

Natural Sciences

Passage 3

The Hot Zone by Richard Preston tells the dramatic story of Ebola, a virus that kills nine out of ten of its victims so quickly and gruesomely that even biohazard experts are terrified. As the tropical wildernesses of the world are destroyed, previously unknown viruses that have lived undetected in the rain forest for eons are entering human populations.

A virus is a small capsule made of membranes and proteins. The capsule contains one or more strands of DNA or RNA, which are long molecules that contain the software program for making a copy of the virus. Some biologists classify viruses as "life forms" because they are not strictly known to be alive. Viruses are ambiguously alive, neither alive nor dead. They carry on their existence in the borderlands between life and nonlife. Viruses that are outside cells merely sit there; nothing happens. They are dead. They can even form crystals. Virus particles that lie around in blood or mucus may seem dead, but the particles are waiting for something to come along. They have a sticky surface. If a cell comes along and touches the virus and the stickiness of the virus matches the stickiness of the cell, then the virus clings to the cell. The cell feels the virus sticking to it and enfolds the virus and drags it inside. Once the virus enters the cell, it becomes a Trojan horse. It switches on and begins to replicate.

A virus is a parasite. It can't live on its own. It can only make copies of itself inside a cell using the cell's materials and machinery to get the job done. All living things carry

viruses in their cells. Even fungi and bacteria are inhabited by viruses and are occasionally destroyed by them. That is, diseases have their own diseases. A virus makes copies of itself inside a cell until eventually the cell gets plugged with virus and pops, and the viruses spill out of the broken cell. Or viruses can bud through a cell wall, like drips coming out of a faucet—drip, drip, drip, copy, copy, copy, copy—that's the way the AIDS virus works. The faucet runs and runs until the cell is exhausted, consumed, and destroyed. If enough cells are destroyed, the host dies. A virus does not "want" to kill its host. That is not in the best interest of the virus, because then the virus may also die, unless it can jump fast enough out of the dying host into a new host.

The genetic code inside Ebola is a single strand of RNA. This type of molecule is thought to be the oldest and most "primitive" coding mechanism for life. The earth's primordial ocean, which came into existence not long after the earth was formed, about four and a half billion years ago, may well have contained microscopic life forms based on RNA. This suggests that Ebola is an ancient kind of life, perhaps nearly as old as the earth itself. Another hint that Ebola is extremely ancient is the way in which it can seem neither quite alive nor quite unalive.

Viruses may seem alive when they multiply, but in another sense they are obviously dead, are only machines, subtle ones to be sure, but strictly mechanical, no more alive than a jackhammer. Viruses are molecular sharks, a motive without a mind. Compact, hard, logical, totally selfish, the virus is dedicated to making copies of itself—which it can do on occasion with radiant speed. The prime directive is to replicate.

Viruses are too small to be seen. Here is a way to imagine the size of a virus. Consider the island of Manhattan shrunk to the size of a tiny dot, just barely large enough to see. This Manhattan could easily hold nine million viruses. If you could magnify this Manhattan and if it were full of

viruses, you would see little figures clustered like the lunch crowd on Fifth Avenue. A hundred million crystallized polio viruses could cover the period at the end of this sentence. There could be 250 Woodstock Festivals of viruses sitting on that period—the combined populations of Great Britain and France—and you would never know it.

Ebola is a rather simple virus—as simple as a firestorm. It kills humans with swift efficiency and with a devastating range of effects. Ebola is distantly related to measles, mumps, and rabies. It is also related to certain pneumonia viruses: to the parainfluenza virus, which causes colds in children, and to the respiratory syncytial virus, which can cause fatal pneumonia in a person who has AIDS. In its own evolution through unknown hosts and hidden pathways in the rain forest, Ebola seems to have developed the worst elements of all the above viruses. Like measles, it triggers a rash all over the body. Some of its effects resemble rabies—psychosis, madness. Other of its effects look eerily like a bad cold.

Questions

Question 1: The author refers to a virus as a Trojan horse because

- A. viruses often begin in farm animals
- B. the particles have a sticky surface
- C. it tricks a cell into dragging it inside
- D. it is also Greek to him

Question 2: The Ebola virus can best be described as a

- A. cell
- B. fungus
- C. parasite
- D. bacteria

Question 3: A virus is a strange life form, not quite dead or alive. A virus can seem dead because

- A. it can't live on its own
- B. it can kill its host
- C. it is so ancient
- D. it can make copies of itself

Question 4: All of the following are true about a virus except:

- A. they seem alive when they multiply
- B. Ebola is a complex virus
- C. the genetic code inside Ebola is a single strand of RNA
- D. they inhabit fungi and bacteria

Question 5: The most "primitive" coding mechanism for life is

- A. RNA
- B. DNA
- C. AIDS
- D. EBOLA

Question 6: You can infer from the passage that if viruses could think, they would prefer that their host

- A. develop a cold
- B. live
- C. die
- D. replicate itself

Question 7: The term "prime directive" most nearly means

- A. careful instruction
- B. prepare for pouring

- C. most important duty
- D. Spock is illogical

Question 8: To help people better grasp the tiny size of a virus particle, the writer compares the virus to the island of Manhattan, a lunch crowd on Fifth Avenue, and 250 Woodstock Festivals. Why did he choose those examples?

- A. for humor
- B. most of his readers live in New York
- C. for emotional appeal
- D. these are familiar images to American readers

Question 9: One can infer from this passage that

- A. a virus is not a parasite
- B. viruses are easily seen
- C. a virus is a motive with a mind
- D. a virus does not “want” to kill its host

Question 10: Ebola is related to a host of contagious illnesses. They include all of the following except:

- A. mumps
- B. hepatitis
- C. pneumonia
- D. measles

Answers

1. C 2. C 3. A 4. B 5. A 6. B 7. C 8. D 9. D 10. B

Commentary

The “Trojan horse” in Question 1 refers, of course, to the famous wooden horse left by the Greeks as an offering to their enemies, the Trojans. After the Trojans had dragged the horse within the city walls and fallen drunkenly asleep after celebrating their victory over the Greeks, the Greek soldiers, cleverly hidden inside the horse, slipped out and routed their rivals. The use of a Trojan horse as a metaphor for a virus is apt because the virus is inert until dragged inside a cell, where it begins to wreak its damage.

Careful reading will help you solve Question 2 as you discover that Ebola is a parasite. Questions 3 and 4 require you to work by eliminating the wrong answers. If you can get the number of possible answers down to two, guess away. Remember that unlike the SAT, wrong guesses won’t hurt you on the ACT (and correct guesses will pay off). Question 5 requires you to draw information from two sentences, the two at the beginning of the third paragraph. Question 6 requires you to reverse one of the author’s statements. The passage states that a virus does not “want” to kill its host; therefore, we can infer that if a virus could “think,” it would prefer that its host survive. For Question 7, pick up contextual clues from previous sentences where we learn that viruses only seem to be alive when they multiply, that they are driven by a single motive, and that they are totally selfish. Putting these clues together, you can surmise that “prime directive” means “most important duty.”

Question 8 requires a judgment call because all four answers are true to some degree. Your challenge is to find the best answer—D (familiar images to Americans). There’s nothing especially humorous or emotional about a lunch crowd on Fifth Avenue, and although Fifth Avenue is located in New York, you would hardly expect most of the author’s readers to live there. Question 9 asks you to draw a conclusion from the entire passage. Question 10 requires careful reading—you’ll almost certainly have to go back to the passage for a quick check.