Question 1-11 are based on the following passage.

This passage is excerpted from Luis Villareal, "Are Viruses Alive?" © 2008 by Scientific American.

The symbol [2004] indicates that the following sentence is referenced in a question.

For about 100 years, the scientific community has repeatedly changed its collective mind over what viruses are. First seen as poisons, then as life-forms, then biological chemicals, viruses today are thought of as being in a gray area between living and nonliving: they cannot replicate on their own but can do so in truly living cells and can also affect the behavior of their hosts profoundly.

The seemingly simple question of whether or not viruses are alive has probably defied a simple answer all these years because it raises a fundamental issue: What exactly defines "life?" A precise scientific definition of life is an elusive thing, but most observers would agree that life includes certain qualities in addition to an ability to replicate. For example, a living entity is in a state bounded by birth and death. Living organisms also are thought to require a degree of biochemical autonomy, carrying on the metabolic activities that produce the molecules and energy needed to sustain the organism. This level of autonomy is essential to most definitions.

Viruses, however, parasitize essentially all biomolecular aspects of life. That is, they depend on the host cell for the raw materials and energy necessary for nucleic acid synthesis, protein synthesis, processing and transport, and all other biochemical activities that allow the virus to multiply and spread. One might then conclude that even though these processes come under viral direction, viruses are simply non-living parasites of living metabolic systems. But a spectrum may exist between what is certainly alive and what is not.

A rock is not alive. A metabolically active sack, devoid of genetic material and the potential for propagation, is also not alive. A bacterium, though, is alive. Although it is a single cell, it can generate energy and the molecules needed to sustain itself, and it can reproduce. But what about a seed?A seed might not be considered alive. Yet it has a potential for life, and it may be destroyed. In this regard, viruses resemble seeds more than they do live cells.

Another way to think about life is as an emergent property of a collection of certain non-living things. Both life and consciousness are examples of emergent complex systems. They each require a critical level of complexity or interaction to achieve their respective states. A neuron by itself, or even in a network of nerves, is not conscious—whole brain complexity is needed. A virus, too, fails to reach a critical complexity. So life itself is an emergent, complex state, but it is made from the same fundamental, physical building blocks that constitute a virus. Approached from this perspective, viruses, though not fully alive, may be thought of as being more than inert matter: they verge on life.

In fact, in October [2004], French researchers announced findings that illustrate afresh just how close some viruses might come. Didier Raoult and his colleagues at the University of the Mediterranean in Marseille announced that they had sequenced the genome of the largest known virus, Mimivirus, which was discovered in 1992. The virus, about the same size as a small bacterium, infects amoebae. Sequence analysis of the virus revealed numerous genes previously thought to exist only in cellular organisms. Some of these genes are involved in making the proteins encoded by the viral DNA and may make it easier for Mimivirus to co-opt host cell replication systems. As the research team noted in its report in the journal Science, the enormous complexity of the Mimivirus's genetic complement "challenges the established frontier between viruses and parasitic cellular organisms."

1

The main purpose of the passage is to

A) promote the work done by a team of researchers.
B) correct a common misunderstanding.
C) argue for an unpopular position.
D) explore reasons why a definition is ambiguous.

2

Over the course of the passage, the main focus shifts from

A) an analysis of historical issues affecting a scientific study to an assessment of that study.
B) the presentation of a question to an analysis of factors affecting its answer.
C) a scientific query to an argument proving that the query is irrelevant and unnecessary.
D) a statement of scientific facts to an argument about the validity of those facts.

3

The author implies that viruses are not considered living primarily because they are not

A) capable of sustaining life without a host organism.
B) made up of other living things.
C) able to replicate in living cells.
D) bounded by birth and death.

CONTINUE

4

Which choice provides the best evidence for the answer to the previous question?

A) lines 11–15 (“A precise . . . death”)
B) lines 20–25 (“Viruses . . . spread”)
C) lines 25–28 (“One . . . not”)
D) lines 31–33 (“A bacterium . . . reproduce”)

5

As used in line 7, “profoundly” most nearly means

A) painfully.
B) sincerely.
C) extremely.
D) wisely.

6

The “rock,” line 29 primarily serves to provide an example of an item that

A) is closer in substance to a metabolically active sack than is a virus.
B) functions exactly like a virus.
C) has a form similar to that of a virus
D) is easy to classify, unlike a virus.

7

The words “emergent,” line 44, and “verge,” line 48, in paragraph five primarily serve to

A) demonstrate the unstable qualities of a virus.
B) show that viruses are in the process of becoming something else.
C) characterize the relationship of viruses to life.
D) explain that scientific inquiry into viruses is new.

8

What does the author imply about viruses in paragraph five?

A) Viruses’ lack of complex systems means that they fail to meet the standards for life.
B) Viruses have the consciousness, but not the complexity, to merit being defined as alive.
C) Viruses have more in common with brains than with bacteria.
D) If viruses could grow large enough, they could eventually be considered alive.

9

Which choice provides the best evidence for the answer to the previous question?

A) lines 37–39 (“Another . . . systems”)
B) lines 40–43 (“They . . . needed”)
C) lines 43–46 (“A virus . . . virus”)
D) lines 46–48 (“Approached . . . life”)

10

Which choice best describes the author’s tone in describing the research described in paragraph six?

A) Analytical.
B) Ambivalent.
C) Biased.
D) Objective.

11

The author uses the information in lines 31–39 mainly to support the assertion that

A) researchers have recently shown that viruses are closer to being alive than previously thought.
B) recent studies have proven that viruses will never be able to truly be classified as alive.
C) viruses will continue to challenge the idea of what “alive” means, without any possible resolution.
D) Mimivirus can be classified as living, but smaller viruses do not merit this classification.

CONTINUE