Reading UNIT 1

取代原P13-19 的TPO31

TPO 46 Ecosystem Diversity and Stability

Conservation biologists have long been concerned that species extinction could have significant consequences for the stability of entire ecosystems—groups of interacting organisms and the physical environment that they inhabit. An ecosystem could survive the loss of some species, but if enough species were lost, the ecosystem would be severely degraded. In fact, it is possible that the loss of a single important species could start a cascade of extinctions that might dramatically change an entire ecosystem. A good illustration of this occurred after sea otters were eliminated from some Pacific kelp (seaweed) bed ecosystems: the kelp beds were practically obliterated too because in the absence of sea otter predation, sea urchin populations exploded and consumed most of the kelp and other macroalgae.

It is usually claimed that species-rich ecosystems tend to be more stable than species-poor ecosystems. Three mechanisms by which higher diversity increases ecosystem stability have been proposed. First, if there are more species in an ecosystem, then its food web will be more complex, with greater redundancy among species in terms of their nutritional roles. In other words, in a rich system if a species is lost, there is a good chance that other species will take over its function as prey, predator, producer, decomposer, or whatever role it played. Second, diverse ecosystems may be less likely to be invaded by new species, notably exotics (foreign species living outside their native range), that would disrupt the ecosystem’s structure and function. Third, in a species-rich ecosystem, diseases may spread more slowly because most species will be relatively less abundant, thus increasing the average distance between individuals of the same species and hampering disease transmission among individuals.

Scientific evidence to illuminate these ideas has been slow in coming, and many shadows remain. One of the first studies to provide data supporting a relationship between diversity and stability examined how grassland plants responded to a drought. Researchers D. Tilman and J A. Downing used the ratio of above-ground biomass in 1988 (after two years of drought) to that in 1986 (predrought) in 207 plots in a grassland field in the Cedar Creek Natural History Area in Minnesota as an index of ecosystem response to disruption by drought. In an experiment that began in 1982, they compared these values with the number of plant species in each plot and discovered that the plots with a greater number of plant species experienced a less dramatic reduction in biomass. Plots with more than ten species had about half as much biomass in 1988 as in 1986, whereas those with fewer than five species only produced roughly one-eighth as much biomass after the two-year drought. Apparently, species-rich plots were likely to contain some drought-resistant plant species that grew better in drought years, compensating for the poor growth of less-tolerant species.

To put this result in more general terms, a species-rich ecosystem may be more stable because it is more likely to have species with a wide array of responses to variable conditions such as droughts. Furthermore, a species-rich ecosystem is more likely to have species with similar ecological functions, so that if a species is lost from an ecosystem, another species, probably a competitor, is likely to flourish and occupy its functional role. Both of these, variability in responses and functional redundancy, could be thought of as insurance against disturbances.

The Minnesota grassland research has been widely accepted as strong evidence for the diversity- stability theory; however, its findings have been questioned, and similar studies on other ecosystems have not always found a positive relationship between diversity and stability. Clearly, this is a complex issue that requires further field research with a broad spectrum of ecosystems and species: grassland plants and computer models will only take us so far. In the end, despite insightful attempts to detect some general patterns, we may find it very difficult to reduce this topic to a simple, universal truth.

**PARAGRAPH 1**

Conservation biologists have long been concerned that species extinction could have **significant** consequences for the stability of entire ecosystems—groups of interacting organisms and the physical environment that they inhabit. An ecosystem could survive the loss of some species, but if enough species were lost, the ecosystem would be severely degraded. In fact, it is possible that the loss of a single important species could start a cascade of extinctions that might dramatically change an entire ecosystem. A good illustration of this occurred after sea otters were eliminated from some Pacific kelp (seaweed) bed ecosystems: the kelp beds were practically obliterated too because in the absence of sea otter predation, sea urchin populations exploded and consumed most of the kelp and other macroalgae.

1. The word**"significant"**in the passage is closest in meaning to

1. direct
2. important
3. long-term
4. surprising

2. According to paragraph 1, why has the extinction of species been a concern for conservation biologists?

1. When ecosystems lose just one species, they undergo permanent change.
2. The extinction of a particular predator species could cause an overpopulation of certain prey species.
3. The loss of one or more species could cause the decline of a whole ecosystem.
4. The extinction of a single species is evidence that plant-food sources are in danger of disappearing.

3. According to paragraph 1, what was the result of the removal of Pacific sea otters?

1. The kelp and sea urchins were destroyed by new predators.
2. The uncontrolled population of sea urchins ate most of the kelp plants.
3. Without sea otters, the kelp beds soon became overgrown.
4. Macroalgae remained as the primary population in the ecosystem.

**PARAGRAPH 2**

It is usually claimed that species-rich ecosystems tend to be more stable than species-poor ecosystems. Three mechanisms by which higher diversity increases ecosystem stability have been proposed. First, if there are more species in an ecosystem, then its food web will be more complex, with greater **redundancy** among species in terms of their nutritional roles. In other words, in a rich system if a species is lost, there is a good chance that other species will take over its function as prey, predator, producer, decomposer, or whatever role it played. Second, diverse ecosystems may be less likely to be invaded by new species, notably exotics (foreign species living outside their native range), that would disrupt the ecosystem’s structure and function. **Third, in a species-rich ecosystem, diseases may spread more slowly because most species will be relatively less abundant, thus increasing the average distance between individuals of the same species and hampering disease transmission among individuals.**

4. The word **“redundancy”**in the passage is closest in meaning to

1. duplication
2. variety
3. requirements
4. flexibility

5. What is the function of paragraph 2 in the passage?

1. To present a hypothesis about ecosystem diversity and some reasons why it might be true
2. To give examples of types of ecosystems that have the greatest diversity
3. To contradict a previous belief about the stability of species-rich ecosystems
4. To contrast species-rich and species-poor ecosystems

6. According to paragraph  2, which of the following increases the stability of an ecosystem?

1. Species in which producers outnumber predators
2. New or exotic species that increase ecosystem diversity
3. Heavily populated species that are free of disease
4. Species that are diverse but have similar nutritional roles

7. 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.

1. In any ecosystem, as the number of individuals in the same species increases, the rate of disease transmission slows down.
2. Ecosystems that have a small number of different species tend to be disease-free, because the species’ habitats are at a safe distance from each other.
3. In ecosystems with many species, diseases spread more slowly because there are fewer individuals in a species and, as a result, the individuals are more widely scattered.
4. The average distance between individuals in a species-rich ecosystem increases, so diseases are prevented from being communicated between species.

**PARAGRAPH 3**

Scientific evidence to illuminate these ideas has been slow in coming, and many shadows remain. One of the first studies to provide data supporting a relationship between diversity and stability examined how grassland plants responded to a drought. Researchers D. Tilman and J A. Downing used the ratio of above-ground biomass in 1988 (after two years of drought) to that in 1986 (predrought) in 207 plots in a grassland field in the Cedar Creek Natural History Area in Minnesota as an index of ecosystem response to disruption by drought. In an experiment that began in 1982, they compared these values with the number of plant species in each plot and discovered that the plots with a greater number of plant species experienced a less dramatic reduction in biomass. Plots with more than ten species had about half as much biomass in 1988 as in 1986, whereas those with fewer than five species only produced roughly one-eighth as much biomass after the two-year drought. Apparently, species-rich plots were likely to contain some drought-resistant plant species that grew better in drought years, **compensating for** the poor growth of less-tolerant species.

8. The phrase **”compensating for"**in the passage Is closest in meaning to

1. working against
2. leaving out
3. making up for
4. spreading over

9. What is the main importance of the study discussed in paragraph 3?

1. It examines the response of certain grassland plants to a drought.
2. It contains an index of plants that survived well in times of drought.
3. It provides scientific evidence that diversity helps to make ecosystems stable.
4. It shows that ecosystems contain both resistant species and less tolerant ones.

**PARAGRAPH 4**

To put this result in more general terms, a species-rich ecosystem may be more stable because it is more likely to have species with a wide array of responses to variable conditions such as droughts. Furthermore, a species-rich ecosystem is more likely to have species with similar ecological functions, so that if a species is lost from an ecosystem, another species, probably a competitor, is likely to flourish and occupy its functional role. Both of these, variability in responses and functional redundancy, could be thought of as insurance against disturbances.

10. Select the TWO answer choices that, according to paragraph 4, are conclusions that can be drawn from the study by Tilman and Downing. To receive credit you must select TWO answer choices.

1. A diverse ecosystem will have species that respond differently to a variety of conditions.
2. Species within a species-rich ecosystem are more likely to have competitors.
3. An ecosystem is more likely to develop diverse and stable species when it is exposed to extreme conditions.
4. Species with similar ecological functions will perform the function of a lost species.

**PARAGRAPH 5**

The Minnesota grassland research has been widely accepted as strong evidence for the diversity- stability theory; however, its findings have been questioned, and similar studies on other ecosystems have not always found a positive relationship between diversity and stability. Clearly, this is a complex issue that requires further field research with a broad spectrum of ecosystems and species: grassland plants and computer models will only take us so far. In the end, despite insightful attempts to **detect** some general patterns, we may find it very difficult to reduce this topic to a simple, universal truth.

11. The word **“detect”** in the passage is closest in meaning to

* 1. repeat
  2. alter
  3. find
  4. emphasize

12. According to paragraph 5, which of the following is true about Tilman and Downing’s findings?

1. General patterns of diversity and stability have been established as a result of the findings.
2. Questions about the findings have been refuted by computer models.
3. The findings have been tested in a broad spectrum of ecosystems with similar results.
4. The findings are not sufficient to prove a definite link between diversity and stability in ecosystems.

**PARAGRAPH 3**

Scientific evidence to illuminate these ideas has been slow in coming, and many shadows remain. [■] One of the first studies to provide data supporting a relationship between diversity and stability examined how grassland plants responded to a drought. [■] Researchers D. Tilman and J A. Downing used the ratio of above-ground biomass in 1988 (after two years of drought) to that in 1986 (predrought) in 207 plots in a grassland field in the Cedar Creek Natural History Area in Minnesota as an index of ecosystem response to disruption by drought. [■]In an experiment that began in 1982, they compared these values with the number of plant species in each plot and discovered that the plots with a greater number of plant species experienced a less dramatic reduction in biomass. [■]Plots with more than ten species had about half as much biomass in 1988 as in 1986, whereas those with fewer than five species only produced roughly one-eighth as much biomass after the two-year drought. Apparently, species-rich plots were likely to contain some drought-resistant plant species that grew better in drought years, compensating for the poor growth of less-tolerant species.

13. Look at the four squares [■] that indicate where the following sentence could be added to the passage. Where would the sentence best fit? Click on a square [■] to add the sentence to the passage.

**It seems clear that there is room for a great deal more research, although some work has been done..**

14. 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. Drag your answer choices to the spaces where they belong To remove an answer choice, click on it Biologists have long been worried about the possible effect of the extinction of species on whole ecosystems.

1. Conservation biology studies indicate that the loss of a single important species may bring temporary change to an ecosystem but it seldom results in lasting damage.
2. Ecosystems having species with similar functions but different responses to adverse conditions can survive environmental disturbances.
3. The Minnesota grassland study by Tilman and Downing presented evidence that the greater the diversity of species in an ecosystem, the more stable the ecosystem.
4. The absence of sea otter predation in a Pacific kelp bed ecosystem dramatically changed the entire ecosystem by stabilizing the total kelp population.
5. The findings of the Minnesota grassland study by Tilman and Downing indicated an equal number of drought-resistant and drought-tolerant plant species in species-rich plots.
6. More research is needed on the relationship between species diversity and ecosystem stability, though a simple explanation is unlikely.

Reading UNIT 4

取代原P.51-P.56的TPO12

TPO 21: The Origins of Agriculture

How did it come about that farming developed independently in a number of world centers (the Southeast Asian mainland, Southwest Asia, Central America, lowland and highland South America, and equatorial Africa) at more or less the same time? Agriculture developed slowly among populations that had an extensive knowledge of plants and animals. Changing from hunting and gathering to agriculture had no immediate advantages. To start with, it forced the population to abandon the nomad's life and became sedentary, to develop methods of storage and, often, systems of irrigation. While hunter-gatherers always had the option of moving elsewhere when the resources were exhausted, this became more difficult with farming. Furthermore, as the archaeological record shows, the state of health of agriculturalists was worse than that of their contemporary hunter-gatherers.  
  
Traditionally, it was believed that the transition to agriculture was the result of a worldwide population crisis. It was argued that once hunter-gatherers had occupied the whole world, the population started to grow everywhere and food became scarce; agriculture would have been a solution to this problem. We know, however, that contemporary hunter-gatherer societies control their population in a variety of ways. The idea of a world population crisis is therefore unlikely, although population pressure might have arisen in some areas.  
  
Climatic changes at the end of the glacial period 13,000 years ago have been proposed to account for the emergence of farming. The temperature increased dramatically in a short period of time (years rather than centuries), allowing for a growth of the hunting-gathering population due to the abundance of resources. There were, however, fluctuations in the climatic conditions, with the consequences that wet conditions were followed by dry ones, so that the availability of plants and animals oscillated brusquely.  
  
It would appear that the instability of the climatic conditions led populations that had originally been nomadic to settle down and develop a sedentary style of life, which led in turn to population growth and to the need to increase the amount of food available. Farming originated in these conditions. Later on, it became very difficult to change because of the significant expansion of these populations. It could be argued, however, that these conditions are not sufficient to explain the origins of agriculture. Earth had experienced previous periods of climatic change, and yet agriculture had not been developed.  
  
It is archaeologist Steven Mithen's thesis, brilliantly developed in his book The Prehistory of the Mind (1996), that approximately 40,000 years ago the human mind developed cognitive fluidity, that is, the integration of the specializations of the mind: technical, natural history (geared to understanding the behavior and distribution of natural resources), social intelligence, and the linguistic capacity. Cognitive fluidity explains the appearance of art, religion, and sophisticated speech. Once humans possessed such a mind, they were able to find an imaginative solution to a situation of severe economic crisis such as the farming dilemma described earlier. Mithen proposes the existence of four mental elements to account for the emergence of farming: (1) the ability to develop tools that could be used intensively to harvest and process plant resources; (2) the tendency to use plants and animals as the medium to acquire social prestige and power; (3) the tendency to develop "social relationships" with animals structurally similar to those developed with people—specifically, the ability to think of animals as people (anthropomorphism) and of people as animals (totemism); and (4) the tendency to manipulate plants and animals.  
  
The fact that some societies domesticated animals and plants, discovered the use of metal tools, became literate, and developed a state should not make us forget that others developed pastoralism or horticulture (vegetable gardening) but remained illiterate and at low levels of productivity; a few entered the modern period as hunting and gathering societies. It is anthropologically important to inquire into the conditions that made some societies adopt agriculture while others remained hunter-gatherers or horticulturalists. However, it should be kept in mind that many societies that knew of agriculture more or less consciously avoided it. Whether Mithen's explanation is satisfactory is open to contention, and some authors have recently emphasized the importance of other factors.

**PARAGRAPH 1**

How did it come about that farming developed independently in a number of world centers (the Southeast Asian mainland, Southwest Asia, Central America, lowland and highland South America, and equatorial Africa) at more or less the same time? Agriculture developed slowly among populations that had an extensive knowledge of plants and animals. Changing from hunting and gathering to agriculture had no immediate advantages. To start with, it forced the population to abandon the nomad's life and became sedentary, to develop methods of storage and, often, systems of irrigation. While hunter-gatherers always had the **option** of moving elsewhere when the resources were exhausted, this became more difficult with farming. Furthermore, as the archaeological record shows, the state of health of agriculturalists was worse than that of their contemporary hunter-gatherers.

1. The word **"option "** in the passage is closest in meaning to

A. choice

B. benefit

C. idea

D. experience

2. According to paragraph 1, all of the following are advantages of hunting and gathering over agriculture EXCEPT:

A. It is a healthier lifestyle.

B. It requires less knowledge of plants and animals.

C. It does not need storage capabilities.

D. It is not tied to any specific location.

**PARAGRAPH 2**

Traditionally, it was believed that the transition to agriculture was the result of a worldwide population crisis. It was argued that once hunter-gatherers had occupied the whole world, the population started to grow everywhere and food became scarce; agriculture would have been a solution to this problem. We know, however, that contemporary hunter-gatherer societies control their population in a variety of ways. The idea of a world population crisis is **therefore** unlikely, although population pressure might have arisen in some areas.

3. The word **"therefore"** in the passage is closest in meaning to

1. in theory
2. obviously
3. frequently
4. as a result

4. Which of the following best describes the way paragraph 2 is organized?

1. A possible explanation for a phenomenon is presented and then criticized
2. Two similar ways of accounting for a puzzling fact are considered.
3. Early societies' response to a problem is contrasted with contemporary societies' response.
4. A prehistoric development is first explained in traditional terms and then in contemporary terms.

**PARAGRAPH 3**

Climatic changes at the end of the glacial period 13,000 years ago have been proposed to account for the emergence of farming. **The temperature increased dramatically in a short period of time years rather than centuries, allowing for a growth of the hunting-gathering population due to the abundance of resources.** There were, however, fluctuations in the climatic conditions, with the consequences that wet conditions were followed by dry ones, so that the availability of plants and animals oscillated brusquely.

5. 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.

1. The resources needed by the growing hunting and gathering population increased rapidly once temperatures rose.
2. Dramatic temperature increases and the simultaneous growth of the hunting and gathering population led to the need for more resources.
3. Higher temperatures led to the existence of increased resources, thus enabling the hunting and gathering population to grow.
4. The dramatic temperature increase occurred during the few years when abundant resources allowed the hunting and gathering population to grow.

6. According to paragraph 3, the abundance of resources fluctuated sharply after the end of the glacial period because

1. locally abundant resources were quickly exhausted by hunter-gatherers
2. the temperature became much higher in some areas over others
3. different types of plants and animals became available as the climate changed
4. the amount of rainfall varied radically from one period to the next

**PARAGRAPH 4**

It would appear that the instability of the climatic conditions led populations that had originally been nomadic to settle down and develop a sedentary style of life, which led in turn to population growth and to the need to increase the amount of food available. Farming originated in these conditions. Later on, it became very difficult to change because of the significant expansion of these populations. It could be argued, however, that these conditions are not sufficient to explain the origins of agriculture. **Earth had experienced previous periods of climatic change, and yet agriculture had not been developed.**

7. It can be inferred from paragraph 4 that it was difficult for people to change from farming back to hunting and gathering because

1. people had become more used to different types of food
2. climatic conditions were no longer favorable for hunting and gathering
3. populations had become too large to be supported by hunting and gathering
4. the farmer's sedentary life was easier than the hunter-gatherer's nomadic life

8. Why does the author state that **"Earth had experienced previous periods of climatic change, and yet agriculture had not been developed "**?

1. To suggest that climate change had occurred long before the development of agriculture
2. To argue that climate change does not properly explain why agriculture developed
3. To challenge the assumption that agriculture developed only in some parts of the world
4. To question the claim that climate change occurred at the time when agriculture developed

**PARAGRAPH 5**

It is archaeologist Steven Mithen's thesis, brilliantly developed in his book The Prehistory of the Mind (1996), that approximately 40,000 years ago the human mind developed cognitive fluidity, that is, the integration of the specializations of the mind: technical, natural history (geared to understanding the behavior and distribution of natural resources), social intelligence, and the linguistic capacity. Cognitive fluidity explains the appearance of art, religion, and sophisticated speech. Once humans possessed such a mind, they were able to find an **imaginative** solution to a situation of severe economic crisis such as the farming dilemma described earlier. Mithen proposes the existence of four mental elements to account for the emergence of farming: (1) the ability to develop tools that could be used intensively to harvest and process plant resources; (2) the tendency to use plants and animals as the medium to acquire social prestige and power; (3) the tendency to develop "social relationships" with animals structurally similar to those developed with people—specifically, the ability to think of animals as people (anthropomorphism) and of people as animals (totemism); and (4) the tendency to manipulate plants and animals.

9. The word **"imaginative"** in the passage is closest in meaning to

1. complex
2. creative
3. immediate
4. reliable

10. According to paragraph 5, Steven Mithen believes that all of the following contributed to the emergence of farming EXCEPT

1. the development of a mind flexible enough to come up with solutions to complex problems
2. the tendency to use plants and animals to acquire power
3. the tendency to emphasize the differences between animals and people
4. the ability to make tools that could be used for the large-scale harvesting of plants

**PARAGRAPH 6**

The fact that some societies domesticated animals and plants, discovered the use of metal tools, became literate, and developed a state should not make us forget that others developed pastoralism or horticulture (vegetable gardening) but remained illiterate and at low levels of productivity; a few entered the modern period as hunting and gathering societies. It is anthropologically important to inquire into the conditions that made some societies adopt agriculture while others remained hunter-gatherers or horticulturalists. However, it should be kept in mind that many societies that knew of agriculture more or less consciously avoided it. Whether Mithen's explanation is satisfactory is open to **contention** and some authors have recently emphasized the importance of other factors.

11. The word **"contention"** in the passage is closest in meaning to

1. investigation
2. improvement
3. debate
4. interpretation

12. According to paragraph 6, which of the following is a weakness of Mithen

1. It does not clearly distinguish agriculture from pastoralism and horticulture.
2. It fails to explain why some societies adopted agriculture while others did not.
3. It explains the domestication of plants and animals but not the development of metal tools.
4. It overlooks the fact that illiteracy and low productivity remain problems even today

**PARAGRAPH 1**

How did it come about that farming developed independently in a number of world centers (the Southeast Asian mainland, Southwest Asia, Central America, lowland and highland South America, and equatorial Africa) at more or less the same time? Agriculture developed slowly among populations that had an extensive knowledge of plants and animals. [■]Changing from hunting and gathering to agriculture had no immediate advantages. [■]To start with, it forced the population to abandon the nomad's life and became sedentary, to develop methods of storage and, often, systems of irrigation. [■]While hunter-gatherers always had the option of moving elsewhere when the resources were exhausted, this became more difficult with farming. [■]Furthermore, as the archaeological record shows, the state of health of agriculturalists was worse than that of their contemporary hunter-gatherers.

13. Look at the four squares [■] that indicate where the following sentence could be added to the passage. Where would the sentence best fit? Click on a square to add the sentence to the passage.

**Because humans had built up this knowledge as hunter-gatherers, it is logical to conclude that over time they would have become extremely efficient..**

**PARAGRAPH 6**

The fact that some societies domesticated animals and plants, discovered the use of metal tools, became literate, and developed a state should not make us forget that others developed pastoralism or horticulture (vegetable gardening) but remained illiterate and at low levels of productivity; a few entered the modern period as hunting and gathering societies. It is anthropologically important to inquire into the conditions that made some societies adopt agriculture while others remained hunter-gatherers or horticulturalists. However, it should be kept in mind that many societies that knew of agriculture more or less consciously avoided it. Whether Mithen's explanation is satisfactory is open to contention, and some authors have recently emphasized the importance of other factors.

14. 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.

It is unclear why hunter-gatherers in different parts of the world independently developed agriculture at roughly the same time.

1. One obstacle to the transition from a nomadic lifestyle to the sedentary lifestyle required by agriculture was that hunter-gatherers had not developed storage techniques.
2. The origins of agriculture maybe linked to climate change at the end of the last ice age, but this does not explain why earlier climatic instability had not led to agriculture.
3. One recent theory suggests that the invention of agriculture was made possible by the integration of various mental capacities in the human mind
4. It seems unlikely that agriculture emerged in response to a food shortage brought on by a worldwide population crisis that developed once the whole world was occupied
5. The only available means of understanding the social organization and technical abilities of ancient hunter-gatherer societies is the study of contemporary hunter-gatherers.
6. Little is known about why only some societies that adopted agriculture rapidly progressed to using metal tools, becoming literate, and developing a state

UNIT 5

取代原P.63-67的TPO11

TPO 23: Rock Art of the Australia Aborigines

Ever since European first explored Australia, people have been trying to understand the ancient rock drawings and cavings created by the Aborigines, the original inhabitants of the continent. Early in the nineteenth century, encounters with Aboriginal rock art tended to be infrequent and open to speculative interpretation, but since the late nineteenth century, awareness of the extent and variety of Australian rock art has been growing. In the latter decades of the twentieth century there were intensified efforts to understand and record the abundance of Australian rock art.

The systematic study of this art is a relatively new discipline in Australia. Over the past four decades new discoveries have steadily added to the body of knowledge. The most significant data have come from a concentration on three major questions. First, what is the age of Australian rock art? Second, what is its stylistic organization and is it possible to discern a sequence or a pattern of development between styles? Third, is it possible to interpret accurately the subject matter of ancient rock art, bring to bear all available archaeological techniques and the knowledge of present-day Aboriginal informants?

The age of Australia’s rock art is constantly being revised, and earlier datings have been proposed as the result of new discoveries. Currently, reliable scientific evidence dates the earliest creation of art on rock surfaces in Australia to somewhere between 30,000 and 50,000 years ago. This in itself is an almost incomprehensible span of generations, and one that makes Australia’s rock art the oldest continuous art tradition in the world.

Although the remarkable antiquity of Australia’s rock art is now established, the sequences and meanings of its images have been widely debated. Since the mid-1970s, a reasonably stable picture has formed of the organization of Australian rock art. In order to create a sense of structure to this picture, researchers have relied on a distinction that still underlies the forms of much indigenous visual culture—a distinction between geometric and figurative elements. Simple geometric repeated patterns—circles, concentric circles, and lines—constitute the iconography (characteristic images) of the earliest rock-art sites found across Australia. The frequency with which certain simple motifs appear in these oldest sites has led rock-art researchers to adopt a descriptive term—the Panaramitee style—a label which takes its name from the extensive rock pavements at Panaramitee North in desert South Australia, which are covered with motifs pecked into the surface. Certain features of these engravings lead to the conclusion that they are of great age—geological changes had clearly happened after the designs had been made and local Aboriginal informants, when first questioned about them, seemed to know nothing of their origins. Furthermore, the designs were covered with “desert varnish,” a glaze that develops on rock surfaces over thousands of years of exposure to the elements. The simple motifs found at Panaramitee are common to many rock-art sites across Australia. Indeed, sites with engravings of geometric shapes are also to be found on the island of Tasmania, which was separated from the mainland of the continent some 10,000 years ago.

In the 1970s when the study of Australian archaeology was in an exciting phase of development, with the great antiquity of rock art becoming clear. Lesley Maynard, the archaeologist who coined the phrase “Panaramitee style,” suggested that a sequence could be determined for Australian rock art, in which a geometric style gave way to a simple figurative style (outlines of figures and animals), followed by a range of complex figurative styles that, unlike the pan-Australian geometric tradition, tended to be much greater regional diversity. While accepting that this sequence fits the archaeological profile of those sites, which were occupied continuously over many thousands of years a number of writers have warned that the underlying assumption of such a sequence—a development from the simple and the geometric to the complex and naturalistic—obscures the cultural continuities in Aboriginal Australia, in which geometric symbolism remains fundamentally important. In this context the simplicity of a geometric motif may be more apparent than real. Motifs of seeming simplicity can encode complex meanings in Aboriginal Australia. And has not twentieth-century art shown that naturalism does not necessarily follow abstraction in some kind of predetermine sequence?

**PARAGRAPH 1**

Ever since European first explored Australia, people have been trying to understand the ancient rock drawings and cavings created by the Aborigines, the original inhabitants of the continent. Early in the nineteenth century, encounters with Aboriginal rock art tended to be **infrequent** and open to speculative interpretation, but since the late nineteenth century, awareness of the extent and variety of Australian rock art has been growing. In the latter decades of the twentieth century there were intensified efforts to understand and record the abundance of Australian rock art.

1. The word **“infrequent”** in the passage (paragraph 1) is closest in meaning to

1. puzzling
2. uncommon
3. questionable
4. undocumented

2. According to paragraph 1, the twentieth-century approach to studying Australian rock art was different from earlier approaches because the twentieth-century approach

1. recognized that many different groups of Aborigines created Australian rock art
2. concentrated on a limited range of Aboriginal rock art
3. examined Aboriginal art from an Aboriginal rather than from a European perspective
4. focused more intensely on understanding and documenting rock art

**PARAGRAPH 2**

The systematic study of this art is a **relatively** new discipline in Australia. Over the past four decades new discoveries have steadily added to the body of knowledge. The most significant data have come from a concentration on three major questions. First, what is the age of Australian rock art? Second, what is its stylistic organization and is it possible to **discern** a sequence or a pattern of development between styles? Third, is it possible to interpret accurately the subject matter of ancient rock art, bring to bear all available archaeological techniques and the knowledge of present-day Aboriginal informants?

3. The word **“relatively”** in the passage is closest in meaning to

1. completely
2. comparatively
3. apparently
4. particularly

4. The word **“discern”** in the passage (paragraph 2) is closest in meaning to

1. indicate
2. apply
3. identify
4. repeat

**PARAGRAPH 3**

The age of Australia’s rock art is constantly being **revised** and earlier datings have been proposed as the result of new discoveries. Currently, reliable scientific evidence dates the earliest creation of art on rock surfaces in Australia to somewhere between 30,000 and 50,000 years ago. This in itself is an almost incomprehensible span of generations, and one that makes Australia’s rock art the oldest continuous art tradition in the world.

5. The word **“revised”** in the passage (paragraph 3) is closest in meaning to

1. discussed
2. raised
3. challenged
4. changed

**PARAGRAPH 4**

Although the remarkable antiquity of Australia’s rock art is now established, the sequences and meanings of its images have been widely debated. Since the mid-1970s, a reasonably stable picture has formed of the organization of Australian rock art. In order to create a sense of structure to this picture, researchers have relied on a distinction that still underlies the forms of much indigenous visual culture—a distinction between geometric and figurative elements. Simple geometric repeated patterns—circles, concentric circles, and lines—constitute the iconography (characteristic images) of the earliest rock-art sites found across Australia. The frequency with which certain simple motifs appear in these oldest sites has led rock-art researchers to adopt a descriptive term—the Panaramitee style—a label which takes its name from the extensive rock pavements at Panaramitee North in desert South Australia, which are covered with motifs pecked into the surface Certain features of these engravings lead to the conclusion that they are of great age—geological changes had clearly happened after the designs had been made and local Aboriginal informants, when first questioned about them, seemed to know nothing of their origins. Furthermore, the designs were covered with “desert varnish,” a glaze that develops on rock surfaces over thousands of years of exposure to the elements. The simple motifs found at Panaramitee are common to many rock-art sites across Australia. Indeed, sites with engravings of geometric shapes are also to be found on the island of Tasmania, which was separated from the mainland of the continent some 10,000 years ago.

6. Which of the sentences below best expresses the essential information in the highlighted sentence in the passage (paragraph 4)? Incorrect choices change the meaning in important ways or leave ways or leave out essential information

1. The oldest rock art sites have simpler motifs than the best known sites of Panaramitee North.
2. Because motifs primarily associated with the Panaramitee region are common in the oldest sites the term Panaramitee style has become the general term for rock art of this type.
3. Because the Panaramitee style is so common in the older sites, researchers have described it most extensively.
4. The motifs carved in the rocky surface of the Panaramitee region make up the oldest form of rock art discovered in Australia.

7. According to paragraph 4, researchers have organized and structured Australian rock art by distinguishing between which of the following?

1. Images found at Panaramitee North and images found in other parts of Australia
2. Images found in a particular type of rock layer and images found in other types of rock layers
3. Images that have geometric elements and images that have figurative elements
4. Images that are typically found and image that are rarely found

8. According to paragraph 4, all of the following are signs of the great age of the Panaramitee engravings EXCEPT:

1. The engravings consisted of simple animal drawings.
2. The engravings were covered with a layer of a substance known as “desert varnish”.
3. Local Aborigines who were asked knew nothing about the origin of the engravings.
4. Geologic changes had occurred after the engravings were made.

9. Why does the author include information about Tasmania in paragraph 4?

1. To provide evidence that the Panaramitee style is widespread and of great age
2. To prove that Aboriginal Australians could not have made the carvings in Tasmania
3. To indicate how researchers have determined how long ago Tasmania separated from the mainland
4. To illustrate the importance of geometric rock art to tourism in Tasmania

**PARAGRAPH 5**

In the 1970s when the study of Australian archaeology was in an exciting phase of development, with the great antiquity of rock art becoming clear. Lesley Maynard, the archaeologist who coined the phrase “Panaramitee style,” suggested that a sequence could be determined for Australian rock art, in which a geometric style gave way to a simple figurative style (outlines of figures and animals), followed by a range of complex figurative styles that, unlike the pan-Australian geometric tradition, tended to be much greater regional diversity. While accepting that this sequence fits the archaeological profile of those sites, which were occupied continuously over many thousands of years a number of writers have warned that the underlying assumption of such a sequence—a development from the simple and the geometric to the complex and naturalistic—obscures the cultural continuities in Aboriginal Australia, in which geometric symbolism remains fundamentally important. In this context the simplicity of a geometric motif may be more apparent than real. Motifs of seeming simplicity can encode complex meanings in Aboriginal Australia. And has not twentieth-century art shown that naturalism does not necessarily follow abstraction in some kind of predetermine sequence?

10. According to paragraph 5, the complex figurative style differs from the geometric style in that the complex figurative style

1. varies significantly from region to region
2. is more meaningful
3. appears on only a few types of rocks
4. has changed little overtime

11. According to paragraph 5, Lesley Maynard made which of the following suggestions about Australian rock art?

1. There were a pattern of human figures being represented in a more complex style than animal figures.
2. Australian archaeology should concentrate on determining the sequence of styles that led up to the Panaramitee style.
3. The great antiquity of Australian rock art would probably make it impossible to determine the ages of the various styles found in rock art.
4. The geometric style of Australian rock art was replaced by increasingly complex figurative styles.

12. In paragraph 5, the author indicates that twentieth century art has shown that naturalism does not necessarily follow abstraction in some kind of predetermined sequence in order to

1. emphasize that it may not be possible to determine what the figures in ancient rock art represent
2. suggest a reply to those who have questioned Maynard’s interpretation of the sequence of Australian rock art
3. provide a counterexample to Maynard’s interpretation of the sequence of Australian rock art
4. indicate that twentieth century art is more advanced than ancient rock art

**PARAGRAPH 2**

The systematic study of this art is a relatively new discipline in Australia. Over the past four decades new discoveries have steadily added to the body of knowledge. The most significant data have come from a concentration on three major questions. First, what is the age of Australian rock art? Second, what is its stylistic organization and is it possible to discern a sequence or a pattern of development between styles? Third, is it possible to interpret accurately the subject matter of ancient rock art, bring to bear all available archaeological techniques and the knowledge of present-day Aboriginal informants? [■]

**PARAGRAPH 3**

The age of Australia’s rock art is constantly being revised, and earlier datings have been proposed as the result of new discoveries. [■]Currently, reliable scientific evidence dates the earliest creation of art on rock surfaces in Australia to somewhere between 30,000 and 50,000 years ago. [■]This in itself is an almost incomprehensible span of generations, and one that makes Australia’s rock art the oldest continuous art tradition in the world. [■]

13. Look at the four squares [■] that indicate where the following sentence could be added to the passage. Where would the sentence best fit?

**While a great deal of information exists, the answers to these questions are not yet definitive..**

**PARAGRAPH 6**

In the 1970s when the study of Australian archaeology was in an exciting phase of development, with the great antiquity of rock art becoming clear. Lesley Maynard, the archaeologist who coined the phrase “Panaramitee style,” suggested that a sequence could be determined for Australian rock art, in which a geometric style gave way to a simple figurative style (outlines of figures and animals), followed by a range of complex figurative styles that, unlike the pan-Australian geometric tradition, tended to be much greater regional diversity. While accepting that this sequence fits the archaeological profile of those sites, which were occupied continuously over many thousands of years a number of writers have warned that the underlying assumption of such a sequence—a development from the simple and the geometric to the complex and naturalistic—obscures the cultural continuities in Aboriginal Australia, in which geometric symbolism remains fundamentally important. In this context the simplicity of a geometric motif may be more apparent than real. Motifs of seeming simplicity can encode complex meanings in Aboriginal Australia. And has not twentieth-century art shown that naturalism does not necessarily follow abstraction in some kind of predetermine sequence?

14. Direction: An introductory sentence for a brief summary of the passage is provides below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some sentences presented in the passage or are minor ideas in the passage. This question is worth 2 points. Interest in the rock art of the original inhabitants of Australia has grown over the last two centuries.

1. Late nineteenth century studies of Aboriginal rock art failed to recognize that a variety of styles existed.
2. The extreme age of the earliest Aboriginal rock art has been established but the interpretation of rock art images is still debated.
3. C.A sequence from geometric to more representative art fits many sites but does not necessarily indicate a progression from simple to complex meaning.
4. In determining the way in which Australian rock art was organized, archaeologists have made little distinction between geometric and figurative elements.
5. Older examples of rock art consist of simple, repeated geometric patterns while later rock art includes figures and animals.
6. Aboriginal informants were able to explain the meanings of ancient rock art symbols

UNIT 9

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TPO 49: Background for the Industrial Revolution

The Industrial Revolution had several roots, one of which was a commercial revolution that, beginning as far back as the sixteenth century, accompanied Europe’s expansion overseas. Both exports and imports showed spectacular growth, particularly in England and France. An increasingly larger portion of the stepped-up commercial activity was the result of trade with overseas colonies. Imports included a variety of new beverages, spices, and ship’s goods around the world and brought money flowing back. Europe’s economic institutions, particularly those in England, were strong, had wealth available for new investment, and seemed almost to be waiting for some technological breakthrough that would expand their profit-making potential even more.

The breakthrough came in Great Britain, where several economic advantages created a climate especially favorable to the encouragement of new technology. One was its geographic location at the crossroads of international trade. Internally, Britain was endowed with easily navigable natural waterway, which helped its trade and communication with the world. Beginning in the 1770’s, it enjoyed a boom in canal building, which helped make its domestic market more accessible. Because water transportation was the cheapest means of carrying goods to market, canals reduced prices and thus increased consumer demand. Great Britain also had rich deposits of coal that fed the factories springing up in industrial and consumer goods.

Another advantage was Britain’s large population of rural, agricultural wage earners, as well as cottage workers, who had the potential of being more mobile than peasants of some other countries. Eventually they found their way to the cities or mining communities and provided the human power upon which the Industrial Revolution was built. The British people were also consumers; the absence of internal tariffs, such as those that existed in France or Italy or between the German states, made Britain the largest free-trade area in Europe. Britain’s relatively stable government also helped create an atmosphere conducive to industrial progress.

Great Britain’s better-developed banking and credit system also helped speed the industrial progress, as did the fact that it was the home of an impressive array of entrepreneurs and inventors. Among them were a large number of nonconformists whose religious principles encouraged thrift and industry rather than luxurious living and who tended to pour their profits back into their business, thus providing the basis for continued expansion.

A precursor to the Industrial Revolution was a revolution in agricultural techniques. Ideas about agricultural reform developed first in Holland, where as early as the mid-seventeenth century, such modern methods as crop rotation, heavy fertilization, and diversification were all in use. Dutch peasant farmers were known throughout Europe for their agricultural innovations, but as British markets and opportunities grew, the English quickly learned from them. As early as the seventeenth century the Dutch were helping them drain marshes and fens where, with the help of advanced techniques, they grew new crops. By the mid-eighteenth century new agricultural methods as well as selective breeding of livestock had caught on throughout the country.

Much of the increased production was consumed by Great Britain’s burgeoning population. At the same time, people were moving to the city, partly because of the enclosure movement; that is, the fencing of common fields and pastures in order to provide more compact, efficient privately held agricultural parcels that would produce more goods and greater profits. In the sixteenth century enclosures were usually used for creating sheep pastures, but by the eighteenth century new farming techniques made it advantageous for large landowners to seek enclosures in order to improve agricultural production. Between 1714 and 1820 over 6 million acres of English land were enclosed. As a result, many small, independent farmers were forced to sell out simply because they could not compete. Non-landholding peasants and cottage workers, who worked for wages and grazed cows or pigs on the village common, were also hurt when the common was no longer available. It was such people who began to flock to the cities seeking employment and who found work in the factories that would transform the nation and, the world.

**PARAGRAPH 1**

Information on past climates is of primary relevance to archaeology because of what it tells us about the effects on the land and on the resources that people needed to survive. The most **crucial** effect of climate was on the sheer quantity of land available in each period, measurable by studying ancient coastlines. **These have changed constantly through time, even in relatively recent periods, as can be seen from the Neolithic stone circle of Er Lannic, in Brittany, France (once inland but now half submerged on an island) or medieval villages in east Yorkshire, England, that have tumbled into the sea in the last few centuries as the North Sea gnaws its way westward and erodes the cliffs.** Conversely, silts deposited by rivers sometimes push the sea farther back, creating new land, as at Ephesus in western Turkey, a port on the coast in Roman times but today some five kilometers inland.

1. The word **"crucial"** in the passage is closest in meaning to

1. interesting
2. important
3. established
4. understood

2. 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.

1. In the last few centuries, the erosion of coastline created the Neolithic stone circle in Brittany, France, at the same time that it destroyed the medieval villages in Yorkshire, England
2. Coastlines have changed even in recent times as shown by the current locations of certain Neolithic monuments and medieval villages
3. Recent changes in the coastlines near the Neolithic stone circle of Er Lannic in Brittany, France, and the medieval villages in Yorkshire, England, suggest that ancient coastlines changed in similar ways
4. Changes in coastlines can lead to the creation of islands such as Er Lannic in France or the total erosion of the cliffs as in Yorkshire in England, though no considerable changes have occurred in recent periods

3. According to paragraph 1, the city of Ephesus in western Turkey is an example of which of the following?

1. Recent changes in the shoreline that have resulted in the creation of new land
2. Port cities that have lost shoreline due to the erosion of land
3. The ocean's role in the formation of new land
4. The importance of changes in shoreline to cities located inland

**PARAGRAPH 2**

Nevertheless, for archeologists concerned with the long periods of time of the Paleolithic period there are variations in coastlines of much greater magnitude to consider. The expansion and contraction of the continental glaciers caused huge and uneven rises and falls in sea levels worldwide. When the ice sheets grew, the sea level would drop as water became locked up in the glaciers; when the ice melted, the sea level would rise again. Falls in sea level often exposed a number of important land bridges, such as those linking Alaska to northeast Asia and Britain to northwest Europe, a phenomenon with far-reaching effects not only on human colonization of the globe but also on the environment as a whole - the flora and fauna of isolated or insular areas were radically and often irreversibly affected. Between Alaska and Asia today lies the Bering Strait, which is so shallow that a fall in sea level of only four meters would turn it into a land bridge. When the ice sheets were at their greatest extent some 18,000 years ago (the glacier maximum), it is thought that the fall was about 120 meters, which therefore created not merely a bridge but a vast plain,1,000 kilometers from the north to the south, which has been called Beringia. The existence of Beringia (and the extent to which it could have supported human life) is one of the crucial pieces of evidence in the continuing debate about the likely route and date of human colonization of the New World.

4. Which of the following can be inferred from paragraph 2 about the effects of climate change during the Paleolithic period?

1. The amount of land not covered by water was a greater during warmer periods
2. Warmer weather encouraged the expansion of the range of flora and fauna
3. As a result of colder weather, land bridges became exposed
4. The rise of sea level occurred during periods of cold weather

5. By indicating that flora and fauna of isolated or insular areas were often irreversibly affected by the changes due to the Ice Age, the author means that the flora and fauna were

1. unable to return to their previous conditions
2. in a constant state of change
3. completely destroyed by human colonization
4. unevenly distributed across the area

6. According to paragraph 2, all of the following are true of Beringia EXCEPT

1. It may have been used by the people who first colonized North America
2. It may have been large enough to support life
3. It was probably still four meters under water during the glacier maximum
4. It was probably a vast plain

7. What purpose does the discussion about the Bering Strait in paragraph 2 serve in the passage?

1. It explains the idea that changes in coastlines do not necessarily result in significant alternations to existing marine life
2. It illustrates the kind of impact that variations in land availability caused by climate change can have
3. It provides a large amount of archaeological evidence that casts doubt on changes in sea level during the Paleolithic period
4. It shows how ancient coastlines can serve as useful models in understanding recent changes in coastlines

**PARAGRAPH 3**

The assessment of past rises and falls in sea level requires study of submerged land surfaces off the coast and of raised or elevated beaches on land. Raised beaches are **remnants** of former coastlines at higher levels relative to the present shoreline and visible, for instance, along the Californian coast north of San Francisco. The height of a raised beach above the present shoreline, however, does not generally give a straightforward indication of the height of a former sea level. In the majority of cases, the beaches lie at a higher level because the land has been raised up through isostatic uplift or tectonic movement. Isostatic uplift of the land occurs when the weight of ice is removed as temperatures rise, as at the end of an ice age; it has affected coastlines, for example, in Scandinavia, Scotland, Alaska, and Newfoundland during the postglacial period. Tectonic movements involve displacements in the plates that make up Earth’s crust. Middle and Late Pleistocene raised beaches in the Mediterranean are one instance of such movements.

8. The word **"remnants"** in the passage is closest meaning to

1. remains
2. regions
3. points
4. origins

9. According to paragraph 3, why is the height of a raised beach not a straightforward indicator of past sea level?

1. The height of the beach may have been raised or altered by human interventions in the shore environment
2. The height of the beach may be the result of erosion over a brief period of time
3. It is difficult to assess if the sea actually existed at that level for any significant period of time
4. The surface of Earth may have shifted, moving the beach from its original positron

10. According to paragraph 3, which of following causes an isostatic uplift?

1. Shifts in Earth's crust
2. A decrease in the pressure of thick ice sheets
3. A decrease in temperature
4. Changes in sea level

**PARAGRAPH 4**

[■] Raised beaches often consist of areas of sand, pebbles, or dunes, sometimes containing seashells or piles of debris **comprising** shells and bones of marine animals used by humans. [■] In Tokyo Bay, for example, shell mounds of the Jomon period (about 10,000 to 300 B.C.E.)mark the position of the shoreline at a time of maximum inundation by the sea (6,500-5,500 years ago),when, through tectonic movement, the sea was three to five meters higher in relation to the contemporary landmass of Japan than at present. [■] Analysis of the shells themselves has confirmed the changes in marine topography, for it is only during the maximum phase that subtropical species of mollusc are present, indicating a higher water temperature. [■]

11. The word **"comprising"** in the passage 4 is closest in meaning to

1. taken from
2. made up of
3. suggesting
4. covering

12. Which of the following can be inferred from paragraph 4 about Tokyo Bay?

1. The coastal land currently available is smaller than it was during the Japan period
2. The height of raised beaches around Tokyo Bay is a poor indicator of ancient sea levels
3. The water temperature in Tokyo Bay is lower at present than it was during the Jomon period
4. Tectonic movement during the Jomon period was not responsible for the formation of Tokyo Bay's raised beaches

13. Look at the four squares [■] that indicate where the following sentence could be added to the passage. Where would the sentence best fit? Click on a square [■] to add the sentence to the passage

14. The location of these heaps of rubbish can be an accurate indicator of earlier coastlines.

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. Changes in climate have altered Earth's coastlines and their environments

1. Changing coastlines affect the total amount of land available for people to live on
2. The existence of Beringia, a vast landmass that may have supported human life,is still debated by archaeologists
3. Raised beaches, which may contain indicators of human activity, are often the result of isotactic uplifts and tectonic movements
4. The expansion and contraction of glaciers caused rises and falls in sea levels all over the world and in some areas, led to radical changes in their flora and fauna
5. The climate changes that led to alternations in the coastlines of San Francisco, Scandinavia, Scotland, Alaska, and Newfoundland isolated species that had once flourished together
6. Because raised beaches along the Mediterranean Sea were caused by tectonic movements, they contain abundant evidence of ancient civilizations