

Topic 1.4

How do systems work together in the human body?

Key Concepts

- The respiratory system carries oxygen to and removes carbon dioxide from the blood.
- The circulatory system transports dissolved gases and nutrients through the body.
- The digestive system breaks down food, absorbs nutrients, and eliminates solid waste.
- Organ systems working together carry out important tasks in the body.

Key Skills

- Inquiry
- Literacy

Key Terms

gas exchange
alveoli
capillaries
red blood cells
absorption

In 2009, Canadian astronaut Robert Thirsk began a six-month stay on the International Space Station (ISS) orbiting around Earth. The astronauts on the ISS place their lives in the hands of the space station's advanced life support system. For the astronauts to survive in space, the temperature and pressure within the ISS must be maintained. An adequate supply of oxygen must be provided, and waste gases, such as carbon dioxide, must be removed. Solid waste must also be removed, but urine is recycled to provide the crew with clean water. All of these functions are achieved with the help of advanced technology systems.

All the systems on the ISS must work together to support life on board. The same is true inside your body. Like the life support system on the ISS, your organ systems must work together to keep you alive. For instance, your body needs systems that enable it to take in oxygen and remove carbon dioxide.



Starting Point Activity

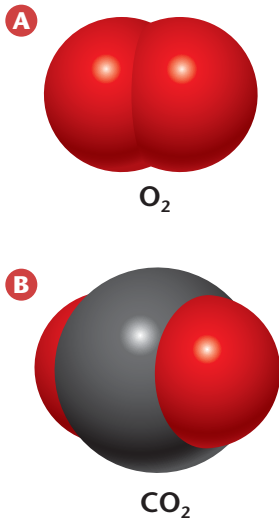
Imagine that you are on the ISS for a month-long stay.

1. Name at least three jobs that the ISS needs to perform to keep you and the other astronauts alive.
2. Brainstorm to create a list of the organ systems you already know about. How are the life support systems on the ISS similar to the organ systems in your body?

Canadian astronauts Julie Payette and Robert Thirsk working together and with other astronauts on the International Space Station during a 2009 mission.



The respiratory system carries oxygen to and removes carbon dioxide from the blood.



▲ **Figure 1.18**
The respiratory system is responsible for the exchange of oxygen (A) and carbon dioxide (B).

Even when you are at rest, a lot of activities are occurring inside your body. For example, your body is sending messages, transporting nutrients, and creating new cells. The cells in your body need a lot of energy to perform these activities. Where does this energy come from? If you answered food, you are only partly right. Cells also need oxygen to release the energy that is stored in food molecules such as glucose. They do this through cellular respiration. Each time you breathe in, the respiratory system takes in the oxygen that your cells require to carry out cellular respiration.

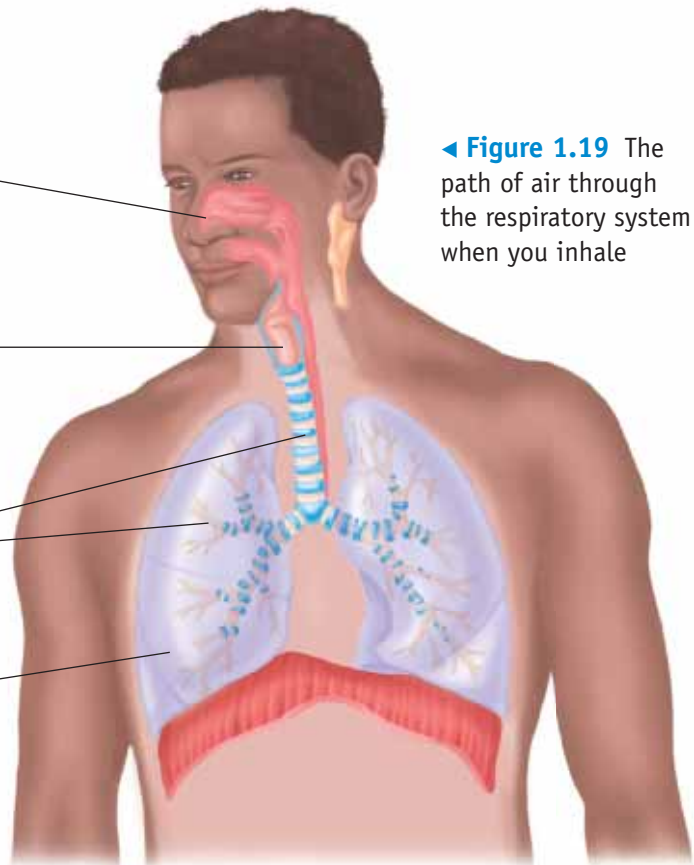
Carbon dioxide and water are also produced when cells carry out cellular respiration. Your body gets rid of carbon dioxide every time you breathe out. The process of taking in oxygen and releasing carbon dioxide is called **gas exchange** (see [Figure 1.18](#)). Gas exchange occurs in your lungs.

Components of the Respiratory System

The respiratory system includes many different organs that work together for gas exchange to take place. [Figure 1.19](#) shows the path that air follows when you inhale.

1. When air is inhaled, dirt and other particles are trapped by tiny hairs and sticky fluid in the nose.
2. The air flows into the throat and passes through the larynx. The larynx contains vocal cords that vibrate as the air moves through them. This produces the sound of your voice.
3. The air continues through a series of tubes that connect the throat to the lungs.
4. The tubes become smaller and smaller as they travel deeper into the lungs. This enables them to carry air to all parts of the lungs.

◀ **Figure 1.19** The path of air through the respiratory system when you inhale



Gas Exchange Takes Place in the Alveoli

Once air reaches the lungs, the actual exchange of gases occurs between the blood and the **alveoli**. Alveoli are clusters of tiny air sacs in the lungs. The wall of each alveolus is a single layer of cells.

Alveoli are surrounded by a network of tiny blood vessels called **capillaries**. The wall of each capillary also is a single layer of cells. The ultra-thin walls of both the alveoli and the capillaries allow the exchange of gases between the air and the blood, as shown in **Figure 1.20**.

Once the air enters the capillaries, oxygen from the air is taken up by the **red blood cells**. The red blood cells are responsible for transporting gases in the bloodstream. Oxygen diffuses through the walls of the alveoli, through the capillary walls, and into the red blood cells.

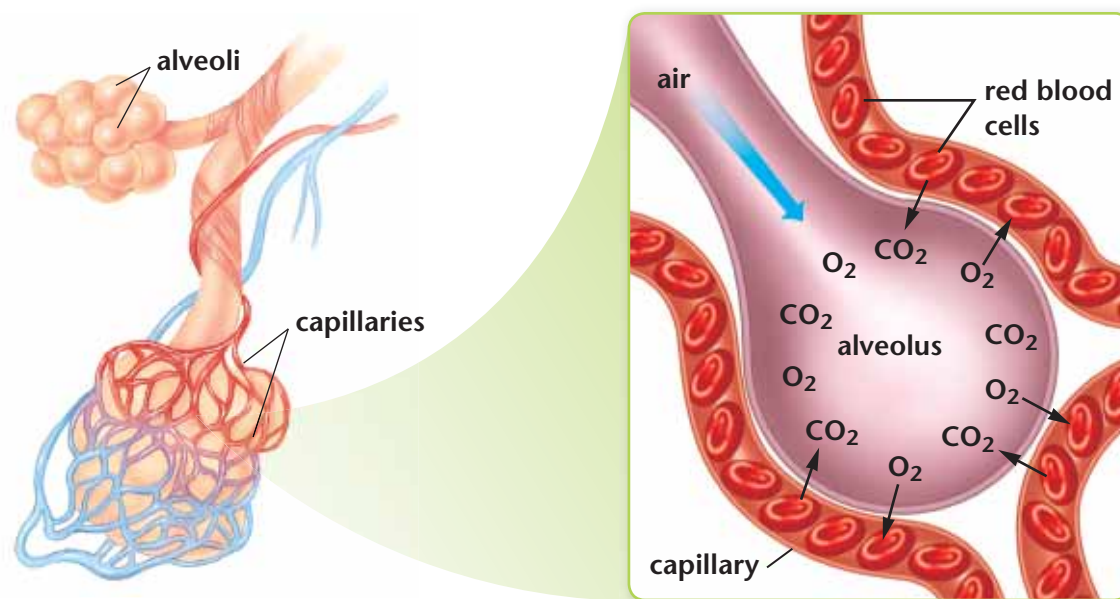
The blood also releases carbon dioxide into the lungs. The path that carbon dioxide follows is the reverse of the path that oxygen follows. Carbon dioxide diffuses from the blood through the capillary walls, through the walls of the alveoli, and into the alveoli. Once in the lungs, the carbon dioxide is exhaled with the next breath.

gas exchange: the process of taking in oxygen and releasing carbon dioxide

alveoli: air sacs in the lungs where gas exchange occurs (singular is alveolus)

capillary: the smallest blood vessel

red blood cells: blood cells that carry oxygen and carbon dioxide in the blood



▲ **Figure 1.20** Gas exchange occurs between the air in the alveoli and the blood in the capillaries.

LEARNING CHECK

1. Why do you breathe?
2. Where does gas exchange occur?
3. Draw a flowchart showing how air travels through the respiratory system when you breathe in.
4. **Figure 1.20** shows that capillary walls are very thin. What would happen to a person with a disease that thickened the capillary walls?

ACTIVITY LINK

Activity 1.20, on page 66.

The circulatory system transports dissolved gases and nutrients through the body.

The respiratory system carries oxygen to and removes carbon dioxide from the blood. The system that transports these gases between the lungs and the cells is the circulatory system.

How the Circulatory System Works

The cells in the body require a constant supply of oxygen and nutrients. They also require the removal of carbon dioxide and other wastes. The circulatory system ensures that both delivery and clean-up occur by transporting blood through the body. The blood carries oxygen and nutrients to the cells. It also carries carbon dioxide and other wastes away from the cells. Blood is pumped through the circulatory system by the heart and travels to and from the cells in the blood vessels.

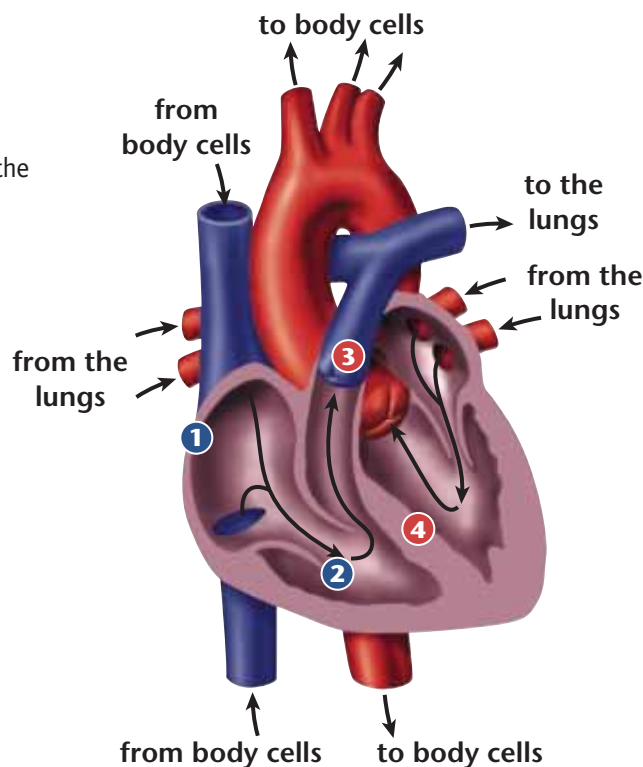
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The Heart: The Pump of the Circulatory System

The heart is the muscular organ that drives the circulatory system. It pumps blood to the cells and then back to the heart. The arrows and numbers in [Figures 1.21](#) show the path that the blood takes as it moves through the body, heart, and lungs.

► **Figure 1.21** Blood flow through the human heart. The arrows show the direction of blood flow.

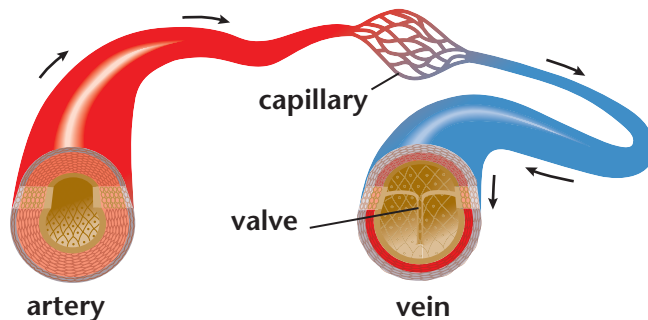


1. The upper-right chamber (right atrium) receives carbon dioxide-rich blood from the body.
2. The carbon-dioxide-rich blood moves into the lower-right chamber (right ventricle), which pumps it to the lungs. Inside the lungs, the blood gets rid of the carbon dioxide and picks up oxygen again.
3. The upper-left chamber (left atrium) receives the oxygen-rich blood from the lungs.
4. The oxygen-rich blood moves into the lower-left chamber (left ventricle), which pumps it to the body cells.

Blood Vessels: The Branches of the Circulatory System

There are many different blood vessels in the human body. The main blood vessels are arteries and veins. These blood vessels branch out from the heart as shown in [Figure 1.22](#). As they move toward the cells, they branch out and grow smaller and smaller. This allows them to bring blood to all the cells in the body. As they move away from the cells, they combine and grow larger again. The changes in the size of the blood vessels are shown in [Figure 1.23](#).

Capillaries: The capillaries are the smallest blood vessels. All the work of the circulatory system related to gas exchange takes place in the capillaries. They are one-cell thick. Oxygen and nutrients, plus carbon dioxide and other wastes, diffuse easily through the thin capillary walls.



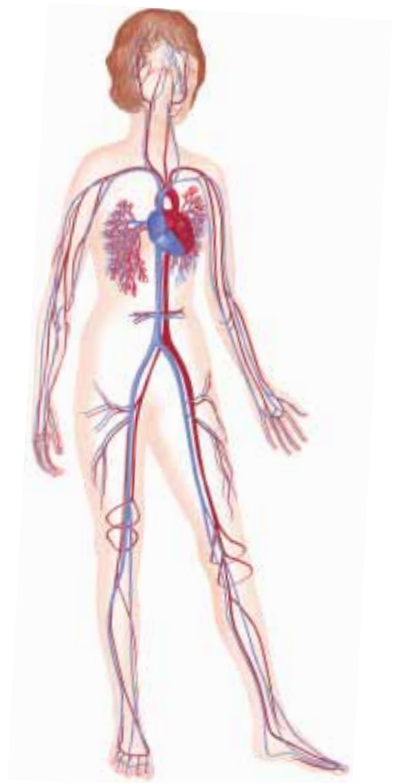
Arteries: Arteries are thick-walled, elastic blood vessels that carry blood away from the heart. The arteries get narrower the farther they are from the heart.

Veins: Veins are thin-walled, inelastic blood vessels. They have valves that keep blood from backing up as it is carried toward the heart.

▲ [Figure 1.23](#) Arteries carry oxygen-rich blood from the heart to the capillaries, where gas exchange takes place. From the capillaries, carbon dioxide-rich blood moves through the veins back to the heart.

LEARNING CHECK

1. List two functions of the circulatory system.
2. Refer to [Figure 1.23](#). Agree or disagree with this statement and give your reasons: “The heart, arteries, and veins exist to get the blood to the capillaries and from the capillaries.”
3. Why do you think that the muscle around the left ventricle is larger than the one around the right ventricle? (Hint: How far does each ventricle have to pump blood?)



▲ [Figure 1.22](#) The arteries and veins in the circulatory system branch out from the heart. Oxygen-rich blood is shown in red. Carbon dioxide-rich blood is shown in blue.

INVESTIGATION LINK

Investigation 1C, on page 68.

The digestive system breaks down food, absorbs nutrients, and eliminates solid waste.

The digestive system is a 10 m long coil of churning muscle. Here are a few facts about the digestive system that you may find surprising:

- The stomach contains chemicals that are as powerful as battery acid.
- Saliva glands near the mouth create an entire litre of saliva (spit) each day.
- As shown in [Figure 1.24](#), the digestive system is home to bacteria that produce over 100 L of gas each year. This gas passes from the digestive system about 14 times a day!

Processes Carried Out by the Digestive System

The digestive system completes the following four tasks in the body:

- **Ingestion:** Food is taken into the body.
- **Digestion:** Food is broken down into nutrients physically (through dissolving and breaking it into smaller bits) and chemically (through chemical reactions).
- **Absorption:** During **absorption**, nutrients diffuse or are moved into the blood. Energy from these nutrients is made available to cells through cellular respiration.
- **Elimination:** Solid waste passes from the digestive system out of the body.

Food takes about 20 to 30 h to move from ingestion to elimination.

[Figure 1.25](#) describes what happens each step of the way.

absorption: the process by which nutrients pass from the digestive system to the blood

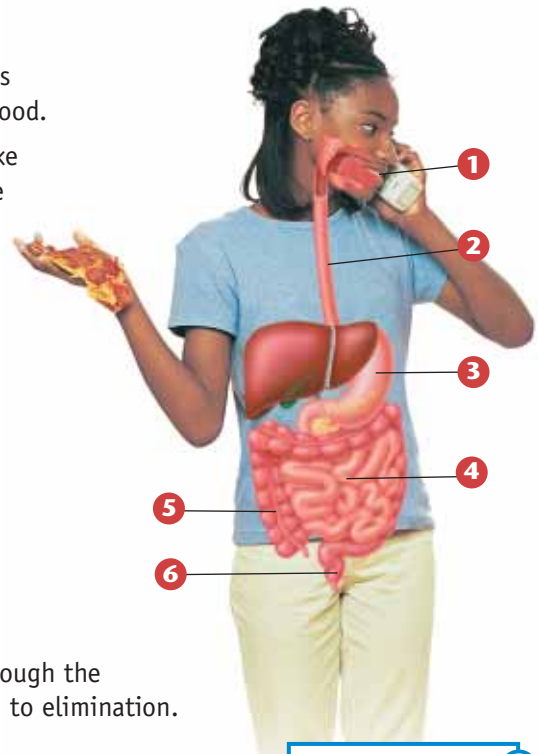
► [Figure 1.24](#) Bacteria like these are a vital part of your digestive system. As they break down food, they release gases such as methane as a byproduct. The gas you pass comes from them!

ACTIVITY LINK

Activity 1.21, on page 67.



1. Ingestion takes place as food enters the mouth. Digestion begins with chewing, as the tongue, teeth, and saliva break down the food.
2. The esophagus pushes the food into the stomach using wave-like muscular contractions. These contractions continue to move the food through the digestive system.
3. Stomach muscles contract to mix the food. At the same time, the stomach releases powerful acids and other chemicals that further break down the food.
4. Digestion continues in the small intestine. Nutrients from the food are absorbed into the bloodstream here.
5. Undigested food passes into the large intestine where water and some nutrients are reabsorbed.
6. Any undigested materials that remain are called feces. Feces are stored in the rectum and eliminated through the anus.



► **Figure 1.25** Food moves through the digestive system from ingestion to elimination.

Inquiry Focus

Activity 1.18

CATCHING THE WAVE

Wave-like muscle contractions called peristalsis move food through your digestive system. You can model this process using a tennis ball, liquid soap, and a knee-high nylon stocking with a hole at the toe-end.

1. Stretch the nylon stocking in different directions, observing changes in the length and width of the stocking.
2. Soak the stocking and ball in water for a few seconds. Then apply one or two squeezes of liquid soap to each. Using your hands, spread the soap throughout the stocking and around the ball.
3. Put the ball in the stocking at the knee end, where the stocking is reinforced. Push the ball until it is below the band of reinforced material. With your free hand, squeeze the stocking above the ball between your thumb and first finger. Observe what happens.
4. Continue to squeeze the ball until it exits the toe end.

LEARNING CHECK

1. Identify four tasks carried out by the digestive system.
2. Using **Figure 1.25**, create a flowchart to show the path that food travels through the digestive system. On your flowchart, identify each stage and organ involved.
3. If a person needs to have part of his or her small intestine removed, how might this affect digestion?

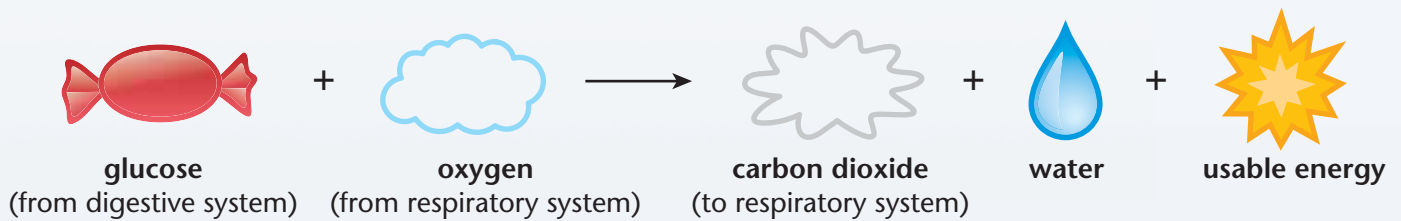
INVESTIGATION LINK

Investigation 1D, on page 70.

Organ systems working together carry out important tasks in the body.

▼ **Figure 1.26** The reaction that occurs during cellular respiration

Most tasks in the body need the support of two or more organ systems working together. Take cellular respiration, for instance—summarized in **Figure 1.26**. This task requires oxygen and food. The respiratory system brings oxygen into the lungs when you breathe. The digestive system breaks food down into nutrients such as glucose.



Now the circulatory system enters the picture. It transports glucose and other nutrients from the digestive system to the cells. The circulatory system also transports oxygen from the lungs to the cells. Now the cells have what they need for cellular respiration: oxygen and glucose.

The teamwork doesn't end there, however. The circulatory system also transports carbon dioxide waste from the cells to the lungs of the respiratory system. Through gas exchange in the lungs, the carbon dioxide waste is removed from your body when you breathe out.

How the Organ Systems Work Together

In the example in [Figure 1.26](#), all the systems have to perform their role for the overall task to be completed successfully. In this way, the organ systems are like the runners in a relay race. Each runner needs to pick up the baton from another runner, run with it, and then pass it to the next runner to complete the race. In your body, organ systems work together in a similar way to complete tasks such as cellular respiration.

Literacy Focus

Activity 1.19

WHICH ORGAN SYSTEMS WORK TOGETHER?

1. Determine which organ systems are working together in each of the following scenarios.



When you run, you begin to breathe heavier and faster. Your heart beats more quickly, bringing more oxygen to your cells. Which organ systems are working together here?



When you lift weights, your arms bulge and your brain signals them to lift despite the resistance. Which two organ systems are working together to raise the weights?



When you finish exercising, you are hot, tired, and sweating. After a bottle of juice, you feel a lot better. Which organ systems are working together in this scenario?

2. Think of two other scenarios in which organ systems are working together. Test a partner to see if he or she can identify these organ systems.

LEARNING CHECK

1. How are organ systems like runners in a relay race?
2. Using [Figure 1.26](#), identify three organ systems that play a role in cellular respiration. Then name two other organ systems that you think also play a role in cellular respiration, and give reasons for your choices. (Hint: Refer to [Figure 1.17](#) back on page 47.)
3. Describe a task other than cellular respiration that is completed by several organ systems working together.

INVESTIGATION LINK

Investigation 1C, on page 68.

Activity 1.20

HOW DO YOU BREATHE?

Lung tissue does not have any muscle cells. What makes your lungs expand and contract? A large muscle called the diaphragm plays a key role in this process. It is located directly beneath the lungs. Build a model to find out how your diaphragm helps you breathe.

Safety

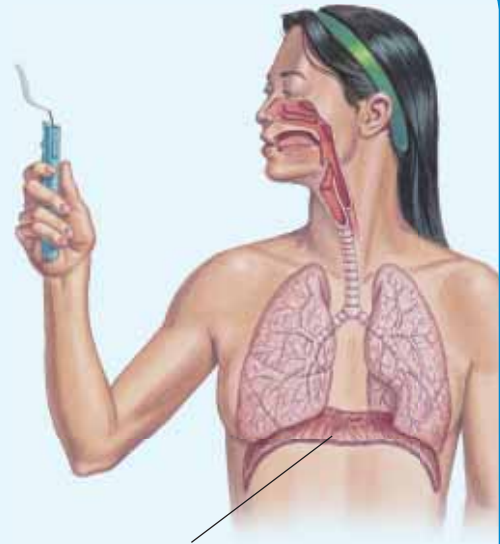
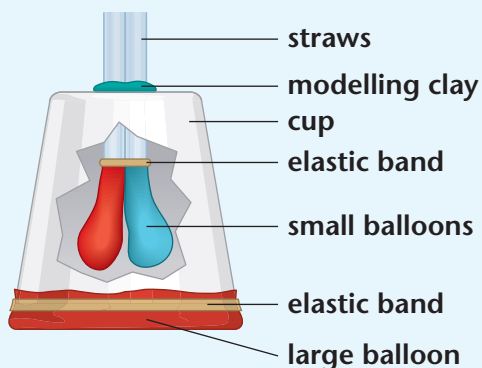


What You Need

- 2 small balloons
- 2 plastic straws
- 2 small elastic bands
- modelling clay
- 500 mL plastic cup with hole in bottom
- large balloon with neck cut off
- large elastic band

What To Do

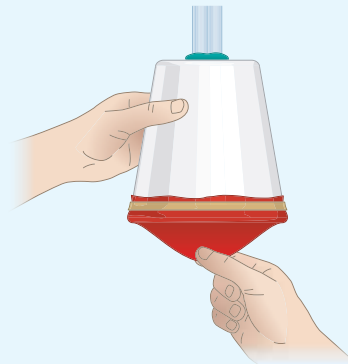
1. Inflate the balloons to stretch them. Then let out the air.
2. Follow these steps to build your model:
 - Insert a straw into the neck of each small balloon. Use an elastic band to hold the balloon and straw together tightly.
 - Fit the straws through the hole in the cup. Use modelling clay to completely seal the hole around each straw.
 - Stretch the large balloon over the mouth of the cup. Use a large elastic band to hold the balloon in place.



diaphragm

The diaphragm is a large muscle located below the lungs.

3. Use one hand to hold the cup. Use your other hand to pull down the centre of the large balloon slowly. Then gently let the balloon go.



What Did You Find Out?

1. a) What happened when you pulled down the centre of the large balloon?
b) What happened when you let the balloon go?
2. Put your hand just below your chest cavity. Take a breath.
 - a) When you inhale, does your diaphragm move up or down?
 - b) When you exhale, does your diaphragm move up or down?
3. How does your model simulate inhaling and exhaling?

Activity 1.21

A TUBE WITH TWISTS

The digestive system is a tube with many twists. The shape of this tube varies along its length. Most adult digestive systems are 9 to 10 m long. They are divided as follows:

- esophagus: 25 cm
- stomach: 15 cm
- small intestine: 6 to 8 m
- large intestine: 1.5 to 2 m
- rectum: 12 cm

In this activity, you will make a 3-D model of the digestive system.

What You Need

- various art materials
- round-tipped scissors
- tape
- glue

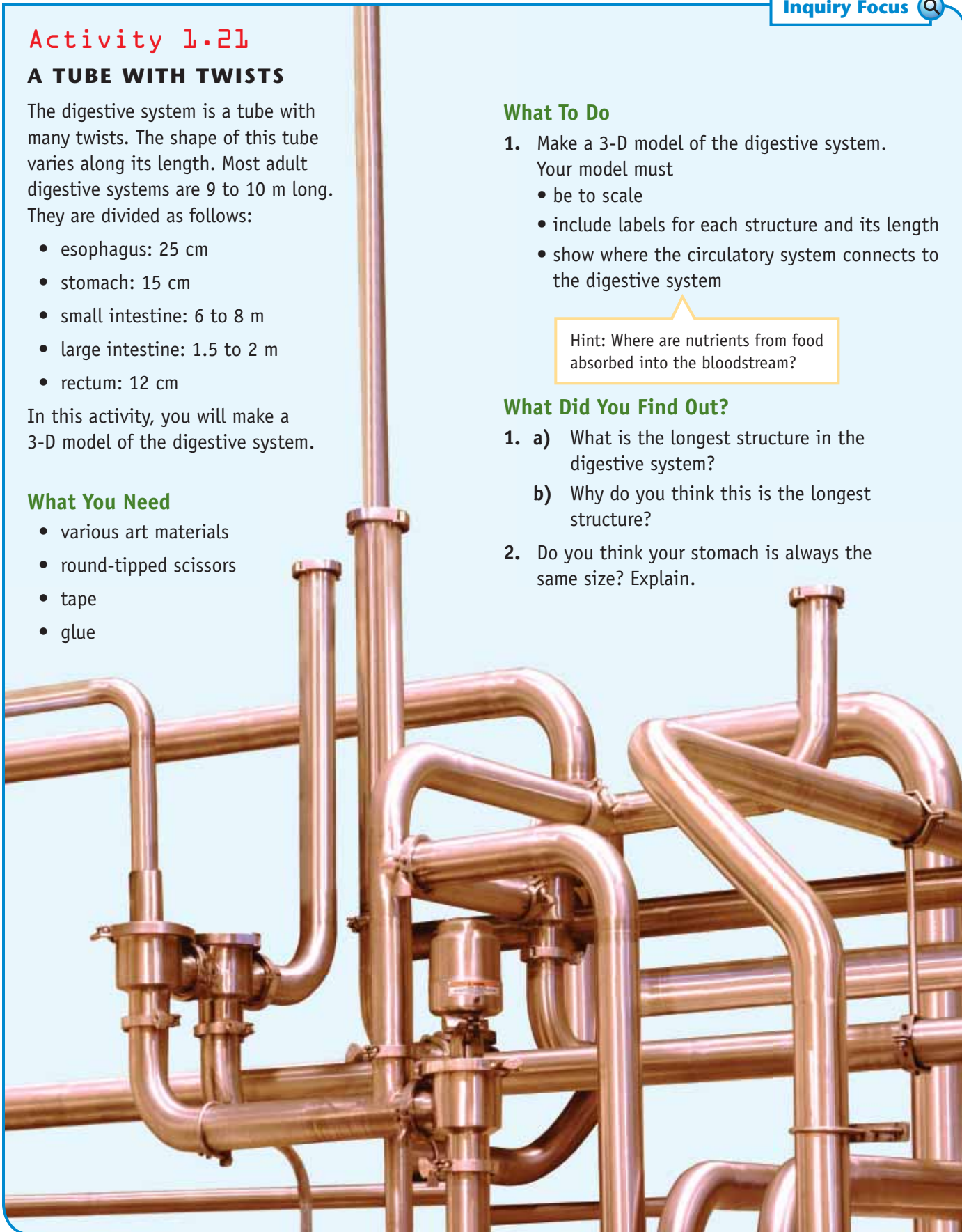
What To Do

1. Make a 3-D model of the digestive system. Your model must
 - be to scale
 - include labels for each structure and its length
 - show where the circulatory system connects to the digestive system

Hint: Where are nutrients from food absorbed into the bloodstream?

What Did You Find Out?

1. a) What is the longest structure in the digestive system?
b) Why do you think this is the longest structure?
2. Do you think your stomach is always the same size? Explain.



Skill Check

- ✓ initiating and planning
- ✓ performing and recording
- ✓ analyzing and interpreting
- ✓ communicating

Safety

- Always take a pulse at the wrist, never at the neck.
- Make sure you do not over-exert yourself.
- Let your teacher know if you have any health conditions that prevent you from participating in physical exercise.

What You Need

- electronic heart monitor (if available)
- various pieces of sports equipment
- graph paper

The Effect of Exercise on Breathing Rate and Heart Rate

The circulatory system and the respiratory system work together to supply your body with the oxygen your cells need. In this investigation, you will look for evidence of the connection between these two systems. In Part 1, you will learn how to take a pulse safely. Taking a person's pulse lets you determine heart rate—the number of times the heart beats in one minute. You will compare heart rate to breathing rate—the number of times a person inhales and exhales in one minute. Then, in Part 2, you will design your own investigation to determine the effect of exercise on heart rate and breathing rate.

What To Do

Part 1 Measuring Resting Heart Rate and Breathing Rate

1. Create a data table to record your measurements and calculations.
2. The resting heart rate is the number of times a person's heart beats per minute while that person is completely at rest. You will find your partner's resting heart rate by taking your partner's pulse. To take a pulse, locate the artery in your partner's wrist. Gently press your index finger and one or two other fingers against the artery. (Don't use your thumb. It has its own pulse.) Count the number of pulses in 15 s. Then multiply that number by 4. This will give you the number of times the heart beats in 1 min, which is the heart rate (number of beats per minute). Record your partner's resting heart rate in the data table.
3. Repeat step 2 two more times. Add the three values for heart rate together, and divide by three. This will give you your partner's average resting heart rate.
4. The resting breathing rate is the number of times a person breathes per minute while that person is completely at rest. To determine your partner's resting breathing rate, count the number of times your partner breathes (one inhale and one exhale) in 15 s. Then multiply that number by 4. This will give you the number of times your partner breathed in 1 min, which is the breathing rate (breaths per minute). Record your partner's resting breathing rate in the data table.
5. Repeat step 4 two more times. Add the three values for breathing rate together, and divide by three. This will give you your partner's average resting breathing rate.
6. Switch roles with your partner and repeat steps 2 to 5.

Part 2 Recovery Time

7. With a partner, state a hypothesis about the time it takes for heart rate and breathing rate to return to their resting rate after light exercise, medium exercise, and intense exercise.
8. Design a procedure to test your hypothesis. As part of your procedure, make decisions about the following:
 - activities to represent light, moderate, and intense exercise (for example: walking, jogging, and running)
 - how long to carry out each activity
 - the time interval between measuring heart rate and breathing rate (for example, taking measurements every 30 s or every 60 s)
9. Write down the procedure you plan to follow. Include the data table you intend to use to record your measurements. Show the procedure to your teacher for approval.
10. Carry out your procedure.
11. Use your completed table to plot recovery rate data on a graph. Title and label the axes of your graph.

What Did You Find Out?

1. Interpret your graph. Are the patterns that you observe what you would have expected? Explain why or why not.
2.
 - a) Identify all the variables that you controlled in your investigation.
 - b) Is it possible that there were variables that were not controlled in your investigation? Identify at least one other variable that you might not have controlled, and explain how you think this might have affected your results.
3. In step 5, you determined an average breathing rate. In step 3, you determined an average heart rate.
 - a) How did the average breathing rate and average heart rate compare with the individual values for breathing rate and heart rate that you counted?
 - b) Explain why using an average breathing rate and an average heart rate improves the accuracy of your overall results.
4. Did your results support your hypothesis? If not, explain why that might be the case.

Skill Check

initiating and planning

- ✓ performing and recording
- ✓ analyzing and interpreting
- ✓ communicating

Safety



- Take extreme care when using dissecting instruments, particularly scalpels. Make cuts away from your body.
- Keep sharp dissection tools pointing down when held in your hand.
- Your frog is preserved in a chemical solution. Wear plastic gloves, goggles, and an apron at all times. If some of the chemical comes into contact with your skin, wash it off immediately.
- Clean up the work area and wash your hands thoroughly when finished.

Frog Dissection

Follow your teacher's instructions to perform a frog dissection. Alternately, your teacher may have you complete a virtual dissection.

What To Do

Part 1: Respect for Life

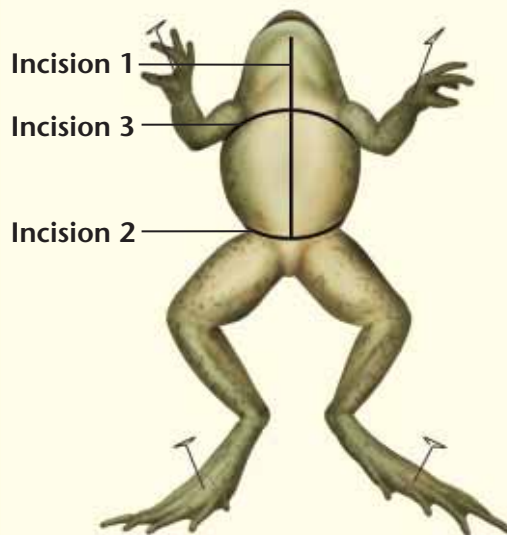
1. Before you begin your dissection, discuss the following quote as a class. How is it important in terms of the dissection you will complete?

“Respect for living things and the environment is... considered essential for meaningful work in science and technology.”

From *Marineland: Life systems*

Part 2: Making Incisions

2. Rinse the frog in water.
3. Place the frog in the dissection tray on its back. Pin its limbs to the tray.
4. Use forceps to lift the frog's skin between the rear legs. Use the scalpel to cut through the lifted skin, making the incisions shown in the diagram. Be careful to cut only the skin.
5. Use the forceps to peel back each flap of skin. Use a scalpel to help separate the skin from the muscle layers below. Pin the skin flaps to the dissection tray.
6. Repeat the three incisions you made in step 4, but this time cut through the muscle and bone layers.
 - Use dissection scissors to cut through the muscles. Be careful to cut only the muscle layer or you may damage the organs underneath.
 - Use dissection scissors to cut through the chest bones. When you reach the front legs, turn the scissor blades sideways, so you cut only through the bones.
 - Separate the muscle flaps from the organs below. To do so, use the forceps to pull back and hold the muscle flaps. Then use the scalpel to separate the muscle from the organ tissue.
 - Pin the muscle flaps to the dissection tray. They should be pulled back far enough to allow easy access to the internal organs.

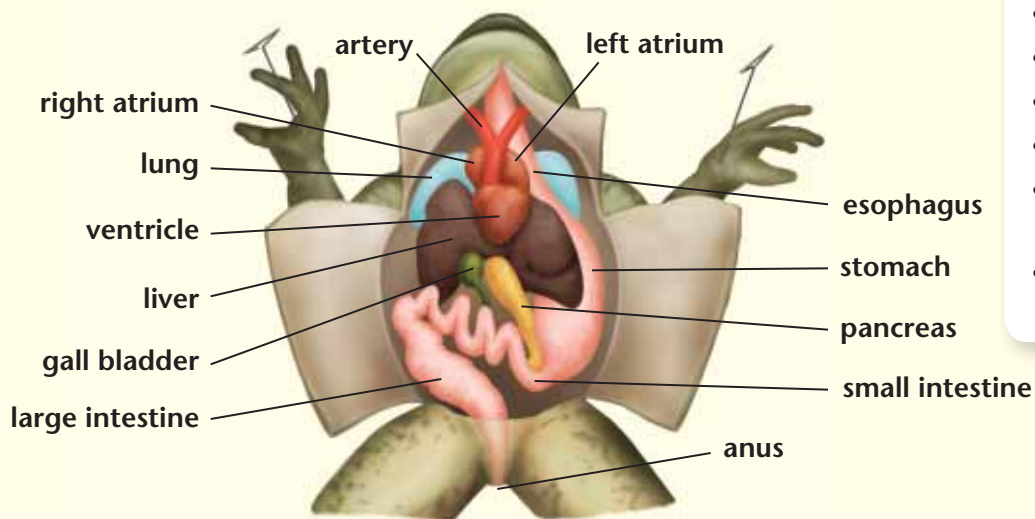


Part 3: Internal Examination

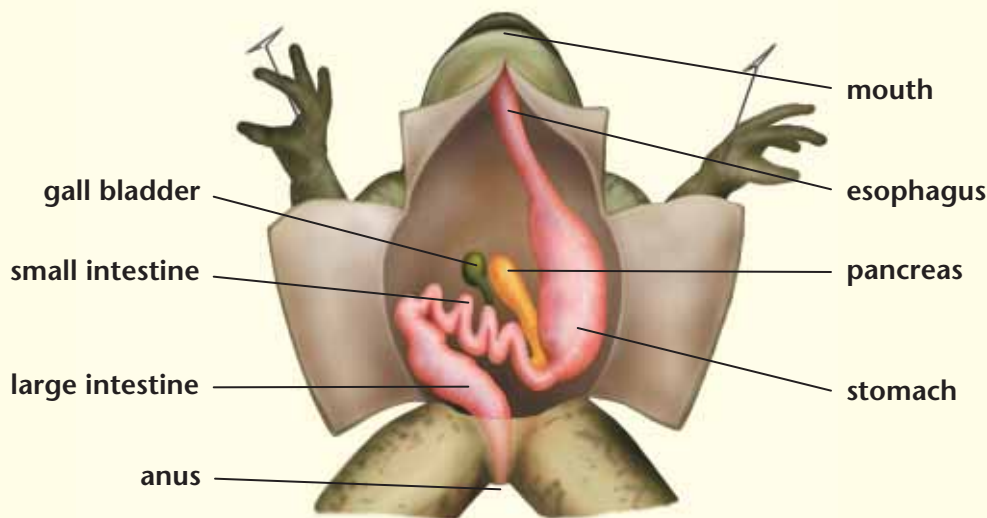
7. In your science notebook, draw an outline of your frog. The first organs you will see in your internal examination are the liver and heart. Draw and label these organs in your frog diagram.
8. The heart and liver cover the digestive organs below them.

What You Need

- preserved frog
- dissection tray
- dissection pins
- dissection scissors
- forceps
- scalpel
- probe
- magnifying glass
- gloves, goggles, and lab apron
- paper towels for clean up

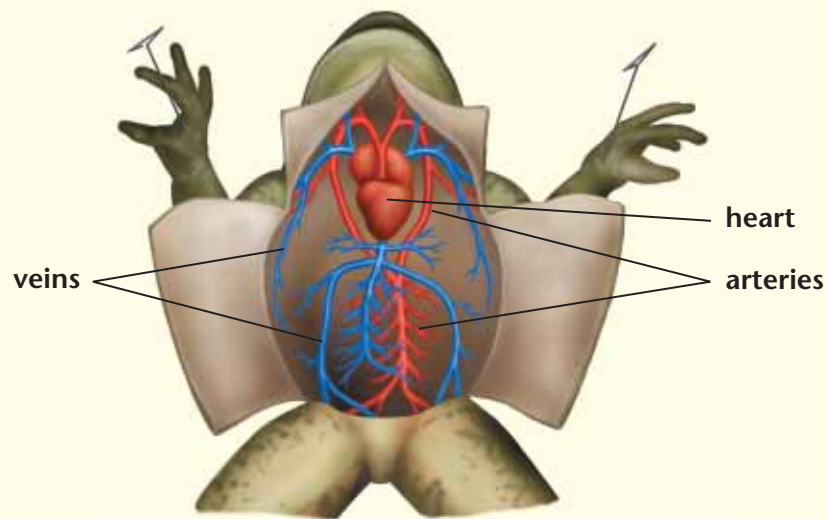


Use the forceps and probe to pick up these organs and hold them to the side. Use the labelled diagram below to find the organs of the digestive system, from the mouth to the anus. Draw and label all the organs you know in your frog diagram.



The digestive system

9. Two organs secrete substances into the digestive system to aid digestion. These are the gall bladder and the pancreas. Use the diagram of the digestive system to help you find them. Hint: The pancreas is a thin, yellowish ribbon.
10. Use the labelled diagram below to find the components of the circulatory system. Draw and label the heart, as well as any visible blood vessels, in your frog diagram. Use the magnifying glass to observe the connections between the circulatory blood vessels and the digestive organs. Describe your observations in your notebook.



The circulatory system

11. Observe the following digestive and circulatory organs in greater detail. Record your observations in your science notebook.
 - Use dissection scissors to cut out the stomach. Cut it open lengthwise. You may find the remains of the frog's last meal. Use a magnifying glass to look at the stomach's muscular walls. Describe what the surface looks like.
 - Use dissection scissors to cut out the small and larger intestine. Unwind the small intestine and stretch it out next to the large intestine. Describe how they compare in size and shape.
 - Use dissection scissors to cut out the heart. Observe how the frog's heart is different from a human heart. Describe these differences.
12. Dispose of your frog according to your teacher's instructions.
13. Rinse and dry all equipment, including the dissection tray.

What Did You Find Out?

1. Identify two of each of the following that you observed during the dissection:
 - a) tissues
 - b) organs
 - c) organ systems
2.
 - a) Frogs eat insects. Create a flowchart that shows the path of an insect as it moves through a frog's digestive system.
 - b) Write a brief paragraph explaining how the organs of the digestive system work together to digest the insect.
3.
 - a) Based on your observations, how do the frog's circulatory and digestive systems connect?
 - b) Explain why the interaction of the digestive and circulatory systems is necessary for the frog's survival.
4. Some people refuse to dissect a real animal. They believe that students can use software to study animal organ systems without cutting up the animals. Other people think that dissecting real animals is useful for students to better understand how organ systems work in animals. What do you think?

Inquire Further

Design a procedure to investigate the frog's respiratory system. Include two What Did You Find Out? questions. With your teacher's approval, exchange procedures and questions with a partner and investigate your frog's respiratory system.

Go to [scienceontario](https://www.scienceontario.ca)
to find out more



Making a DIFFERENCE



April Duteil is from Haida Gwaii, a collection of about 150 islands off the northwestern coast of British Columbia. These islands, also known as the Queen Charlotte Islands, are home to the Haida. Approximately 5000 people live in communities scattered about the islands. April's community is 25 minutes from an ambulance and 40 minutes from a hospital. When April was in high school, she realized there was a need to improve health care on the islands. She met with her local fire chief and medical first responder to discuss ways to make improvements. They decided that providing free CPR training would be the most effective way to help, since some communities could not afford CPR training for their firefighters. April applied for funding and organized free classes that taught CPR to firefighters, teachers, and students.

April has since completed her Emergency Medical Responder training. As a result she is able to work on an ambulance in Northern British Columbia during the summers. This training is provided by the Canadian Red Cross. The program provides the skills and knowledge needed to reduce the harm caused by an injury or sickness. The training helps maintain life and minimize pain during an emergency until the next level of health care can take over.

April believes young people can make a difference in their communities. "If you have a vision and believe in it, you can make it happen, despite what others may believe."

What changes could be made to improve health care in your community?



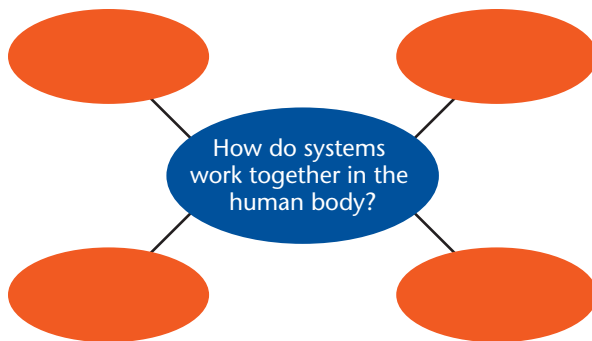
Topic 1.4 Review

Key Concept Summary

- The respiratory system carries oxygen to and removes carbon dioxide from the blood.
- The circulatory system transports dissolved gases and nutrients through the body.
- The digestive system breaks down food, absorbs nutrients, and eliminates solid waste.
- Organ systems working together carry out important tasks in the body.

Review the Key Concepts

1. **K/U** Answer the question that is the title of this topic. Copy and complete the graphic organizer below in your notebook. Fill in four examples from the topic using key terms as well as your own words.



2. **K/U** What organ systems are involved in
- a) supplying body cells with nutrients?
 - b) supplying body cells with oxygen and removing carbon dioxide from cells?
3. **K/U** Using **Figure 1.21**, create a flowchart that traces the path that blood takes through the circulatory system.
4. **K/U** Identify two characteristics of alveoli that make gas exchange easier.
5. **K/U** How do nutrients pass from the digestive system to the circulatory system?
6. **T/I** Explain how your digestive system would be affected if your circulatory system failed.
7. **T/I** **A** A condition called anemia often results from too few red blood cells. People who are anemic are often tired. Explain why this is so using what you know about the respiratory and circulatory system.

8. **C** The diagram below shows four disorders that can impair the proper function of the respiratory system. Predict how each disorder would impair respiratory system function.

- a) pneumonia: alveoli fill with thick fluid
- b) bronchitis: airways (the branches leading to alveoli) are inflamed due to infection or irritation
- c) asthma: airways are inflamed and constricted
- d) emphysema: alveoli burst and fuse into enlarged air spaces

