



• 6th Grade | Unit 2

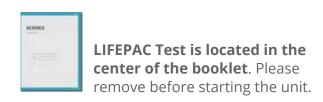


# **SCIENCE 602**

# Body Systems

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INTRODUCTION	_

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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 LIFEPAC®, 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 LIFEPAC. When you have finished this LIFEPAC, 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.
- Identify the function of each main part of the excretory system.
- Identify ways to prevent common diseases of the excretory system.
- Name and locate the main parts of the skeletal system—the muscles and bones.
- Identify the main functions of muscles and bones.
- 9. Identify ways to prevent common diseases of muscles and bones.

Survey the LIFEPAC. Ask yo	ourself some questions about this study and write your questions he	ere.

## 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:

- 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 shan). 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, cãre, fär; let, ēqual, term; it, īce; hot, ōpen, ôrder; oil; out; cup, put, rüle; child; long; thin; /TH/ for then; /zh/ for measure; /a/ represents /a/ in about, /e/ in taken, /i/ in pencil, /o/ in lemon, and /u/ in circus.

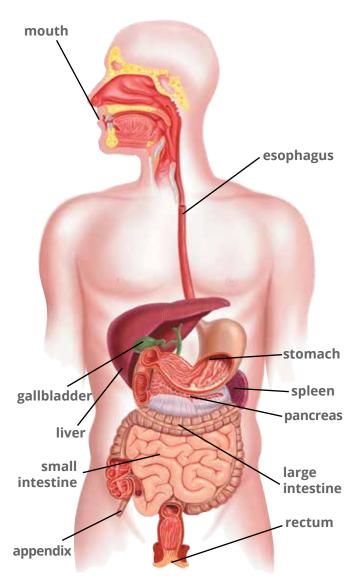
## **STRUCTURE**

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.

_

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

a	b	C
d.	е.	f.

### **FUNCTION**

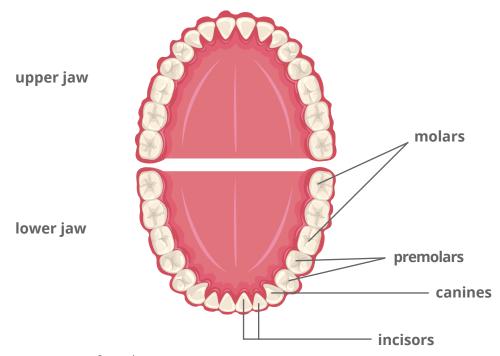
Let's look at each of the main parts of the alimentary canal. Each part is very important to the life of the animal.

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 bicuspids 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 LIFEPAC 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.

	Complete the following activities.
1.4	Describe what happens when saliva and starch mix
	(You may want to review Science LIFEPAC 601 to help you with this activity.)
1.5	Go to a reference source such as the Internet, an encyclopedia, or the library, and write a short report on a tooth. In the space below, draw a picture of a tooth, label its parts, and explain what you learned to an adult at home. Write a brief report below your drawing.
Repo	ort:



initials

date

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 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.





#### 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 (junket 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.
Ansv	wer the following question.
1.9	How does the preceding paragraph describe how mammals might be affected if rennin was
	not present in their stomachs ?

<b>FEACHER</b>	<b>CHECK</b>		
		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 LIFEPAC. 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** 

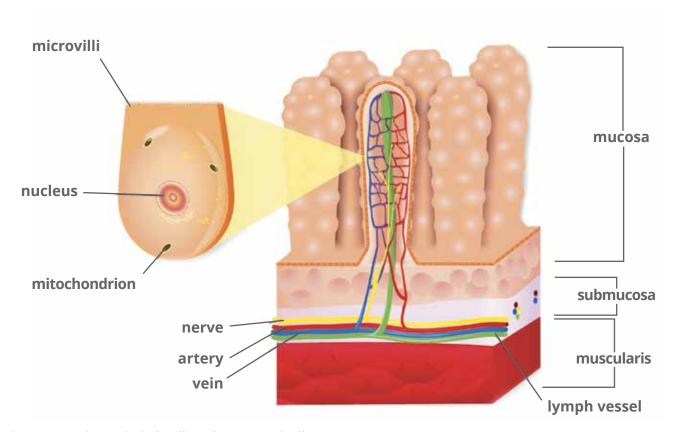
	Record your observations.
1.10	Record your observations for oil and water (Step 2).
1.11	Record your observations for oil, soap, and water (Step 4).
Ansv	ver the following questions.
1.12	The soap works the same way as bile. The oil breaks up into tiny droplets, which will not come back together. Now, the <b>pancreatic</b> 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

**Small intestine**. The small intestine is the most important body part for transferring digested food to the blood stream. The food stays in the small intestine for about ten hours to allow the digested food time to dissolve and be absorbed in the blood. The food is then transported to all parts of the body. Vitamins and minerals enter the blood stream in the small intestine. Since vitamins and minerals are already **soluble** in water, they don't need to be digested. They must remain in their natural (organic) form to be useful to the body. Because they must be natural, many artificial mineral and food additives are of little use in our diets.

In most cases, there are enough vitamins and minerals in a balanced diet that it isn't necessarv to supplement them with artificial minerals and other food additives. If a balanced diet is eaten every day, the body receives most, if not all, of the nutrition it needs to sustain itself all day long. In some cases, artificial vitamins and

minerals are necessary supplements for some people. For instance, someone who is anemic may need to take an iron supplement if he or she is not able to get enough iron through a balanced diet. A person should consult a family physician before taking any dietary supplements.

Every living body cell needs food to live. Therefore, the digested food must get from the small intestine to all of the body cells. The inside of the small intestine wall is made of hundreds of small fingers called villi. Each villus has a blood vessel to absorb the digested food. The digested food is absorbed through the cell walls of the small intestine into the blood stream. Since the blood circulates to all parts of the body, the blood carries the digested food to each cell in other parts of the body. The following experiment will show you how some foods can pass through a cell wall and others cannot.



Intestinal epythelial cell and intestinal villi



# Try this experiment to learn absorption and diffusion.

**Overview.** You will use a membrane with solutions of honey and starch to explain how cells get food.

#### These supplies are needed:

- water
- dialysis membrane or semipermeable membrane (2 squares, 5 cm x 5 cm)
- honey
- starch (corn starch)
- masking tape

- glucose test strips
- 2 dental rubber bands/small rubber bands
- 2 small baby food jars/beakers/cups
- 2 small bottles or test tubes that will fit easily into another jar
- 1 drop of iodine solution inside the baby food jars

Note: Some of these materials can be purchased through science supply stores, hobby stores, the internet, pharmacies, or mail order.

**Follow these directions.** Check each box when the step is completed. This experiment will take twenty minutes today and twenty minutes tomorrow. 6. Label. Write your name, sugar water, 1. Fill one baby food jar, beaker, or cup 1/2 full with water. Add 1/2 teaspoon and the date on a piece of masking of honey. Stir until the honey is distape. Put the label on the sugar water solved. This will give you sugar water. part of the experiment. 2. Pour the sugar water into one of the 7. Fill the second baby food jar/beaker/ bottles or test tubes. cup 1/2 full with water. Add a pinch of starch. Stir until the starch is dissolved. 3. Center the membrane squarely over the bottle top or test tube. Place the 8. Pour the starch solution into the rubber band down over the bottle or second small bottle/test tube. Cap with test tube to secure the membrane. the second membrane and rubber 4. Wash out the baby food jar/beaker/ cup. Fill 1/4 full with clean water. 9. Wash the baby food jar/beaker/cup, fill it 1/4 full with clean water, and place 5. Wash off the outside of the sealed the small bottle/test tube in it upside bottle/test tube of sugar water. Place down as before. it upside down in the baby food jar/ beaker/cup of water.

Experiment 602.C Absorption and Diffusion (continued on next page)

<ul> <li>□ 10. Label this part like you did the other part but write starch water. Let the two experiments set one day (24 hours).</li> <li>□ 11. Get a piece of glucose test strip. Test the water in the jar outside the honey water bottle/test tube. Wait one minute. Record your results in 1.14.</li> </ul>	<ul> <li>12. Take the membrane off the honey water bottle. Test the honey with a glucose test strip. Wait one minute. Record your observations in 1.15.</li> <li>13. Place a drop of iodine solution in the water outside the starch bottle/test tube. Record your observation in 1.16.</li> <li>14. Remove the membrane from the top of the starch bottle. Put in a drop of iodine solution. Record your observation in 1.17.</li> <li>15. Wash, clean, and return all equipment and chemicals to their proper places.</li> </ul>	
Experiment 602.	C Absorption and Diffusion	
Record your observations and answer to on the lines.	he following questions. Write your answers	
<b>1.14</b> a. Observation for Step 11:		

b. What color was the glucose test strip from the water outside the honey jar? \_\_\_\_\_

c. Does this indicate sugar (honey) is in this water?

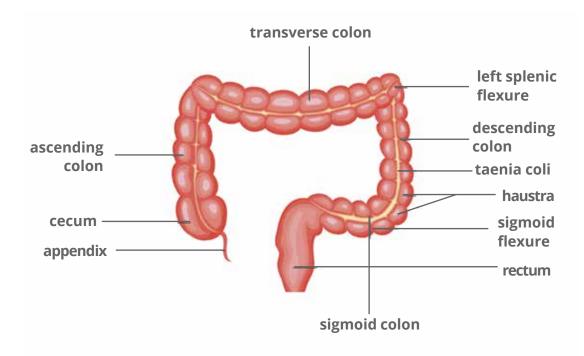
1.15	a. Observation for Step 12:
	b. What color was the glucose test strip from the honey water?
	c. Does this show that sugar is present?
	d. How do you think the sugar got into the water outside the bottle/test tube?
1.16	a. Observation for Step 13:
	b. Iodine plus starch gives a bluish-black color. Is starch present in the water outside the starch bottle?
1.17	a. Observation for Step 14:
	b. What color is the starch solution when iodine is added?
	c. ls starch present?
1.18	Compare and contrast the results of the two systems. Explain why the sugar (honey) could get through the plastic membrane and the starch could not.
	Discuss this experiment with your teacher or an adult.
	TEACHER CHECK
	initials date

Large intestine. When the small intestine has completed its job of digesting food and absorbing the useful substances into the blood stream, there is a small amount of undigested food that remains. This undigested food passes on to the large intestine. The undigested food consists of water, minerals, and wastes. Another name for the large intestine is the colon. Removing water and collecting wastes are the main functions of the large intestine. The large intestine or colon absorbs much of the remaining water and minerals from the food. These pass into the blood stream and are supplied to the rest of the body. The remaining undigested food, harmful bacteria, and disease organisms move to the end of the large intestine where they are collected. These waste materials pass out of the body through the lower part of the colon called the *rectum*.

When an intestinal flu, infection, or disorder is present, the normal bacteria in the large

intestine is affected. As a result, the time the food spends in the colon is too short to allow for the removal of all excess water and diarrhea (die' uh ree' uh) occurs. If the waste stays too long in the colon, more of the water is removed and constipation results.

Doctors have found that a good diet is very important to a healthy colon. Lots of bulky foods like celery, lettuce, cabbage, and other vegetables are needed to help the material move through easier. This will prevent constipation. Drinking plenty of water helps to provide a slick surface to the lining of the colon. Cancer of the colon is very dangerous. Diet, exercise, and a genetic trait that people get from their parents seem to be factors that put people at risk for colon cancer. Studies have shown that eating bulky foods and getting regular physical activity both help to lessen the chance of developing cancer of the colon.



The large intestine (colon)



## Complete the following activities.

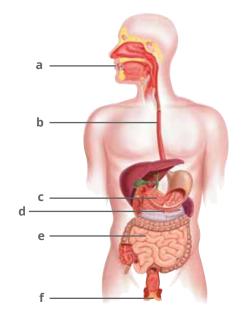
1.19	List two functions of the colon. a.							
	u							
	b							
1.20	Describe at least one problem that a person can have in the large intestine and why it happens							
	n the following list of activities, select at least one to do. Check your choice. When you finished, read it to at least one other person. Have your teacher evaluate the report with you							
1.21	Write a complete report on the digestive system of an earthworm, fish, grasshopper, or frog. Describe the system, including differences from your human digestive system.							
	Write a detailed report on one part of the digestive system. Include information you may find in an encyclopedia or from a website. Show good scholarship in your research, use several sources for your information, and quote your sources at the end of the report.							
	Microscopic organisms like amoeba and paramecium also need food to live.  However, they have no mouths, stomachs, or intestines. Write a report on how one of these types of organisms takes in and digests food. Include some drawings or							
	pictures to show the details.							

Review the material in this section in preparation for the Self Test. The Self Test will check your mastery of this particular section. The items missed on this Self Test will indicate specific areas where restudy is needed for mastery.

# **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
- stomach 1.03
- \_\_\_\_\_ esophagus 1.04
- 1.05 \_\_\_\_\_ rectum
- **1.06** \_\_\_\_\_ pancreas



Match these items (each answer, 2 points).

- **1.07** gall bladder
- **1.08** \_\_\_\_\_ liver
- **1.09** \_\_\_\_\_ salivary glands
- **1.010** \_\_\_\_\_ appendix

- a. makes bile
- b. fastened to colon
- c. stores bile
- 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:
- 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 fun	ctio	ns of the small intes	tine	:		
	a						
	b						
1.015	List two functions of						
	a						
	b						
Write	the letter for the cor	rect	answer on the bla	nk	(each answer, 2 poir	nts)	
1.016	The food stays in the	sto	mach about				
	a. six hours	b.	thirty minutes	С.	three hours	d.	ten hours
1.017	The most important p	art	for transferring diges	ted	food to the blood st	reai	m is the
	a. mouth	b.	colon	С.	small intestine	d.	appendix
1.018	The time to digest the						
	a. six hours		thirty minutes				
1.019	Doctors say proper d	_	1				
	a. twenty		ten		five .	a.	fifteen
1.020							
	<ul><li>a. respiratory system</li><li>c. esophagus</li></ul>	I			circulation system		
1.021	The greenish-yellow j	uice	stored in the gall bl		-		
	a. rennin		starch			d.	bile
1.022	Saliva contains an en	zym	e that digests				
	a. sugar	b.	starch	C.	fat	d.	protein
1.023	Bile is necessary to d	iges	t				
	a. sugar	b.	starch	С.	fat	d.	protein
1.024	The digestion of prot		-				
	a. mouth	b.	stomach	C.	liver	d.	colon
1.025	Rennin is an enzyme		_				
	a. bread	b.	milk	С.	potatoes	d.	lettuce

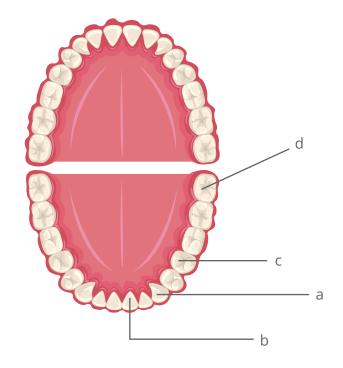
## Match these items by writing the correct letter in the blank (each answer, 2 points).

**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

**1.031** necessary for good health

**1.032** prevents cancer of the colon

**1.033** are not digested

**1.034** prevents tooth decay

**1.035** an enzyme

a. rennin

b. brushing

c. bile

d. colon

e. protein

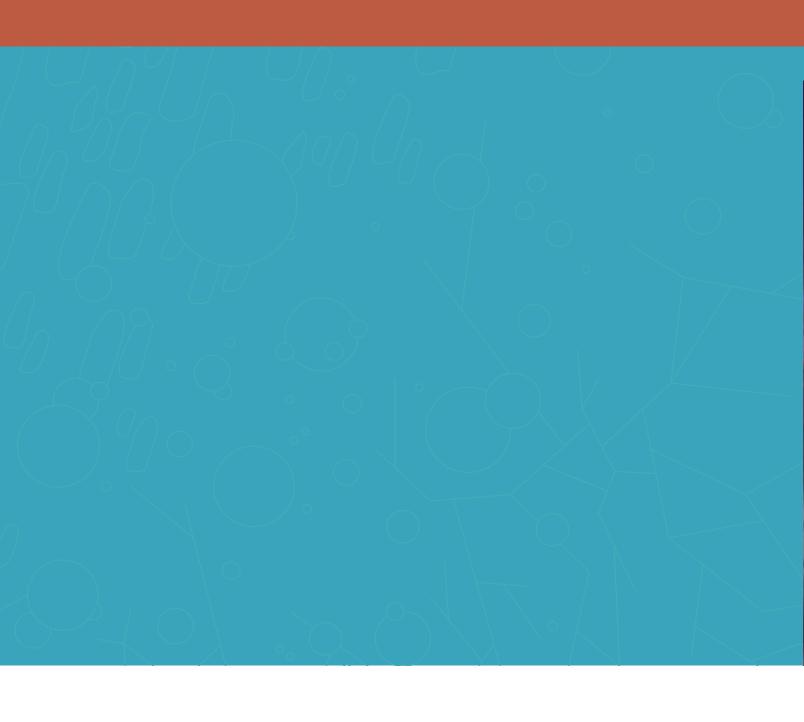
f. bulk in diet

g. vitamins

h. balanced diet

Answe	er 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?							







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