tpo_35_passage_1

Phytoplankton are minute , free-floating aquatic plants. In addition to the marked changes in abundance observed in phytoplankton over the course of a year, there is also a marked change in species composition. This change in the dominant species from season to season is called seasonal succession, and it occurs in a wide variety of locations. Under seasonal succession, one or more species dominate the phytoplankton for a shorter or longer period of time and then are replaced by another set of species. This pattern is repeated yearly. This succession is different from typical terrestrial ecological succession in which various plants replace one another until finally a so-called climax community develops, which persists for many years. What are the factors causing this phenomenon? Considering that seasonal succession is most often and clearly seen in temperate seas, which have a marked change in temperature during a year, temperature has been suggested as a cause. This may be one of the factors, but it is unlikely to be the sole cause because there are species that become dominant species at various temperatures. Furthermore, temperature changes rather slowly in seawater, and the replacement of dominant species often is much more rapid. Another suggested reason is the change in nutrient level over the year, with differing concentrations favoring different phytoplankton species. While this factor may also contribute, observations suggest that phytoplankton populations rise and fall much more quickly than nutrient concentrations change. Yet another explanation is that species succession is a consequence of changes in seawater brought about by the phytoplankton living in it. Each species of phytoplankton secretes or excretes organic molecules into the seawater. These metabolites can have an effect on the organisms living in the seawater, either inhibiting or promoting their growth. For any individual organism, the amount of metabolite secreted is small. But the effect of secretions by all the individuals of the dominant species can be significant both for themselves and for other species. These organic metabolites could, and probably do, include a number of different classes of organic compounds. Some are likely toxins, such as those released by the dinoflagellates (a species of plankton) during red tides, which inhibit growth of other photosynthetic organisms. In such cases, the population explosion of dinoflagellates is so great that the water becomes brownish red in color from the billions of dinoflagellate cells. Although each cell secretes a minute amount of toxin, the massive dinoflagellate numbers cause the toxin to reach concentrations that kill many creatures. This toxin can be concentrated in such filter-feeding organisms as clams and mussels, rendering them toxic to humans. Another class of metabolite is the vitamins. It is now known that certain phytoplankton species have requirements for certain vitamins, and that there are considerable differences among species as to requirements. The B vitamins, especially vitamin B12, thiamine, and biotin, seem to be the most generally required. Some species may be unable to thrive until a particular vitamin, or group of vitamins, is present in the water. These vitamins are produced only by another species; hence, a succession of species could occur whereby first the vitamin-producing species is present and then the vitamin-requiring species follows. Other organic compounds that may inhibit or promote various species include amino acids, carbohydrates, and fatty acids. Although it is suspected that these organic metabolites may have an important role in species succession and it has been demonstrated in the laboratory that phytoplankton species vary both in their ability to produce necessary vitamins and in their requirements for such in order to grow, evidence is still inadequate as to their real role in the sea. There is

also evidence to suggest that grazers (animals that feed on plants or stationary animals),particularly selective grazers, can influence the phytoplankton species composition. Many copepods (small, herbivorous crustaceans) and invertebrate larvae pick out selected phytoplankton species from mixed groups, changing the species composition. A growing body of evidence now suggests that all of the factors considered here are operating simultaneously to produce species succession. The importance of any factor will vary with the particular phytoplankton species and the environmenta conditions.

question 1

The word "minute" in the passage is closest in meaning to

A light

B common

C tiny

D simple

question 2

According to paragraph 2, one reason temperature is not likely to be the sole cause of seasonal succession in phytoplankton is

A the temperature of seawater changes too often

B seasonal succession usually occurs only in temperate seas

C the rate of replacement of dominant species is slower than that of temperature change

D certain dominant species have been observed at different temperatures

question 3

Why does the author provide the information that "phytoplankton populations rise and fall much more quickly than nutrient concentrations change" ?

A To argue that the nutrient level does not determine phytoplankton succession

B To argue that the succession of phytoplankton is actually the cause of changes in the nutrient level

C To indicate that phytoplankton populations are very sensitive to changes in the nutrient level

D To imply that changes in the nutrient level explain the succession of phytoplankton

question 4

According to paragraph 4, all of the following are true about metabolites secreted by phytoplankton EXCEPT:

A They have a less significant effect on the dominant species of phytoplankton than they do on other species of phytoplankton.

B They affect the growth of phytoplankton living in seawater.

C They are secreted in small amounts by individual phytoplankton.

D They cause changes in seawater that result in species succession of phytoplankton.

question 5

According to paragraph 5, all of the following statements are true about dinoflagellates EXCEPT:

A They produce toxins that inhibit the growth of other organisms.

B Each produces a very little amount of toxin.

C Their toxins can concentrate in clams and mussels.

D Their toxins are dangerous only to other photosynthetic organisms.

question 6

Paragraph 6 supports which of the following statements about a phytoplankton species that cannot produce thiamine?

A It can be followed in a seasonal succession only by another phytoplankton species that cannot produce thiamine.

B It can never become the dominant species in a seasonal succession.

C It can be preceded in a seasonal succession only by a phytoplankton species that produces thiamine.

D It is able to produce B vitamins other than thiamine.

question 7

The copepods mentioned in paragraph 8 are

A one type of phytoplankton

B stationary animals

C selective grazers

D invertebrate larva

question 8

Which of the following statements best describes how the passage is organized?

A A description of a phenomenon is provided, and the rest of the passage puts forward hypotheses as to the phenomenon’ s cause.

B Two phenomena are introduced, and the rest of the passage provides reasons as to why the first is more common than the second.

C A group of species is discussed, and the rest of the passage explains the environmental factors threatening it.

D A phenomenon is described, and the rest of the passage discusses effects of that phenomenon on the environment.

question 9

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

Phytoplankton are minute, free-floating aquatic plants. In addition to the marked

changes in abundance observed in phytoplankton over the course of a year, there is also a marked change in species composition. [] This change in the dominant species from season to season is called seasonal succession, and it occurs in a wide variety of locations. [] Under seasonal succession, one or more species dominate the phytoplankton for a shorter or longer period of time and then are replaced by another set of species. [] This pattern is repeated yearly. [] This succession is different from typical terrestrial ecological succession in which various plants replace one another until finally a so-called climax community develops, which persists for many years. What are the factors causing this phenomenon? Considering that seasonal succession is most often and clearly seen in temperate seas, which have a marked change in temperature during a year, temperature has been suggested as a cause. This may be one of the factors, but it is unlikely to be the sole cause because there are species that become dominant species at various temperatures. Furthermore, temperature changes rather slowly in seawater, and the replacement of dominant species often is much more rapid. Another suggested reason is the change in nutrient level over the year, with differing concentrations favoring different phytoplankton species. While this factor may also contribute, observations suggest that phytoplankton populations rise and fall much more quickly than nutrient concentrations change. Yet another explanation is that species succession is a consequence of changes in seawater brought about by the phytoplankton living in it. Each species of phytoplankton secretes or excretes organic molecules into the seawater. These metabolites can have an effect on the organisms living in the seawater, either inhibiting or promoting their growth. For any individual organism, the amount of metabolite secreted is small. But the effect of secretions by all the individuals of the dominant species can be significant both for themselves and for other species. These organic metabolites could, and probably do, include a number of different classes of organic compounds. Some are likely toxins, such as those released by the dinoflagellates (a species of plankton) during red tides, which inhibit growth of other photosynthetic organisms. In such cases, the population explosion of dinoflagellates is so great that the water becomes brownish red in color from the billions of dinoflagellate cells. Although each cell secretes a minute amount of toxin, the massive dinoflagellate numbers cause the toxin to reach concentrations that kill many creatures. This toxin can be concentrated in such filter-feeding organisms as clams and mussels, rendering them toxic to humans. Another class of metabolite is the vitamins. It is now known that certain phytoplankton species have requirements for certain vitamins, and that there are considerable differences among species as to requirements. The B vitamins, especially vitamin B12, thiamine, and biotin, seem to be the most generally required. Some species may be unable to thrive until a particular vitamin, or group of vitamins, is present in the water. These vitamins are produced only by another species; hence, a succession of species could occur whereby first the vitamin-producing species is present and then the vitamin-requiring species follows. Other organic compounds that may inhibit or promote various species include amino acids, carbohydrates, and fatty acids. Although it is suspected that these organic metabolites may have an important role in species succession and it has been demonstrated in the laboratory that phytoplankton species vary both in their ability to produce necessary vitamins and in their requirements for such in order to grow, evidence is still inadequate as to their real role in the sea. There is also evidence to suggest that grazers (animals that feed on plants or stationary animals),particularly selective grazers, can influence the phytoplankton species composition. Many copepods (small, herbivorous crustaceans) and invertebrate larvae pick out selected phytoplankton species from mixed groups, changing the

species composition. A growing body of evidence now suggests that all of the factors considered here are operating simultaneously to produce species succession. The importance of any factor will vary with the particular phytoplankton species and the environmenta conditions.

question 10

Directions: An introductory sentence for a brief summary of the passage is provided below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some sentences do not belong in the summary because they express ideas that are not presented in the passage or are minor ideas in the passage. This question is worth 2 points.

A. At any given place and time a particular group of phytoplankton species dominates, but the group that has dominance changes in a pattern of seasonal succession that is repeated on an annual basis.

B. The seasonal succession among phytoplankton populations are influenced by a number of factors including water temperature, nutrient levels, and the activities of selective grazers.

C. Organic chemicals released by the dominant phytoplankton species, including toxins and vitamins, may influence successions by inhibiting or promoting the populations of other phytoplankton species.

D. Seasonal succession, unlike terrestrial ecological succession, results in a climax community, which can last indefinitely provided the right environmental conditions persist.

E. Certain species of phytoplankton release concentrated toxins that can kill other species of

phytoplankton.

F. Laboratory experiments have shown that, in temperate seas, temperature is the primary factor in phytoplankton species composition.