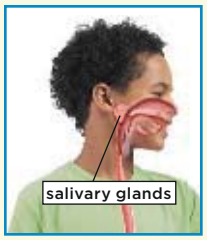
CHAPTER 3

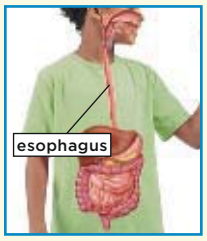
Human Body Systems

Vocabulary

digestion breaking down food into simpler substances that your body can use

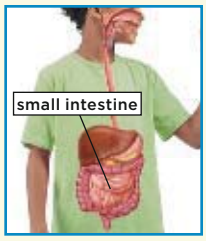


saliva a watery fluid that softens and moistens food



esophagus the long muscular tube that brings food into the stomach

stomach a muscular organ that changes food into a thick soupy liquid



small intestine the organ that completes digestion and allows digested food to enter the blood

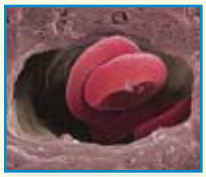
large intestine the thick tube-like organ that removes undigested waste

diaphragm a large, flat muscle that pulls air in and pushes air out of the lungs

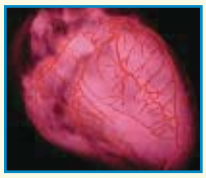
lung one of the two organs that fills with air when you inhale

How does your body work?

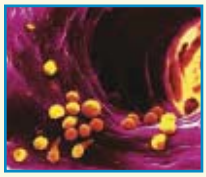
alveoli air sacs in the lungs where gases move into and out of the blood



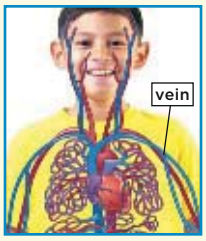
capillary a tiny blood vessel



heart a muscular organ that constantly pumps blood throughout the body

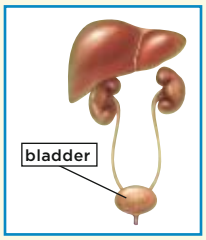


artery a thick-walled blood vessel that carries blood away from the heart



vein a blood vessel that carries blood back to the heart

kidney an organ that filters certain body wastes out of the blood



bladder an organ that stores liquid wastes from the kidneys temporarily

nephron a part of the kidneys where waste materials are separated from useful materials in the blood

What are organ systems?

The human body is organized to do many jobs at the same time.

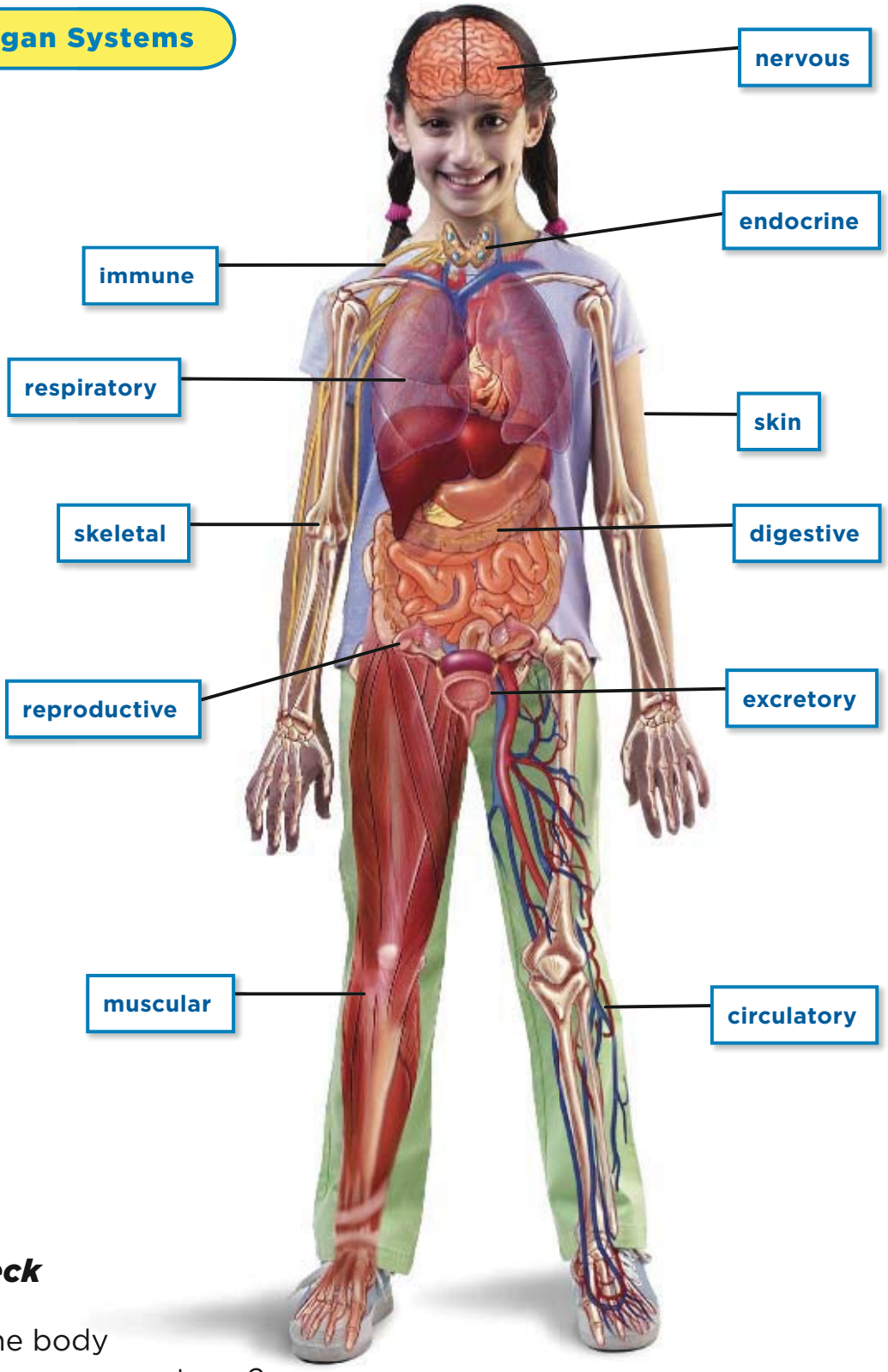
- The smallest part of the body is the cell, such as blood cells.
- Similar cells working together to do a job make up a tissue.
- Different tissues working at the same job make up an organ.
- Organs working together at certain jobs form an *organ system*.

Organ systems work together to carry out all your life activities.

Human Organ Systems

System	Summary
skeletal	made of 206 bones, which support and protect the body and give it shape
muscular	made of muscles, which move the skeleton and make up some organs
respiratory	brings oxygen to lungs and then to the body cells and gets rid of carbon dioxide
circulatory	uses the heart, blood, and blood vessels to move materials to and from cells
excretory	uses skin, lungs, and kidneys to remove wastes from the body
nervous	sends messages throughout the body by way of the brain, spinal cord, and nerves
digestive	uses the mouth, stomach, and small intestines to turn food into nutrients that the cells of the body can use
immune	protects and fights against disease and helps heal injuries
skin	protects the body from injury and germs and removes some wastes
endocrine	produces chemicals that travel in the blood to control growth and other activities
reproductive	produces offspring (that is, more of one's own kind)

Organ Systems



Quick Check

1. Why does the body need so many organ systems?

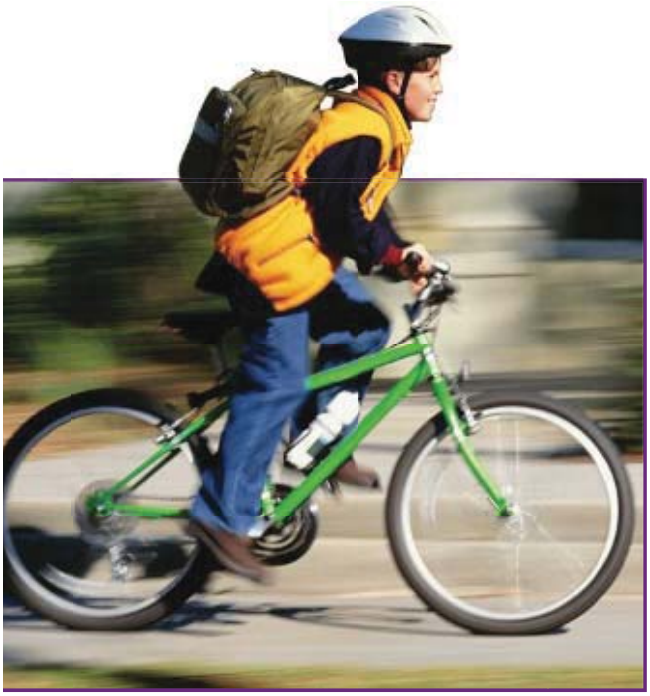
_____

_____

What do organ systems do?

Each organ system has certain jobs. However, they work together, at the same time. When you ride a bicycle, for example, some of the organ systems at work are:

- **skeletal** (SKEL•i•tul): supports your body
- **muscular** (MUS•kyuh•luhr): works with the skeletal system as you pedal and tighten the brakes
- **respiratory** (RES•puhr•uh•tawr•ee): brings oxygen into the lungs
- **circulatory** (SUR•kyuh•luh•tawr•ee): carries the oxygen from the lungs to your cells
- **excretory** (EK•skri•tawr•ee) and **skin**: remove wastes and keep the body from overheating
- **nervous** (NUR•vuhs): controls the other systems
- **endocrine** (EN•duh•krin): prepares you for a sudden stop



Your organ systems work at the same time as you do any everyday activity.

Quick Check

List two details that support the main idea.

Main Idea	Details
Many organ systems carry out your life activities.	**2.** _____
	3. _____

How are materials transported?

Materials are moving through your body all the time. They include nutrients from the foods you eat, oxygen that you inhale, and wastes from your cells. Four organ systems are working together to move these materials. These organ systems are your body's *transport systems*.

A highway is a transport system for cities.

Transport Systems of the Human Body

System	What It Transports	Summary
digestive	food and nutrients	moves food through digestive organs and breaks it down into nutrients
respiratory	oxygen	moves oxygen into lungs, where it is picked up by circulatory system
circulatory	nutrients, oxygen, wastes	carries oxygen and nutrients to cells, carries wastes away from cells
excretory	wastes such as carbon dioxide, sweat	uses blood to carry wastes to organs that remove them from the body

Quick Check

4. How is a highway similar to transport systems of the body?

_____

_____

5. Why is the excretory system important? _____

_____

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What is digestion?

Every cell in your body needs energy to live and grow. This energy comes from food. However, food has to be broken down into a form your cells can use. Breaking down food into simpler substances that your body can use is called **digestion** (die•JES•chuhn).

Here is how food reaches your cells:

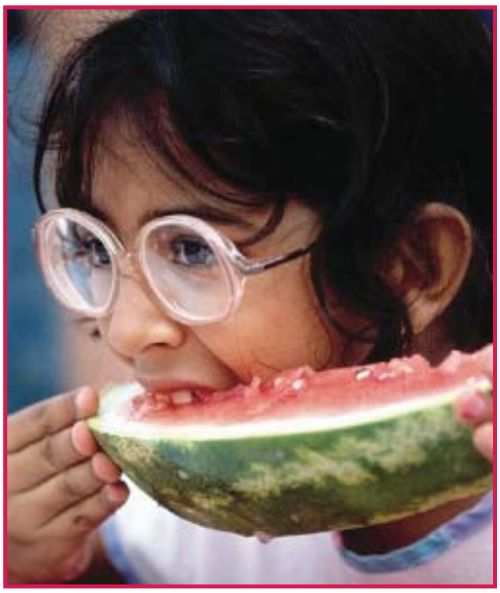
1. When you bite into and chew food:

- your teeth and tongue break the food into small pieces
- chemicals in your mouth break down some of the food into nutrients.

A *nutrient* is a simple form of food that your cells can use.

2. The process continues in other organs where food is broken down further.

3. The nutrients eventually pass into your blood. Blood carries them to your cells. The nutrients give your cells energy and materials for growing.



Your digestive system starts working on food in your mouth.

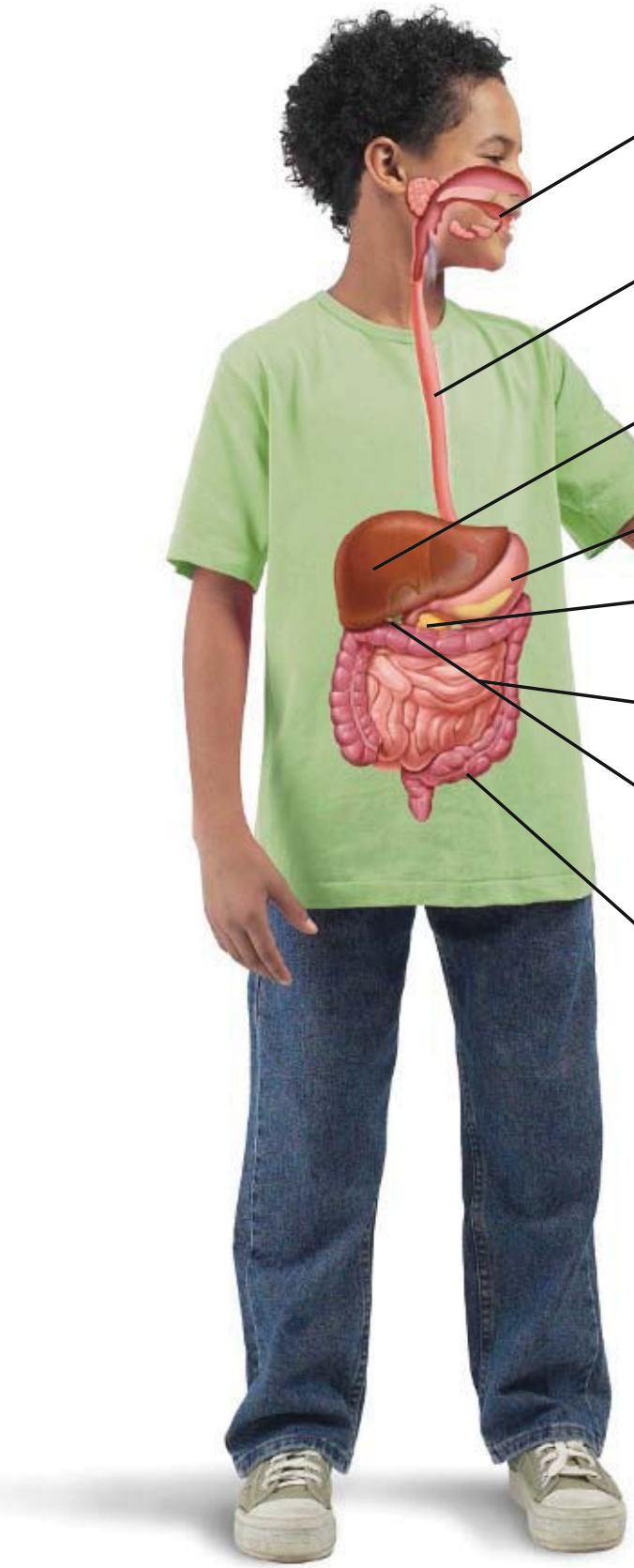
Quick Check

6. Why is digestion an important life process?

_____

_____

Digestive System



Mouth is where digestion starts.

Esophagus moves food from the mouth to the stomach

Liver adds digestive juices to break down food

Stomach turns food into a soupy liquid.

Pancreas adds digestive juices to break down food.

Small Intestine completes digestion and lets food pass into the blood.

Gall Bladder stores digestive juices from the liver until needed.

Large Intestine eliminates undigested wastes.

Quick Check

7. Why are there so many organs in your digestive system?

_____

_____

_____

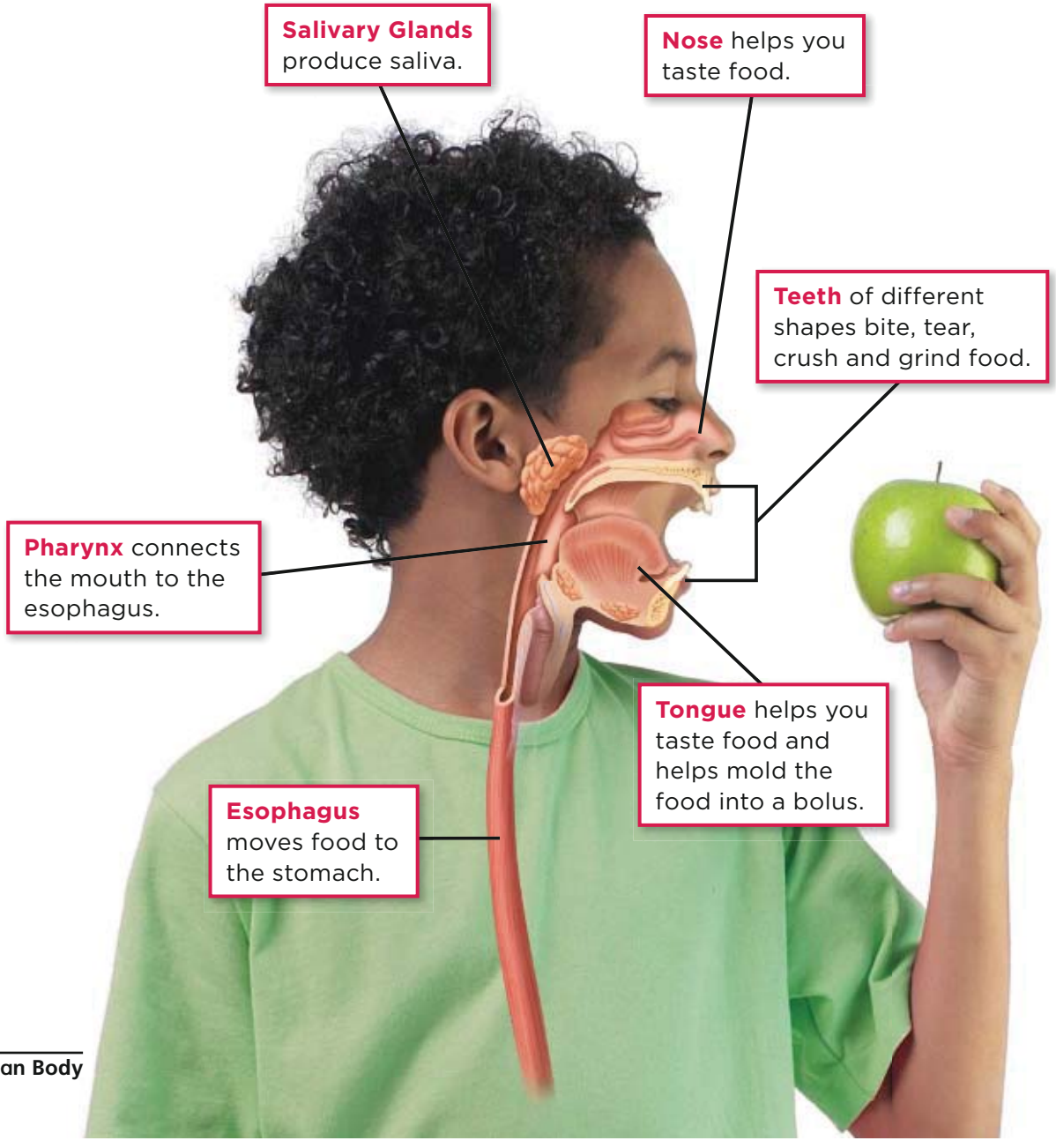
How does it start?

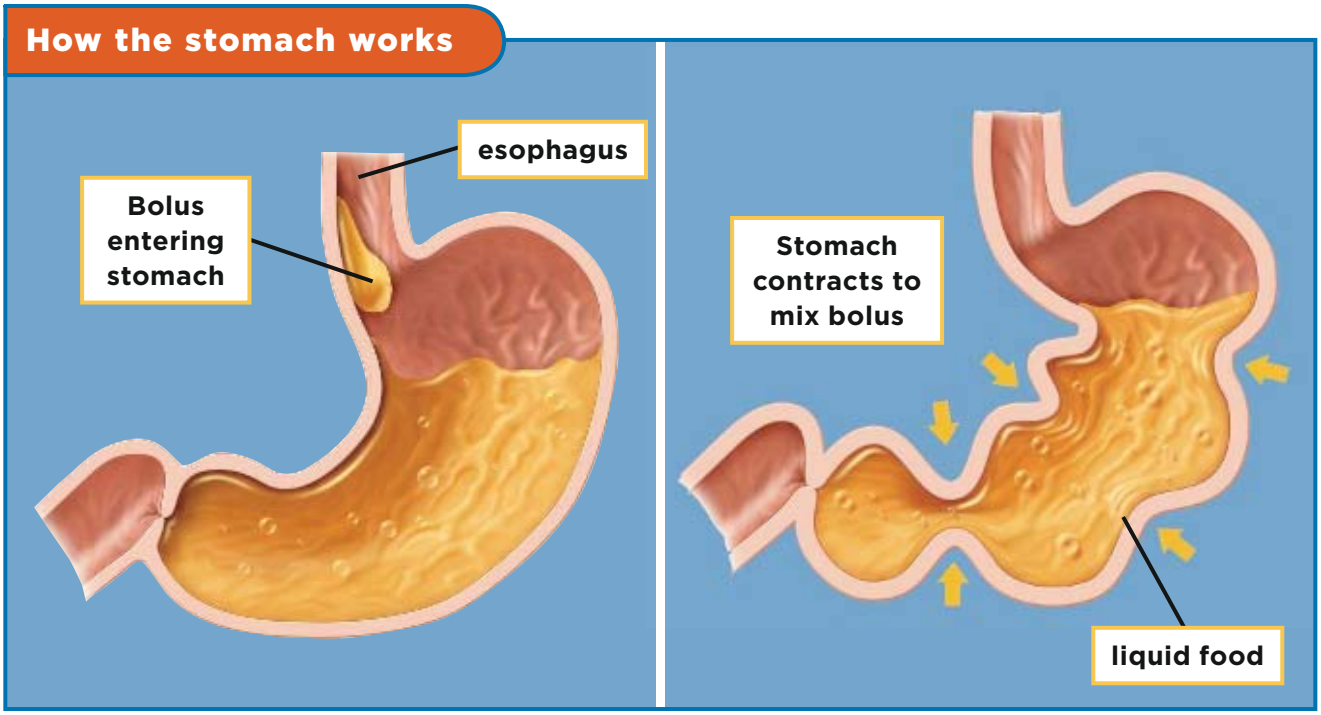
When you eat an apple

- your front teeth bite into it and tear it
- your back teeth grind and crush it
- your back teeth and tongue roll the food into a ball, called a *bolus*.

Your mouth produces saliva (seh•LIE•vuh). **Saliva** helps to moisten and soften the bolus and starts to break it into some nutrients. The bolus then reaches the pharynx (FAR•ingks) in the throat.

The bolus then enters the esophagus (i•SOF•uh•guhs). The **esophagus** is long, muscular tube that moves food into the stomach.





The Stomach

The bolus enters the stomach. The **stomach** is a digestive organ with muscular walls.

- The walls of the stomach produce chemicals that break down the bolus further into nutrients.
- The muscles in the walls of the stomach squeeze (contract) and relax over and over. This muscle action mixes up the bolus with the chemicals.

After about 4 to 6 hours of squeezing and mixing, the bolus has become a thick, soupy liquid. The liquid then moves into the next digestive organ.

Quick Check

Match each word with its description

8. ____ moves food into the stomach	**a.** stomach
9. ____ moistens the bolus in the mouth	**b.** teeth
10. ____ tears and crushes food	**c.** esophagus
11. ____ turns food into a soupy liquid	**d.** saliva

How is food broken down further?

When food leaves the stomach, it moves into an organ that has folds in its walls. That organ is the small intestine. The **small intestine** is a long, coiled tube-like organ. The folds are a clue to what happens there.

The fingerlike folds in the walls of the small intestine soak up nutrients.

Other parts of the digestive system pour digestive juices into the small intestine:

- the *pancreas* adds juices that digest most kinds of foods.
- the *liver* adds *bile*, which breaks up fats.

As food moves through the long small intestine:

1. the juices mix with food until it is all broken down into nutrients.
2. the folds in the walls of the small intestine soak up the nutrients.
3. In the folds, the nutrients pass into tiny blood vessels. Blood carries the nutrients to the cells.

Quick Check

Fill in the diagram. Summarize digestion into three main steps.

12. First _____

↓

13. Next _____

↓

14. Last _____

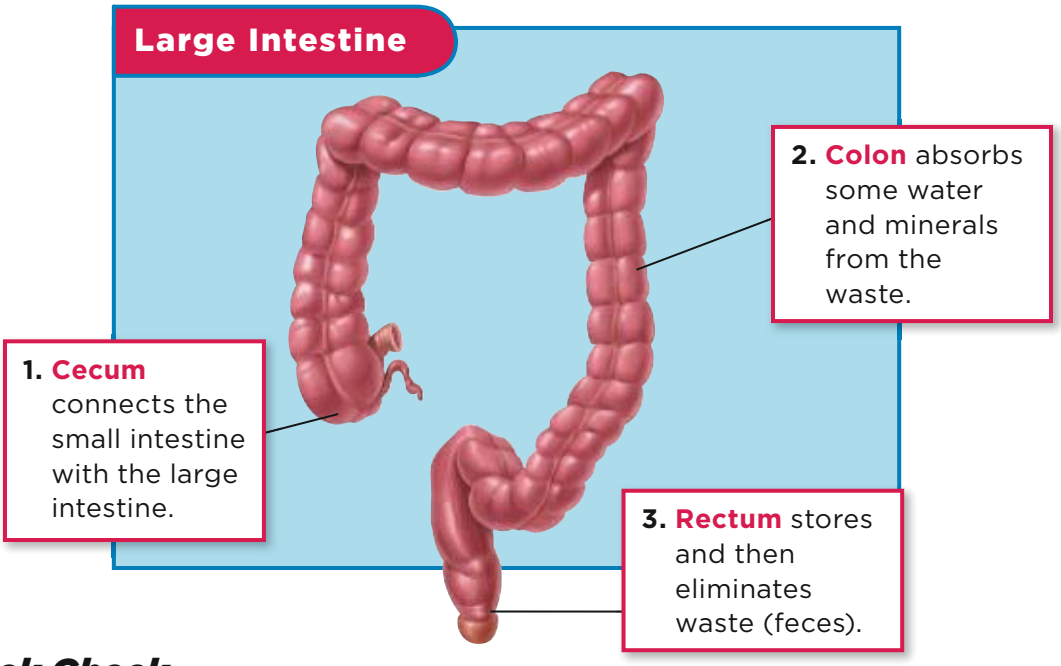
What is the large intestine?

Not everything that you chew is digested. Undigested parts of the food are a form of waste. This waste moves from the small intestine into the large intestine. The **large intestine** is a thick tube-like organ that removes undigested waste from the body.

In this organ, wastes move through three parts:

- cecum (SEE•kuhm)
- colon (KOH•luhn)
- rectum (REK•tuhm)

Solid waste, *feces* (FEE•seez), is pushed out from the rectum. It leaves the body through the *anus* (AY•nuhs). This process is called elimination (i•li•muh•NAY•shuhn).



Quick Check

15. How is the job of the large intestine different from the job of the small intestine? _____

_____

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What does the respiratory system do?

You breathe all the time, even while you sleep. Breathing is a job of your respiratory system. This system works to take in oxygen from the air and bring it to your blood. Your blood brings oxygen to all your cells. Here's how it works:

- You have a muscle, the **diaphragm** (DIGH•uh•fram), that works to pull air in and push air out of your body,
- When the diaphragm pulls down, you inhale (in•HAYL). Air enters your mouth and nose and fills your **lungs**, the main organs for breathing.
- In the lungs, oxygen passes into the blood. The blood, in turn, drops off carbon dioxide, a waste gas, into your lungs.
- When the diaphragm moves back up, you exhale. The carbon dioxide is pushed out of your body

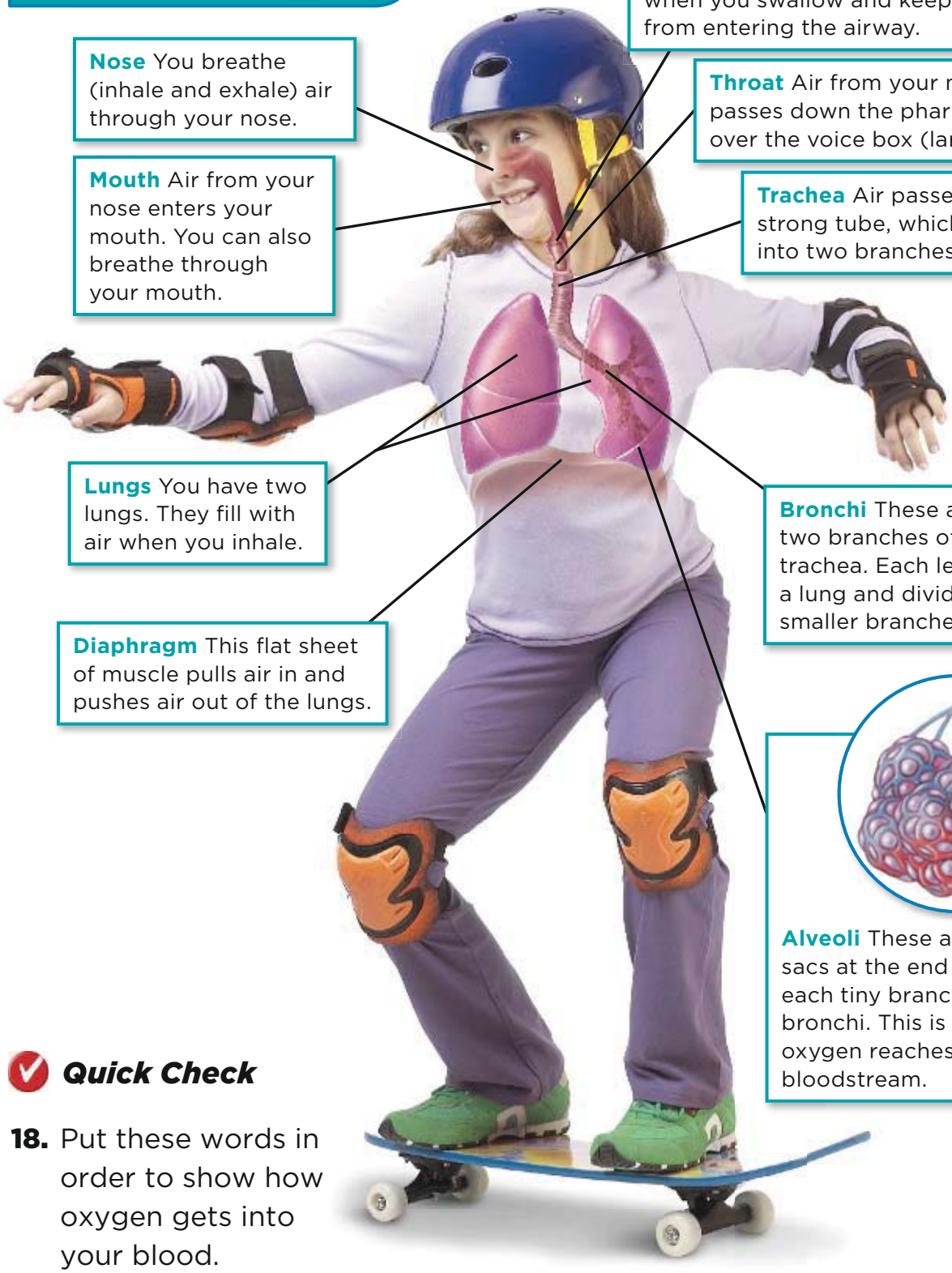
When you blow up a balloon, you are exhaling air with carbon dioxide.

Quick Check

Fill in the diagram. Tell two ways the diaphragm moves as you breathe.

Main Idea	Details
The diagram controls your breathing.	**16.** inhale _____
	17. exhale _____

The Respiratory System



Epiglottis This flap of tissue closes when you swallow and keeps food from entering the airway.

Nose You breathe (inhale and exhale) air through your nose.

Throat Air from your mouth passes down the pharynx and over the voice box (larynx).

Mouth Air from your nose enters your mouth. You can also breathe through your mouth.

Trachea Air passes into this strong tube, which divides into two branches.

Lungs You have two lungs. They fill with air when you inhale.

Bronchi These are the two branches of the trachea. Each leads into a lung and divides into smaller branches.

Diaphragm This flat sheet of muscle pulls air in and pushes air out of the lungs.

Alveoli These are small sacs at the end of each tiny branch of the bronchi. This is where oxygen reaches the bloodstream.

Quick Check

18. Put these words in order to show how oxygen gets into your blood.

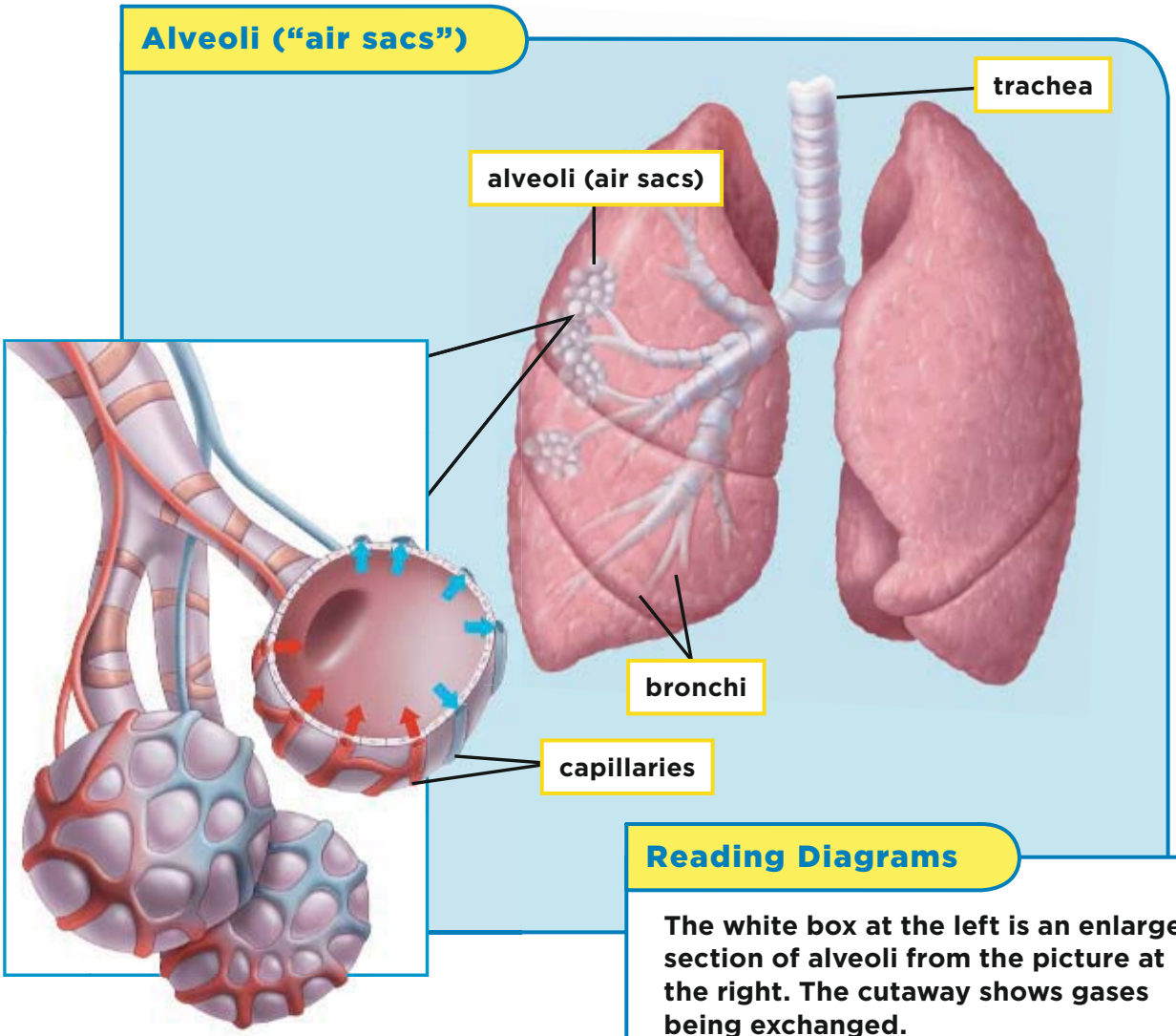
mouth trachea alveoli bronchi

Where are gases exchanged?

As you inhale, air enters your nose and mouth. Air follows this path:

- Air moves through the trachea (TRAY•chee•uh), a thick tube that leads into smaller and smaller tubes, ending with the bronchi (BRONG•kigh).
- The bronchi lead to air sacs called **alveoli** (al•VEE•uh•ligh). The alveoli are surrounded by tiny blood vessels, **capillaries** (KAP•uh•ler•eehs).
- In the alveoli, oxygen from the air goes into the blood in the capillaries. Carbon dioxide leaves the blood and enters the alveoli. Carbon dioxide is exhaled.

Alveoli ("air sacs")



Reading Diagrams

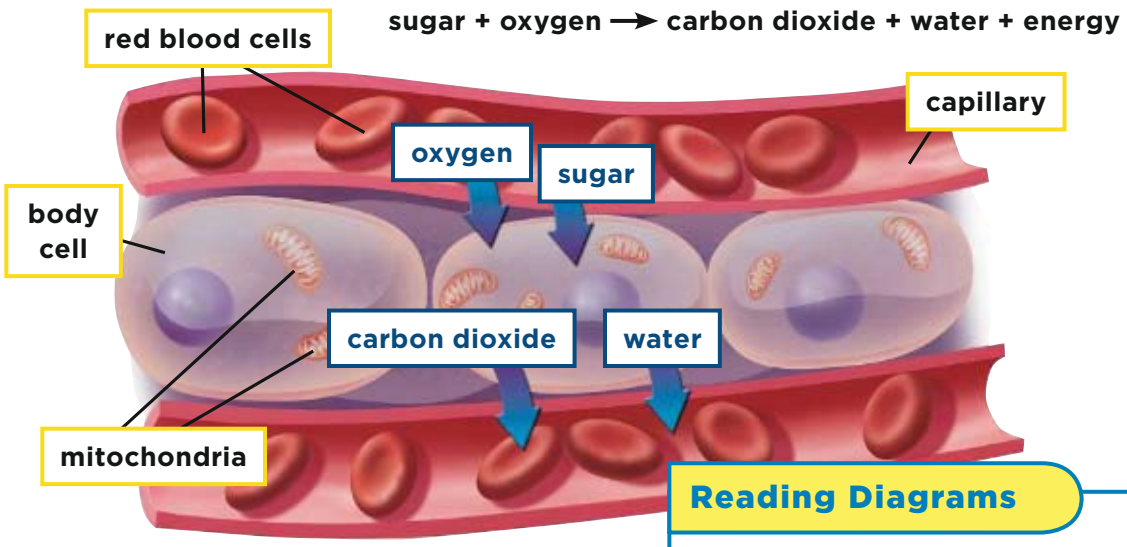
The white box at the left is an enlarged section of alveoli from the picture at the right. The cutaway shows gases being exchanged.

Respiration in the Cells

What happens to oxygen in the blood? The oxygen is picked up by red blood cells. Blood is also carrying sugar from digested food.

When blood flows through a capillary, sugar and oxygen move into body cells. In a body cell, they go to the mitochondria. Here respiration takes place. The oxygen is used to break down the sugar and release energy. Two wastes are produced, carbon dioxide and water. Blood cells carry carbon dioxide back to the lungs, where it is exhaled. You'll learn later how water is removed.

Cellular Respiration



Reading Diagrams

Two arrows show sugar and oxygen entering a cell. Two other arrows show two wastes leaving the cell.

Quick Check

19. Two gases exchanged in the air sacs are _____ and carbon dioxide.

20. Blood carries oxygen and _____ to body cells.

21. Body cells release carbon dioxide and _____.

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