METHODS FOR SOLVING PROBLEMS RELATED TO FOOD CHAINS AND ECOLOGICAL PYRAMIDS AND THEIR IMPORTANCE

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Abstract. This article presents various computational problems and exercises, along with methods for solving them and suggestions for exploring topics related to food chains or ecological pyramids. Problem-solving in these areas is closely tied to the degree of mastery of theoretical knowledge. Without the necessary theoretical understanding of food chains or ecological pyramids, students will be unable to independently solve any exercises or problems. Therefore, some essential information required for solving food chain problems is provided in a simplified manner.

Key words: producers, consumers, reductants, autotrophs, heterotrophs.

The degree of mastery of the academic subject is determined not only by theoretical knowledge, but also by the ability to apply the acquired knowledge in different situations. If a student doesn't know how to solve a math problem, it shows that he doesn't know math. Even if he knows all the theorems and laws. Unfortunately, many people do not understand that this also applies to biology. The knowledge acquired by students is not determined by the amount of biological terms that we demand from students, but also by their ability to apply them in problem situations.

and exercises presented in the article are developed in accordance with the current curriculum and work program. The solution of the problems from different areas of biology allows to study biological laws, the correct use of nature's gifts, the biology and ecology of individual animals and plants in depth. The article also briefly describes the conditions, working methods, solutions and gives methodical instructions. Solving problems from biology allows students to strengthen and develop their scientific worldview, logical thinking, and knowledge gained from all biology lessons.

Let's look at the methods of processing problems related to food chains or ecological pyramids.

Issue 1. The ecological pyramid consists of potato, Colorado potato beetle, chittak and lion. If the lion's feed contains 40% lipid, and the amount of energy released from it is 1860 kcal , determine the total mass of organic matter in potatoes (t).

Solution: We write the food chain:

Potatoes - Colorado beetle – Chittak - Lion is 40% lipid

The amount of energy released from the lipid is given. We know that 1 g of fat produces 9.3 kcal of energy. We can determine how much fat produces 1860 kcal of energy:

$$\begin{array}{l} 1 \text{———} 9,3 \\ X \text{———} 1860 \end{array} \quad X=200$$

If the lipid in the lion's body is 200 g and it makes up 40% of the total organic matter, we can determine the total organic matter:

$$\begin{array}{l} 200 \text{———} 40\% \\ X \text{———} 100 \end{array} \quad X=500$$

500 g is the total organic matter in the lion's body, we follow the ecological pyramid rule to determine the substances in potatoes. Potatoes contain 500,000 g, that is , 0.5 tons of organic matter.

Answer: 0.5 t

Issue 2. In the ecological pyramid, the food chain consists of wheat, grasshopper, lizard, white stork and crocodile. The amount of energy separated from the protein in the white stork's body is 8448 kJ and it is 40% of the total organic matter. If 1/3 of the total organic matter in the bird's body is fat, determine the amount of energy released from the carbohydrate in the wheat (kJ).

Solution: If the amount of energy released from the protein in the white stork's body is 8448 kJ, we determine the mass of the protein:

$$\begin{array}{l} 1 \text{ g} \text{———} 17.6 \text{ kj} \\ X \text{———} 8448 \text{ kj} \end{array} \quad X=480\text{g}$$

480 g of protein is 40% of the total organic matter, we determine the mass of the total organic matter:

480 g —— 40% kj
X —— 100 kj X=1200g

1/3 of the total organic matter is lipid, its mass

1200:3=400 g.

to us the mass of protein and fat in the body of the white stork. We determine the mass of the carbohydrate:

1200-(480+400)= 320 g of carbohydrates

The mass of carbohydrates in a wheat plant increases to 320,000 g according to the ecological pyramid rule. We determine the energy released from it:

320 000 *17 .6 =5632000 kJ

Answer: 5632000 kJ

3. According to the rule of the ecological pyramid, the food chain consists of wheat, locusts, grasshoppers, and foxes. 2112 kJ of energy was released from the protein in the rat's body. If protein is 30% of the total organic matter in the body of wheat, determine the total organic matter (kg) in the body of wheat (a). If 40% of the total organic matter in the wheat body is glucose synthesized in the chloroplasts, how much ATF energy (kJ) was expended (b)?

Solution: If the amount of energy released from the protein in the body of the snail is 2112 kJ, we determine the mass of the protein:

1 g—— 17.6 kj
X —— 2112 kj X=120g

If 120 g of protein is 30% of total organic matter, we determine the mass of total organic matter:

120g —— 30%
X —— 100% kj X=400g

A) we find the total organic matter in the body of wheat in kg.

According to the ecological pyramid rule, wheat contains 4000 g, i.e. 40 kg of organic matter.

B) if glucose makes up 40% of the total organic substances in the body of wheat, we determine its mass:

40,000——100%
X —— 40% kj | X=16000

We determine the ATF energy (kJ) produced as a result of photosynthesis. In this process, when one mole of glucose is formed, 18 moles of ATF-720 kJ (18*40) energy is also formed . If 16000 g of glucose is formed, we determine how much ATF is synthesized:

180g —— 8 mol
16000—— X | X=1600 mol

1600 x 40=64000 kJ

Answer: a) 40 kg b) 64000 kJ

Issue 4. In the food chain there are cabbage, white butterfly worm, minnow, wolf. Lipid in the body of the brain makes up 20% of organic substances, and the amount of energy released from it is 7780 kJ. Determine the amount of energy (kcal) released from protein and carbohydrate in the body of the white butterfly worm .

Solution: If the amount of energy released from the lipid in the brain body is 7780 kJ, we determine the mass of the lipid:

1g —— 38.9 kj
X ——7780 kj | X=200 g

If 200 g of lipid is 20% of total organic matter, we determine the mass of total organic matter:

200g —— 20%
1000g —— 100% | X=1000 g

The remaining 80% of organic matter is carbohydrates and proteins. The combined mass of protein and carbohydrate in the white butterfly worm is 8000 g. 1 g of protein and carbohydrate is equal, that is, it produces 4.1 kcal of energy . Let's determine how much energy 8000 g of protein and carbohydrates will produce:

8000x4.1 = 32800 kcal

Answer : 32800 kcal

CONCLUSION

Problems of various forms develop the student's logical thinking, especially to teach students to retain biological concepts in memory, to study science in depth and to apply it in practice. In addition, problems and exercises make the lesson interesting and meaningful.

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