



Food and nutrition

All living things need **nutrients**. Nutrients are the substances a body uses to build, repair and maintain itself. The process of feeding the body with nutrients is called nutrition.



Fascinating fact

If you were eaten by a lion, your body would be digested and rebuilt into parts of the lion's body!

Lesson 1

When you have completed this lesson you will be able to:

- explain what is meant by a nutrient, and describe how plants and animals obtain the nutrients they need
- list the five main nutrients the human body needs and explain their role in the diet
- explain the importance of fibre (roughage) in the diet

Plants use sunlight, water and a gas from the air to make the food that gives them energy. They take other nutrients from the soil through their roots. Animals must obtain all the nutrients they need by eating food. Most of our food comes from eating plants, or the bodies of other animals.

Activity 1

Make a list of all the different foods you ate yesterday. Group them in two columns – food from plants and food from animals.

Can you think of any foods that do not come from plants or animals?

After a meal we digest the food we have eaten. Digestion breaks the food down into substances our bodies can use.

Different nutrients

There are five main types of nutrient we need from our food. These are **carbohydrates**, **proteins**, **fats**, **minerals** and **vitamins**. A sixth important part of our diet is roughage or **fibre**.

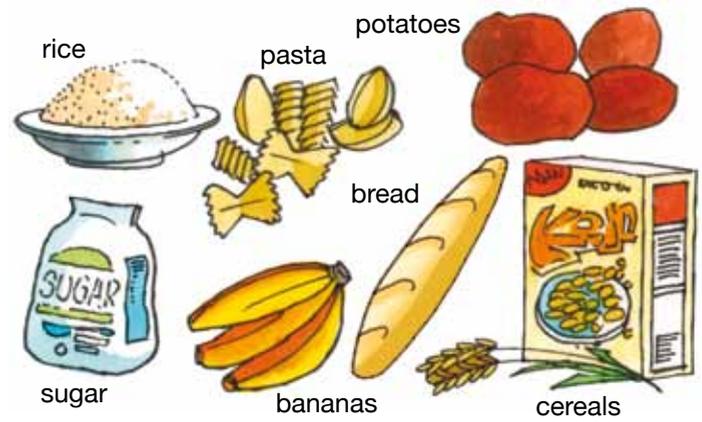
Fibre

Fibre does not provide nutrition, but it helps bulk up waste so that it passes easily through the body. People who do not consume enough roughage are more likely to suffer from constipation, which can sometimes lead to more serious diseases of the intestines.



Carbohydrates

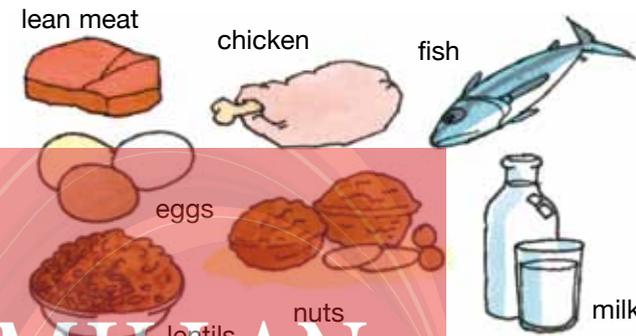
Carbohydrates are mainly used by the body as fuel. Digestion breaks them into a simple sugar called glucose. This is carried in the blood to provide energy for all our body parts.



Carbohydrate-rich foods. An athlete must eat plenty of carbohydrate before a race to provide the energy needed.

Proteins

Proteins perform many important jobs in the body. Your body needs them to grow, and to make repairs when it is damaged.



Protein-rich foods. Children need protein if their bodies are to grow healthy and strong.

Fats

The body needs some fat to build its parts and keep them working properly. Fat can also be used as fuel, for energy. Surplus fat is stored under our skin as a reserve fuel supply.



Take care! Eating too much fat can make you gain weight or become obese. As you get older too much fat can damage your heart.

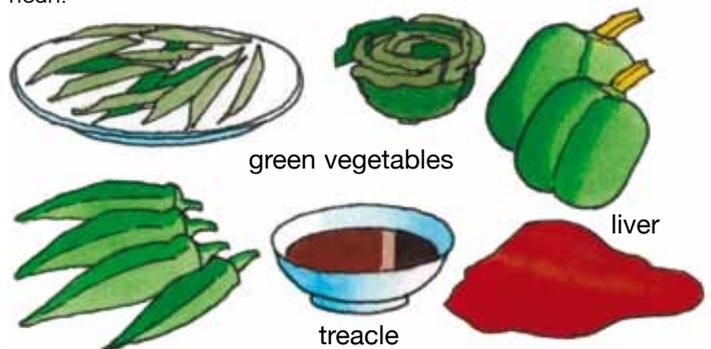
Minerals

Minerals are simple substances such as calcium, iron and salt that the body needs for building bones, carrying oxygen in the blood, and controlling blood pressure. You need to eat a lot of mineral-rich foods when your body is growing.

If you lose blood then the iron it contained must be replaced or you will become weak. Dark green vegetables, treacle and liver are good sources of iron.

Young children need calcium from milk to build strong bones.

We need some salt in our diet to replace the sodium we lose by sweating, but too much salt can raise our blood pressure.



Mineral-rich foods. We need a variety of minerals for different purposes.

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Vitamins

Vitamins are special substances that your body needs in tiny amounts but cannot make itself.



Activity 2

Copy and complete this table with a description of the importance of each food group.

Nutrient	Importance in the diet
1. carbohydrates	provide energy
2. proteins	
3. fats	
4. vitamins	
5. minerals	
6. fibre	

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What you have learnt

Our food gives us the different ____ our bodies need to stay healthy and grow. We need ____ for energy, and ____ for growth and repair. We need some ____ for making and maintaining body parts, but not too many. To stay healthy we also need ____ and ____ in small quantities. These substances perform special tasks in the body. ____ does not give us nutrition, but it helps waste pass easily through the body.

Key words

carbohydrates fats
fibre minerals nutrients
proteins vitamins

Check your progress

- ① What is a nutrient? List five nutrients we need from our food.
- ② Explain why fibre is important in the diet.
- ③ Name the nutrients that:
 - an athlete eats for energy
 - help build and maintain the body
 - are special substances the body needs in small amounts but cannot make itself.



Food groups

Different foods contain different amounts of the important nutrients we need. This is why we must eat a mixture of different foods – not just one type of food all the time. Foods may be grouped as sources of carbohydrate, protein or fat.

Carbohydrates are contained in **starchy** foods such as roots, cereals, bread and rice, and in **sweet** foods in the form of sugars.

Proteins are contained in **meat**, dairy products, fish, beans, seeds and nuts.

Fat-rich foods are **butter**, margarine, groundnuts, animal and plant oils and fatty meat.

Lesson 2

When you have completed this lesson you will be able to:

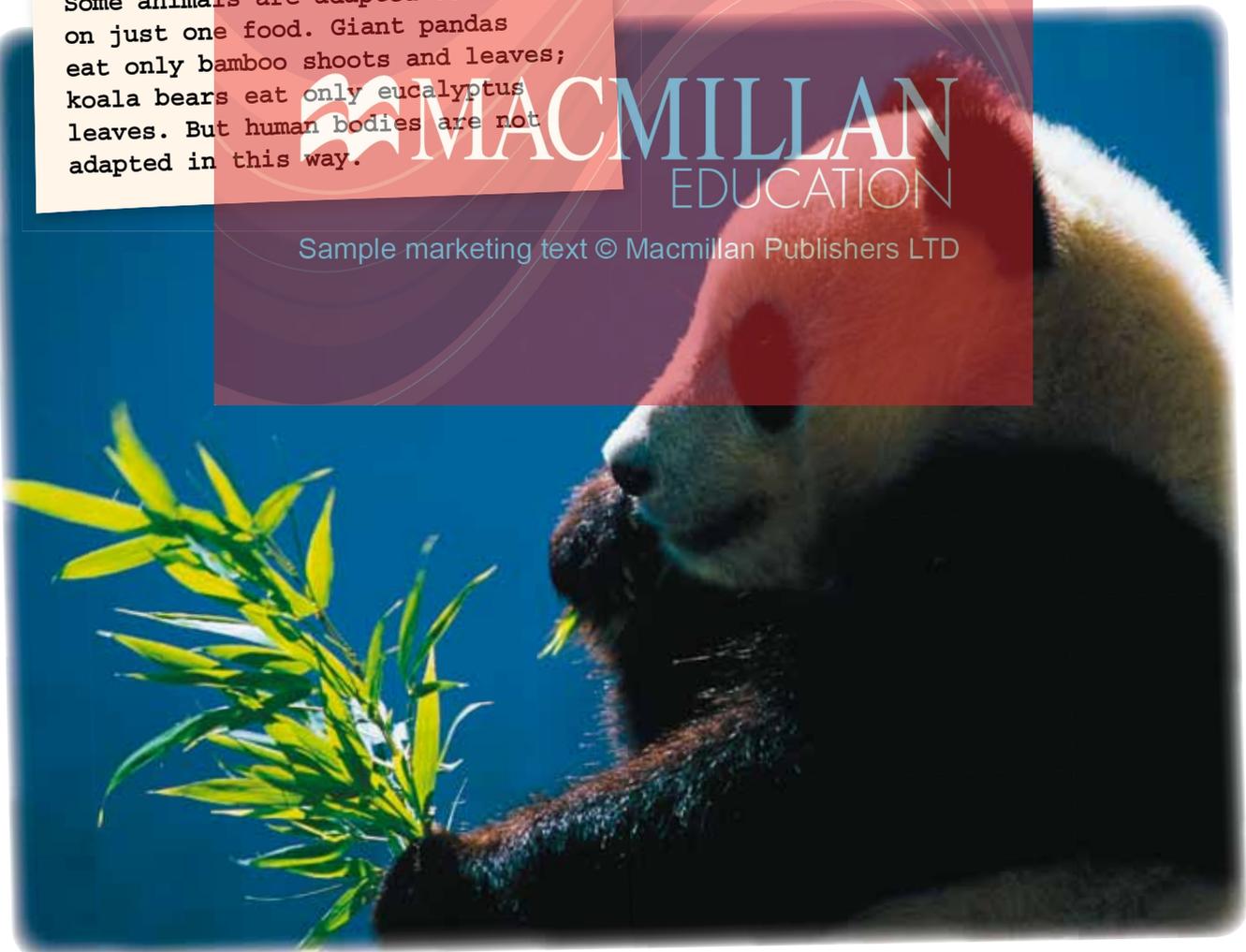
- identify the main food groups provided by common foods
- name foods that provide vitamins and minerals in the diet
- know how to test for two food types

Fascinating fact

Some animals are adapted to survive on just one food. Giant pandas eat only bamboo shoots and leaves; koala bears eat only eucalyptus leaves. But human bodies are not adapted in this way.

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Activity 1

We are going to group foods. Look at the foods in the picture. Discuss which nutrients each food contains.

Copy the nutrients diagram onto a large sheet of paper. Write the name of each food in the correct circle.

Some foods contain more than one nutrient: red meat, for example, contains protein and fat. These foods can go in the spaces where the circles overlap.

Fill the circles with as many foods as you can think of.



Food group diagram

Sources of minerals and vitamins

These foods on the right are especially good for you because of the vitamins and minerals they contain. Can you name these?

This table lists some different vitamins and their importance in the body.



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Vitamin	Some foods that contain it	What it does in the body
A	egg yolk, green vegetables, carrots, liver, milk	keeps eyes healthy
B1	rice, beans, meat, egg yolk, green vegetables, nuts, pineapples, apricots	keeps nerves healthy
B2	beans, meat, egg yolk, green vegetables	keeps the skin healthy
C	fruit, vegetables	keeps the skin, gums and blood vessels healthy
D	fish, fat, egg yolk, also made in the skin by sunlight	helps the bones to grow properly
K	green vegetables, egg yolk	needed for blood clotting

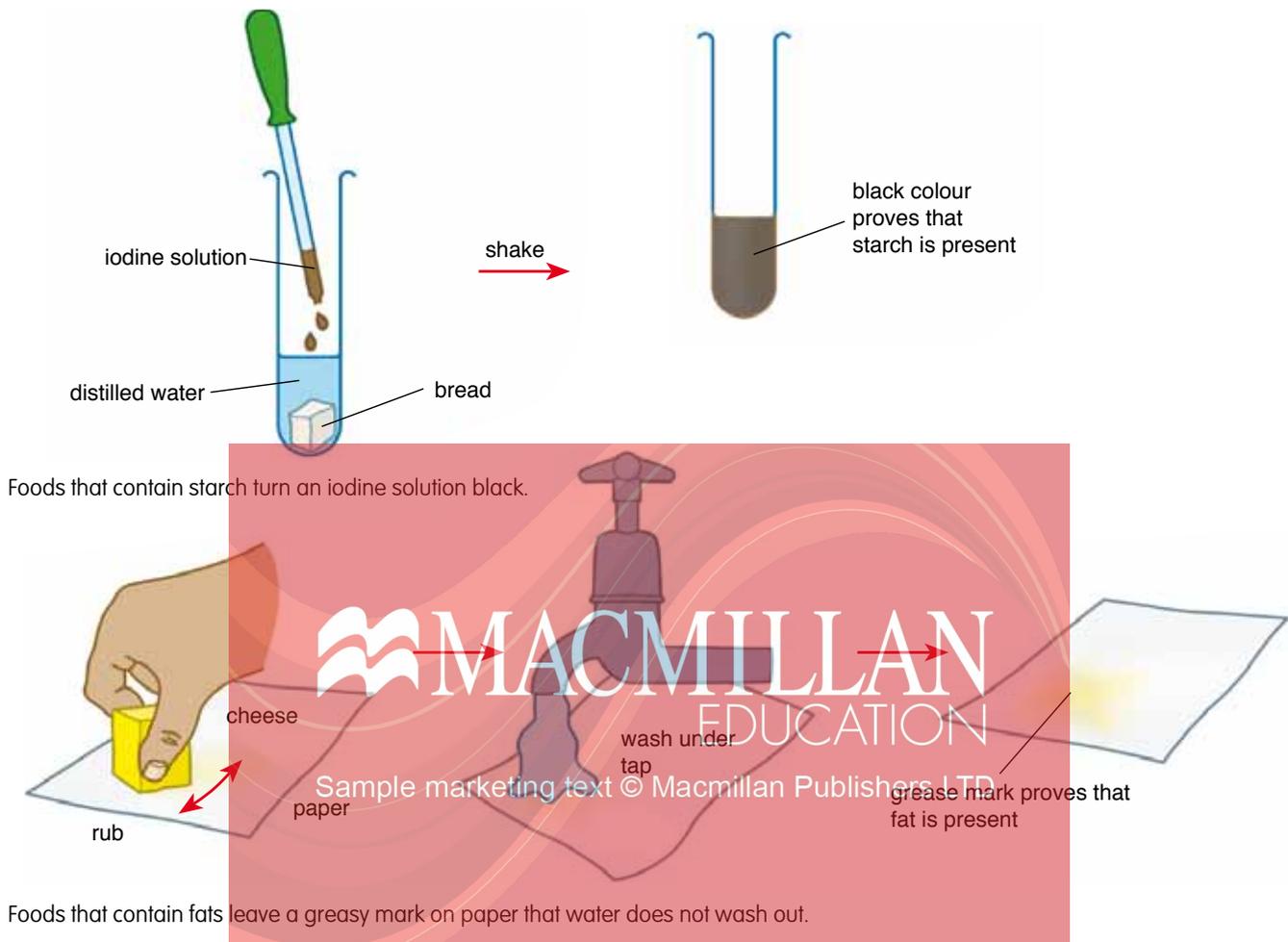
Activity 2

Use the table to say which vitamins each of the foods illustrated above contain.



Food tests

How do we know which foods contain which nutrients? Scientists have invented chemical tests for proteins, starch, fats and other nutrients. These pictures show two **food tests**.



What you have learnt

Foods contain different _____. ____ and ____ foods are rich in carbohydrates. Dairy foods, nuts, beans, fish and ____ are good sources of protein. Oil, margarine and ____ are fatty foods. We can use _____ to identify the different nutrients that a food contains.

Key words

butter nutrients food tests
meat starchy sweet

Check your progress

- Give three examples each of foods that are rich in:
 - carbohydrates
 - proteins
 - fats
- Name an important vitamin that you obtain from eating fresh fruit and vegetables. Why is this vitamin important for health?



A balanced diet

We must eat the correct quantity and mixture of different food types to stay healthy. This is called eating a **balanced diet**.

A balanced diet contains carbohydrates, proteins, some fat and plenty of fresh fruit and vegetables rich in vitamins and minerals.

Lesson 3

When you have completed this lesson you will be able to:

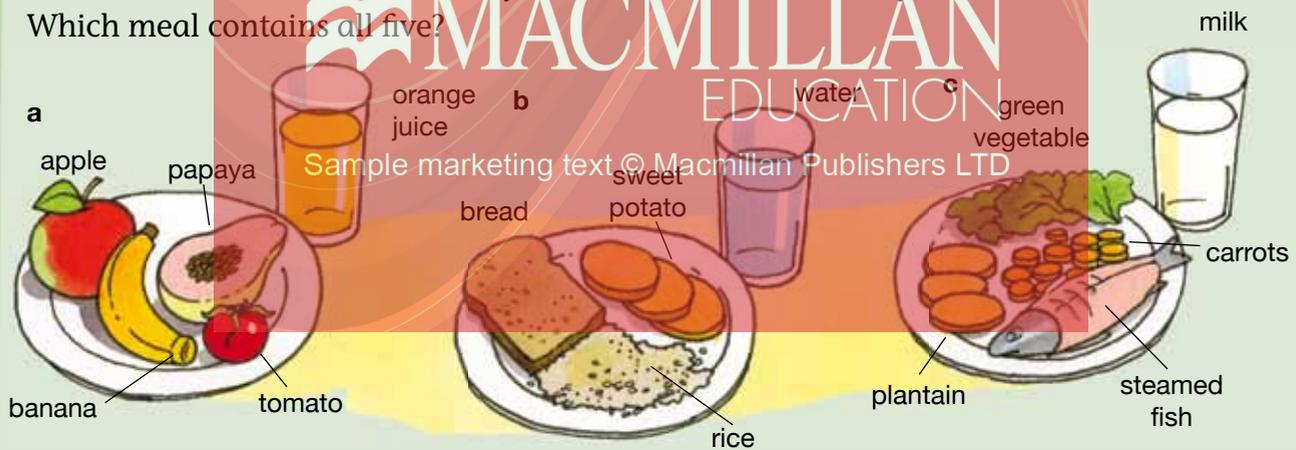
- explain what is meant by a balanced diet
- plan a menu to provide a balanced diet that includes all the important food groups
- describe the importance of water in the diet

Activity 1

Make a list of the food you ate yesterday.

1. Did you eat any animal protein (meat or fish)?
2. Did you eat any carbohydrates such as potatoes or rice?
3. Did you eat any fats, such as butter or cream?
4. Did you eat any fresh fruit and vegetables?

Look at these three meals. Identify the different nutrients they contain. Which meal contains all five?



In wealthy countries food-related health problems are usually caused by eating too much food, eating the wrong kinds of foods and by lack of exercise.

In developing countries many people do not have enough to eat. As much as 60 per cent of the world's population struggle to survive on a diet short of carbohydrates, protein, minerals and vitamins.





Activity 2

Draw a chart like this to plan your meals for the next three days. Work with a partner. You should make sure you eat some protein, carbohydrate, a little fat, fresh fruit and vegetables each day. Do not eat the same foods every day.

Meal	Day 1	Day 2	Day 3
Breakfast			
Lunch			
Evening meal			

Discuss your menu with your teacher. Is it a balanced diet?

It is not necessary that every meal contains all five nutrients, but you should eat from each of them **every day**.

The importance of water in the diet

As well as food, your body needs water. You could survive for many days without food, but without water you would die in just a few days. This diagram shows some different uses for water in the body.

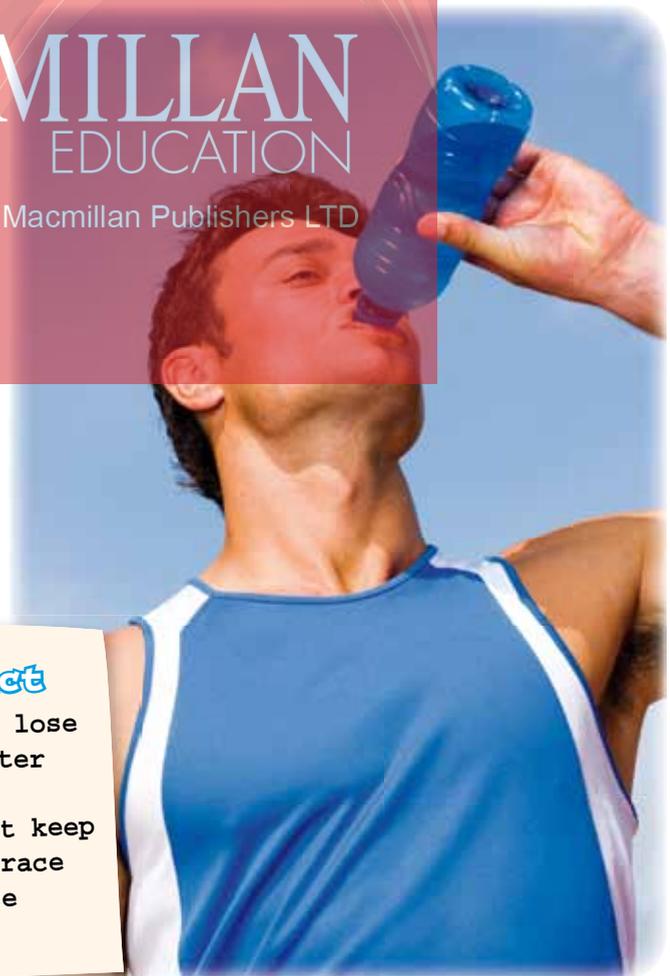
To stay healthy the level of water in our bodies must stay the same. We have to balance the amount of water that passes out, with the amount taken in. If we do not have enough water we become **dehydrated**.

Fascinating fact

Marathon runners can lose up to 6 litres of water during a race in hot conditions. They must keep drinking during the race or they will collapse from dehydration.

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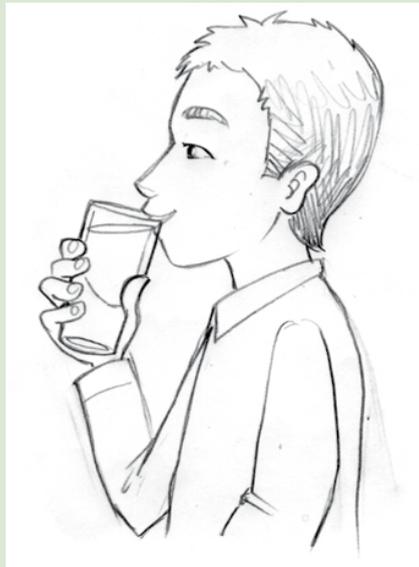
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Activity 3

1. List five uses for water in the body.
2. List the ways that water enters the body.
3. List the ways that water leaves the body.
4. Add up the water losses. Is this person's water in balance? Explain why.



This table shows that an average adult takes in about 2.6 litres of water a day. This water comes from drinks, moist food and by breaking down food in the body.

Water intake in cm^3		Water losses in cm^3	
2600	urine	1500	
	sweat	600	
	breathing out	400	
	faeces	100	

What you have learnt

A ____ provides the correct mixture of nutrients to keep the body in good health. We should eat from each of the five nutrients every day. Fresh fruit and vegetables are an important part of a balanced diet. Water is an essential part of the diet. If you do not replace water lost through urination, sweating and other routes, the body becomes ____.

Key words

balanced diet dehydrated

Check your progress

- 1 Explain what is meant by a balanced diet.
- 2 Give an example of a meal that contains all five nutrients.
- 3 Explain why the adult body needs to take in at least 2.6 litres of water each day.



Food and energy



A peanut candle

When you eat a peanut, the chemicals produced by digestion are slowly 'burnt' in your body. In this process they release about the same amount of **energy** as that released by the flame of a burning nut.

Lesson 4

When you have completed this lesson you will be able to:

- investigate the energy content of foods
- state (in calories) the normal energy needs of the human body
- interpret the nutritional information provided by the labels on packaged foods

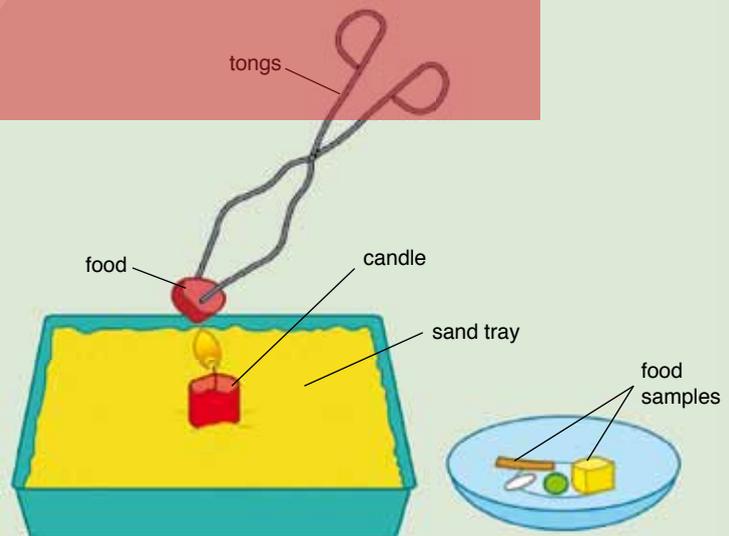
Activity 1

Comparing the energy contents of foods

- Stand the candle on the sand and light it.
- Use the tongs to hold each food sample (a whole nut or a similar sized piece of cheese, bread or chocolate) in the flame. Observe what happens and record your observations in a table. The food may bubble and melt at first. Moist food will steam. Eventually most food samples will catch fire and carry on burning when taken out of the flame.
- Compare the different foods. Which burns longest? Which produces the biggest flame? Which types of food do you think contain the most energy?

You will need:

food samples (nuts, hard cheese, dry bread, chocolate), kitchen tongs, a candle, a metal tray filled with sand.





Being a good scientist (science skill – measurement)

Good scientists measure the things they observe to make their comparisons reliable. You could try to measure the amount of heat given out by the different foods, perhaps by seeing how much the burning sample will raise the temperature of a certain amount of water. This is a difficult experiment to perform accurately, but your teacher may demonstrate how it might be done.

Food scientists measure the energy in foods by burning them inside a special container called a **calorimeter**. They find the heat released by the rise in temperature. Fats and oils are the most energy-rich foods, with 900 calories of energy per 100 grams (g) of food. Carbohydrates and proteins contain about 400 calories per 100 g. The number of **calories** in the food you buy in shops and supermarkets is shown on the packaging.

Eating for energy

Depending on what you eat, the energy needs of your body may be provided by carbohydrates, fats or proteins. Ideally, most of the energy should be provided by carbohydrates, since it is wasteful for the body to break down protein and fat for fuel.



A resting human body needs about 1 calorie of energy per minute (this equals 1440 calories a day) to keep its basic life processes going. As your activity level increases, so do your energy needs. Vigorous sport uses up 10 to 20 times more energy than resting.

Most adults require somewhere between 2000 and 3000 calories per day to maintain a steady body weight. An active, growing teenager needs a similar number of calories per day.



Lesson 4: Food and energy

The energy content of packaged foods is shown on the **food label**. The label also provides other nutrition information such as the fat, fibre and salt content of the food.

Activity 2

Make a collection of food labels from packaged foods. Which foods contain the most calories per 100 g? Which have the most fat? Which have the most salt?

Nutrition Facts
 Serving Size (30g)
 Servings Per Container About 3
Amount Per Serving
Calories 80 Calories from Fat 25
 % Daily Value*
Total Fat 3g 3%
 Saturated Fat 0.5g 1%
 Trans Fat 0g
 Polyunsaturated Fat 2g
 Monounsaturated Fat 0g
Cholesterol 0mg
Sodium 260mg 5%
Potassium 120mg
Total Carbohydrate 3g
 Dietary Fiber 1g
 Sugars less than 1g
Protein 10g

Fascinating fact
 One calorie is the amount of heat energy needed to raise the temperature of 1 litre of water by 1 degree Celsius (1°C).

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What you have learnt

Different foods provide different amounts of _____. Scientists measure the energy content of foods by burning them in a _____. When you are resting, your body needs about one _____ of energy per minute. Your energy needs increase when you are active. Fats and oils are the most energy-rich foods. The energy content of packaged foods can be found on the _____.

Key words

calorie calorimeter
 energy food label

Check your progress

- ① How many calories are contained in 100 g of fat?
- ② How many calories does an active teenager require each day?
- ③ Predict what will happen if you eat too many calories each day.



Digestion

The food you eat is digested as it passes through your **alimentary canal**. Digestion is the process in which food is broken down into simpler substances that your body can use.

Lesson 5

When you have completed this lesson you will be able to:

- describe how food moves through the alimentary canal
- explain how food is digested and absorbed as it passes through the digestive system

Fascinating fact

You can swallow food when you are lying down, or even when you are hanging upside down. Astronauts can swallow food in space. These observations prove that the food is not just pulled down by the force of gravity.

The alimentary canal is really just a long tube with your mouth, the entrance, at one end, and your anus, the exit at the other. If you laid out this tube in a straight line it would be about 7 metres (m) long. When you swallow a ball of food it begins its journey from one end of this tube to the other – but how does it move?

Activity 1

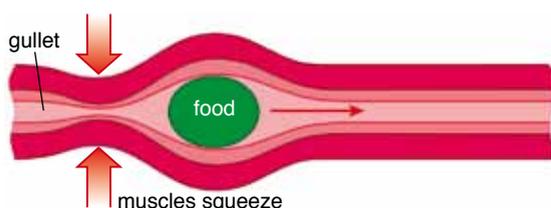
Investigating movement through the alimentary canal

- Use the tape to measure a 7m length of hose. This is the length of your alimentary canal.
- Can you make the marble move through the tube? How can you use your hand to make it move in either direction?

You can make a marble move along the tube by squeezing the tube just behind it. Balls of food move through the alimentary canal in just the same way.

You will need:

a tape measure, a hosepipe, a marble slightly bigger than the inside diameter of the pipe.



The walls of the alimentary canal contain muscle tissue. They move a ball of food along by squeezing behind and relaxing in front. It's a bit like squeezing toothpaste from a tube.



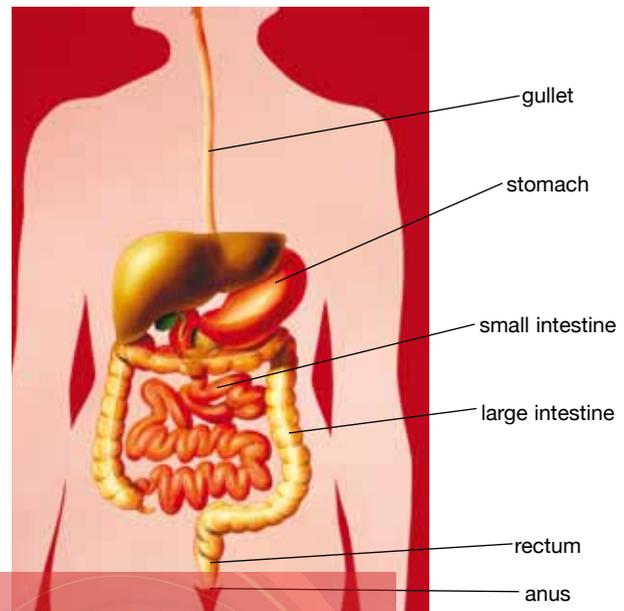
Digestion

Digestion starts in the mouth when you chew food and mix it with saliva. Saliva contains a special chemical called an enzyme, which breaks starch into sugars.

When you swallow the food, it passes from your mouth into your stomach through the gullet. The stomach can expand to take all the food you eat during a meal.

Inside the stomach, food is mixed with gastric juices. These contain **acid**, which kills bacteria, and different **enzymes** that start to digest protein.

Food stays in the stomach for two to three hours, and then passes into the small intestine, where more enzymes complete the digestion process.



Absorption

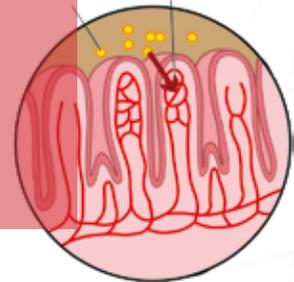
The walls of the small intestine are covered with tiny folds. These contain blood vessels into which the digested food passes. The folds increase the surface area, making it easier for substances to pass through.

Undigested food passes into the large intestine. There are a lot of bacteria here, which continue to digest food remains, often producing lots of gas. Water and minerals are absorbed from the mixture through the large intestine walls.

As the contents of the large intestine move down into the rectum, they form into faeces. Faeces consist of water, bacteria and undigested food in about equal amounts. The faeces are stored in the rectum until they pass out of the body through the anus.

blood vessels absorb digested food into blood stream

digested food inside small intestine



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Activity 2

Answer these questions.

1. What job does the stomach do?
2. Where are most digestion products absorbed?
3. What happens to water in the large intestine?

Please see overmatter