

A Journey Through the Digestive System

Objective

Students will use math and science skills while taking a journey through the digestive system.

Background

The main function of the digestive system is to break down food into molecules small enough for the body to absorb. The nutrients are absorbed in the body and used for energy. Our digestive system goes through eight basic steps.

1. **Mouth/Teeth**—First steps in the digestive system take place in the mouth as the teeth cut, tear, and grind the food down into small enough pieces so that it can fit down the throat. Saliva is squirted into the food to moisten and soften the food. The mouth makes close to 500 milliliters (1/2 quart) of saliva each day. Saliva contains chemicals called enzymes, which break down the starches in the food. The enzyme in saliva that breaks down starch into sugar is called amylase.
2. **Tongue**—A muscle that works with the food and saliva to form a “ball” that can be swallowed. Of course, the tongue also contains taste buds that help us tell the difference between salty, sour, sweet and bitter foods.
3. **Esophagus**—The esophagus is simply a transportation tube from the mouth to the stomach. When we swallow, what we are really doing is closing a trap door in our throat called the epiglottis. This sends food down the esophagus and prevents food from going down the trachea (or windpipe) and into our lungs. Food moves down the esophagus by a process called peristalsis. Peristalsis uses layers of muscle in your esophagus and intestines. These muscles relax and contract in a wave motion to pass food forward.
4. **Stomach**—The first stop after the esophagus is the stomach. Once the food gets to the stomach, the stomach uses chemicals to try to make the food particles tinier. These chemicals are called gastric juices, and they include hydrochloric acid and enzymes (chemicals that break down food). The food is moved around in the stomach and mixed with the chemicals for 3-4 hours. When the stomach is finished with it, the food is a creamlike liquid called chyme. This substance is still not small enough to get into our blood stream, and it has not yet provided the body with anything useful. Now a valve at the end of the stomach opens, sending the food past the liver.
5. **Liver/Gallbladder**—At this point, our food is hit with more chemicals. The liver makes a chemical called bile, and it is stored in the gallbladder. When the gallbladder mixes bile with our food, it does an important job: breaking down the fat (from milk, butter, cheeses) into tiny droplets. This fat will supply us with much energy later.

Oklahoma Academic Standards

GRADE 3

Speaking and Listening: R.1,2,3; W.1,2. Reading and Writing Process: R.3. Critical Reading and Writing: W.2. Vocabulary: R.1,3,5. Number & Operations: 2.3,5. Measurement: 2.3,4. Health—1.11 PE—5.34; 6.2

GRADE 4

Speaking and Listening: R.1,2,3; W.1,2. Reading and Writing Process: R.3. Critical Reading and Writing: W.2. Vocabulary: R.1,3,5. Number & Operations: 1.5. Algebraic Reasoning: 2.2. Measurement: 2.4,5. Life Science: 1-1 Health—1.11

GRADE 5

Speaking and Listening: R.1,2,3; W.1,2. Reading and Writing Process: R.3. Critical Reading and Writing: W.2. Vocabulary: R.1,3,5. Physical Science: 1-4. Life Science: 2-1. Number & Operations: 1.4. Measurement: 3.2,3,4. Health—1.8; 3.10. PE—4.1; 5.5; 6.3; 7.1,3

Materials
long string and a yardstick
unsalted or regular crackers
dictionaries
chalk or marker

6. Pancreas—The pancreas also adds a digestive chemical as the food leaves the stomach. This digestive juice works on breaking down the carbohydrates (from breads, potatoes, pasta, etc.) and the proteins (from meats, eggs, peanut butter, etc.)
7. Small intestine—The small intestine is the real hero of the digestive system. The small intestine is a tube that is about 18 feet long! This is where the real digestion takes place. As the food passes through, it is mixed with the new chemicals and is finally digested enough to be put to use by the body. Along the walls of the intestine are thousands of tiny fingers called villi. Blood vessels (capillaries) in the villi can absorb the tiny food molecules and send them off to the rest of our body through the blood.
8. Large Intestine—Whatever the body cannot put to use is sent to the large intestine. Many plants, for example, contain cellulose, which cannot be digested. The big job of the large intestine is to remove water. Water has been necessary up until this point in the digestive process. Now it is no longer needed; therefore, the water in the large intestine is sent into the bloodstream. Food spends about 12 hours in the large intestine. Undigested food is called solid waste feces, and this is stored in the rectum until it leaves the body.

You can help your digestive system by drinking water and fluids, at least eight glasses a day, and eating a healthy diet that includes foods rich in fiber. High-fiber foods, like fruits, vegetables, and whole grains, make it easier for solid waste to pass through your system.

The digestive system is a pretty important part of your body. Without it, you couldn't get the nutrients you need to grow properly and stay healthy. Next time you sit down to lunch, you'll know where your food goes—from start to finish!

English Language Arts

1. Provide copies of the student worksheet.
 - Read and discuss background.
 - Students will fill in the blanks on the worksheet as they listen to you read the background information.
2. Hand out vocabulary worksheet.
 - Review vocabulary
 - Students will write the correct word next to the definition. Provide dictionaries.
3. Students will write, diagram or act out the eight-step journey of food through the digestive system.

Science

1. Discuss the role of saliva in breaking down food. Saliva contains chemicals called enzymes, which break down the starches in the food. The enzyme in saliva that breaks down starch into sugar is called amylase. Why does saliva help digest food?

- Students take several bites of a cracker and chew thoroughly but DO NOT SWALLOW the cracker.
- Students write descriptions of the cracker’s flavor and texture.
- Students keep chewing the cracker for at least one minute and try not to swallow.
- Students write descriptions of the cracker’s flavor and texture after the saliva has worked on it.
- Ask students what they think the saliva does to the starch in the cracker. Students write their answers.
- Discuss some of the ways saliva helps digest food.

Math

- How long is the average digestive system?
 - Mark off 3 inches (7 cm) of string to represent your mouth.
 - Add 10 inches (25 cm) for your esophagus.
 - Add 6 inches (15 cm) for your stomach.
 - Add 18 feet (5.5 m) for your small intestine.
 - Add 5 feet (1.5 m) more for your large intestine.
 - Measure the entire length of the string and record the results. How many inches? Centimeters? Feet? Meters? Yards?

Physical Education

- Play this game to test students’ knowledge of vocabulary words.
 - Write “Digestive System” on two separate places on the chalkboard.
 - Create an open space where students can move from the back of the room to the front of the room to the chalkboard.
 - Divide the class into two groups. Make sure the teams are divided evenly. One person may have to go twice.
 - Each group will line up at the back of the room for a relay race.
 - The first person in each line will be given a piece of chalk.
 - One by one, students will hop, walk backwards or skip to the chalkboard.
 - At the chalkboard, each student will write one of the vocabulary words before returning to the group hopping, walking backward, etc.
 - The returning student will pass the chalk to the next person in his/her line. That person will hop, walk backward or skip across the room and add another different word to the list. No team member can use a word already used by another team member.
 - Students repeat the process until everyone has had a chance to write a word on the chalkboard.
 - First group to finish wins.

Vocabulary

- amylase**— an enzyme that speeds up the digestion of starch or glycogen
- bile**— a thick bitter yellow or greenish fluid that is secreted by the liver and aids in the digestion and absorption of fats in the duodenum
- capillary**— any of the tiny blood vessels connecting the small arteries and veins
- cellulose**— a complex carbohydrate that is the chief part of the cell walls of plants
- chyme**— the partly fluid and partly solid mass of incompletely digested food that passes from the stomach into the first part of the small intestine
- digestion**—the act of to converting food into simpler forms that can be taken in and used by the body
- enzyme**— any of various complex proteins produced by living cells that bring about or speed up reactions (as in the digestion of food) without being permanently altered
- epiglottis**— a thin plate of flexible cartilage in front of the glottis that folds back over and protects the glottis during swallowing
- esophagus**— a muscular tube that leads from the cavity behind the mouth to the stomach
- feces**— bodily waste discharged through the anus
- gallbladder**— a muscular sac in which bile from the liver is stored
- large intestine**— the last part of the intestine which is wider and shorter than the small intestine, which consists of the cecum, colon, and rectum, and which absorbs water from the material left over from digestion and prepares the feces for release from the body
- liver**— a large glandular organ of vertebrates that secretes bile and causes changes in the blood (as by changing sugars into glycogen and by forming urea)
- mouth**— the opening through which food passes into the body of an animal and which in vertebrates is typically surrounded on the outside by the lips and encloses the tongue, gums, and teeth

Vocabulary

pancreas— a large gland of vertebrates that lies near the stomach and produces digestive enzymes and insulin

peristalsis— the contracting and expanding movements by which food and waste products of digestion are forced through parts (as the esophagus and intestine) of the digestive system

rectum— the end of the large intestine that links the colon to the anus

saliva— a fluid containing water, protein, salts, and often a starch-splitting enzyme that is secreted into the mouth by salivary glands

small intestine— the long narrow part of the intestine between the stomach and the colon in which food is mostly digested, from which digested food is absorbed into the body, and which consists of the duodenum, jejunum, and ileum

stomach— a pouch of the vertebrate digestive system into which food passes from the esophagus for mixing and digestion before passing to the duodenum of the small intestine

tooth— one of the hard bony structures that are usually located on the jaws of vertebrates and are used for seizing and chewing food and as weapons b : any of various usually hard and sharp structures especially around the mouth of an invertebrate

tongue— a fleshy movable muscular part of the floor of the mouth of most vertebrates that has sensory organs (as taste buds) and small glands and functions especially in taking and swallowing food and in human beings as a speech organ

trachea— the main part of the system of tubes by which air passes to and from the lungs in vertebrates -- called also windpipe

villi— one of the tiny finger-shaped processes of the mucous membrane of the small intestine through which digested food is absorbed

Resources used for this lesson: www.sciencebob.com/lab/bodyzone/digestion.html

www.quia.com/jg/66042.html

www.imcpl.org/kids/guides/health/digestivesystem.html

Carothers, Sue, and Elizabeth Henke, "Skills for Success—Human Body—Grades 4-6 workbook, Carson-Dellosa.

Shevic, Edward, Health Science Workbook—Grades 4-8, Teaching and Learning.

Extra Reading

Bloch, Serge, *You Are What You Eat and Other Mealtime Hazards*, Sterling, 2010.

Corcoran, Mary K., and Jef Czekaj, *The Quest to Digest*, Charlesbridge, 2006.

Junior Master Gardener, *Health and Nutrition From the Garden*, Texas Agriculture Extension, 2002.

Macaulay, David, *The Way We Work*, Houghton Mifflin, 2008.

Miller, Edward, *The Monster Health Book: A Guide to Eating Healthy, Being Active and Feeling Great for Monsters & Kids*, Holiday House, 2008.

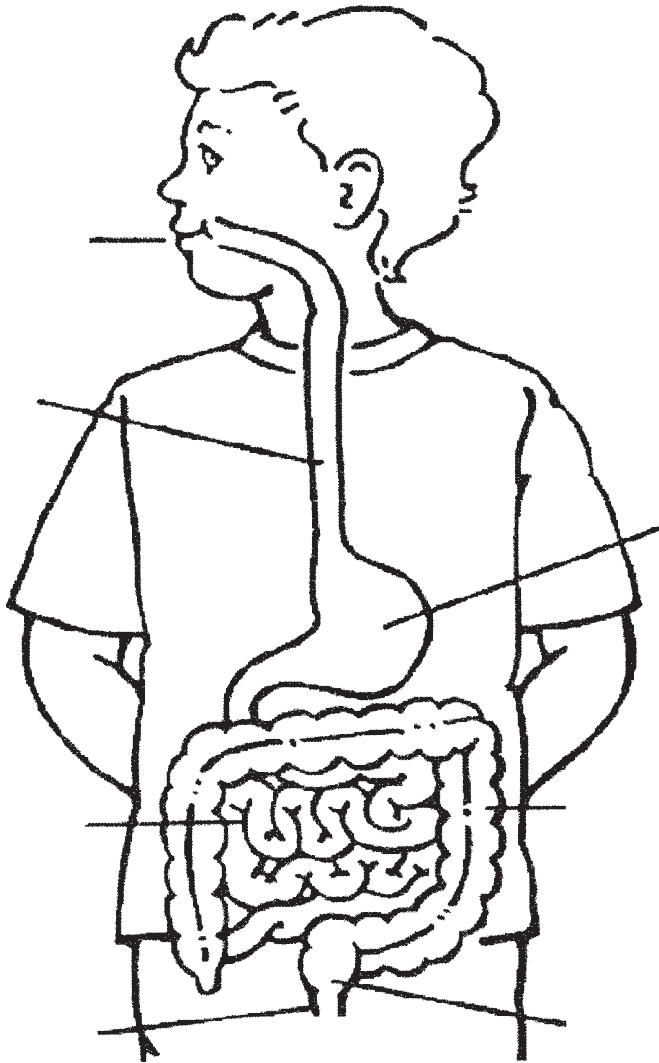
Showers, Paul, and Edward Miller, *What Happens to a Hamburger?*, Collins, 2001.

Name _____

Digestive Tract

Use the words in the box to label the digestive tract below. Write the correct words in the spaces provided.

anus
esophagus
large
intestine
mouth
rectum
small intestine
stomach

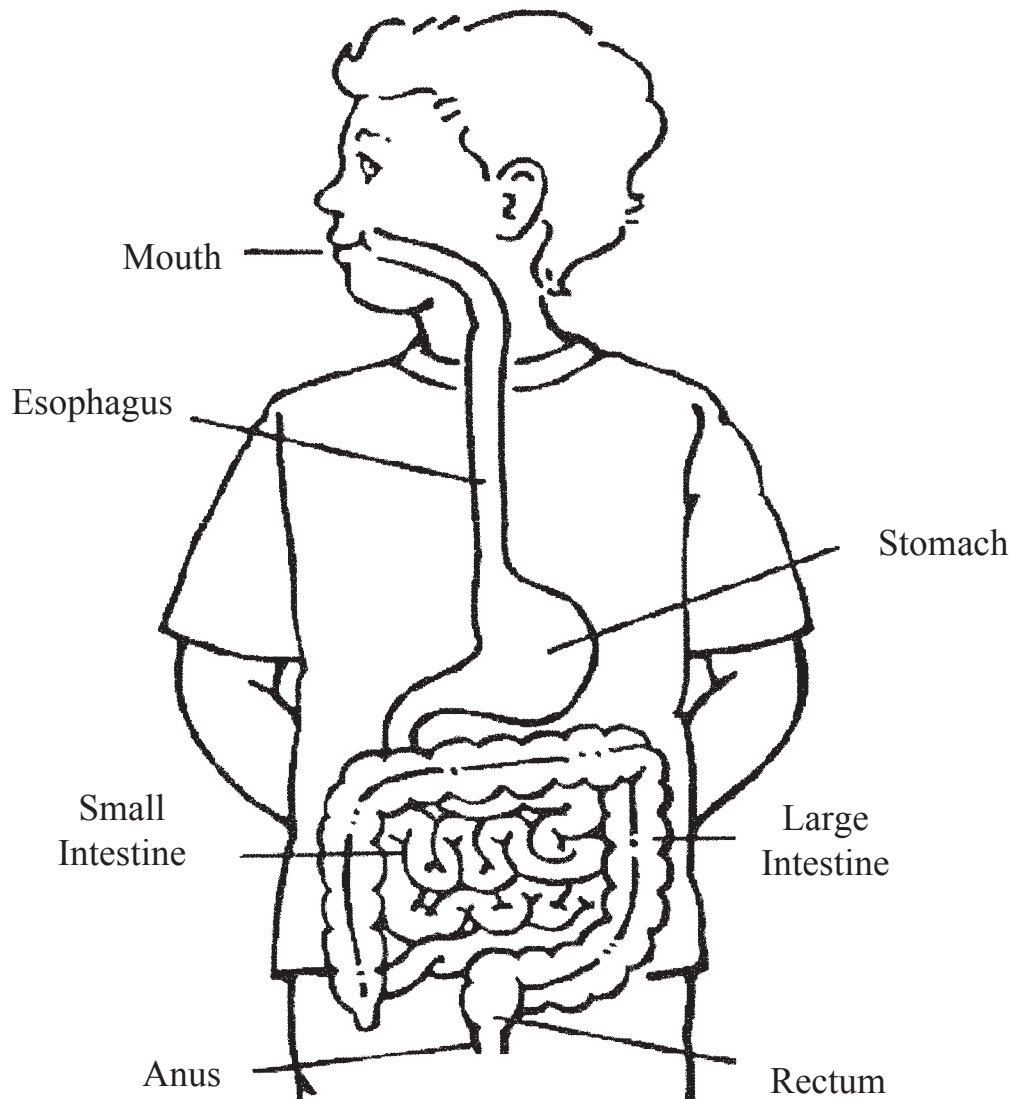


Name _____

Digestive Tract (Answers)

Use the words in the box to label the digestive tract below. Write the correct words in the spaces provided.

anus
esophagus
large intestine
mouth
rectum
small intestine
stomach



Name _____

Digestion Vocabulary

Find the word in the box that matches the definition. Write the definition on the line provided. Use a dictionary if you need one.

- | | | |
|-----------|--|-----------------|
| 1. _____ | a large, lobed organ that produces bile | amylase |
| 2. _____ | any of the tiny blood vessels connecting the small arteries and veins | bile |
| 3. _____ | a liquid produced by the liver that helps digest fat | capillary |
| 4. _____ | a complex carbohydrate that is the chief part of the cell walls of plants | cellulose |
| 5. _____ | process by which the body changes food so it can be used to supply energy | chyme |
| 6. _____ | flap of tissue that covers the windpipe during swallowing of food | digestion |
| 7. _____ | the main part of the system of tubes by which air passes to and from the lungs in vertebrates, called also windpipe | enzyme |
| 8. _____ | a muscular tube which connects the throat to the stomach | epiglottis |
| 9. _____ | a J-shaped, muscular sac that stores food and helps digest it | esophagus |
| 10. _____ | bodily waste discharged through digestive system/ process | feces |
| 11. _____ | a fluid containing water, protein, salts and often a starch-splitting enzyme that is secreted into the mouth by salivary glands | gallbladder |
| 12. _____ | organ where bile is stored | large intestine |
| 13. _____ | one of the hard bony structures that are usually located on the jaws of vertebrates and are used for seizing and chewing food | liver mouth |
| 14. _____ | the enzyme in saliva that breaks down starch into sugar | pancreas |
| 15. _____ | a short, wide tube in which water is absorbed from undigested food | peristalsis |
| 16. _____ | finger-like structures that cover the inner wall of the small intestine | rectum |
| 17. _____ | chemicals that break down food | saliva |
| 18. _____ | the opening through which food passes into the body | salivary glands |
| 19. _____ | a gland that produces pancreatic juice | small intestine |
| 20. _____ | squeezing motion that pushes food through the digestive system | stomach |
| 21. _____ | part of the body at the end of the large intestine where solid wastes are stored until they leave the body; a straight muscle | tooth |
| 22. _____ | the partly fluid and partly solid mass of incompletely digested food that passes from the stomach into the first part of the small intestine | tongue |
| 23. _____ | glands that produce saliva | trachea |
| 24. _____ | a long, coiled tube in which food is digested and absorbed | villi |
| 25. _____ | a muscle that works with the food and saliva to form a "ball" | |

Name _____

Digestion Vocabulary (answers)

Find the word in the box that matches the definition. Write the definition on the line provided. Use a dictionary if you need one.

- | | | |
|----------------------------------|--|---|
| 1. <u>liver</u> _____ | a large, lobed organ that produces bile | amylase
bile
capillary
cellulose
chyme
digestion
enzyme
epiglottis
esophagus
feces
gallbladder
large intestine
liver mouth
pancreas
peristalsis
rectum
saliva
salivary glands
small intestine
stomach
tooth
tongue
trachea
villi |
| 2. <u>capillary</u> _____ | any of the tiny blood vessels connecting the small arteries and veins | |
| 3. <u>bile</u> _____ | a liquid produced by the liver that helps digest fat | |
| 4. <u>cellulose</u> _____ | a complex carbohydrate that is the chief part of the cell walls of plants | |
| 5. <u>digestion</u> _____ | process by which the body changes food so it can be used to supply energy | |
| 6. <u>epiglottis</u> _____ | flap of tissue that covers the windpipe during swallowing of food | |
| 7. <u>trachea</u> _____ | the main part of the system of tubes by which air passes to and from the lungs in vertebrates, called also windpipe | |
| 8. <u>esophagus</u> _____ | a muscular tube which connects the throat to the stomach | |
| 9. <u>stomach</u> _____ | a J-shaped, muscular sac that stores food and helps digest it | |
| 10. <u>feces</u> _____ | bodily waste discharged through digestive system/ process | |
| 11. <u>saliva</u> _____ | a fluid containing water, protein, salts and often a starch-splitting enzyme that is secreted into the mouth by salivary glands | |
| 12. <u>gallbladder</u> _____ | organ where bile is stored | |
| 13. <u>tooth</u> _____ | one of the hard bony structures that are usually located on the jaws of vertebrates and are used for seizing and chewing food | |
| 14. <u>amylase</u> _____ | the enzyme in saliva that breaks down starch into sugar | |
| 15. <u>large intestine</u> _____ | a short, wide tube in which water is absorbed from undigested food | |
| 16. <u>villi</u> _____ | finger-like structures that cover the inner wall of the small intestine | |
| 17. <u>enzymes</u> _____ | chemicals that break down food | |
| 18. <u>mouth</u> _____ | the opening through which food passes into the body | |
| 19. <u>pancreas</u> _____ | a gland that produces pancreatic juice | |
| 20. <u>peristalsis</u> _____ | squeezing motion that pushes food through the digestive system | |
| 21. <u>rectum</u> _____ | part of the body at the end of the large intestine where solid wastes are stored until they leave the body; a straight muscle | |
| 22. <u>chyme</u> _____ | the partly fluid and partly solid mass of incompletely digested food that passes from the stomach into the first part of the small intestine | |
| 23. <u>salivary glands</u> _____ | glands that produce saliva | |
| 24. <u>small intestine</u> _____ | a long, coiled tube in which food is digested and absorbed | |
| 25. <u>tongue</u> _____ | a muscle that works with the food and saliva to form a "ball" | |