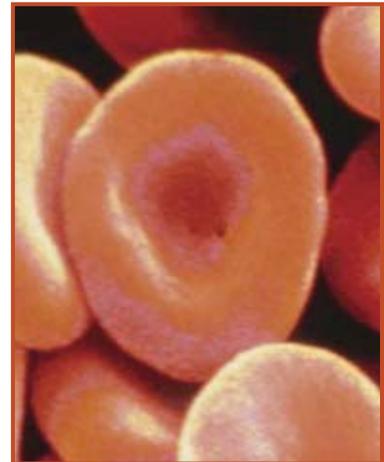


## How does blood transport materials?

Your circulatory system is a “delivery system.” Red blood cells travel in the blood, bringing things to and from your body cells.

- The main organ of the system is heart. The **heart** is a muscular organ that constantly pumps blood throughout the body.
- Blood vessels called **arteries** (AHR•teer•ees) carry blood away from your heart. Blood in an artery brings oxygen and food to body cells.
- Arteries lead to capillaries, the thinnest blood vessels. Here oxygen and food pass into body cells. The body cells release wastes, such as carbon dioxide, into the blood.
- The capillaries now lead to the veins (VAYNZ). A **vein** is a blood vessel that carries blood back to the heart.



Red blood cells are the messengers of the circulatory system.

### **Quick Check**

Trace the path of blood after it is pumped from the heart.

22. First \_\_\_\_\_



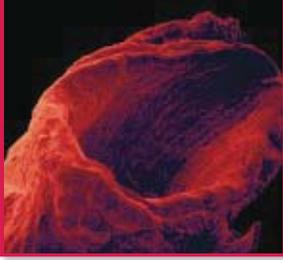
Next The vessels described above lead blood to capillaries.



23. Last \_\_\_\_\_

## The Circulatory System

**Vein** Veins carry blood back to the heart. The blue color is used to show blood with carbon dioxide.



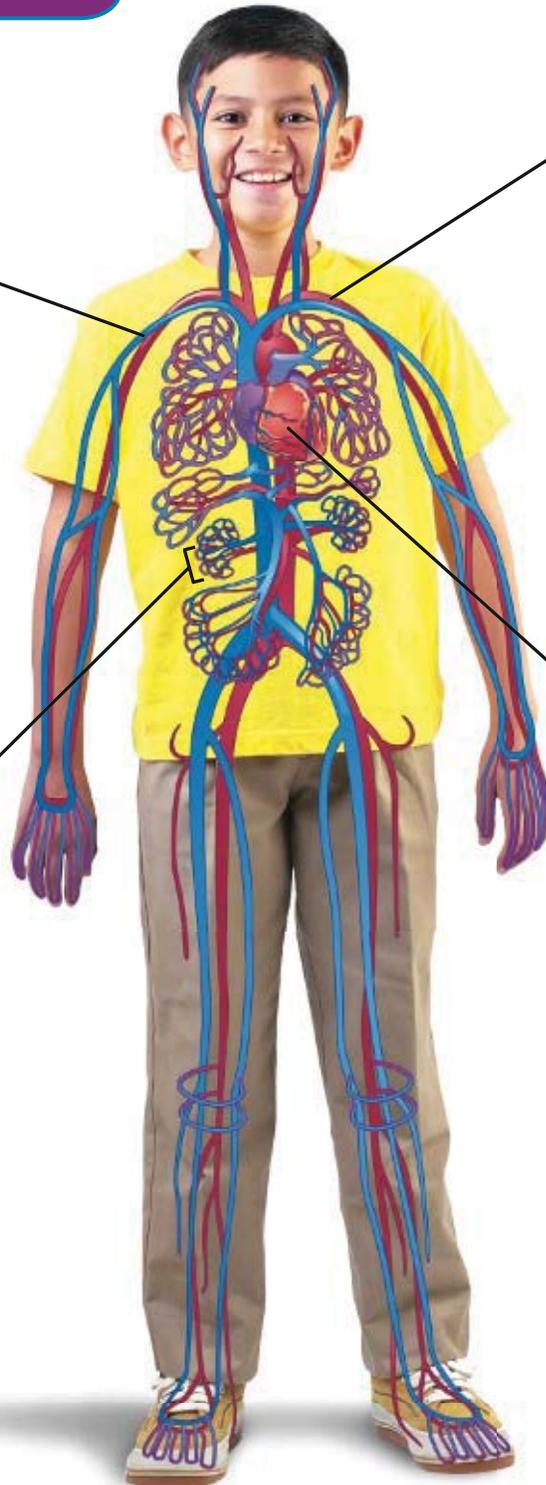
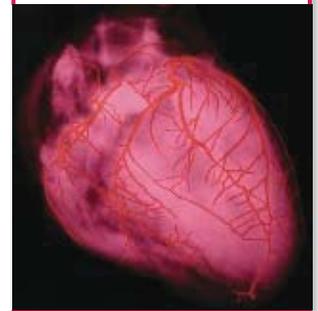
**Artery** Arteries carry blood away from the heart. The red color is used to show blood with oxygen.



**Capillary** This is the thinnest kind of blood vessel. Only one red blood cell at a time fits through.



**Heart** A heart beats 70 to 90 times a minute, pumping blood throughout your body.



### Quick Check

24. Why is the heart the *main* organ of the circulatory system?

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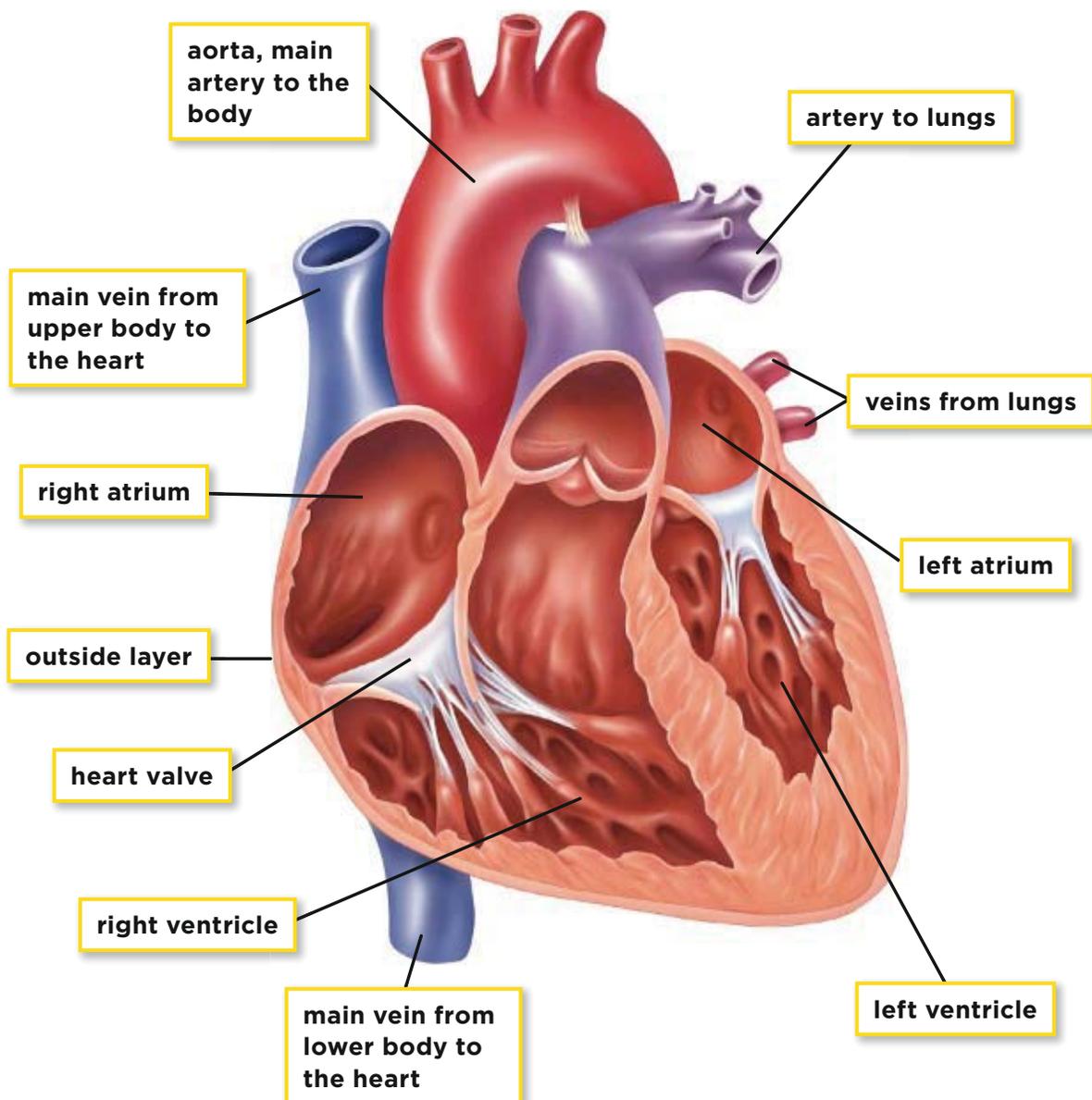
25. Red is used to show blood that has \_\_\_\_\_.

## How can systems work together?

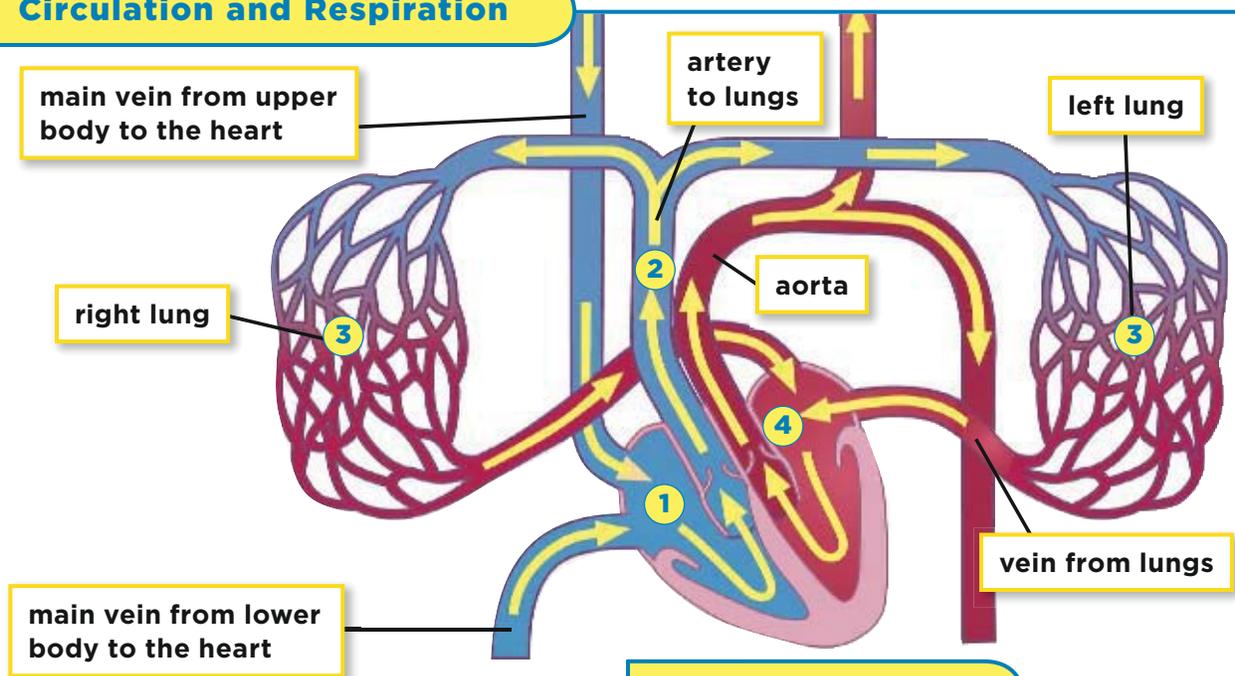
The circulatory and respiratory systems work together. Here's how:

- Veins bring blood into an upper “chamber” of the heart called an *atrium* (AY•tree•uhm).
- From an atrium, blood flows through a *valve* to a lower “chamber,” called a *ventricle* (VEN•tri•kul).
- Blood is pumped out of the ventricle through an artery.

### The Heart



## Circulation and Respiration



### Reading Diagrams

What are the main steps as blood flows through the heart to the lungs and back?

**LOG ON** *Science in Motion* Watch how the circulatory and respiratory systems work together@ [www.macmillanmh.com](http://www.macmillanmh.com)

### Heart to Lungs

Follow the numbers in the diagram as you read.

1. Veins bring blood with carbon dioxide to the right side of the heart.
2. The blood is pumped through an artery to the lungs.
3. In the lungs, blood drops off carbon dioxide. Blood takes in oxygen.
4. Veins bring oxygen-rich blood to the left side of the heart. It is pumped out to the body through a main artery, called the *aorta* (ay•AWR•tuh).

### Quick Check

26. Why does the heart pump blood to the lungs?
-

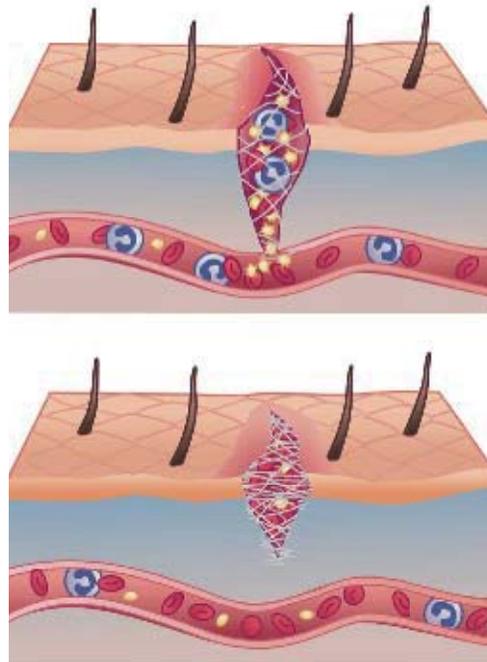
# What is blood?

Blood looks like a red liquid. However, it is made of a liquid *and* cells.

- **Plasma** (PLAZ•muh) is a clear liquid. It makes up just over half of your blood. Plasma carries the solid parts of the blood. It also carries nutrients from your digested food to all your cells.
- **Red blood cells** make up just less than half your blood. Red blood cells carry oxygen to all the cells of your body. They pick up carbon dioxide from your cells and bring it to the lungs.
- **White blood cells** make up a small amount of your blood. They fight germs that enter the body.
- **Platelets** (PLAYT•lits) are small pieces of cells. They clump together to form a scab or clot when you cut yourself.

## How Platelets Heal

Platelets help heal cuts by clotting or sticking together.



### Quick Check

Match the word and its description.

- |                           |                 |
|---------------------------|-----------------|
| 27. ___ red blood cells   | a. fight germs  |
| 28. ___ platelets         | b. carry oxygen |
| 29. ___ white blood cells | c. forms clots  |
30. Why do you think there is so much plasma in your blood?

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## How do vessels and valves work?

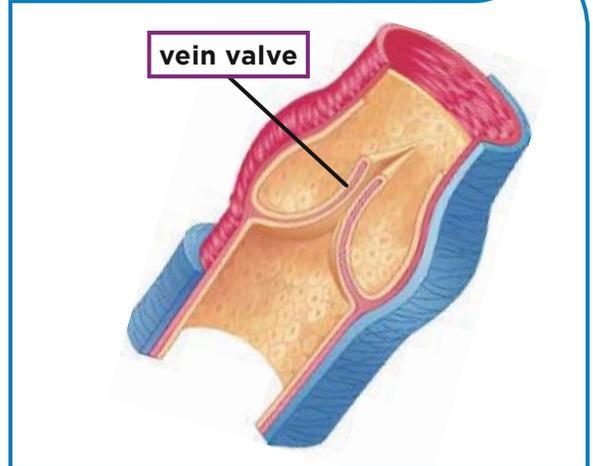
Blood vessels form an unbroken path for blood.

- Arteries are thick-walled vessels leading away from the heart.
- Veins, which lead blood back to the heart, are thinner-walled. They are still thick enough to keep materials from passing through.
- Capillaries connect arteries to veins. They have thin walls. So nutrients can pass through the walls. So can oxygen and carbon dioxide.

Many veins have valves. These valves close up as needed to keep blood from backing up in the wrong direction. They then open to let blood flow in the correct direction.

Valves in the heart do much the same. They let blood flow from an atrium to a ventricle. However, they close to keep blood from flowing back in the wrong direction.

### Structure of Vein Valves



### Heart Valve



Heart valves are like doors between chambers of the heart. They keep blood from flowing in the wrong direction.

### Quick Check

31. Why are valves important? \_\_\_\_\_

\_\_\_\_\_

32. Why does the body have three kinds of blood vessels? \_\_\_\_\_

\_\_\_\_\_

## Lesson 5 The Excretory System

### What is the excretory system?

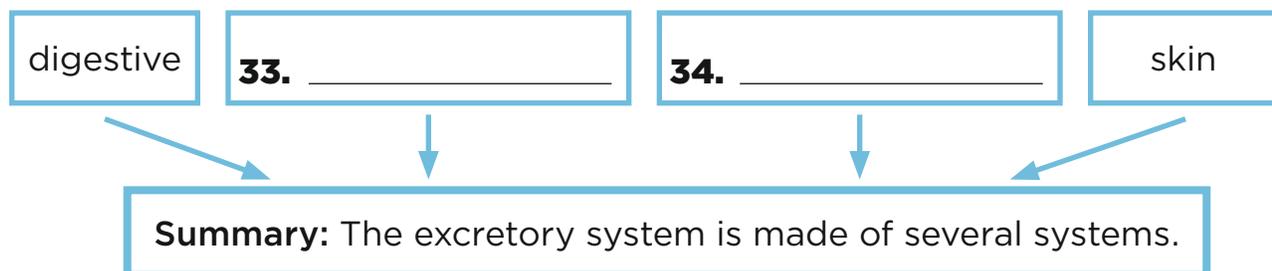
Your body produces wastes. Your excretory system gets rid of these wastes. This system is really several systems:

- **solid waste from digestion** Remember, this waste leaves through the end of the large intestine (digestive system).
- **carbon dioxide from body cells** Remember, you exhale this waste from your lungs (respiratory system).
- **liquid wastes from body cells** The urinary (YUR•uh•ner•ee) system gets rid of these wastes:
  1. These wastes are carried in the blood from the liver to the kidneys. The **kidneys** (KID•nees) are two bean-shaped organs that filter these wastes out of the blood.
  2. The kidneys then produce urine (YUR•in). Urine is waste and water.
- **sweat** Sweat is water, salts, and wastes. It leaves your body through your skin system.

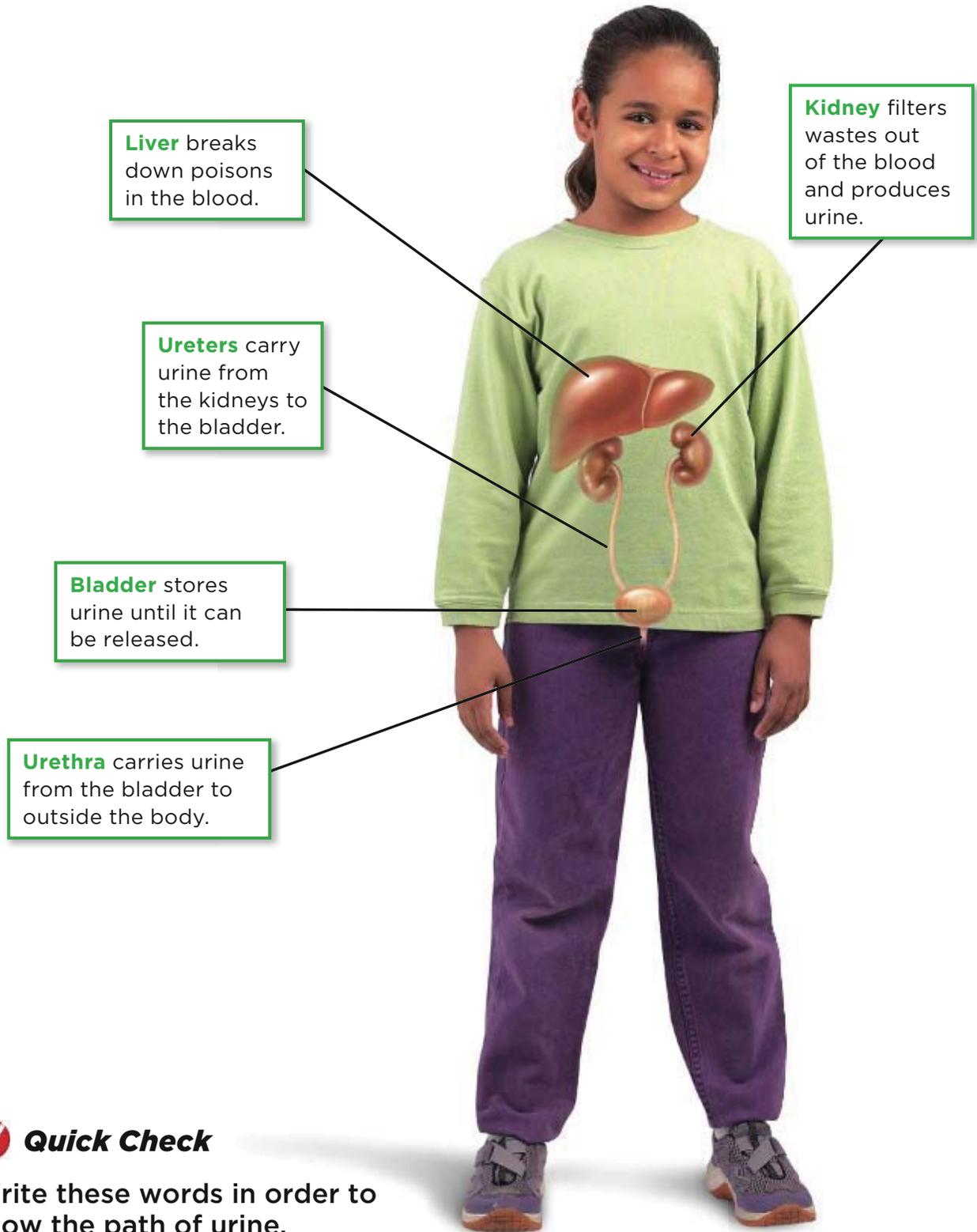
This lesson is about how urine and sweat leave the body.

#### **Quick Check**

Fill in the diagram with the names of organ systems.



## The Excretory System



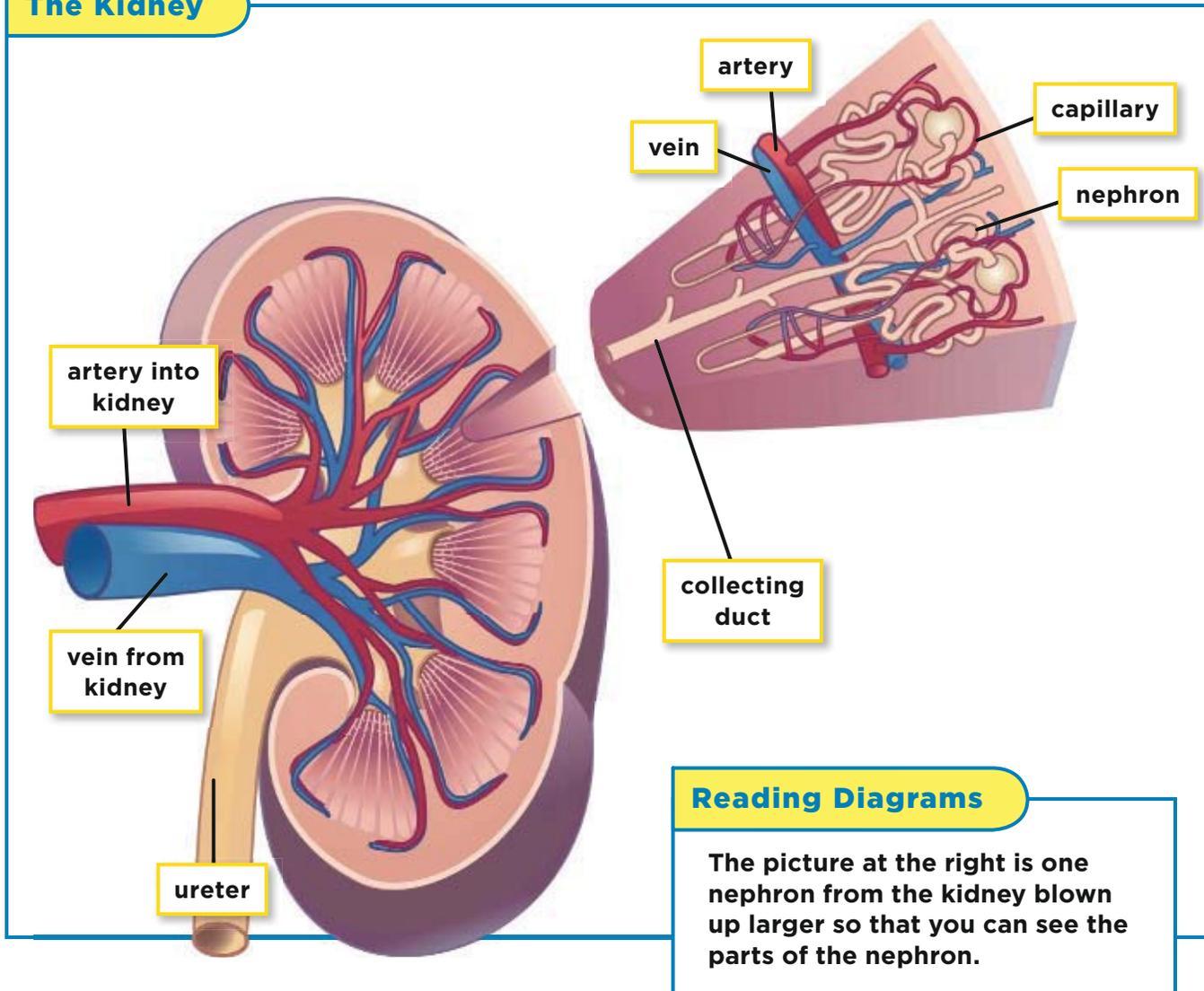
### **Quick Check**

Write these words in order to show the path of urine.

bladder urethra ureters

35. \_\_\_\_\_

## The Kidney



### Reading Diagrams

The picture at the right is one nephron from the kidney blown up larger so that you can see the parts of the nephron.

## How does your kidney work?

All your blood passes through your kidneys about 60 times a day! Your kidneys remove substances from the blood that your body no longer needs. They also return to the blood substances your body does need. Here's how:

1. An artery brings blood into a kidney. The artery branches into capillaries. The capillaries bring blood to the nephrons (NEF•rons). A **nephron** is the part of a kidney where waste materials are separated from useful materials in the blood.

2. Wastes from the blood move out from the capillaries into the nephron. The wastes flow through a collecting duct. Collecting ducts from all the nephrons join into the ureter. The ureter leads the waste (urine) out of the kidney.
3. At the nephron, useful substances that may have been removed from the blood pass back into the capillaries. These capillaries lead blood to a vein. The vein carries the cleaned blood out of the kidney.

### If Kidneys Stop Working

Sometimes the kidneys may stop working properly. Wastes can build up in the blood to dangerous levels. People with this problem may need dialysis (digh•AL•uh•sis).

Dialysis is a treatment that uses a machine to do the job of the kidneys.



Dialysis removes dangerous wastes from this patient's blood.

### Quick Check

36. How do wastes leave the kidney? \_\_\_\_\_

\_\_\_\_\_

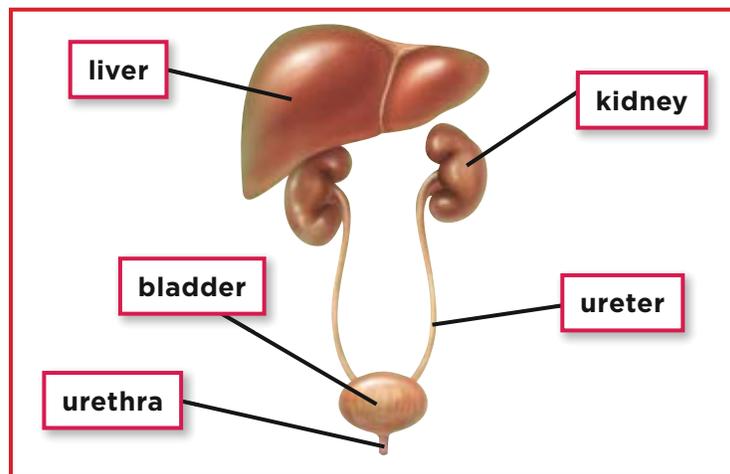
37. How does cleaned blood leave the kidney? \_\_\_\_\_

\_\_\_\_\_

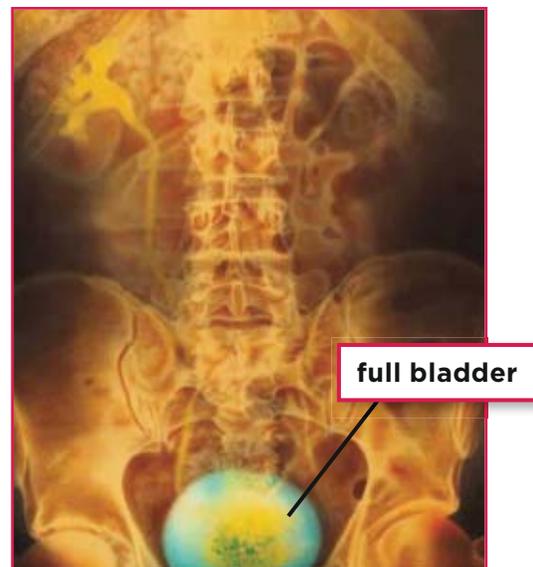
## How does your body get rid of liquid wastes?

Your urinary system is like a drainage system. Your kidney collects wastes from the blood and forms urine.

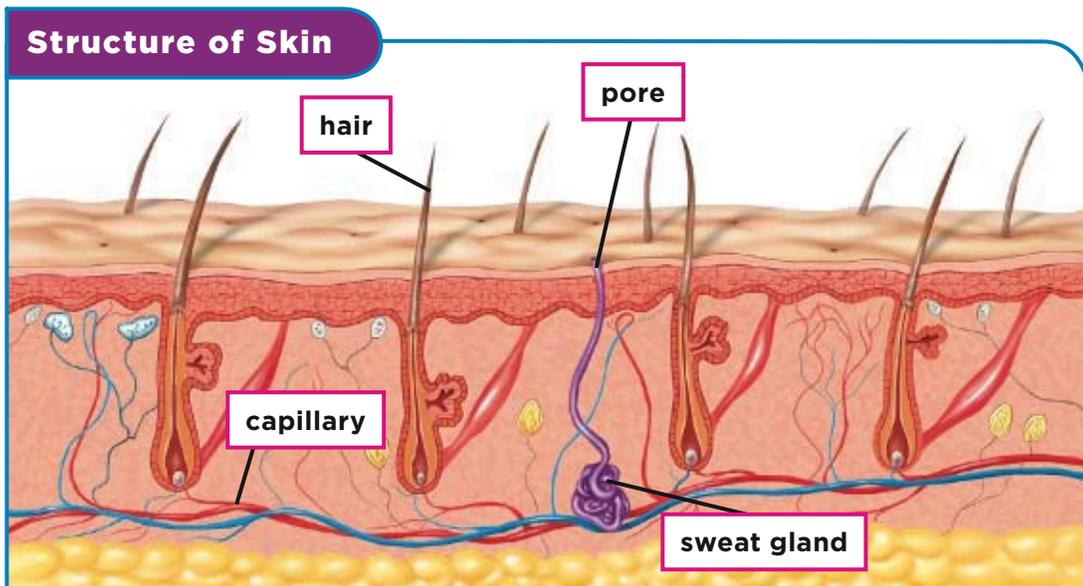
- A tube called a ureter (yu•REE•tuh) leads the urine out of the kidney
- The ureter brings urine into the bladder. Urine collects in the bladder for several hours.
- When the bladder is holding a lot of urine, eventually it is released into the urethra (yu•REE•thruh), The urethra carries urine from the bladder to outside the body.



Empty, a bladder is about the size of a plum.



Full, it is about the size of a grapefruit.



## The Skin

Liquid waste also leaves your body through the skin. Sweat is made up of water, salts, and other wastes. Follow what happens in the skin diagram.

- Blood in the capillaries carries wastes. The wastes collect in a sweat gland.
- Sweat from the gland is pushed upward. It reaches the surface through an opening, called a pore (PAWR). At the surface it collects as droplets.
- The sweat evaporates from the surface. That is, the liquid turns into a gas and goes into the air. As the liquid turns into gas, it takes heat away from the skin. As heat is removed, your skin cools down.

### Quick Check

Match the word with its description.

- |                                     |            |
|-------------------------------------|------------|
| 38. ___ holds urine                 | a. pore    |
| 39. ___ opening in the skin         | b. ureter  |
| 40. ___ leads urine out of the body | c. bladder |
| 41. ___ brings urine to the bladder | d. urethra |

# The Human Body

Choose the letter of the best answer.

- The air sacs in the lungs where gases move into and out of the blood are called
  - bronchi
  - arteries
  - alveoli
  - veins
- The thick tube-like organ that removes undigested waste is called the
  - large intestine
  - small intestine
  - esophagus
  - nephron
- Breaking down food into simpler substances that your body can use is called
  - respiration
  - breathing
  - transport
  - digestion
- The long muscular tube that brings food into the stomach is the
  - diaphragm
  - heart
  - kidney
  - esophagus
- The thinnest kind of blood vessel is a(n)
  - artery
  - vein
  - capillary
  - alveoli
- The part of the kidneys where waste materials are separated from useful materials in the blood is called the
  - small intestine
  - nephron
  - lung
  - stomach
- The organ that completes digestion and allows digested food to enter the blood is the
  - small intestine
  - bladder
  - diaphragm
  - saliva
- A large, flat muscle that pulls air in and pushes air out of the lungs is the
  - heart
  - stomach
  - diaphragm
  - kidney

