

STEP 1級 読解問題演習

Read the passage and choose the best answer from among the four choices for each question.

An Unforgiving Universe

At one time, science-fiction writers fantasized about aliens on the moon, on Mars, and even on the sun. But as science has dispelled such possibilities in our own solar system, writers have populated more distant regions of the universe with alien life forms. Nevertheless, the notion of life in faraway galaxies is under similar threat as the latest scientific scrutiny shows that the habitable universe is much smaller than many would like to believe.

It has already been established that there is an optimal location for life within some solar systems, a ringlike region known as the circumstellar habitable zone (CHZ). Water is able to exist in liquid state on planets in these regions for at least a few billion years. Such planets are neither too close to their stars, which would cause their oceans to boil away, nor so far away that their oceans freeze. The orbits of these planets must not be too elliptical, or all life would be eradicated when they wandered out of their CHZ.

Now scientists believe that CHZs exist within the confines of their galactic equivalent, the galactic habitable zone (GHZ). The GHZ is a ringlike region neither too close nor too far from the galactic center. GHZs are defined by two requirements: the availability of the metals needed to build habitable planets, and adequate protection from a variety of cosmic threats.

During the 10 billion to 15 billion years since the big bang, hydrogen and helium have been heated into a more extensive menu of elements, including metals. Stars with a metallicity of less than 40% of our sun's appear incapable of producing planets large enough to form an atmosphere and sustain life-giving geologic activity.

In one study of the stellar cluster known as 47 Tucanae, whose stars have metallicities of less than 25% of our sun's, no planets were detected. Also, stars with vastly higher metallicities would produce giant planets that, because of their stronger gravity, would have less topographic relief and perhaps be completely covered in water, and unable to provide atmospheric conditions vital for the development of life. The giant planets also have less stable orbits and would likely shove any Earth-sized planets into the sun or completely out of the solar system.

To give life a chance, planets must also be relatively free from bombardment by interstellar objects and radiation blasts. As one gets closer to the galactic center, the high density of stars greatly increases the likelihood of collisions with asteroids and comets as well as deadly supernovae and gamma-ray bursts. It has been estimated that about 90% of planets and stars suffer from these limitations.

While we cannot say for sure that all planets outside a GHZ are lifeless, it now appears that our galaxy and solar system are unusually hospitable. Life forms as we know them may be so rare that we are effectively alone in the universe.

- (1) It is clear the author believes that science-fiction writers have
 - 1 passed off fiction as proven scientific theory.
 - 2 always shown a tendency to ignore the accepted scientific facts of their day.
 - 3 an uncanny ability to predict future scientific realities.
 - 4 fewer choices for inhabited planets as science reveals more about the universe.

- (2) According to the passage, which of the following planets are most likely to support life forms as we know them?
 - 1 Those that happen to fall within both a CHZ and a GHZ.
 - 2 Those with elliptical orbits that bring them into a CHZ at least part of the time.
 - 3 Those located in regions of the galaxy that have a heavier density of stars.
 - 4 Those that have flatter topographies and are completely covered by seas.

- (3) One of the reasons why life forms are less likely to exist as one approaches the galactic center is that
 - 1 the giant planets created in this part of the galaxy would shove Earth-sized planets out of the solar system.
 - 2 the heat from suns in this part of the galaxy would boil away the seas on any existing planets.
 - 3 there is a greater risk of life-destroying cosmic events in this part of the galaxy.
 - 4 the stars in this region possess insufficient metallicity for creating planets.