



Экологическая олимпиада
«Формула Единства» / «Третье тысячелетие»
2025–2026 учебный год. Отборочный этап



Задачи для 8–9 классов

Задания должны загружаться в виде единого файла. Файл может быть формата pdf, txt, docx с напечатанным текстом. Рукописные ответы не будут рассматриваться. Последний день сдачи — **24 февраля**.

Вся информация об олимпиаде и инструкция по участию — на странице <https://www.formulo.org/ru/olymp/2025-eco-ru/>.

8.1. "Friends or Rivals?"

A meadow is home to various grasses, including deep-flowered clover and small-flowered dandelions. Adjacent to the meadow is a forest where linden trees and wild berries (e.g., blueberries) grow. The flowers of all these plants are pollinated by both bees and bumblebees.

Question: In your opinion, do the bees and bumblebees in this combined area (meadow and forest) primarily compete for nectar and pollen, or do they complement each other? Choose one option and justify your answer.

In your justification, consider the distinctive biological characteristics of these insects, their pollination strategies, and the diversity of plants in both ecosystems.

8.2. "Secrets of the Plot"

You are presented with a photograph of an old garden plot. Examine it carefully.

Question: What are the two main limiting factors (conditions that restrict life) determining the state of the buildings and the location of the vegetable garden in this picture? Explain your conclusion, using specific examples from the image.



8.3. "Greenhouse Ecology"

Examine the picture of a greenhouse in early spring. It is still cold and cloudy outside, but inside, people create special conditions for the plants.

Question: Identify everything in the picture that helps the plants grow. Create a list where you describe for each item:

1. What problem (a deficiency or an excess) for the plant does it solve?
2. Who is adapting here: the plant, or the human who is modifying the environment?



8.4. "City Trees"

Question: Why do you think trees growing in a city, including those along roads with relatively light traffic, can sometimes grow worse and sometimes better than their counterparts in a forest? Justify your answer.

8.5. "An Incomplete Carboniferous Forest"

Examine the reconstruction of a Carboniferous forest (the Carboniferous period, ~350 million years ago).

In the foreground, giant tree-like lycophytes (Lepidodendron) and horsetails (Calamites) are depicted. A dragonfly with a wingspan of about 70 cm is flying among them.

Question: List other important elements of the Carboniferous period ecosystem that are clearly missing from this reconstruction.



8.6. "A Farmyard as an Ecosystem"

Study the picture carefully. Mutually beneficial relationships between some of these living creatures have developed. They are similar to symbiosis in nature but organized by humans.

Question:

1. Provide as many examples as possible of mutually beneficial relationships in the "animal-animal" or "animal-plant" pairs present in this farmyard.

2. For each pair, explain:

- What does one member of the pair receive from the other (food, protection, a service)?
- What is given in return to the first member?



8.7. "An Environmental Improvement Project"

Question: Analyze the environmental situation in the region where you live (specify the country, region, or locality). Based on the identified local problems, propose a list of specific practical measures. The implementation of these measures should contribute to improving the quality of the environment in your region (for Russia — to achieve the target indicators of the national project "Environmental Well-Being").



Задачи для 10–11 классов

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10.1. "Greenhouse Sustainability Timeline"

The picture shows a greenhouse in early spring. Human creates conditions for plant growth and high yields. Study the picture and answer the following questions:

Question 1: What devices can you see in the drawing? What are their purposes?

1. Identifying Factors: Name the key abiotic factors that must be controlled in such a system to prevent the plants from dying.
2. Assessing Criticality: For each factor you named, estimate (in order of increasing criticality) the approximate time period after which a significant deviation from the norm will lead to irreversible plant death (e.g., minutes, hours, days, weeks).
3. Developing a Protocol: Based on Shelford's Law of Tolerance and your assessments from point 2, develop an emergency protocol for the operator in case of a complex system failure when all parameters begin to deviate simultaneously. Explain the logic behind the priority order of actions you establish.



Question 2: What is the core functional similarity between a greenhouse (operating as an artificial ecosystem) and the Earth's biosphere (functioning as a global system)?

10.2. "Carbon Footprint of a Farmyard: 18th Century vs. 21st Century"

Study the illustration depicting an 18th-century peasant farmyard as an integrated system.

Question 1: Does this type of household produce waste? If yes, does this waste fit the modern definition of waste?

Question 2: Greenhouse Gas Balance: Give a rough estimate of the potential methane (CH_4) and carbon dioxide (CO_2) emissions from this farmyard into the atmosphere (in tonnes of CO_2 equivalent per year)

Question 3: What is the fundamental ecological difference between the carbon balance of such a farmyard and that of a modern industrial livestock complex or crop farming enterprise? State the main reasons for this difference.



10.3. "Snowball Earth"

In the 1960s, Soviet climatologist M.I. Budyko, while analyzing climate models, proposed the "Snowball Earth" hypothesis. According to it, during the Neoproterozoic era (~700 million years ago), the Earth could have been completely covered in ice from the poles to the equator.

Question 1: Stability Mechanism: Explain why such a "Snowball Earth" state is stable. What feedback loops between ice formation and global cooling do you see here?

Question 2: Exit from the Crisis: What geological, biological, and cosmic processes could ultimately have pulled the planet out of this state? Describe the chain of events.

Question 3: Modern Context: What is the key difference between the Neoproterozoic glaciation and the current melting of polar ice, in terms of the direction of the feedback and the role of the anthropogenic factor?

10.4. "The Riddle of the Pine Forest on the Sands"

In Bryansk region there are large deposits of pure quartz sand which is used in the production of crystal. The sand is almost white and lies in a thick layer up to 20 meters deep. A beautiful, light pine forest grows directly on these nutrient-poor sands.

Question: Answer in your own words:

1. What is the source of the nutrients necessary for the trees' life?
2. Why do the pines growing on these sands appear just as healthy as those on more fertile soils?
3. Why in such a well-lit forest grasses and shrubs barely grow?

10.5. "Forest Grazing: Cows vs. Moose"

An experiment on controlled grazing was started in two identical mixed forests (spruce, birch, undergrowth, grass cover), each with an area of 200 hectares. The animal density was the same — 1 individual per 10 hectares (i.e., 20 animals in each forest). Both forests are crossed by a winding stream.

- In the first forest, a herd of 20 cows was grazed.
- In the second forest, 20 moose were released.

After two years, ecologists discovered a significant difference in the ecological state of the two forests.

Question: In your opinion:

1. What do you think the difference was?
2. What is the main cause of the observed changes?
3. In which case did the forest and the stream suffer less damage?

10.6. "The Cost of the Harvest"

A farmer treated a field with insecticides to control pests. The harvest was saved. A week later, all the bees died at a neighboring apiary.

Question: Who is affected more significantly by this environmental problem — the farmer, the beekeeper, or society as a whole? Formulate your answer based on three levels of consequences: economic, ecosystem, and social.

10.7. "An Environmental Improvement Project"

Question: Analyze the environmental situation in the region where you live (specify the country, region, or locality). Based on the identified local problems, propose a list of specific practical measures. The implementation of these measures should contribute to improving the quality of the environment in your region (for Russia — to achieve the target indicators of the national project "Environmental Well-Being").