

Questions 1–12

Panspermia

The idea that life did not originate on Earth, but was carried here either deliberately or by natural processes, has its roots at least as far back as the ancient Greeks. This idea, often referred to as *panspermia*, took on a scientific form in the work of various nineteenth-century authors. It later gained widespread popular appeal through the work of the Swedish chemist Svante Arrhenius, who argued that spores of life could survive in space and travel between star systems through the pressure of solar radiation.

The panspermia hypothesis eventually fell out of favor for a variety of reasons. Skeptics pointed out that microorganisms could not possibly survive the damage caused by ultraviolet radiation and cosmic rays while being propelled out of a solar system away from a star. Indeed, it was unclear how biological material could escape from a planet by natural processes in the first place. If unprotected, the molecules of life would quickly be destroyed by radiation near the ejecting planet. Furthermore, it was not clear how microorganisms, having made a journey across the huge distances of interstellar space, could have safely descended to the surface of the Earth or any other planet. Arrhenius himself argued that organisms caught inside meteorites would be subjected to incandescent* temperatures while entering the atmosphere of a terrestrial body. Such heat would destroy any life-forms lucky enough to have survived to this point.

Despite the seeming implausibility* of the panspermia hypothesis, some theorists have resurrected the notion in recent decades since laboratory research has shown that many of the objections to the hypothesis can be overcome. Scientists have shown that microorganisms protected from radiation by grains of material could be ejected from a solar system if the repulsive force (*p*) of the ejecting star is greater than the attractive force (*g*) of the star's gravity. Such ejecting stars cannot be too luminous since brighter stars emit too much ultraviolet radiation for the survival of bacteria. Organisms can only enter new solar systems whose stars' *p/g* ratio is low, thus allowing the gravity to pull the microbes into the planetary orbits. According to some researchers, material ejected from a planetary system could also eventually become part of an interstellar molecular cloud, which eventually produces a new planetary system as well as a large number of comets. Comets can retain microorganisms protected by other material and water, and impact onto new planets, which by then would have cooled sufficiently for the life in the grains to take hold.

Further supporting evidence about the likelihood of survival of bacteria traveling through space and entering a planetary atmosphere has been gained from studies of a meteorite of Martian origin found in Antarctica in 1984. Whether or not the meteorite contains fossils of Martian bacteria (and many researchers now seem to reject this possibility), microscopic studies of its internal structure have shown that the interior was not heated to more than 40 degrees Celsius since before leaving the Martian surface. In other words, neither the original impact that must have ejected the rock away from the Martian surface nor the heat generated by its entry into the Earth's atmosphere did, in fact, melt or vaporize the internal portions of the meteorite. So it is quite possible that any life-form that had undergone such a trip would survive. As for the long journey itself, experiments aboard a European Space Agency mission have shown that bacterial spores can survive in deep space for at least five years. This is sufficient time for viable interplanetary travel, although not, of course, for interstellar travel.

Today, the panspermia hypothesis is being regarded with less skepticism than formerly. Although the orthodox view is still that life evolved on Earth (and possibly other planets in the universe) without extraterrestrial input, more and more research is pointing to the feasibility

of some form of interstellar “seeding.” Wickramasinghe and Hoyle, who championed the hypothesis of the interstellar transmission of life during the 1970s, argued persuasively that prebiotic chemicals have been shown to exist by remote sensing data of Comet Halley. Furthermore, they point out that evidence for viable microorganisms existing in comets could be attained in the near future if unmanned space missions could capture and return to Earth with cometary material.

***incandescent:** producing a bright light after being heated to a high temperature

***implausibility:** the condition of being difficult to believe

1. Early supporters of the panspermia hypothesis

- (A) rejected the main elements of the hypothesis
- (B) argued that some primitive life has been detected on a comet
- (C) pointed out that space missions will find life elsewhere
- (D) suggested that the “seeds” of life may have been deliberately planted

[Refer to the full passage.]

2. The word “propelled” in the passage is closest in meaning to

- (A) rejected
- (B) plunged
- (C) heaved
- (D) thrust

The panspermia hypothesis eventually fell out of favor for a variety of reasons. Skeptics pointed out that microorganisms could not possibly survive the damage caused by ultraviolet radiation and cosmic rays while being propelled out of a solar system away from a star. Indeed, it was unclear how biological material could escape from a planet by natural processes in the first place. If unprotected, the molecules of life would quickly be destroyed by radiation near the ejecting planet. Furthermore, it was not clear how microorganisms, having made a journey across the huge distances of interstellar space, could have safely descended to the surface of the Earth or any other planet. Arrhenius himself argued that organisms caught inside meteorites would be subjected to incandescent temperatures while entering the atmosphere of a terrestrial body. Such heat would destroy any life-forms lucky enough to have survived to this point.

3. According to the passage, the panspermia hypothesis fell out of favor for all of the following reasons EXCEPT

- (A) the potential damage caused by ultraviolet radiation
- (B) the unlikelihood of natural processes leading to the ejection of biological material
- (C) the probability that heat would destroy incoming life-forms
- (D) the knowledge that life can't exist elsewhere in the universe

[Refer to the full passage.]

4. The word "resurrected" in the passage is closest in meaning to

- (A) destroyed
- (B) reintroduced
- (C) initiated
- (D) succeeded

Despite the seeming implausibility of the panspermia hypothesis, some theorists have resurrected the notion in recent decades since laboratory research has shown that many of the objections to the hypothesis can be overcome. Scientists have shown that microorganisms protected from radiation by grains of material could be ejected from a solar system if the repulsive force (p) of the ejecting star is greater than the attractive force (g) of the star's gravity. Such ejecting stars cannot be too luminous since brighter stars emit too much ultraviolet radiation for the survival of bacteria. Organisms can only enter new solar systems whose stars' p/g ratio is low, thus allowing the gravity to pull the microbes into the planetary orbits. According to some researchers, material ejected from a planetary system could also eventually become part of an interstellar molecular cloud, which eventually produces a new planetary system as well as a large number of comets. Comets can retain microorganisms protected by other material and water, and impact onto new planets, which by then would have cooled sufficiently for the life in the grains to take hold.

5. The word "retain" in the passage is closest in meaning to

- (A) prevent
- (B) erode
- (C) avert
- (D) keep

Despite the seeming implausibility of the panspermia hypothesis, some theorists have resurrected the notion in recent decades since laboratory research has shown that many of the objections to the hypothesis can be overcome. Scientists have shown that microorganisms protected from radiation by grains of material could be ejected from a solar system if the repulsive force (p) of the ejecting star is greater than the attractive force (g) of the star's gravity. Such ejecting stars cannot be too luminous since brighter stars emit too much ultraviolet radiation for the survival of bacteria. Organisms can only enter new solar systems whose stars' p/g ratio is low, thus allowing the gravity to pull the microbes into the planetary orbits. According to some researchers, material ejected from a planetary system could also eventually become part of an interstellar molecular cloud, which eventually produces a new planetary system as well as a large number of comets. Comets can retain microorganisms protected by other material and water, and impact onto new planets, which by then would have cooled sufficiently for the life in the grains to take hold.

6. According to the passage, the panspermia hypothesis is

- (A) of historical interest only
- (B) being taken seriously again
- (C) not really good science
- (D) probably true

[Refer to the full passage.]

7. The word "its" in the passage refers to

(A) the Martian
(B) the bacteria
(C) the meteorite
(D) the interior

Further supporting evidence about the likelihood of survival of bacteria traveling through space and entering a planetary atmosphere has been gained from studies of a meteorite of Martian origin found in Antarctica in 1984. Whether or not the meteorite contains fossils of Martian bacteria (and many researchers now seem to reject this possibility), microscopic studies of its internal structure have shown that the interior was not heated to more than 40 degrees Celsius since before leaving the Martian surface. In other words, neither the original impact that must have ejected the rock away from the Martian surface nor the heat generated by its entry into the Earth's atmosphere did, in fact, melt or vaporize the internal portions of the meteorite. So it is quite possible that any life-form that had undergone such a trip would survive. As for the long journey itself, experiments aboard a European Space Agency mission have shown that bacterial spores can survive in deep space for at least five years. This is sufficient time for viable interplanetary travel, although not, of course, for interstellar travel.

8. The phrase "such a trip" in the passage refers to

(A) a journey from Mars to Earth
(B) the descent through Earth's atmosphere
(C) a trip from another solar system
(D) interstellar traveling

Further supporting evidence about the likelihood of survival of bacteria traveling through space and entering a planetary atmosphere has been gained from studies of a meteorite of Martian origin found in Antarctica in 1984. Whether or not the meteorite contains fossils of Martian bacteria (and many researchers now seem to reject this possibility), microscopic studies of its internal structure have shown that the interior was not heated to more than 40 degrees Celsius since before leaving the Martian surface. In other words, neither the original impact that must have ejected the rock away from the Martian surface nor the heat generated by its entry into the Earth's atmosphere did, in fact, melt or vaporize the internal portions of the meteorite. So it is quite possible that any life-form that had undergone such a trip would survive. As for the long journey itself, experiments aboard a European Space Agency mission have shown that bacterial spores can survive in deep space for at least five years. This is sufficient time for viable interplanetary travel, although not, of course, for interstellar travel.

9. According to the passage, the meteorite found in Antarctica
- does not contain bacteria fossils
 - might contain bacteria fossils
 - has fossils originating on Earth
 - could not originate from Mars

[Refer to the full passage.]

10. 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.
- Nowadays, the panspermia hypothesis has been more or less rejected.
 - Currently, the panspermia hypothesis is looked on with more astonishment than previously.
 - These days, the panspermia hypothesis is judged more plausible than before.
 - The modern scientific establishment now generally accepts the validity of the panspermia hypothesis.

Today, the panspermia hypothesis is being regarded with less skepticism than formerly. Although the orthodox view is still that life evolved on Earth (and possibly other planets in the universe) without extraterrestrial input, more and more research is pointing to the feasibility of some form of interstellar "seeding." Wickramasinghe and Hoyle, who championed the hypothesis of the interstellar transmission of life during the 1970s, argued persuasively that prebiotic chemicals have been shown to exist by remote sensing data of Comet Halley. Furthermore, they point out that evidence for viable microorganisms existing in comets could be attained in the near future if unmanned space missions could capture and return to Earth with cometary material.

11. Look at the four squares [■] that indicate where the following sentence could be added to the passage.
- However, even if organisms were somehow shielded inside fine grains of carbon they would be too heavy to be ejected from a planetary system by the pressure of radiation.**

Where would the sentence best fit?

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

The panspermia hypothesis eventually fell out of favor for a variety of reasons. A Skeptics pointed out that microorganisms could not possibly survive the damage caused by ultraviolet radiation and cosmic rays while being propelled out of a solar system away from a star. Indeed, it was unclear how biological material could escape from a planet by natural processes in the first place. B If unprotected, the molecules of life would quickly be destroyed by radiation near the ejecting planet. C Furthermore, it was not clear how microorganisms, having made a journey across the huge distances of interstellar space, could have safely descended to the surface of the Earth or any other planet. D Arrhenius himself argued that organisms caught inside meteorites would be subjected to incandescent* temperatures while entering the atmosphere of a terrestrial body. Such heat would destroy any life-forms lucky enough to have survived to this point.

- 12. Directions:** Select the appropriate phrases from the answer choices and match them to the category to which they relate. THREE 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) Prebiotic chemicals exist in comets.
- (B) Bright stars emit a lot of ultraviolet radiation.
- (C) Distances in interstellar space are huge.
- (D) Comets are made up of water and other materials.
- (E) Interstellar space has ultraviolet radiation and cosmic rays.
- (F) Meteorites are subjected to burning temperatures when entering Earth's atmosphere.
- (G) Meteorites from Mars have been found on Earth in areas of Antarctica where the cold temperatures protected life-forms.
- (H) The meteorite found in Antarctica contained frozen fossils.
- (I) Bacterial spores have been shown capable of surviving for several years in space.
- (J) Stars with a repulsive force greater than their attractive force are able to eject material.

Arguments Against Panspermia Hypothesis

- Prebiotic chemicals do not exist in comets.
- Bright stars do not emit a lot of ultraviolet radiation.
- Distances in interstellar space are not huge.
- Comets are not made up of water and other materials.
- Interstellar space does not have ultraviolet radiation and cosmic rays.
- Meteorites are not subjected to burning temperatures when entering Earth's atmosphere.
- Meteorites from Mars have not been found on Earth in areas of Antarctica where the cold temperatures protected life-forms.
- The meteorite found in Antarctica did not contain frozen fossils.
- Bacterial spores have not been shown capable of surviving for several years in space.
- Stars with a repulsive force less than or equal to their attractive force are not able to eject material.

Support for Panspermia Hypothesis

- Evidence supporting the panspermia hypothesis includes the presence of bacteria, however, in meteorites and the presence of organic molecules in meteorites.
- Evidence supporting the panspermia hypothesis includes the presence of bacterial spores in meteorites.
- Evidence supporting the panspermia hypothesis includes the presence of organic molecules in meteorites.
- Evidence supporting the panspermia hypothesis includes the presence of organic molecules in meteorites.
- Evidence supporting the panspermia hypothesis includes the presence of organic molecules in meteorites.
- Evidence supporting the panspermia hypothesis includes the presence of organic molecules in meteorites.
- Evidence supporting the panspermia hypothesis includes the presence of organic molecules in meteorites.
- Evidence supporting the panspermia hypothesis includes the presence of organic molecules in meteorites.
- Evidence supporting the panspermia hypothesis includes the presence of organic molecules in meteorites.
- Evidence supporting the panspermia hypothesis includes the presence of organic molecules in meteorites.

Questions 13–25**Ocean Energy Systems**

In recent years, the oceans have been seen as a potential source of energy. Oceans are huge reservoirs of renewable energy, which have yet to be properly harnessed*. Some estimates say that during the second decade of this century, ocean energy sources will generate more than 1,000 megawatts of electricity, which is enough to power a million homes in the industrialized world. Several technologies have been developed for exploiting these resources in a practical way, among which ocean thermal energy conversion (OTEC) is one of the most promising. Experimental OTEC plants have been constructed using different operating principles, although as yet no large-scale commercially viable plant has been launched.

The basic operation behind this system uses the heat energy stored in the oceans as a source of power. The plant exploits the difference in water temperature between the warm surface waters heated by the sun and the colder waters found at ocean depths. A minimum temperature difference of 20 degrees Celsius between surface and depth is required for efficient operation, and this situation is typically found only in tropical and subtropical regions of the world. There are two basic kinds of OTEC system: the open cycle system and the closed cycle system. In the open cycle system, the warm surface water is converted into steam in a partial vacuum and this steam drives a turbine connected to an electrical generator. In a closed cycle system, the warm surface water is used to boil a fluid, such as ammonia, which has a low boiling point. In both systems cold water pumped up from the ocean depths condenses the vapor. In the open system, the steam is condensed back into a liquid by cold water pumped from deep-ocean water and then discharged. In the closed system, the condensed ammonia is used to repeat the cycle continuously. Various hybrid systems using characteristics of both open and closed cycle plants have also been designed.

The OTEC system is potentially an important source of clean, renewable energy, which could significantly reduce our reliance on fossil fuels and nuclear fission. Unlike other forms of renewable energy, such as those provided directly by the sun and wind, OTEC plants can generate power 24 hours per day, 365 days per year. Furthermore, the design of this technology avoids any significant release of carbon dioxide into the atmosphere. OTEC can offer other important benefits apart from power production. Aquaculture is one important spinoff. It may also be economically feasible to extract minerals from the pumped seawater. Freshwater for drinking and irrigation is another by-product, and this will be an important advantage in regions where freshwater is limited.

Some drawbacks to this form of power generation have been noted. Perhaps the biggest drawback at present is the high capital cost of initial construction due mainly to the expense of the large pipeline used to pump water from 1,000 meters below the surface. Furthermore, the conversion of thermal to electrical energy in the OTEC system works at very low efficiency, which means that these plants will have to use a lot of water to generate practical amounts for the power grid. For this reason, the net power output is reduced, since a significant portion of the output must be used to pump water. There are also potential ecological drawbacks, since the water discharges will change the water temperature and disturb some marine habitats. This impact could, however, be minimized if the water is discharged at greater depths.

The main obstacle created by high initial expenses will have to be met before OTEC competes with conventional alternatives, and until such time, OTEC will remain restricted to experimental plants. When technology permits lower start-up costs, this technology will make an important contribution to world energy requirements.

*harnessed: controlled for use

13. The word “viable” in the passage is closest in meaning to

- (A) clever
- (B) feasible
- (C) optimistic
- (D) convenient

In recent years, the oceans have been seen as a potential source of energy. Oceans are huge reservoirs of renewable energy, which have yet to be properly harnessed. Some estimates say that during the second decade of this century, ocean energy sources will generate more than 1,000 megawatts of electricity, which is enough to power a million homes in the industrialized world. Several technologies have been developed for exploiting these resources in a practical way, among which ocean thermal energy conversion (OTEC) is one of the most promising. Experimental OTEC plants have been constructed using different operating principles, although as yet no large-scale commercially viable plant has been launched.

14. It can be inferred from the passage that

- (A) renewable energy can be put into reservoirs
- (B) the experimental plants are ready to be launched
- (C) the oceans could be used in the future to generate electricity
- (D) 1,000 megawatts of electricity is the amount needed in the average home

[Refer to the full passage.]

15. According to the passage, what can be inferred about the factor that allows the ocean to be used as an energy source?

- (A) The oceans are so large that they can produce a lot of energy.
- (B) In polar climates, the sun does not sufficiently heat the deeper water for practical energy use.
- (C) The oceans can store vast amounts of heat energy to be used to run basic electricity plants.
- (D) The plants are typically found in the tropical and subtropical regions of the world because of the warm weather.

[Refer to the full passage.]

16. According to the passage, in what way are the basic kinds of OTEC systems similar?

- (A) They turn surface water into steam.
- (B) They use cold water to cause condensation.
- (C) They discharge unused water into the ocean.
- (D) They convert water in a vacuum.

[Refer to the full passage.]

17. The phrase "other forms" in the passage refers to energy produced through

- (A) fossil fuels and nuclear fission
- (B) chemical reactions
- (C) OTEC systems
- (D) sun and wind

The OTEC system is potentially an important source of clean, renewable energy, which could significantly reduce our reliance on fossil fuels and nuclear fission. Unlike other forms of renewable energy, such as those provided directly by the sun and wind, OTEC plants can generate power 24 hours per day, 365 days per year. Furthermore, the design of this technology avoids any significant release of carbon dioxide into the atmosphere. OTEC can offer other important benefits apart from power production. Aquaculture is one important spinoff. It may also be economically feasible to extract minerals from the pumped seawater. Freshwater for drinking and irrigation is another by-product, and this will be an important advantage in regions where freshwater is limited.

18. In paragraph 3, what can be inferred about the different sources of energy?

- (A) We rely too much on fossil fuels and nuclear fission.
- (B) Renewable energy releases a lot of carbon dioxide into the atmosphere.
- (C) Energy from OTEC is provided directly by the sun and wind.
- (D) Energy forms other than OTEC do not have important benefits.

Paragraph 3 is marked with an arrow [➡].

➡ The OTEC system is potentially an important source of clean, renewable energy, which could significantly reduce our reliance on fossil fuels and nuclear fission. Unlike other forms of renewable energy, such as those provided directly by the sun and wind, OTEC plants can generate power 24 hours per day, 365 days per year. Furthermore, the design of this technology avoids any significant release of carbon dioxide into the atmosphere. OTEC can offer other important benefits apart from power production. Aquaculture is one important spinoff. It may also be economically feasible to extract minerals from the pumped seawater. Freshwater for drinking and irrigation is another by-product, and this will be an important advantage in regions where freshwater is limited.

19. In paragraph 3, why does the author write about aquaculture and mineral extractions?

- (A) To give examples of possible developments related to OTEC
- (B) To demonstrate what other activities can be done in the ocean
- (C) To point out OTEC's advantages in regions of limited resources
- (D) To show how the environment can be improved by using clean, renewable energy

Paragraph 3 is marked with an arrow [➡].

➡ The OTEC system is potentially an important source of clean, renewable energy, which could significantly reduce our reliance on fossil fuels and nuclear fission. Unlike other forms of renewable energy, such as those provided directly by the sun and wind, OTEC plants can generate power 24 hours per day, 365 days per year. Furthermore, the design of this technology avoids any significant release of carbon dioxide into the atmosphere. OTEC can offer other important benefits apart from power production. Aquaculture is one important spinoff. It may also be economically feasible to extract minerals from the pumped seawater. Freshwater for drinking and irrigation is another by-product, and this will be an important advantage in regions where freshwater is limited.

20. According to the passage, all of the following are problems with the OTEC system as a power-generating system EXCEPT

- (A) the costs of constructing the power system
- (B) the damage caused to fishing grounds
- (C) the effect of discharged water on the environment
- (D) the amount of water needed to produce a useful amount of electricity

[Refer to the full passage.]

21. The word “conventional” in the passage is closest in meaning to

- (A) conservative
- (B) traditional
- (C) tentative
- (D) natural

The main obstacle created by high initial expenses will have to be met before OTEC competes with conventional alternatives, and until such time, OTEC will remain restricted to experimental plants. When technology permits lower start-up costs, this technology will make an important contribution to world energy requirements.

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

- (A) Water outflow temperatures could upset local marine life.
- (B) Water discharges will disturb the ecology of the oceans.
- (C) The OTEC system has a tendency to upset marine environments.
- (D) Outflows of water will affect the ocean temperature at great depths.

Some drawbacks to this form of power generation have been noted. Perhaps the biggest drawback at present is the high capital cost of initial construction due mainly to the expense of the large pipeline used to pump water from 1,000 meters below the surface. Furthermore, the conversion of thermal to electrical energy in the OTEC system works at very low efficiency, which means that these plants will have to use a lot of water to generate practical amounts for the power grid. For this reason, the net power output is reduced, since a significant portion of the output must be used to pump water. There are also potential ecological drawbacks, since the water discharges will change the water temperature and disturb some marine habitats. This impact could, however, be minimized if the water is discharged at greater depths.

23. Which of the following statements most accurately reflects the author's opinion about OTEC technology?

- (A) OTEC will eventually supply most of the world's energy needs.
- (B) The disadvantages of OTEC energy outweigh its advantages.
- (C) OTEC technology has a useful role to play in total energy production.
- (D) Only very large OTEC plants can be made efficient.

[Refer to the full passage.]

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

The nutrient-rich cold water is an excellent medium for growing phytoplankton, which provide support for various commercially exploitable fish and shellfish.

Where would the sentence best fit?

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

The OTEC system is potentially an important source of clean, renewable energy, which could significantly reduce our reliance on fossil fuels and nuclear fission. A Unlike other forms of renewable energy, such as those provided directly by the sun and wind, OTEC plants can generate power 24 hours per day, 365 days per year. Furthermore, the design of this technology avoids any significant release of carbon dioxide into the atmosphere. OTEC can offer other important benefits apart from power production. B Aquaculture is one important spinoff. C It may also be economically feasible to extract minerals from the pumped seawater. D Freshwater for drinking and irrigation is another by-product, and this will be an important advantage in regions where freshwater is limited.

25. **Directions:** An introductory sentence for a brief summary of the passage is provided below. Complete the summary by circling 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.**

Write the letters of the answer choices in the spaces where they belong.

Refer to the full passage.

The OTEC system of power generation is a promising source of energy.

-
-
-
-

Answer Choices

- (A) OTEC systems use ocean temperature differences at different climates to create a significant amount of energy.
- (B) OTEC systems can produce clean, renewable energy without harmful environmental effects.
- (C) The OTEC system's pump would require a significant amount of energy of the total output.
- (D) OTEC plants can produce more than enough electricity to supply over a million energy users.
- (E) The OTEC system can generate power nonstop, unlike other renewable resources like sun and wind energy.
- (F) The OTEC system has the added benefit of providing nutritious cold water suitable for fish production.

Questions 26–39

Neolithic Agriculture Development

In the Neolithic period, starting around 10,000 years ago, perhaps the most important economic revolution in human history occurred – the commencement of agriculture and the domestication of animals for human consumption. From this point in time, people could start to rely on a more consistent and much increased food supply. As a corollary of this, considerably larger populations could be supported and people could settle in one place without the need to migrate in search of food supplies. Equally important, the surpluses of crops and animals meant that not all the population needed to dedicate their time and energy to farming; some could now learn specialized skills such as crafts or trade. The building of permanent settlements where skills could be developed brought about the conditions necessary for the first growth of towns. But several thousand years elapsed between the beginnings of agriculture and the rise of what we call civilization about 6,000 years ago.

Recent evidence seems to indicate that while the Neolithic revolution first took place in the Middle East – in the valleys of the Tigris-Euphrates and of the Nile – it occurred independently in other areas of the world. The origins of the revolution are not known in great detail, but it is known that the wild grasses that were the ancestors of wheat and barley grew natively in the Eastern Mediterranean area. It may be that Mesolithic (Middle Stone Age) foragers* simply supplemented their diet by reaping these wild grasses, and later came to understand the advantage of returning some of the grain to the soil as seed. Whatever the case, we know that at an early date people living in the Eastern Mediterranean region, who lived by hunting, fishing, and gathering, began to make sickles, with stone teeth set in bone handles. Such tools were certainly used for reaping some grass crop, whether cultivated or wild.

Around this time, other communities in the Middle East cultivated plants from which they learned how to obtain flour. Evidence shows that they ground down the grain with a simple type of mill, consisting of a large saddle-shaped stone on which a smaller stone was rubbed up and down. The livestock they bred – cattle, sheep, pigs, and goats – was exploited for their meat, skins, and milk.

Both in Egypt and Mesopotamia, the periodic floods of great rivers such as the Nile and the Tigris-Euphrates not only supplied water to the fields but also brought down fresh soil in the form of fertile muddy sediments. This sediment was deposited on flood plains around such rivers, thus annually restoring the fruitfulness of the land. This regular flooding and sediment deposit allowed these early farmers to continue cultivating the same fields repeatedly for generations without exhausting the fertility of the soil, and crop surpluses were, therefore, available to allow an increase in population and a growth in trade and skills development. The area available for cultivation was expanded when people learned to draw off the river water into man-made irrigation canals and ditches, watering and fertilizing larger and larger areas of land.

The practice of artificial irrigation affected the soil in various ways, but not always for the good. Since the channels were often shallow, there was frequently a great loss of water through evaporation in a hot climate. This could lead to a marked increase in soil salinity, since the salts held in solution or suspension were deposited as the water evaporated, and too much salinity could eventually damage the soil. But overall the effect of the irrigation system was to create an artificial environment – and to some extent an artificial climate – with a range of conditions that favored both human experiment and agricultural development. Beyond this, settled agriculture led to the development of property rights and hence to a legal framework and mechanisms to enforce laws. This in turn led to a more extensive and hierarchical government organization and hence to the development of large, stable communities.

***foragers:** people who go searching for food

26. The word "corollary" in the passage is closest in meaning to

- (A) basis
- (B) result
- (C) source
- (D) purpose

In the Neolithic period, starting around 10,000 years ago, perhaps the most important economic revolution in human history occurred – the commencement of agriculture and the domestication of animals for human consumption. From this point in time, people could start to rely on a more consistent and much increased food supply. As a corollary of this, considerably larger populations could be supported and people could settle in one place without the need to migrate in search of food supplies. Equally important, the surpluses of crops and animals meant that not all the population needed to dedicate their time and energy to farming; some could now learn specialized skills such as crafts or trade. The building of permanent settlements where skills could be developed brought about the conditions necessary for the first growth of towns. But several thousand years elapsed between the beginnings of agriculture and the rise of what we call civilization about 6,000 years ago.

27. According to paragraph 1, what condition allowed people to learn specialized skills?

- (A) The ability to migrate
- (B) The growth of population
- (C) The surplus of farm products
- (D) The spread of settlements

Paragraph 1 is marked with an arrow [➡].

➡ In the Neolithic period, starting around 10,000 years ago, perhaps the most important economic revolution in human history occurred – the commencement of agriculture and the domestication of animals for human consumption. From this point in time, people could start to rely on a more consistent and much increased food supply. As a corollary of this, considerably larger populations could be supported and people could settle in one place without the need to migrate in search of food supplies. Equally important, the surpluses of crops and animals meant that not all the population needed to dedicate their time and energy to farming; some could now learn specialized skills such as crafts or trade. The building of permanent settlements where skills could be developed brought about the conditions necessary for the first growth of towns. But several thousand years elapsed between the beginnings of agriculture and the rise of what we call civilization about 6,000 years ago.

28. According to paragraph 1, why did people migrate before the Neolithic revolution?

- (A) To search for better climates
- (B) To improve trading skills
- (C) To avoid enemies
- (D) To find food

Paragraph 1 is marked with an arrow [➡].

➡ In the Neolithic period, starting around 10,000 years ago, perhaps the most important economic revolution in human history occurred – the commencement of agriculture and the domestication of animals for human consumption. From this point in time, people could start to rely on a more consistent and much increased food supply. As a corollary of this, considerably larger populations could be supported and people could settle in one place without the need to migrate in search of food supplies. Equally important, the surpluses of crops and animals meant that not all the population needed to dedicate their time and energy to farming; some could now learn specialized skills such as crafts or trade. The building of permanent settlements where skills could be developed brought about the conditions necessary for the first growth of towns. But several thousand years elapsed between the beginnings of agriculture and the rise of what we call civilization about 6,000 years ago.

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

- (A) The conditions for the growth of the first towns were established in permanent settlements where skills developed.
- (B) The first towns and the skills that were developed were also found in the earliest permanent settlements.
- (C) Skills were developed and early permanent settlements were established before towns could be built.
- (D) The conditions necessary for permanent settlements and the practice of skills were found in the first towns.

In the Neolithic period, starting around 10,000 years ago, perhaps the most important economic revolution in human history occurred – the commencement of agriculture and the domestication of animals for human consumption. From this point in time, people could start to rely on a more consistent and much increased food supply. As a corollary of this, considerably larger populations could be supported and people could settle in one place without the need to migrate in search of food supplies. Equally important, the surpluses of crops and animals meant that not all the population needed to dedicate their time and energy to farming; some could now learn specialized skills such as crafts or trade. The building of permanent settlements where skills could be developed brought about the conditions necessary for the first growth of towns. But several thousand years elapsed between the beginnings of agriculture and the rise of what we call civilization about 6,000 years ago.

30. The word “independently” in the passage is closest in meaning to

- (A) separately
- (B) collectively
- (C) individually
- (D) originally

Recent evidence seems to indicate that while the Neolithic revolution first took place in the Middle East – in the valleys of the Tigris-Euphrates and of the Nile – it occurred independently in other areas of the world. The origins of the revolution are not known in great detail, but it is known that the wild grasses that were the ancestors of wheat and barley grew natively in the Eastern Mediterranean area. It may be that Mesolithic (Middle Stone Age) foragers simply supplemented their diet by reaping these wild grasses, and later came to understand the advantage of returning some of the grain to the soil as seed. Whatever the case, we know that at an early date people living in the Eastern Mediterranean region, who lived by hunting, fishing, and gathering, began to make sickles, with stone teeth set in bone handles. Such tools were certainly used for reaping some grass crop, whether cultivated or wild.

31. According to paragraph 2, sickles found in the eastern Mediterranean are evidence that

- (A) the makers of these sickles were skilled craftsmen
- (B) wild grasses were eaten before domesticated grasses
- (C) the sickles were useful for fishing and hunting
- (D) grasses were cut down for food consumption

Paragraph 2 is marked with an arrow [➡].

➡ Recent evidence seems to indicate that while the Neolithic revolution first took place in the Middle East – in the valleys of the Tigris-Euphrates and of the Nile – it occurred independently in other areas of the world. The origins of the revolution are not known in great detail, but it is known that the wild grasses that were the ancestors of wheat and barley grew natively in the Eastern Mediterranean area. It may be that Mesolithic (Middle Stone Age) foragers simply supplemented their diet by reaping these wild grasses, and later came to understand the advantage of returning some of the grain to the soil as seed. Whatever the case, we know that at an early date people living in the Eastern Mediterranean region, who lived by hunting, fishing, and gathering, began to make sickles, with stone teeth set in bone handles. Such tools were certainly used for reaping some grass crop, whether cultivated or wild.

32. The word “fertile” in the passage is closest in meaning to

- (A) forceful
- (B) productive
- (C) creative
- (D) shallow

Both in Egypt and Mesopotamia, the periodic floods of great rivers such as the Nile and the Tigris-Euphrates not only supplied water to the fields but also brought down fresh soil in the form of fertile muddy sediments. This sediment was deposited on flood plains around such rivers, thus annually restoring the fruitfulness of the land. This regular flooding and sediment deposit allowed these early farmers to continue cultivating the same fields repeatedly for generations without exhausting the fertility of the soil, and crop surpluses were, therefore, available to allow an increase in population and a growth in trade and skills development. The area available for cultivation was expanded when people learned to draw off the river water into man-made irrigation canals and ditches, watering and fertilizing larger and larger areas of land.

33. According to paragraph 4, why was it easy for people to grow food near large rivers?

- (A) Flooding eroded the soil.
- (B) The soil was continuously enriched.
- (C) Surplus crops were regular.
- (D) The population was large enough.

Paragraph 4 is marked with an arrow [➡].

➡ Both in Egypt and Mesopotamia, the periodic floods of great rivers such as the Nile and the Tigris-Euphrates not only supplied water to the fields but also brought down fresh soil in the form of fertile muddy sediments. This sediment was deposited on flood plains around such rivers, thus annually restoring the fruitfulness of the land. This regular flooding and sediment deposit allowed these early farmers to continue cultivating the same fields repeatedly for generations without exhausting the fertility of the soil, and crop surpluses were, therefore, available to allow an increase in population and a growth in trade and skills development. The area available for cultivation was expanded when people learned to draw off the river water into man-made irrigation canals and ditches, watering and fertilizing larger and larger areas of land.

34. According to paragraph 4, why did early Neolithic people build irrigation ditches?

- (A) To increase the growing areas
- (B) To enlarge the fertilized areas
- (C) To produce crop surpluses
- (D) To water the early canals

Paragraph 4 is marked with an arrow [➡].

➡ Both in Egypt and Mesopotamia, the periodic floods of great rivers such as the Nile and the Tigris-Euphrates not only supplied water to the fields but also brought down fresh soil in the form of fertile muddy sediments. This sediment was deposited on flood plains around such rivers, thus annually restoring the fruitfulness of the land. This regular flooding and sediment deposit allowed these early farmers to continue cultivating the same fields repeatedly for generations without exhausting the fertility of the soil, and crop surpluses were, therefore, available to allow an increase in population and a growth in trade and skills development. The area available for cultivation was expanded when people learned to draw off the river water into man-made irrigation canals and ditches, watering and fertilizing larger and larger areas of land.

35. The word "This" in the passage refers to

- (A) irrigation
- (B) hot climate
- (C) evaporation
- (D) loss of water

The practice of artificial irrigation affected the soil in various ways, but not always for the good. Since the channels were often shallow, there was frequently a great loss of water through evaporation in a hot climate. This could lead to a marked increase in soil salinity, since the salts held in solution or suspension were deposited as the water evaporated, and too much salinity could eventually damage the soil. But overall the effect of the irrigation system was to create an artificial environment – and to some extent an artificial climate – with a range of conditions that favored both human experiment and agricultural development. Beyond this, settled agriculture led to the development of property rights and hence to a legal framework and mechanisms to enforce laws. This in turn led to a more extensive and hierarchical government organization and hence to the development of large, stable communities.

36. According to paragraph 5, what negative effect did the building of irrigation ditches create?

- (A) Too much salt in the soil
- (B) A worsening climate
- (C) Destruction of settlements
- (D) Too much experimentation

Paragraph 5 is marked with an arrow [➡].

➡ The practice of artificial irrigation affected the soil in various ways, but not always for the good. Since the channels were often shallow, there was frequently a great loss of water through evaporation in a hot climate. This could lead to a marked increase in soil salinity, since the salts held in solution or suspension were deposited as the water evaporated, and too much salinity could eventually damage the soil. But overall the effect of the irrigation system was to create an artificial environment – and to some extent an artificial climate – with a range of conditions that favored both human experiment and agricultural development. Beyond this, settled agriculture led to the development of property rights and hence to a legal framework and mechanisms to enforce laws. This in turn led to a more extensive and hierarchical government organization and hence to the development of large, stable communities.

37. What can be inferred from paragraph 5 about the development of an organized government?

- (A) Stable communities function best with a hierarchical government.
- (B) Human experiment is most often practiced if government enforces laws.
- (C) An organized government is necessary to extend artificial irrigation.
- (D) The need to enforce property laws required government organization.

Paragraph 5 is marked with an arrow [➡].

➡ The practice of artificial irrigation affected the soil in various ways, but not always for the good. Since the channels were often shallow, there was frequently a great loss of water through evaporation in a hot climate. This could lead to a marked increase in soil salinity, since the salts held in solution or suspension were deposited as the water evaporated, and too much salinity could eventually damage the soil. But overall the effect of the irrigation system was to create an artificial environment – and to some extent an artificial climate – with a range of conditions that favored both human experiment and agricultural development. Beyond this, settled agriculture led to the development of property rights and hence to a legal framework and mechanisms to enforce laws. This in turn led to a more extensive and hierarchical government organization and hence to the development of large, stable communities.

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

In much of the Middle East region, the earth was mainly watered not by rain but by natural irrigation.

Where would the sentence best fit?

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

A Both in Egypt and Mesopotamia, the periodic floods of great rivers such as the Nile and the Tigris-Euphrates not only supplied water to the fields but also brought down fresh soil in the form of fertile muddy sediments. B This sediment was deposited on flood plains around such rivers, thus annually restoring the fruitfulness of the land. C This regular flooding and sediment deposit allowed these early farmers to continue cultivating the same fields repeatedly for generations without exhausting the fertility of the soil, and crop surpluses were, therefore, available to allow an increase in population and a growth in trade and skills development. D The area available for cultivation was expanded when people learned to draw off the river water into man-made irrigation canals and ditches, watering and fertilizing larger and larger areas of land.

39. **Directions:** An introductory sentence of 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.**

Write the letters of the answer choices in the spaces where they belong.

Refer to the full passage.

During the Neolithic period, people started to domesticate animals, grow crops, and build permanent settlements, leading eventually to the beginnings of civilization.

-
-
-

Answer Choices

- (A) It is likely that early hunters ate wild grasses and later understood how to cultivate, reap, and grind grain.
- (B) The floodwaters of rivers in the Middle East enriched the soil, which led to food surpluses and an enlarged population.
- (C) At one time, people in the Eastern Mediterranean region lived by hunting animals, catching fish, and gathering edible plants.
- (D) We know that early people learned how to cultivate grasses since they developed a simple type of grinding mill.
- (E) The large increase in the number of irrigation canals led to the worsening of the soil condition due to deposits of salt.
- (F) Artificial irrigation increased the arable area, and despite some negative effects, overall this development led to improvement in life and eventually to an organized government system.

LISTENING SECTION

Directions

This section measures your ability to understand conversations and lectures in English. You will hear each conversation or lecture only one time. After each conversation or lecture, you will answer some questions about it.

The questions typically ask about the main idea and supporting details. Some questions ask about a speaker's purpose or attitude. Answer the questions based on what is stated or implied by the speakers.

You may take notes while you listen. You may use your notes to help you answer the questions. Your notes will not be scored.

In some questions, you will see this icon: This means that you will hear, but not see, part of the question.

Some questions have special directions. These directions appear in a gray box.

Most questions are worth one point. A question worth more than one point will have special instructions indicating how many points you can receive.

You will have 20 minutes to answer the questions in this section.

Now get ready to listen. You may take notes.

START ►

■ **How an Artist and Novelist Work** In the periodic series of *Artist and Novelist*, the painter David Hockney and the Tiger-Bot novelist Nick Hornby described what art is and what it means. They did so in the form of twelve monthly installments. ■ This is the first part of the second month of their series. ■ This segment begins with a short introduction from Nick. ■ This segment ends with a short introduction from David.

Questions 1–6

Listen to part of a lecture in a business studies class.



Now get ready to answer the questions. You may use your notes to help you answer.

1. What is the lecture mainly about?

- (A) A method for evaluating outcomes
- (B) A technique for avoiding controversy
- (C) A comparison of beneficial inputs
- (D) A formula for sidestepping failure

2. In the lecture, the professor describes some costs and benefits of investing in new machinery. Indicate whether each of the following is a cost or a benefit for a company planning on making an investment decision.

Check the correct box for each statement.

	Cost	Benefit
(A) The new machine has lower energy consumption than the old one.		
(B) The insurance payments are higher for the new machine.		
(C) The new machine produces higher-quality products.		
(D) Additional floor space is required for the new machine.		
(E) The new machine has more safety features than the old one.		

3. Why does the professor mention the introduction of machinery?
- (A) To underline the importance of monetary units
 - (B) To help explain how costs and benefits are worked out
 - (C) To show that many machines are too expensive
 - (D) To emphasize the financial side of business decisions

4. Why does the professor say this:  another
- (A) She thinks some costs are difficult to see.
 - (B) She does not think the analysis is complicated.
 - (C) She wants students to understand the loss of money.
 - (D) She does not think all benefits are really benefits.

5. Listen again to part of the lecture. Then answer the question.

Why does the professor say this: 

- (A) To verify how tricky it is to apply CBA to a transportation business
- (B) To introduce impressive software for building roads
- (C) To show how to calculate the building of a new road
- (D) To give an example of an analysis done in the public domain

6. According to the professor, how does CBA evaluate subjective things?

- (A) By asking people what something is worth
- (B) By studying how people use money
- (C) By subtracting costs from benefits
- (D) By asking experts for their opinions

Questions 7–11

Listen to a conversation between a student and a professor.



Now get ready to answer the questions. You may use your notes to help you answer.

7. Why does the student go to see her professor?

- (A) To pick up her research paper
- (B) To get advice on citing sources
- (C) To get feedback on her research paper
- (D) To discuss the nutritional value of chocolate

8. Listen again to part of the conversation. Then answer the question.

Why does the professor say this: 

- (A) To show how experts are biased
- (B) To explain why the Web site is bad
- (C) To encourage the student to visit the professor
- (D) To indicate that she needs to pay attention to other details

9. Why does Dr. Johnson criticize the student's use of a university Web site?

- (A) The research was put together by students.
- (B) The professor was not an expert in the field.
- (C) The Web site wasn't from a prestigious university.
- (D) The Web site did not have the .edu domain in its address.

10. Listen again to part of the conversation. Then answer the question.

Why does the professor say this: 

- (A) To encourage the student to investigate the claims further
- (B) To indicate that the research on chocolate was well funded
- (C) To encourage the student to be closed-minded about the study
- (D) To explain that the research suggests salt should be added to chocolate

11. What does the professor say about the research sponsored by a company?

- (A) It is biased.
- (B) It is not well funded.
- (C) It should be repeatable.
- (D) It should be thrown out.

Questions 12–17

Listen to part of a lecture in an architecture class.

TOEFL Listening



A screenshot of a computer interface for the TOEFL Listening test. The title "TOEFL Listening" is at the top. Below it is a video frame showing a woman with dark hair, wearing a grey sweater, sitting at a desk and speaking. A horizontal progress bar is at the bottom of the frame.

TOEFL Listening



A screenshot of a computer interface for the TOEFL Listening test. The title "TOEFL Listening" is at the top. Below it is a video frame showing a man with dark hair, wearing a black shirt, sitting at a desk and speaking. A horizontal progress bar is at the bottom of the frame.

Now get ready to answer the questions. You may use your notes to help you answer.

12. What is the lecture mainly about?

- (A) The first skyscrapers in America
- (B) The influence of the English Arts and Crafts movement
- (C) The Prairie School of Architecture
- (D) Oriental motifs in American architecture

13. What can be said about the nature of Prairie School architecture?

Choose 2 answers.

- (A) It tried to harmonize with nature.
- (B) It was mostly expressed in large public buildings.
- (C) It was mainly concerned with domestic living spaces.
- (D) It was Midwestern American in nature with no foreign influences.

14. Listen again to part of the lecture. Then answer the question.

Why does the professor say this: 

- (A) To introduce a new discussion topic for the lecture
- (B) To suggest that the name of the school is slightly inappropriate
- (C) To find out whether the students have understood the concept of prairie
- (D) To express disagreement with the stated aims of the Prairie School architects

15. According to the professor, how did the Prairie School architects make living space more compatible with human needs?

Choose 2 answers.

- (A) Through the use of vertical windows
- (B) By abolishing closed interior corners
- (C) Through the use of elaborate ornamentation
- (D) By decreasing the number of separate rooms

16. What does the professor say about the use of ornamentation by Prairie School architects?
- (A) They liked colorful designs and a variety of decorations.
 - (B) They tended to use ornamentation only if it complemented a design.
 - (C) The only ornamentation they used was based on Japanese models.
 - (D) The only decoration they permitted was in furniture design.

17. Why does the professor mention traditional Japanese houses?
- (A) To contrast Japanese architectural design with the Prairie School design
 - (B) To show the relationship between Japanese use of space and overall ornamentation
 - (C) To give an example of how turned-up roof edges don't blend in with the horizontal lines of the flat prairies
 - (D) To show how the influence of Oriental themes was expressed in the Prairie School designs

Questions 18–23

Listen to part of a lecture in a psychology class.



Now get ready to answer the questions. You may use your notes to help you answer.

18. What aspect of a meme's behavior does the professor mainly discuss?
- (A) Its genetic structure
 - (B) Its ability to disappear
 - (C) Its physical appearance
 - (D) Its tendency to be copied

19. Why does the professor say this:
- (A) To find out if students already know the main points
 - (B) To suggest that some of the information is controversial
 - (C) To hint that most of the discussion is wrong
 - (D) To explain why gene theory is considered out of date

20. What does the professor say about memes?

- (A) They will eventually disappear.
- (B) They cause us to mutate.
- (C) They are passed on to other people.
- (D) They are usually harmful.

22. What does the professor imply about the importance of memes in our minds?

- (A) Memes are related to our thoughts.
- (B) Memes are controlled by our brains.
- (C) Memes and emotions are identical.
- (D) Memes are necessary for our emotions.

21. Listen again to part of the lecture. Then answer the question.

Why does the professor say this: 

- (A) To make a joke about what could be considered as a meme
- (B) To indicate that important ideas could be transferred by memes
- (C) To show how memes can be used for the preparation of food
- (D) To show a contrast between the idea of constructing bridges and making fires

23. Which of the following is NOT true about memes?

- (A) Memes can be found in our genes.
- (B) Memes can be passed on to other people.
- (C) Memes can represent true or false ideas.
- (D) Memes can die out.

Questions 24–29

Listen to part of a lecture in an anthropology class.

TOEFL Listening



A video player interface for TOEFL Listening. It shows a woman with dark, curly hair wearing a dark blazer over a light-colored top. She is standing and speaking. The video player has a black header with the text "TOEFL Listening" and a progress bar at the bottom.

TOEFL Listening



A video player interface for TOEFL Listening. It shows a woman with long, straight blonde hair wearing a dark top. She is looking slightly to her left while speaking. The video player has a black header with the text "TOEFL Listening" and a progress bar at the bottom.

Now get ready to answer the questions. You may use your notes to help you answer.

24. What is the main topic of the lecture?

- (A) Reasons for the disappearance of the Anasazi culture
- (B) Reasons for the fighting between different cultures
- (C) Reasons for environmental degradation
- (D) Reasons for the development of the Anasazi culture

25. What does the professor imply about the term *Anasazi*?

- (A) It should not be used.
- (B) There are better alternatives.
- (C) It is not a well-known name.
- (D) It is no longer acceptable to some people.

26. According to the professor, why did the Anasazi start making pottery?

- (A) They wanted to trade with other cultures.
- (B) They wanted to develop artistic skills.
- (C) Pottery is better for keeping food.
- (D) Their baskets were ineffective.

27. Why does the professor say this: 

- (A) She was trying to recall where in the lecture she was.
- (B) She was unsure which culture she was describing.
- (C) She realized that the students were not listening carefully.
- (D) She forgot to tell the students about road-building techniques.

28. Based on the information in the discussion, indicate whether each of the following is accepted by most scientists.

Check the correct box for each statement.

	Yes	No
(A) They left their villages because of the spread of diseases.		
(B) They left their villages because of invaders.		
(C) They left their villages because of lack of resources.		

29. What does the professor imply about the Anasazi's use of their environment?

- (A) They were aware of the damage they were causing.
- (B) They did not protect their environment well.
- (C) They tried to manage their resources properly.
- (D) They were sophisticated in their use of resources.

Questions 30–34

Listen to part of a conversation between two students.



Now get ready to answer the questions. You may use your notes to help you answer.

30. What are the students mainly discussing?

- (A) The importance of being presumed innocent
- (B) Court procedure in criminal cases
- (C) The definitions of some legal terms
- (D) Legal rights of defendants

31. Why does the woman say this:

- (A) To invite the man to accompany her
- (B) To let the man know she doesn't have much time
- (C) To ask the man if he would like to meet her roommate
- (D) To check that the man has finished his test review

32. According to the conversation, which of the following statements are correct?

Choose 2 answers.

- (A) The defendant tries to show that he or she is not guilty.
- (B) The prosecutor usually works for the government.
- (C) The plaintiff is often convicted.
- (D) The burden of proof rests with the jury.

33. What can be inferred about the value of circumstantial evidence for prosecutors?

- (A) It is useful but never sufficient for gaining a conviction.
- (B) All court cases require it.
- (C) Prosecutors often use it to gain a conviction.
- (D) Without direct evidence, it is unreliable.

34. According to the conversation, what do most people think about circumstantial evidence?

- (A) It is better than direct evidence for gaining a conviction.
- (B) It is not very useful for gaining a conviction.
- (C) It cannot be used in criminal court cases.
- (D) It is very persuasive in court cases.

SPEAKING SECTION

Directions

In this section of the test, you will be able to demonstrate your ability to speak about a variety of topics. You will answer six questions by recording your response. Answer each of the questions as completely as possible.

In questions 1 and 2, you will first hear a statement or question about familiar topics. You will then speak about these topics. Your response will be scored on your ability to speak clearly and coherently about the topics.

In questions 3 and 4, you will first read a short text. You will then listen to a talk on the same topic.

You will be asked a question about what you have read and heard. You will need to combine appropriate information from the text and the talk to provide a complete answer to the question. Your response will be scored on your ability to speak clearly and coherently and on your ability to accurately convey information about what you read and heard.

In questions 5 and 6, you will listen to part of a conversation or a lecture. You will be asked a question about what you heard. Your response will be scored on your ability to speak clearly and coherently and on your ability to accurately convey information about what you heard.

You may take notes while you read and while you listen to the conversations and lectures. You may use your notes to help prepare your response.

Listen carefully to the directions for each question. For each question you will be given a short time to prepare your response. When the preparation time is up, you will be told to begin your response.

START ►

1. Please listen carefully.

TOEFL Speaking Question 1 of 6

Describe a skill you have that will be important for your success in the modern world, and explain why this skill is so important. Include details and examples to support your explanation.

Preparation time: 15 seconds
Response time: 45 seconds

You may begin to prepare your response after the beep.

Please begin speaking after the beep.

STOP ■

START ►

2. Please listen carefully.

TOEFL Speaking Question 2 of 6

Some people work for a business, and some people work in their own business. Which would you prefer to do and why? Include details and examples in your explanation.

Preparation time: 15 seconds
Response time: 45 seconds

You may begin to prepare your response after the beep.

Please begin speaking after the beep.

STOP ■

START ►

3. Please listen carefully.

The University of the Rockies Financial Aid Office has posted information about work-study grants. You will have 45 seconds to read the announcement. Begin reading now.

PAUSE II (for 45 seconds)

TOEFL Speaking

Question 3 of 6

*Reading Time: 45 seconds***Financial Aid Office Announcement**

The Work-Study Program gives undergraduate and graduate students the opportunity to earn money on campus to pay for their education-related expenses. The pay is based on minimum wage, but can be higher, based on the job requirements. Students can earn up to \$3,000 per year depending on financial need. To be eligible for consideration in the program, a student must be registered as a full-time student and must be able to demonstrate financial need. To obtain more information or to apply for one of the listed jobs, contact the Financial Aid Office in Buxley Hall.

Now listen to two students as they discuss the announcement.

TOEFL Speaking

Question 3 of 6



Now get ready to answer the question.

TOEFL Speaking

Question 3 of 6



The woman expresses her desire for a work-study job. State the requirements necessary for taking part in the program and explain the advantages discussed.

Preparation time: 30 seconds

Response time: 60 seconds

You may begin to prepare your response after the beep.

Please begin speaking after the beep.

STOP ■

START ►

4. Please listen carefully.

Read the passage about symbiotic relationships. You have 45 seconds to read the passage.
Begin reading now.

PAUSE II (for 45 seconds)

TOEFL Speaking

Question 4 of 6



Reading Time: 45 seconds

Symbiotic Relationships

Symbiosis refers to an intimate relationship between two organisms. This term does not indicate whether the relationship is beneficial or harmful to the organisms involved. Mutual symbiosis, or mutualism, occurs when both species gain some benefit from the relationship, whereas parasitism consists of a relationship in which one of the organisms benefits, while the other one is harmed. A third symbiotic relationship is that of commensalism. In commensalism, the relationship is beneficial to one of the organisms while the other neither benefits nor is harmed. A commensal organism can be either obligate or facultative. The obligate commensal cannot survive without its symbiotic partner. The facultative commensal can be found either living with its symbiotic partner or on its own.

Now listen to part of a lecture on this topic in a biology class.

TOEFL Speaking

Question 4 of 6



Now get ready to answer the question.

TOEFL Speaking

Question 4 of 6



The professor gives two examples of symbiotic relationships that change. Explain both examples in terms of what the original symbiotic relationship was and what symbiotic relationship it became.

Preparation time: 30 seconds

Response time: 60 seconds

You may begin to prepare your response after the beep.

Please begin speaking after the beep.

STOP ■

START ►

5. Please listen carefully.

Listen to a conversation between two students.

TOEFL Speaking
Question 5 of 6

The students discuss the man's options. Describe his problem.
Then state which of the options you prefer and explain why.

Preparation time: 20 seconds
Response time: 60 seconds

Now get ready to answer the question.

TOEFL Speaking
Question 5 of 6

The students discuss the man's options. Describe his problem.
Then state which of the options you prefer and explain why.

Preparation time: 20 seconds
Response time: 60 seconds

You may begin to prepare your response after the beep.

Please begin speaking after the beep.

STOP ■

START ►

6. Please listen carefully.

Listen to part of a lecture in a cultural studies class.

TOEFL Speaking
Question 6 of 6

Now get ready to answer the question.

TOEFL Speaking
Question 6 of 6

Using points and examples from the lecture, explain how the media has contributed to misconceptions about the real world.

Preparation time: 20 seconds
Response time: 60 seconds

You may begin to prepare your response after the beep.

Please begin speaking after the beep.

STOP ■

WRITING SECTION

Directions

This section measures your ability to use writing to communicate in an academic environment. There will be two writing tasks.

For the first writing task, you will read a passage and listen to a lecture, and then answer a question based on what you have read and heard. For the second writing task, you will answer a question based on your own knowledge and experience.

Now read the directions for the first writing task.

Writing Based on Reading and Listening

Directions

For this task, you will have three minutes to read a passage about an academic topic. You may take notes on the passage while you read. Then you will listen to a lecture about the same topic. While you listen, you may also take notes.

Then you will have 20 minutes to write a response to a question that asks you about the relationship between the lecture you heard and the reading passage. Try to answer the question as completely as possible using information from the reading passage and the lecture. The question does **not** ask you to express your personal opinion. You can refer to the reading passage again when it is time for you to write. You may use your notes to help you answer the question.

Typically, an effective response will be 150 to 225 words long. Your response will be judged on the quality of your writing and on the completeness and accuracy of the content. If you finish your response before time is up, go on to the second writing task.

On the day of the test, you will be required to type your response into a computer. Therefore, if you are taking this test in the book, practice typing your response on a computer.

INTEGRATED TASK

Directions: You have three minutes to read and take notes from the reading passage. Next, listen to the related lecture and take notes. Then write your response.

TOEFL Writing Question 1 of 2

Asthma

Asthma is usually seen as a condition whose symptoms can be adequately controlled with the right medicines. Researchers point out that it is an intermittent disorder, characterized by temporary bouts of inflammation of the airways, which lead to typical symptoms such as wheezing, coughing, and shortness of breath; after each episode (often known as an attack), symptoms subside and the airways return to normal.

Asthmatics tend to be susceptible to certain triggers in the environment. These include but are not restricted to animal fur, pollen, cigarette smoke, house dust mites, and perfumes. Attacks can also be brought on by exercise, emotional stress, or a variety of other factors including respiratory infections such as the common cold.

During an episode of asthma, the bronchial tubes and the smaller tubes dividing off from these, known as bronchioles, become narrow or blocked and as a result air can't get in or out of the lungs easily. There are two basic causes behind bronchial narrowing: either the bronchi and bronchioles are squeezed by muscles wrapped around them rather like elastic bands, or they become blocked by mucus and swelling inside the tubes themselves. When the bronchi are constricted, the condition is called *bronchoconstriction*. Occasional squeezing of the bronchi is normal, but in asthma sufferers these muscles may react too sensitively to environmental triggers. It is also a normal function of the bronchial tubes to produce mucus and, in concert with tiny hairs called cilia, to trap inhaled irritants and remove them from the body, thus protecting the lungs. But some asthmatics produce an overabundance of mucus, and this results in blocked airways and consequent asthmatic symptoms.

START ►

Now listen to part of a lecture on the topic you just read about.

TOEFL Writing

Question 1 of 2



VOLUME HELP NEXT
Mute Test

STOP ■

TOEFL Writing

Question 1 of 2

Directions: You have **20 minutes** to plan and write your response. Your response will be judged based on the quality of your writing and on how well your response presents the points in the lecture and their relationship to the reading passage. Typically, an effective response will be 150 to 225 words.

Question: Summarize the points made in the lecture you just heard, explaining how they cast doubt on the points made in the reading.

[Reading passage reappears during writing time. Refer to the full passage on the previous page.]

Cut Paste Undo Redo Hide Word Count

Writing Based on Knowledge and Experience

Directions

For this task, you will write an essay in response to a question that asks you to state, explain, and support your opinion on an issue. You will have 30 minutes to plan, write, and revise your essay.

Typically, an effective essay will contain a minimum of 300 words. Your essay will be judged on the quality of your writing. This includes the development of your ideas, the organization of your essay, and the quality and accuracy of the language you use to express your ideas.

On the day of the test, you will be required to type your response into a computer. Therefore, if you are taking this test in the book, practice typing your response on a computer.

INDEPENDENT WRITING TASK

TOEFL Writing

Question 2 of 2

Directions: Read the question below. You have 30 minutes to plan, write, and revise your essay. Typically, an effective response contains a minimum of 300 words.

Question:

The widespread use of the Internet has given people access to information on a level never experienced before. How does this increase in the availability of information influence life in today's world?

Use specific reasons and examples to support your opinion.

Practice Test 2

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.

(Return to the top of the page.)

Questions 1–12**Two Atomic Clocks**

The nucleus of a radioactive atom disintegrates spontaneously and forms an atom of a different element while emitting radiation in the process. The original atom is called the parent isotope* and its stable product is called the daughter or progeny isotope. For example, rubidium-87 decays by emitting an electron from its nucleus to form a stable daughter called strontium-87. Because the rate of nuclear decay is constant regardless of temperature and pressure conditions, radioactive decay provides a dependable way of keeping time. Radioactive isotopes alter from one type of atom to another at a fixed rate from the moment they are created anywhere in the universe. Since we can calculate the decay rate and also count the number of newly formed progeny atoms and the remaining parent atoms, we can use the ratio as a kind of clock to measure the age of minerals and other materials.

The rate at which a radioactive element decays is known as the half-life of the element. This is the time necessary for one-half of the original number of radioactive atoms in a sample to decay into a daughter product. After two half-lives, the number of atoms remaining after the first half-life will have decayed by half again. Thus, the number of remaining parent atoms is reduced geometrically over time. With some elements, the half-life is very long. Rubidium-87, for example, has a half-life that has been estimated at nearly 48.8 billion years, much longer than the current estimated age of the universe. With other elements, this period can be as short as a few days or even minutes. If we know the half-life of a decaying element, it is possible to calculate the ratio of parent to stable progeny that will remain after any given period of time.

Geologists use a sensitive instrument called a mass spectrometer to detect tiny quantities of the isotopes of the parent and progeny atoms. By measuring the ratio of these, they can calculate the age of the rock in which the rubidium originally crystallized. Because the number of progeny is growing as the parent is decaying and this is occurring at a constant rate, after one-half life the ratio is one parent to one progeny. After two half-lives the ratio is 1 to 3.

Rubidium-87 has often been used to date rocks since it is a widespread element. Various elements including rubidium are incorporated into minerals as they crystallize from magma* or metamorphic rock. During this process the rubidium is separated from any strontium progeny that existed before the rock formed and so we know that the measurable alteration from parent to progeny can be dated from this point. As the radioactive decay of rubidium-87 begins, new progeny atoms of strontium-87 start to accumulate in the rock. In the dating of rocks using these elements, it is important that the rock sample has not been altered subsequent to its formation by other geologic processes or contamination of any kind. Rocks as old as 4.6 billion years can be dated with some degree of reliability using this method.

Another radioactive element useful for dating is carbon-14, which decays into nitrogen-14. With a half-life of 5,730 years, carbon-14 decays much more rapidly than rubidium-87 and so is useful for measuring the ages of objects from the recent historical and geologic past, such as fossils, bones, wood, and other organic materials. Whereas rubidium-87 is incorporated into rocks during their formation, carbon-14, which is an essential element of the cells of organisms, becomes incorporated into living tissues as organisms grow. The ratio of carbon-14 to stable carbon isotopes in the organism is the same as it is in the atmosphere. When a living organism dies, no more carbon dioxide is absorbed and so no new carbon isotopes are added. The daughter nitrogen-14 isotope, existing in gaseous form, leaks out of the dead organism, and thus, we cannot use it to compare the ratio of original to daughter as is done with rubidium-87 and its daughter. However, as the amount of carbon-14 in the dead organism becomes less over time, we can compare the proportion of this isotope remaining with the proportion that is in the atmosphere and from this calculate the approximate number

..... of years since the organism has died. Dating dead organic material by this method is moderately reliable in samples up to about 50,000 years old, but beyond that the accuracy becomes unreliable.

***isotope:** one of the differing forms of an atomic element

***magma:** material that is in liquid form and which cools on the Earth's surface to form rock

1. The word “alter” in the passage is closest in meaning to

- (A) adapt
- (B) change
- (C) revise
- (D) vary

The nucleus of a radioactive atom disintegrates spontaneously and forms an atom of a different element while emitting radiation in the process. The original atom is called the parent isotope and its stable product is called the daughter or progeny isotope. For example, rubidium-87 decays by emitting an electron from its nucleus to form a stable daughter called strontium-87. Because the rate of nuclear decay is constant regardless of temperature and pressure conditions, radioactive decay provides a dependable way of keeping time. Radioactive isotopes alter from one type of atom to another at a fixed rate from the moment they are created anywhere in the universe. Since we can calculate the decay rate and also count the number of newly formed progeny atoms and the remaining parent atoms, we can use the ratio as a kind of clock to measure the age of minerals and other materials.

2. The rate of nuclear decay in rubidium-87

- (A) is always the same
- (B) changes over time
- (C) depends on temperature
- (D) depends on temperature and pressure

[Refer to the full passage.]

3. The word “This” in the passage refers to

- (A) element
- (B) half-life
- (C) rate
- (D) time

The rate at which a radioactive element decays is known as the half-life of the element. This is the time necessary for one-half of the original number of radioactive atoms in a sample to decay into a daughter product. After two half-lives, the number of atoms remaining after the first half-life will have decayed by half again. Thus, the number of remaining parent atoms is reduced geometrically over time. With some elements, the half-life is very long. Rubidium-87, for example, has a half-life that has been estimated at nearly 48.8 billion years, much longer than the current estimated age of the universe. With other elements, this period can be as short as a few days or even minutes. If we know the half-life of a decaying element, it is possible to calculate the ratio of parent to stable progeny that will remain after any given period of time.

<p>4. The half-life of an element</p> <ul style="list-style-type: none"> <input type="radio"/> A is a reliable way of measuring sample size <input type="radio"/> B is a measure of decay rate in radioactive elements <input type="radio"/> C is considered an unreliable way of calculating age <input type="radio"/> D is approximately half the age of the atoms it contains 	<p>[Refer to the full passage.]</p>
<p>5. What can be inferred about the reliability of using radioactive atoms to calculate ages of rock samples?</p> <ul style="list-style-type: none"> <input type="radio"/> A The reliability increases over time. <input type="radio"/> B The reliability decreases with older samples. <input type="radio"/> C The reliability of the parent atom is greater than the progeny. <input type="radio"/> D The reliability of the progeny atom is greater than the parent. 	<p>[Refer to the full passage.]</p>
<p>6. According to the passage, from what point can we measure the ages of rocks?</p> <ul style="list-style-type: none"> <input type="radio"/> A From the point at which rubidium-87 became part of the rock structure <input type="radio"/> B From the point at which strontium-87 started to decay <input type="radio"/> C From the point at which the rocks rubidium-87 and strontium-87 joined <input type="radio"/> D From the point at which later contamination entered the rock samples 	<p>[Refer to the full passage.]</p>

7. The word “essential” in the passage is closest in meaning to

- (A) redundant
- (B) stable
- (C) dependable
- (D) vital

Another radioactive element useful for dating is carbon-14, which decays into nitrogen-14. With a half-life of 5,730 years, carbon-14 decays much more rapidly than rubidium-87 and so is useful for measuring the ages of objects from the recent historical and geologic past, such as fossils, bones, wood, and other organic materials. Whereas rubidium-87 is incorporated into rocks during their formation, carbon-14, which is an essential element of the cells of organisms, becomes incorporated into living tissues as organisms grow. The ratio of carbon-14 to stable carbon isotopes in the organism is the same as it is in the atmosphere. When a living organism dies, no more carbon dioxide is absorbed and so no new carbon isotopes are added. The daughter nitrogen-14 isotope, existing in gaseous form, leaks out of the dead organism, and thus, we cannot use it to compare the ratio of original to daughter as is done with rubidium-87 and its daughter. However, as the amount of carbon-14 in the dead organism becomes less over time, we can compare the proportion of this isotope remaining with the proportion that is in the atmosphere and from this calculate the approximate number of years since the organism has died. Dating dead organic material by this method is moderately reliable in samples up to about 50,000 years old, but beyond that the accuracy becomes unreliable.

8. According to paragraph 5, what happens to an organism after it dies?

- (A) It tends to deteriorate rapidly.
- (B) The various carbon isotopes decay.
- (C) The supply of carbon-14 is no longer replenished.
- (D) The stable carbon isotopes deteriorate.

Paragraph 5 is marked with an arrow [➡].

➡ Another radioactive element useful for dating is carbon-14, which decays into nitrogen-14. With a half-life of 5,730 years, carbon-14 decays much more rapidly than rubidium-87 and so is useful for measuring the ages of objects from the recent historical and geologic past, such as fossils, bones, wood, and other organic materials. Whereas rubidium-87 is incorporated into rocks during their formation, carbon-14, which is an essential element of the cells of organisms, becomes incorporated into living tissues as organisms grow. The ratio of carbon-14 to stable carbon isotopes in the organism is the same as it is in the atmosphere. When a living organism dies, no more carbon dioxide is absorbed and so no new carbon isotopes are added. The daughter nitrogen-14 isotope, existing in gaseous form, leaks out of the dead organism, and thus, we cannot use it to compare the ratio of original to daughter as is done with rubidium-87 and its daughter. However, as the amount of carbon-14 in the dead organism becomes less over time, we can compare the proportion of this isotope remaining with the proportion that is in the atmosphere and from this calculate the approximate number of years since the organism has died. Dating dead organic material by this method is moderately reliable in samples up to about 50,000 years old, but beyond that the accuracy becomes unreliable.

9. According to paragraph 5, why can't scientists compare the ratio of carbon-14 to nitrogen-14?

- (A) The amount of nitrogen-14 is not predictable.
- (B) The ratio of these two elements doesn't change.
- (C) Nitrogen-14 has an unpredictable decay rate.
- (D) Carbon-14 tends to evaporate too quickly.

Paragraph 5 is marked with an arrow [➡].

➡ Another radioactive element useful for dating is carbon-14, which decays into nitrogen-14. With a half-life of 5,730 years, carbon-14 decays much more rapidly than rubidium-87 and so is useful for measuring the ages of objects from the recent historical and geologic past, such as fossils, bones, wood, and other organic materials. Whereas rubidium-87 is incorporated into rocks during their formation, carbon-14, which is an essential element of the cells of organisms, becomes incorporated into living tissues as organisms grow. The ratio of carbon-14 to stable carbon isotopes in the organism is the same as it is in the atmosphere. When a living organism dies, no more carbon dioxide is absorbed and so no new carbon isotopes are added. The daughter nitrogen-14 isotope, existing in gaseous form, leaks out of the dead organism, and thus, we cannot use it to compare the ratio of original to daughter as is done with rubidium-87 and its daughter. However, as the amount of carbon-14 in the dead organism becomes less over time, we can compare the proportion of this isotope remaining with the proportion that is in the atmosphere and from this calculate the approximate number of years since the organism has died. Dating dead organic material by this method is moderately reliable in samples up to about 50,000 years old, but beyond that the accuracy becomes unreliable.

10. According to paragraph 5, the amount of carbon-14 in an organism

- (A) replaces other carbon isotopes after an organism dies
- (B) tends to be the same as the other carbon isotopes
- (C) increases rapidly when an organism dies
- (D) deteriorates from the moment of death

Paragraph 5 is marked with an arrow [➡].

➡ Another radioactive element useful for dating is carbon-14, which decays into nitrogen-14. With a half-life of 5,730 years, carbon-14 decays much more rapidly than rubidium-87 and so is useful for measuring the ages of objects from the recent historical and geologic past, such as fossils, bones, wood, and other organic materials. Whereas rubidium-87 is incorporated into rocks during their formation, carbon-14, which is an essential element of the cells of organisms, becomes incorporated into living tissues as organisms grow. The ratio of carbon-14 to stable carbon isotopes in the organism is the same as it is in the atmosphere. When a living organism dies, no more carbon dioxide is absorbed and so no new carbon isotopes are added. The daughter nitrogen-14 isotope, existing in gaseous form, leaks out of the dead organism, and thus, we cannot use it to compare the ratio of original to daughter as is done with rubidium-87 and its daughter. However, as the amount of carbon-14 in the dead organism becomes less over time, we can compare the proportion of this isotope remaining with the proportion that is in the atmosphere and from this calculate the approximate number of years since the organism has died. Dating dead organic material by this method is moderately reliable in samples up to about 50,000 years old, but beyond that the accuracy becomes unreliable.

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

Both the unstable carbon-14 and stable carbon isotopes are taken in from the carbon dioxide present in the atmosphere.

Where would the sentence best fit?

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

Another radioactive element useful for dating is carbon-14, which decays into nitrogen-14. **A** With a half-life of 5,730 years, carbon-14 decays much more rapidly than rubidium-87 and so is useful for measuring the ages of objects from the recent historical and geologic past, such as fossils, bones, wood, and other organic materials. Whereas rubidium-87 is incorporated into rocks during their formation, carbon-14, which is an essential element of the cells of organisms, becomes incorporated into living tissues as organisms grow. **B** The ratio of carbon-14 to stable carbon isotopes in the organism is the same as it is in the atmosphere. **C** When a living organism dies, no more carbon dioxide is absorbed and so no new carbon isotopes are added. **D** The daughter nitrogen-14 isotope, existing in gaseous form, leaks out of the dead organism, and thus, we cannot use it to compare the ratio of original to daughter as is done with rubidium-87 and its daughter. However, as the amount of carbon-14 in the dead organism becomes less over time, we can compare the proportion of this isotope remaining with the proportion that is in the atmosphere and from this calculate the approximate number of years since the organism has died. Dating dead organic material by this method is moderately reliable in samples up to about 50,000 years old, but beyond that the accuracy becomes unreliable.

12. **Directions:** Select the appropriate phrases from the answer choices and match the dating technique 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) Can be used for dating artifacts made of bones or wood
- (B) Destroys progeny isotopes
- (C) Essential to living organisms
- (D) Has a half-life of billions of years
- (E) Incorporated into minerals when they crystallized
- (F) Progeny cannot be used for dating
- (G) Unreliable for dating samples
- (H) Used for dating dead trees
- (I) Used for dating rocks

Rubidium-87

-
-
-
-
-
-
-
-
-

Carbon-14

-
-
-
-
-
-
-
-
-

Questions 13–25

Demographic Transition

Historically, as countries have developed industrially, they have undergone declines in death rates followed by declines in birth rates. Over time they have tended to move from rapid increases in population to slower increases, then to zero growth and finally to population decreases. The model which demographers use to help explain these changes in population growth is known as the *demographic transition model*. In order to properly appreciate the demographic transition model, it is necessary to understand two basic concepts: the crude* birth rate (CBR) and the crude death rate (CDR). The CBR is determined by taking the number of births in a country in a given year and dividing it by the total population of the country and then multiplying the answer by one thousand. So, for example, the CBR of the United States in 2004 was 14 (in other words, there were 14 births per thousand living people in that year). CDR is worked out in a similar way. The CDR for the United States in 2004 was 8 per thousand.

The first stage of the demographic transition model portrays a preindustrial era when both the birth rate and the death rate were high. Typically, women gave birth to a large number of babies. This was partly due to cultural and religious pressures but also because families required a large number of children, since often many didn't survive into adulthood due to the harsh living conditions. Furthermore, children were needed to help adults work the land or perform other chores. The death rate was high due to the high incidence of diseases and famine and also because of poor hygiene. Total population tended to fluctuate due to occasional epidemics, but overall there was only a very gradual long-term increase during this stage.

During the second stage, improvements in hygiene, medical care, and food production led to a decrease in the death rate in newly industrializing regions of Western Europe. However, birth rates remained high due to tradition and because many people were involved in agrarian occupations. The combination of a lowered CDR and a stable CBR led to dramatic increases in population starting at the beginning of the nineteenth century.

In stage three, birth rates also began to fall. In cities there was less incentive to produce large numbers of children, since city dwellers no longer worked the land, and the cost of raising children in an urban environment was greater than in rural districts. Furthermore, more children survived into adulthood due to improved living conditions. These economic pressures led to a lower CBR and over time the numbers of people being born started to approximate the numbers dying.

The final stage, which some demographers have called the *postindustrial stage*, occurs when birth rates and death rates are about equal. In this case there is zero natural population growth. Over time the birth rate may fall below the death rate, and without immigration the total population may slowly decrease. By the early twenty-first century, several European countries were experiencing population declines due to the CDR outstripping the CBR. For example, in Italy in 2004 there were about 9 births per thousand against 10 deaths per thousand.

The demographic transition took about 200 years to complete in Europe. Many developing countries are still in stage two of the demographic transition model: births far outstrip deaths. In these countries, CDR has declined due to improvements in sanitation and increases in food productivity, but the birth rate has still not adjusted downward to the new realities of improved living conditions. This imbalance of births over deaths in the developing world is the fundamental reason for the dramatic population explosion in the latter half of the twentieth century. However, population statistics indicate that in many less developed countries the CBRs have begun to decline over recent decades, giving rise to optimism in some quarters about future trends. The rapid industrialization of many parts of the developing world has meant that these countries have reached stage three of the model much faster than countries

in the developed world did during the nineteenth century. This fact has led many demographers to predict that world population will reach an equilibrium level sooner and at a lower total than more pessimistic earlier predictions.

*crude: not analyzed into specific classes

13. The word "it" in the passage refers to

- (A) population
- (B) year
- (C) country
- (D) number

Historically, as countries have developed industrially, they have undergone declines in death rates followed by declines in birth rates. Over time they have tended to move from rapid increases in population to slower increases, then to zero growth and finally to population decreases. The model which demographers use to help explain these changes in population growth is known as the *demographic transition model*. In order to properly appreciate the demographic transition model, it is necessary to understand two basic concepts: the crude birth rate (CBR) and the crude death rate (CDR). The CBR is determined by taking the number of births in a country in a given year and dividing it by the total population of the country and then multiplying the answer by one thousand. So, for example, the CBR of the United States in 2004 was 14 (in other words there were 14 births per thousand living people in that year). CDR is worked out in a similar way. The CDR for the United States in 2004 was 8 per thousand.

14. According to paragraph 1, what is useful about the demographic transition model?

- (A) It helps explain trends in population growth over time.
- (B) It can be used to measure birth and death rates.
- (C) It clarifies the causes of population increase.
- (D) It predicts the relative speed of population patterns.

Paragraph 1 is marked with an arrow [➡].

➡ Historically, as countries have developed industrially, they have undergone declines in death rates followed by declines in birth rates. Over time they have tended to move from rapid increases in population to slower increases, then to zero growth and finally to population decreases. The model which demographers use to help explain these changes in population growth is known as the *demographic transition model*. In order to properly appreciate the demographic transition model, it is necessary to understand two basic concepts: the crude birth rate (CBR) and the crude death rate (CDR). The CBR is determined by taking the number of births in a country in a given year and dividing it by the total population of the country and then multiplying the answer by one thousand. So, for example, the CBR of the United States in 2004 was 14 (in other words there were 14 births per thousand living people in that year). CDR is worked out in a similar way. The CDR for the United States in 2004 was 8 per thousand.

15. The word "portrays" in the passage is closest in meaning to

- (A) suggests
- (B) represents
- (C) transmits
- (D) associates

The first stage of the demographic transition model **portrays** a preindustrial era when both the birth rate and the death rate were high. Typically, women gave birth to a large number of babies. This was partly due to cultural and religious pressures but also because families required a large number of children, since often many didn't survive into adulthood due to the harsh living conditions. Furthermore, children were needed to help adults work the land or perform other chores. The death rate was high due to the high incidence of diseases and famine and also because of poor hygiene. Total population tended to fluctuate due to occasional epidemics, but overall there was only a very gradual long-term increase during this stage.

16. In paragraph 2, which of the following is NOT mentioned as relevant to the high birth rates in the preindustrial stage?

- (A) The high level of childhood deaths
- (B) The need for help in work situations
- (C) The pressures of tradition
- (D) The high rate of maternal deaths

Paragraph 2 is marked with an arrow [➡].

➡ The first stage of the demographic transition model portrays a preindustrial era when both the birth rate and the death rate were high. Typically, women gave birth to a large number of babies. This was partly due to cultural and religious pressures but also because families required a large number of children, since often many didn't survive into adulthood due to the harsh living conditions. Furthermore, children were needed to help adults work the land or perform other chores. The death rate was high due to the high incidence of diseases and famine and also because of poor hygiene. Total population tended to fluctuate due to occasional epidemics, but overall there was only a very gradual long-term increase during this stage.

17. What can be inferred from paragraph 2 about the effect of epidemic diseases on population during the preindustrial stage?

- (A) They tended to dramatically lower the population growth.
- (B) They caused the population to decline temporarily.
- (C) They reduced overall population significantly.
- (D) They led to sudden overall increases in the birth rate.

Paragraph 2 is marked with an arrow [➡].

➡ The first stage of the demographic transition model portrays a preindustrial era when both the birth rate and the death rate were high. Typically, women gave birth to a large number of babies. This was partly due to cultural and religious pressures but also because families required a large number of children, since often many didn't survive into adulthood due to the harsh living conditions. Furthermore, children were needed to help adults work the land or perform other chores. The death rate was high due to the high incidence of diseases and famine and also because of poor hygiene. Total population tended to fluctuate due to occasional epidemics, but overall there was only a very gradual long-term increase during this stage.

18. The word "agrarian" in the passage is closest in meaning to

- (A) basic
- (B) menial
- (C) farming
- (D) village

During the second stage, improvements in hygiene, medical care, and food production led to a decrease in the death rate in newly industrializing regions of Western Europe. However, birth rates remained high due to tradition and because many people were involved in **agrarian** occupations. The combination of a lowered CDR and a stable CBR led to dramatic increases in population starting at the beginning of the nineteenth century.

19. According to paragraph 4, what was one of the main causes of the drop in birth rates?

- (A) The improvements in hygiene
- (B) The lack of agricultural work
- (C) The development of urbanization
- (D) The superior environment

Paragraph 4 is marked with an arrow [➡].

➡ In stage three, birth rates also began to fall. In cities there was less incentive to produce large numbers of children, since city dwellers no longer worked the land, and the cost of raising children in an urban environment was greater than in rural districts. Furthermore, more children survived into adulthood due to improved living conditions. These economic pressures led to a lower CBR and over time the numbers of people being born started to approximate the numbers dying.

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

- (A) The population gradually declines when there is no immigration and deaths exceed births.
- (B) In time there may be an overall drop in population as the birth rate and death rate fluctuate.
- (C) The relationship between birth and death rates is an important reason for limiting immigration.
- (D) If population losses aren't replaced through immigration, the birth rate may fall below the death rate.

The final stage, which some demographers have called the *postindustrial stage*, occurs when birth rates and death rates are about equal. In this case there is zero natural population growth. Over time, the birth rate may fall below the death rate, and without immigration the total population may slowly decrease. By the early twenty-first century, several European countries were experiencing population declines due to the CDR outstripping the CBR. For example, in Italy in 2004 there were about 9 births per thousand against 10 deaths per thousand.

21. The word “equilibrium” in the passage is closest in meaning to

- (A) economic
- (B) stable
- (C) variable
- (D) fixed

The demographic transition took about 200 years to complete in Europe. Many developing countries are still in stage two of the demographic transition model: births far outstrip deaths. In these countries, CDR has declined due to improvements in sanitation and increases in food productivity, but, the birth rate has still not adjusted downward to the new realities of improved living conditions. This imbalance of births over deaths in the developing world is the fundamental reason for the dramatic population explosion in the latter half of the twentieth century. However, population statistics indicate that in many less developed countries the CBRs have begun to decline over recent decades, giving rise to optimism in some quarters about future trends. The rapid industrialization of many parts of the developing world has meant that these countries have reached stage three of the model much faster than countries in the developed world did during the nineteenth century. This fact has led many demographers to predict that world population will reach an equilibrium level sooner and at a lower total than more pessimistic earlier predictions.

22. According to paragraph 6, what is at the root of the huge population increases during the twentieth century?

- (A) The improvements in health throughout the developing world
- (B) The fact that birth rates are increasing in many countries
- (C) The lack of resources in many developing countries
- (D) The failure of the CDR to respond to economic pressures

Paragraph 6 is marked with an arrow [➡].

➡ The demographic transition took about 200 years to complete in Europe. Many developing countries are still in stage two of the demographic transition model: births far outstrip deaths. In these countries, CDR has declined due to improvements in sanitation and increases in food productivity, but the birth rate has still not adjusted downward to the new realities of improved living conditions. This imbalance of births over deaths in the developing world is the fundamental reason for the dramatic population explosion in the latter half of the twentieth century. However, population statistics indicate that in many less developed countries the CBRs have begun to decline over recent decades, giving rise to optimism in some quarters about future trends. The rapid industrialization of many parts of the developing world has meant that these countries have reached stage three of the model much faster than countries in the developed world did during the nineteenth century. This fact has led many demographers to predict that world population will reach an equilibrium level sooner and at a lower total than more pessimistic earlier predictions.

23. Why does the author mention the optimism felt in some quarters about future population trends?

- (A) To introduce the fact that birth rates in some developing countries may be declining faster than anticipated
- (B) To emphasize that most researchers have taken a pessimistic view of population expansion
- (C) To show that the demographic transition is a valid model of population trends
- (D) To suggest that some countries have worked hard at reducing birth rates

[Refer to the full passage.]

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

Industrialization had led to increased urbanization.

Where would the sentence best fit?

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

In stage three, birth rates also began to fall. A In cities there was less incentive to produce large numbers of children, since city dwellers no longer worked the land, and the cost of raising children in an urban environment was greater than in rural districts. B Furthermore, more children survived into adulthood due to improved living conditions. C These economic pressures led to a lower CBR and over time the numbers of people being born started to approximate the numbers dying. D

25. 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.

Write the letters of the answer choices in the spaces where they belong.

Refer to the full passage.

The demographic transition model links trends in population growth to the level of industrial development.

-
-
-

Answer Choices

- (A) Preindustrial populations tended to increase due to the large numbers of births and a slowly declining death rate.
- (B) Due to economic pressures, the birth rate dropped to match the death rate, leading to zero growth and eventually a decline in population.
- (C) High birth and death rates are associated with a preindustrial stage of development when there was only a gradual increase in overall population numbers.
- (D) Improvements in medical techniques led to a dramatic drop in death rates, allowing industrialization to increase.
- (E) Dramatic increases in population occurred when the death rates declined due to improvements in the quality of life.
- (F) The final stage of demographic transition occurs when birth rates outstrip death rates, leading to a new round of population growth.

Questions 26–39

Communicating with the Future

In the 1980s the United States Department of Energy was looking for suitable sites to bury radioactive waste material generated by its nuclear energy programs. The government was considering burying the dangerous waste in deep underground chambers in remote desert areas. The problem, however, was that nuclear waste remains highly radioactive for thousands of years. The commission entrusted with tackling the problem of waste disposal was aware that the dangers posed by radioactive emissions must be communicated to our descendants of at least 10,000 years hence. So the task became one of finding a way to tell future societies about the risk posed by these deadly deposits.

Of course, human society in the distant future may be well aware of the hazards of radiation. Technological advances may one day provide solutions to this dilemma. But the belief in constant technological advancement is based on our perceptions of advances made throughout history and prehistory. We cannot be sure that society won't have slipped backward into an age of barbarism* due to any of several catastrophic events, whether the result of nature such as the onset of a new ice age or perhaps humankind's failure to solve the scourges of war and pollution. In the event of global catastrophe, it is quite possible that humans of the distant future will be on the far side of a broken link of communication and technological understanding.

The problem then becomes how to inform our descendants that they must avoid areas of potential radioactive seepage* given that they may not understand any currently existing language and may have no historical or cultural memory. So, any message dedicated to future reception and decipherment must be as universally understandable as possible.

It was soon realized by the specialists assigned the task of devising the communication system that any material in which the message was written might not physically endure the great lengths of time demanded. The second law of thermodynamics shows that all material disintegrates over time. Even computers that might carry the message cannot be expected to endure long enough. Besides, electricity supplies might not be available in 300 generations. Other media storage methods were considered and rejected for similar reasons.

The task force under the linguist Thomas Sebeok finally agreed that no foolproof way would be found to send a message across so many generations and have it survive physically and be decipherable by a people with few cultural similarities to us. Given this restriction, Sebeok suggested the only possible solution was the formation of a committee of guardians of knowledge. Its task would be to dedicate itself to maintaining and passing on the knowledge of the whereabouts and dangers of the nuclear waste deposits. This so-called atomic priesthood would be entrusted with keeping knowledge of this tradition alive through millennia and in developing the tradition into a kind of mythical taboo forbidding people to tamper in any way with the nuclear waste sites. Only the initiated atomic priesthood of experts would have the scientific knowledge to fully understand the danger. Those outside the priesthood would be kept away by a combination of rituals and legends designed to warn off intruders.

This proposal has been criticized because of the possibility of a break in continuity of the original message. Furthermore, there is no guarantee that any warning or sanction passed on for millennia would be obeyed, nor that it could survive with its original meaning intact. To counterbalance this possibility, Sebeok's group proposed a "relay system" in which information is passed on over relatively short periods of time, just three generations ahead. The message is then to be renewed and redesigned if necessary for the following three generations and so on over the required time span. In this way information could be relayed into the future and avoid the possibility of physical degradation.

A second defect is more difficult to dismiss, however. This is the problem of social exclusiveness brought about through possession of vital knowledge. Critics point out that the atomic priesthood could use its secret knowledge to control those who are scientifically ignorant. The establishment of such an association of insiders holding powerful knowledge not available except in mythic form to nonmembers would be a dangerous precedent for future social developments.

***barbarism:** a state of existence in which the experience, habits, and culture of modern life are absent

***seepage:** an amount of liquid or gas that flows through another substance

26. The word "chambers" in the passage is closest in meaning to

- (A) cavities
- (B) partitions
- (C) openings
- (D) fissures

In the 1980s the United States Department of Energy was looking for suitable sites to bury radioactive waste material generated by its nuclear energy programs. The government was considering burying the dangerous waste in deep underground chambers in remote desert areas. The problem, however, was that nuclear waste remains highly radioactive for thousands of years. The commission entrusted with tackling the problem of waste disposal was aware that the dangers posed by radioactive emissions must be communicated to our descendants of at least 10,000 years hence. So the task became one of finding a way to tell future societies about the risk posed by these deadly deposits.

27. What problem faced the commission assigned to deal with the burial of nuclear waste?

- (A) How to reduce the radioactive life of nuclear waste materials
- (B) How to notify future generations of the risks of nuclear contamination
- (C) How to form a committee that could adequately express various nuclear risks
- (D) How to choose burial sites so as to minimize dangers to people

[Refer to the full passage.]

28. In paragraph 2, the author explains the possible circumstances of future societies
- (A) to warn us about possible natural catastrophes
 - (B) to highlight humankind's inability to resolve problems
 - (C) to question the value of our trust in technological advances
 - (D) to demonstrate the reason nuclear hazards must be communicated

Paragraph 2 is marked with an arrow [➡].

➡ Of course, human society in the distant future may be well aware of the hazards of radiation. Technological advances may one day provide solutions to this dilemma. But the belief in constant technological advancement is based on our perceptions of advances made throughout history and prehistory. We cannot be sure that society won't have slipped backward into an age of barbarism due to any of several catastrophic events, whether the result of nature such as the onset of a new ice age or perhaps humankind's failure to solve the scourges of war and pollution. In the event of global catastrophe, it is quite possible that humans of the distant future will be on the far side of a broken link of communication and technological understanding.

29. The word "scourges" in the passage is closest in meaning to
- (A) worries
 - (B) pressures
 - (C) afflictions
 - (D) annoyances

Of course, human society in the distant future may be well aware of the hazards of radiation. Technological advances may one day provide solutions to this dilemma. But the belief in constant technological advancement is based on our perceptions of advances made throughout history and prehistory. We cannot be sure that society won't have slipped backward into an age of barbarism due to any of several catastrophic events, whether the result of nature such as the onset of a new ice age or perhaps humankind's failure to solve the scourges of war and pollution. In the event of global catastrophe, it is quite possible that humans of the distant future will be on the far side of a broken link of communication and technological understanding.

30. Which of the sentences below best expresses the essential information in the highlighted sentence in the passage? Incorrect choices change the meaning in important ways or leave out essential information.
- (A) A message for future generations must be comprehensible to anyone in the world.
 - (B) A universally understandable message must be deciphered for future generations.
 - (C) Any message that is globally understandable must be received and deciphered.
 - (D) The message that future generations receive and interpret must be dedicated.

The problem then becomes how to inform our descendants that they must avoid areas of potential radioactive seepage given that they may not understand any currently existing language and may have no historical or cultural memory. So, any message dedicated to future reception and decipherment must be as universally understandable as possible.

31. In paragraph 4, the author mentions the second law of thermodynamics

- (A) to contrast the potential life span of knowledge with that of material objects
- (B) to give the basic scientific reason behind the breakdown of material objects
- (C) to show that knowledge can be sustained over millennia
- (D) to support the view that nuclear waste will disperse with time

→ It was soon realized by the specialists assigned the task of devising the communication system that any material in which the message was written might not physically endure the great lengths of time demanded. The second law of thermodynamics shows that all material disintegrates over time. Even computers that might carry the message cannot be expected to endure long enough. Besides, electricity supplies might not be available in 300 generations. Other media storage methods were considered and rejected for similar reasons.

Paragraph 4 is marked with an arrow [➡].

32. The word "Its" in the passage refers to

- (A) knowledge
- (B) guardians
- (C) committee
- (D) solution

The task force under the linguist Thomas Sebeok finally agreed that no foolproof way would be found to send a message across so many generations and have it survive physically and be decipherable by a people with few cultural similarities to us. Given this restriction, Sebeok suggested the only possible solution was the formation of a committee of guardians of knowledge. Its task would be to dedicate itself to maintaining and passing on the knowledge of the whereabouts and dangers of the nuclear waste deposits. This so-called atomic priesthood would be entrusted with keeping knowledge of this tradition alive through millennia and in developing the tradition into a kind of mythical taboo forbidding people to tamper in any way with the nuclear waste sites. Only the initiated atomic priesthood of experts would have the scientific knowledge to fully understand the danger. Those outside the priesthood would be kept away by a combination of rituals and legends designed to warn off intruders.

33. In paragraph 5, why is the proposed committee of guardians referred to as the "atomic priesthood"?

- (A) Because they would be an exclusive religious order
- (B) Because they would develop mythical taboos surrounding their traditions
- (C) Because they would use rituals and legends to maintain their exclusiveness
- (D) Because they would be an exclusive group with knowledge about nuclear waste sites

Paragraph 5 is marked with an arrow [➡].

➡ The task force under the linguist Thomas Sebeok finally agreed that no foolproof way would be found to send a message across so many generations and have it survive physically and be decipherable by a people with few cultural similarities to us. Given this restriction, Sebeok suggested the only possible solution was the formation of a committee of guardians of knowledge. Its task would be to dedicate itself to maintaining and passing on the knowledge of the whereabouts and dangers of the nuclear waste deposits. This so-called atomic priesthood would be entrusted with keeping knowledge of this tradition alive through millennia and in developing the tradition into a kind of mythical taboo forbidding people to tamper in any way with the nuclear waste sites. Only the initiated atomic priesthood of experts would have the scientific knowledge to fully understand the danger. Those outside the priesthood would be kept away by a combination of rituals and legends designed to warn off intruders.

34. The word "sanction" in the passage is closest in meaning to

- (A) security
- (B) approval
- (C) counsel
- (D) penalty

This proposal has been criticized because of the possibility of a break in continuity of the original message. Furthermore, there is no guarantee that any warning or sanction passed on for millennia would be obeyed, nor that it could survive with its original meaning intact. To counterbalance this possibility, Sebeok's group proposed a "relay system" in which information is passed on over relatively short periods of time, just three generations ahead. The message is then to be renewed and redesigned if necessary for the following three generations and so on over the required time span. In this way information could be relayed into the future and avoid the possibility of physical degradation.

35. According to the author, why did the task force under Sebeok propose a relay system for passing on information?

- (A) To compensate for the fact that meaning will not be stable over long periods of time
- (B) To show that Sebeok's ideas created more problems than they solved
- (C) To contrast Sebeok's ideas with those proposed by his main critics
- (D) To support the belief that breaks in communication are inevitable over time

[Refer to the full passage.]

36. According to paragraph 7, the second defect of the atomic priesthood proposal is that it could lead to
- the possible misuse of exclusive knowledge
 - the establishment of a scientifically ignorant society
 - the priesthood's criticism of points concerning vital knowledge
 - the nonmembers turning knowledge into dangerous mythical forms

Paragraph 7 is marked with an arrow (➡).

➡ A second defect is more difficult to dismiss, however. This is the problem of social exclusiveness brought about through possession of vital knowledge. Critics point out that the atomic priesthood could use its secret knowledge to control those who are scientifically ignorant. The establishment of such an association of insiders holding powerful knowledge not available except in mythic form to nonmembers would be a dangerous precedent for future social developments.

37. All of the following are mentioned in the passage as difficulties in devising a communication system with the future EXCEPT
- the loss of knowledge about today's civilization
 - the failure to maintain communication links
 - the inability of materials to endure over time
 - the exclusiveness of a priesthood

[Refer to the full passage.]

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

Perhaps scientists will find efficient ways to deactivate radioactive materials.

Where would the sentence best fit?

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

Of course, human society in the distant future may be well aware of the hazards of radiation. **A** Technological advances may one day provide solutions to this dilemma. **B** But the belief in constant technological advancement is based on our perceptions of advances made throughout history and prehistory. **C** We cannot be sure that society won't have slipped backward into an age of barbarism due to any of several catastrophic events, whether the result of nature such as the onset of a new ice age or perhaps humankind's failure to solve the scourges of war and pollution. **D** In the event of global catastrophe, it is quite possible that humans of the distant future will be on the far side of a broken link of communication and technological understanding.

39. **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.**

Write the letters of the answer choices in the spaces where they belong.

Refer to the full passage.

The problem of how to pass on knowledge of the dangers posed by buried radioactive waste was addressed by a commission of experts.

-
-
-

Answer Choices

- (A) A task force argued that a select group should be entrusted with passing on knowledge of the dangers of radioactive deposits by using a relay system.
- (B) Electricity supplies may not exist in the future, so computers should not be entrusted with storage of vital information.
- (C) Technological improvements will possibly allow future generations to decontaminate nuclear waste.
- (D) The atomic priesthood proposal has been criticized due to its potential for creating a future society divided into those who hold special knowledge and those who don't.
- (E) The atomic priesthood would develop rituals and legends designed to warn off trespassers into the nuclear burial sites.
- (F) Various means of storing and passing on information are unreliable over time because of the difficulty of communicating with future societies and the likely physical decay of storage media.

LISTENING SECTION

Directions

This section measures your ability to understand conversations and lectures in English. You will hear each conversation or lecture only one time. After each conversation or lecture, you will answer some questions about it.

The questions typically ask about the main idea and supporting details. Some questions ask about a speaker's purpose or attitude. Answer the questions based on what is stated or implied by the speakers.

You may take notes while you listen. You may use your notes to help you answer the questions. Your notes will not be scored.

In some questions, you will see this icon: . This means that you will hear, but not see, part of the question.

Some questions have special directions. These directions appear in a gray box.

Most questions are worth one point. A question worth more than one point will have special instructions indicating how many points you can receive.

You will have 20 minutes to answer the questions in this section.

Now get ready to listen. You may take notes.

START ►

Questions 1–6

Listen to part of a lecture in a biology class.



Now get ready to answer the questions. You may use your notes to help you answer.

1. What is the lecture mainly about?
- (A) How the tide affects the estuarine environment
 - (B) How the adaptations of estuarine organisms developed
 - (C) How the salinity of water is associated with maintaining the right balance
 - (D) How organisms have adapted to differing concentrations of water and salt

2. Listen again to part of the lecture. Then answer the question.
What does the professor imply when he says this:
- (A) The students probably know the term already.
 - (B) The students should have kept better notes.
 - (C) The term is not relevant to the lecture.
 - (D) The term is in their class notes.

3. What two adaptations are mentioned that allow crabs to survive in the estuary environment?

Choose 2 answers.

- (A) Their hard shells keep out water and salt.
- (B) Their gills and skin adjust to changes rapidly.
- (C) They can burrow into the soft mud.
- (D) Their internal organs regulate salt intake.

4. Listen again to part of the lecture. Then answer the question.

Why does the professor say this:

- (A) To test the students' understanding of osmoregulators
- (B) To find out if the students understand how blue crabs breed
- (C) To show a discrepancy in the behavioral pattern of the crab
- (D) To give the students an opportunity to ask questions

5. Indicate whether each word or phrase below describes a physiological adaptation or behavioral adaptation.

Check the correct box for each statement.

	Physiological	Behavioral
(A) migrating		
(B) osmoregulating		
(C) dropping leaves		
(D) burrowing into mud		

6. The adaptations of which estuarine creature are NOT discussed in the lecture?

- (A) fish
- (B) birds
- (C) plants
- (D) invertebrates

Questions 7–11

Listen to a conversation between a student and a professor.

TOEFL Listening

The image shows a TOEFL listening interface. At the top, it says "TOEFL Listening". Below that is a video frame showing a student in a striped shirt standing and a professor in a dark sweater sitting at a desk with papers. A progress bar at the bottom of the video frame indicates the audio has been played for approximately 1 minute and 40 seconds. The background of the page features faint text from the previous page.

Now get ready to answer the questions. You may use your notes to help you answer.

7. Why does the student go to see the professor?

- A To discuss degree requirements
- B To get advice about changing degrees
- C To ask about American Sign Language
- D To inform the professor of changes in his degree program

8. Listen again to part of the conversation. Then answer the question.

What can be inferred about the professor?

- A She does not understand why the student has come to her office.
- B She expects the student to have a background in linguistics.
- C She advises students getting degrees in linguistics.
- D She is not sure why students want to switch majors.

9. Why does the student want to change degree programs?

- A He wants to study languages in Peru.
- B He's worried about financing his studies.
- C He enjoyed his English teaching experience.
- D He likes helping people with speech disorders.

10. Listen again to part of the conversation. Then answer the question.

Why does the professor say this: 

- A To avoid giving the student false hopes
- B To influence the student's choice of languages
- C To suggest that the student may have false information
- D To point out to the student the reasons to be cautious

11. What can be inferred about the student?

- A He may not be able to finance a change in degree programs.
- B He does not intend to take a heavier course load to graduate on schedule.
- C He has highlighted all the prerequisites for upper-level courses.
- D He wants to look at all the options for other language courses.

Questions 12–17

Listen to a discussion in an education class.



Now get ready to answer the questions. You may use your notes to help you answer.

12. What is the discussion mainly about?

- (A) The kinds of questions that encourage thought processes
- (B) The factors that discourage students from asking questions
- (C) The personality traits of a particular professor in the faculty
- (D) The way classroom size affects students' abilities to form questions

13. Why does the professor say this:

- (A) He is expecting the students to consider an answer to his questions.
- (B) He is preparing the students for the discussion that he wants them to take up.
- (C) He is giving an example of the kinds of questions teachers ask students.
- (D) He is telling the students the kinds of questions students should ask themselves.

14. Listen again to part of the discussion. Then answer the question.

What can be inferred about the students?

- (A) They both question the professor's classification of the pressure of feeling stupid.
- (B) The woman doesn't agree with the man that class size is an aspect of appearing stupid.
- (C) The man is convinced that it is better to ask questions in a small class.
- (D) They have different reasons for considering class size as a negative pressure.

15. Why does Lisa mention Professor Clarkson?

- (A) To make fun of his course
- (B) To give an example of time pressure
- (C) To praise his style of answering questions
- (D) To encourage the others to take his course

16. In the discussion, the professor elicits different reasons why students don't ask questions. Indicate whether each of the following is one of the discussed fears.

Check the correct box for each statement.

	Yes	No
(A) Fear of asking too many questions		
(B) Fear of being considered stupid		
(C) Fear of being the victim of a joke		
(D) Fear of making a mistake		
(E) Fear of wasting a professor's time		

17. Listen again to part of the discussion. Then answer the question.

Why does the professor say this: 

- (A) To change the group discussion assignment to a different topic
- (B) To challenge the students to reconsider the pressures they have mentioned
- (C) To inform the students that they have not done a good job of listing the pressures
- (D) To indicate to the students that they are not limited to the pressures written on the board

Questions 18–23

Listen to a lecture in a history of ideas class.

TOEFL Listening

TOEFL Listening

Now get ready to answer the questions. You may use your notes to help you answer.

18. What is the lecture mainly about?

- (A) A theory about criminal personality development
- (B) A system for evaluating personality theory
- (C) A method of psychological analysis
- (D) A comparison of early psychological theories

19. What points does the professor make about Gall's phrenological theory?

Choose 2 answers.

- (A) Abilities were evenly distributed in the brain.
- (B) Each part of the brain was used for a different ability.
- (C) The shape of the skull corresponded to brain shape.
- (D) The shape of the brain was less important than the size.

20. Listen again to part of the lecture. Then answer the question.

Why does the professor say this:

- (A) To express her disagreement with the students' opinions
- (B) To agree that many people might think this theory is strange
- (C) To test the students' understanding of the concepts
- (D) To remind the students of a previous unusual idea

21. According to the professor, how did phrenologists approach evidence?

- (A) They carefully examined evidence that did not fit with their theory.
- (B) They were not interested in seeking confirmation of their claims.
- (C) They only accepted the evidence that seemed to fit their claims.
- (D) They looked for evidence that they knew was false.

22. What does the professor imply about phrenology?

- (A) It was once more highly thought of than today.
- (B) It was mainly a waste of research time.
- (C) It was never more than a minority interest.
- (D) It was usually on the receiving end of satirical humor.

23. According to the professor, which of the following modern beliefs was contributed to by phrenology?

- (A) Certain organs within the brain are responsible for certain kinds of behavior.
- (B) The power of the brain is related to the size and shape of the organ.
- (C) The shape of the skull is determined by the shape of the brain.
- (D) Certain abilities are related to specific areas of the brain.

Questions 24–29

Listen to a discussion in an astronomy class.



Now get ready to answer the questions. You may use your notes to help you answer.

24. What is the discussion mainly about?

- (A) The differences between conditions on Mars and conditions on Earth
- (B) The possibility of radically transforming the conditions on Mars
- (C) The necessity of human migration in the search for new resources
- (D) The ethical problems arising from the human settlement of Mars

25. Why does the professor say this:

- (A) To express doubt about the possibility of terraforming
- (B) To criticize the science community for wasting resources
- (C) To indicate that terraforming would be a technologically amazing feat
- (D) To encourage students to think clearly about the need for terraforming

26. Why does the professor mention the migration of Europeans to the Americas?

- (A) To emphasize that people like to explore new regions
- (B) To give an example of the fact that population pressures cause migrations
- (C) To provide background information on the need to terraform Mars
- (D) To argue that the settlement of the Americas was a valuable use of resources

27. According to the professor, why is Mars the planet that scientists want to terraform?

Choose 2 answers.

- (A) It is nearer to Earth than other planets.
- (B) Its atmospheric conditions are rather similar to those on Earth.
- (C) The other planets are unsuitable for several reasons.
- (D) Mars contains water and its surface is solid.

28. Listen again to part of the discussion. Then answer the question.

Why does the professor say this:

- (A) He wants to focus on the technological considerations of terraforming.
- (B) He thinks the ethical considerations are not relevant to classroom discussion.
- (C) He thinks the students know his opinion about the right way to use Earth's resources.
- (D) He wants the students to make up their own minds about the ethics of terraforming.

29. Which of the following is NOT mentioned as a method of terraforming Mars?

- (A) Crashing ammonia-rich asteroids onto the planet's surface
- (B) Introducing oxygen-releasing plants from Earth
- (C) Heating the surface with sunlight reflected from orbiting mirrors
- (D) Building greenhouse gas producing factories on the Martian surface

Questions 30–34

Listen to part of a conversation between a student and a research coordinator.



Now get ready to answer the questions. You may use your notes to help you answer.

30. Why has the student gone to see the research coordinator?

- (A) To investigate food disorders
- (B) To find out where the Pharmacology Lab is
- (C) To participate in an experiment
- (D) To volunteer for making weekly breakfasts

31. Why does the research coordinator ask the student personal questions?

- (A) To make sure the student fits all the requirements
- (B) To test if the student has read the announcement correctly
- (C) To see if the student understands the experiment
- (D) To help the student decide whether she wants to participate

32. Listen again to part of the conversation. Then answer the question.

Why does the student say this: 

- (A) Because she gets ill infrequently
- (B) Because she can only know about her current health
- (C) Because she intends to stay well for the week
- (D) Because her bout with flu is over

33. Which of the following topics does the research coordinator NOT ask the student about?

- (A) Her susceptibility to allergies
- (B) Her use of medications
- (C) Her preferences for snacks
- (D) Her current health situation

34. What example does the research coordinator give of the breakfast that will be provided?

- (A) Pickled onions or grasshoppers
- (B) Candy bars or potato chips
- (C) Yogurt or nuts
- (D) Eggs or cereal

STOP ■

SPEAKING SECTION

Directions

In this section of the test, you will be able to demonstrate your ability to speak about a variety of topics. You will answer six questions by recording your response. Answer each of the questions as completely as possible.

In questions 1 and 2, you will first hear a statement or question about familiar topics. You will then speak about these topics. Your response will be scored on your ability to speak clearly and coherently about the topics.

In questions 3 and 4, you will first read a short text. You will then listen to a talk on the same topic.

You will be asked a question about what you have read and heard. You will need to combine appropriate information from the text and the talk to provide a complete answer to the question. Your response will be scored on your ability to speak clearly and coherently and on your ability to accurately convey information about what you read and heard.

In questions 5 and 6, you will listen to part of a conversation or a lecture. You will be asked a question about what you heard. Your response will be scored on your ability to speak clearly and coherently and on your ability to accurately convey information about what you heard.

You may take notes while you read and while you listen to the conversations and lectures. You may use your notes to help prepare your response.

Listen carefully to the directions for each question. For each question you will be given a short time to prepare your response. When the preparation time is up, you will be told to begin your response.

START ►

1. Please listen carefully.

TOEFL Speaking
Question 1 of 6

A good teacher should have some special qualities. What qualities do you think are necessary for a good teacher to have and why? Include details and examples in your explanation.

Preparation time: 15 seconds
Response time: 45 seconds

You may begin to prepare your response after the beep.

Please begin speaking after the beep.

STOP ■**START ►**

2. Please listen carefully.

TOEFL Speaking
Question 2 of 6

Some people believe that people who play video games are learning important life skills. Others believe that video game players are wasting their time. Which view do you agree with and why? Include details and examples in your explanation.

Preparation time: 15 seconds
Response time: 45 seconds

You may begin to prepare your response after the beep.

Please begin speaking after the beep.

STOP ■

START ►

3. Please listen carefully.

The University of the Rockies newspaper has published a letter to the editor concerning a university policy. Read the letter about the hiring of temporary instructors. You will have 45 seconds to read the letter. Begin reading now.

PAUSE II (for 45 seconds)

TOEFL Speaking

Question 3 of 6



Reading Time: 45 seconds

Letter to the Editor

Most students are unaware of the employment conditions of our instructors. In fact, an ever increasing percentage of our university teachers have adjunct contracts. This means that they are only hired for a semester at a time, are underpaid, and receive no benefits. Although universities make great savings by following a policy of using temporary instructors, students do not benefit from these savings in the form of lower tuition fees. Considering how our university is exploiting teachers, we as students should be asking in what ways our education is suffering from this situation.

Now listen to two students as they discuss the issue brought up in the letter.

TOEFL Speaking

Question 3 of 6



Now get ready to answer the question.

TOEFL Speaking

Question 3 of 6



The man expresses his opinion on the issue of temporary instructors. State his opinion and explain the reasons he gives for that opinion.

Preparation time: 30 seconds

Response time: 60 seconds

You may begin to prepare your response after the beep.

Please begin speaking after the beep.

STOP ■

START ►

4. Please listen carefully.

Read the passage about imprinting in baby birds. You have 45 seconds to read the passage. Begin reading now.

PAUSE II (for 45 seconds)

TOEFL Speaking

Question 4 of 6



Reading Time: 45 seconds

Imprinting

Animal psychologists have long known that young geese and ducks instinctively follow their mother, but only if they have the opportunity to do so at an early point in their lives. If these goslings or ducklings are separated from their mothers during this sensitive period, they will not develop an attachment to her.

Konrad Lorenz, the scientist who developed our knowledge of this phenomenon, used the term *imprinting* to identify the process in which this bond is formed. Lorenz noted that imprinting appears immediately after hatching and that the period during which it can develop lasts for at most a couple of days. Moreover, Lorenz argued that imprinting was irreversible and that a hatchling will imprint on its mother, or, remarkably, on any suitable moving object if the mother is not available.

Now listen to part of a lecture on this topic in an ecology class.

TOEFL Speaking Question 4 of 6



More than 50 years ago, Konrad Lorenz, a Austrian zoologist, studied the behavior of young geese. They are only able to follow their mother or another bird they have seen first. They do not have the ability to distinguish between different sounds, and therefore can be easily tricked by imitating their mother's voice. This is called imprinting.

Preparation time: 30 seconds Response time: 60 seconds

Now get ready to answer the question.

TOEFL Speaking Question 4 of 6

The professor explains the notion of imprinting in young geese and ducks. Explain how this behavior develops and how it might be important for the birds' survival.

Preparation time: 30 seconds
Response time: 60 seconds

You may begin to prepare your response after the beep.

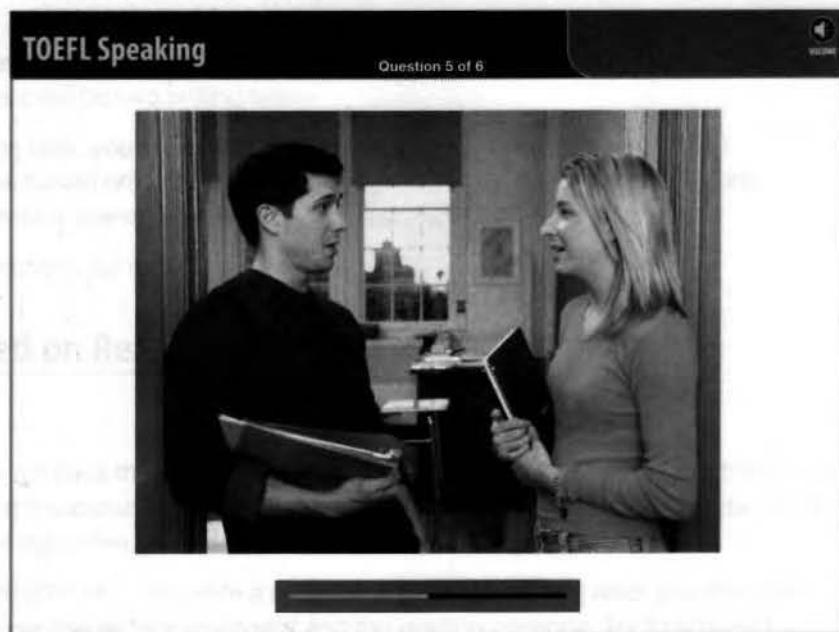
Please begin speaking after the beep.

STOP ■

START ►

5. Please listen carefully.

Listen to a conversation between two students.



Now get ready to answer the question.

A screenshot of the TOEFL Speaking software. The title "TOEFL Speaking" is at the top left, and "Question 5 of 6" is at the top right. A small speaker icon is in the top right corner. Below the title is a text box containing the task instructions: "The students discuss different solutions to the woman's problem. Describe the problem. Then state which of the solutions you prefer and why." Below the instructions is a horizontal line. Further down, there is another text box with the preparation and response times: "Preparation time: 20 seconds" and "Response time: 60 seconds".

You may begin to prepare your response after the beep.

Please begin speaking after the beep.

STOP ■

START ►

6. Please listen carefully.

Listen to part of a lecture in an architecture class.

TOEFL Speaking

Question 6 of 6

A black and white video frame showing a man from the chest up. He has dark hair and is wearing a white shirt, a dark vest over it, and a tie. He appears to be speaking into a microphone. The background is a plain wall. Below the video is a horizontal progress bar.

Now get ready to answer the question.

TOEFL Speaking

Question 6 of 6

A question card for a speaking task. At the top, it says "TOEFL Speaking" and "Question 6 of 6". Below that is a large text area containing a lecture transcript. The transcript discusses the importance of considering various loads when building structures. It mentions wind load, snow load, and seismic load. The text ends with a question: "Using points and examples from the lecture, explain the kinds of loads an engineer must consider when building a structure." Below the question is a preparation time indicator: "Preparation time: 20 seconds".

You may begin to prepare your response after the beep.

Please begin speaking after the beep.

STOP ■

WRITING SECTION

Directions

This section measures your ability to use writing to communicate in an academic environment. There will be two writing tasks.

For the first writing task, you will read a passage and listen to a lecture, and then answer a question based on what you have read and heard. For the second writing task, you will answer a question based on your own knowledge and experience.

Now read the directions for the first writing task.

Writing Based on Reading and Listening

Directions

For this task, you will have three minutes to read a passage about an academic topic. You may take notes on the passage while you read. Then you will listen to a lecture about the same topic. While you listen, you may also take notes.

Then you will have 20 minutes to write a response to a question that asks you about the relationship between the lecture you heard and the reading passage. Try to answer the question as completely as possible using information from the reading passage and the lecture. The question does **not** ask you to express your personal opinion. You can refer to the reading passage again when it is time for you to write. You may use your notes to help you answer the question.

Typically, an effective response will be 150 to 225 words long. Your response will be judged on the quality of your writing and on the completeness and accuracy of the content. If you finish your response before time is up, go on to the second writing task.

On the day of the test, you will be required to type your response into a computer. Therefore, if you are taking this test in the book, practice typing your response on a computer.

INTEGRATED TASK

Directions: You have three minutes to read and take notes from the reading passage. Next, listen to the related lecture and take notes. Then write your response.

TOEFL Writing Question 1 of 2

Dowsing

Dowsing is the millennia-old practice of finding hidden things. The most well-known activity of dowsing involves the use of a device such as a forked stick to locate underground water. To this end, the dowser walks slowly back and forth over an area of ground holding the dowsing tool out in front with both hands. It is said that the dowser, by concentrating carefully, is somehow able to feel the energy of the flowing underground streams vibrating through the rod at certain frequencies, and thus is able to tell precisely where to dig or drill to find water. Sometimes the dowsing tool will twist and jerk or suddenly point downward. Some dowsers hold two L-shaped rods, one in each hand. In this case, when he or she walks over an area of underlying water, the rods cross over indicating the place where digging should commence.

In recent years dowsing has gained in popularity not only as a method for finding underground water but also for trying to uncover other objects including buried treasure, oil, or even dead bodies. A recent application has been the search for what some consider harmful energy fields in an attempt to avoid them. Even large businesses and official organizations pay dowsers for their detection skills. Although no one is completely sure how dowsing works, the testimonials of satisfied customers bear witness to the success of this ancient art.

START ►

Now listen to a professor's response to the reading passage.

**STOP ■**

TOEFL Writing
Question 1 of 2

Directions: You have **20 minutes** to plan and write your response. Your response will be judged based on the quality of your writing and on how well your response presents the points in the lecture and their relationship to the reading passage. Typically, an effective response will be 150 to 225 words.

Question: Summarize the points made in the lecture you just heard, explaining how they cast doubt on the points made in the reading.

[Reading passage reappears during writing time. Refer to the full passage on the previous page.]

The interface includes a toolbar with "Cut", "Paste", "Delete", "Save", and "Hide Word Count". There is also a vertical scroll bar on the right side of the writing area.

Writing Based on Knowledge and Experience

Directions

For this task, you will write an essay in response to a question that asks you to state, explain, and support your opinion on an issue. You will have 30 minutes to plan, write, and revise your essay.

Typically, an effective essay will contain a minimum of 300 words. Your essay will be judged on the quality of your writing. This includes the development of your ideas, the organization of your essay, and the quality and accuracy of the language you use to express your ideas.

On the day of the test, you will be required to type your response into a computer. Therefore, if you are taking this test in the book, practice typing your response on a computer.

INDEPENDENT WRITING TASK

The screenshot shows a software window titled "TOEFL Writing". At the top, it says "Question 2 of 2". Below the title, there is a "Directions" box containing the following text:

Directions: Read the question below. You have 30 minutes to plan, write, and revise your essay. Typically, an effective response contains a minimum of 300 words.

Below the directions, there is a "Question" box containing the following text:

Question:
Do you agree or disagree with the following statement?
There is nothing that an uneducated person can teach an educated person.
Use specific reasons and examples to support your opinion.

The main writing area is a large, empty text box where the student can type their response. The interface includes standard toolbar buttons for Cut, Paste, Undo, Redo, and a "Hide Word Count" button.