



SCIENCE

STUDENT BOOK

▶ **6th Grade | Unit 2**

SCIENCE 602

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Body Systems

Introduction

Just as God marvelously designed a vast variety of plants, He also created people and animals with various body parts that interrelate in a complex fashion. We call these related parts “body systems.” For example, God designed a way for people and animals to eat and digest food in their bodies. We call this the “digestive system.” All animals and humans have a digestive system. In fact, if we examine the various “systems” within the human body, we can get a good idea of the basic operation of most of the “animal systems” that God has designed.

The human body is among the most wonderful parts of God’s creation. Psalm 139:14 records that we are “fearfully and wonderfully made!” God designed the various parts of our bodies in a very detailed and marvelous fashion. In this LIFEPAK®, we will explore three major “systems” of the human body: (1) the digestive system, (2) the excretory system, and (3) the skeletal system. By examining these three systems of the human body, you will learn about the body systems common to all animals.

Objectives

These objectives tell what you should be able to do when you have completed this LIFEPAK. When you have finished this LIFEPAK, you should be able to:

1. Name and locate the main parts of the digestive system.
2. Identify the function of each main part of the digestive system.
3. Explain different ways to prevent common digestive diseases.
4. Name and locate the main parts of the excretory system.
5. Identify the function of each main part of the excretory system.
6. Identify ways to prevent common diseases of the excretory system.
7. Name and locate the main parts of the skeletal system—the muscles and bones.
8. Identify the main functions of muscles and bones.
9. Identify ways to prevent common diseases of muscles and bones.

1. DIGESTIVE SYSTEM

The human digestive system is the most wonderful chemical laboratory known to us! It converts the food eaten into energy and raw materials to build and maintain the work of the body. All animals, from earthworms to

grasshoppers to birds, have digestive systems very similar to the human digestive system. All have about the same digestive parts and purposes. In this section, we will learn mostly about our human digestive system.

Section Objectives

Review these objectives. When you have completed this section, you should be able to:

1. Name and locate the main parts of the digestive system.
2. Identify the function of each main part of the digestive system.
3. Explain different ways to prevent common digestive diseases.

Vocabulary

Study these words to enhance your learning success in this section.

alimentary canal (al ə men tər e kə nal). Parts of the body through which food passes.

dissolve (di zolv). To become a liquid or part of a liquid. Like sugar *dissolving* in water.

emulsion (i mul shən). Milky liquid with drops of fat or oil.

esophagus (ē sof ə gəs). Tube connecting the mouth to the stomach.

pancreas (pan krē əs). Gland near stomach that produces digestive juices.

pancreatic (pan krē at ik). Of the pancreas or from the pancreas.

soluble (sol yə bəl). Can be dissolved. Salt is *soluble* in water.

Note: All vocabulary words in this LIFEPAC appear in **boldface** print the first time they are used. If you are not sure of the meaning when you are reading, study the definitions given.

Pronunciation Key: hat, āge, cāre, fār; let, ēqual, term; it, īce; hot, ōpen, ōrder; oil; out; cup, pūt, rüle; child; long; thin; /TH/ for then; /zh/ for measure; /ə/ represents /a/ in about, /e/ in taken, /i/ in pencil, /o/ in lemon, and /u/ in circus.

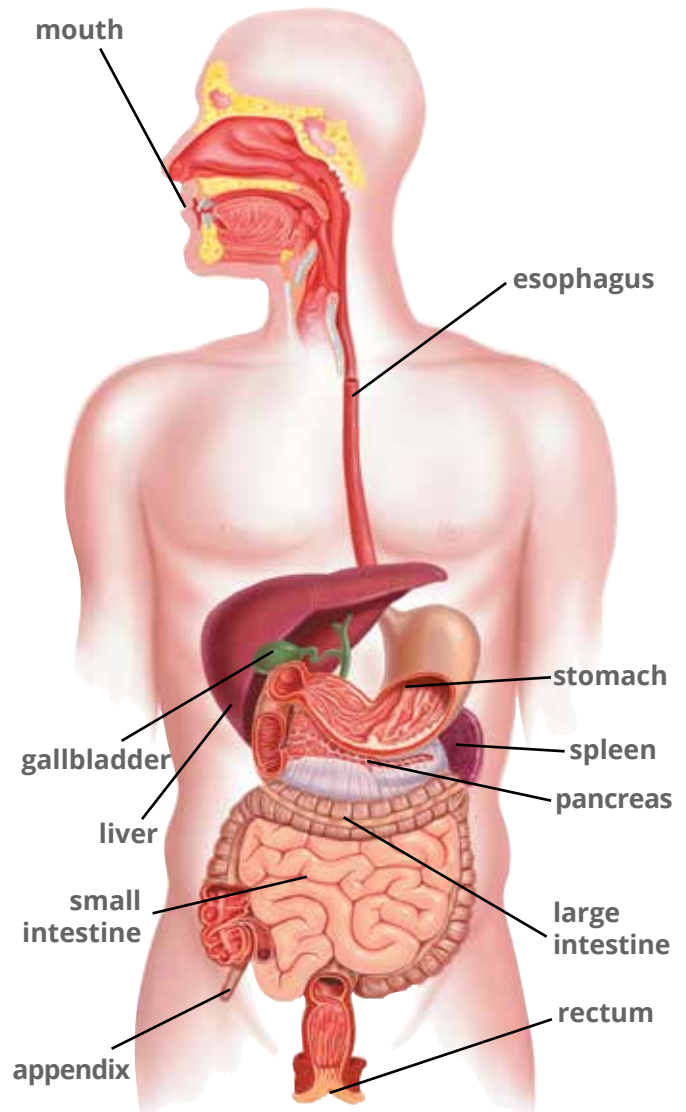
STRUCTURE

Digestion is a process used by animals to break down their food. Large chemicals like starch and protein must be broken down into simple chemicals. These chemicals must be able to **dis-solve** in water and pass through the cell walls.

Food that is eaten passes through the digestive system, also known as the **alimentary canal**. The digestive system begins with the mouth and continues down through the **esophagus**, stomach, small intestine, large intestine, and rectum. All along the alimentary canal, digestive glands add juices to the food to aid digestion. If these juices are not there at the right time in the right amount, indigestion or other illnesses may result.

Each part has a special task to do. If any one part fails to do that task, the whole body suffers.

We as children of God work the same way. Each one of us is created with a special task to do in life. If we don't do that task the best we can, others who depend on us will suffer (1 Corinthians 12:14-31). God wants us to perform and accomplish the task and roles in life that He has given us to do. We will be the happiest as we do these things.



| The Digestive System



Complete the following activities.

1.1 What does the digestive system do? _____

1.2 Why is it necessary to digest the food we eat? _____

1.3 List in order the six main parts in the alimentary canal.

- a. _____ b. _____ c. _____
 d. _____ e. _____ f. _____

FUNCTION

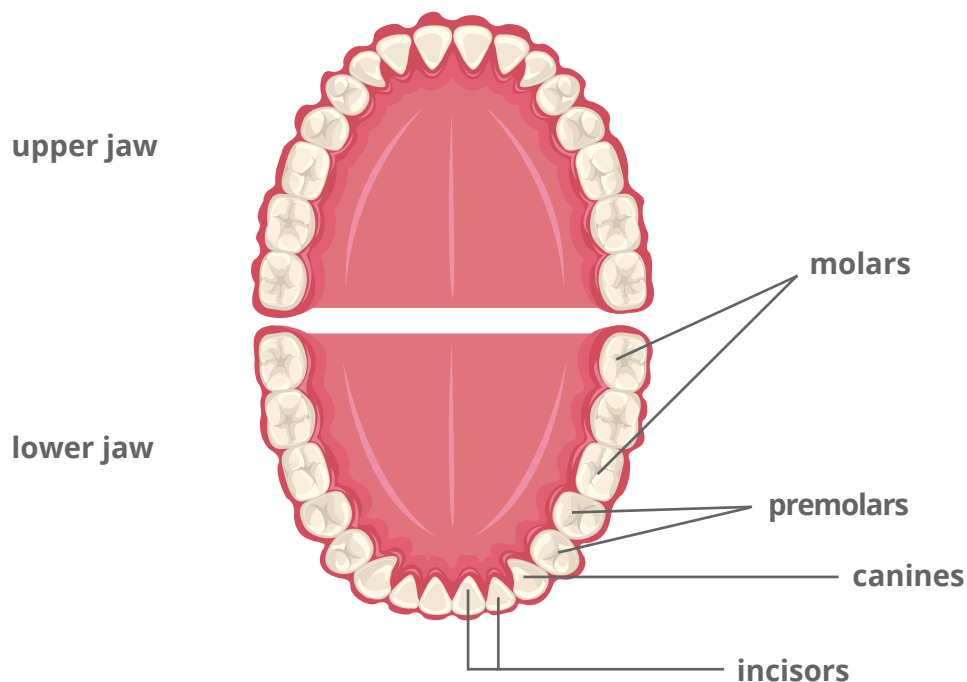
Let's look at each of the main parts of the alimentary canal. Each part is very important to the life of the animal.

Mouth. The mouth has two functions. First, it chews and grinds the food into small pieces. The teeth and tongue do this work. Doctors suggest that we chew our food at least twenty times for each bite. This chewing allows time for the mouth to grind the food and to add saliva and mucus.

Most humans and mammals have two sets of teeth during their lifetime. The first set, about twenty, are "baby" teeth and come out as we grow up. Permanent teeth are designed to last a lifetime. Normally, an adult will have a set of thirty-two permanent teeth. Our front teeth, the incisors, help us to cut food; the canines

help us to bite food; and the bicuspid and molars are used to grind food.

The second purpose of the mouth is to begin breaking down the food for the body's use. Saliva contains the enzyme *amylase*, which breaks down starch into the sugar glucose. You may remember in LIFEPAK 601 that eating a cracker by chewing it a long time causes it to become sweet. This change in taste occurs because the starch is turning into sugar. Salivary glands are located under the tongue, near each ear, and under each side of your jaw. When you smell or taste food, these glands work very rapidly. At this same time, the taste buds of the tongue become active. If the food tastes bad or we dislike it, we can spit it out. This helps us protect our bodies from eating harmful food.



| Humans have two sets of teeth.

1.6 Do at least one of the following activities. Discuss your choice with your teacher. Then, get his or her initials.

_____ Prepare a report on tooth decay. Include such things as common causes and prevention.

_____ Visit with a local dentist. Ask if the dentist has a model of a tooth and see if you can identify and describe each part.

_____ Make a display of some tooth X-rays showing some healthy ones and some decayed ones.

_____ Prepare a report on diseases of teeth and gums.

TEACHER CHECK

_____ initials

_____ date

Stomach. From the mouth, the food passes through the esophagus. No digestion occurs here. The esophagus is a muscular tube that carries the food to the stomach. Between the esophagus and the stomach is an opening called the esophageal opening. This opening is controlled by the muscles of the esophagus. The opening relaxes and allows food to pass through to the stomach and then closes after the food passes through it. This contraction closes off the stomach so that food doesn't come back up the esophagus during digestion. You can test this process by standing on your head. Food won't fall out of your stomach. When you get a stomach flu, this muscle relaxes so your body can get rid of the unwanted food.

Dr. William Beaumont (1785-1853) was an American scientist. He was one of the first scientists to study the digestion process in the stomach. One day in 1822, Alexis St. Martin, a trapper, was treated by Dr. Beaumont. St. Martin accidentally shot himself in the side with his shotgun. As a result, he had a large hole in the left side of his body. Since Dr. Beaumont knew

very little about stomach surgery, he did his best to sew up the wound.

Something interesting happened as a result. St. Martin lived, but the side of his stomach healed and attached itself to the side of his ribs. This left a hole in his side that led directly into his stomach. Bandages were left to cover the hole so the food would not fall out. Dr. Beaumont realized the possibilities of this situation and convinced St. Martin to be his patient. Then, Dr. Beaumont began his experiments on how the stomach worked. His studies of St. Martin lasted nearly eleven years.

Dr. Beaumont's studies showed that the stomach has two main purposes. He found that as food entered the stomach, it churned and moved, grinding up the food. Also, the stomach produced juices that broke down the tissues of different kinds of meat. This stomach juice is called *gastric juice*. It contains acid, enzymes, and water which digest the foods we eat. One of these enzymes is *rennin*. Let's investigate how it works.



View 602 Rennin Lab, from the Grade 6 SCIENCE EXPERIMENTS video.



Try this experiment to learn about rennin.

Overview. You will examine the effect of the enzyme rennin on milk.

These supplies are needed:

- stove/hot plate/alcohol burner
- 1 Rennet tablet or 1/2 gram of rennin (Note: Rennet tablets or rennin (junktet tablets are a brand name) can be found at pharmacies, grocery stores, stores with cheese-making supplies, and online sources.)
- Pyrex beaker (about 250 ml) or other glass container that won't break easily
- metric measuring cup or dropper
- water
- 10 ml whole milk
- test tube and clamp

Follow these directions. Check each box when the step is completed. This investigation will take twenty minutes.

1. Fill the beaker 3/4 full with water. Heat to boiling. Proceed to the next step while you wait.
2. Crush one Rennet tablet or use 1/2 gram of rennin.
3. Put 10 milliliters whole milk in a test tube.
4. Add the crushed Rennet tablet or rennin.
5. Slowly heat the test tube of milk and rennin in the boiling water bath.
6. Record your observations in 1.7.
7. Clean up your equipment and put it away.



Experiment 602.A Rennin Lab

**Complete the following activities.**

1.7 Record your observation of heated milk and rennin (Step 5). _____

1.8 Predict what you think will happen to milk in your stomach. _____

This reaction is evidence of God's particular creation of humans and animals. Only humans and mammals that feed milk to their babies have rennin in their stomach. Some examples of these mammals are horses, cattle, dogs, and cats. Rennin is necessary to change the protein in milk into simple chemicals the baby can use. If rennin were not present, the baby would probably die of starvation due to a lack of protein.

Answer the following question.

1.9 How does the preceding paragraph describe how mammals might be affected if rennin was not present in their stomachs ? _____

TEACHER CHECK

initials

date

About every thirty minutes, the stomach empties some of its contents. This partly digested food passes out of the lower end of the stomach and into the small intestine through an opening called the *pyloric orifice*. Recall that muscular contractions control the food leaving the stomach. The pyloric orifice relaxes, allowing food to pass through, and then closes again.

Intestines. Review the diagram on the structure of the digestive system from earlier in this

section of the LIFEPAK. Notice that the small intestine is located near three other body parts. These body parts are the liver, gall bladder, and **pancreas**. They produce the digestive juices necessary to finish the food digestion. The liver secretes a liquid called *bile*. This greenish-yellow juice is stored in the gall bladder and is used in the small intestine to break down fats into an **emulsion**. To see how bile works in digestion, let's investigate an emulsion.



Try this experiment to learn about emulsions.

Overview. You will learn about the way bile works in digestion by observing the effect of soap on a mixture of oil and water.

These supplies are needed:

- two test tubes with stoppers or two tall thin bottles (vials) with lids
- 10 drops of cooking oil
- 4 drops of liquid soap
- water

Follow these directions. Check each box when the step is completed.

1. Get the tall containers with lids. Fill them about 1/2 full with water.
2. Add 5 drops of oil to each container.
3. Record what you see in 1.10.
4. Add 2 drops of soap to one of the test tubes. Shake rapidly. Then let it stand for one or two minutes.
5. Record what you see in 1.11.
6. Wash your equipment and return it to the proper place.



Experiment 602.B Emulsions



View 602 Emulsions, from the Grade 6 SCIENCE EXPERIMENTS video.

**Record your observations.**

1.10 Record your observations for oil and water (Step 2). _____

1.11 Record your observations for oil, soap, and water (Step 4). _____

Answer the following questions.

1.12 The soap works the same way as bile. The oil breaks up into tiny droplets, which will not come back together. Now, the **pancreatic** juices can get to the work of digesting fats. Bile is not an enzyme. It only causes the fat to emulsify. Why do you think it is necessary to break up the fat into tiny droplets?

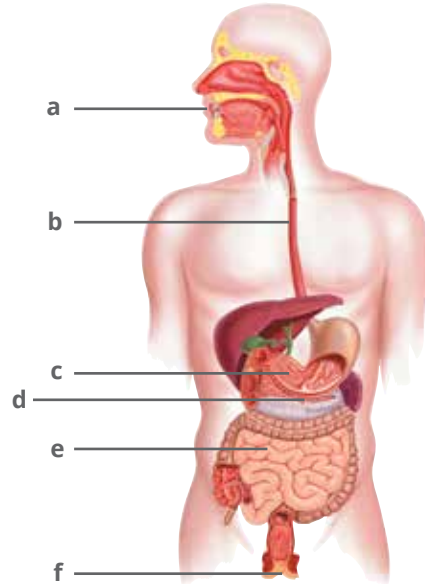
1.13 How could you explain why soap is able to clean the oil and dirt off our bodies?

TEACHER CHECK_____
initials_____
date

SELF TEST 1

Match these items by writing the correct letter in each blank (each answer, 2 points).

- 1.01 _____ small intestine
- 1.02 _____ mouth
- 1.03 _____ stomach
- 1.04 _____ esophagus
- 1.05 _____ rectum
- 1.06 _____ pancreas



Match these items (each answer, 2 points).

- | | |
|----------------------------|-------------------------|
| 1.07 _____ gall bladder | a. makes bile |
| 1.08 _____ liver | b. fastened to colon |
| 1.09 _____ salivary glands | c. stores bile |
| 1.010 _____ appendix | d. teeth |
| _____ | e. located in the mouth |

Complete these statements (each answer, 3 points).

- 1.011 List two main reasons the mouth is necessary in digestion:
 a. _____ b. _____
- 1.012 The esophagus joins the a. _____ to the b. _____.
- 1.013 The stomach has the function of a. _____ and b. _____.

1.014 List the two main functions of the small intestine:

- a. _____
b. _____

1.015 List two functions of the colon:

- a. _____
b. _____

Write the letter for the correct answer on the blank (each answer, 2 points)

1.016 The food stays in the stomach about ____ .

- a. six hours b. thirty minutes c. three hours d. ten hours

1.017 The most important part for transferring digested food to the blood stream is the ____ .

- a. mouth b. colon c. small intestine d. appendix

1.018 The time to digest the food in the small intestine is about ____ .

- a. six hours b. thirty minutes c. three hours d. ten hours

1.019 Doctors say proper digestion is helped by chewing each bite ____ times.

- a. twenty b. ten c. five d. fifteen

1.020 The six main parts of the digestive tract are known as the ____ .

- a. respiratory system b. alimentary canal
c. esophagus d. circulation system

1.021 The greenish-yellow juice stored in the gall bladder is called ____ .

- a. rennin b. starch c. fat d. bile

1.022 Saliva contains an enzyme that digests ____ .

- a. sugar b. starch c. fat d. protein

1.023 Bile is necessary to digest ____ .

- a. sugar b. starch c. fat d. protein

1.024 The digestion of protein occurs mostly in the ____ .

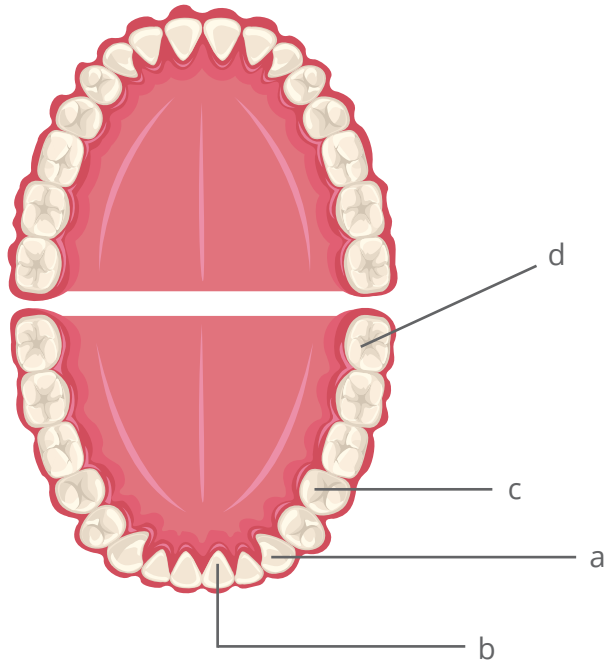
- a. mouth b. stomach c. liver d. colon

1.025 Rennin is an enzyme that digests ____ .

- a. bread b. milk c. potatoes d. lettuce

Match these items by writing the correct letter in the blank (each answer, 2 points).

- 1.026 _____ canines
- 1.027 _____ incisors
- 1.028 _____ premolars
- 1.029 _____ molars



Match these items (each answer, 2 points).

- | | | | |
|-------|------------------------------|----|---------------|
| 1.030 | broken down before digested | a. | rennin |
| 1.031 | necessary for good health | b. | brushing |
| 1.032 | prevents cancer of the colon | c. | bile |
| 1.033 | are not digested | d. | colon |
| 1.034 | prevents tooth decay | e. | protein |
| 1.035 | an enzyme | f. | bulk in diet |
| | | g. | vitamins |
| | | h. | balanced diet |

Answer these questions (each answer, 5 points).

1.036 Why is it necessary to digest the food we eat? _____

1.037 What are some things that are necessary for good health? _____

	SCORE _____	TEACHER _____	initials	date
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