Diagnostic Test

READING SECTION

Directions

In this section, you will read three passages and answer reading comprehension questions about each passage. Most questions are worth one point, but the last question in each set is worth more than one point. The directions indicate how many points you may receive.

You have 60 minutes to read all of the passages and answer the questions. Some passages include a word or phrase followed by an asterisk (*). Go to the bottom of the page to see a definition or an explanation of these words or phrases.

Questions 1–12

Causes of Ice Ages

Geologists have shown that for about 80 percent of the past 2.5 million years, ice-age conditions have prevailed on the Earth's surface. During the past one million years, increased glacial conditions have run in cycles of approximately 100,000 years.

Many different factors may contribute to these increases in glaciation at regular intervals throughout Earth's more geologically recent history. The three most prominent factors probably relate to the amount of sunlight that reaches the Earth. This varies over time for three main reasons. First, the planet wobbles* as it spins, due to the pull of the sun and moon. Furthermore, the Earth tilts* on its axis and the degree of tilt changes over time. Finally, the orbit of the Earth around the sun is elliptical and the length of the major axis of the ellipse changes over a period of about 100,000 years. A mathematician named Milutin Milankovitch discovered in the 1930s that the pattern of insolation, or sunlight, predicted by these eccentricities in the Earth's movement matched the period of the last several eras of intense glaciation.

These Milankovitch insolation cycles were the dominant theory in ice-age research for much of the twentieth century despite the fact that the match between periods of peak insolation and most intense glaciation were not exact. For example, a cycle of 400,000 years predicted by the Milankovitch theory has never shown up in the climate records obtained through the study of microfossils deposited on the sea floor. Also, recent analysis has shown that the insolation theory predicts peaks of sunlight at intervals of 95,000 and 125,000 years. Climatological data does not support this predicted sunlight peaking. Other damaging evidence was the indication of a precisely measured sudden rise in temperature at a water-filled cave in Nevada, which preceded the increase in solar radiation that was supposed to cause it.

These and other problems with the Milankovitch cycles led some researchers to seek alternative explanations for the cyclic arrival of extended ice ages. In the 1990s, it was discovered that the orbital inclination of the Earth to the sun and planets could also be responsible for climate changes. If we imagine a flat plane with the sun in the center and the planets revolving around it, the Earth slowly moves in and out of the flat plane by a few degrees, repeating the cycle every 100,000 years. Two scientists, Muller and MacDonald, have proposed that it is this orbital inclination which is ultimately responsible for the periods of glaciation and warming. They argue that because of the oscillation, the Earth periodically travels through clouds of debris, in the form of dust and meteoroids. Such debris could reduce the amount of solar energy reaching the surface of our planet, thus plunging it into regular cold periods.

The advantage of this theory is that it is not confronted with several of the problems associated with the Milankovitch theory. In particular, the new theory fits well with the analysis of ocean sediments taken from eight locations around the world. This analysis yielded data clearly showing the peak of the last several ice ages with a period of 100,000 years and corresponding to the periods when the Earth's oscillating inclination takes it through clouds of extraterrestrial debris.

However, many researchers in this field are not yet persuaded by the inclination hypothesis. The main problem is that the amount of dust that falls to the ground when the Earth travels through space debris is relatively small – not enough to produce radical climate changes. Volcanic eruptions, for example, release much greater amounts of ash and dust and have relatively little effect on climate. Supporters have countered that the by-products created by the dust as it vaporizes on entering the atmosphere cause subtle changes to the energy levels. Nevertheless, the necessary physical proof has yet to be found to convince the skeptics.

***wobble:** to shake or move from side to side
***tilt:** to be in a sloping position

1. The word "prevailed" in the passage is closest in meaning to (A) ruled (B) existed (C) survived (D) triumphed	Geologists have shown that for about 80 percent of the past 2.5 million years, ice-age conditions have prevailed on the Earth's surface. During the past one million years, increased glacial conditions have run in cycles of approximately 100,000 years.

2. What can be inferred from paragraph 2 about the factors that contribute to glaciation? (A) They affect the Earth's spin. (B) They are geologically recent. (C) Only three factors relate to levels of sunlight. (D) Other factors than those relating to the sunlight affect ice buildup. Paragraph 2 is marked with an arrow [➡].	➡ Many different factors may contribute to these increases in glaciation at regular intervals throughout Earth's more geologically recent history. The three most prominent factors probably relate to the amount of sunlight that reaches the Earth. This varies over time for three main reasons. First, the planet wobbles as it spins, due to the pull of the sun and moon. Furthermore, the Earth tilts on its axis and the degree of tilt changes over time. Finally, the orbit of the Earth around the sun is elliptical and the length of the major axis of the ellipse changes over a period of about 100,000 years. A mathematician named Milutin Milankovitch discovered in the 1930s that the pattern of insolation, or sunlight, predicted by these eccentricities in the Earth's movement matched the period of the last several eras of intense glaciation.

3. The phrase "these eccentricities" in the passage refers to all of the following EXCEPT (A) the various movements of the Earth as it spins (B) the degree of change in the Earth's tilt over time (C) the pattern of insolation matching the Earth's movement (D) the changing distance to the sun during the Earth's elliptical orbit	Many different factors may contribute to these increases in glaciation at regular intervals throughout Earth's more geologically recent history. The three most prominent factors probably relate to the amount of sunlight that reaches the Earth. This varies over time for three main reasons. First, the planet wobbles as it spins, due to the pull of the sun and moon. Furthermore, the Earth tilts on its axis and the degree of tilt changes over time. Finally, the orbit of the Earth around the sun is elliptical and the length of the major axis of the ellipse changes over a period of about 100,000 years. A mathematician named Milutin Milankovitch discovered in the 1930s that the pattern of insolation, or sunlight, predicted by these eccentricities in the Earth's movement matched the period of the last several eras of intense glaciation.

4. Scientists accepted the Milankovitch theory even though (A) the peaks of sunlight occurred at intervals of 95,000 and 125,000 years (B) the peaks of insolation and intense glaciation did not match (C) there were climate records of a 400,000-year cycle (D) there were microfossil deposits on the sea floor	[Refer to the full passage.]

5. In paragraph 4, why does the author suggest the image of a flat plane?
   - (A) To help the reader visualize the positions and movements of the heavenly bodies
   - (B) To demonstrate to the reader how the Earth orbits the sun
   - (C) To support the argument that the orbital inclination increases tilting
   - (D) To show how the Milankovitch theory doesn't explain the cyclical changes in climate

Paragraph 4 is marked with an arrow [➡].

➡ These and other problems with the Milankovitch cycles led some researchers to seek alternative explanations for the cyclic arrival of extended ice ages. In the 1990s, it was discovered that the orbital inclination of the Earth to the sun and planets could also be responsible for climate changes. If we imagine a flat plane with the sun in the center and the planets revolving around it, the Earth slowly moves in and out of the flat plane by a few degrees, repeating the cycle every 100,000 years. Two scientists, Muller and MacDonald, have proposed that it is this orbital inclination which is ultimately responsible for the periods of glaciation and warming. They argue that because of the oscillation, the Earth periodically travels through clouds of debris, in the form of dust and meteoroids. Such debris could reduce the amount of solar energy reaching the surface of our planet, thus plunging it into regular cold periods.

6. The word "it" in the passage refers to
   - (A) such debris
   - (B) solar energy
   - (C) the surface
   - (D) our planet

These and other problems with the Milankovitch cycles led some researchers to seek alternative explanations for the cyclic arrival of extended ice ages. In the 1990s, it was discovered that the orbital inclination of the Earth to the sun and planets could also be responsible for climate changes. If we imagine a flat plane with the sun in the center and the planets revolving around it, the Earth slowly moves in and out of the flat plane by a few degrees, repeating the cycle every 100,000 years. Two scientists, Muller and MacDonald, have proposed that it is this orbital inclination which is ultimately responsible for the periods of glaciation and warming. They argue that because of the oscillation, the Earth periodically travels through clouds of debris, in the form of dust and meteoroids. Such debris could reduce the amount of solar energy reaching the surface of our planet, thus plunging it into regular cold periods.

7. In paragraph 4, the author explains that
   - (A) Milankovitch did not know about the orbital inclination of the Earth
   - (B) glaciation occurs when the orbital inclination has entered a new cycle
   - (C) the Earth always travels through clouds of debris after moving out of the plane by a few degrees
   - (D) the amount of solar energy reaching the Earth's surface causes the changes of temperature

Paragraph 4 is marked with an arrow [➡].

➡ These and other problems with the Milankovitch cycles led some researchers to seek alternative explanations for the cyclic arrival of extended ice ages. In the 1990s, it was discovered that the orbital inclination of the Earth to the sun and planets could also be responsible for climate changes. If we imagine a flat plane with the sun in the center and the planets revolving around it, the Earth slowly moves in and out of the flat plane by a few degrees, repeating the cycle every 100,000 years. Two scientists, Muller and MacDonald, have proposed that it is this orbital inclination which is ultimately responsible for the periods of glaciation and warming. They argue that because of the oscillation, the Earth periodically travels through clouds of debris, in the form of dust and meteoroids. Such debris could reduce the amount of solar energy reaching the surface of our planet, thus plunging it into regular cold periods.

8. What problem in the Milankovitch theory was mentioned as being explained by the Muller and MacDonald theory?

(A) The climate records obtained by studying microfossil deposits not matching his predicted cycle
(B) The irregularities of the Earth's movements through orbital inclinations not following any pattern
(C) The Earth's spin wobbling in relation to the Earth's oscillating inclination
(D) The peak in the ice ages occurring at intervals between 95,000 and 125,000 years instead of 400,000

[Refer to the full passage.]

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

(A) convinced
(B) discouraged
(C) affected
(D) challenged

However, many researchers in this field are not yet persuaded by the inclination hypothesis. The main problem is that the amount of dust that falls to the ground when the Earth travels through space debris is relatively small – not enough to produce radical climate changes. Volcanic eruptions, for example, release much greater amounts of ash and dust and have relatively little effect on climate. Supporters have countered that the by-products created by the dust as it vaporizes on entering the atmosphere cause subtle changes to the energy levels. Nevertheless, the necessary physical proof has yet to be found to convince the skeptics.

10. What problem is associated with the Muller and MacDonald theory?

(A) The amount of debris that is released from volcanoes is proportional to the amount of interstellar dust.
(B) The amount of ash from volcanoes and space dust that vaporizes in the atmosphere is too small.
(C) The amount of dust entering the atmosphere is less than the amount of ash and dust released by volcanoes.
(D) The by-products created by vaporized space dust cause relevant changes to the energy levels.

[Refer to the full passage.]

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

When the Earth is at its furthest from the sun, less sunlight reaches the surface.

Where would the sentence best fit?

Choose the letter of the square that shows where the sentence should be added.

Many different factors may contribute to these increases in glaciation at regular intervals throughout Earth's more geologically recent history. A The three most prominent factors probably relate to the amount of sunlight that reaches the Earth. This varies over time for three main reasons. First, the planet wobbles as it spins, due to the pull of the sun and moon. B Furthermore, the Earth tilts on its axis and the degree of tilt changes over time. C Finally, the orbit of the Earth around the sun is elliptical and the length of the major axis of the ellipse changes over a period of about 100,000 years. D A mathematician named Milutin Milankovitch discovered in the 1930s that the pattern of insolation, or sunlight, predicted by these eccentricities in the Earth's movement matched the period of the last several eras of intense glaciation.

12. **Directions:** Select the appropriate phrases from the answer choices and match them to the flaws in the ice-age theories to which they relate. TWO of the answer choices will NOT be used. **This question is worth 4 points.**

Write the letters of the answer choices in the spaces where they belong.
Refer to the full passage.

Answer Choices

- (A) Data of climate records not coinciding with predicted intervals of sunlight
- (B) Temperature rises occurring before the increase of sunlight
- (C) The irregularities of the Earth's movement during its orbit around the sun
- (D) The inconsistency between the periods of sunlight and glaciation
- (E) The relatively mild effect of volcanic eruptions on the climate
- (F) The orbital inclination of Earth through clouds of debris
- (G) The relatively small amount of interstellar debris reaching Earth
- (H) The lack of clear support from ocean sediment data
- (I) The lack of physical evidence in support of the effects of the inclination hypothesis

Flaws in the Milankovitch Cycles Theory

- •
- •
- •
- •

Flaws in the Muller and MacDonald Theory

- •
- •
- •

Questions 13–26

Bird Migration

The phenomenon of seasonal bird migration has been known about for thousands of years, but it is still not fully understood by scientists. Not all birds migrate, but generally speaking the more northerly the breeding ground, the more likely is it that a species will migrate south for the winter. The main reason for this annual shifting of residence is that during the northern winters food becomes scarce and the cold temperatures make survival difficult. Some species are well adapted to these harsh conditions, but for those that aren't, moving south to warmer conditions is advantageous.

Changes in the weather can trigger the start of the journey south, although birds in the Northern Hemisphere seem to know when it is time to migrate south before the winter. In some species at least, the changes in the length of the day cause glands in the birds' bodies to secrete hormones that produce other changes, which ready the birds for the long flight south. At this time fat starts to accumulate under the skin, and this provides a store of energy for the long flight when they will be expending more calories flying than they can obtain during their brief rest stops.

In fact, bird-migration patterns are more complex than the simple pattern implied above. Birds that breed in the Southern Hemisphere migrate north to wintering grounds. Other birds travel on an approximately east-west path since milder climates can often be found in coastal areas of continental regions. Some birds find conditions more suitable at lower altitudes in a mountainous region and so migrate to lower levels in winter.

Perhaps the most mysterious and as yet not totally understood aspect of bird migration is how birds can navigate such long distances and arrive so precisely at their destination. Various possibilities exist. The most obvious explanation is that they learn the topographic* features of their route. However, it is not feasible that this method could be used for crossing larger stretches of water or very long trips across whole continents. Another possible explanation is that some birds may use magnetic fields. Scientists have actually detected tiny crystals of magnetite in the olfactory* tract of some species, and homing pigeons have been shown to follow magnetic field lines of the Earth.

A further possibility is that birds can detect the polarization patterns in sunlight. Some light waves from the sun are absorbed in the atmosphere, and some pass through. The resulting pattern of light waves forms a large bowtie-shaped image in the sky. The image has fuzzy ends and is sometimes known as Haidinger's brush after the discoverer of the effect. The image is oriented in a north and south direction and is visible at sunset. Although birds may not see this shape, they can discern gradations of polarization, which give them a kind of compass for determining directions.

Scientists believe that some birds navigate by use of star positions; this has been established with at least one species. In a series of studies, caged birds were subjected to the projection of the nighttime Northern Hemisphere inside a planetarium. All stars rotate around Polaris, the pole star, and this movement seemed to give the birds the information they needed to orientate themselves in the correct direction. However, some recent research contradicts this. Perhaps it is not the lack of movement of the pole star but rather the constellation patterns that guide them. It has also been found that when fewer stars were visible on the planetarium ceiling, the birds' sense of direction became poorer. And this, too, implies that the general star pattern does have some bearing on orientation.

The current state of research suggests that all of the above-mentioned methods probably have an influence on bird migration. Different species use one, some, or even all methods at different times and in various situations.

***topographic:** relating to the natural features of land
***olfactory:** connected with the sense of smell

13. In paragraph 1, it is understood that some birds don't migrate south in the winter because they
   - (A) already live in warmer conditions
   - (B) live in areas that have an abundant food supply
   - (C) have difficulty surviving the frigid temperatures
   - (D) are suited to the difficult conditions

Paragraph 1 is marked with an arrow [➡].

➡ The phenomenon of seasonal bird migration has been known about for thousands of years, but it is still not fully understood by scientists. Not all birds migrate, but generally speaking the more northerly the breeding ground, the more likely is it that a species will migrate south for the winter. The main reason for this annual shifting of residence is that during the northern winters food becomes scarce and the cold temperatures make survival difficult. Some species are well adapted to these harsh conditions, but for those that aren't, moving south to warmer conditions is advantageous.

14. The word "those" in the passage refers to
   - (A) northern winters
   - (B) cold temperatures
   - (C) harsh conditions
   - (D) some bird species

The phenomenon of seasonal bird migration has been known about for thousands of years, but it is still not fully understood by scientists. Not all birds migrate, but generally speaking the more northerly the breeding ground, the more likely is it that a species will migrate south for the winter. The main reason for this annual shifting of residence is that during the northern winters food becomes scarce and the cold temperatures make survival difficult. Some species are well adapted to these harsh conditions, but for those that aren't, moving south to warmer conditions is advantageous.

15. According to paragraph 2, what are the results of changes in the weather?
   - (A) The change in the length of the day
   - (B) The secretion of hormones by the birds
   - (C) The expenditure of calories
   - (D) The onset of migration

Paragraph 2 is marked with an arrow [➡].

➡ Changes in the weather can trigger the start of the journey south, although birds in the Northern Hemisphere seem to know when it is time to migrate south before the winter. In some species at least, the changes in the length of the day cause glands in the birds' bodies to secrete hormones that produce other changes, which ready the birds for the long flight south. At this time fat starts to accumulate under the skin, and this provides a store of energy for the long flight when they will be expending more calories flying than they can obtain during their brief rest stops.

16. The word "accumulate" in the passage is closest in meaning to
   - (A) build up
   - (B) fill in
   - (C) break up
   - (D) cut back

Changes in the weather can trigger the start of the journey south, although birds in the Northern Hemisphere seem to know when it is time to migrate south before the winter. In some species at least, the changes in the length of the day cause glands in the birds' bodies to secrete hormones that produce other changes, which ready the birds for the long flight south. At this time fat starts to accumulate under the skin, and this provides a store of energy for the long flight when they will be expending more calories flying than they can obtain during their brief rest stops.

17. All of the bird migration patterns are mentioned in the passage EXCEPT (A) the migration north from the Southern Hemisphere (B) the migration east or west toward milder climates (C) the migration from mountainous regions to lower altitudes (D) the migration from east to west towards hotter climates.	[Refer to the full passage.]

18. The word "precisely" in the passage is closest in meaning to (A) finally (B) exactly (C) entirely (D) decisively	Perhaps the most mysterious and as yet not totally understood aspect of bird migration is how birds can navigate such long distances and arrive so precisely at their destination. Various possibilities exist. The most obvious explanation is that they learn the topographic features of their route. However, it is not feasible that this method could be used for crossing larger stretches of water or very long trips across whole continents. Another possible explanation is that some birds may use magnetic fields. Scientists have actually detected tiny crystals of magnetite in the olfactory tract of some species, and homing pigeons have been shown to follow magnetic field lines of the Earth.

19. It can be inferred that polarization patterns (A) absorb sunlight (B) are tied in the center (C) are invisible at night (D) cause a magnetic force	[Refer to the full passage.]

20. Why does the author mention Haidinger's brush? (A) To understand the phenomenon (B) To describe the pattern (C) To explain what birds see (D) To define the fuzzy ends	[Refer to the full passage.]

21. The word "subjected" in the passage is closest in meaning to (A) exposed (B) subjugated (C) constrained (D) invited	Scientists believe that some birds navigate by use of star positions; this has been established with at least one species. In a series of studies, caged birds were subjected to the projection of the nighttime Northern Hemisphere inside a planetarium. All stars rotate around Polaris, the pole star, and this movement seemed to give the birds the information they needed to orientate themselves in the correct direction. However, some recent research contradicts this. Perhaps it is not the lack of movement of the pole star but rather the constellation patterns that guide them. It has also been found that when fewer stars were visible on the planetarium ceiling, the birds' sense of direction became poorer. And this, too, implies that the general star pattern does have some bearing on orientation.

22. According to paragraph 6, how do some birds navigate during the night? (A) By using a projection of the star positions (B) By circling around the pole star (C) By orientating themselves using the constellations (D) By getting their bearings from a few visible stars Paragraph 6 is marked with an arrow [➡].	➡ Scientists believe that some birds navigate by use of star positions; this has been established with at least one species. In a series of studies, caged birds were subjected to the projection of the nighttime Northern Hemisphere inside a planetarium. All stars rotate around Polaris, the pole star, and this movement seemed to give the birds the information they needed to orientate themselves in the correct direction. However, some recent research contradicts this. Perhaps it is not the lack of movement of the pole star but rather the constellation patterns that guide them. It has also been found that when fewer stars were visible on the planetarium ceiling, the birds' sense of direction became poorer. And this, too, implies that the general star pattern does have some bearing on orientation.