Constraints on Natural Selection

Natural selection is the process in which organisms with certain traits survive and reproduce while organisms that are less able to adapt to their environment die off. As Darwin pointed out, natural selection does not necessarily produce evolutionary progress, much less perfection. The limits to the effectiveness of natural selection are most clearly revealed by the universality of extinction. More than 99.9 percent of all evolutionary lines that once existed on Earth have become extinct. Mass extinctions remind us forcefully that evolution is not a steady approach to an ever-higher perfection but an unpredictable process in which the best-adapted organisms may be suddenly exterminated by a catastrophe and their place taken by lineages that prior to the catastrophe seemed to be without distinction or prospects.

There are numerous constraints, or limits, on the power of natural selection to bring about change. First, the genetic variation needed to perfect a characteristic may not be forthcoming. Second, during evolution, the adoption of one among several possible solutions to a new environmental opportunity may greatly restrict the possibilities for subsequent evolution. For instance, when a selective advantage for a skeleton developed among the ancestors of the vertebrates and the arthropods, the ancestors of the arthropods had the prerequisites for developing an external skeleton, and those of the vertebrates had the prerequisites for acquiring an internal skeleton. The entire subsequent history of these two large groups of organisms was affected by the two different paths taken by their remote ancestors. The vertebrates were able to develop such huge creatures as dinosaurs, elephants, and whales. A large crab is the largest type that the arthropods were able to achieve.

1. Which of the sentences below best expresses the essential information in the highlighted sentence in the passage? Incorrect choices change the meaning in important ways or leave out essential information.

○ Evolution is an unpredictable process because in mass extinctions highly-evolved organisms are exterminated.

○ Evolution does not progress steadily to ever-higher levels of perfection because, as shown by mass extinctions, lineages favored by evolution can be suddenly replaced by those not favored previously when circumstances change.

○ Catastrophes remind us that evolution is a process in which the best-adapted organisms are exterminated and their place taken by lineages shown to be poorly adapted.

○ When mass extinctions exterminate the best-adapted organisms, less important lineages suddenly become better adapted and take their place.

2. According to paragraph 1, which of the following provides evidence that natural selection does not always lead to evolutionary progress?

○ Most evolutionary lines that once existed on Earth have become extinct.

○ Evolutionary lines usually weaken as they increase in age.

○ The history of evolution shows that many evolutionary lines can become extinct at the same time.

○ So far, less than one percent of evolutionary lines have achieved such perfect adaptation to their environment that they will never become extinct.

3. The word ”remote” in the passage is closet in meaning to

○ corresponding ○ distant ○separate ○ direct

ANS: BAB