CHAPTER 11

Maintaining

Getting Ready...

- How might lifestyle and genetic factors affect your health?
- What happens if your body cannot respond to changing conditions?
- What technologies help bodies preserve internal balance?

Science Log

Clothes and jewellery are already being used to monitor life functions. Many runners wear heart monitors to keep track of their heart rate. As you learn about the technologies in this chapter, consider how and why they might be adapted for day-to-day use.

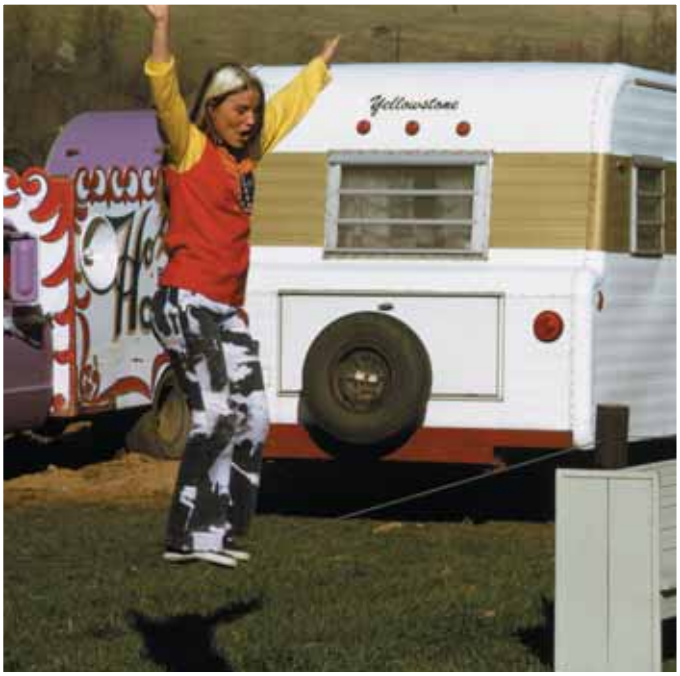
Tightrope walkers walk a fine line! Somehow they have mastered the art of leaning a little to the left and leaning a little to the right to maintain their balance. Like tightrope walkers, our bodies do a careful balancing act in order to maintain a stable internal set of conditions.

Our bodies work continually to maintain balance. If they did not do this, we would not survive! In this chapter, you will learn how your body maintains its balance by responding to changing conditions. You will investigate how healthy body systems interact with one another. You will also learn about factors that affect your body's ability to respond to changing conditions.

Sometimes a body loses its ability to respond to change. You will explore some health conditions that may result. You will also find out how modern technology is used to help preserve a body's balance.

As you learn about how your body constantly monitors life functions to keep itself in balance, remember the image of the tightrope walker. It is an amazing act!

Homeostasis



What You Will Learn

In this chapter you will learn:

- how the digestive and circulatory systems interact to maintain internal balance
- how diet and lifestyle influence internal balance
- what happens when the body struggles to maintain internal balance
- about some technologies used to maintain internal balance

Why It Is Important

- You need to understand how your body works to maintain stable conditions inside itself. How well your body can do this depends on you. That is why it is so important to make good lifestyle choices.

Skills You Will Use

In this chapter you will:

- identify lifestyle choices that affect internal balance
- observe the effects of changes in temperature on heart rate
- design an activity to evaluate heart recovery rate
- identify some major disorders of the body
- calculate the percentage of substances absorbed to preserve balance

Starting Point

ACTIVITY

Comparing Body Temperature

Does everyone's body maintain the same body temperature?

Safety Precautions

- Clean the thermometer with rubbing alcohol after each use.
- **Do not** stick the thermometer in your mouth to take your body temperature.

What You Need

1 thermometer per group

graph paper

What to Do

1. If using a regular thermometer, take readings on the inside of the elbow (when the fore-arm and upper arm are pressed together).
2. Take and record the body temperature for each member of the group.
3. Use a graph to record the class results.
   - **(a)** On the *x*-axis, place the initials of students. Use one colour for males and another colour for females. Record the information using the same colours.
   - **(b)** On the *y*-axis, record a temperature scale that shows the lowest and highest body temperatures recorded in your class.
4. Calculate the average body temperature of males and the average body temperature of females in your class.
5. Wash your hands and the inside of your elbow thoroughly.

11.1 Keeping an Internal Balance

DidYouKnow?

Hans Selye (1907–1982) was a Canadian scientist who made the term "stress" popular. He studied what you can do to help your body adjust to the strains or stresses put on it.

The environment around you is always changing. The environment inside your body is constantly changing as well. For example, during stressful situations your body reacts by producing some hormones that supply you with energy right away and others that cause your heart to speed up. This reaction to stress helps you perform well during competitions, tests, and emergencies.

Whether you realize it or not, your body is constantly responding to changes that occur in the environment around you. Figure 11.1 shows some examples of how your body adjusts to new conditions.

Figure 11.1 How do our bodies adjust to conditions such as these?

Like a teeter-totter, your body can go in and out of balance. A change in the outside environment generates a response from your body's internal environment. Your body has to maintain the proper internal conditions while responding to changes in the outside environment.

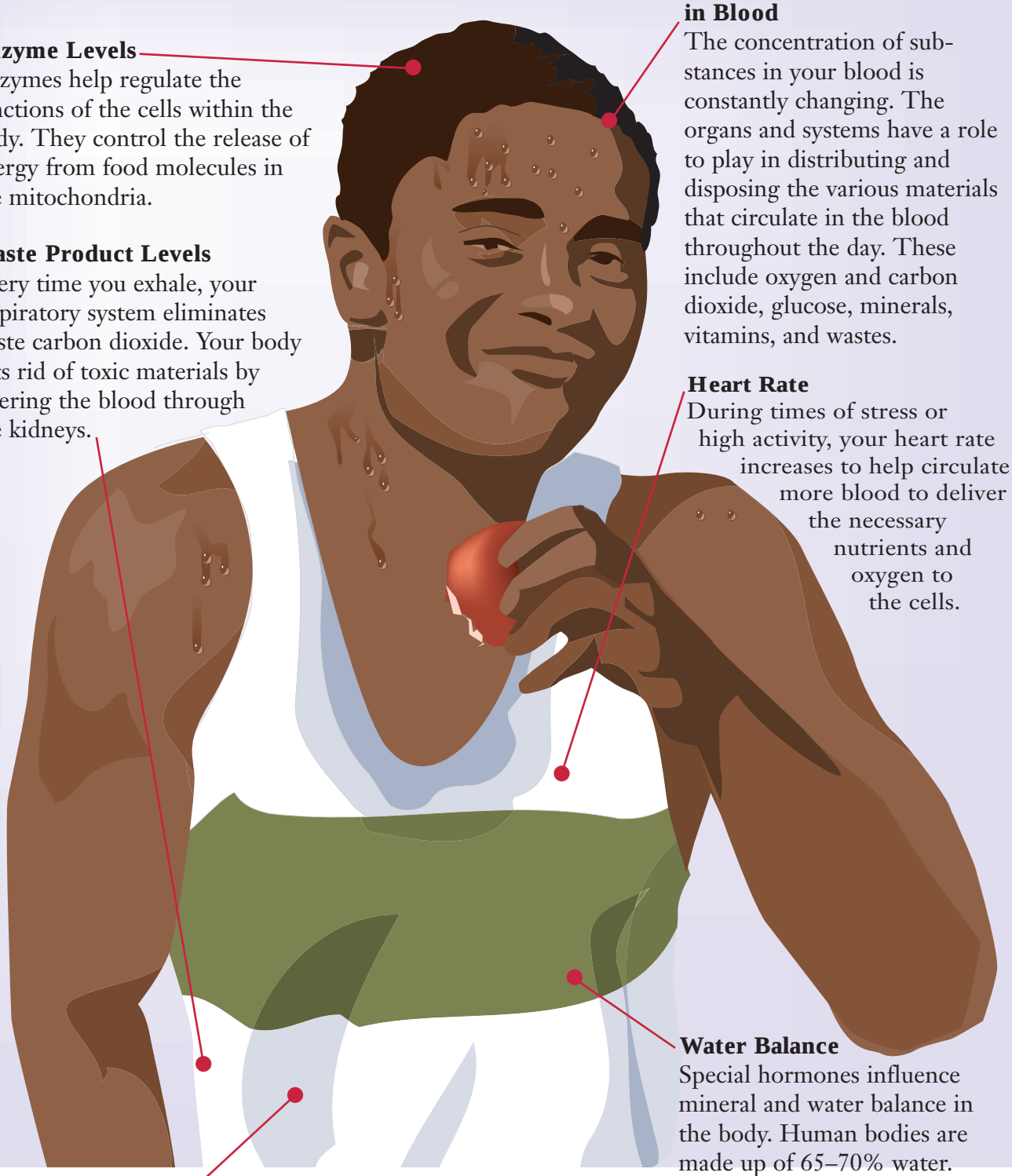
READING Check

What is homeostasis?

When a teeter-totter is in balance, we say that it is in equilibrium. The ability of your body to maintain an internal balance is called **homeostasis** (hoh mee o STAY sis).

Look back at the list of life functions on page 180 and the body systems discussed on pages 186–187. All the body systems and life functions work together to maintain homeostasis. The mechanisms of homeostasis operate at all of the levels of organization in your body systems, including the molecular and cellular levels.

Figure 11.2 Homeostasis maintains the proper conditions of life.



Enzyme Levels
Enzymes help regulate the functions of the cells within the body. They control the release of energy from food molecules in the mitochondria.

Waste Product Levels
Every time you exhale, your respiratory system eliminates waste carbon dioxide. Your body gets rid of toxic materials by filtering the blood through the kidneys.

Concentration of Substances in Blood
The concentration of substances in your blood is constantly changing. The organs and systems have a role to play in distributing and disposing the various materials that circulate in the blood throughout the day. These include oxygen and carbon dioxide, glucose, minerals, vitamins, and wastes.

Heart Rate
During times of stress or high activity, your heart rate increases to help circulate more blood to deliver the necessary nutrients and oxygen to the cells.

Water Balance
Special hormones influence mineral and water balance in the body. Human bodies are made up of 65–70% water. This balance is necessary for cell activity. That is because most of a cell's cytoplasm consists of water.

Blood Sugar Level
After you eat a meal high in sugar, the concentration of glucose in the blood vessels rises. In response, the pancreas releases a hormone called **insulin**. Insulin moves glucose from the blood to body tissues. This returns glucose concentrations to an optimal level.

READING Check

Take a second look at the pictures on page 216. For one of the pictures, describe how the body is trying to maintain homeostasis.

CONDUCT AN

INVESTIGATION 11–A

SKILL CHECK

- Initiating and Planning
- Performing and Recording
- Analyzing and Interpreting
- Communication and Teamwork

How Does the Heart Respond to Temperature Changes?

In this investigation, you will observe what happens to the heart rate of water fleas (or *Daphnia*) when they are subjected to changes in temperature.

Problem

What happens to the heartbeat of *Daphnia* when the temperature changes?

Prediction

1. What do you expect will happen to the heart rate of *Daphnia* when they are exposed to temperatures lower than room temperature?
2. What do you expect will happen to the heart rate of *Daphnia* when they are exposed to temperatures higher than room temperature?

Safety Precautions

Note: This investigation involves three tests. Each test requires some different materials and some different procedures. Be sure to read the instructions carefully.

- Handle the hot water with great care.

Apparatus

microscope
depression slide
2 medicine droppers
watch with second hand, or stopwatch
thermometer
50 mL beaker
3 beakers (150 mL)
aquarium or large aerated jar filled with water

Materials

crushed ice
hot water
cotton fibres
12 *Daphnia*
aquarium water

Procedure

1. Fill one 150 mL beaker with aquarium water, and place 12 *Daphnia* in it using a medicine dropper.

Test 1: Room Temperature Water

1. Record the temperature of the water in the beaker. To take an accurate reading, leave the thermometer in the water until the temperature stops changing.

2. Use a medicine dropper to remove one *Daphnia* from the large beaker. Place the *Daphnia* in a depression slide. Add some cotton fibres to restrict its movement. Use the medicine dropper to add just enough room temperature water to cover the *Daphnia* without allowing it to swim freely.
3. Place the slide under the microscope and observe the *Daphnia* under low power.
4. Use a stopwatch to count the number of heartbeats for one minute. Record the heartbeat count.

5. Once you have finished with the *Daphnia*, place it in an aquarium filled with water.
6. Repeat Steps 2 to 5 *three* more times choosing a different *Daphnia* each time.
7. Calculate the average number of heartbeats of the *Daphnia* during the four trials.

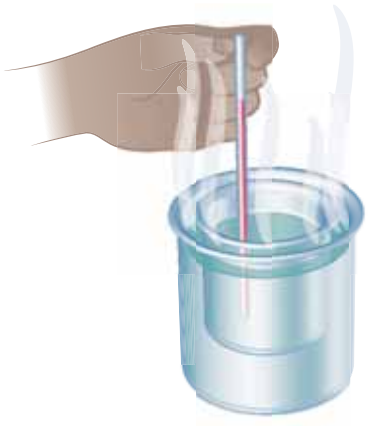
Test 2: Cold Water

1. Prepare an ice bath by adding crushed ice to the second 150 mL beaker.

2. Place a 50 mL beaker containing aquarium water in the ice bath. Record the temperature of the water in the smaller beaker. To take an accurate reading, leave the thermometer in the beaker until the temperature stops changing.
3. Use a medicine dropper to remove four *Daphnia* from the large beaker and put them in the beaker with cold aquarium water. Carefully stir the contents of the beaker for one minute.
4. Use a medicine dropper to remove one *Daphnia* from this beaker. Place the *Daphnia* in a depression slide. Add some cotton fibres to restrict its movement. Use a second medicine dropper to add just enough ice water to cover the *Daphnia* without allowing it to swim freely.
5. Place the slide under the microscope and observe the *Daphnia* under low power.
6. Use a stopwatch to count the number of heartbeats for one minute. Record the heartbeat count.
7. Once you have finished with the *Daphnia*, place it in an aquarium filled with water.
8. Repeat Steps 4 to 7 *three* more times choosing a different *Daphnia* each time.
9. Calculate the average number of heartbeats of the *Daphnia* during the four trials.

Test 3: Hot Water

1. Prepare a hot water bath by adding water at 70 to 80°C to the third 150 mL beaker.



2. Place a 50 mL beaker containing aquarium water in the hot water bath. Record the temperature of the water in the beaker. To take an accurate reading, leave the thermometer in the beaker until the temperature stops changing.
3. Use a medicine dropper to remove four *Daphnia* from the large beaker and put them in the 50 mL beaker containing aquarium water. Carefully stir the contents of the beaker for one minute.

4. Use a medicine dropper to remove one *Daphnia* from the beaker. Place the *Daphnia* in a depression slide. Add some cotton fibres to restrict its movement. Use a second medicine dropper to add just enough hot water from the bath to cover the *Daphnia* without allowing it to swim freely.

5. Place the slide under the microscope and observe the *Daphnia* under low power.

6. Use a stopwatch to count the number of heartbeats for one minute. Record the heartbeat count.

7. Once you have finished with the *Daphnia*, place it in an aquarium filled with water.

8. Repeat Steps 4 to 7 *three* more times choosing a different *Daphnia* each time.

9. Calculate the average number of heartbeats of the *Daphnia* used during the four trials.

10. Wash your hands when you have finished.

Analyze

1. What is the importance of taking a heartbeat count at room temperature?

2. How does cold water affect heartbeat?

3. How does hot water affect heartbeat?

Conclude and Apply

4. How might the following conditions affect your heart rate?

(a) Wearing a winter coat, you walk outside on a hot day.

(b) Wearing indoor clothing, you go outside during a blizzard.

5. Make a general statement about the effect of a change in the external environment on an organism.

Key Terms

homeostasis
insulin

Check Your Understanding

1. Develop a short oral explanation of homeostasis.

2. Think of a situation when your body has to adjust to a new set of conditions. Use a sketch to show the adjustments your body makes to maintain homeostasis.

3. What is the connection between hunger and homeostasis of the digestive system?

4. Explain why you could consider excretion as an example of homeostasis.

11.2 What Affects Homeostasis?

The digestive and circulatory systems work together to maintain blood sugar levels, water balance, enzyme levels, and waste product levels. Many things can interfere with the balance of these body systems. Some of these, including lifestyle and diet choices, are within your control.

- If the circulatory system transports too many, too few, or poor quality nutrients, your body will suffer.
- Lack of exercise or sleep may create problems.
- Smoking also interferes with homeostasis.

Other factors are linked to genetics. These are the things that you inherit from one or both birth parents. Take a look at Figure 11.6 on the next page.

Classify each factor as being related to lifestyle, diet, genetics, or a combination of these.

You can do several things to reduce your risk factors, including:

- stop doing whatever puts you at risk;
- reduce other risk factors if you have genetic risks; and
- seek the advice of a health-care provider to counsel you about making some positive changes.

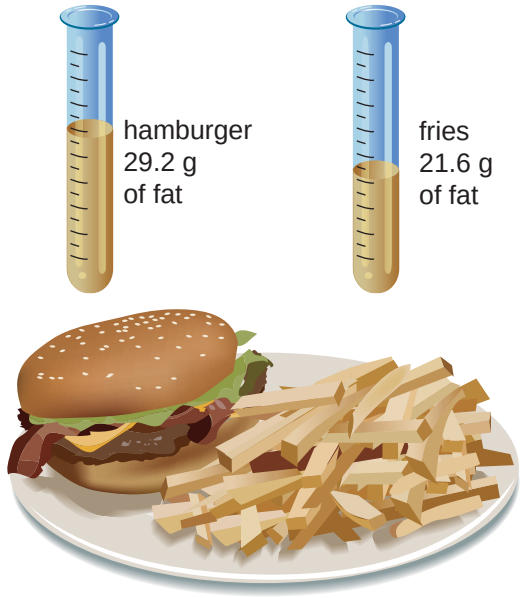


Figure 11.3 The meal shown here contains 50.8 grams of fat. What is the recommended number of grams of fat that you should eat each day?

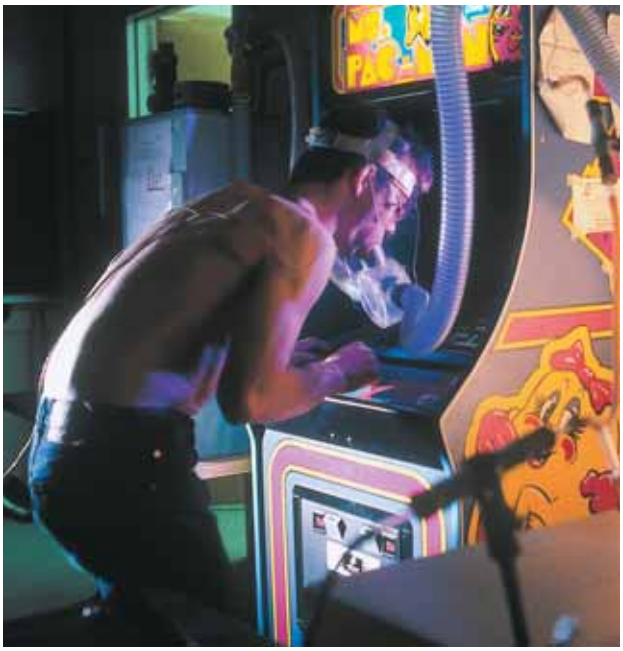


Figure 11.4 Researchers measure the amount of energy spent playing an arcade game by comparing oxygen intake to carbon dioxide output. You burn the same amount of energy playing an arcade game as you do when you participate in mild activities. Exercising can be fun!

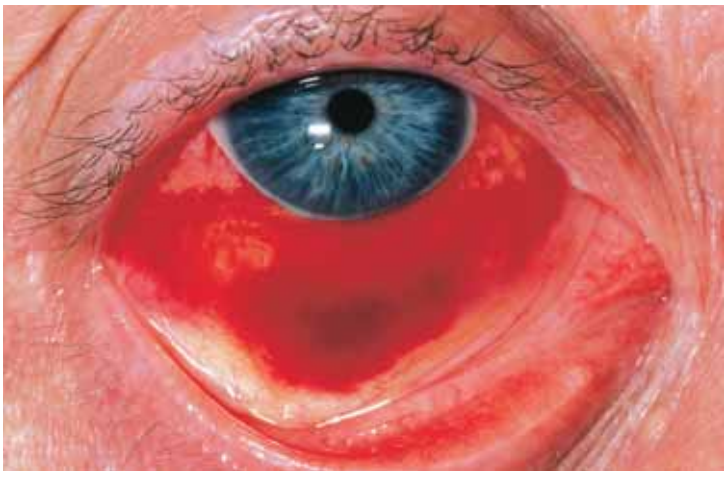


Figure 11.5 High blood pressure is a common adult illness that damages blood vessels. The photograph shows ruptured blood vessels inside an eye. The bleeding may lead to a partial loss of vision. High blood pressure is called a silent killer because there are often no symptoms. Eating too much salt may contribute to high blood pressure.

READING Check

What can you do to reduce your risk factors?

Figure 11.6 Health risks

Factor	Effects
 **Figure 11.6A** Diet high in cholesterol and fats	• fats are harder to digest than other nutrients; high fat diets tax the digestive system • fatty deposits from cholesterol and fat clog blood vessels • deposits in the arteries make the heart work harder • cholesterol can crystallize to form **gallstones**
 **Figure 11.6B** People who are 10 percent over the ideal body weight for their height and bone structure are referred to as obese. The condition is **obesity**.	• often results from overeating or eating the wrong foods • strains heart function, adding a risk of heart disease • eating large portions of food can lead to **heartburn**, which is a burning sensation caused by stomach acids escaping into the esophagus • a particularly high risk factor when associated with high cholesterol levels, high blood pressure, or diabetes
 **Figure 11.6C** Smoking	• during smoking, the body secretes a hormone that temporarily increases blood pressure, which makes the heart work harder • decreases the amount of oxygen available to the heart • doubles the risk of heart attacks and sudden cardiac death • may relax the muscle at the bottom of esophagus, causing heartburn • can cause indigestion • linked to respiratory problems and lung cancer
 **Figure 11.6D** Drugs such as stimulants and depressants	*Stimulants:* • temporarily increase rate of life functions • speed up heart rate and may cause palpitations • may cause diarrhea, abdominal pain, changes in sleep patterns, anxiety, loss of appetite, vomiting • coffee dehydrates body and causes constipation *Depressants:* • decrease the rate of life functions • slow down heart rate • may cause nausea, increased acid production, vomiting, and diarrhea or constipation
 **Figure 11.6E** Lack of exercise	• digested food stays in large intestine too long; coating of feces on walls results in poor absorption of nutrients • constricts blood vessels • increased heart disease risk • risk of becoming overweight • increased risk of joint disorders such as arthritis • poor digestion that can cause constipation

DESIGN & DO

INVESTIGATION 11–B

SKILL CHECK

- Initiating and Planning
- Performing and Recording
- Analyzing and Interpreting
- Communication and Teamwork

Recovery Time

Learn more about how your body works to maintain its internal balance by finding out how long it takes for your heart to recover after exercise.

Challenge

1. Design an investigation that tests the time it takes for your heart to recover after light, medium, and intense exercise.
2. Design your activity so you can compare results from smokers to results from non-smokers.

Safety Precautions

- Make sure you do not overexert yourself.
- Let your teacher know if you have health concerns that prevent you from participating in physical exercise.

Apparatus

electronic heart monitor (if available)

various pieces of sports equipment supplied by the teacher or brought from home

Materials

graph paper

To take a pulse, press your index finger and one or two other fingers against an artery. Count the number of pulses in 15 seconds. Multiply by 4 to get the number of beats per minute.

READING Check

List three factors that put the health of your circulatory and digestive systems at risk. Which one(s) *can* you do something about? Which one(s) are you willing to do something about?

Design Criteria

A. Choose three levels of intensity for the activities you wish to test.

B. Determine a resting heart rate, heart rate after activity ("working" rate), and recovery heart rate.

C. Create a chart to record the data. You need to represent the data in a way that compares smokers and non-smokers.

D. Plot recovery rate data on a graph.

Plan and Construct

1. In small groups, make decisions about the following:
   - activities to represent light, moderate, and heavy intensity. An example is walking, jogging, and running.
   - how long to do each activity
   - time interval between pulse readings after activity. For example, take a reading every minute.

   Get your teacher's approval before you start.
2. Brainstorm ideas about how to represent the collected data.
3. Create a data chart. Give it a title.
4. Determine the resting heart rate for each member of your group using a monitor or the index finger method. Record the data.
5. Test the members of your group at each level of activity. Take and record the working pulse rate.
6. After each level of activity, continue to check the pulse using the time interval you have chosen. How many minutes does it take to recover to the resting heart rate?
7. For each level of activity, calculate the average recovery rates for smokers and non-smokers. Plot recovery rate data on a graph. Title and label the axes of your graph.

Find Out ACTIVITY

Clogged Tubes: Teacher Demonstration

Model a blocked artery to show how the blockage affects blood flow.

SKILL CHECK

- Initiating and Planning
- Performing and Recording
- Analyzing and Interpreting
- Communication and Teamwork

Safety Precautions

- Wash your hands when you have completed the activity.
- Be aware of allergies to tomato juice.

What You Need

tomato juice

straws of different diameters

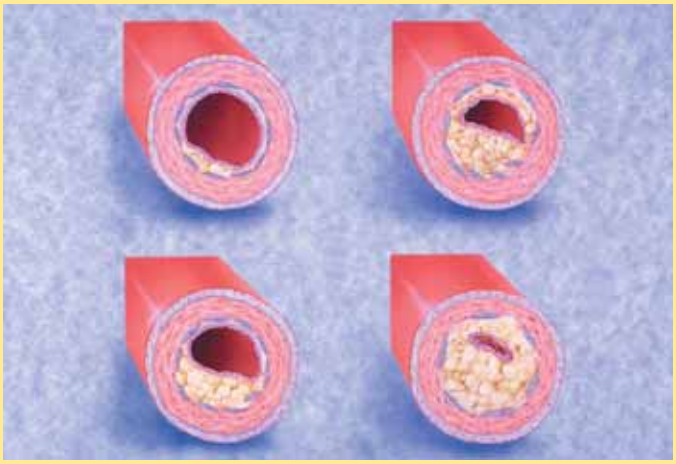
drinking glass

What to Do

1. Pour your juice into a glass.
2. Using a regular straw, suck some of the liquid through the straw to establish a control.
3. Repeat using straws of different diameter.
4. Compare the effort or suction needed to get the liquid up through the straw.

What Did You Find Out?

1. How did changing the diameter of the straw change the amount of suction needed to pull the drink through the straw?
2. How does this activity relate to what happens when arteries become clogged?



This artery is clogged with cholesterol.

Internet CONNECT

www.mcgrawhill.ca/links/science.connect1

Go to the above web site, then to Internet Connects, Unit C, Chapter 11, and then to Life Expectancy to calculate your life expectancy based on lifestyle factors. Follow the links from there.

Key Terms

high blood pressure
gallstone
obesity
heartburn

Check Your Understanding

1. **(a)** What could happen to your circulatory system if you ate the food shown above regularly and did not eat many fresh fruits or vegetables?
   (b) What would happen to your digestive system?
2. Develop a short oral explanation of how a stimulant such as coffee affects the circulatory and digestive systems.
3. Suggest a way to lower high blood pressure.

11.3 When Your Body Cannot Cope

Some teens can eat junk food every day and remain healthy. Others cannot. What is the difference?

As you saw earlier, your health depends on diet, lifestyle choices, and genetics. The wisest path is to take the best care of your body that you can. When you do get sick, find out about the disease and what you can do to help your body deal with it.

The following section discusses diseases common to teenagers.

READING Check

Identify two major illnesses that affect the circulatory and digestive systems.

Diabetes — Lifestyle and Genetics

People with **diabetes** have abnormally large amounts of sugar in their blood and urine. This problem stems from the pancreas. Usually, the pancreas secretes insulin to maintain optimal blood sugar levels in your body. In one type of diabetes, the pancreas no longer produces enough insulin to control the amount of glucose in blood. In another type, insulin levels are normal, but the insulin does not work.

With treatment and care, most diabetics maintain nearly normal blood sugar levels. Daily injections of insulin, a balanced diet, and exercise also help to control the disease.

Figure 11.7 Some diabetics use insulin pumps. The pumps deliver insulin to the body at regular intervals. Other diabetics have daily injections of insulin.

Ulcers — Genetics

Ulcers consist of holes or breaks in the lining of the esophagus and stomach. Acids normally present in the digestive juices destroy the mucous lining. This causes people with ulcers to feel a burning, aching, or gnawing sensation in the lower chest region.

There is little evidence to support the claim that ulcers are caused by stress or by eating too quickly. In fact, most ulcers seem to be genetic. Recent medical research indicates that some ulcers are caused by a bacterium.

Several different drugs, including antibiotics, are used to treat the condition.

Figure 11.8 An endoscope is used to view the digestive tract. This view shows several ulcers on the surface of the stomach.

DidYouKnow?

Canadians Frederick Banting and Charles Best discovered insulin in 1921. Injections of this hormone can control diabetes.

SKILL CHECK

- Initiating and Planning
- Performing and Recording
- Analyzing and Interpreting
- Communication and Teamwork

How Important Are Your Kidneys?

Think About It

Although most people are born with two kidneys, you need only one or part of one to survive. Kidneys are the body's filters. The chart shows what happens to six substances found in the blood when the blood is filtered through the kidneys. Use the figures and some calculations to learn how kidneys function.

What to Do

1. Copy the chart into your notebook.
2. Calculate the amount of each substance left in the urine. Record your answers in the fourth column of the chart.
3. Calculate the percentage of each substance absorbed into the blood. Record your answers in the fifth column.

Absorbed by the Blood Substance	Amount Initially Filtered out of Bloodstream	Amount Returned to Bloodstream	Amount in Urine	Percent Absorbed
water	100 L	99 L	$100 - 99 = 1$ L	$\frac{99}{100} \times 100 = 99\%$
chloride ion	370 g	364 g		
glucose	70 g	70 g		
urea	30 g	10 g		
uric acid	4 g	3.5 g		
calcium ion	10 g	9.85 g		

Analyze

1. Look at the percentages you calculated.

(a) Which substance is removed from the bloodstream in the largest quantity?

(b) Which substance is returned to the bloodstream in the largest quantity?

Extend Your Skills

2. Why is it important for your body to absorb so much water and glucose?

3. The kidneys normally return all glucose back to the bloodstream.

(a) What happens to glucose next?

(b) Why do you need to eat foods that are sources of glucose?

4. During a urine test, your doctor finds glucose in your urine. What disease might you suffer from?

Eating Disorders — Lifestyle

Anorexia Nervosa

In anorexia nervosa or **anorexia**, people do not eat enough. This condition is most common in young people, especially young women.

People with anorexia are afraid of gaining weight. No matter how thin they are, they view themselves as being fat. As a result, they ignore normal hunger signals. Most severely restrict their food intake and compulsively exercise to get rid of what they think is "excessive weight."

Bulimia Nervosa

In bulimia nervosa or **bulimia**, people eat too much. Then, some force themselves to vomit in order to get rid of the food before digesting it. Others take laxatives to get rid of the food in bowel movements. That is why bulimia is called the "binge and purge" disease.

These forms of purging deplete body fluids and nutrients, and can affect heart function. Repeated vomiting also damages the esophagus and breaks down tooth enamel due to the large amounts of acid in vomit.

Some people with eating disorders die of starvation. Others suffer from malnutrition and an increased number of infections. Treatment for both conditions involves education and counselling. Antidepressants and hospitalization can also be helpful.

Figure 11.9 This teen has been trained in CPR. Find out when and where courses are offered in your area.

Heart Attack — Genetics/Lifestyle

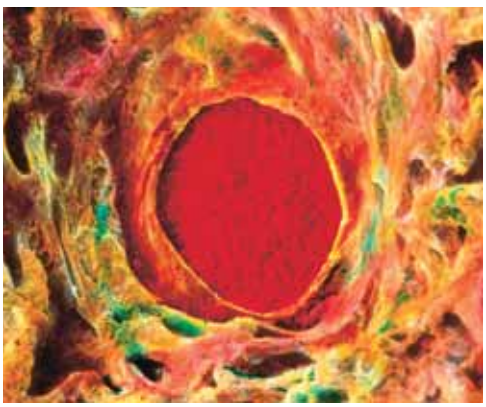
During a **heart attack**, blood flow to the arteries supplying the heart is severely restricted. The heart fails to pump steadily. As a result, heart tissues begin to die.

A **cardiac arrest** occurs when the heart stops. Treatment includes administering CPR or electric shock to restore heart function.

People can inherit a tendency to develop blocked arteries caused by cholesterol. These people — like everyone else — can lower their risk by eating a diet low in fat, exercising regularly, and not smoking.

Check Your Understanding

1. What is cardiac arrest?
2. Compare a healthy body's response to sugar to a diabetic's response to sugar.
3. What causes the breaks or holes in the stomach lining you see in this photograph?



Key Terms

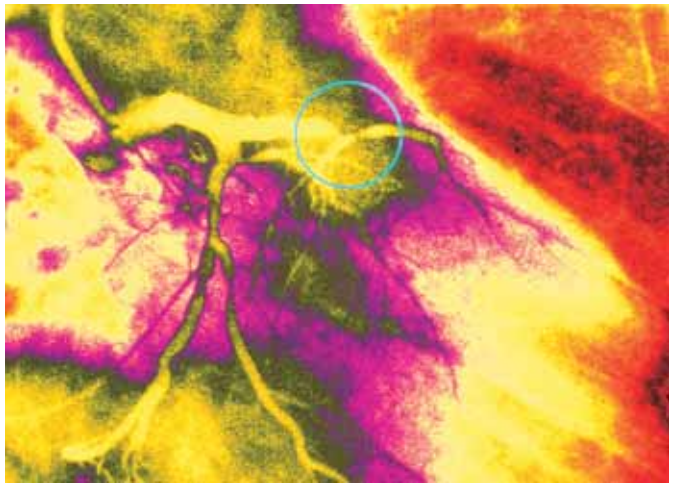
- diabetes
- ulcer
- anorexia
- bulimia
- heart attack
- cardiac arrest

11.4 Technology That Maintains Homeostasis

DidYouKnow?

The first heart transplant took place in 1967 at Groote Schuur Hospital in Cape Town, South Africa. Dr. Christiaan Barnard was the surgeon; Louis Washkansky was the patient. Do you know how you can become an organ donor?

Health-care providers use technology to diagnose and treat illnesses and diseases, and to preserve homeostasis. In this section, you will identify the technologies that help keep your digestive and circulatory systems in order.

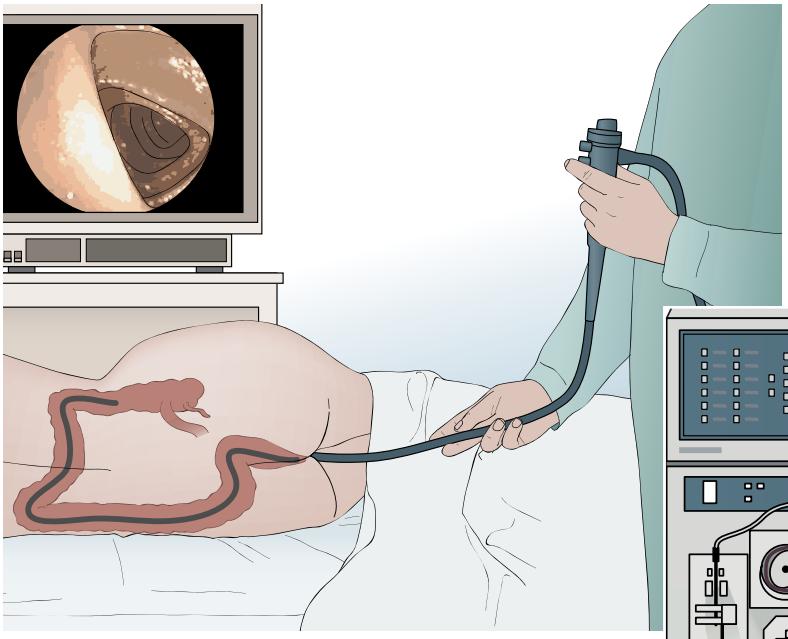


A Doctors diagnose artery disease by inserting a hollow tube into an artery in the groin or elbow. An **angiogram** provides an X-ray picture of blood vessels. This X ray shows any irregularities in blood flow.

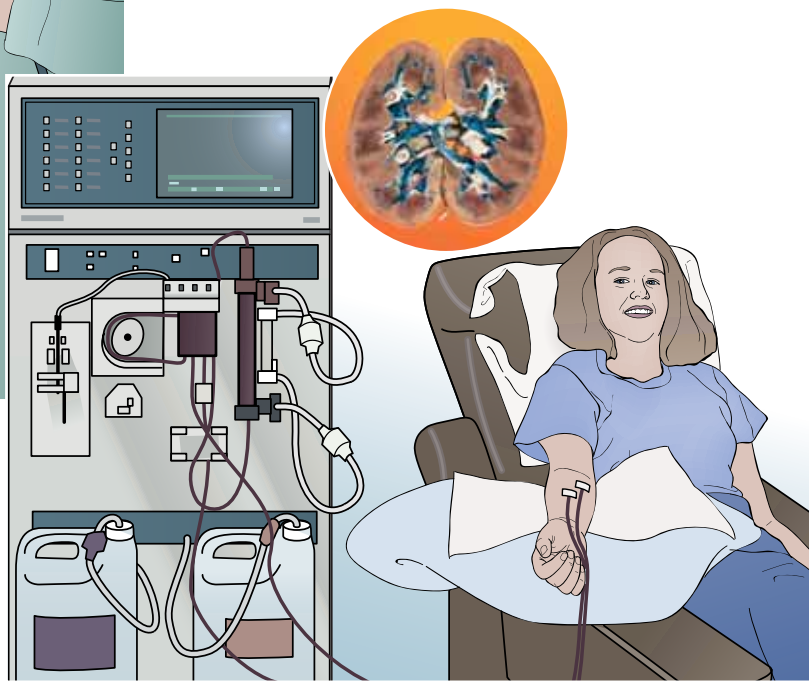
B A procedure called angioplasty clears a blocked artery. A balloon is threaded into a hollow tube. When it reaches the blocked area, it is inflated. This enlarges the artery and restores normal blood flow.

C A **pacemaker** is an electrical device implanted under the collarbone. It releases electrical charges to stimulate a steady heartbeat. The heart continues to beat normally after its natural pacemaker no longer works properly.

D The Jarvik-7 is an **artificial heart**. Artificial hearts are used because there are not enough human heart donors and it is difficult for humans to stay alive on hearts from other species. Researchers continue to improve artificial hearts.



E A technician inserts an endoscope into the rectum and large intestine. This provides a view of the lower digestive tract. Colonoscopy is used to check for abnormalities, cancer, inflammation, and rectal bleeding.



F Kidney dialysis is used when the kidneys no longer function. A system of tubing allows blood to flow into a machine that removes waste products. Purified blood is then cycled back into the body.

Career CONNECT

This personal care attendant displays an electronic monitor that automatically keeps track of a patient's pulse, heart rate, and glucose levels. Personal care attendants work in a variety of settings to help clients with personal care needs. They must be able to communicate effectively and have basic math skills. Most employers look for people who have completed a two-year community college program in this area of study.

Figure 11.10

Check Your Understanding

1. Explain why someone might need dialysis.
2. Describe three forms of technology used to diagnose or treat heart problems.

Key Terms

- angiogram
- pacemaker
- artificial heart
- kidney dialysis

Computer CONNECT

Use a word processor to write your report.

CHAPTER

11 Review

Key Terms

homeostasis	obesity	anorexia	angiogram
insulin	heartburn	bulimia	pacemaker
high blood pressure	diabetes	heart attack	artificial heart
gallstone	ulcer	cardiac arrest	kidney dialysis

Reviewing Key Terms

If you need to review, the section numbers show you where these terms were introduced.

1. In your notebook, match each description in column A with a term in column B.

A	B
(a) hormone that regulates blood sugar levels	i. diabetes (11.3)
(b) electrical device that keeps the heartbeat steady	ii. homeostasis (11.1)
(c) replacement for the body's filtration system	iii. ulcer (11.3)
(d) heart stop	iv. artificial heart (11.4)
(e) Jarvik-7	v. pacemaker (11.4)
(f) word for the body maintaining a stable set of internal conditions	vi. heartburn (11.2)
(g) caused by acids regurgitating	vii. high blood pressure (11.2)
(h) occurs when blood flow to the arteries supplying the heart is severely restricted and the heart fails to pump steadily	viii. kidney dialysis (11.4)
(i) damages blood vessels over time	ix. insulin (11.1)
(j) symptoms of this condition include large amounts of sugar in blood and urine	x. heart attack (11.3)
(k) sores on stomach lining	xi. cardiac arrest (11.3)

Understanding Key Ideas

Section numbers are provided if you need to review.

2. (a) Use your own words to define "homeostasis."

(b) Use a sketch to help explain one example of homeostasis. (11.1)

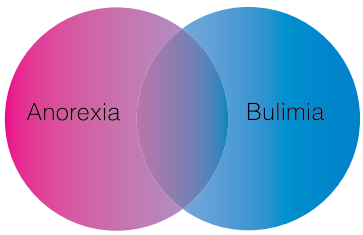
3. Identify the major health risks affecting your circulatory and digestive systems. (11.2)

4. How is the product shown here linked to your health? (11.2)

5. Defend the statement, "Smoking negatively affects the health of your digestive and circulatory systems." (11.2)

6. In your notebook, draw a Venn diagram similar to the sketch shown here. Complete the diagram by doing the following.

- In the anorexia circle, describe only anorexia.
- In the bulimia circle, describe only bulimia.
- In the place where the circles overlap, list what anorexia and bulimia have in common. (11.3)



7. Briefly describe a procedure used to clear a blocked artery. (11.4)

Developing Skills

8. **(a)** Keep track of your diet and activities for three days. Record the information in a chart. (11.2)
   (b) Using your own judgement and the information in this unit, assess whether the food and activity choices you have made promote a healthy lifestyle. How might you reduce your health risks?

9. You have just received a kidney transplant from the victim of a car accident. Research the facts about kidney transplants. Include your findings in a journal entry describing your reactions to the procedure, your thoughts about the extension to your life, and your thoughts about the victim's family. (11.4)

10. Make a table with three columns. (11.3, 11.4)
    - In the first column, list three disorders that result from the inability of your body to cope with major disturbances in the digestive and circulatory systems.
    - In the second column, list effects of each disorder on your body.
    - In the third column, list treatment(s) for each disorder.

11. Biomedical engineers invented the pacemaker, the EKG, and the defibrillator. Research to find out more about *one* of these inventions. Present your findings in the form of a brief report. (11.4)

Problem Solving/Applying

12. Peter is 17 years old, smokes 10 to 15 cigarettes a day, eats fast food at least four times a week, and plays on the school wrestling and volleyball teams. Koya is 35 years old, is a non-smoker, eats a well-balanced diet, and does not exercise. (11.2)
    (a) Identify the health risks for each.
    (b) Which one currently has greater health risks?
    (c) If their lifestyles do not change, which one will have greater health risks later in life? Explain your answer.

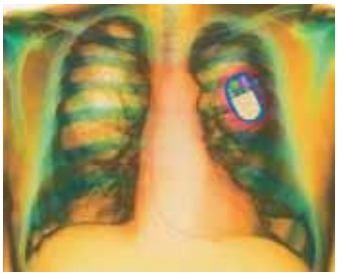
13. If you were Peter and Koya's doctor, what recommendations would you make to each? (11.2)

Critical Thinking

14. You are skiing down a hill when the wind direction and speed change. (11.1)
    (a) How might you respond?
    (b) How might your body respond?

15. People in certain regions of the world live longer, healthier lives than those in other areas. Identify any factors that may account for differences in life span. (11.2, 11.3)

Pacemaker



EKG

Defibrillator

Pause & Reflect

1. Check your original answers to the Getting Ready questions on page 214. How has your thinking changed? How would you answer these questions now that you have investigated the topics in this chapter?
2. How have the computer and the television affected your health and lifestyle?

unit C PROJECT

SKILL CHECK

- Initiating and Planning
- Performing and Recording
- Analyzing and Interpreting
- Communication and Teamwork

Grow a Clone

What do you think of when you hear the word "clone"?

Some people think of science fiction programs in which whole races of people are developed from the same genes. Other people might think of *Multiplicity*, a comedy in which Michael Keaton plays himself and several clones.

But do you know that you probably eat clones every day?

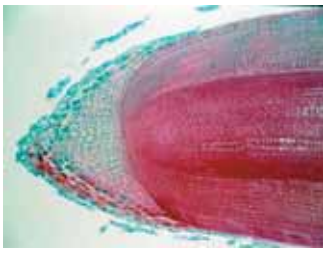
In fact, many of the apples, grapes, and oranges sold in grocery stores are cloned. Cloning consists of growing identical offspring from a single cell or piece of tissue. In this activity, you will grow some plant clones.

Problem

How can you clone several plants from the same parent plant?

Prediction

What do you think cloned plants will have in common?



The very tip of the root area is made up of stem cells. These cells are useful for cloning because they are unspecialized. At a certain point in their growth, such cells specialize into cells that make up roots, stems, and leaves. Bone marrow and fatty tissue also have stem cells.

Safety Precautions

- Be careful when using scissors or other sharp objects.

Apparatus

250 mL beaker
scissors
metric ruler
small flower pot

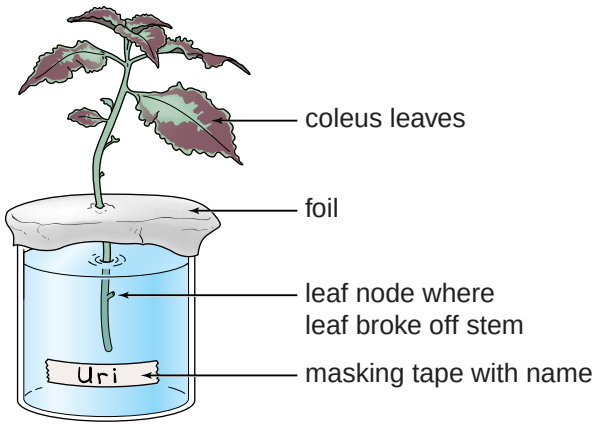
Materials

masking tape for label
aluminum foil
several large *coleus*, *geranium*, or *impatiens* plants
water
potting soil

Procedure

1. Work in small groups. Each person in the group should cut off a small cutting from the same plant. Make sure the cutting has two or three leaves on it.

2. Label the beaker with your name; fill it with water. Cover the top of the beaker with foil. Use a pencil or pen to punch a small hole in the centre of the foil.



3. Insert the cut end of the cutting through the hole in the foil. Make sure that the bottom 3 cm of the cutting dips into the water, and that there is a leaf node in the water.

4. Prepare a data table with the following headings:
   - Date
   - Appearance of Bottom Tip of Cutting

5. Check the cutting each day for a week. Observe and record any changes. Sketches would be great. Add water as needed to keep the bottom 3 cm of your cutting in water.

6. Continue to observe your clone, and record data about it until it has developed roots about 3 cm in length.

7. When the roots are 3 cm long, fill the small pot with soil and carefully plant the cutting. Clean the beaker.

8. Continue to observe and record information about your plant as it grows.

9. Remember to wash your hands thoroughly after each part of the activity.

Analyze

1. Compare the cuttings taken by each of the students in your group. In what ways are the cuttings similar? How do they differ?

Conclude and Apply

2. With a group, brainstorm and record some advantages and disadvantages of cloning.

Extension

3. (a) Continue to grow your plant for several weeks. At the end of that time, compare your plant with those of the other members of your group.

(b) Compare your group's plants with those from other groups. How are all of the plants similar? How do the plants from other groups differ from your group's plants?

(c) What would you expect a new plant to look like if you took a cutting from your plant? Explain.

Internet CONNECT

In 1997, a Scottish scientist named Dr. Ian Wilmut cloned an adult sheep. Using just one cell, he produced Dolly, a sheep clone.

www.mcgrawhill.ca/links/science.connect1

Dolly was the only lamb to survive from the 277 eggs that Dr. Wilmut worked with in his investigation. Find out more about cloning research by going to the above web site, then to Internet Connects, Unit C, Closer, and then to What Is Cloning?

DidYouKnow?

Identical twins are nature's clones. They come from a single cell — the same cell. At some point, the fertilized egg splits, making two copies with exactly the same cellular structure.