chapter 18

Nutrients and Digestion

section ● Nutrition

What You'll Learn

- the six kinds of nutrients
- why each nutrient is important
- how your diet affects your health

Before You Read

List on the lines below five foods that you think are good for you, or are nutritious. Explain what makes them nutritious.

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Read to Learn

Study Coach

Use an Outline As you read, make an outline to summarize the information in the section. Use the main headings in the section as the main headings in the outline. Add information under each heading in the section.

Why do you eat?

Your body needs energy for every activity that it performs. You need energy to run, blink your eyes, and lift your backpack. This energy comes from the foods you eat. The foods you eat also give your body the nutrients it needs. **Nutrients** (NEW tree unts) are substances in food that provide the energy and materials cells need to develop, grow, and repair themselves.

How is the energy in food measured?

The amount of energy you need depends on your body mass, age, and how active you are. The amount of energy in food is measured in Calories. A Calorie (Cal) is the amount of heat needed to raise the temperature of 1 kg of water 1°C. The number of calories in a food depends on the kinds of nutrients the food contains.

Classes of Nutrients

Six kinds of nutrients are found in food. The six nutrients are proteins, carbohydrates, fats, vitamins, minerals, and water. Proteins, carbohydrates, vitamins, and fats are organic nutrients because they contain carbon. Minerals and water are inorganic nutrients because they do not contain carbon.

Reading Check

1. **Identify** three nutrients found in foods.

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Absorption of Nutrients Foods with carbohydrates, fats, and proteins have to be digested or broken down before the body can use them. Water, vitamins, and minerals are absorbed directly into the bloodstream.

How does the body use proteins?

Proteins replace and repair body cells and help the body grow. **Proteins** are large molecules that contain carbon, hydrogen, oxygen, nitrogen, and sometimes sulfur. A protein molecule is made up of many smaller units called **amino acids**. Different foods have different amounts of protein, as shown in the table below.

Calories and Protein in Selected Food Items

Food	Calories	Protein
Pepperoni pizza (1 slice)	280	16 g
Large taco	186	15 g
Banana split	540	10 g

What are essential amino acids?

Your body needs 20 amino acids to make the thousands of proteins that your cells use. Most of the amino acids can be made in the body's cells. Eight of the amino acids, however, cannot be made by the body. These eight are called essential amino acids. You have to get them from the food you eat. Foods that provide all eight essential amino acids are called complete proteins. Complete proteins are found in eggs, milk, cheese, and meat. Incomplete proteins are missing one or more of the essential amino acids. Vegetarians need to eat a wide variety of protein-rich vegetables, fruits, and grains to get all eight essential amino acids.

Why are carbohydrates important?

Carbohydrates (kar boh HI drayts) are the main sources of energy for your body. A carbohydrate molecule is made up of carbon, hydrogen, and oxygen atoms. Energy holds these atoms together. When carbohydrate molecules break apart in the cells, energy is released for your body to use.

What are the three types of carbohydrates?

The three types of carbohydrates are sugar, starch, and fiber. Sugars are simple carbohydrates. Table sugar is one of these sugars. Fruits, honey, and milk also contain forms of sugar. Your cells break down glucose, which is a simple sugar.

Picture This

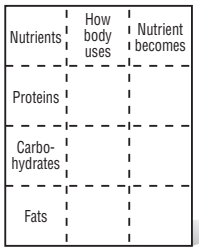
2. **Determine** Which of the food choices in the table has the most Calories?

3. **Explain** What unit is used to measure protein?

4. **Identify** Which of the food choices in the table provides the least protein?

FOLDABLES™

● **Classify** Make a folded table, as shown below, to explain how your body uses proteins, carbohydrates, and fats.



What is the difference between starch and fiber?

Starch and fiber are complex carbohydrates. Starch is found in potatoes and in foods made from grains such as pasta. Starches are made up of simple sugars strung together in long chains. Fiber is found in the cell walls of plant cells. Foods such as whole-grain breads, cereals, beans, and vegetables and fruits are good sources of fiber. You cannot digest fiber, but it is needed to keep your digestive system running smoothly.

How does the body use fats?

Fats, also called lipids, provide the body with energy and help it absorb vitamins. Fat tissue cushions the body's internal organs. A major part of every cell membrane is made up of fat. Fats release more energy than carbohydrates do. When food is being digested, fat is broken down into smaller molecules called fatty acids and glycerol (GLIH suh rawl). Fat is a good storage unit for energy. Your body takes excess energy from the foods you eat and changes it to fat that is stored for later use.

What are saturated and unsaturated fats?

There are two kinds of fats, unsaturated fats and saturated fats. Unsaturated fats are usually liquid at room temperature. Vegetable oil is an example of an unsaturated fat. Saturated fats are usually solid at room temperature. Saturated fats are found in meats, animal products, and some plants.

Eating too many saturated fats has been linked to high levels of cholesterol in the body. Cholesterol is part of the cell membrane in all of your cells. However, a diet that is high in cholesterol can cause deposits to form on the inside walls of blood vessels. The deposits can keep the blood supply from getting to organs. The deposits also can increase blood pressure and lead to heart disease and strokes.

What are vitamins?

Vitamins are nutrients that the body needs in small amounts. Vitamins help the body grow, help keep the body functioning properly, and help prevent some diseases. Most foods contain some vitamins. However, no single food has all the vitamins you need.

Think it Over

5. **Explain** why fats are an important part of a healthful diet.

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Reading Check

6. **Determine** which fat is usually liquid at room temperature and which fat is solid.

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Think it Over

7. **Describe** a major difference between the two groups of vitamins.

What is the difference between water-soluble and fat-soluble vitamins?

There are two groups of vitamins, water-soluble and fat-soluble. Water-soluble vitamins dissolve easily in water. Your body does not store these vitamins, so you need to get them every day. Fat-soluble vitamins dissolve only in fat. These vitamins are stored in the body.

You get most of your vitamins from food. However, your body makes some vitamins. For example, your body makes vitamin D when your skin is exposed to sunlight.

How do minerals affect the body?

Minerals are inorganic nutrients that take part in many chemical reactions in your body. Minerals build cells, send nerve impulses throughout your body, and carry oxygen to body cells.

Your body uses about 14 minerals. Of the 14 minerals, your body uses calcium and phosphorus in the largest amounts. Calcium and phosphorus help form and maintain bones. Some minerals, such as copper, are trace minerals. The body only needs very small amounts of trace minerals. Review the table below to learn more about some of the minerals your body uses.

Picture This

8. **Identify** Which minerals does your body use to help conduct nerve impulses?

Health Benefits of Minerals from Your Food

Mineral	Health Effect	Food Sources
Calcium	builds strong bones and teeth, helps blood clotting and muscle and nerve activity	milk, cheese, eggs, green leafy vegetables, soy
Phosphorus	builds strong bones and teeth, helps muscles contract, stores energy	cheese, meat, cereal
Potassium	balances water in cells, conducts nerve impulses, helps muscles contract	bananas, potatoes, nuts, meat, oranges
Sodium	balances fluid in tissues, conducts nerve impulses	meat, milk, cheese, salt, beets, carrots, nearly all foods
Iron	moves oxygen in hemoglobin by red blood cells	red meat, raisins, beans, spinach, eggs
Iodine (trace)	helps thyroid activity, stimulates metabolism	seafood, iodized salt

Why is water an important nutrient?

Next to oxygen, water is the most important thing your body needs for survival. You could live a few weeks without food but only a few days without water. Cells need water to carry out their work. Many other nutrients that the body needs have to be dissolved in water before they can be used.

Water Loss Water makes up about 60 percent of the weight of your body. Most of the body's water is located in body cells. Water is also found around cells and in blood. Your body loses water when you perspire and when you exhale. Your body also loses water when it gets rid of wastes. To replace the amount of water your body loses each day, you need to drink about 2 L of liquids. Drinking liquids is not the only way to get water. Many foods, such as apples and meats, are made up of a large amount of water.

Why do you get thirsty?

When your body needs to replace water that it lost, messages are sent to your brain that make you feel thirsty. Drinking water satisfies your thirst. Drinking water also helps to restore the body's homeostasis (hoh mee oh STAY sus). When your body is in homeostasis, or balance, it has the right amount of water and the right temperature. When homeostasis returns, the messages to the brain stop, and you no longer feel thirsty.

Food Groups

No natural food has all the nutrients your body needs. You need to eat a variety of foods. Nutritionists have set up food guidelines to help people choose foods that supply all the nutrients the body needs for energy and growth. The guidelines are shown below.

Dietary Guidelines for Americans 2005 from the USDA

Food Group	Recommendations
Fruits	Eat a variety of fresh, frozen, canned, or dried fruits instead of fruit juice for most fruit choices. For a 2,000-Calorie diet, eat two cups of fruit each day.
Vegetables	Eat dark green vegetables and dark leafy greens. Eat orange vegetables, such as carrots and sweet potatoes. Also eat beans, peas, and lentils.
Calcium-rich Foods	Eat three cups of low-fat or fat-free milk products every day or choose lactose-free milk products and/or calcium-fortified foods and beverages.
Grains	Eat at least three ounces of grain products daily. Look for "whole grains" in the list of ingredients. In general, at least half the grains should be whole grains and the other enriched or whole-grain products.
Proteins	Choose lean meats and poultry. Vary your protein choices—with more fish, beans, peas, nuts, and seeds.

Reading Check

9. **Define** What is homeostasis?

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Picture This

10. **Apply** Beside each food group, write the approximate number of servings you ate in each food group yesterday.

What are the five food groups?

Foods that have the same type of nutrient belong to a **food group**. There are five food groups: grains, vegetables, fruits, calcium-rich foods, and proteins. ☑

Reading Check

11. Define What is a food group?

What should you eat from each food group?

The food guidelines on the previous page show the recommendations for each food group. Eating the recommended amount for each group will give your body the nutrients it needs for good health. The size of a serving is different for different food groups.

Why should you read food labels?

The food labels, such as the one below, on all packaged foods contain nutritional facts about the foods. These facts can help you make healthful food choices. The labels can help you plan meals that include the recommended amounts of nutrients.

Picture This

12. Identify Circle the total number of Calories per serving on the label.

Nutrition Facts

Serving Size 1 Meal

Amount Per Serving

Calories 330 Calories from Fat 60

% Daily Value*

Total Fat 7g	**10%**
Saturated Fat 3.5g	**17%**
Polyunsaturated Fat 1g	
Monounsaturated Fat 2.5g	
Cholesterol 35mg	**12%**
Sodium 460mg	**19%**
Total Carbohydrate 52g	**18%**
Dietary Fiber 6g	**24%**
Sugars 17g	
Protein 15g	

Vitamin A 15% • Vitamin C 70%

Calcium 4% • Iron 10%

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After You Read

Mini Glossary

amino acid: one of the small units that make up a protein molecule

carbohydrate (kar boh HI drayt): a molecule made up of carbon, hydrogen, and oxygen atoms; nutrient that is the main source of energy for the body

fat: necessary nutrient that provides the body with energy and helps it absorb vitamins; also known as a lipid

food group: foods that have the same type of nutrient

mineral: inorganic nutrient that takes part in many chemical reactions in the body

nutrient (NEW tree unt): substances in food that provide energy and materials for cells to develop, grow, and repair themselves

protein: large molecules that contain carbon, hydrogen, oxygen, nitrogen, and sometimes sulfur; one of the six kinds of nutrients

vitamin: nutrient that is needed in small amounts to help the body grow, to regulate body functions, and to prevent some diseases

1. Review the terms and their definitions in the Mini Glossary. Write a sentence that explains the relationship between amino acids and proteins.

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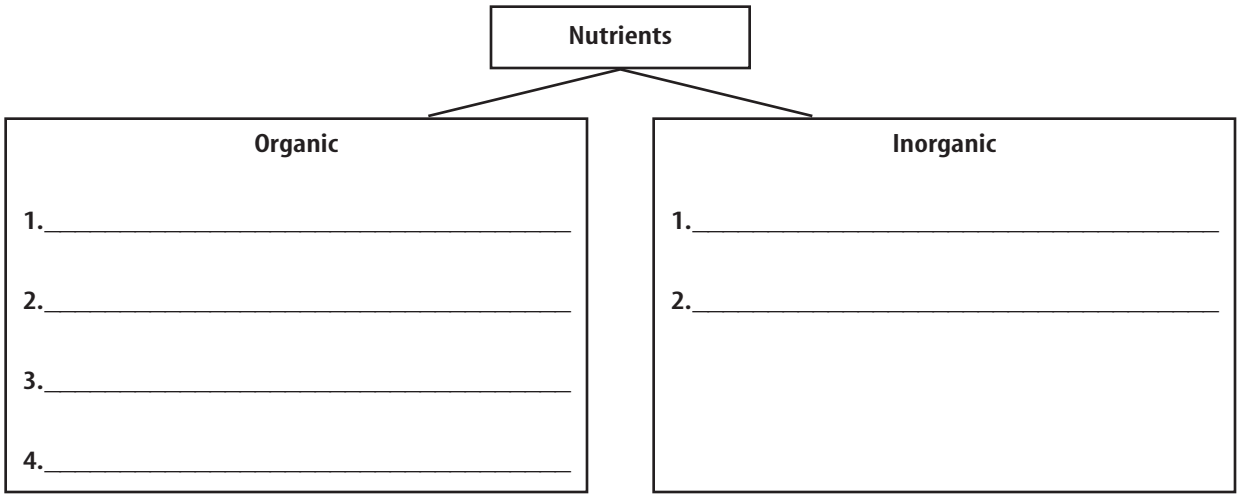
2. Complete the diagram below by classifying the six kinds of nutrients.



3. How does your outline help you understand ideas about nutrition?

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ScienceOnline Visit **life.msscience.com** to access your textbook, interactive games, and projects to help you learn more about nutrition.

End of Section