



## Proteins, carbohydrates, fats

- [Proteins, carbohydrates, fats](#)
- [Lesson plan \(English\)](#)
- [Lesson plan \(Polish\)](#)



## Proteins, carbohydrates, fats

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### Before you start you should know

- human is a heterotrophic organism;
- nourishment means absorbing nutrients which are a building material, an energy source and a reserve supply.

### You will learn

- to talk about types, significance and sources of nutrients;
- to present the functions of fiber;
- to describe the functions of complete and incomplete proteins in the correct functioning of our organism;
- to justify the necessity for eating fruit and vegetables regularly;
- to plan and conduct experiments that allow to detect proteins, sugars, fats that are in food and interpret the results of these experiments.

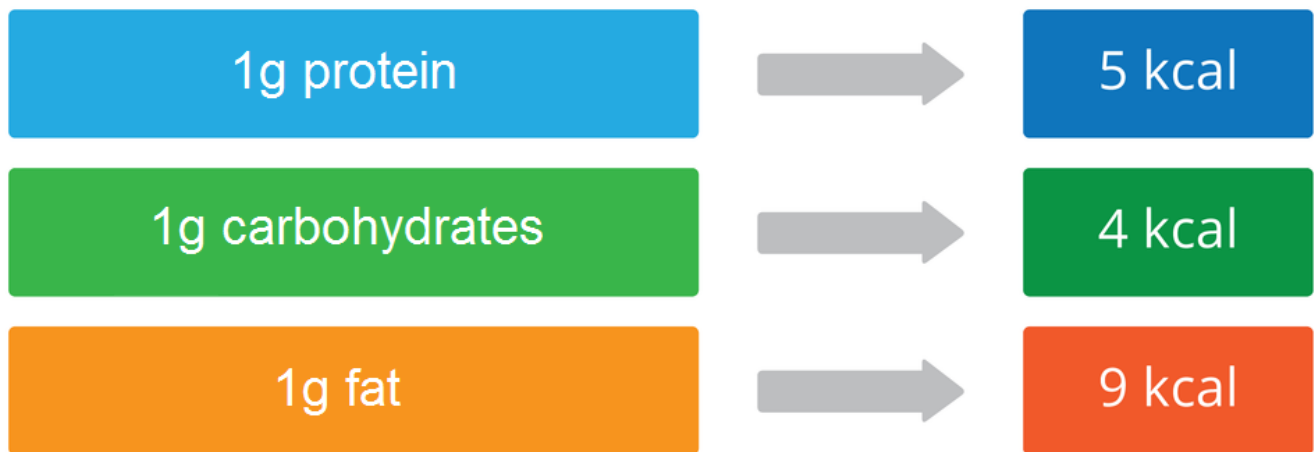
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Nagranie dźwiękowe abstraktu

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## Proteins

For organisms to be able to fulfill all vital functions, maintain (or increase) their mass and reproduce, they need various substances. The most important are organic compounds: proteins, sugars, fats, vitamins, and inorganic compounds – water and mineral salts.



Energy value of nutrients

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Proteins are absorbed with food and used mainly to build the organism. They constantly renew used cell elements, they are an ingredient of various secretions of the cells, and in childhood and puberty they create new cells, allowing our organism to grow and develop. In addition, they may be used as an energy ingredient, but this happens rarely (e.g. in periods of hunger) and leads to, e.g. muscle atrophy. Other functions of proteins are presented in the table.

Functions of proteins	Examples of proteins and their functions
building	actin, myosin – ingredients of muscle cells
ingredients of cell membranes, hair, nails, bones	keratin, collagen – ingredients of skin
enzymatic	pepsin – digesting proteins
digestion of other ingredients of food	other digestive enzymes
immunological	antibodies – fight against bacteria and viruses
transport	hemoglobin – it transports oxygen and carbon dioxide
hormonal	insulin – it increases the transport of sugar from the blood to the cells
receptive	rhodopsin – reacting to light
receiving other stimuli	other receptive proteins

In the digestive tract, plant proteins and animal proteins are digested into amino acids, from which our body constructs proteins as needed. Part of the 20 amino acids included in proteins can be produced by our body as a result of the digestion of proteins, sugars and

fats. These are **endogenous amino acids**. Other amino acids must be taken from food, as our body cannot create them. These are **exogenous amino acids**.

Valuable proteins that include all the necessary amino acids are present in animal products, such as milk and dairy, in meat and in fish. They are defined as a standard. Seeds of legumes are characterized by high amount of plant proteins, called sub-standard proteins. In case of a plant based diet (vegetarian diet), only a combination of selected plant products that underwent a specific preparation is able to provide our body with all necessary amino acids. Giving up on eating meat may lead to deficiencies of some of them. Without them, specific proteins will not be created, which may cause to inhibit growth, can lead to dystrophy of muscles and of other tissues, to anaemia and decalcification of bones.

The daily amount of protein for an adult is around 1 gram per 1 kilogram of body weight. In people who work physically, pregnant women, children and teenagers who are still growing, the amount is twice as high.

### Task 1

Explain why pregnant women should increase the amount of proteins they consume.

## Carbohydrates (sugars)

The main source of carbohydrates are mainly products of plant origin and, to smaller extent, products of animal origin. By eating them, we provide our body mainly with:

- polysaccharides, like **starch** – plant spare sugar, **glycogen** – animal spare sugar;
- disaccharides, like sucrose – sugar in fruit, cereals, available in crystal sugar form or powdered form; lactose – sugar in milk and dairy;
- monosaccharides, such as fructose – fruit sugar.

Polysaccharides and disaccharides in the digestive tract are digested by digestive enzymes until they become monosaccharides, from which **glucose** has the most important role. It is the main source of energy used by cells. Some time after eating, its concentration in blood increases, and as the digestion progresses, it is maintained at a rather even level. It gives us the sense of satiety.

Glucose present, for example, in sweets, malt sugar and jams does not require digestion, meaning it enters the bloodstream really quick. Glucose is the product of digestion of starch, e.g. in wholemeal bread, is gradually released into the blood and, for some time, it stays at a certain level. When glucose level in the blood drops, we feel the urge to eat. In case of eating sweets, we start feeling hungry shortly after we finish eating. This may be the cause of eating more portions of food and can lead to obesity.

If monosaccharides are not used as a source of energy (e.g. during physical exercises or intense mental work), their excess is partially stored in the liver and muscles as a spare sugar **glycogen**. The rest is transformed into fat and, in that form, is stored in fat cells, e.g. in the subcutaneous fat tissue.

The most popular source of polysaccharides of plant origins are potatoes and cereals: wheat, rye, barley, oat, corn and rice. Flour used to bake bread and make pasta (as well as rice) is very often purified, that is made from grains that lack tegument. Such flour is white, just like the bread we get from it. Bleaching flour deprives it of B group vitamins, calcium, phosphorus, iron and fiber. **Fiber** includes cellulose (polysaccharide constructing cell walls in plants), which is not digested by human digestive tract. Fiber does not have any nutrients or energy values. However, it has a great health significance, because it speeds up the movement of the food content in the intestine, prevents constipation and colon cancer. It expands inside the stomach and gives you the feeling of satiety, it binds the surplus of hydrochloric acid and lowers the level of cholesterol. It is present in large amounts in cereals, fruit and vegetables. This is why we should eat wholemeal bread and pasta, dark rice and fruit with peel on (which is rich in fiber).

The type and amount of carbohydrates we eat has an important influence on our health. Too much of them can lead to caries, obesity and diabetes. Caring for the correct condition of our body, we should limit the use of sucrose available mainly in form of sugar and sweets. Young people and adults should consume carbohydrates in the amount of 3-4 grams per kilogram of body weight a day, depending on their activity. In addition, they should consume 30-50 grams of fibers.

## Task 2

Prove and give 2 arguments why eating food rich in fiber prevents obesity.

## Experiment 1

Detecting starch in food.

### You will need

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- iodine,
- dropping pipette,
- potato starch, a slice of raw potato, a slice of raw cucumber, apple, a piece of cottage cheese, a slice of banana, a hot dog sausage,
- 1 big plate with separated samples.

### Instruction

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1. Check the result of the reaction between iodine and starch. Add a drop of iodine to potato starch (substance which we know for sure that consists mainly of starch). As a result of the reaction with starch, brown-reddish iodine turns dark blue.
2. Put a drop of iodine into each of the remaining products and observe the colour.

### Summary

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If iodine changes colour from brown to dark blue, this means the product we are testing has starch in it.

## Observation 1

To assess how bran behaves in contact with water.

### You will need

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- water at 37°C,
- 50 ml of rye bran, wheat bran and oat bran,
- 3 beakers with the capacity of 200 ml,
- 3 dishes with water, with the capacity of 50 ml.

### Instruction

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1. Put bran into the beakers. Mark the level where the bran reaches to.
2. Pour equal amount of warm water (50 ml) into all the bran beakers at the same time.
3. Put the beakers aside for 20 minutes.
4. After this time, mark the level where the bran reaches to.
5. Observe, which beaker absorbed most water.

### Summary

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The main ingredient of bran is fiber, which soaks water and swells.

## Fats

Fats provide twice as much energy than sugars, which is why they are the energy reserve of our body used mainly during an intense physical effort. Besides this, they are the ingredient of biological membranes, hormones (e.g. sex hormones) and facilitate the absorption of vitamins A, D, E and K. They are also stored in the subcutaneous fat tissue where they form insulating layer, and by covering certain internal organs (e.g. kidneys), they protect them from injuries and impact. We eat fats in form of fats defined as hard fats (butter, margarine), oils (e.g. sunflower seed oil, rapeseed oil), and together with fried foods, e.g. scrambled eggs, fries and chips.

Simplifying it, we can say that a fat particle consists of **glycerol** and 3 molecules of **fatty acids**. The nutrient value of fats is decided by the amount and type of fatty acids. The most beneficial fats for our health found in seawater fish and plants are rich in fatty acids defined as unsaturated. Unsaturated fatty acids lower the level of **cholesterol** in the blood, lessening the risk of arteriosclerosis. The most important are the unsaturated fatty acids omega-6, present in plant oils, as well as omega-3, present in fish. Those acids help the nervous system to develop, which is why they should be an important element of a child's diet. They also facilitate wound healing and lower blood pressure.

Pork, mutton and beef fats contain **saturated fatty acids**, which can increase the level of cholesterol. You need to remember that cholesterol has also beneficial functions in our body – it is the component of the casing of neural protrusions, bile, vitamin D and some hormones. Surplus of this compound is stored in the walls of the blood vessels, which makes them more and more narrow and restrict blood flow.

**Trans fatty acids** are dangerous for our health. They can be found in hardened fats (e.g. margarine) used in frying and baking. Those acids cause the arteriosclerosis to develop, they are the cause of embolisms in blood vessels and heart attacks. Even beneficial vegetable oils, after undergoing incorrect or too long (sometimes repeated) heat treatment, are transformed and release harmful fatty acids. Because of that, we should eliminate from our daily diet fast food (chips, fries, fried food) and substitute them with boiled or steamed products. An adult human being needs around 1 gram of fat per 1 kilogram of body weight. This amount is smaller in children and elderly people and higher in people who have physically demanding jobs.



## Experiment 2

Detecting fats in food.

### You will need

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- tissue paper discs or paper tissues,
- potato masher or hammer,
- vegetable oil, sunflower seeds, nuts, flaxseed,
- dropping pipette.

### Instruction

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1. Check, whether the fat leaves an oily stain on the tissue paper (a stain that does not dry). Put a drop of oil onto the paper and observe the stain that is created.
2. Between pieces of tissue paper put separately: sunflower seeds, flax seed, a piece of a nut without a shell. Crush them in a way that does not damage the tissue paper.
3. After 2-3 minutes throw away the crushed samples and observe how the tissue paper looks like. Compare this tissue paper with the one with oil on it.

### Summary

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If they leave fat stains, this means they included fats.

Comestible products (100 g)	Protein	Carbohydrates	Fats	Fibres
soy	35,9	15,8	18,3	15,7
Pasmesan cheese	35,6		25,8	

Comestible products (100 g)	Protein	Carbohydrates	Fats	Fibres
Emmentaler cheese	28,7	0,2	29,7	4,6
lean pork	21,8		2,4	
tuna	21,5		15,5	
beef	20,6		8,1	
turkey	20,6		6,9	
trout	19,5		2,7	
chicken	18		18,8	
cream cheese	16,8	13	4,2	
semi-skimmed curd cheese	13,5	4	0,2	
wholemeal pasta	12,6	59,9	3,6	3,5
buckwheat	12,6	70,1	3,1	5,9
chicken eggs	12,5	1	10,5	
prunes	4,9	70,8	0,9	16
mushroom	2,7	0,7	0,3	1,9
spinach	2,5	0,6	0,3	1,8

### Exercise 1

Select the nutrients that can be found in seawater fish meat in high amounts.

- protein
- carbohydrates
- unsaturated fatty acids
- saturated fatty acids

### Exercise 2

Select the nutrients that provide most energy to the body.

- proteins
- carbohydrates
- fats
- fibre

### Exercise 3

Nutrients introduced into the body

- must be divided into smaller particles
- should connect with each other before digestion
- immediately reach the cells

### Exercise 4

Proteins

- are ingredients of muscle cells
- are digesting proteins (pepsin)
- are composed of glycerol and fatty acids
- are a component of ATP

### Exercise 5

Backup sugar in our body is

- amino acid
- fatty acid
- glucose
- glycogen

## Summary

- Nutrients are organic compounds: proteins, sugars, fats, vitamins, and inorganic compounds – water and mineral salts.
- Elements that provide energy are: sugars, fats and proteins (in extreme situations).
- Building elements are: proteins, fats, mineral salts and water.
- A healthy diet should be balanced and it should include, among other things, vegetable fats which are rich in unsaturated fatty acids.
- Food that comes from animals provides us with exogenic amino acids.

### Homework

### Task 3.1

Present 3 arguments that confirm the thesis that every day diet should be rich in vegetables and fruit.

## Keywords

proteins, carbohydrates, fats

## Glossary

### exogenous amino acids

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Nagranie dźwiękowe słówka

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**aminokwasy egzogenne** – aminokwasy, których organizm nie potrafi wytworzyć i musi je przyjmować z pokarmem w postaci gotowej do wykorzystania

### endogenous amino acids

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Nagranie dźwiękowe słówka

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**aminokwasy endogenne** – aminokwasy, które organizm wytwarza z dostarczonych mu składników pokarmowych

### fiber

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Nagranie dźwiękowe słówka

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**błonnik** – zespół substancji pochodzenia roślinnego, zawierający m.in. celulozę, regulujący procesy trawienne

## cholesterol

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Nagranie dźwiękowe słówka

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**cholesterol** – składnik błon komórkowych, osłonek mielinowych nerwów; powstają z niego niektóre hormony; może odkładać się w naczyniach krwionośnych i wywoływać miażdżycę

## glycerol

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Nagranie dźwiękowe słówka

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**glicerol** – związek organiczny, który może przyłączyć kwasy tłuszczowe i wraz z nimi utworzyć cząsteczkę tłuszczu; jego popularna nazwa to gliceryna

## glycogen

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Nagranie dźwiękowe słówka

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**glikogen** – wielocukier zapasowy zwierząt; jest gromadzony w wątrobie i mięśniach

## fatty acids

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Nagranie dźwiękowe słówka

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**kwasy tłuszczowe** – związki organiczne, w skład których wchodzi m.in. łańcuchy węglowodorów; w reakcji z glicerolem tworzą tłuszcze; w komórkach pełnią funkcję energetyczną i zapasową

## starch

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Nagranie dźwiękowe słówka

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**skrobia** – wielocukier zapasowy gromadzony przez rośliny

**vitamins**

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Nagranie dźwiękowe słówka

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**witaminy** – związki organiczne, które pełnią w organizmie funkcję regulacyjną

# Lesson plan (English)

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**Topic:** Proteins, carbohydrates, fats

**Author:** Elżbieta Szedzianis

**Target group**

7th grade students of an eight-year elementary school (new core curriculum)

**Core curriculum**

Cele kształcenia – wymagania ogólne

II. Planowanie i przeprowadzanie obserwacji oraz doświadczeń; wnioskowanie w oparciu o ich wyniki. Uczeń:

1. określa problem badawczy, formułuje hipotezy, planuje i przeprowadza oraz dokumentuje obserwacje i proste doświadczenia biologiczne;
2. określa warunki doświadczenia, rozróżnia próbę kontrolną i badawczą;
3. analizuje wyniki i formułuje wnioski;

III. Posługiwanie się informacjami pochodzącymi z analizy materiałów źródłowych. Uczeń:

1. wykorzystuje różnorodne źródła i metody pozyskiwania informacji;

IV. Rozumowanie i zastosowanie nabytej wiedzy do rozwiązywania problemów biologicznych. Uczeń:

1. interpretuje informacje i wyjaśnia zależności przyczynowo-skutkowe między zjawiskami, formułuje wnioski;
2. przedstawia opinie i argumenty związane z omawianymi zagadnieniami biologicznymi.

V. Znajomość uwarunkowań zdrowia człowieka. Uczeń:

1. analizuje związek między własnym postępowaniem a zachowaniem zdrowia oraz rozpoznaje sytuacje wymagające konsultacji lekarskiej;

Treści nauczania – wymagania szczegółowe

III. Organizm człowieka.

4. Układ pokarmowy i odżywianie się. Uczeń:

3) przedstawia źródła i wyjaśnia znaczenie składników pokarmowych (białka, cukry, tłuszcze, witaminy, sole mineralne i woda) dla prawidłowego funkcjonowania organizmu oraz planuje i przeprowadza doświadczenie wykrywające obecność wybranych składników pokarmowych w produktach spożywczych;

5) analizuje skutki niedoboru niektórych witamin (A, D, K, C, B6, B12) i składników mineralnych (Mg, Fe, Ca) w organizmie oraz skutki niewłaściwej suplementacji witamin i składników mineralnych;

6) wyjaśnia rolę błonnika w funkcjonowaniu układu pokarmowego oraz uzasadnia konieczność systematycznego spożywania owoców i warzyw;

### **Lesson plan overview (Process)**

The students list sources of proteins, carbohydrates and fats and describe the meaning of these nutrients for the body.

### **Key Success Criteria**

- you will present food that has high amounts of proteins, carbohydrates and fats;
- you will describe the functions of proteins, carbohydrates and fats in the body,
- you will explain the stages of experiments that aim at detecting the presence of starch and proteins in food.

### **Key Competences**

- communicating in the mother tongue;
- communicating in a foreign language;
- mathematical competence and basic competences in science and technology;
- digital competence;
- learning to learn;
- social and civic competences.

### **Methods/Forms of work**

Interception strategy, JIGSAW method, presentation, a talk, 'tell your neighbour' method.

Individual work, work in pairs and work in groups.

### **Teaching measures**

- abstract;
- interactive or traditional whiteboard;
- tablets/computers;
- iodine;
- dropping pipette;



- potato starch;
- slices of raw potato, banana, cucumber and apple;
- a piece of cottage cheese;
- a hot dog sausage;
- 1 big plate with separated samples.

### **Before the lesson**

Before the lesson the teacher divides students into three groups at random. Each group receives a different nutrient to describe according to the abstract: proteins, carbohydrates or fats.

The students work on their topic answering the following questions:

- Which food have proteins/carbohydrates/fats?
- What simpler substances are created from proteins/carbohydrates/fats during digestion?
- What significance do proteins/carbohydrates/fats have to our body?
- How can you detect proteins/carbohydrates/fats?

### **Lesson plan overview (Process)**

#### **Introduction**

1. The teacher explains how the students will gain knowledge during this lesson. He encourages the students to look through their notes that were prepared before classes.
2. The teacher tells the topic of the lessons, defines the purpose of the course using simple language and shows students the criteria for success.

#### **Realization**

3. The teacher asks the students to create 5 groups of 6 people, and that each team should include 2 students who worked on proteins, 2 students who worked on carbohydrates and 2 students who worked on fats. The students exchange information on each nutrient, and then they go back to their original groups and compare the knowledge they have gained.
4. The students individually complete the interactive exercise. Working in pairs, they talk about the correct answers.
5. The teacher shows the interactive illustration that presents the models of chemical compounds. He asks the students to point to carbohydrates, proteins and fats, and to explain their choices.
6. Volunteers, in front of the class, conduct an experiment that is aimed at detecting the presence of starch in foods ("Experiment 1"). They comment on their actions and their results.

7. The teacher shows a movie titled "Detection of proteins". Volunteers describe the presented experiment and talk about the results.
8. The students analyze a table that presents average amount of nutrients in selected foods. They select foods that have high amounts of proteins, fats and carbohydrates.

## Summary

9. The teacher asks the students whether they agree with the common opinion that eating fatty foods and products with high amount of carbohydrates facilitates obesity. He asks the students to justify their answers.
10. The teacher asks the students to use the method "Tell your neighbour" and to share their opinions on the most interesting information during this class with their neighbour.

## Homework

Look for information about 3 enzymes and briefly describe them.

## The following terms and recordings will be used during this lesson

### Terms

**exogenous amino acids**

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Nagranie dźwiękowe słówka

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**aminokwasy egzogenne** – aminokwasy, których organizm nie potrafi wytworzyć i musi je przyjmować z pokarmem w postaci gotowej do wykorzystania

**endogenous amino acids**

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**fiber**

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Nagranie dźwiękowe słówka

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**blonnik** – zespół substancji pochodzenia roślinnego, zawierający m.in. celulozę, regulujący procesy trawienne

**cholesterol**

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Nagranie dźwiękowe słówka

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**glycerol**

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Nagranie dźwiękowe słówka

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**glycogen**

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Nagranie dźwiękowe słówka

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**fatty acids**

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Nagranie dźwiękowe słówka

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**starch**

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Nagranie dźwiękowe słówka

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**vitamins**

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Nagranie dźwiękowe słówka

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## Texts and recordings

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Nagranie dźwiękowe abstraktu

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### Proteins, carbohydrates, fats

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Proteins are absorbed with food and used mainly to build the organism. They constantly renew used cell elements, they are an ingredient of various secretions of the cells, and in childhood and puberty they create new cells, allowing our organism to grow and develop. In addition, they may be used as an energy ingredient, but this happens rarely (e.g. in periods of hunger) and leads to, e.g. muscle atrophy. Other functions of proteins are presented in the table.

In the digestive tract, plant proteins and animal proteins are digested into amino acids, from which our body constructs proteins as needed. Part of the 20 amino acids included in proteins can be produced by our body as a result of the digestion of proteins, sugars and

fats. These are endogenous amino acids. Other amino acids must be taken from food, as our body cannot create them. These are exogenous amino acids.

Valuable proteins that include all the necessary amino acids are present in animal products, such as milk and dairy, in meat and in fish. They are defined as a standard. Seeds of legumes are characterized by high amount of plant proteins, called sub-standard proteins. In case of a plant based diet (vegetarian diet), only a combination of selected plant products that underwent a specific preparation is able to provide our body with all necessary amino acids. Giving up on eating meat may lead to deficiencies of some of them. Without them, specific proteins will not be created, which may cause to inhibit growth, can lead to dystrophy of muscles and of other tissues, to anaemia and decalcification of bones.

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The main source of carbohydrates are mainly products of plant origin and, to smaller extent, products of animal origin. By eating them, we provide our body mainly with:

- polysaccharides, like starch – plant spare sugar, glycogen – animal spare sugar;
- disaccharides, like sucrose – sugar in fruit, cereals, available in crystal sugar form or powdered form; lactose – sugar in milk and dairy;
- monosaccharides, such as fructose – fruit sugar.

Polysaccharides and disaccharides in the digestive tract are digested by digestive enzymes until they become monosaccharides, from which **glucose** has the most important role. It is the main source of energy used by cells. Some time after eating, its concentration in blood increases, and as the digestion progresses, it is maintained at a rather even level. It gives us the sense of satiety.

Glucose present, for example, in sweets, malt sugar and jams does not require digestion, meaning it enters the bloodstream really quick. Glucose is the product of digestion of starch, e.g. in wholemeal bread, is gradually released into the blood and, for some time, it stays at a certain level. When glucose level in the blood drops, we feel the urge to eat. In case of eating sweets, we start feeling hungry shortly after we finish eating. This may be the cause of eating more portions of food and can lead to obesity.

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The most popular source of polysaccharides of plant origins are potatoes and cereals: wheat, rye, barley, oat, corn and rice. Flour used to bake bread and make pasta (as well as rice) is very often purified, that is made from grains that lack tegument. Such flour is white, just like

the bread we get from it. Bleaching flour deprives it of B group vitamins, calcium, phosphorus, iron and fiber. Fiber includes cellulose (polysaccharide constructing cell walls in plants), which is not digested by human digestive tract. Fiber does not have any nutrients or energy values. However, it has a great health significance, because it speeds up the movement of the food content in the intestine, prevents constipation and colon cancer. It expands inside the stomach and gives you the feeling of satiety, it binds the surplus of hydrochloric acid and lowers the level of cholesterol. It is present in large amounts in cereals, fruit and vegetables. This is why we should eat wholemeal bread and pasta, dark rice and fruit with peel on (which is rich in fiber).

The type and amount of carbohydrates we eat has an important influence on our health. Too much of them can lead to caries, obesity and diabetes. Caring for the correct condition of our body, we should limit the use of sucrose available mainly in form of sugar and sweets. Young people and adults should consume carbohydrates in the amount of 3-4 grams per kilogram of body weight a day, depending on their activity. In addition, they should consume 30-50 grams of fibers.

Fats provide twice as much energy than sugars, which is why they are the energy reserve of our body used mainly during an intense physical effort. Besides this, they are the ingredient of biological membranes, hormones (e.g. sex hormones) and facilitate the absorption of vitamins A, D, E and K. They are also stored in the subcutaneous fat tissue where they form insulating layer, and by covering certain internal organs (e.g. kidneys), they protect them from injuries and impact. We eat fats in form of fats defined as hard fats (butter, margarine), oils (e.g. sunflower seed oil, rape seed oil), and together with fried foods, e.g. scrambled eggs, fries and chips.

Simplifying it, we can say that a fat particle consists of glycerol and 3 molecules of fatty acids. The nutrient value of fats is decided by the amount and type of fatty acids. The most beneficial fats for our health found in seawater fish and plants are rich in fatty acids defined as unsaturated. Unsaturated fatty acids lower the level of cholesterol in the blood, lessening the risk of arteriosclerosis. The most important are the unsaturated fatty acids omega-6, present in plant oils, as well as omega-3, present in fish. Those acids help the nervous system to develop, which is why they should be an important element of a child's diet. They also facilitate wound healing and lower blood pressure.

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**Trans fatty acids** are dangerous for our health. They can be found in hardened fats (e.g. margarine) used in frying and baking. Those acids cause the arteriosclerosis to develop, they are the cause of embolisms in blood vessels and heart attacks. Even beneficial vegetable oils,

after undergoing incorrect or too long (sometimes repeated) heat treatment, are transformed and release harmful fatty acids. Because of that, we should eliminate from our daily diet fast food (chips, fries, fried food) and substitute them with boiled or steamed products. An adult human being needs around 1 gram of fat per 1 kilogram of body weight. This amount is smaller in children and elderly people and higher in people who have physically demanding jobs.

- Nutrients are organic compounds: proteins, sugars, fats, vitamins, and inorganic compounds – water and mineral salts.
- Elements that provide energy are: sugars, fats and proteins (in extreme situations).
- Building elements are: proteins, fats, mineral salts and water.
- A healthy diet should be balanced and it should include, among other things, vegetable fats which are rich in unsaturated fatty acids.
- Food that comes from animals provides us with exogenic amino acids.

# Lesson plan (Polish)

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**Temat:** Białka, węglowodany, tłuszcze

**Autor:** Elżbieta Szedzianis

**Adresat**

Uczeń klasy VII szkoły podstawowej.

**Podstawa programowa**

Cele kształcenia – wymagania ogólne

II. Planowanie i przeprowadzanie obserwacji oraz doświadczeń; wnioskowanie w oparciu o ich wyniki. Uczeń:

1. określa problem badawczy, formułuje hipotezy, planuje i przeprowadza oraz dokumentuje obserwacje i proste doświadczenia biologiczne;
2. określa warunki doświadczenia, rozróżnia próbę kontrolną i badawczą;
3. analizuje wyniki i formułuje wnioski;

III. Posługiwanie się informacjami pochodzącymi z analizy materiałów źródłowych. Uczeń:

1. wykorzystuje różnorodne źródła i metody pozyskiwania informacji;

IV. Rozumowanie i zastosowanie nabytej wiedzy do rozwiązywania problemów biologicznych. Uczeń:

1. interpretuje informacje i wyjaśnia zależności przyczynowo-skutkowe między zjawiskami, formułuje wnioski;
2. przedstawia opinie i argumenty związane z omawianymi zagadnieniami biologicznymi.

V. Znajomość uwarunkowań zdrowia człowieka. Uczeń:

1. analizuje związek między własnym postępowaniem a zachowaniem zdrowia oraz rozpoznaje sytuacje wymagające konsultacji lekarskiej;

Treści nauczania – wymagania szczegółowe

III. Organizm człowieka.

4. Układ pokarmowy i odżywianie się. Uczeń:



3) przedstawia źródła i wyjaśnia znaczenie składników pokarmowych (białka, cukry, tłuszcze, witaminy, sole mineralne i woda) dla prawidłowego funkcjonowania organizmu oraz planuje i przeprowadza doświadczenie wykrywające obecność wybranych składników pokarmowych w produktach spożywczych;

5) analizuje skutki niedoboru niektórych witamin (A, D, K, C, B6, B12) i składników mineralnych (Mg, Fe, Ca) w organizmie oraz skutki niewłaściwej suplementacji witamin i składników mineralnych;

6) wyjaśnia rolę błonnika w funkcjonowaniu układu pokarmowego oraz uzasadnia konieczność systematycznego spożywania owoców i warzyw;

## **Cel lekcji**

Uczniowie wymieniają źródła białek, węglowodanów i tłuszczów oraz opisują znaczenie tych składników pokarmowych dla organizmu.

## **Kryteria sukcesu**

- przedstawisz produkty spożywcze, które zawierają duże ilości białek, węglowodanów i tłuszczów;
- opisziesz funkcje białek, węglowodanów i tłuszczów w organizmie,
- omówisz przebieg doświadczeń mających na celu wykrycie obecności skrobi i białek w produktach spożywczych.

## **Kompetencje kluczowe**

- porozumiewanie się w języku ojczystym;
- porozumiewanie się w językach obcych;
- kompetencje matematyczne i podstawowe kompetencje naukowo-techniczne;
- kompetencje informatyczne;
- umiejętność uczenia się;
- kompetencje społeczne i obywatelskie.

## **Metody/formy pracy**

Strategia wyprzedzająca, metoda „JIGSAW”, pokaz, pogadanka, metoda „Powiedz sąsiadowi”.

Praca indywidualna, praca w parach oraz praca w grupach.

## **Środki dydaktyczne**

- abstrakt;
- tablica interaktywna lub tradycyjna;
- tablety/komputery;
- jodyna;

- zakraplacz;
- mąka ziemniaczana;
- plasterki surowego ziemniaka, banana, ogórka i jabłka;
- kawałek sera białego;
- parówka;
- 1 duży talerz z ułożonymi oddzielnie próbkami.

## **Przed lekcją**

Przed zajęciami nauczyciel w sposób losowy dzieli uczniów na trzy grupy. Każdej przydziela do opracowania na podstawie abstraktu inny rodzaj składników pokarmowych: białka, węglowodany lub tłuszcze.

Uczniowie opracowują swój temat, odpowiadając na pytania:

- Jakie produkty spożywcze zawierają białka/ węglowodany/ tłuszcze?
- Jakie substancje prostsze powstają z białek/ węglowodanów/ tłuszczów w wyniku trawienia?
- Jakie znaczenie mają dla organizmu białka/ węglowodany/ tłuszcze ?
- Jak się wykrywa białka/ węglowodany/ tłuszcze?

## **Fazy lekcji**

### **Wstępna**

1. Nauczyciel przedstawia sposób zdobywania wiedzy przez uczniów podczas lekcji. Zachęca ich do przejrzenia swoich notatek sporządzonych przed zajęciami.
2. Nauczyciel podaje temat i cel lekcji w języku zrozumiałym dla ucznia oraz wyświetla kryteria sukcesu.

### **Realizacyjna**

1. Nauczyciel prosi uczniów, żeby utworzyli pięć sześćosobowych zespołów, przy czym w każdym powinno się znaleźć dwóch uczniów z grupy opracowującej zagadnienie białek, dwóch uczniów z grupy opracowującej zagadnienie węglowodanów i dwóch uczniów z grupy opracowującej zagadnienie tłuszczów. Uczniowie wymieniają się informacjami na temat poszczególnych składników pokarmowych, a następnie wracają do swoich pierwotnych grup i porównują zdobytą wiedzę.
2. Uczniowie samodzielnie wykonują ćwiczenia interaktywne. Pracując w parach, omawiają poprawne rozwiązania.
3. Nauczyciel prezentuje ilustrację interaktywną przedstawiającą modele związków chemicznych. Prosi podopiecznych, żeby wskazali węglowodany, białka i tłuszcze oraz wyjaśnili swoje wybory.
4. Ochotnicy na forum klasy przeprowadzają doświadczenie, mające na celu wykrycie obecności skrobi w produktach spożywczych („Doświadczenie 1”). Komentują swoje

czynności i wyniki.

5. Nauczyciel wyświetla film pt. „Wykrywanie białka”. Ochotnicy opisują przebieg przedstawionego doświadczenia i omawiają wnioski.
6. Uczniowie analizują tabelę prezentującą przeciętną zawartość składników pokarmowych w wybranych produktach spożywczych. Wskazują pokarmy zawierające duże ilości białek, tłuszczów i węglowodanów.

### Podsumowująca

1. Nauczyciel pyta uczniów, czy zgadzają się z powszechną opinią, że spożywanie tłustych pokarmów i produktów, które zawierają dużą ilość węglowodanów, sprzyja otyłości. Prosi o uzasadnienie odpowiedzi.
2. Nauczyciel poleca uczniom, żeby zastosowali metodę „Powiedz sąsiadowi” i podzielili się z najbliższymi kolegami refleksją na temat najciekawszych dla nich informacji, z którymi zapoznali się w czasie zajęć.

### Praca domowa

Poszukaj informacji o 3 enzymach i krótko je opisz.

### Słownictwo

## W tej lekcji zostaną użyte m.in. następujące pojęcia oraz nagrania

### Pojęcia

**exogenous amino acids**

[Nagranie dostępne na portalu epodreczniki.pl](#)

Nagranie dźwiękowe słówka

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**aminokwasy egzogenne** – aminokwasy, których organizm nie potrafi wytworzyć i musi je przyjmować z pokarmem w postaci gotowej do wykorzystania

**endogenous amino acids**

[Nagranie dostępne na portalu epodreczniki.pl](#)

Nagranie dźwiękowe słówka

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**aminokwasy endogenne** – aminokwasy, które organizm wytwarza z dostarczonych mu składników pokarmowych

**fiber**

[Nagranie dostępne na portalu epodreczniki.pl](#)

Nagranie dźwiękowe słówka

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**błonnik** – zespół substancji pochodzenia roślinnego, zawierający m.in. celulozę, regulujący procesy trawienne

**cholesterol**

[Nagranie dostępne na portalu epodreczniki.pl](#)

Nagranie dźwiękowe słówka

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**cholesterol** – składnik błon komórkowych, osłonek mielinowych nerwów; powstają z niego niektóre hormony; może odkładać się w naczyniach krwionośnych i wywoływać miażdżycę

**glycerol**

[Nagranie dostępne na portalu epodreczniki.pl](#)

Nagranie dźwiękowe słówka

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**glicerol** – związek organiczny, który może przyłączyć kwasy tłuszczowe i wraz z nimi utworzyć cząsteczkę tłuszczu; jego popularna nazwa to gliceryna

**glycogen**

[Nagranie dostępne na portalu epodreczniki.pl](#)

Nagranie dźwiękowe słówka

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**glikogen** – wielocukier zapasowy zwierząt; jest gromadzony w wątrobie i mięśniach

**fatty acids**

[Nagranie dostępne na portalu epodreczniki.pl](#)

Nagranie dźwiękowe słowa

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**kwasy tłuszczowe** – związki organiczne, w skład których wchodzi m.in. łańcuchy węglowodorów; w reakcji z glicerolem tworzą tłuszcze; w komórkach pełnią funkcję energetyczną i zapasową

**starch**

[Nagranie dostępne na portalu epodreczniki.pl](#)

Nagranie dźwiękowe słowa

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**skrobia** – wielocukier zapasowy gromadzony przez rośliny

**vitamins**

[Nagranie dostępne na portalu epodreczniki.pl](#)

Nagranie dźwiękowe słowa

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**witaminy** – związki organiczne, które pełnią w organizmie funkcję regulacyjną

## Teksty i nagrania

[Nagranie dostępne na portalu epodreczniki.pl](#)

Nagranie dźwiękowe abstraktu

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### Proteins, carbohydrates, fats

For organisms to be able to fulfill all vital functions, maintain (or increase) their mass and reproduce, they need various substances. The most important are organic compounds: proteins, sugars, fats, vitamins, and inorganic compounds – water and mineral salts.

Proteins are absorbed with food and used mainly to build the organism. They constantly renew used cell elements, they are an ingredient of various secretions of the cells, and in childhood and puberty they create new cells, allowing our organism to grow and develop. In addition, they may be used as an energy ingredient, but this happens rarely (e.g. in periods of hunger) and leads to, e.g. muscle atrophy. Other functions of proteins are presented in the table.

In the digestive tract, plant proteins and animal proteins are digested into amino acids, from which our body constructs proteins as needed. Part of the 20 amino acids included in proteins can be produced by our body as a result of the digestion of proteins, sugars and fats. These are endogenous amino acids. Other amino acids must be taken from food, as our body cannot create them. These are exogenous amino acids.

Valuable proteins that include all the necessary amino acids are present in animal products, such as milk and dairy, in meat and in fish. They are defined as a standard. Seeds of legumes are characterized by high amount of plant proteins, called sub-standard proteins. In case of a plant based diet (vegetarian diet), only a combination of selected plant products that underwent a specific preparation is able to provide our body with all necessary amino acids. Giving up on eating meat may lead to deficiencies of some of them. Without them, specific proteins will not be created, which may cause to inhibit growth, can lead to dystrophy of muscles and of other tissues, to anaemia and decalcification of bones.

The daily amount of protein for an adult is around 1 gram per 1 kilogram of body weight. In people who work physically, pregnant women, children and teenagers who are still growing, the amount is twice as high.

The main source of carbohydrates are mainly products of plant origin and, to smaller extent, products of animal origin. By eating them, we provide our body mainly with:

- polysaccharides, like starch – plant spare sugar, glycogen – animal spare sugar;
- disaccharides, like sucrose – sugar in fruit, cereals, available in crystal sugar form or powdered form; lactose – sugar in milk and dairy;
- monosaccharides, such as fructose – fruit sugar.

Polysaccharides and disaccharides in the digestive tract are digested by digestive enzymes until they become monosaccharides, from which **glucose** has the most important role. It is the main source of energy used by cells. Some time after eating, its concentration in blood increases, and as the digestion progresses, it is maintained at a rather even level. It gives us the sense of satiety.

Glucose present, for example, in sweets, malt sugar and jams does not require digestion, meaning it enters the bloodstream really quick. Glucose is the product of digestion of starch, e.g. in wholemeal bread, is gradually released into the blood and, for some time, it stays at a certain level. When glucose level in the blood drops, we feel the urge to eat. In case of eating sweets, we start feeling hungry shortly after we finish eating. This may be the cause of eating more portions of food and can lead to obesity.

If monosaccharides are not used as a source of energy (e.g. during physical exercises or intense mental work), their excess is partially stored in the liver and muscles as a spare sugar **glycogen**. The rest is transformed into fat and, in that form, is stored in fat cells, e.g. in the subcutaneous fat tissue.

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