Where Viruses Fit

Weigh evidence about the boundary of life

BIO.13.a "Evaluate evidence supporting claims that viruses should be placed in a separate category from living things."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline three observations that support placing viruses apart from living things, and circle one observation that challenges that claim. Number the underlined observations from strongest to weakest evidence.

A Virus at the Boundary

1 In a laboratory, a bacteriophage lands on an E. coli cell and injects its DNA. The phage has genetic material inside a protein coat, but it is not a cell. E. coli has a cell membrane, cytoplasm, and structures that help it make proteins. The phage has none of those working parts outside a host. This difference matters because every organism classified as living is made of at least one cell. A phage can remain intact outside a cell, but being intact is not the same as carrying out the activities of life.

2 Once inside E. coli, the phage's DNA directs the cell to make viral proteins and copies of viral DNA. Those parts are assembled into new phages. The host supplies the ribosomes and much of the energy needed for this process. An isolated phage does not take in nutrients and use them to produce its own energy. These observations support placing viruses in a separate category from living things. Still, needing a host is not enough by itself to settle the question: some bacteria must live inside other cells, yet they remain cells with their own machinery for life processes.

3 There is evidence on the other side, too. Errors can occur when viral DNA is copied. If an inherited change helps a phage infect bacteria more successfully, that version may become more common over generations. In this way, viruses evolve, a pattern also seen in living populations. Scientists must weigh that shared pattern against the phage's lack of cells and independent energy use. They generally place viruses outside the category of living things, while recognizing that viruses share some traits with life. The decision rests on several kinds of evidence, not on a single test.

2 ANSWER WITH EVIDENCE

Use the passage

1. How does the phage's structure support placing it apart from living things? Use the passage's comparison with E. coli.

2. Why is the phage's energy use stronger evidence for a separate category than the fact that it stays intact outside a cell?

3. Why does the passage warn against using dependence on a host as the only test for whether something is living?

4. Which evidence in the passage challenges the separate-category claim, and why does it not settle the question?

3 YOUR TURN

Your own words

Imagine scientists find a new infectious particle with genetic material inside a protein coat. Outside a host cell, it can use sugar to produce energy, but it makes complete copies of itself only inside a host. Write one paragraph arguing whether it belongs with living things or in a separate category. Weigh both observations, and explain which carries more weight in your decision.

Where Viruses Fit

PART 1 · READ AND MARK

Underline three observations that support placing viruses apart from living things, and circle one observation that challenges that claim. Number the underlined observations from strongest to weakest evidence. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How does the phage's structure support placing it apart from living things? Use the passage's comparison with E. coli.	**Unlike E. coli, the phage is not a cell and lacks a cell's working parts. All organisms classified as living are made of cells.**
2	Why is the phage's energy use stronger evidence for a separate category than the fact that it stays intact outside a cell?	**The isolated phage cannot take in nutrients to produce its own energy, an activity of life. Remaining intact does not show that it carries out life processes.**
3	Why does the passage warn against using dependence on a host as the only test for whether something is living?	**Some bacteria must live inside other cells but are still living cells with their own machinery for life processes.**
4	Which evidence in the passage challenges the separate-category claim, and why does it not settle the question?	**Phages evolve through inherited changes, as living populations do. That shared pattern does not erase their lack of cells and independent energy use.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would place the particle in a separate category, although the decision is not simple. Its ability to use sugar for energy outside a host supports placing it with living things because it carries out a life process independently. However, it cannot make complete copies without a host cell. I give that limit more weight because the particle cannot complete its own reproduction. Scientists would need more evidence, including whether it has the structures of a cell, before making a firm decision.

Accept either placement in Part 3 if the response accurately weighs independent energy use against host-dependent reproduction and explains its judgment. Students may note that host dependence alone does not rule out life.