an experiment that measured the rate at which protein in egg white was digested by pepsin in a mixture of hydrochloric acid.

Use the graph to answer the questions.

- Infer** Would all the protein you eat be digested by the time it leaves the stomach? Explain.

- CHALLENGE** Draw a line on the graph that you think might show the results of an experiment on carbohydrate digestion. Explain.



Chemical Digestion Chemical digestion occurs as the churning food mixes with digestive juice. Digestive juice is a fluid produced by cells that line the stomach. It contains the enzyme pepsin, which chemically digests proteins into short chains of amino acids. A graph of protein digestion is shown in **Figure 5**.

Digestive juice also contains hydrochloric acid, a strong acid that helps your stomach function in two ways. First, pepsin works best in an acid environment. Second, the acid kills many bacteria that you swallow with your food. Mucus, which lines the stomach, protects the stomach from the acid.

Food usually stays in your stomach for a few hours until mechanical digestion is complete. Then, the food you ate, now a thick liquid, enters the next part of the digestive system. That is where chemical digestion continues and absorption take place.

Lab zone Do the Lab Investigation *As the Stomach Churns.*

Assess Your Understanding

- Review** The _____ in your body speed up chemical reactions.
- Compare and Contrast** The stomach is similar to a washing machine because _____

got it?

- I get it! Now I know that the role of the mouth, esophagus, and stomach is _____

- I need extra help with _____

Go to **my science** **COACH** online for help with this subject.