

Chapter 8

Food and Nutrition

Section 1

Carbohydrates, Fats, and Proteins

- **Hands-On Activity** Which Foods Contain Fats?

Building Health Skills

- **Setting Goals** Breaking a Bad Habit

Section 2

Vitamins, Minerals, and Water

Section 3

Guidelines for Healthful Eating

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TEENS Talk

CLASSROOM VIDEO #8

Food for Thought

Preview Activity

How Do Food Ads Influence You?

Complete this activity before you watch the video.

1. Predict how many food ads you are exposed to in a typical day.
2. Keep a log for a day. For each food ad you see, note the type of ad, where you saw it, and its message.
3. Did the actual number of food ads you saw surprise you? Was the number higher than you predicted?
4. In a paragraph, discuss some of the ways that food ads influence the food choices that you and other teens make. **WRITING**

Section 1

Objectives

- ▶ **Name** the three classes of nutrients that supply your body with energy.
- ▶ **Explain** how the body obtains energy from foods.
- ▶ **Describe** the roles that carbohydrates, fats, and proteins play in your body.

Vocabulary

- nutrient
- metabolism
- calorie
- carbohydrate
- fiber
- fat
- unsaturated fat
- saturated fat
- cholesterol
- trans fat
- protein
- amino acid

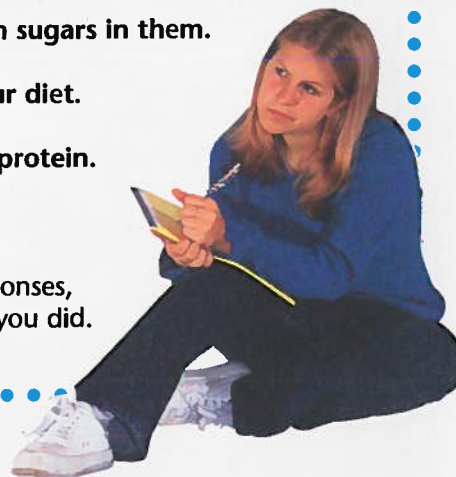
Carbohydrates, Fats, and Proteins

Warm-Up

Quick Quiz Which of these statements are always true? Which are sometimes true? Which are always false?

- 1 Foods that are high in calories are unhealthy.
- 2 You should avoid foods with sugars in them.
- 3 You should avoid fats in your diet.
- 4 Vegetarian diets are low in protein.
- 5 Snacking is bad for you.

WRITING For each of your responses, explain why you gave the answer you did.



Foods Supply Nutrients

What do you think of when you hear the word *food*? You probably recall your favorite foods. Maybe you imagine the smell of fresh-baked bread or the spicy taste of curry. You might also think of occasions when food is especially important, such as family celebrations and meals with friends. Food is more than something that satisfies your hunger. It is a source of enjoyment, and it is an important aspect of your social life as well.

Your body needs food, and the food that you eat affects your health in many ways—how you look and feel, how well you resist disease, and even how well you perform mentally and physically. It does all those things by providing your body with **nutrients** (NOO tree unts), substances that the body needs to regulate bodily functions, promote growth, repair body tissues, and obtain energy. Your body requires more than 40 different nutrients for these tasks. The process by which the body takes in and uses these nutrients is called nutrition.

There are six classes of nutrients: carbohydrates, fats, proteins, vitamins, minerals, and water. Each class of nutrient is necessary for good health. **Carbohydrates, fats, and proteins can all be used by the body as sources of energy.** Vitamins, minerals, and water perform other essential functions that will be discussed in the next section.

Foods Supply Energy

The foods you eat are your body's energy source. You rely on the energy from food for everything you do—running, playing a musical instrument, and even sleeping. You need energy to maintain your body temperature, keep your heart beating, and enable you to understand what you read.

Fuel for Your Body When your body uses the nutrients in foods, a series of chemical reactions occurs inside your cells. As a result, energy is released. **Metabolism** (muh TAB uh liz um) is the chemical process by which your body breaks down food to release this energy. Metabolism also involves the use of this energy for the growth and repair of body tissues.

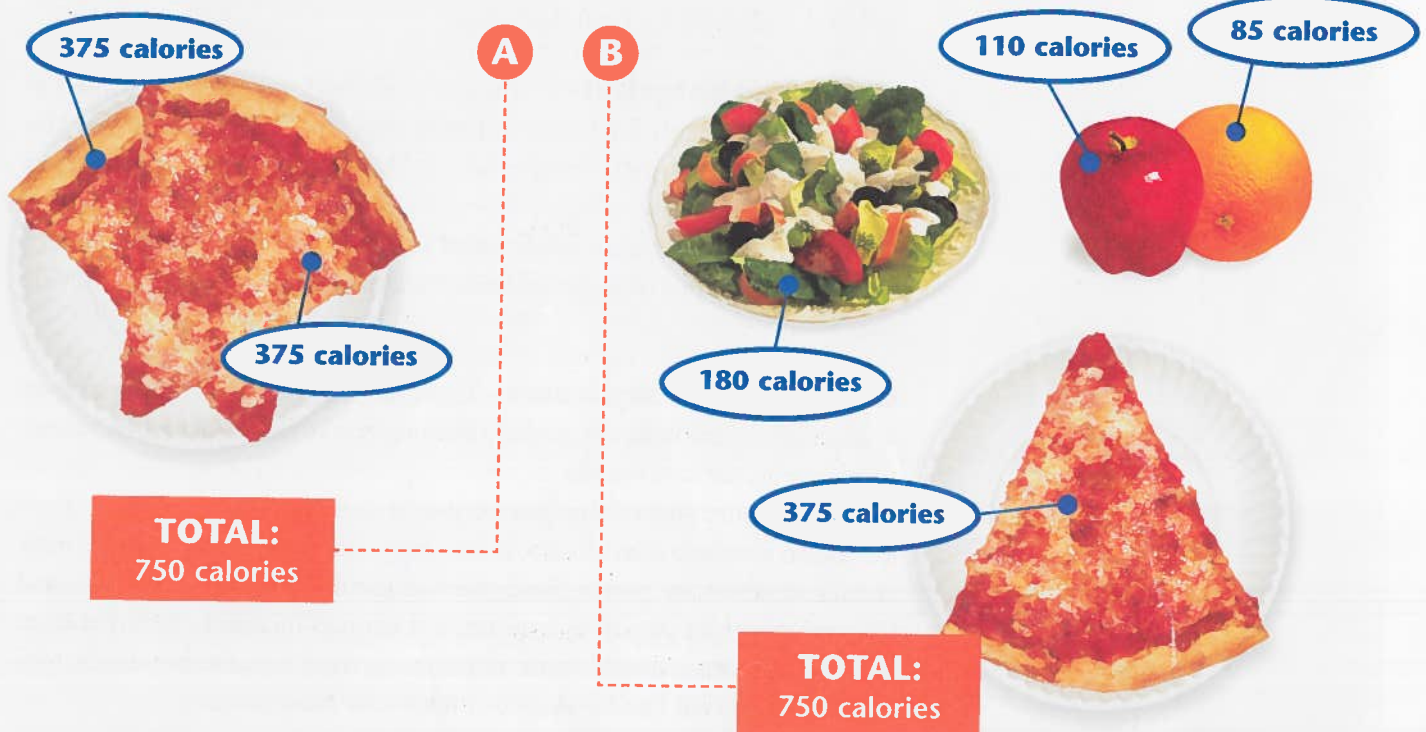
What Are Calories? The amount of energy released when nutrients are broken down is measured in units called **calories**. The more calories a food has, the more energy it contains. You can see in Figure 1 that the calorie content of different foods varies greatly. Contrast the energy that you get from a slice of pizza with the energy that you get from an apple, an orange, or a salad.

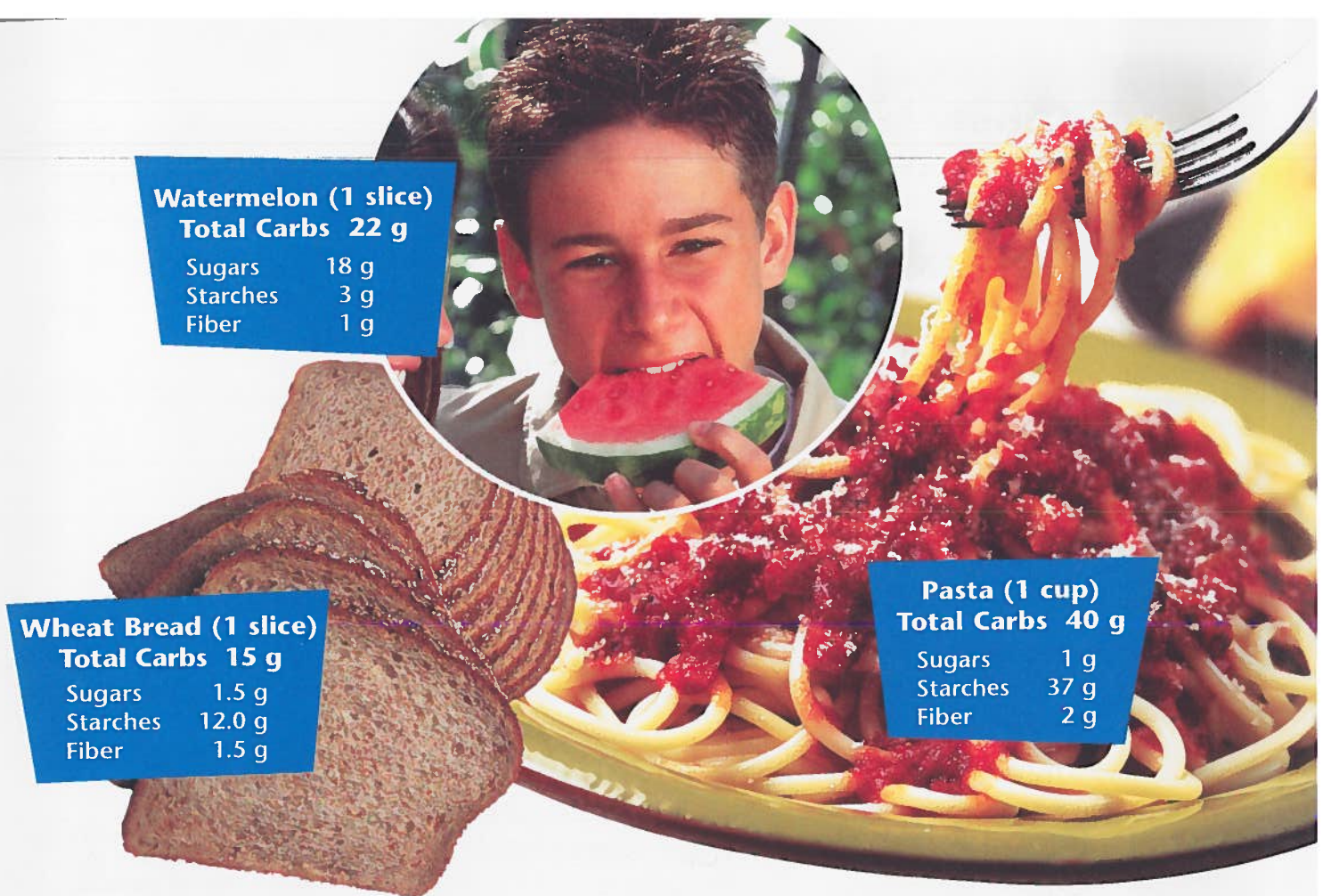
For good health, the number of calories in the food that you eat should match the calorie needs of your body. But when planning what to eat, you need to think about more than just the calorie content of foods. You also need to consider whether or not the foods you choose contain all the nutrients your body needs.

Connect to YOUR LIFE How many calories are in a serving of your favorite snack food?

FIGURE 1 These two meals contain the same amount of energy but different nutrients. **Calculating** About how many salads would it take to equal the calories found in one slice of pizza? **MATH**

Which Lunch Would You Eat?





Watermelon (1 slice)
Total Carbs 22 g
 Sugars 18 g
 Starches 3 g
 Fiber 1 g

Wheat Bread (1 slice)
Total Carbs 15 g
 Sugars 1.5 g
 Starches 12.0 g
 Fiber 1.5 g

Pasta (1 cup)
Total Carbs 40 g
 Sugars 1 g
 Starches 37 g
 Fiber 2 g

FIGURE 2 Whole-grain breads, fruits, and pasta are good sources of carbohydrates.

Carbohydrates

Carbohydrates (kahr boh HY drayts) are nutrients made of carbon, hydrogen, and oxygen. **Carbohydrates supply energy for your body's functions.** There are two general types of carbohydrates—simple carbohydrates and complex carbohydrates.

Simple Carbohydrates Simple carbohydrates are also known as sugars. Sugars occur naturally in fruits, vegetables, and milk. They are added to many manufactured foods, such as cookies, candies, and soft drinks. There are several types of sugars, but glucose (GLOO kohs) is the most important because it is the major provider of energy for your body's cells. All other types of sugar are converted to glucose once they are inside your body.

Complex Carbohydrates Complex carbohydrates are made up of sugars that are linked together chemically to form long chains, something like beads in a necklace.

Starches are one of the main types of complex carbohydrates. They are found in many plant foods, including potatoes and grains. Rice, oats, corn, and wheat are grains. Foods such as tortillas, whole-wheat rolls, and Chinese moo shu pancakes are excellent sources of starch. When you eat foods containing starch, your digestive system breaks the starch into simple sugars that can be absorbed into your bloodstream.

Fiber **Fiber** is a type of complex carbohydrate that is found in plants. Strictly speaking, fiber is not really a nutrient because it cannot be broken down and then absorbed into your bloodstream. Instead, fiber passes out of your body without being digested. However, it is still necessary for the proper functioning of your digestive system. A high-fiber diet

- ▶ helps prevent constipation
- ▶ may reduce the risk of colon cancer
- ▶ may help prevent heart disease

Whole-grain breads and cereals, vegetables, fruits, nuts, beans, and seeds provide fiber in your diet.

Your Body's Energy Reserves At a meal, you usually eat more carbohydrates than your body can immediately use. The extra glucose is converted into a type of starch called glycogen (GLY kuh jun), which is stored in your body. When your body needs more glucose, the glycogen is converted back to glucose. If you eat so many carbohydrates that the body's glycogen stores are full, then the excess carbohydrates are stored as fat instead.

Daily Carbohydrate Intake Nutritionists recommend that 45 to 65 percent of a person's daily calorie intake come from carbohydrates. It is better to eat foods rich in complex carbohydrates rather than simple carbohydrates. One reason is that while simple carbohydrates give quick bursts of energy, complex carbohydrates provide better long-term, sustained energy.

When you choose foods containing complex carbohydrates, try to choose whole grains. Whole grains are better than processed grains because they contain more fiber and nutrients. Whole-wheat breads and pastas and brown rice are examples of whole-grain foods. In contrast, foods high in sugars, such as candy and soft drinks, may have few valuable nutrients. If you have a craving for sweets, eat naturally sweet foods, such as fruits. Those foods provide vitamins and trace amounts of some minerals, too.

Connect to YOUR LIFE List some carbohydrates you typically eat. Are they sugars or starches?

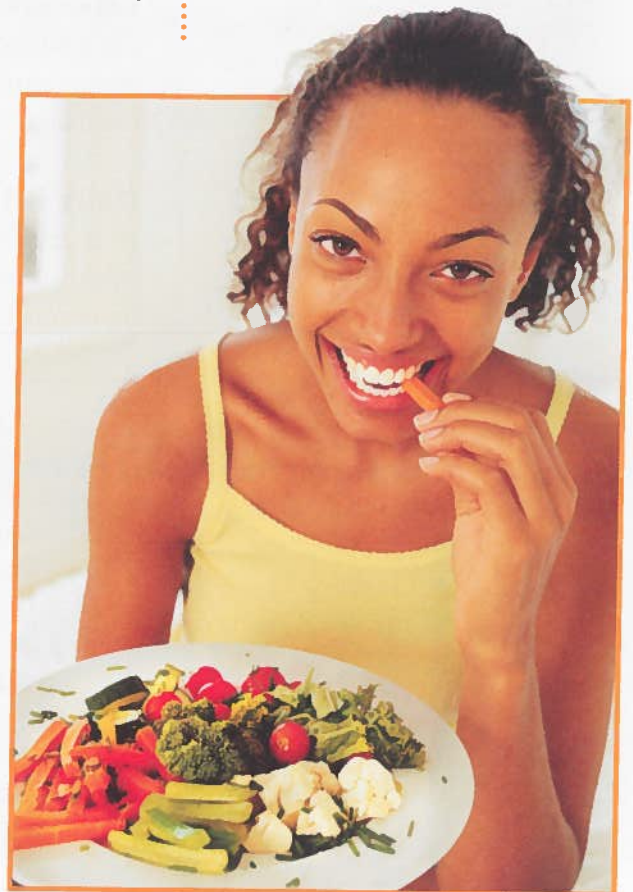


FIGURE 3 Beans and vegetables with edible skins and seeds are good sources of fiber.

Fats

Like carbohydrates, **fats** are made of carbon, hydrogen, and oxygen, but in different proportions. **Fats supply your body with energy, form your cells, maintain body temperature, and protect your nerves.** Ounce for ounce, fat has twice as many calories as carbohydrates.

Unsaturated Fats Fats come in different forms. **Unsaturated fats** have at least one unsaturated bond in a place where hydrogen can be added to the molecule. Unsaturated fats are usually liquid at room temperature. These fats are found in vegetable oils, nuts, and seeds.

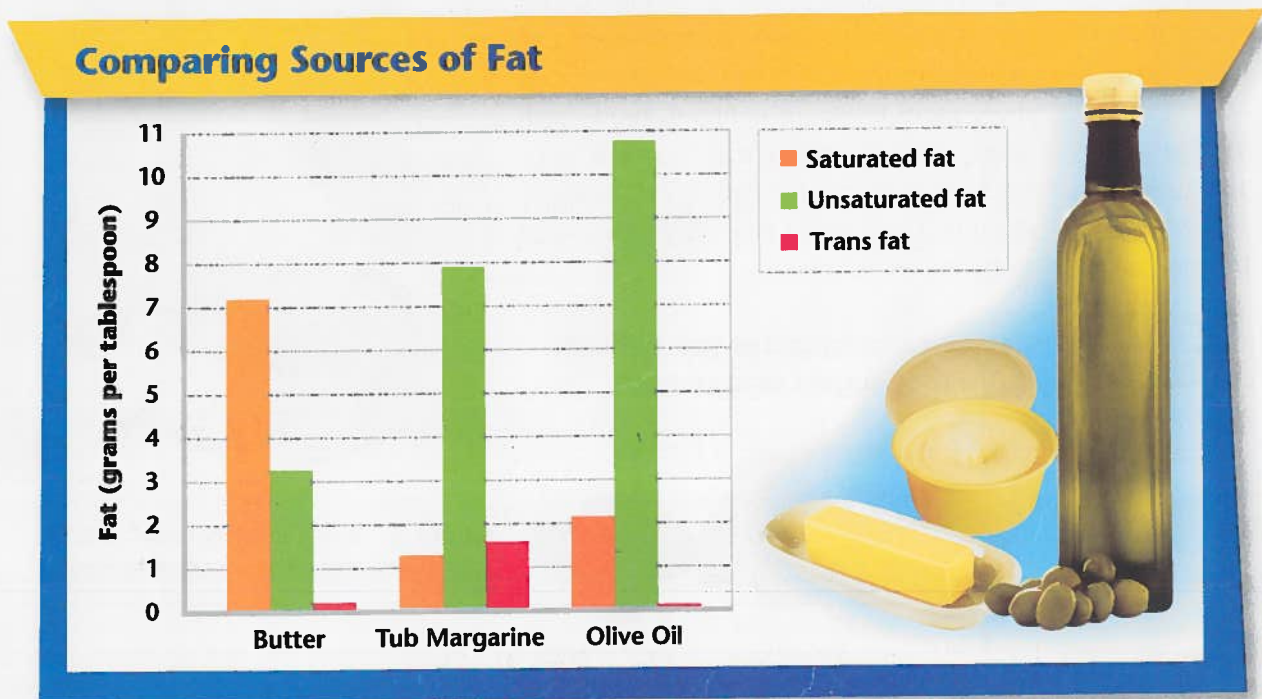
Unsaturated fats are classified as either monounsaturated fats or polyunsaturated fats. Foods that contain monounsaturated fats include olive oil, peanuts, and canola oil. Foods that contain polyunsaturated fats include safflower, corn, and soybean oil, as well as seafood. A balance between monounsaturated and polyunsaturated fats in the diet is important for cardiovascular health. Unsaturated fats can actually help fight heart disease.

Saturated Fats Fats that have all the hydrogen the carbon atoms can hold are called **saturated fats**. Saturated fats are usually solid at room temperature. Animal fats, such as lard, and dairy products contain saturated fats. Too much saturated fat in your diet can lead to heart disease.

Daily Fat Intake Nutritionists recommend that 20 to 35 percent of your calories come from fat, primarily unsaturated fat. To reduce your intake of saturated fat, you can substitute low-fat foods for the meats and dairy products that are high in saturated fats.

FIGURE 4 Eating foods containing unsaturated fats, such as olive oil, is more healthful than eating foods containing saturated fats.

Reading Graphs Which of the fat sources in the graph is lowest in saturated fat?



Hands-On Activity

Which Foods Contain Fats?

Materials

brown paper bag
scissors
marker
dropper
potato chip
milk chocolate
carrot
whole milk
skim milk
apple juice
ground beef

Try This

- 1 Cut a brown paper bag into squares about 3 inches on each side. Write the name of each food on a square.
- 2 Rub each food on the square with its name. If the food is a liquid, place a few drops on the square.
- 3 Let the squares dry. Then hold each square up to a light.

Think and Discuss

- 1 Which squares had a spot when you held them up to the light? Those foods contain fat. Which squares did not have a spot?
- 2 Does your daily diet include many foods that are high in fat? (To be sure, try testing some foods that you commonly eat.) How could you reduce the amount of fat that you consume each day?



Cholesterol **Cholesterol** (kuh LES tuh rawl) is a waxy, fatlike substance that is found only in animal products. Your body needs a certain amount of cholesterol to make cell membranes and nerve tissue, certain hormones, and substances that aid in the digestion of fat. Your liver can make all of the cholesterol your body needs. Therefore, cholesterol is not a necessary part of the diet.

A diet high in fat and cholesterol can increase the amount of cholesterol in the blood. When the level of cholesterol circulating in the blood gets too high, deposits called plaque form on the walls of blood vessels. Heavy plaque buildup may block blood flow to the heart, depriving the heart of oxygen and leading to a heart attack.

Some research suggests that high blood cholesterol is hereditary. Cholesterol levels also tend to rise as a person ages. These are risk factors you can't change, but there is one you can control: your diet. You can reduce your risk of heart disease by reducing the amount of meat and dairy fat in your diet.

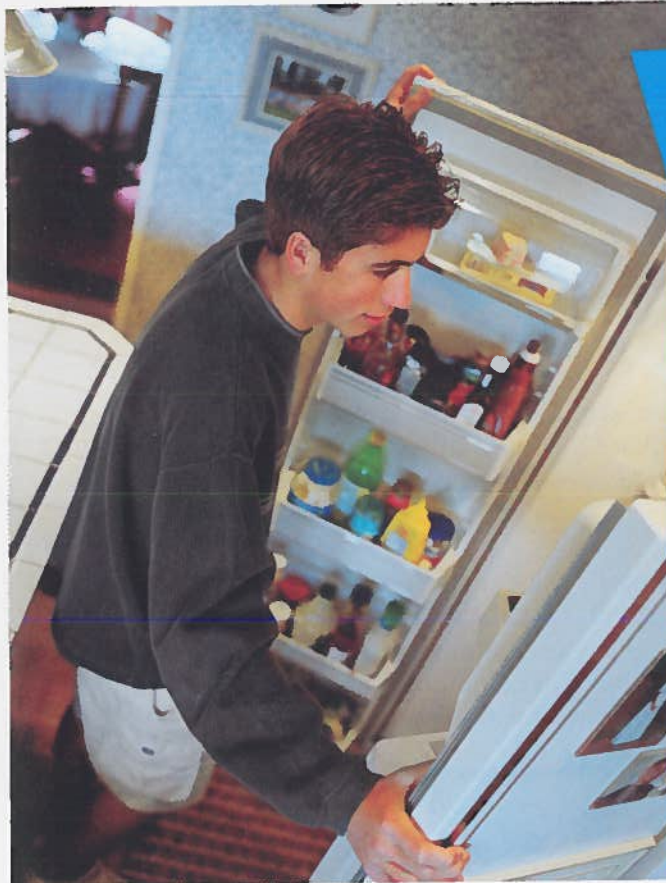
Trans Fats You may have heard about trans fats. **Trans fats** are made when manufacturers add hydrogen to the fat molecules in vegetable oils. Foods that contain trans fats stay fresh longer than foods that contain unsaturated fats. But, trans fat seems to have few of the benefits of unsaturated fat and many of the risks of saturated fat. Trans fats are found in margarine, chips, and commercially baked goods. The stick forms of margarine tend to contain more trans fats than the softer, tub margarines.

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What high-fat foods do you eat? How can you cut down on these foods?

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How Much Protein Is in Your Refrigerator?

Broiled beefsteak (6 oz)	49.9 grams
Cheddar cheese (1 oz)	7.1 grams
Corn (1 ear)	2.0 grams
Egg (1 large)	6.3 grams
Fried chicken (1 drumstick)	13.2 grams
Orange juice (1 cup)	2.0 grams
Peanut butter (2 tbsp)	8.0 grams
Refried beans (1/2 cup)	6.9 grams
Salmon (6 oz)	37.6 grams
Tofu (1/2 cup)	10.3 grams
Whole milk (1 cup)	7.9 grams

FIGURE 5 Meats, fish, eggs, and dairy products are excellent sources of protein. **Calculating** Which has more protein per ounce: beefsteak or cheddar cheese? **MATH**

Proteins

Nutrients that contain nitrogen as well as carbon, hydrogen, and oxygen are called **proteins**. Like carbohydrates and fats, proteins can serve as a source of energy. **The most important function of proteins, however, is their role in the growth and repair of your body's tissues.** A good portion of your body is made up of protein. High-protein foods include meats, eggs, poultry, milk, and milk products. Nuts, dried beans, dried peas, and lentils also contain a lot of protein.

Amino Acids Like carbohydrates, proteins are long chains of smaller “links” that are bound together chemically. These smaller substances are known as **amino acids** (uh MEE noh). When you eat protein, your digestive system breaks it down into individual amino acids. These amino acids are then absorbed into your bloodstream and reassembled by cells to form the kinds of proteins you need.

Essential Amino Acids The proteins in your body are made up of 20 different amino acids. Your diet has to supply nine of these amino acids; your body can manufacture the rest. The nine amino acids that the body cannot manufacture are called essential amino acids. You can remember this by thinking of them as an essential part of your diet.

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What are the main sources of protein in your diet?

Complete and Incomplete Proteins Protein from animal sources—meats, fish, and so forth—is said to be complete protein because it contains all nine essential amino acids in the proportions needed by your body. In contrast, most protein from plant sources, such as beans, is incomplete, because it lacks one or more essential amino acids.

Daily Protein Intake Nutritionists recommend that 10 to 35 percent of your calories come from proteins. A diet that contains both plant and animal foods can easily supply all of the essential amino acids you need. Simply eat a wide variety of foods, such as red and white meats, fish, dairy products, legumes, nuts, and grains.

Proteins for Vegetarians People who don't eat meat can combine two or more plant protein sources that, taken together, provide all the essential amino acids. Suppose, for example, you prepare a casserole that contains both rice and beans. The protein found individually in the rice and beans is incomplete. When the rice and beans are combined, however, they supply all the essential amino acids needed by your body. When you combine incomplete protein foods in such a way that you obtain all nine of the essential amino acids, you form a complementary protein combination.



FIGURE 6 Together, rice and beans form a complementary protein combination that contains all of the essential amino acids.

Section 1 Review

Key Ideas and Vocabulary

1. Which three classes of nutrients supply the body with energy?
2. Define the term **metabolism**. How is metabolism related to the nutrients in food?
3. What roles do the following nutrients play in the body?
a. carbohydrates b. fats c. proteins
4. What is **cholesterol**? How does diet affect cholesterol levels in the blood?

Critical Thinking

5. **Predicting** Name some circumstances during which you might use your body's stores of glycogen.

Health at School

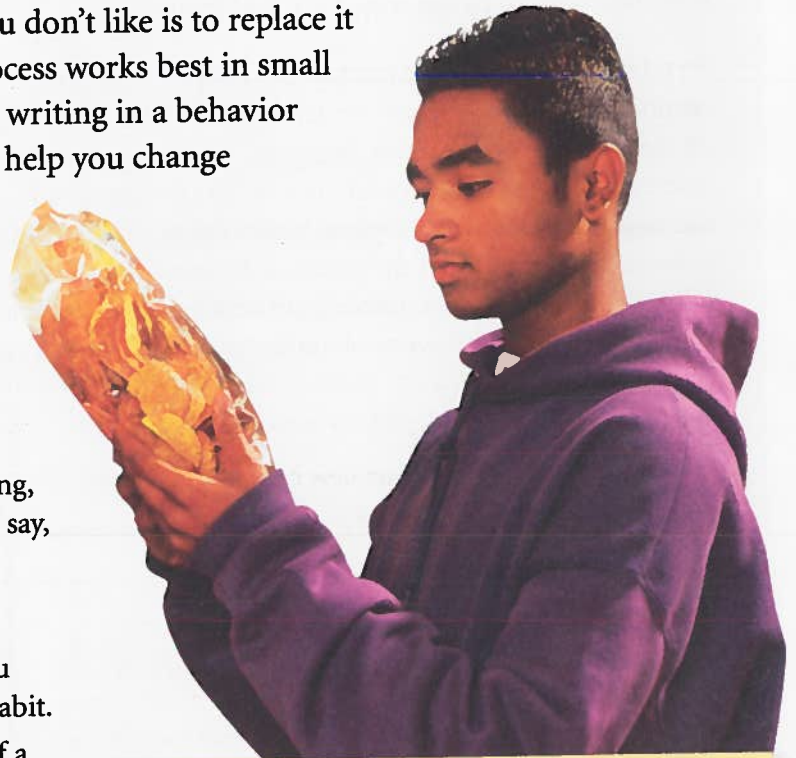
School Lunches Evaluate your school's lunch menu over a three-day period. To do this, list each lunch item and the classes of nutrients it provides. Then, write a paragraph about the influence of school lunches on health. **WRITING**

6. **Comparing and Contrasting** How do saturated fats differ from unsaturated fats? Name two sources of each type of fat.
7. **Calculating** Suppose that you ate 2,500 calories in a day. Of those calories, 1,200 calories were from carbohydrates, 675 from fats, and the rest from protein. What percentage of your total day's calories came from carbohydrates? From fats? From protein? **MATH**

Breaking a Bad Habit

Sam has developed a poor nutritional habit—snacking on high-fat foods, such as potato chips. Although he wants to cut down on the amount of fatty foods he eats each day, he thinks that he doesn't have the willpower to do it.

The key to changing a habit you don't like is to replace it with a new, positive habit. The process works best in small steps and by putting everything in writing in a behavior contract. The steps given here will help you change almost any habit.



1 Define the habit you want to change.

Describe your habit in a specific way. For example, instead of saying, "I don't eat very well," you might say, "I eat too many potato chips."

2 Set your goal.

A goal describes the behavior you would like to substitute for the habit.

- ▶ Your goal should be specific. If a goal is too broad, break it into sub-goals.
- ▶ The goal should emphasize what you will do, not what you won't do—"For snacks, I will choose foods low in fat, such as fruits and low-fat cheeses."
- ▶ Set a realistic deadline.
- ▶ Write a behavior contract like the one shown, and fill in your goal.

Behavior Contract

Habit: eating too many chips

I Sam Brown plan to substitute fruit or low-fat cheese by May 4th.

I will reach this goal by doing the following target behavior: substituting fruit/cheese once a day at first and gradually increasing to three times a day

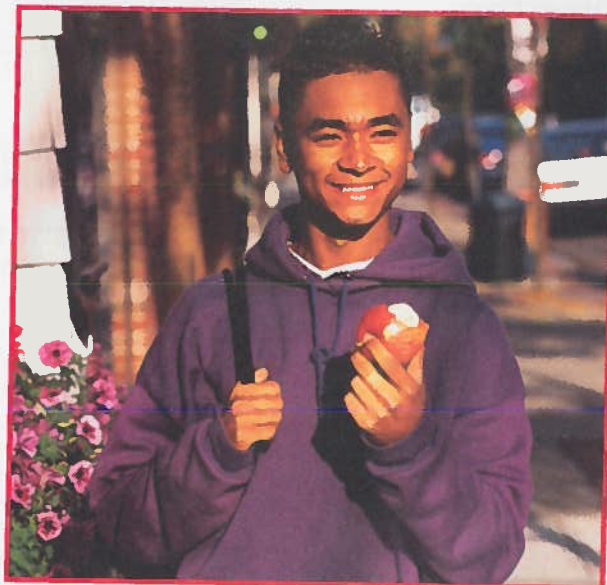
To create a supportive change environment, I will get help from the following role models: Mom and Loretta, reward myself by going to the movies with friends after successful weeks along the way, and by buying myself a new baseball glove when I reach my goal.

Signed Sam Brown Date March 6th

3 Design an action plan.

- ▶ Monitor your habit. Spend a week carefully observing and recording your habit. Use a chart like the one shown. This will help you understand what triggers and reinforces the habit.

Habit Record			
Beforehand		Behavior	Afterward
Scene	Feelings	Details	Results
Monday lunch at school	tired and bored	1 oz. bag of potato chips	less energetic



- ▶ Write your plan. Describe in detail the day-to-day changes you will make to reach your goal. Your plan should be a gradual, step-by-step process.
- ▶ Keep a log. Log your new behavior daily, including any setbacks.

Behavior Log							
Action Plan	M	T	W	Th	F	Sa	Su
	← substitute fruit or cheese for chips →						
Behavior	✓	ate potato chips	✓	ate corn chips	✓	✓	✓

4 Build a supportive environment.

- ▶ Reward yourself for accomplishments along the way. Ask family and friends to keep an eye on your progress.
- ▶ Keep a list handy of the benefits of your new behavior.
- ▶ Structure your surroundings to support your efforts. If you are trying to break a potato-chip habit, try not to keep any potato chips in your house.



Practice the Skill

1. List three habits you would like to break.
2. Of the three habits, choose the one you would most like to change. Clearly define what the habit is. Set a specific goal for eliminating the habit. Write the goal on a behavior contract like the one shown.
3. Monitor your habit for one week. Every time you exhibit the habit, record where and when it occurred. Record your thoughts and feelings before and after. Can you detect any patterns in your behavior?
4. Use your behavior patterns to devise a detailed plan for breaking the habit. Record the plan on your contract. Also, fill in ways you can build a supportive environment.
5. Log your behavior for three weeks.
6. After three weeks, evaluate your performance. What made it hard for you to stick to the plan? What aspects of your plan worked for you? **WRITING**

Section 2

Vitamins, Minerals, and Water

Objectives

- ▶ **Identify** the two main classes of vitamins.
- ▶ **List** seven minerals your body needs in significant amounts.
- ▶ **Explain** why water is so important to your body.

Vocabulary

- vitamin
- antioxidant
- mineral
- anemia
- homeostasis
- electrolyte
- dehydration

Warm-Up

Myth As part of a healthy diet, people need to take dietary supplements.

Fact A diet that contains a variety of healthful foods usually supplies all the vitamins and minerals that your body needs.

WRITING Where do you think most teens get their information about nutrition? How factual do you think their information is?



Vitamins

You're probably aware that vitamins are important for your body and health, but where do they come from? What do they do? And how many different kinds do you need?

One of the first discoveries of the importance of vitamins came in the 1700s. Sailors on long voyages survived on hard, dry biscuits, salted meat, and not much else. Because of their limited diet, many sailors developed a serious disease called scurvy. People with scurvy suffer from bleeding gums, stiff joints, and sores that do not heal.

A Scottish doctor, James Lind, discovered that sailors who were fed citrus fruits recovered from scurvy. Today, health scientists know that scurvy is caused by a lack of vitamin C, which is found in abundance in citrus fruits. After Lind made his discovery, sailors were provided with oranges, lemons, and limes. The word *limey*, a British slang term for sailor, comes from the limes that sailors ate to ward off scurvy.



What Are Vitamins? Nutrients that are made by living things, are required only in small amounts, and that assist many chemical reactions in the body are **vitamins**. Unlike carbohydrates, fats, and proteins, vitamins do not directly provide you with energy or the raw materials of which your cells are made. Instead, vitamins help the body with various processes, including the use of other nutrients. Vitamins also play roles in various chemical reactions in the body. For example, vitamin K helps your blood clot when you get a cut or a scrape.

Your body is able to make some vitamins. For example, your skin manufactures vitamin D when it is exposed to sunlight. However, most vitamins must be supplied in the food you eat. **There are two classes of vitamins: fat-soluble vitamins, which dissolve in fatty materials, and water-soluble vitamins, which dissolve in water.**

Fat-Soluble Vitamins Fat-soluble vitamins—vitamins A, D, E, and K—occur in vegetable oils, liver, eggs, and certain vegetables. Figure 7 outlines the food sources and functions of each fat-soluble vitamin.

Fat-soluble vitamins can be stored by the body. The absorption of fat-soluble vitamins by the digestive system is enhanced by dietary fat. Some indigestible fat substitutes that are used in low-fat or low-calorie products can prevent absorption of these vitamins. To prevent this from happening, extra vitamins, particularly vitamins A and D, are often added to foods prepared with fat substitutes.

**Connect to
YOUR LIFE**

Name three foods you eat regularly that supply vitamin A.

Go Online
HEALTH LINKS.
For: Updates on nutrients
Visit: www.SciLinks.org/health
Web Code: ctn-3082

FIGURE 7 Fat-soluble vitamins are found in many dietary sources and have important functions.

Fat-Soluble Vitamins



Vitamin Good Sources

Main Functions

A Liver; eggs; cheese; milk; yellow, orange, and dark green vegetables and fruit

Maintains healthy skin, bones, teeth, and hair; aids vision in dim light

D Milk; eggs; liver; exposure of skin to sunlight

Maintains bones and teeth; helps in the use of calcium and phosphorus

E Margarine; vegetable oils; wheat germ; whole grains; legumes; green, leafy vegetables

Aids in maintenance of red blood cells, vitamin A, and fats

K Green, leafy vegetables; potatoes; liver; made by intestinal bacteria

Aids in blood clotting

Water-Soluble Vitamins Water-soluble vitamins—including vitamin C and all of the B vitamins—are found in fruits, vegetables, and other sources. Unlike the fat-soluble vitamins, water-soluble vitamins cannot be stored by the body. Therefore, it is important to eat foods that supply them every day. Figure 8 outlines the food sources and functions of the water-soluble vitamins.

Water-Soluble Vitamins

Vitamin	Good Sources	Main Functions
B1 (Thiamin)	Pork products; liver; whole-grain foods; legumes	Aids in carbohydrate use and nervous system function
B2 (Riboflavin)	Milk; eggs; meat; whole grains; dark green vegetables	Aids in metabolism of carbohydrates, proteins, and fats
B3 (Niacin)	Poultry; meat; fish; whole grains; nuts	Aids in metabolism
B6 (Pyridoxine)	Meat; poultry; fish; whole-grain foods; green vegetables	Aids in metabolism of carbohydrates, proteins, and fats
B12 (Cobalamin)	Meat; fish; poultry; eggs; milk; cheese	Maintains healthy nervous system and red blood cells
Pantothenic acid	Organ meats; poultry; fish; eggs; grains	Aids in metabolism
Folate (Folic acid)	Green, leafy vegetables; legumes	Aids in formation of red blood cells and protein
Biotin	Organ meats; poultry; fish; eggs; peas; bananas; melons	Aids in metabolism
C (Ascorbic acid)	Citrus fruits; green vegetables; melons; potatoes; tomatoes	Aids in bone, teeth, and skin formation; resistance to infection; iron uptake



FIGURE 8 Water-soluble vitamins are found in many food sources. **Reading Tables** Which vitamins aid in metabolism?

Antioxidants Vitamins called **antioxidants** help protect healthy cells from the damage caused by the normal aging process as well as from certain types of cancer. Vitamins C and E are two of the most powerful antioxidants. Sources of vitamin C include citrus fruits, strawberries, broccoli, tomatoes, and potatoes. Sources of vitamin E include vegetable oils, whole grains, seeds, nuts, and peanut butter.

Minerals

Your body requires only small amounts of **minerals**, which are nutrients that occur naturally in rocks and soil. Plants absorb minerals from rocks and soil through their roots. Animals obtain these nutrients by either eating the plants or eating animals that have eaten the plants.

Twenty-four different minerals have been shown to be essential for good health. **You need seven minerals—calcium, sodium, potassium, magnesium, phosphorus, chlorine, and sulfur—in significant amounts.** You need only trace amounts of others, such as iron, fluorine, iodine, copper, and zinc. Minerals perform a wide variety of functions in the body.

Calcium Some minerals are of special nutritional concern. For example, many people's diets do not include enough calcium. Calcium is important in blood clotting and the functioning of your nervous system. It is an essential ingredient in the formation and maintenance of bones and teeth. Milk and other dairy products are good sources of calcium, but many people cannot digest dairy products. Beet greens, collard greens, broccoli, and tofu are also good sources of calcium.

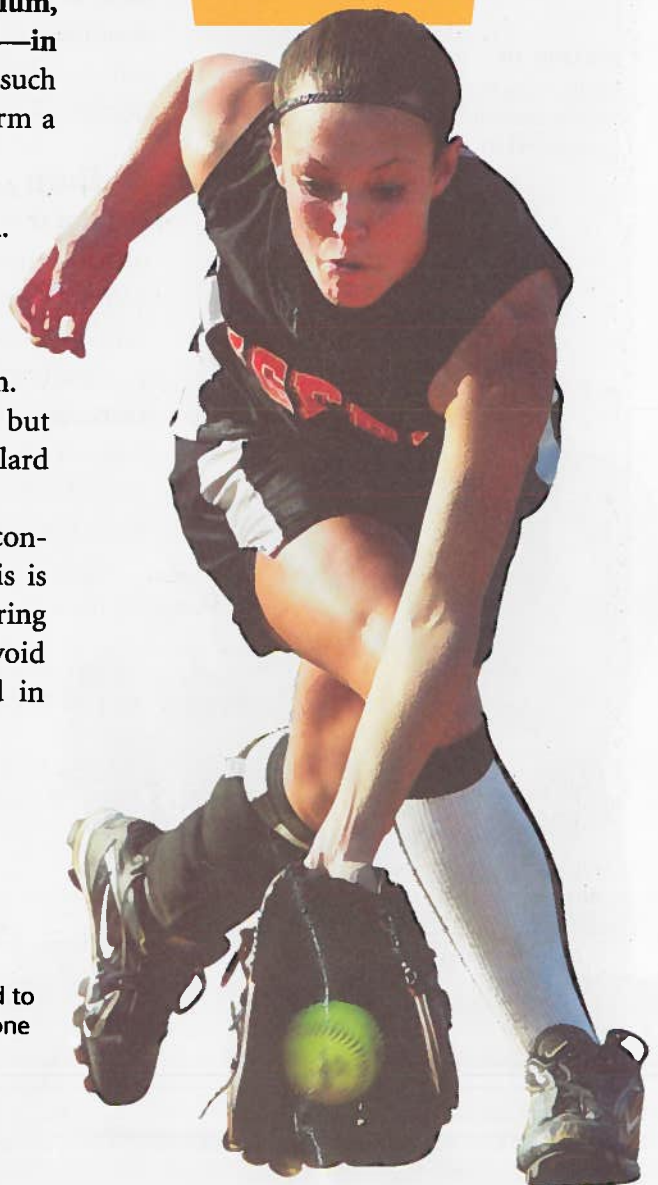
A lack of calcium can sometimes lead to osteoporosis, a condition in which the bones gradually weaken. Osteoporosis is usually a disease of older people, but your calcium intake during adolescence can help you build stronger bones now to avoid osteoporosis later in life. Osteoporosis will be discussed in Chapter 11.

Connect to YOUR LIFE

What are you doing now to prevent osteoporosis in the future?

FIGURE 9 Calcium is essential for building the strong bones you need to play sports now and to maintain bone strength as you age.

85% of teenage girls do not get enough calcium in their diets.



Potassium Potassium and sodium work together to maintain water balance in the body. In addition, people who consume enough potassium each day generally have lower blood pressure than people who do not. The problem is that most Americans do not consume enough potassium. Foods that are rich in potassium include baked potatoes, spinach, bananas, dried fruits, oranges, soybeans, and tomato products.

Iron Iron is necessary for healthy red blood cells. These cells have an iron-containing substance called hemoglobin, which carries oxygen from your lungs to all parts of your body. Adolescent girls and adult women need extra iron, because they lose iron during menstruation. Both adolescent girls and boys also need iron to build muscle mass.

There are many good sources of iron. During one day, for example, you might fulfill your iron requirements by eating an iron-fortified breakfast cereal, a salad containing garbanzo beans, a serving of cooked spinach, several dried apricots, and a serving of lean beef. If a person's diet does not include enough iron, he or she may develop **anemia** (uh NEE me uh), a condition in which the red blood cells do not contain enough hemoglobin. People suffering from anemia are often weak and tired, and they may become sick easily.

Sodium In contrast to calcium, most people consume far more sodium than they need. Table salt, or sodium chloride, is a major source of this mineral. So are some processed, or manufactured, foods, such as canned soups and frozen pizza. Salty snack foods, including chips and salted nuts, are also high in sodium.

Sodium is important in several body processes, including the functioning of the heart and water balance. However, too much sodium can cause a problem with blood pressure. People who have high blood pressure should reduce their salt intake because an excess of sodium can raise their blood pressure levels.

**Connect to
YOUR LIFE**

Find out the sodium content of a snack that you ate today.

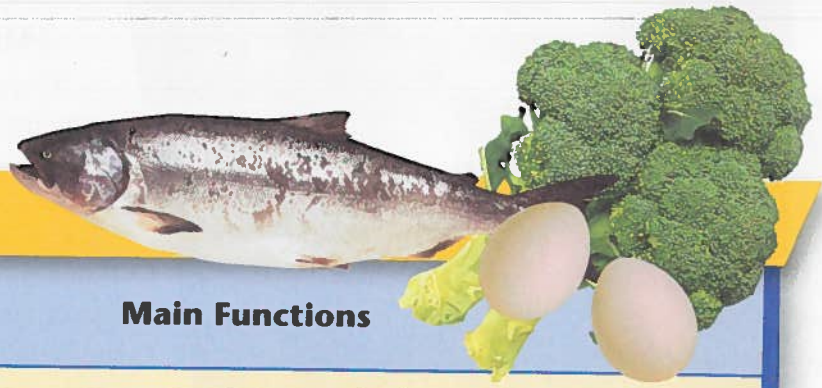
**To Limit Sodium
in Snacks**

- Focus on fresh fruits and vegetables.
- Eat unsalted pretzels and popcorn.
- Choose low-fat yogurt or fruit smoothies.

FIGURE 10 You can limit sodium by making your own snacks instead of eating processed foods or fast foods.



FIGURE 11 Minerals are found in a variety of foods and perform many essential functions in the body. **Reading Tables** Which minerals aid in the function of the nervous system?



Minerals

Mineral	Good Sources	Main Functions
Calcium	Milk and milk products; dark green, leafy vegetables; tofu; legumes	Helps build and maintain bones and teeth; nerve and muscle function; blood clotting
Phosphorus	Meat; eggs; poultry; fish; legumes; milk and milk products	Helps build and maintain bones and teeth; energy metabolism
Magnesium	Leafy green vegetables; legumes; nuts; whole-grain food	Helps build bones and protein; energy metabolism; muscle contraction
Sodium	Table salt; processed food; soy sauce	Helps maintain water balance; nerve function
Chlorine	Table salt; soy sauce; processed foods	Helps maintain water balance; digestion
Potassium	Vegetables, fruits, meat, poultry, fish	Helps maintain water balance and make protein; functioning of heart and nervous system
Sulfur	Milk and milk products; meat; poultry; fish; legumes; nuts	Forms part of some amino acids and B vitamins
Iodine	Seafood; iodized salt	Helps in metabolism as part of thyroid hormone
Selenium	Seafoods; meats; organ meat	Helps break down harmful substances
Iron	Red meats; seafood; legumes; green, leafy vegetables; fortified cereals; dried fruits	Part of red blood cells; helps in energy metabolism
Zinc	Meats; poultry; seafood; milk; whole-grain foods	Part of many substances that help carry out body processes
Fluorine	Fish; fluoridated water	Helps form strong teeth and bones



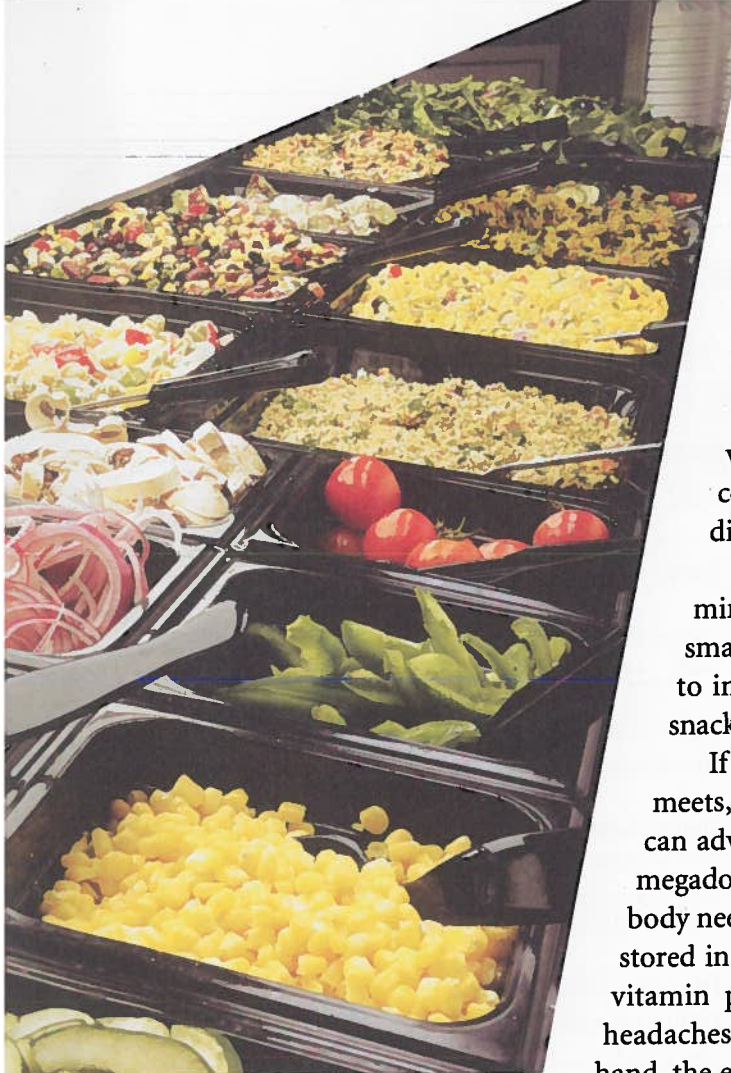


FIGURE 12 Salad bars loaded with fresh vegetables are a great way to get all the vitamins and minerals you need without taking supplements.

Vitamin and Mineral Supplements

If a person does not get enough of a specific nutrient, a nutrient deficiency can occur. People who eat a wide variety of healthy foods, however, seldom suffer from nutrient deficiencies. Vitamin and mineral supplements, therefore, are not usually necessary if your diet is nutritious and well-balanced. In fact, an excess, or overdose, of vitamins or minerals may damage your health. Some common symptoms of overdose include nausea, vomiting, diarrhea, and rash.

If you want to boost your intake of a particular vitamin or mineral, first consider how to meet your needs by making small adjustments to your daily diet. For example, if you need to increase your calcium intake, consider eating yogurt as a snack, or drinking milk with dinner instead of a soft drink.

If you do take a vitamin or mineral supplement, take one that meets, but does not exceed, your needs. A health care provider can advise you about how much is the right amount. Beware of megadosing, or taking in larger amounts of a nutrient than your body needs. For fat-soluble vitamins, the excess amounts would be stored in body fat and can cause vitamin poisoning. Symptoms of vitamin poisoning include nausea, vomiting, joint pain, severe headaches, and hair loss. For water-soluble vitamins, on the other hand, the excess amount would be excreted by your body. Therefore, taking megadoses of these vitamins may not be a wise investment.

Water

About 65 percent of your body weight is water. You do not get energy from this nutrient directly. Nevertheless, water is essential for all life processes, including the production of energy. **Nearly all of the body's chemical reactions, including those that produce energy and build new tissues, take place in a water solution.** Water is the primary component of blood and tissue. It carries dissolved waste products out of the body and helps digest food.

Water and Homeostasis **Homeostasis** (ho mee oh STAY sis) is the process of maintaining a steady state inside your body. What roles does water play in homeostasis?

- ▶ When you become overheated, your body excretes perspiration, which cools your body. Thus, water regulates body temperature.
- ▶ Water contains dissolved substances called **electrolytes** that regulate many processes in your cells. For example, your nervous and muscular systems depend on electrolytes, such as sodium and potassium.

Preventing Dehydration Very heavy perspiring or severe diarrhea can result in **dehydration** (dee hy DRAY shun), a serious reduction in the body's water content. When the body becomes dehydrated, it loses important electrolytes along with the water. Symptoms of dehydration can include weakness, rapid breathing, and a weak heartbeat. Whenever your body loses a lot of water, you need to be careful to increase your intake of water and electrolytes to prevent dehydration.

How Much Water? Every day, you need at least ten 8-ounce cups of water if you are a female 14 to 18 years old. Males in the same age group need 14 cups of water per day. This water can be in the form of foods that contain a lot of water, such as fruits and vegetables, or juices. Drinks that contain caffeine—coffee, tea, and some sodas—may not be good sources of water for your body. This is because caffeine increases the amount of water your body excretes. It is probably better to obtain water from foods that do not contain caffeine.

Water Versus Sports Drinks Experts in the field of sports medicine recommend that you drink about 2 cups of fluid 2 hours before exercise. During exercise, take a drink about every 15 minutes. Are sports drinks a better choice than water? A sports drink is not necessary if you exercise for 60 minutes or less. If you exercise longer, a sports drink that contains carbohydrates may be beneficial. However, sports drinks with electrolytes are not necessary unless you exercise for 5 hours or more.

You can lose **4 cups of water** during every **hour of heavy exercise.**

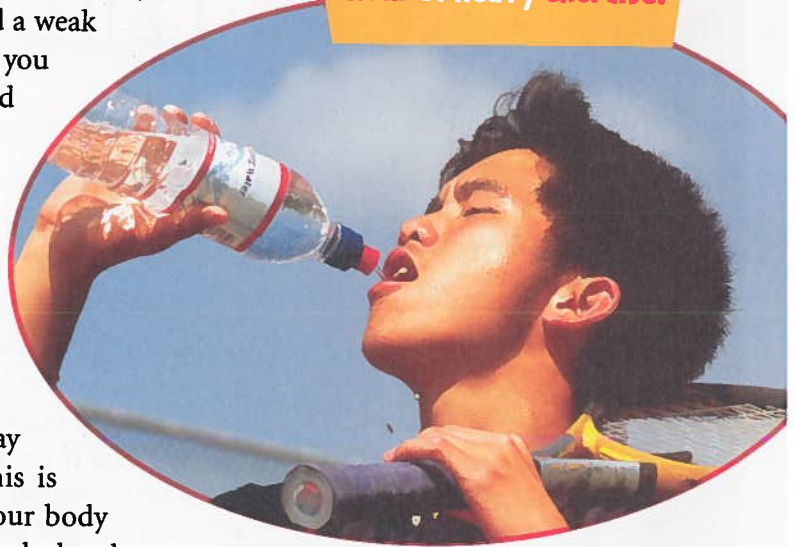


FIGURE 13 It is important to drink plenty of water every day.

Section 2 Review

Key Ideas and Vocabulary

1. What are **vitamins**? How do they differ from **minerals**?
2. What are the two classes of vitamins? Which vitamins fall into each class?
3. Which seven minerals are needed by the body in significant amounts?
4. What roles does water play in the body?
5. Define **homeostasis**.

Critical Thinking

6. **Classifying** What vitamins are supplied by green, leafy vegetables? By citrus fruits?

Health and Community

Fluoride and the Water Supply Find out whether your community adds fluoride to its water supply. If possible, talk to a town official, dentist, or other knowledgeable adult in your community. Write a paragraph summarizing your findings. **WRITING**

7. **Applying Concepts** What are some ways that people with high blood pressure can reduce their sodium intake?
8. **Relating Cause and Effect** Explain how feelings of thirst can help a person maintain homeostasis on a hot day.

Section 3

Objectives

- **Explain** how the *Dietary Guidelines for Americans* can help you plan a healthful diet.
- **Summarize** the recommendations in the MyPyramid plan.

Vocabulary

- *Dietary Guidelines for Americans*
- nutrient-dense food
- MyPyramid plan

Guidelines for Healthful Eating

Warm-Up

Dear Advice Line,

My family is really busy, and we don't have a lot of time to cook. It seems like we eat an awful lot of take-out, packaged meals, and frozen dinners. I wonder if we are getting too much sodium, sugar, and fat. I also don't think we get enough fresh vegetables and whole grains. What can we do?

WRITING Write a response to this teen to help solve the problem.



The Dietary Guidelines

How can you make sure you get enough nutrients while consuming the number of calories that is right for you? The United States Department of Agriculture (USDA) and the U.S. Department of Health and Human services have published the *Dietary Guidelines for Americans* to help you figure out the answer to this question. The ***Dietary Guidelines for Americans*** is a document developed by nutrition experts to promote health and help people reduce their risk for heart disease, cancer, and diabetes through diet and physical activity. **The *Dietary Guidelines* provide information on how to make smart food choices, balance food intake with physical activity, get the most nutrition out of the calories you consume, and handle food safely.**

Make Smart Food Choices To obtain all the nutrients you need, choose a wide variety of foods. Include plenty of whole-grain foods, vegetables, and fruits. These foods are rich in complex carbohydrates and fiber. Milk and milk products are an important part of a healthful diet, especially for adolescents who are still growing. Milk products provide the calcium needed to prevent bone loss. Choose low-fat or nonfat milk and milk products to keep cholesterol down and thus reduce your risk of heart disease.



Hungry for a snack? Try these nutrient-dense foods:

- Fresh fruit
- Low-fat yogurt
- Nuts and raisins
- Raw veggies

FIGURE 14 If you're hungry for a snack, it is still possible to make healthy food choices.

Balance Food and Physical Activity Regular physical activity is important for your overall health and fitness. Maintaining a healthy weight is a matter of balancing the calories you take in with how active you are. Health problems can develop if you are overweight or underweight. The *Dietary Guidelines* recommend that teenagers be active for 60 minutes most days.

Get the Most Nutrition Out of Your Calories Choose foods that are nutrient-dense. **Nutrient-dense foods** contain lots of vitamins and minerals relative to the number of calories. At the same time, nutrient-dense foods are low in saturated fat, trans fat, added sugar, and salt. Lean meats, fish, poultry, and legumes are nutrient-dense foods. If you are hungry for a snack, some good nutrient-dense choices are shown in Figure 14. Limit your intake of sweet snacks and soft drinks. These foods contain lots of sugar but few other useful nutrients.

Most people consume too much sodium but not enough potassium. Eating more fruits and vegetables can boost your potassium intake. To reduce your sodium intake, limit salty snacks, pickled foods, luncheon meats, and canned soups.

Handle Food Safely Part of good nutrition is using safe procedures to prepare, handle, and store the food you eat. Food-borne illnesses can be prevented if you follow a few simple steps.

- ▶ Keep your hands and surfaces that come into contact with food clean.
- ▶ Separate raw and cooked foods while preparing or storing them.
- ▶ Cook meat, poultry, and fish to safe internal temperatures.
- ▶ If food is perishable, chill it right away.
- ▶ Thaw foods in the refrigerator, not on the counter.

Connect to YOUR LIFE What kinds of things could you do to be more active each day?

MyPyramid Plan

FIGURE 15 The MyPyramid plan emphasizes a balance between nutrient intake and physical activity that can be tailored to your nutritional needs.

Interpreting Diagrams Which group should you consume in the smallest amount?

Physical Activity

As a teenager, you should try to be active 60 minutes most days.



Grains

Make half the grains you eat whole grains. Look for the word *whole* before the name of the grain. Good choices are

- breads: whole-wheat or rye, pita, rolls, tortillas
- pasta: macaroni, spaghetti, rice noodles
- other grains: rice, crackers, couscous, bulgur, breakfast cereals



Vegetables

Vary your vegetables. Include in your diet

- dark green vegetables: spinach, kale, mustard or collard greens
- orange vegetables: carrots, squash, sweet potatoes
- dry beans and peas
- starchy vegetables: potatoes, corn, lima beans



Fruits

- Eat a variety of fruits, such as apples, bananas, mangoes, oranges, papayas, grapes, and pineapples.
- Limit your fruit juices.



Oils

- Consume most of your fats from fish, nuts, and vegetable oils.
- Limit solid fats, such as butter, stick margarine, shortening, and lard.



Milk

- Get plenty of calcium-rich foods.
- Choose low-fat or fat-free when you consume milk, yogurt, or cheese.



Meat and Beans

Choose low-fat or lean meats and poultry. Vary your protein by choosing

- fish, nuts, seeds
- beans or peas, such as kidney, garbanzo, fava, navy, lentils



The “MyPyramid Plan”

You now know that you need to eat a variety of foods. But how should you choose which foods to eat? To help people plan their meals and snacks, the USDA has designed a set of diagrams called “MyPyramid Plans.” Figure 15 shows the basic parts of the MyPyramid diagram.

The **MyPyramid plan** groups foods according to types and indicates how much of each type should be eaten daily for a healthy diet. **Unlike past plans, the MyPyramid plans differ with a person’s age, sex, and activity level. The pyramid also includes physical activity as an important part of staying healthy.**

The Colored Bands Notice that the pyramid is divided into six colored bands. Each band represents one of five food groups, plus oils. The width of each band indicates the proportion of your diet that should come from that group. For example, by comparing the width of the grains band to that of the meat and beans band, you learn that your diet should include more grains than meat and beans.

The Stair Steps The stair steps in the pyramid represent physical activity. Exercise is important for balancing the calories you consume with the calories you use. The chart below shows how the recommended servings from each group vary for teens depending on their activity level.

Creating Your Own MyPyramid Plan You can create your own personalized MyPyramid plan by visiting the USDA’s Web site on the Internet. It contains details about the foods in each group, suggestions for planning menus, and calorie counts based on activity levels.

Connect to YOUR LIFE

How could you include more whole grains in your diet?

Go Online

PHSchool.com

For: More on MyPyramid plans

Visit: PHSchool.com

Web Code: ctd-3083

Recommended Servings Per Day for 16-Year-Olds

Activity Level	Grains	Vegetables	Fruits	Milk	Meat and Beans
Sedentary					
Male	8 ounces	3 cups	2 cups	3 cups	6 $\frac{1}{2}$ ounces
Female	6 ounces	2 $\frac{1}{2}$ cups	1 $\frac{1}{2}$ cups	3 cups	5 ounces
Moderate					
Male	10 ounces	3 $\frac{1}{2}$ cups	2 $\frac{1}{2}$ cups	3 cups	7 ounces
Female	6 ounces	2 $\frac{1}{2}$ cups	2 cups	3 cups	5 $\frac{1}{2}$ ounces
Active					
Male	10 ounces	4 cups	2 $\frac{1}{2}$ cups	3 cups	7 ounces
Female	8 ounces	3 cups	2 cups	3 cups	6 $\frac{1}{2}$ ounces



FIGURE 16 Eating a healthy breakfast will help you to resist unhealthy foods later in the day.

Using the Food Guidelines

Planning a nutritious diet does not mean you must forego all the foods you love. You can still have a dab of margarine on your toast and your favorite chocolate bar as a rare treat. Here are some tips for following the *Dietary Guidelines* and the MyPyramid plan.

Meals You don't need to consume every food group at every meal. But you should try to vary your diet at each meal.

- ▶ **Breakfast** Don't skip breakfast. Choose whole-grain cereals, low-fat milk or yogurt, and fruit. Limit pastries, eggs, and bacon.
- ▶ **Lunch** Focus on whole grains, fruits, and vegetables. Use mustard or ketchup instead of mayonnaise. Try low-fat cheese on pizza.
- ▶ **Dinner** Trim excess fat from meats. Instead of fried meats or fish, try them grilled. Choose low-fat dressings, and limit butter.

Snacks When snacking, choose foods with high nutrient density.

- ▶ Try satisfying your sweet tooth with fruit instead of cookies.
- ▶ Make a whole-wheat bagel, not a donut, your after-school treat.
- ▶ When you go to the movies, choose unbuttered popcorn.

Eating Out When you eat at fast-food restaurants, follow these tips.

- ▶ Substitute low-fat milk, water, or fruit juice for shakes and soft drinks.
- ▶ Select the salad bar in place of fries or onion rings. But go easy on dressings, cheese, bacon bits, and croutons.
- ▶ Choose a grilled chicken sandwich instead of a burger.

Section 3 Review

Key Ideas and Vocabulary

1. What are the four main recommendations contained in the *Dietary Guidelines for Americans*?
2. What does it mean to say that food is **nutrient-dense**? Give an example of a nutrient-dense food.
3. What is indicated by the different bands in the MyPyramid plan? What do the stair steps mean?

Critical Thinking

4. **Evaluating** Choose the row in the chart on page 213 that best applies to you. Evaluate whether your diet is in line with the recommended number of servings from each food group.

Health at Home

Improving Your Diet Keep track of how many fats and sweets you eat over the next three days. Then, come up with a plan to substitute nutrient-dense foods for the fats and sweets you eat. Monitor your diet for a week and evaluate how well you stuck to your plan. **WRITING**

5. **Classifying** In the MyPyramid plan, the milk product butter is placed with oils rather than with the milk group. Why do you think it is classified this way?

Food for Thought List three ways the video helped you become a smarter consumer.

Section 1 Carbohydrates, Fats, and Proteins

Key Ideas

- ✓ Carbohydrates, fats, and proteins can all be used by the body as sources of energy.
- ✓ When your body uses the nutrients in foods, a series of chemical reactions occurs inside your cells. As a result, energy is released.
- ✓ Carbohydrates supply energy for your body's functions.
- ✓ Fats supply your body with energy, form your cells, maintain body temperature, and protect your nerves.

- ✓ The most important function of proteins is their role in the growth and repair of your body's tissues.

Vocabulary

- nutrient (192)
- metabolism (193)
- calorie (193)
- carbohydrate (194)
- fiber (195)
- fat (196)
- unsaturated fat (196)
- saturated fat (196)
- cholesterol (197)
- trans fat (197)
- protein (198)
- amino acid (198)



Section 2 Vitamins, Minerals, and Water

Key Ideas

- ✓ There are two classes of vitamins: fat-soluble vitamins, which dissolve in fatty materials, and water-soluble vitamins, which dissolve in water.
- ✓ You need seven minerals—calcium, sodium, potassium, magnesium, phosphorus, chlorine, and sulfur—in significant amounts.

- ✓ Nearly all of the body's chemical reactions, including those that produce energy and build new tissues, take place in a water solution.

Vocabulary

- vitamin (203)
- antioxidant (205)
- mineral (205)
- anemia (206)
- homeostasis (208)
- electrolyte (208)
- dehydration (209)

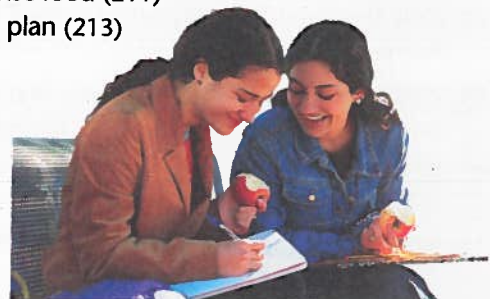
Section 3 Guidelines for Healthful Eating

Key Ideas

- ✓ The *Dietary Guidelines* provide information on how to make smart food choices, balance food intake with physical activity, get the most nutrition out of the calories you consume, and handle food safely.
- ✓ Unlike past plans, the MyPyramid plans differ with a person's age, sex, and activity level. The pyramid also includes physical activity as an important part of staying healthy.

Vocabulary

- *Dietary Guidelines for Americans* (210)
- nutrient-dense food (211)
- MyPyramid plan (213)



Reviewing Key Ideas

Section 1

- Complex carbohydrates are
 - composed of sugars linked together.
 - found in grain products.
 - good sources of energy.
 - all of the above.
- Which of the following foods is high in protein?
 - an apple
 - lettuce
 - candy
 - chicken
- What is the role of glucose in the body?
- Why is fiber necessary for the proper functioning of the digestive system?
- How can you limit your intake of fats and cholesterol?
- What are amino acids? Why are some of them called "essential"?
- Critical Thinking** In many cultures, people get very little protein from animal sources. How might these people obtain the protein they need?

Section 2

- Which of these nutrients is sometimes associated with high blood pressure?
 - sodium
 - calcium
 - iron
 - carbohydrate
- Loss of water through heavy perspiring can result in
 - homeostasis.
 - dehydration.
 - anemia.
 - metabolism.
- Explain how antioxidants are important to your health. Which foods are good sources of antioxidants?
- Which mineral can help build strong bones and teeth? Name one nondairy source of this mineral.
- Give three reasons why water is such an important nutrient.
- Critical Thinking** If a person's diet does not contain enough iron, his or her tissues may not get all the oxygen they need. Explain why this is so.
- Critical Thinking** How can your diet today affect your future health? Explain.

Section 3

- Which of the following is *not* used to determine the amounts you should consume from each food group in the MyPyramid plan?
 - age
 - sex
 - weight
 - activity level
- The *Dietary Guidelines* recommend that you make smart food choices. Explain what this recommendation means.
- Which band in the MyPyramid plan is the widest? Explain what this means.
- Critical Thinking** Several friends are planning a week-long backpacking trip in the mountains. They must carry all of their food in backpacks, so amounts must be limited. What kind of foods could they take to meet their nutritional needs?



Building Health Skills

- Analyzing Influences** Many American teenagers have diets high in fats. Write a letter to the editor of your local newspaper explaining why. Suggest steps that can be taken to improve teen diets. **WRITING**
- Accessing Information** Laurie dislikes dairy products. Research and plan three meals that include calcium-rich foods.
- Setting Goals** Write down everything you eat for a week. Classify the foods into the groups in the MyPyramid plan. Then, come up with a plan to align your diet with the amounts recommended for your age, sex, and activity level. See how you do for the next week.

Health and Community

Food Pantry Visit Volunteer at a local food pantry or soup kitchen for a day. You may be involved in preparing food, chatting with patrons, or cleaning up afterward. What did you find out that you didn't know before? Write an editorial describing your experience. **WRITING**

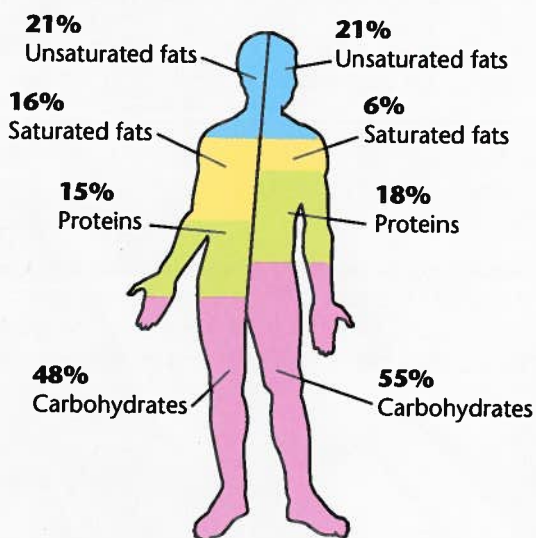


Standardized Test Prep

Math Practice

The graphic below compares the typical American diet to the diet recommended by nutritionists. Use the graphic to answer Questions 22–24.

Typical Diet Recommended Diet



22. Which nutrient do Americans typically eat more than double the recommended amount?
- A unsaturated fats
 - B proteins
 - C carbohydrates
 - D saturated fats
23. In the typical diet, if a person consumed a total of 2,000 calories in a day, how many of those calories would be from fats?
- F 420 calories
 - G 620 calories
 - H 740 calories
 - J 940 calories
24. To bring the typical diet more in line with the recommended diet, people should
- A cut their intake of unsaturated fats by one half.
 - B cut their intake of saturated fats by two thirds.
 - C cut their protein intake in half.
 - D double their carbohydrate intake.

Reading and Writing Practice

Read the passage. Then answer Questions 25–28.

Trans fats are produced in a laboratory by heating vegetable oil and bubbling hydrogen through it. How then do animal products, such as beef or milk, contain small amounts of trans fats? In cows, the digestive process produces hydrogen. The hydrogen then mixes with unsaturated fats from the cow's diet to produce a small amount of trans fats. However, foods such as donuts, cookies, and other baked goods contain trans fats in much greater amounts. Thus, avoiding these processed foods is the most effective way to limit trans fats in your diet.

25. In a cow, trans fats are produced when hydrogen
- A mixes with saturated fats from the cow's diet.
 - B mixes with vegetable oil.
 - C is given off during respiration.
 - D mixes with unsaturated fats during digestion.
26. Trans fats can best be limited in the diet by
- F eating chicken instead of beef.
 - G limiting baked goods.
 - H drinking low-fat milk.
 - J eliminating milk.
27. Which of the following does *not* contain trans fats?
- A donuts
 - B a cow's diet
 - C milk
 - D low-fat yogurt

Constructed Response

28. In a paragraph, compare how trans fats are formed in the lab versus in an animal.

Test-Taking Tip

Be sure to eat a good breakfast the morning of your test. The brain works better when it has fuel.