Try-out lesson material for schools in Belarus

FOOD AND DIET
The study of food is called nutrition.

Why do we need food?

We need food for four main reasons:

- it serves as a fuel, giving us energy and warmth.
- it provides materials for growth.
- it enables us to repair and replace tissues.
- it keeps us healthy and helps us to fight disease.

Our diet

The food we eat each day makes up our diet. Whatever we choose to eat, our diet must include the following substances: carbohydrates, fats, proteins, water, minerals and vitamins. A diet which contains all the necessary substances, but not too much of any of them, is called a **balanced diet** (picture 1). The food substances themselves are called nutrients.

Here we shall concentrate on the part they play in our diet. We shall deal with the substances that we need in a bulk first and then those we need only in small amounts.

Carbohydrates

- S**ugar**

Sugar gives us energy, so we call it an energy food. Different foods contain different kinds of sugar. For example, the sugar in fruit is **fructose** or **glucose**, and in milk it is **lactose**. Ordinary table sugar is **sucrose**.

A source of sugar is sugar beet, which is grown in temperate countries including Belarus. Sugar beet stores sugar in thick swollen roots.

- **Starch**

Starch is found in bread, potatoes and cereals. Like sugar, starch gives us energy.

Starch occurs in plant cells as starch grains. Each gain contains many tightly packed starch molecules, and each of these consists of a chain of sugar molecules. So starch is a concentrated store of energy.

Fats

Fats occur in both animal and plant foods. Butter, dripping and lard are animal fats obtained from cattle and pigs. These fats are solid at room temperature, though if you heat them they become liquid.

Plant fats, on the other hand, are normally liquid at room temperature, we call them oils. Two well know examples are corn oil and olive oil. Both are used in cooking.

Margarine, unlike butter, consists mainly of plant oils. These are obtained from peanuts, soya beans and so on, and are then turned into solid fat by chemical treatment.

Fats give us energy, so –like carbohydrates-they are energy foods. In humans and other mammals, fat is stored under the skin; this helps to keep the body warm, as well as serving as an energy store.

Proteins

A certain amount of protein is present in most food, but is particularly plentiful in milk, eggs and meat. In milk and eggs the protein is in liquid form. In meat it consists of solid thread-like fibres-the animal muscle.

Proteins form the main structures of the body like muscles and skin. So we need proteins for growth and bodybuilding, and for repairing tissues. Plus we can get energy out of it.

Water

Water is essential for life. It must therefore be included in our diet. A person can go without food for several weeks, but would die in a few days from lack of water.

We take in water mainly by drinking. However, there is plenty of water in most solid foods. A lettuce or cabbage is 90 per cent water, and even bread contains about 40 per cent. Some animals get al their water from solid food and never drink, but humans normally need to drink about a litre of liquid every day.

Shortage of water in our environment (drought) is one of the main causes of famine. It kills livestock, and causes crops to fail.

Mineral salts

Mineral salts contain certain chemical elements. All these elements have particular jobs to do in the body. Here are two of the most important ones:

- S**odium**

We take in sodium when we eat salt, for common salt is sodium chloride. Salt is present in most foods, though of course some are saltier than others are.

Our blood must contain the right amount of salt. It helps our nerves to transmit messages and our muscles to contract. If you run short of it, you get cramp. We lose salt when we sweat. Miners, and other people, who work in hot places, eat salt tablets to make up salt they lose in sweating.

It's important not to eat too much salt. It can cause high blood pressure, and may be linked with heart disease.

- C**alcium**

When a baby is born, its bones are soft. For the bones to harden, they must take up calcium compounds. A similar process makes the teeth hard.

Calcium occurs particularly in milk, cheese and fish. If a child does not get enough calcium, its bones remain soft and become deformed. This is called rickets. Calcium is also needed for making muscles contract, and it helps blood to clot when you cut yourself.

Vitamins

Vitamins are substances needed in the diet. Each has a specific job to do. If any of them is missing from the diet, we become ill and may die. They are needed only in small amounts.

Vitamins are known by letters: A, B, C etc. This way of naming them was introduced before the chemical structure was known.

For vitamins to do there job they must be in solution. Some of them dissolve in water, other in fat. This is one of many reasons why we need water and fat in our diet.

Now let's look at some of the more important vitamins in detail.

vitamin	it is abundant in the following food	you need it for
A	fish liver oil, carrots, milk, cheese, butter	Important for your eyes. It protects their surface, and helps us to see in dim light.
B	cereals, meat, fish, milk	function of the nervous system
C	potatoes, vegetables and fruit	Helps the cells to keep together.
D	eggs, butter, (under the influence of sunlight it can also be made by the body itself)	Taking up calcium salts to become bones hard.

Useless elements

Some food may contain substances we don't need; radioactive materials for example. As a consequence of the Chernobyl disaster milk and mushrooms can still be contaminated with radioactive elements. In certain amounts these elements are harmful for the body.

Food as a fuel

We can show that food is a fuel by burning it. When the food is burned in the cells of your body, energy is transferred to the surrounding, warming them.

The energy is measured in a unit called the kilojoule (kJ). The three main substances found in food are carbohydrates, fat and protein. We can estimate the amount of energy in kilojoules obtainable from each of these substances. We can then compare their energy values. Here they are:

- Carbohydrate: 1g gives 17 kJ
- Fat: 1g gives 39 kJ
- Protein: 1g gives 18 kJ

Notice that fat gives about twice as much energy as either carbohydrate or protein.

How much energy is given by different foods?

Table I tells you how much energy is given by some everyday foods. The amount of energy gives by a particular food depends on the substances it contains. For example, margarine and butter consists almost entirely of fat, so they give a lot of energy. On the other hand, a cabbage is ninety per cent water, so it gives very little energy.

Another thing that determines how much energy a particular food gives is how it is cooked. For example, potatoes fried in fat give three times as much energy as potatoes boiled in water.

How much energy do we need?

Image you are lying in bed doing nothing. Even in this inactive state you need energy to breathe, make the hart beat, and drive all those countless chemical reactions which keep you alive.

How much energy do you need varies from one individual to another. Very roughly, the amount needed is 7000 kJ per day. This is about the same amount of energy needed to boil water for 100 cups of tea.

Few of us spend our days lying in the bed – most of us do something. Table II tells you roughly how much energy is needed by different people in the course of a normal day. A person who spends most of the time sitting in an office needs far less energy than a very active person does. So the amount of energy needed depends on the person's age, sex and occupation.

What happens if we eat too little?

Suppose you eat no energy food at all. What happens? At first you obtain energy from your fat stores. As a result you lose weight.

Eventually all your fat gets used up. In order to stay alive, the body starts getting energy from your tissue proteins, particularly your muscles. As a result, you waste away, becoming thin and weak. Death will occur after about two months. This has happened to victims in concentration camps, and in famine areas such as Ethiopia.

Digestion

Before the body can use the nutrients in the food, the nutrients must be transported by blood to the cells. Small particles like vitamins are taken up directly. Also particles like Caesium, a contaminant of the Chernobyl disaster, are taken up in this way. Not all nutrients can directly be absorbed in the blood. The bulk of food you eat, carbohydrates, fats and proteins is made up of large molecules. The digestive system is designed to break down these large molecules into much smaller ones. This process is called digestion. Digestion takes place in your mouth, stomach and small intestine. In the small intestine the digested food (small molecules) passes through the intestinal wall and is absorbed into the blood. The blood will then transported the small molecules to the cells where they are used for repair and building up part of the body.

Waste leaves the body by urine and poop. Even most of the caesium leaves your body within several days by urine.

A varied diet

By eating in a healthy way, we give our body all nutrients it needs (carbohydrates, proteins, fats, minerals, vitamins and liquid). Unfortunately a food product which contains all nutrients in sufficient measure doesn't exist. Therefore we need a varied diet.

By varying our food we can get all nutrients we daily need. Besides we reduce the chance of getting too much harmful substances.

To help you to compose a varied diet:

Choose every day products from each of the four following groups. And drink at least 1 litre liquid a day.

	necessary food	indispensable for
group I	bread and potatoes (or rice, pasta. pulse)	starch, protein, vitamins and minerals
group II	vegetables and fruit	vitamin C
group III	milk, cheese (or other diary-production) and meat, meat products, chicken, fish or eggs	proteins, vitamins, calcium and iron
group IV	margarine or oil	fats and vitamins

☞ Now please do the tasks 1, 2 and 3 about the topic “food” on your worksheet.

CYCLE

Feeding relationships

In the natural world, animals feed on plants and on other animals. This is an essential part of the balance of nature.

A food chain

Suppose we look into a meadow where there are cows grazes. We find that the cows eat the grass. We can sum up the feeding relationship between the two organisms like this:

grass ? cows

We call this a **food chain.** Cows eat only plants: they are **herbivores**. In contrast, the great animals like tiger eat only other animals: they are **carnivores** (picture 2). When a man eats cow meat he is also a carnivore.

Producers and consumers

Let's think about this food chain in a bit more detail. The grass makes its own food by photosynthesis. They get the energy for doing this from sunlight. Because they make food, we call them **producers**.
In contrast, the animals in the chain get their food by eating other organisms. For this reason we call them **consumers**.

Lost of energy

In picture 2 only a small fraction of the sun's energy that falls on the grass is transferred to the plants' tissues and food stores. And when a cow eats a grass only about one tenth of the energy in the plant is transferred to the body of the cow. The rest is lost in the cows' waste matter or in its respiration. The same thing happens when the cow is eaten by a bear and again when the bear is killed by a man.

In other words, at each step of the food chain, a lot of energy is lost.

Food webs

In a natural habitat such as a forest, it would be unusual for the organisms to be linked together in a simple chain. Many more species will be present than the ones in picture 2 and each may have several sources of food.

By observing all the organisms in a habitat, you can build up a diagram summarizing who feeds on what. This is a **food web**. A simple food web is shown in picture 3.

Food chains in the service of humans

Look at picture 2 again. The cow that ate the grass might be killed by a farmer. The food chain would then be:

grass ? cows ? human

So food chain can provide us with food.

Some of the most important food chains occur in the sea. In the surface waters where light can penetrate, there are millions of microscopic organisms called **plankton**. Some of these organisms are like plants and feed on the plant-like ones. The animal plankton, in turn, is eaten by fish such as herring, giving us the following food chain:

plant plankton ? animal plankton ? herring ? human

Our fishing industry depends on this and other similar food chains. On land, farming involves several important food chains as:

grass ? sheep ? human
grass ? cattle ? human

Of course humans eat plants as well as animals: we are **omnivores**. When we eat such things as bread, we are the primary (and only) consumers in this very simple food chain:

wheat ? human

The decrease in energy which occurs at each level of food chain is a very important consideration in growing crops and raising livestock.

Decomposers

When animals and plants die their bodies decay**.** This is because they are fed upon by bacteria and other microorganisms which break them down.

The organisms which bring about decay are called **decomposers**. As a result of their activities, simple substances are released from the dead bodies. These substances are absorbed by plants, and can go through the food chain all over again (picture 4).

Decomposers thus enable chemicals to be re-cycled and used again. They play an important part.

Food chains and radioactive contamination

Unfortunately it isn't always useful substances that get into food chains. Sometimes poisons do so too. Such is the case with the radioactive Cesium 137—a fall out product from the Chernobyl disaster.

Cs 137 keeps its poisonous properties for a long time after it has been released into the environment. If it gets into a river or lake, it is taken by the plankton. It then passes along the food chains. Cs 137 damages the health of animals and men.

Unfortunately Cs137 isn't the only poisonous substance to get into food chains. Some years ago over 60 people died in Japan from eating fish whose bodies contained mercury. The mercury had been discharged into the sea from a factory and had passed right trough the food chains.

Germs, too, nay pass along food chains. For example, if *Salmonella* bacteria are present in the food given to hens, the hens and their eggs may become infected. The bacteria may then get into humans, causing Salmonella poisoning.

☞ Now please do the tasks 4 - 9 about the topic "cycle" on your worksheet.

Picture 2 A food chain is made up of a series of feeding levels. In the chain shown here the grass is on the first level, the cow at the second, the tiger or a man on the third.

Picture 4 decomposers enable the chemical elements in the bodies of the producers and consumers to be used again. The arrows show the flow of materials from one organism to another.

Name **City (village)** **Age** **Gender**

QUESTIONS

FOOD AND DIET

1 Statements

Explain the following statements:

a Healthy food doesn't exist.

b Eggs are better for body-building than bread.

c Somebody from 14 years uses more energy in rest than somebody from 45 years.

2 Olga eats apples

a What mass of apples does Olga (13 years old) have to eat in a day to just satisfy her energy needs? Include your calculation in your answer.

b Why can't Olga live by only eating apples, although it may cover her daily energy needs?

3 What did you learn?

a Mark the next statements with true or false. Don't know is also an option.

true	false	don't know	
❑	❑	❑	When it is cold I should eat more.
❑	❑	❑	Fatty food gives me more energy then the food containing less fat.
❑	❑	❑	I can't hardly influence which food will be on my plate.
❑	❑	❑	If I eat an apple, the substances of it can reach all cells of my body.
❑	❑	❑	Natural food is always healthy.
❑	❑	❑	Radioactive Cs leaves my body by urine.
❑	❑	❑	I can obtain energy from fat for work and sport.
❑	❑	❑	Mushroom contain vitamins.

b Compare your answers with those you have given in the beginning. Explain the difference.

QUESTIONS

CYCLES

4 Building up a food cycle

a Set up your own cycle. Make a drawing here of your own cycle.

b Write down the names of the organism under your drawing.

c Mark at every organism if the organism is a producer, consumer or decomposer.

d Explain what will happen if you removed the producers from the cycle you draw.

5 Missing organism

Fill in the missing organism in each of the following cycles:

a mushroom ? ? ? human
b grass ? deer ? ?
c cabbage ? ? ? fox

d Add the decomposers in any row above.

6 Food chain with human

The following is a food chain that ends with the human:

plant ? bee ? human

a Explain how plants provide food for bees.

b Explain how bees provide food for humans.

c How does this chain differ from the ones in the previous question?

7 Food web

This question is about the food web in picture 3.

a How many food chains can you see in this picture?

b Write the food chains out separately.

c Suppose all fox and owl are destroyed. Explain for all the other organisms in the web what would happen with the number of them.

d A food chain is more easily destroyed than a food web. Why? Use picture 3 to illustrate your answer.

8 On the farm

On the farm of Vladimir the eggs are found to be radioactive, as the chickens. Also the soil were the water from the radioactive roof falls down is radioactive.

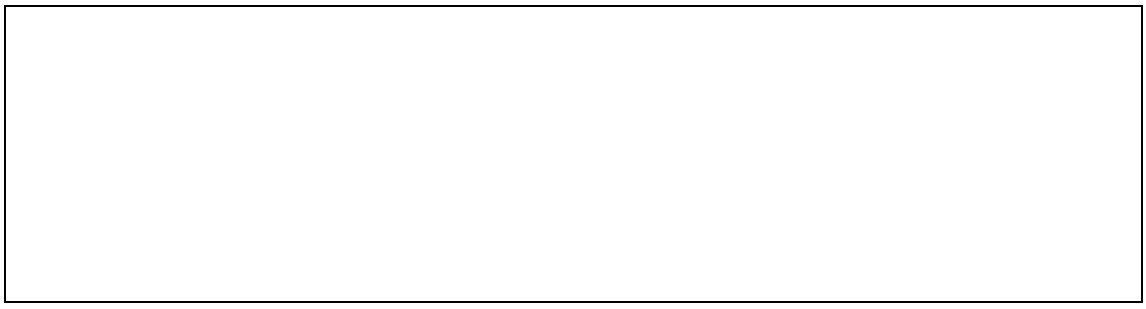
a Draw a food chain with chickens, eggs, children of the farmer and the grains the chicken eat from the soil in the gutter where the roof waters down.

b Give with red dots the way the radioactive material goes through this food chain.

c Try to make a cycle out of it. Add wheat and decomposers in your drawing.

d How will the radioactivity goes here in the cycle? Make red dots again.

e What would farmer Vladimir do to diminish the cycling of radioactive materials?



9 What did you learn?

a Mark the next statements with true or false. Don't know is also an option.

true	false	don't know	
❑	❑	❑	Plants can make their own food.
❑	❑	❑	Mushrooms don't need food.
❑	❑	❑	If a chicken eat contaminated food, her eggs become contaminated too.
❑	❑	❑	Radioactive elements can enter a food cycle.
❑	❑	❑	Bacteria play an important role in the food cycle.
❑	❑	❑	A food web is a diagram summarising who feeds on what.
❑	❑	❑	By playing in the forest we can be contaminated by radioactive elements.
❑	❑	❑	Grass contains energy.

b Compare your answers with those you have given in the beginning. Explain the difference.

10 Your opinion

What did you like, what didn't you like in our lesson? What are your thoughts?

FRONT-PAGES

Sentences for in the balloons front-page FOOD AND DIET

I only need food
to avoid being hungry.

Food can only be
digested in my stomach.

Now, it's your turn!
Mark the next statements
with true or false.
Don't know is also an option.

true	false	don't know	
❑	❑	❑	When it is cold I should eat more.
❑	❑	❑	Fatty food gives me more energy then the food containing less fat.
❑	❑	❑	I can't hardly influence which food will be on my plate.
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❑	❑	❑	Mushroom contain vitamins.

Sentences for in the balloons front-page CYCLES

Humans don't play
any role in a food cycle.

A cycle goes round and round.

Now, it's your turn!
Mark the next statements
with true or false.
Don't know is also an option.

true	false	don't know	
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