

第7問 (配点 16)

You are using the following article to prepare for a presentation about mosquitoes in your science class.

Controlling the “World’s Deadliest Animal”

Have you ever had your outdoor event ruined by mosquitoes? Just as you are about to enjoy a lovely summer picnic, some mosquitoes come to crash the party. Although they may be merely an annoyance in Japan, globally, the story is quite different. The mosquito has been classified as the “world’s deadliest animal” by the Centers for Disease Control and Prevention (CDC) in the US. According to the World Health Organization (WHO), more than 600,000 people are killed every year from mosquito-borne diseases such as malaria and dengue fever. However, out of the nearly 3,700 species of mosquitoes worldwide, only a small number transmit serious diseases. For example, the *Aedes* mosquito is responsible for spreading dengue fever, which is common in tropical regions.

What can be done to safeguard the public? There are various strategies that governments can implement to help protect citizens from mosquitoes. Local governments need to keep accurate records about mosquitoes including the variety and the size of the mosquito population. In addition, cities and towns should inform their citizens about how to stay safe around mosquitoes. When people go outside, they should wear long sleeves to prevent bites. Around the home, any standing water where mosquitoes may breed should be removed. Also, when windows are opened, screens are necessary and should be checked for damage. Governments must also take the lead in managing mosquito populations. Traditional methods tend to include the use of industrial chemicals. These chemicals can reduce mosquito populations, but they may negatively impact the ecosystem. In response to this problem, some innovative techniques which are environmentally safer have recently become available.

One promising new discovery in mosquito control makes use of a spray

that contains a surfactant. Surfactants, which are often contained in shampoo, reduce the surface tension of a liquid, which allows water and oil to mix. A Japanese company successfully incorporated this idea and produced a new mosquito spray in 2023. Normally, mosquito bodies and wings are protected by a wax-like coating. This coating prevents water from being absorbed by the mosquito. However, the new spray is able to go through this coating and allow water into the mosquito's body. As a result, its wings get wet and it is unable to fly, making it an easy target for enemies such as ants or spiders. Furthermore, the spray covers the breathing holes on the mosquito's body, so it is unable to breathe. Additionally, surfactants are safe for humans because they do not contain any harmful chemicals.

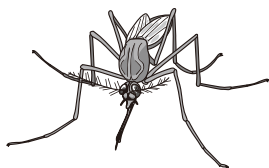
Recent studies on reducing the number of mosquitoes through genetic modification also seem to be encouraging. Researchers now have the technology to place a fatal gene into mosquitoes. When mosquitoes with this gene go back into the wild and mate, the newly born mosquitoes inherit it. Because the gene is deadly, the mosquitoes die before becoming adults. This technique has found success in Panama, Brazil, and some Pacific Islands. Given that genetic modification is still a relatively new technology, further research is required to learn about its long-term effects on the environment.

Another recent discovery focuses on the treatment of mosquito eggs. Scientists are making use of a common bacteria called *Wolbachia*, which is found naturally in approximately 60% of all insects. Researchers first inject the bacteria into mosquito eggs. Mosquitoes carrying the bacteria are then born and raised in a factory. After maturing, the male mosquitoes with the bacteria are released into the environment. When the males mate with females that do not possess the bacteria, the eggs that they produce will never hatch. Thus, the bacteria work to reduce the population of mosquitoes. Moreover, *Wolbachia* is neither a threat to the natural environment nor to humans.

The human race has been in a constant battle against mosquitoes and the diseases they carry. In modern times, humans appear to be making steady and consistent progress. With continued scientific innovation and collaboration, we may be able to more effectively control the mosquito population.

Slide drafts

Mosquitoes



The World's Deadliest Animal

1

Much More Than an Annoyance

Mosquitoes 32 .

2

Public Health

The government should 33 .

3

New Mosquito Spray

• It 34 .

• It 35 .

4

Studies of Genetically Modified Mosquitoes

- Failure to mature
- Panama, Brazil, Pacific Islands
- Long-term effects unknown

5

Steps to Control Mosquitoes Using *Wolbachia*

36



The eggs will not hatch.

6

Conclusion

37

7

問 1 Choose the best option for

32

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- ① bite more than 600,000 people per year
- ② disturb popular outdoor activities
- ③ reduce the number of species to 3,700
- ④ spread fatal diseases to human beings

問 2 Choose the best option for

33

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- ① apply traditional methods of mosquito control, rather than modern ones
- ② establish new standards and laws to control the mosquito population
- ③ focus on mosquito monitoring and control, as well as public education
- ④ provide private companies with funding for mosquito control research

問 3 Choose the best options for

34

 and

35

. (The order does not matter.)

- ① covers the mosquito with a wax
- ② destroys bacteria in the mosquito's body
- ③ interferes with the mosquito's breathing
- ④ prevents the mosquito from flying
- ⑤ stops chemicals from harming the mosquito

問 4 Choose the correct order of steps that scientists take to control the mosquito population with *Wolbachia*. Use only **four** out of the six statements (A ~ F).

36

A : Female mosquitoes are injected with *Wolbachia*.

B : Female mosquitoes transmit *Wolbachia* to males.

C : Male mosquitoes are released into the wild.

D : Male mosquitoes mate with females.

E : Mosquitoes are born in a factory.

F : *Wolbachia* is inserted into mosquito eggs.

① A → C → D → B

② A → E → B → C

③ E → A → D → B

④ E → D → F → C

⑤ F → B → E → D

⑥ F → E → C → D

問 5 Choose the best option for

37

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① Humans are making advances to reduce the mosquito population to control diseases.

② Humans have eliminated mosquito-borne diseases through mosquito control.

③ Humans should control mosquito-borne diseases mainly through genetic modification.

④ Humans will resolve issues related to mosquito control in the next few years.