Survival of Plants and Animals in Desert Conditions

The harsh conditions in deserts are intolerable for most plants and animals. Despite these conditions, however, many varieties of plants and animals have adapted to deserts in a number of ways. Most plant tissues die if their water content falls too low: the nutrients that feed plants are transmitted by water; water is a raw material in the vital process of photosynthesis; and water regulates the temperature of a plant by its ability to absorb heat and because water vapor lost to the atmosphere through the leaves helps to lower plant temperatures. Water controls the volume of plant matter produced. The distribution of plants within different areas of desert is also controlled by water. Some areas, because of their soil texture, topographical position, or distance from rivers or groundwater, have virtually no water available to plants, whereas others do.

The nature of plant life in deserts is also highly dependent on the fact that they have to adapt to the prevailing aridity. There are two general classes of vegetation: long-lived perennials, which may be succulent (water-storing) and are often dwarfed and woody, and annuals or ephemerals, which have a short life cycle and may form a fairly dense stand immediately after rain.

The ephemeral plants evade drought. Given a year of favorable precipitation, such plants will develop vigorously and produce large numbers of flowers and fruit. This replenishes the seed content of the desert soil. The seeds then lie dormant until the next wet year, when the desert blooms again.

The perennial vegetation adjusts to the aridity by means of various avoidance mechanisms. Most desert plants are probably best classified as xerophytes. They possess drought-resisting adaptations: loss of water through the leaves is reduced by means of dense hairs covering waxy leaf surfaces, by the closure of pores during the hottest times to reduce water loss, and by the rolling up or shedding of leaves at the beginning of the dry season. Some xerophytes, the succulents (including cacti), store water in their structures. Another way of countering drought is to have a limited amount of mass above ground and to have extensive root networks below ground. It is not unusual for the roots of some desert perennials to extend downward more than ten meters. Some plants are woody in type —an adaptation designed to prevent collapse of the plant tissue when water stress produces wilting. Another class of desert plant is the phreatophyte. These have adapted to the environment by the development of long taproots that penetrate downward until they approach the assured water supply provided by groundwater. Among these plants are the date palm, tamarisk, and mesquite. They commonly grow near stream channels, springs, or on the margins of lakes.

Animals also have to adapt to desert conditions, and they may do it through two forms of behavioral adaptation: they either escape or retreat. Escape involves such actions as aestivation, a condition of prolonged dormancy, or torpor, during which animals reduce their metabolic rate and body temperature during the hot season or during very dry spells.

Seasonal migration is another form of escape, especially for large mammals or birds. The term retreat is applied to the short-term escape behavior of desert animals, and it usually assumes the pattern of a daily rhythm. Birds shelter in nests, rock overhangs, trees, and dense shrubs to avoid the hottest hours of the day, while mammals like the kangaroo rat burrow underground.

Some animals have behavioral, physiological, and morphological (structural) adaptations that enable them to withstand extreme conditions. For example, the ostrich has plumage that is so constructed that the feathers are long but not too dense. When conditions are hot, the ostrich erects them on its back, thus increasing the thickness of the barrier between solar radiation and the skin. The sparse distribution of the feathers, however, also allows considerable lateral air movement over the skin surface, thereby permitting further heat loss by convection. Furthermore, the birds orient themselves carefully with regard to the Sun and gently flap their wings to increase convection cooling.

Paragraph 1: The harsh conditions in deserts are intolerable for most plants and animals. Despite these conditions, however, many varieties of plants and animals have adapted to deserts in a number of ways. Most plant tissues die if their water content falls too low: the nutrients that feed plants are transmitted by water; water is a raw material in the vital process of photosynthesis; and water regulates the temperature of a plant by its ability to absorb heat and because water vapor lost to the atmosphere through the leaves helps to lower plant temperatures. Water controls the volume of plant matter produced. The distribution of plants within different areas of desert is also controlled by water. Some areas, because of their soil texture, topographical position, or distance from rivers or groundwater, have virtually no water available to plants, whereas others do.

1. According to paragraph 1, water provides all of the following essential functions for plants EXCEPT (A)

○ improving plants’ ability to absorb sunlight

○ preventing plants from becoming overheated

○ transporting nutrients

○ serving as a raw material for photosynthesis

Paragraph 2: The nature of plant life in deserts is also highly dependent on the fact that they have to adapt to the prevailing aridity. There are two general classes of vegetation: long-lived perennials, which may be succulent (water-storing) and are often dwarfed and woody, and annuals or ephemerals, which have a short life cycle and may form a fairly dense stand immediately after rain.

Paragraph 3: The ephemeral plants evade drought. Given a year of favorable precipitation, such plants will develop vigorously and produce large numbers of flowers and fruit. This replenishes the seed content of the desert soil. The seeds then lie dormant until the next wet year, when the desert blooms again.

2. Paragraph 3 suggests that during a dry year ephemerals (B)

○ produce even more seeds than in a wet year

○ do not sprout from their seeds

○ bloom much later than in a wet year

○ are more plentiful than perennials

3. How is paragraph 2 related to paragraph 3? (B)

○ Paragraph 2 provides a general description of desert plants, and paragraph 3 provides a scientific explanation for these observations.

○ Paragraph 2 divides desert plants into two categories, and paragraph 3 provides further information about one of these categories.

○ Paragraph 2 proposes one way of dividing desert plants into categories, and paragraph 3 explains one problem with this method of classification.

○ Paragraph 2 discusses two categories of desert plants, and paragraph 3 introduces a third category of plants.

4. In saying that ephemerals will develop “vigorously" when there is favorable precipitation, the author means that their development will be (D)

○ sudden

○ early

○ gradual

○ strong and healthy

Paragraph 4: The perennial vegetation adjusts to the aridity by means of various avoidance mechanisms. Most desert plants are probably best classified as xerophytes. They possess drought-resisting adaptations: loss of water through the leaves is reduced by means of dense hairs covering waxy leaf surfaces, by the closure of pores during the hottest times to reduce water loss, and by the rolling up or shedding of leaves at the beginning of the dry season. Some xerophytes, the succulents (including cacti), store water in their structures. Another way of countering drought is to have a limited amount of mass above ground and to have extensive root networks below ground. It is not unusual for the roots of some desert perennials to extend downward more than ten meters. Some plants are woody in type —an adaptation designed to prevent collapse of the plant tissue when water stress produces wilting. Another class of desert plant is the phreatophyte. These have adapted to the environment by the development of long taproots that penetrate downward until they approach the assured water supply provided by groundwater. Among these plants are the date palm, tamarisk, and mesquite. They commonly grow near stream channels, springs, or on the margins of lakes.

5. The word “countering” in the passage is closest in meaning to (C)

○ eliminating

○ making use of

○ acting against

○ experiencing

6. According to paragraph 4, some desert plants with root systems that are extraordinarily well developed have (A)

○ relatively little growth aboveground

○ very leafy aboveground structures

○ non woody plant tissue resistant to wilting

○ water stored within their roots

7: The word “assured” in the passage is closest in meaning to (C)

○ pure

○ diminished

○ guaranteed

○ deep

8. What do “the date palm, tamarisk, and mesquite" have in common? (C)

○ They are always found together.

○ They depend on surface water provided by streams, springs, and lakes.

○ They are phreatophytes.

○ Their roots are capable of breaking through hard soils

Paragraph 5: Animals also have to adapt to desert conditions, and they may do it through two forms of behavioral adaptation: they either escape or retreat. Escape involves such actions as aestivation, a condition of prolonged dormancy, or torpor, during which animals reduce their metabolic rate and body temperature during the hot season or during very dry spells.

9. 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. (A)

○ One way animals escape is by entering a state of extended dormancy, known as aestivation, during the hottest and driest times of year.

○ Animals can escape without using direct action, or aestivation, simply by reducing their metabolic rate and body temperature.

○ The actions that an animal uses to escape are known as aestivation, which sometimes involves a reduction in metabolic rate or body temperature.

○ When the weather is especially hot and dry, an animal may suffer from a condition known as aestivation, at which point the animal needs to escape.

Paragraph 6:Seasonal migration is another form of escape, especially for large mammals or birds. The term retreat is applied to the short-term escape behavior of desert animals, and it usually assumes the pattern of a daily rhythm. Birds shelter in nests, rock overhangs, trees, and dense shrubs to avoid the hottest hours of the day, while mammals like the kangaroo rat burrow underground.

10. It can be inferred from paragraph 6 that all of the places desert animals retreat to (A)

○ provide shade from the sun

○ sometimes become crowded

○ are places where supplies of food are plentiful

○ leave the animals vulnerable to predators

Paragraph 7: Some animals have behavioral, physiological, and morphological (structural) adaptations that enable them to withstand extreme conditions. For example, the ostrich has plumage that is so constructed that the feathers are long but not too dense. When conditions are hot, the ostrich erects them on its back, thus increasing the thickness of the barrier between solar radiation and the skin. The sparse distribution of the feathers, however, also allows considerable lateral air movement over the skin surface, thereby permitting further heat loss by convection. Furthermore, the birds orient themselves carefully with regard to the Sun and gently flap their wings to increase convection cooling.

11: According to paragraph 7, what special adaptation helps the ostrich cope with hot desert conditions? (D)

○ Each of its feathers is very short and dense.

○ Its wings produce only lateral air movement when flapping.

○ Its feathers are very thickly set on both its back and its wings.

○ It can make its feathers stand up on its back.

Paragraph 1: The harsh conditions in deserts are intolerable for most plants and animals. Despite these conditions, however, many varieties of plants and animals have adapted to deserts in a number of ways. Most plant tissues die if their water content falls too low: the nutrients that feed plants are transmitted by water; water is a raw material in the vital process of photosynthesis; and water regulates the temperature of a plant by its ability to absorb heat and because water vapor lost to the atmosphere through the leaves helps to lower plant temperatures. ■Water controls the volume of plant matter produced. ■The distribution of plants within different areas of desert is also controlled by water. ■Some areas, because of their soil texture, topographical position, or distance from rivers or groundwater, have virtually no water available to plants, whereas others do.■

12: Look at the four squares [■] that indicate where the following sentence could be added to the passage.

**For this reason, the total amount of plant material in a desert is often 100 times less than the amount of plant material in an equivalent area of temperate forest.**

Where would the sentence best fit?

13: **Directions:** Select from the seven phrases below the two phrases that correctly characterize special adaptations found primarily in desert annuals and the three phrases that correctly characterize special adaptations found primarily in desert perennials. Select each phrase you select in the appropriate column of the table. **This question is worth 3 points.**

Adaptations of Annuals

* (B)
* (F)

Adaptations of Perennials

* (A)
* (D)
* (G)

Four of the phrases will NOT be used.

Answer Choices

○ Woody structures

○ Explosive growth in wet years

○ Long, thin, shallow roots

○ Storage of water in plant tissue

○ Minimization of the amount of water used for photosynthesis

○ Short life cycle

○ Leaves designed to minimize water loss