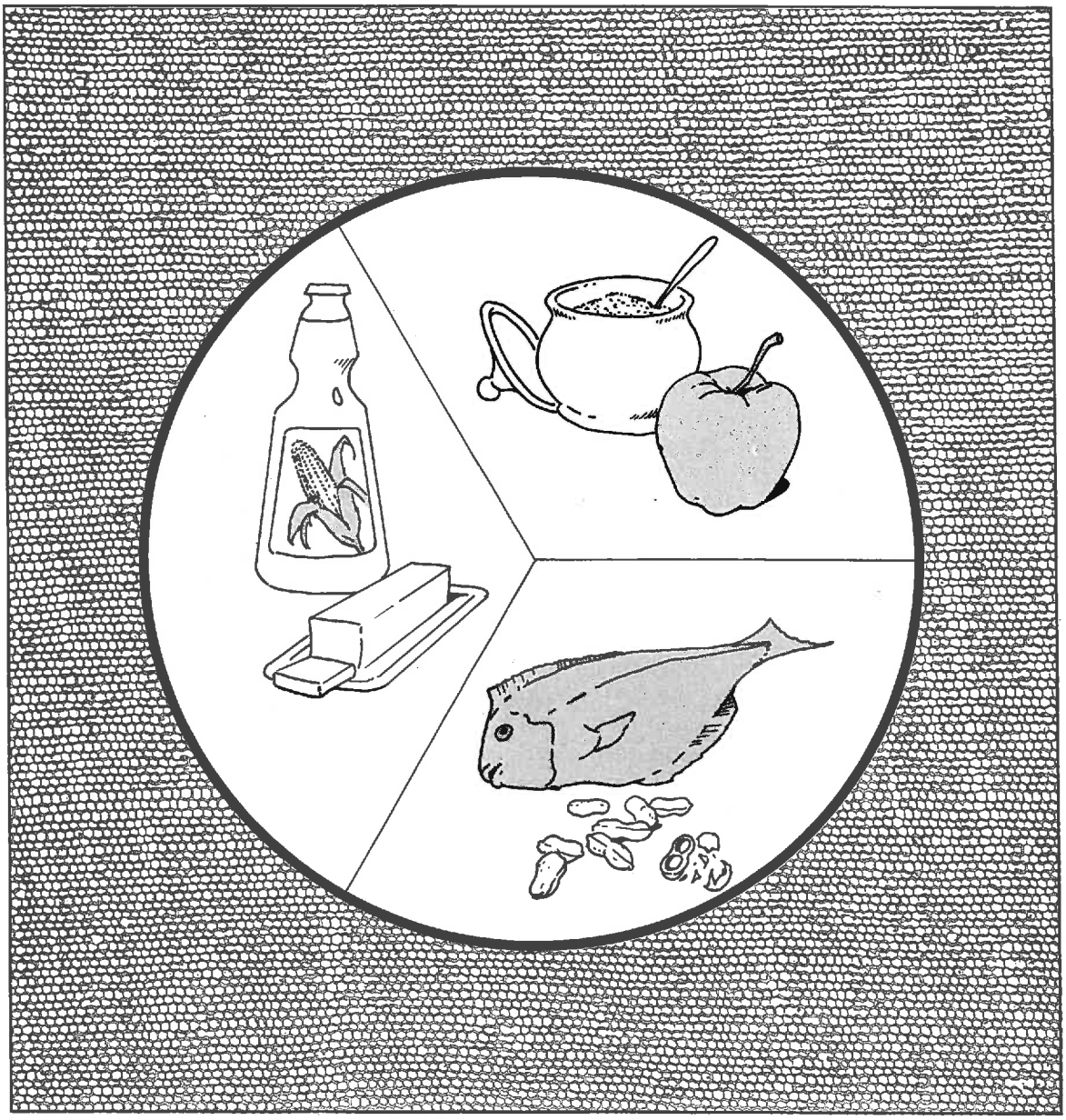
What are carbohydrates, fats, and proteins?

6



amino acid: building block of proteins
carbohydrate [kar-buh-HY-drayt]: nutrient that supplies energy
fat: energy-storage nutrient
protein [PRO-teen]: nutrient needed to build and repair cells

LESSON 6 | What are carbohydrates, fats, and proteins?

CARBOHYDRATES

Make a list of the foods you eat in one day. Chances are that about half your diet is made up of **carbohydrates.** That's about normal for most Americans.

What are carbohydrates? Carbohydrates are chemical compounds. They are made up of only carbon, hydrogen, and oxygen—in certain proportions (balanced amounts).

There are two groups of carbohydrates—starches and sugars. Starches and sugars are "energy" foods. During digestion, starches and double sugars are changed to glucose. Glucose is the simple sugar our bodies "burn" during respiration. This supplies the energy we need to carry out the life processes.

FATS

Like carbohydrates, **fats** are "energy" nutrients. In fact, fats provide more than twice the energy of an equal weight of carbohydrates.

Fats can be either solids or liquids. Solid fats come mostly from animals. Liquid fats are called **oils.**

Fats are very important. They cushion the body and give it shape. Every cell membrane contains fat.

Our bodies contain fat tissue. Important nutrients are stored in this tissue. Fat also helps to insulate the body against the cold.

PROTEINS

Proteins are the building blocks of living matter.

The body uses proteins in several ways. The two most important uses of proteins are:

- to build new cells, and
- to repair damaged cells.

What is the chemical make-up of proteins? Proteins contain atoms of carbon, hydrogen, oxygen, and nitrogen. Some proteins also contain sulfur and phosphorus.

TESTING FOR SIMPLE SUGAR

What You Need (Materials)

small pieces of apple (or any other fruit)
Benedict's solution
test tube and holder
Bunsen burner

How To Do The Test (Procedure)

1) Place a few small pieces of the apple in the test tube.

2) Add Benedict's solution (make the test tube about one-third full).

3) Place the test tube over a flame so that the bottom of the tube just touches the flame. Tilt the test tube so that it is pointed away from you.

4) Boil the mixture for about one minute. BE CAREFUL!

If the Benedict's solution turns orange or brick red, then simple sugar is present. If it turns a darker orange, then a lot of simple sugar is present. A light greenish color means very little sugar is present.

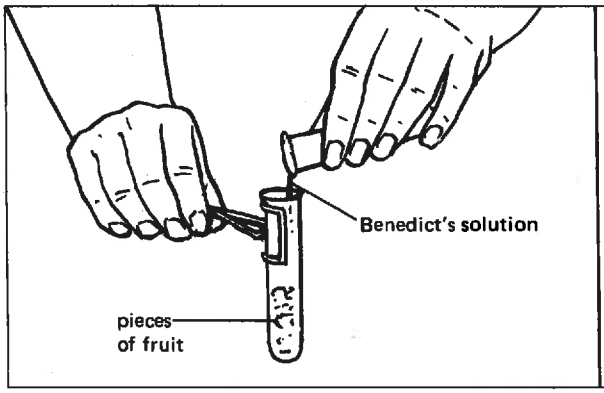


Figure A

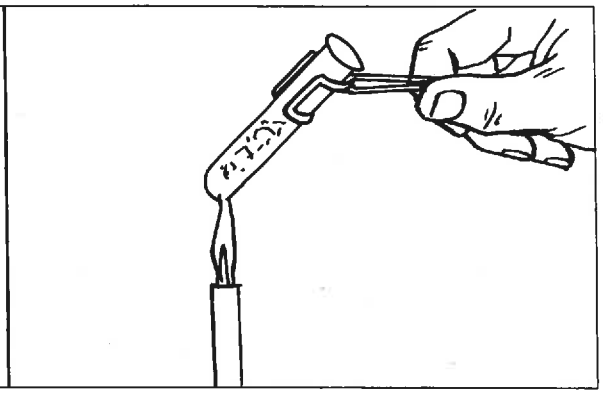


Figure B

What You Learned

Answer the following questions about the test for sugar.

1. Did the mixture change color? _____

2. What color did the mixture become? _____

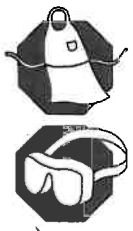
3. Does the fruit tested have simple sugar in it? _____

4. What is the name of the special chemical that we used to test for simple sugar?

_____

TESTING FOR STARCH

What You Need (Materials)



Slice of bread or potato
iodine or Lugol's solution
dropper

How To Do The Test (Procedure)

1. Place a drop of iodine or Lugol's solution on the food. The food will turn blue-black if it has starch.

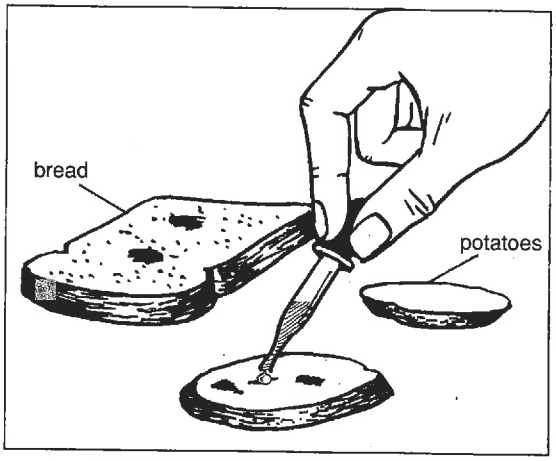


Figure C

What You Learned (Observations)

Answer the following questions about the test for starch.

1. Did the bread or potato turn blue-black? _____
2. Does the bread or potato have starch? _____
3. What liquid did you use to test for starch? _____

TESTING FOR FATS

What You Need (Materials)

butter (or margarine)
piece of brown wrapping paper

How To Do The Test (Procedure)

1. Rub a small amount of the butter on the paper. Fat makes a spot on the paper. Light can pass through the paper at that spot. The oil makes the paper translucent [trans-LOO-sent].

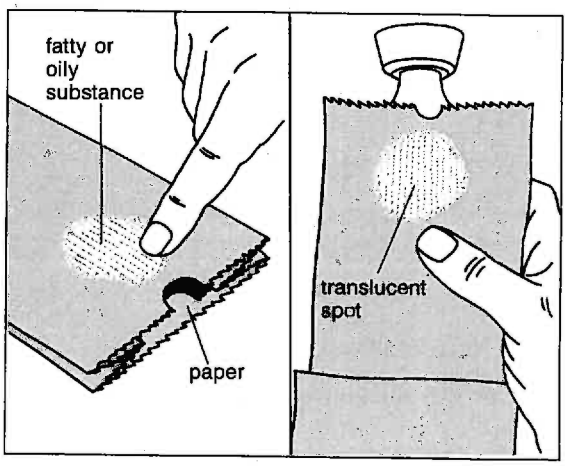


Figure D

What You Learned (Observations)

Answer these questions about the test for oil.

1. Did the butter (or margarine) make a spot on the paper? _____
2. Did the oil make the paper translucent? _____
3. Does the material you tested contain oil? _____

MORE ABOUT PROTEINS

Proteins are made up of smaller compounds called **amino acids.** Amino acids can link up in many different ways. Because of this, there are many kinds of proteins.

Your body uses twenty different amino acids. It can make 12 of them. The other eight must come from food.

- When proteins are digested, the amino acids break away from one another.
- The blood carries the amino acids to the cells. The cells put the amino acids together. They become proteins again.

There are thousands of kinds of proteins. Different cells need different kinds of proteins. Each cell "custom makes" the proteins it needs.

Proteins are giant molecules. They are very complicated. A single protein molecule may have as many as 100,000 amino acids. That is large as far as molecules go. Yet a protein is still very tiny. You cannot see a protein molecule even with the most powerful microscope.

HOW THE BODY MAKES PROTEINS

Look at Figures E and F below and read about them. Then answer questions 1–7 on the next page.

Each one of these shapes stands for an amino acid. There are twenty different amino acids.

Amino acids link up to make proteins. Different kinds of link-ups make different kinds of protein.

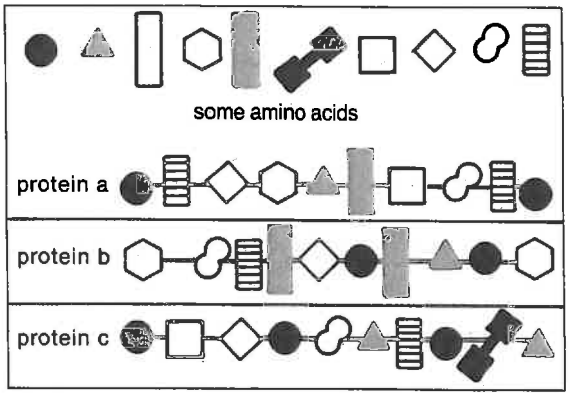


Figure E

1. Food contains proteins. We eat food.

2. Digestion separates the amino acids in the food protein. Blood sends the amino acids to every cell in the body.

3. The cells put these amino acids together again. They become proteins. The cells also put together the amino acids made by the body.

The body needs thousands of different kinds of proteins. Each cell makes the kinds that it needs.

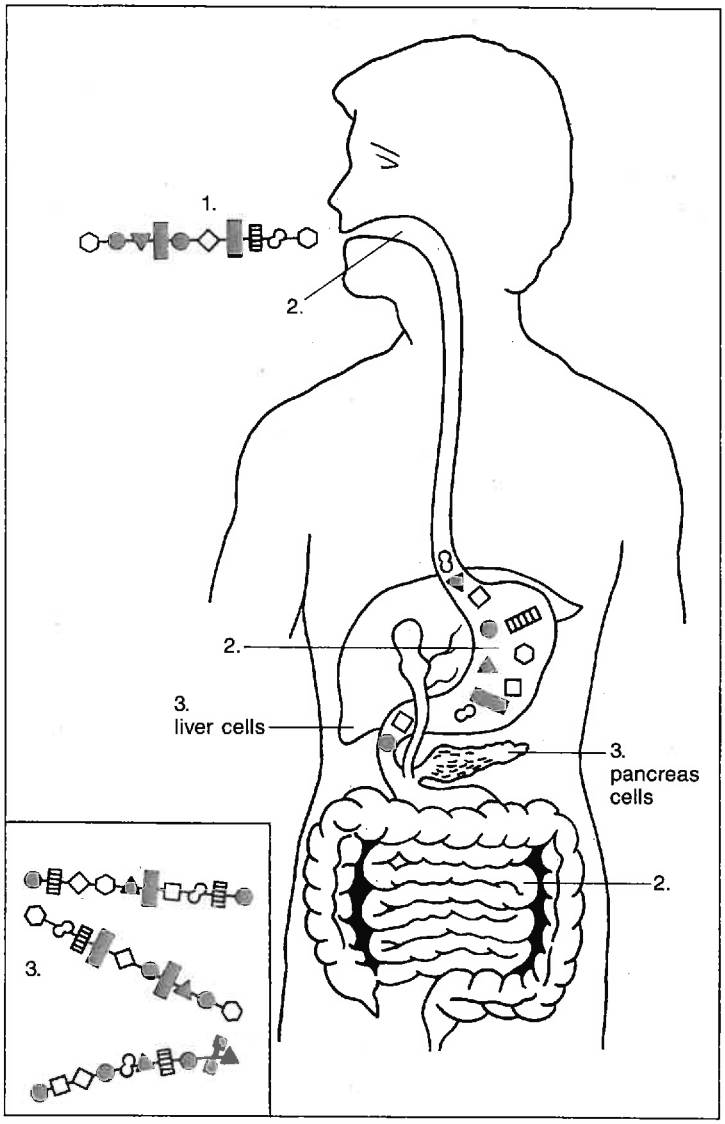


Figure F

ANSWER THESE QUESTIONS

1. How many kinds of amino acids are there? _____
2. What is built when amino acids link up? _____
3. Where do we get proteins? _____
4. What does digestion do to the protein we eat? _____
5. How do amino acids get to cells in every part of the body? _____
6. What do the cells do with the amino acids? _____

FILL IN THE BLANK

Complete each statement using a term or terms from the list below. Write your answers in the spaces provided.

digestion	oxygen	twelve
hydrogen	twenty	starches
amino acids	sugars	carbon
eight	respiration	twice
liquid		

1. Carbohydrates are compounds made up of only _____,
   _____, and _____.
2. The two kinds of carbohydrates are _____ and _____.
3. The "burning" of a "fuel" by a cell to obtain energy is called _____.
4. Fats supply more than _____ the amount of energy of carbohydrates.
5. Oils are _____ at room temperature.
6. Proteins are built from linked-up chemicals called _____.
7. The number of amino acids is _____.
8. The number of amino acids a person's body can make is _____.
9. The number of amino acids that we must get from foods is _____.
10. Proteins are broken down into amino acids during _____.

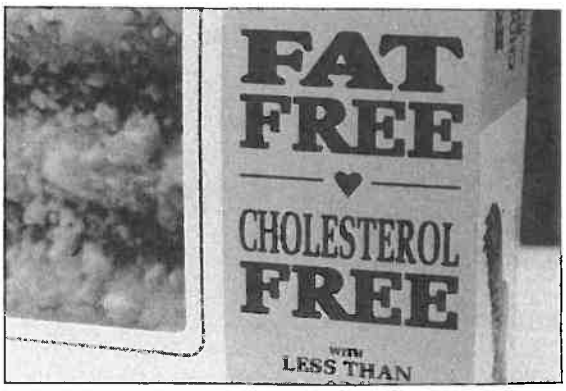
MATCHING

Match each term in Column A with its description in Column B. Write the correct letter in the space provided.

Column A		Column B
_____	1. glucose	**a)** liquid fats
_____	2. eight amino acids	**b)** fats
_____	3. cell repair and building new cells	**c)** simple sugar
_____	4. oils	**d)** cannot be made by the body
_____	5. cushion, insulate, and give shape	**e)** main jobs of proteins

SCIENCE EXTRA

Reading Food Labels



Do you think that today's shoppers must be detectives or mind readers to understand some food labels and health claims about certain foods? In many cases, they do. This is because some food labels are misleading.

For example, some foods claim to be "light." But what exactly does this mean? To most health-conscious shoppers, "light" means low calorie. But "light" on some food labels refers only to COLOR!

The words "sugar-free" or "sugarless" often appear on packaged foods. When you see these words, you may think there is no sugar in the food. But this is not necessarily true. The food may contain corn syrup. Corn syrup is another name for sugar. Other names for sugar are honey, sucrose, fructose, and natural sweeteners.

"Low Salt" and "Salt-Free" are other phrases used on food labels. These foods may be low in table salt (NaCl), but they may still contain sodium. And sodium is the harmful element in salt. Too much sodium is bad for you.

Food companies want your business. That is understandable. So are "jazzy" ads and commercials. But, they should not be misleading. Nor should they make untrue health claims. Some companies falsely link products they sell to the prevention of certain diseases. Misleading and dishonest food claims can cost you money. Even worse, they can endanger your health.

In October, 1989, Congress passed a broad truth-in-labeling bill. This bill, for example, directs that food manufacturers and suppliers provide more information about their products. It also bars them from making unproved health claims. Standards will be set for such terms as *light, low fat, reduced calories,* and *high fiber.* Labels will also have to list full information about calories, vitamins, and minerals. Labels must also disclose the number of calories derived from different sources such as fats and cholesterol. The regulations will go into effect in 1993. Until then, you should read the ingredients on food labels carefully.