Life Around the Pond

Use evidence to weigh helpful and harmful effects.

L.6.4.5 "Engage in scientific arguments to support claims that bacteria (Archaebacteria and Eubacteria) and viruses can be both helpful and harmful to other organisms and the environment."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Circle evidence of helpful effects, underline evidence of harmful effects, and write A, E, or V beside each example to show whether it involves archaea, eubacteria, or viruses.

A Farm, a Pond, and Tiny Organisms

1 In a farm's covered manure tank, bacteria break down waste into smaller substances. Archaea called methanogens use some of those substances to make methane. When the farmer captures and burns the gas, it supplies energy and helps keep methane out of the air. But a cracked cover lets methane escape. Methane traps heat in the atmosphere, so a leak adds to climate change. The same archaea can therefore be part of a useful waste system and an environmental problem. The result depends partly on what happens to the gas.

2 Beside the tank sits a pond and a field of beans. In the field, eubacteria in root nodules change nitrogen from the air into a form the plants can use. This helps the beans grow without as much added fertilizer. After heavy rain, extra fertilizer can wash from the field into the pond. Some eubacteria, called cyanobacteria, may then grow in thick blooms. Certain blooms release toxins that can harm fish, pets, or people. The bloom can also shade plants below the water. Eubacteria do not all affect the environment in the same way.

3 A bacteriophage is a virus that infects bacteria. A phage that infects a disease-causing bacterium may lower that bacterium's numbers in pond water. This can help other organisms exposed to the water. Yet viruses can also harm life in the pond. Some viruses infect fish, multiply inside their cells, and cause disease. Viruses need living cells to reproduce; they cannot grow in the water alone. To argue whether viruses are helpful or harmful, name the host they infect and explain what happens next. One label cannot describe every virus.

2 ANSWER WITH EVIDENCE

Use the passage

1. How can methanogens be both helpful and harmful? Use evidence about methane to support your answer.

2. Use evidence from the field and pond to explain why eubacteria cannot all be called helpful or all be called harmful.

3. What evidence supports the claim that some viruses harm fish?

4. A student claims that viruses only harm other organisms. What evidence challenges this claim? Explain how it does so.

3 YOUR TURN

Your own words

The farmer can afford to repair the manure tank cover or reduce fertilizer runoff into the pond, but not both. Choose one change and write a short argument for it. Use passage evidence about a helpful effect and a harmful effect to explain your choice.

ANSWER KEY

Life Around the Pond

GRADE 6 · L.6.4.5

PART 1 · READ AND MARK

Circle evidence of helpful effects, underline evidence of harmful effects, and write A, E, or V beside each example to show whether it involves archaea, eubacteria, or viruses. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How can methanogens be both helpful and harmful? Use evidence about methane to support your answer.	**Methanogens make methane that the farmer can capture and burn for energy. If methane leaks from the tank, it traps heat in the atmosphere and adds to climate change.**
2	Use evidence from the field and pond to explain why eubacteria cannot all be called helpful or all be called harmful.	**Eubacteria in bean roots supply usable nitrogen, helping the plants grow with less added fertilizer. Some cyanobacteria form pond blooms that release toxins or shade underwater plants.**
3	What evidence supports the claim that some viruses harm fish?	**Some viruses infect fish, multiply inside their cells, and cause disease.**
4	A student claims that viruses only harm other organisms. What evidence challenges this claim? Explain how it does so.	**A bacteriophage can infect a disease-causing bacterium and lower its numbers in pond water. This may help other organisms exposed to that water.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The farmer should reduce fertilizer runoff into the pond. Eubacteria in bean roots already help the plants get nitrogen, so the field can grow beans with less added fertilizer. When extra fertilizer washes into the pond, some cyanobacteria may form thick blooms. Certain blooms release toxins that harm animals, and blooms can shade underwater plants. Reducing runoff would help protect pond life while the root bacteria continue helping the beans.

Accept arguments for either change when the student makes a clear choice and connects passage evidence of both a helpful and a harmful effect to that choice. Do not require students to claim that all members of an organism group have the same effect.