



SCIENCE • GRADE 5

California Content Standards
Life Sciences: 2.A
Life Sciences: 2.B
Life Sciences: 2.C
Life Sciences: 2.D

Above Level

Internal Structures of Animals

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Internal Structures of Animals

California's Content Standards Met

GRADE 5 SCIENCE

LIFE SCIENCES: 2—Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials. As a basis for understanding this concept:

- a. Students know many multicellular organisms have specialized structures to support the transport of materials.
- b. Students know how blood circulates through the heart chambers, lungs, and body and how carbon dioxide (CO₂) and oxygen (O₂) are exchanged in the lungs and tissues.
- c. Students know the sequential steps of digestion and the roles of teeth and the mouth, esophagus, stomach, small intestine, large intestine, and colon in the function of the digestive system.
- d. Students know the role of the kidney in removing cellular waste from blood and converting it into urine, which is stored in the bladder.

GRADE 5 ENGLISH LANGUAGE ARTS

1.0 WORD ANALYSIS, FLUENCY, AND SYSTEMATIC VOCABULARY DEVELOPMENT

Vocabulary and Concept Development 1.4—Know abstract, derived roots and affixes from Greek and Latin and use this knowledge to analyze the meaning of complex words (e.g., *controversial*).

2.0 READING COMPREHENSION

Structural Features of Informational Materials 2.1—Understand how text features (e.g., format, graphics, sequence, diagrams, illustrations, charts, maps) make information accessible and useable.

Comprehension and Analysis of Grade-Level-Appropriate Text 2.3—Discern main ideas and concepts presented in texts, identifying and assessing evidence that supports those ideas.

Comprehension and Analysis of Grade-Level-Appropriate Text 2.4—Draw inferences, conclusions, or generalizations about text and support them with textual evidence and prior knowledge.



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Student Book

Internal Structures of Animals

Print pages 5 – 18 of this PDF for the student book.

How to Make the Student Book

- The student book is contained on pages 5–18 of this PDF. It begins on the next page.
- To make one student book, or a two-sided master copy that can be photocopied, you will print on both sides of seven sheets of 8.5" x 11" paper.
- Do a test printout of one book first to familiarize yourself with the procedure.
- Follow these instructions carefully.

First—Select the Paper

Since you will be printing on both sides of the sheets of paper, select a good quality white paper. We recommend using at least a 22 lb sheet.

Second—Check Printer Settings

Be sure you have the correct page setup settings for your computer and printer. You will print these pages in landscape format.

Third—Print EVEN Pages

Open the PDF of the book you want to print. Select print from your file menu. In your printer's dialogue box enter pages 5–18 to print. Then select EVEN pages only. It is important to print only the EVEN pages first. Click "Print" to print the even pages. (**Important note:** The first page that prints will be blank. DO NOT discard this page. It will be needed to print the cover in the next step.)

Fourth—Print ODD Pages

When the even pages have printed, flip the stack of pages over to print the odd pages. Place the stack back in your printer. Select print from the file menu again. In your printer's dialogue box, select pages 5-18 to print. Then select ODD pages. Click "Print" to print the odd pages.

Fifth—Fold the Book

You now have a complete book. Check to be sure the pages are in the correct order with the book's cover as the top page. Then fold the stack of paper in half.

Sixth—Staple the Book

Use an extended-length stapler to staple the pages together. Place two staples in the spine of the book.

Please Note

Printers vary in how they output pages. Do a test printing of one book and adjust the procedure as necessary.

If you want to make a one-sided master copy, print ALL pages 5–18 at once. Then select "one-sided to two-sided" on the copy machine.

Internal Structures of Animals

California's Content Standards Met

AL

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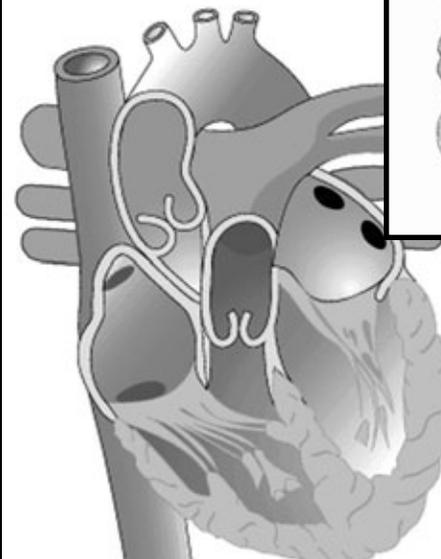
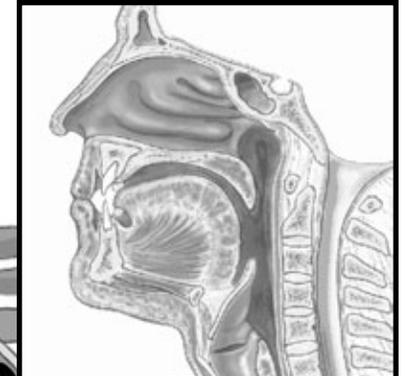
Life Sciences: 2.C

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Internal Structures of Animals

by Tom Sibila





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INTRODUCTION

Transportation Systems

All animals, including you, need food, water, and oxygen to survive. Food, water, and oxygen are **consumed** to obtain energy. Energy is used by the body to move, grow, and repair itself. Animals cannot survive without energy.

The food and water animals take in has to be carried from the mouth to cells in all parts of the body. In addition, the oxygen animals breathe in has to be carried from lungs or gills to every cell in the body. In many animals, these materials are transported from one part of the body to another through blood.

When the body uses food, water, and oxygen to create energy, waste is created. This waste then has to be eliminated, or carried out of, the body.

In this book, you will learn about the amazing transportation systems found in the bodies of all animals that allow them to survive.

consumed: used up

The Respiratory System

To survive, animals must exchange the air inside their bodies with the air outside their bodies.

The system that transports air into and out of the body is called the respiratory system.

The purpose of the respiratory system is the same in all animals. It takes in oxygen for the body so the cells can unlock the energy in food. It also eliminates carbon dioxide, a waste product, from the body. However, animals have different types of respiratory systems. For example, animals that live in water use gills to exchange these gases. Animals that live on dry land, including you, use lungs. Frogs and salamanders use their moist skin along with their lungs to exchange gases.

The respiratory system allows an animal to adjust the flow of gases in and out of the body to meet its needs. More activity requires more energy. To get this energy, more oxygen is needed. Think about how you breathe when you are sitting and how you breathe when you are running. Active animals breathe harder in order to get more oxygen.

Lungs

The respiratory system is made up of the organs that help animals breathe. In mammals for example, lungs are the main organ of the respiratory system. Air that is rich in oxygen is inhaled into the lungs and air with more carbon dioxide is exhaled, or breathed out. These gases are exchanged in the lungs and transported through the body by blood.

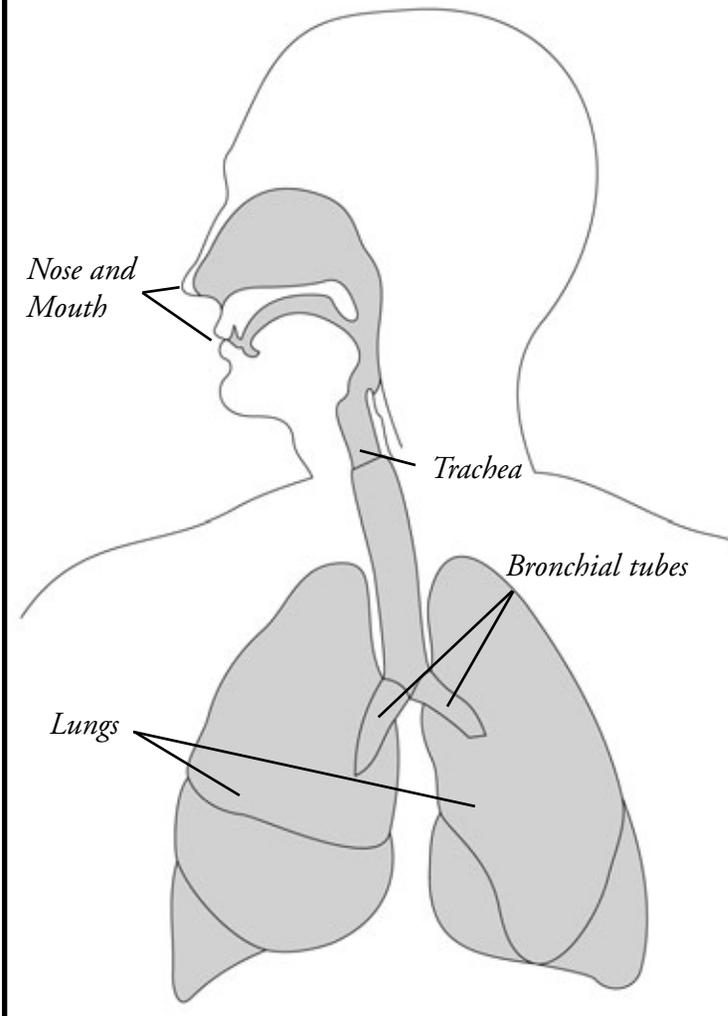
When we inhale, red blood cells in the lungs pick up oxygen and carry it to all the cells in the body. The red blood cells drop off the oxygen to the body cells and pick up carbon dioxide from those same cells.

Carbon dioxide is a waste product created when the cells use oxygen to release energy from **carbohydrates** in the food. After dropping oxygen off, the red blood cells pick up and transport carbon dioxide back to the lungs. When we exhale, the carbon dioxide is released into the air.

What is a benefit of animals releasing carbon dioxide into the air?

carbohydrates: sugars and starches found in foods we eat

Organs of the Respiratory System



Humans have two lungs inside their bodies. The lungs are rich in blood vessels that pick up inhaled oxygen and drop off carbon dioxide to be exhaled.

Trachea

The trachea, also called the windpipe, is located in the back of the throat. **Mucus** lining the trachea helps filter the air breathed in. It has rings around the outside. These rings are made of strong, flexible tissue. You can feel these rings on the front of your neck. They keep the trachea open when you turn or bend your neck.

Bronchial Tubes

The bronchial tubes are two tubes that branch off the trachea and carry air directly into the lungs. In each lung, the bronchial tubes divide into hundreds of smaller tubes. At the ends of these smaller tubes are clusters of tiny air sacs called alveoli. There are about 300 million alveoli in a pair of human lungs.

Diaphragm

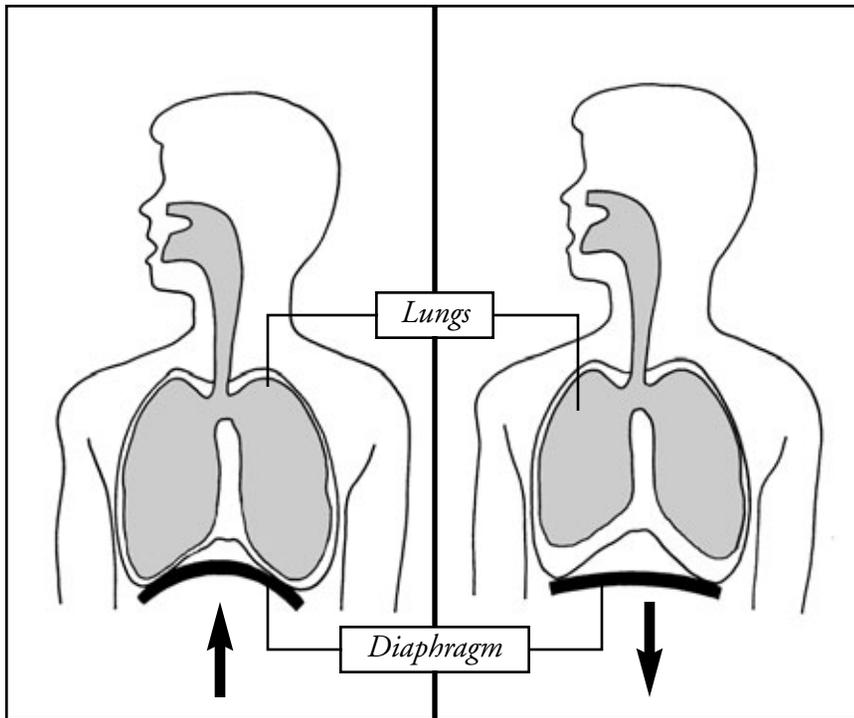
The diaphragm is a muscle below your lungs. When you inhale, your diaphragm flattens and moves downward making your chest cavity larger. When you exhale, it pushes up making your chest cavity smaller.

mucus: a thick liquid that moistens the respiratory system and helps get rid of dust and other particles that are breathed in

How the Diaphragm Works

Exhaling

Inhaling



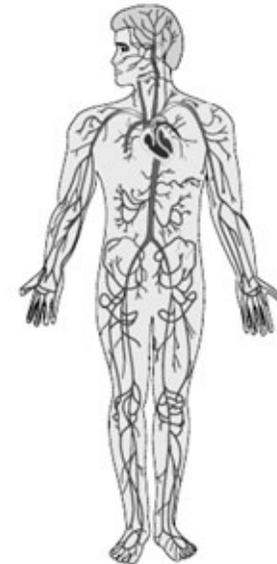
When you inhale, your diaphragm flattens and moves downward making your chest cavity larger. When you exhale, it pushes up making your chest cavity smaller.

CHAPTER 2

The Circulatory System

Another transportation system in the body is the circulatory system. You know oxygen is carried to cells in the body through blood. Other **nutrients** are also carried by blood. The circulatory system moves blood through the body to provide the necessary oxygen and nutrients cells need.

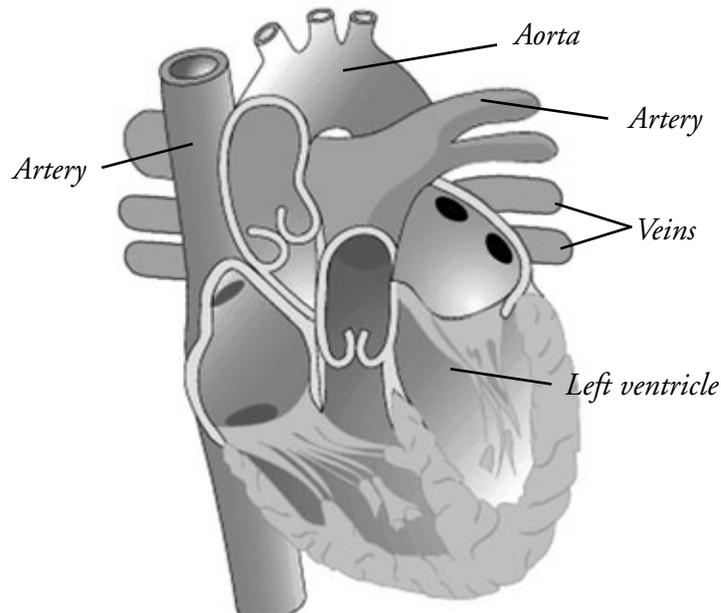
The circulatory system is made up of the vessels and the muscles that control the flow of blood around the body. This process is called circulation. The main parts of the system are the heart, arteries, and veins.



nutrients: any substance found in food that is needed for the life and growth of plants and animals

Heart

The heart is the strongest muscle in your body. Its job is to pump blood around your body. It is divided into two sides. The right side receives blood from all parts of the body except the lungs and pumps blood to the lungs where it picks up oxygen and gets rid of carbon dioxide. The blood leaves the lungs and enters the left side of the heart and then is pumped to the rest of the body.



The left side of the heart receives oxygen-rich blood from the lungs and pumps it to the rest of the body. The right side of the heart pumps blood back to the lungs to release carbon dioxide and receive a fresh supply of oxygen.

Arteries and Veins

Blood leaves the left side of the heart through the aorta. The aorta is the largest artery in our body. Arteries are tubes that carry blood away from the heart.

As the arteries move into tissues and organs they become smaller and smaller. The smallest blood vessels are called capillaries. The capillaries deliver oxygen and nutrients to individual cells and pick up waste products such as carbon dioxide and some nitrogen compounds.

After picking up the waste materials from the cells, the blood moves through larger and larger veins on its way back to the right side of the heart. The pulmonary artery carries the blood back to the lungs and the cycle is repeated thousands of times each day.

Explain the functions of the heart, arteries, and veins.

CHAPTER 3

The Digestive System

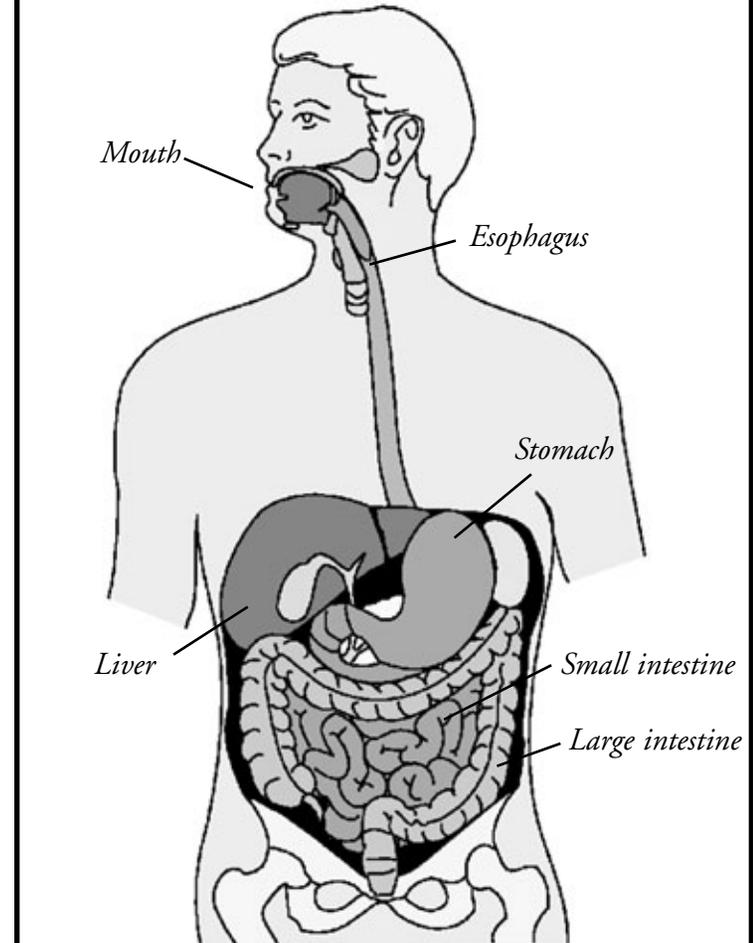
The digestive system is responsible for converting the food we eat into smaller particles. Digestion, or the breaking down of food, is important because the food we eat, such as bread, meat, and vegetables, are not in a form that our bodies can use as **nourishment**. Food and drink must be changed into smaller particles before they can be absorbed into the blood and carried to cells throughout the body.

The cells use some of the food to produce energy for living. Some of the particles are used as raw materials for making needed materials and for the growth and repair of cells and tissues.

The main organs that make up the digestive system are the mouth, esophagus, stomach, small intestine, large intestine (including the colon and rectum), and anus.

nourishment: something that contributes to health and growth

The Digestive System



Mouth

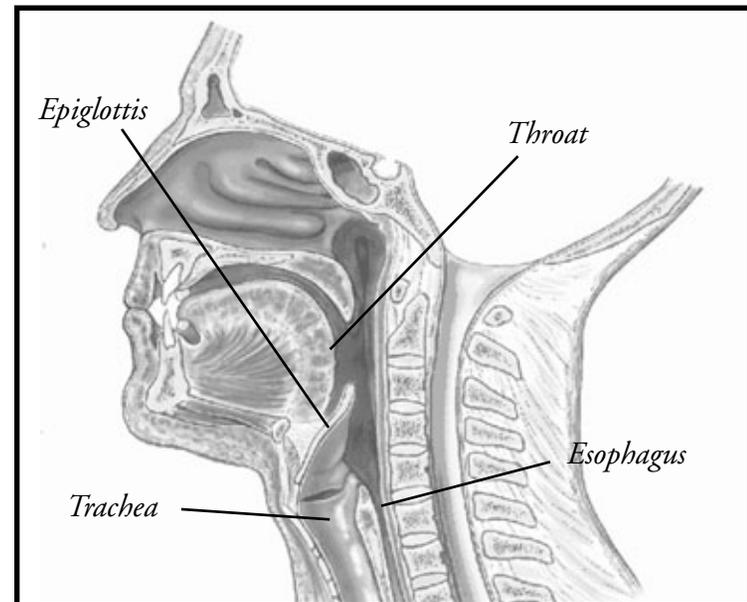
Digestion of food begins when you put food into your mouth and begin to chew. Your teeth start to break the food into smaller pieces. **Saliva** in your mouth helps soften the food. **Enzymes** in the saliva also help begin the digestion of starch in the food. When the food is small and soft enough, your tongue can push the food into your throat to swallow.

Esophagus

Swallowed food is pushed into the esophagus which connects the back of the throat to the stomach. When food enters, muscles in the walls of the esophagus squeeze the food downward to the stomach.

saliva: a thin, watery liquid produced in the mouth to help in swallowing and digestion
enzymes: materials that speed up some digestive processes

You know that the trachea is in the back of your throat. When you eat, a small flap called the epiglottis closes your windpipe keeping food out of the trachea. Sometimes, when eating or drinking, the flap does not close fast enough. Then the food goes “down the wrong pipe” and you cough to clear your windpipe.



The epiglottis is a flap that keeps food from entering the trachea.

Stomach

The stomach is a muscular sack that receives food and liquid from the esophagus. It has three functions, or jobs.

1. It stores food and liquid.
2. It breaks down the food into a thick liquid or paste.
3. It empties the broken down food and liquid into the small intestine.

The stomach receives and stores the food you eat and the liquid you drink. It also acts like a mixer and grinder.

The stomach produces digestive juices that help further break down the food. The strong muscles in the walls of the stomach then mix the food, liquid, and digestive juices. Food is usually treated in the stomach for about two hours and then empties into the small intestine.

Describe the three functions of the stomach.

Small Intestine

After leaving the stomach, food enters the small intestine. This is a long tube about 2 inches around and about 20 to 25 feet long. The small intestine is loosely coiled and packed beneath the stomach.

The small intestine breaks down the food mixture even more so that the body can absorb all the vitamins, minerals, proteins, carbohydrates, and fats from the food. Food may stay in the small intestines for as long as 4 hours. This allows the food to be absorbed into your blood stream and the nutrients to be carried to all the cells in the body.

Liver

The nutrient-rich blood coming from the stomach, small intestine, and large intestine passes through the liver. The liver has many functions in processing the nutrients. These include removing harmful substances and storing nutrients not immediately needed.

What is the main purpose of the small intestine?

Large Intestine

The body does not digest all the food we eat. What is left over passes from the small intestine to the large intestine. The large intestine is thicker and wider than the small intestine, about 4 inches around, but it is only about 5 feet long.

The undigested food enters the large intestine as a liquid paste. The large intestine removes the water and turns what is left into a solid waste. The waste then passes through the part of the large intestine called the colon. This is the body's last chance to absorb water and nutrients into the body.

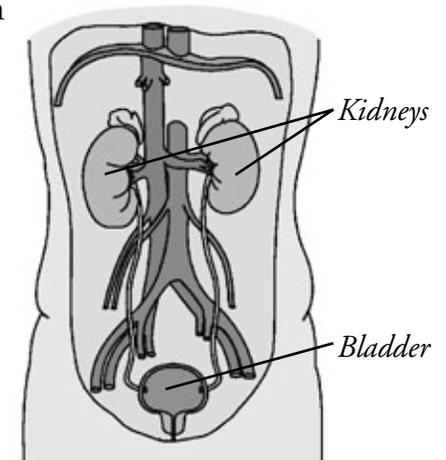
Finally, the waste leaves the colon and is pushed into the rectum. The waste is stored there until the body is ready to get rid of it. When you go to the bathroom, you are getting rid of this solid waste through the anus.

Kidneys

Your body has another filtering system as well. The kidneys are bean-shaped organs, each about the size of your fist. They are located on either side of the spine just below the rib cage.

Your kidneys filter harmful waste products carried from the cells by the blood. Much of the liquid waste is processed into **urea** by the liver and then transported to the kidneys. Urea is filtered out of the blood by the kidneys and stored in the bladder as urine.

Each day, the kidneys process about 200 quarts of blood resulting in about 2 quarts of urine. Urine is released through the urethra when you go to the bathroom.



urea: a liquid waste product resulting from the breakdown of food particles in cells

Specialized Structures

You have learned that animals have specialized structures to support the transport of materials in their bodies. The respiratory system supplies oxygen to the body and releases carbon dioxide waste. The digestive system allows the body to take in food for energy and eliminate waste. The circulatory system is the engine that pumps blood through the body to carry the oxygen, food, and waste products.

Without these amazing transportation systems, animals could not survive. Think about it when you breathe in and out and when you eat food and drink liquids. Ask yourself how your body uses these substances to help you survive.

Name and describe the transportation systems that help animals survive.

Glossary

carbohydrates—sugars and starches found in foods we eat

consumed—used up

enzymes—materials that speed up some digestive processes

mucus—a thick liquid that moistens the respiratory system and helps get rid of dust and other particles that are breathed in

nourishment—something that contributes to health and growth

nutrients—any substance found in food that is needed for the life and growth of plants and animals

saliva—a thin, watery liquid produced in the mouth to help in swallowing and digestion

urea—a liquid waste product resulting from the breakdown of food particles in cells

To Find Out More . . .

Want to learn more about the internal structures of animals?

Try these books

Guts: Our Digestive System by Seymour Simon. HarperCollins, 2005.

The Circulatory System (True Books-Health) by Darlene R. Stille. Childrens Press, 1998.

The Heart: Our Circulatory System by Seymour Simon. HarperCollins, 2006.

Lungs: Your Respiratory System by Seymour Simon. HarperCollins, 2007.

Access these Web sites

KidsHealth for Kids
<http://kidshealth.org/kid/htbw/>

Write for more information

The American Heart Association
National Center
7272 Greenville Avenue
Dallas, TX 75231

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Above Level

English-language Arts Activities

Internal Structures of Animals

Print pages 20–24 of this PDF for the reading activities.

Draw Conclusions

TRY THE SKILL

Authors often do not tell you everything you need to know. To figure out more, you can draw conclusions. First, you think about what you read and what you already know. Then you compare the new information with what you know and draw a conclusion.

To practice, read this paragraph:

The purpose of the respiratory system is the same in all animals. It gets oxygen for the body so the cells can unlock the energy in food. It also eliminates carbon dioxide, a waste product, from the body. However, animals have different types of respiratory systems. For example, animals that live in water use gills to exchange these gases. Animals that live on dry land, including you, use lungs. Frogs and salamanders use their moist skin along with their lungs to exchange gases.

Why do animals have different respiratory systems?

You can draw a conclusion to answer this question by thinking about what you already know. You know fish live in water, so they cannot get oxygen from the air. Their bodies have adapted to their environment to let them survive. Animals respiratory systems have adapted to their environments to survive.

Read this passage. Then answer the question that follows it.

Another transportation system in the body is the circulatory system. You know oxygen is carried to cells in the body through blood. Other nutrients are also carried by blood. The circulatory system moves blood through the body to provide the necessary oxygen and nutrients cells need.

Why do you think this transportation system is called the circulatory system?

Question and Answer

TRY THE SKILL

You can monitor your understanding of what you read by asking questions about the topic and then reading to find the answer. Sometimes authors will even write a question in the text and then answer it.

Read the paragraph from *Internal Structures of Animals*.

Another transportation system in the body is the circulatory system. You know oxygen is carried to cells in the body through blood. Other nutrients are also carried by blood. The circulatory system moves blood through the body to provide the necessary oxygen and nutrients cells need.

What is the question?

What is the purpose of the circulatory system?

What is the answer?

The circulatory system moves blood through the body to provide the necessary oxygen and nutrients cells need.

After reading *Internal Structures of Animals*, you should be able to answer the following questions.

What is the purpose of the respiratory system?

Now think of another question you could ask based on *Internal Structures of Animals*. Then, write an answer in your own words.

Roots and Suffixes

TRY THE SKILL

Understanding roots and suffixes can help you understand the meanings of words and increase your vocabulary. The following table shows the meaning of different suffixes.

Suffix	Meaning	Example
<i>-ed</i>	Makes a verb past tense	Evaporated—The water evaporated yesterday.
<i>-ing</i>	Makes a verb ongoing	Evaporating—Lakes are constantly evaporating.
<i>-tion</i>	Makes a verb a noun	Evaporation—Evaporation occurs when something wet dries.

What form of the word *digest* should you use in the following sentences?

- _____ of food begins when you put food in your mouth.
- _____ your food is necessary for you to survive.
- Nutrients from _____ food are absorbed and carried to cells in the body through blood.

The first sentence used *digest* as a noun (digestion).
The second sentence is ongoing (digesting). The third sentence uses *digest* in the past tense (digested).

Read the roots and suffixes. Write sentences in the chart that combine the roots and suffixes. The first one is done for you.

Root	Suffix	Sentence
Circulate	<i>-ing</i>	Blood is circulating around your body at all times.
	<i>-ed</i>	
	<i>-tion</i>	
Transport	<i>-ing</i>	
	<i>-ed</i>	
	<i>-tion</i>	

Answer Key

Draw Conclusions

You can draw a conclusion by using what you know about the word *circulate*. *Circulate* means “to move in a regular course and return to the same point.” The circulatory system circulates, or moves, blood through the body.

Question and Answer

Possible answer: The purpose of the respiratory system is to supply oxygen for the body so the cells can unlock the energy in food. It also eliminates carbon dioxide, a waste product, from the body.

Roots and Suffixes

Sentences will vary.

Diagrams

The purpose of the digestive system is to convert the food we eat into smaller particles so our bodies can absorb the nutrients in the food. The main organs that make up the digestive system are the mouth, esophagus, stomach, small intestine, large intestine (colon, rectum), and anus.