

Underground Life

【Paragraph 1】 Until about the late 1980s, most scientists believed that life was restricted to the top few meters of the soil or ocean sediments. The few reports of organisms being recovered from great depths within Earth were dismissed as contamination with material from the surface layers. Two technical developments changed this view. The first was the development of drilling techniques that gave confidence that samples could be retrieved from depth without contamination. Samples were recovered using a diamond-studded drill bit that headed a great length of rotating steel pipe from a drilling derrick. A concentrated tracer material was added to the lubricating fluid so that when a deep sample of rock was removed, any contaminated material could be identified and cut away to leave a **pristine** sample of rock from deep within Earth. The second development was the advent of techniques for identifying microorganisms without having to grow them in culture. All organisms contain DNA, and their presence can be **revealed** by dyes that either stain DNA directly or can be attached to nucleic acid probes. By varying the nucleic acid probe, scientists can demonstrate the presence of different types of microorganisms.

【Paragraph 2】 The first scientists to use these techniques were involved in the Subsurface Science Program of the United States Department of Energy (DOE). They were interested in the possibility that if organisms existed in the depths of Earth, they might degrade organic pollutants and help maintain the purity of groundwater or, **rather less usefully**, degrade the containers in which the DOE was proposing to deposit the radioactive waste from nuclear facilities. They demonstrated the presence of many different types of microorganisms in rocks at depths down to 500 meters beneath the surface. Since then, microbes have been discovered in many different types of rocks and deep within ocean sediments. The record depth at which life has been found is at the bottom of a South African gold mine, 3.5 kilometers below ground. Pressure and temperature increase as you go deeper into Earth. Some scientists think that subsurface bacteria could withstand temperatures as high as 150°C. This would allow organisms to exist to depths of about 7 kilometers beneath the seafloor and to 4 kilometers below the surface of the land. Although the organisms are often sparsely distributed, this is such an enormous volume that it has been estimated that the total biomass of deep subsurface organisms exceeds that of those living on, or just below, the surface.

【Paragraph 3】 Bacteria are the most numerous of these subsurface organisms, but there are also fungi and protozoa. Some 10,000 strains of microorganism have been isolated from subsurface cores. Each gram of rock contains anything from 100 bacteria to 10 million bacteria (compared with more than 1 billion per gram in agricultural soils); ocean sediments contain even higher numbers. The protozoa feed on the bacteria, forming part of a simple subterranean food chain, but **what do the bacteria feed on?** Sedimentary rocks are formed from sands and from ocean, river, or lake sediments that have organic material trapped within them. Microbes living in pores within the sediments can utilize these ancient nutrients and grow. As sedimentary rocks are buried more deeply, they become increasingly **compacted** and their pores filled with minerals. The distribution of microorganisms is thus likely to become more patchy, condensed into the remaining pores and concentrations of nutrients. The bulk of Earth's crust, however, consists of igneous rocks, such as granite and basalt, which are solidified from molten magma. These rocks were too hot to support life when they were first formed; the organisms that inhabit cracks and fissures within the rocks are carried there by the groundwater flowing through them. Subsurface bacteria do not just **rely on** nutrients trapped within the rock or carried there by groundwater. Some are chemotrophs, deriving their energy from the oxidation of iron or sulfur compounds and building organic material directly from the carbon dioxide and hydrogen gas dissolved in the rock. These bacteria excrete organic compounds that are then utilized by other types of bacteria. These ecosystems based on chemotrophic bacteria are completely independent of material and solar energy from the surface.

1. Select the TWO answer choices that, according to paragraph 1, indicate what scientists believed before the 1980s about underground organisms. To receive credit, you must select TWO answers.

- A. It was impossible for organisms to live beyond just a few meters underground.
- B. Organisms were filtered into the soil from ocean sediments.
- C. Organisms that were supposedly found at great depths were actually from the surface layers.
- D. Contamination from the surface layers of the soil was seriously affecting life underground.

2. The word "pristine" in the passage is closest in meaning to
- A. Suitable
 - B. pure
 - C. precise
 - D. solid
3. According to paragraph 1, what is the purpose of using concentrated tracer material during drilling?
- A. To lubricate the drill
 - B. To obtain uncontaminated rock samples
 - C. To cut away the samples of rock
 - D. To identify rock sample types
4. The word "revealed" in the passage is closest in meaning to
- A. added to
 - B. made known
 - C. restricted
 - D. replaced
5. According to paragraph 1, what can be inferred about the new techniques for the identification of underground microorganisms?
- A. They depend on growing microorganisms in culture.
 - B. They sometimes add contaminants to the sample.
 - C. They involve DNA analysis
 - D. They cannot demonstrate the presence of different types of microorganisms.
6. Why does the author use the phrase "rather less usefully" in the passage?
- A. To question the usefulness of microorganism identification
 - B. To identify two negative effects of pollution, the second one more dangerous than the first
 - C. To compare the scientific usefulness of two theories
 - D. To contrast a possible benefit of the existence of subsurface organisms with a potential danger
7. According to paragraph 2, what is the greatest depth at which life has been found to this day?

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- A. 500 meters below ground
- B. 35 kilometers below ground
- C. 4 kilometers below ground
- D. 7 kilometers beneath the seafloor

8. The author asks "what do the bacteria feed on?" for the purpose of

- A. presenting a problem that scientists have not yet been able to solve
- B. expressing doubts about the theory that bacteria can live at great depths
- C. introducing the explanation that answers the question
- D. arguing against the idea that bacteria form part of a subterranean food chain

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

- A. complicated
- B. strengthened
- C. absorbent
- D. compressed

10. Which of the following can be inferred from paragraph 3 about the organisms in cracks and fissures in igneous rock?

- A. They produce the cracks and fissures in the rock
- B. They grow in the molten magma that forms the rock.
- C. They can survive changing temperatures
- D. They have not originated in the igneous rock

11. The phrase "rely on" in the passage is closest in meaning to

- A. use up
- B. head for
- C. depend on
- D. pass on

12. According to paragraph 3, why are chemotrophic bacteria important to their ecosystems?

- A. They compete with other microorganisms.
- B. They allow other bacteria to use organic compounds
- C. They do not depend on the iron or sulfur compounds that other microorganisms consume.
- D. They process material and solar energy for other underground organisms to use.

13. Look at the four squares 【】 that indicate where the following sentence could be added to the passage

However, it would be wrong to think that these factors make life at great depths impossible.

Where would the sentence best fit? Click on a square 【】 to add the sentence to the passage.

【Paragraph 2】 The first scientists to use these techniques were involved in the Subsurface Science Program of the United States Department of Energy (DOE). They were interested in the possibility that if organisms existed in the depths of Earth, they might degrade organic pollutants and help maintain the purity of groundwater or, rather less usefully, degrade the containers in which the DOE was proposing to deposit the radioactive waste from nuclear facilities. They demonstrated the presence of many different types of microorganisms in rocks at depths down to 500 meters beneath the surface. Since then, microbes have been discovered in many different types of rocks and deep within ocean sediments. The record depth at which life has been found is at the bottom of a South African gold mine, 3.5 kilometers below ground. 【A】 Pressure and temperature increase as you go deeper into Earth. 【B】 Some scientists think that subsurface bacteria could withstand temperatures as high as 150°C. 【C】 This would allow organisms to exist to depths of about 7 kilometers beneath the seafloor and to 4 kilometers below the surface of the land. 【D】 Although the organisms are often sparsely distributed, this is such an enormous volume that it has been estimated that the total biomass of deep subsurface organisms exceeds that of those living on, or just below, the surface.

14. It is only recently that living organisms have been found below the top few meters of the soil or ocean sediments.

Answer Choices

- A. It became necessary to develop techniques that would prevent the lubricating fluid on the drill from contaminating the samples recovered from the depths.
- B. Subsurface life is thought to live at greater depths and to resist higher temperatures than was once thought possible
- C. Rather than consuming other food available, chemotrophs process some minerals they find in rocks to obtain the nutrients they need
- D. The discovery of subsurface life was enabled by the development of sophisticated drilling and microorganism identification techniques.
- E. Scientists involved in the Subsurface Science Program found underground life accidentally while studying the effects of pollution on groundwater
- F. The food chain below the surface involves fungi, protozoa, bacteria, and the organic material and minerals in or derived from sedimentary and igneous rock.

The Revolution of Cheap Print

【Paragraph 1】 The first half of the nineteenth century saw dramatic changes in the economics of the printed word in both the United States and Europe, though the changes generally happened earlier and on a wider basis in America. In the 1830s and 1840s, sharp reductions in prices for newspapers and books in America highlighted the **advent** of an era of cheap print. Now there were daily newspapers that instead of 6 cents per copy sold for a penny or two. Now there were novels that instead of an earlier price of \$2 sold for 25 cents or less, when the same books in Britain cost the equivalent of more than \$7. So steep were the declines in the price of print over so short a period that they amounted to an information-price revolution, the first of several such episodes of declining prices that have profoundly affected information and culture during the past two centuries. Two mid-nineteenth-century American cultural innovations, the "penny press" and the "dime novel," were actually named for their low price. These were criticized for being cheap in both senses of that word: low in price and low in taste. But low price did not necessarily mean lowbrow. Increasingly, book publishers issued even the most esteemed works in cheap as well as expensive editions to reach as wide a public as possible. The information-price revolution also affected religious and political publishing, as reading became a basis of mass persuasion for the first time in history.

【Paragraph 2】 Cheap print was not entirely **unprecedented**. In seventeenth- and eighteenth-century England and France, cheap collections of stories, ballads, and other miscellany had circulated among the lower classes. But since only a minority of the poor could read, most listened while a few read aloud; thus cheap print reached not so much a reading as a listening public. The **expansion** of cheap print in the nineteenth century in America and Europe was on a much larger scale, and it took place during a great increase in popular literacy. Together these amounted to a cultural watershed. Traditionally, even in literate homes, books and other publications had been relatively rare and treasured objects; reading meant returning to a few texts, especially religious works. But with the explosion of print, reading became more varied, and readers scanned newspapers, magazines, and cheap books that they soon passed on or discarded. Intensive reading of religious and other works did not disappear, but reading became an increasingly common form of diversion as well as devotion.

【Paragraph 3】 The usual explanation for the rise of cheap print emphasizes new technology. Unquestionably, the full development of cheap print could not have happened without technological change. Print, however, had already become cheaper in America before technological advances played a significant role; new technology arrived once the process was under way, not at the beginning. This was no accident: the continuing expansion of print created an incentive for technological innovation. To conceive of technology as the causal force is to understate the prior importance of politics, culture, and markets in creating the conditions that allowed investments in new technology to pay off.

【Paragraph 4】 Cheap print was public policy in America. While European governments taxed newspapers and other publications, the United States let them go tax free and even subsidized them, to a degree, through the postal system. The rise of cheap books and other forms of cheap print in the United States also reflected distinctive patterns of nineteenth-century American consumer markets. As the economic historian Nathan Rosenberg remarks, citing **the cases of cutlery, guns, boots, and clothing**, "Americans readily accepted products which had been deliberately designed for low cost, mass production methods" at a time when handmade goods persisted in Britain. Books fit this pattern. Americans had not been primarily responsible for introducing new manufacturing technology to the production of books. On the contrary, most of the key advances in printing and papermaking before 1850 had traveled west across the Atlantic rather than the reverse. But the industrialization of book production proceeded more rapidly in the United States, where the market by the middle decades of the century was not only larger than in Britain but also apparently more sensitive to price than to quality, perhaps because elite readers constituted a smaller proportion of book buyers.

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

- A. success
- B. situation
- C. ideal
- D. beginning

2. Which of the following claims is made about the low-price publications mentioned in paragraph 1?
- A. Inexpensive novels did not actually have a wide readership
 - B. The criticism that cheap novels lacked taste was not always valid.
 - C. Only the most highly regarded books were unavailable in cheap editions.
 - D. Book publishers issued as many esteemed works as works that were not widely respected.
3. All of the following are mentioned in paragraph 1 as being true of nineteenth-century print prices EXCEPT:
- A. Prices first experienced a significant decrease in the 1830s and 1840s
 - B. Daily newspapers that sold for 6 cents in Britain sold for a penny or two in America.
 - C. Some American novels declined in price from two dollars to about 25 cents
 - D. Reductions in print prices had effects that lasted well into the twentieth century
4. The word “unprecedented” in the passage is closest in meaning to
- A. reliable
 - B. new
 - C. accepted
 - D. effective
5. The word “expansion” in the passage is closest in meaning to
- A. introduction
 - B. popularity
 - C. spread
 - D. acceptance
6. According to paragraph 2, which of the following was true of cheap print in seventeenth- and eighteenth-century England and France?
- A. An increase in popular literacy allowed cheap print to succeed
 - B. Cheap publications of stories and ballads reached a wider readership in France than they did in England
 - C. Decreasing print prices did not affect the reading habits of the upper classes
 - D. Cheap print reached more people by being read aloud than by being read silently

7. According to paragraph 2, reading changed in all of the following ways after the explosion of print EXCEPT:
- A. Reading for amusement became more common.
 - B. People began to read books more carefully than they had in the past.
 - C. People began to read a greater variety of publications
 - D. Readers began to discard books more frequently
8. In paragraph 3, the author expresses which of the following points of view on the relationship between technology and the development of cheap print?
- A. Changes in technology, politics, culture, and markets all preceded the development of cheap print.
 - B. Technological advances were the most important causal force in the print revolution.
 - C. The arrival of new technology made the development of cheap print possible.
 - D. The growth of cheap print provided people with a reason to develop new technology
9. Why does the author refer to Nathan Rosenberg' s remarks on " the cases of cutlery, guns, boots and clothing" ?
- A. To explain how new production methods used for books were quickly applied to other types of products
 - B. To point out similarities between consumer patterns in the United States and in Britain
 - C. To support the claim that books fit the pattern of the nineteenth-century American consumer markets
 - D. To explain why handmade products were not as popular in America during the nineteenth century as they were in Britain
10. The word "persisted" in the passage is closest in meaning to
- A. spread
 - B. suffered
 - C. continued
 - D. improved
11. 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.

【 Paragraph 4 】 Cheap print was public policy in America. While European governments taxed newspapers and other publications, the United States let them go tax free and even subsidized them, to a degree, through the postal system. The rise of cheap books and other forms of cheap print in the United States also reflected distinctive patterns of nineteenth-century American consumer markets. As the economic historian Nathan Rosenberg remarks, citing the cases of cutlery, guns, boots, and clothing, "Americans readily accepted products which had been deliberately designed for low cost, mass production methods" at a time when handmade goods persisted in Britain Books fit this pattern. Americans had not been

primarily responsible for introducing new manufacturing technology to the production of books. On the contrary, most of the key advances in printing and papermaking before 1850 had traveled west across the Atlantic rather than the reverse. But the industrialization of book production proceeded more rapidly in the United States, where the market by the middle decades of the century was not only larger than in Britain but also apparently more sensitive to price than to quality, perhaps because elite readers constituted a smaller proportion of book buyers.

- A. The American book industry's larger market and commitment to low prices prevented it from selling books that were similar in quality to the books sold to British buyers
- B. Industrialization of book production occurred more rapidly in the United States than is usually realized, perhaps because of the large markets and low prices that were common in the nineteenth century.
- C. A larger market than in Britain and a greater demand for cheap books in the United States contributed to the faster industrialization of book production
- D. The industrialization of book production occurred more quickly in the United States than in Britain because elite readers in America were not as sensitive to quality as elite readers in Britain were.

12. Paragraph 4 suggests which of the following about books in Britain?

- A. British and American book markets fit a similar pattern in the nineteenth century
- B. Government taxes were intended to prevent British books from reaching a wide audience.
- C. Mass-produced books were less popular in Britain than in the United States
- D. Britain possessed the most advanced technology for making books before 1850.

13. Look at the four squares 【】 that indicate where the following sentence could be added to the passage

Although people did not read widely, or extensively, they read intensively so as to thoroughly understand the limited number of books that were available for reading.

Where would the sentence best fit? Click on a square 【】 to add the sentence to the passage.

【Paragraph 2】 Cheap print was not entirely unprecedented. In seventeenth- and eighteenth-century England and France, cheap collections of stories, ballads, and other miscellany had circulated among the lower classes. But since only a minority of the poor could read, most listened while a few read aloud; thus cheap print reached not so much a reading as a listening public. The expansion of cheap print in the nineteenth century in America and Europe was on a much larger scale, and it took place during a great increase in popular literacy. Together these amounted to a cultural watershed. 【A】 Traditionally, even in literate homes, books and other publications had been relatively rare and treasured objects; reading meant returning to a few texts, especially religious works. 【B】 But with the explosion of print, reading became more varied, and readers scanned newspapers, magazines, and cheap books that they soon passed on or discarded. 【C】 Intensive reading of religious and other works did not disappear, but reading became an increasingly common form of diversion as well as devotion. 【D】

14. Cheap print experienced early success in the United States.

Answer Choices

- A. Cheap print was initially criticized because it was feared that religious and moral reading would disappear and be replaced by reading solely for the purpose of diversion

- B. The introduction of cheap books to seventeenth-and eighteenth-century England and France did not succeed because most of the publications were of little interest to the general public.
 - C. Books and other kinds of publications followed the pattern of the American consumer markets of the time, and American consumers were more willing than Europeans to buy mass-produced products.
 - D. The growth of cheap print gave more parts of the population access to different kinds of publications, and it affected the way people read and their primary reasons for reading
 - E. Advances in printing technology originated mostly in Europe, but unlike European governments, the United States encouraged cheap print by not taxing newspapers and other publications
 - F. By the end of the nineteenth century, low production costs made it possible for United States publishers to expand their markets and sell their books all over Europe.
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Earth' s Core

【Paragraph 1】 Knowledge of Earth' s deep interior is derived from the study of the waves produced by earthquakes, called seismic waves. Among the various kinds of seismic waves are primary waves (P-waves) and secondary waves (S-waves). Primary and secondary waves pass deep within Earth and therefore are the most **instructive**. Study of abrupt changes in the characteristics of seismic waves at different depths provides the basis for a threefold division of Earth into a central core; a thick, overlying mantle; and a thin, enveloping crust. Sudden changes in seismic wave velocities and angles of transmission are termed discontinuities.

【Paragraph 2】 One of the discontinuities is the Gutenberg discontinuity, which is located nearly halfway to the center of Earth at a depth of 2,900 kilometers and marks the outer boundary of Earth's core. At that depth, the S-waves cannot propagate, while at the same time P-wave velocity is **drastically** reduced. S-waves are unable to travel through fluids. Thus, if S-waves were to encounter a fluidlike region of Earth' s interior, they would be absorbed there and would not be able to continue. Geophysicists believe this is what happens to S-waves as they enter the outer core. As a result, the S-waves generated on one side of Earth fail to appear at seismograph stations on the opposite side of Earth, and this observation is the principal evidence of an outer core that behaves as a fluid. Unlike S-waves, P-waves are able to pass through liquids. They are, however, **abruptly** slowed and sharply refracted (bent) as they enter a fluid medium. Therefore, as P-waves encounter the molten outer core of Earth, their velocity is reduced and they are refracted downward.

【Paragraph 3】 The radius of the core is about 3,500 kilometers. The inner core is solid and has a radius of about 1,220 kilometers, which makes this inner core slightly larger than the Moon. Most geologists believe that the inner core has the same composition as the outer core and that it can only exist as a solid because of the enormous pressure at the center of Earth. Evidence of the existence of a solid inner core is derived from the study of hundreds of records of seismic waves produced over several years. These studies showed that the inner core behaves seismically as if it were a solid.

【Paragraph 4】 Earth has an overall density of 5.5 grams per cubic centimeter, yet the average density of rocks at the surface is less than 3.0 grams per cubic centimeter. This difference indicates that materials of high density must exist in the deep interior of the planet to achieve the 5.5 grams per cubic centimeter overall density. Under the extreme pressure conditions that exist in the region of the core, iron mixed with nickel would very likely have the required high density. Laboratory experiments, however, suggest that a highly pressurized iron-nickel alloy might be too dense and that minor amounts of such elements such as silicon, sulfur, carbon, or oxygen may also be present to lighten the core material.

【Paragraph 5】 Support for the theory that the core is composed of iron (85 percent) with lesser amounts of nickel has come from the study of meteorites. Many of these samples of solar system materials are iron meteorites that consist of metallic iron alloyed with a small percentage of nickel. Some geologists suspect that iron meteorites may be fragments from the core of a shattered planet. The presence of iron meteorites in our solar system suggests that the existence of an iron-nickel core for Earth is plausible.

【Paragraph 6】 There is further evidence that Earth may have a metallic core. Anyone who understands the functioning of a compass is aware that Earth has a magnetic field. The planet itself behaves as if there was a great bar magnet **embedded** within it. A magnetic field is developed by the flow of electric charges and requires good electrical conductors. Silicate rocks, such as those in the mantle and crust, do not conduct electricity very well, whereas metals such as iron and nickel are good conductors. Heat-driven movements in the outer core, coupled with movements induced by Earth' s spin, are thought to provide the necessary flow of electrons (very small particles that carry a negative charge) around the inner core that produces the magnetic field. Without a metallic core, Earth' s magnetic field would not be possible.

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

- A. inaccurate
- B. intense
- C. inaccessible
- D. informative

2. According to paragraph 1, which of the following findings provides the basis for Earth' s division into three parts?

- A. All seismic waves pass deep within Earth.
- B. There are no significant differences in the behavior of P-waves and S-waves.
- C. Discontinuities occur at different depths within Earth
- D. Earth' s crust is too thin to account for the size of the planet.

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

- A. gradually
- B. severely
- C. typically
- D. permanently

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

- A. suddenly
- B. eventually
- C. smoothly
- D. normally

5. According to paragraph 2, entering the outer core affects seismic waves in each of the following ways EXCEPT: 1

- A. S-waves do not continue traveling.
- B. S-waves are absorbed by the outer core.
- C. P-waves are slowed down
- D. P-waves do not change direction

6. Paragraph 3 supports which of the following statements about the inner core?

- A. It is smaller in volume than the Moon.
- B. It consists of materials different from those found in the outer core
- C. It is subject to more pressure than the outer core
- D. It is not solid even though it behaves seismically as if it were.

7. According to paragraph 4, why do scientists believe that Earth' s core consists of materials of very high density?

- A. Under the extreme pressure conditions near the center of Earth, any materials would become very dense.

- B. Without a very dense core, Earth's overall density would not be as high as it is found to be
- C. Earth's deep interior is known to be solid, and solids are always denser than liquids.
- D. Earth's core is known to contain the same high-density rocks that are formed on Earth's surface.
8. According to paragraph 4, why do scientists believe that Earth's core contains materials other than iron mixed with nickel?
- A. In the absence of such materials, the core might be too dense
- B. Iron and nickel do not mix evenly without the presence of lighter elements.
- C. Laboratory experiments showed that minor amounts of silicon, sulfur, carbon, and oxygen are present in samples from Earth's core
- D. Iron-nickel alloys always contain minor amounts of elements such as silicon, sulfur, carbon, or oxygen.
9. According to paragraph 5, why does the presence of iron meteorites in our solar system suggest that an iron-nickel core for Earth is plausible?
- A. Iron meteorites indicate that our solar system contains large quantities of iron alloyed with nickel.
- B. Some scientists think that the iron meteorites were originally part of Earth and broke off long ago
- C. Some scientists think that iron meteorites may be pieces from the core of a planet that broke apart
- D. Iron meteorites in our solar system were formed at about the same time that Earth was formed.
10. The word "embedded" in the passage is closest in meaning to
- A. active
- B. revolving
- C. formed
- D. enclosed
11. 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

【Paragraph 6】 There is further evidence that Earth may have a metallic core. Anyone who understands the functioning of a compass is aware that Earth has a magnetic field. The planet itself behaves as if there was a great bar magnet embedded within it. A magnetic field is developed by the flow of electric charges and requires good electrical conductors. Silicate rocks, such as those in the mantle and crust, do not conduct electricity very well, whereas metals such as iron and nickel are good conductors. Heat-driven movements in the outer core, coupled with movements induced by Earth's spin, are thought to provide the necessary flow of electrons (very small particles that carry a negative charge) around the inner core that produces the magnetic field. Without a metallic core, Earth's magnetic field would not be possible.

- A. A combination of different motions produces Earth's magnetic field, and the magnetic field is thought to cause a flow of electrons around the planet's inner and outer core.
- B. The flow of electrons around the planet that produces Earth's magnetic field is the combined effect of motions that are thought to occur in the planet's inner core
- C. The flow of electrons around the inner core that produces Earth's magnetic field is thought to be the joint result of motions in the outer core and motions caused by Earth's spin
- D. Heat-driven motions in the outer core interact with motions caused by the spin of the inner core to produce a flow of electrons that is thought to result in Earth's magnetic field

12. In paragraph 6, why does the author discuss Earth's magnetic field?

- A. To cast doubt on its existence, given what scientists now know about Earth's composition
- B. To provide additional support for the theory of an iron-nickel core for Earth
- C. To present a puzzling feature of Earth that has not yet been explained satisfactorily
- D. To explain why so many iron meteorites are found near Earth

13. Look at the four squares 【】 that indicate where the following sentence could be added to the passage

Several of these have been named after their discoverers.

Where would the sentence best fit? Click on a square 【】 to add the sentence to the passage.

【Paragraph 1】 Knowledge of Earth's deep interior is derived from the study of the waves produced by earthquakes, called seismic waves. Among the various kinds of seismic waves are primary waves (P-waves) and secondary waves (S-waves). 【A】 Primary and secondary waves pass deep within Earth and therefore are the most instructive. 【B】 Study of abrupt changes in the characteristics of seismic waves at different depths provides the basis for a threefold division of Earth into a central core; a thick, overlying mantle; and a thin, enveloping crust. 【C】 Sudden changes in seismic wave velocities and angles of transmission are termed discontinuities. 【D】

14. Our knowledge of Earth's interior is based on the study of the transmission of seismic waves within the planet.

Answer Choices

- A. Study of marked changes in the transmission of seismic waves at different depths has led scientists to divide Earth into the crust, the mantle, and the core.
- B. Studies of the transmission of seismic waves show that Earth's core is less dense than the solid crust, which explains why the core exists mostly as a liquid
- C. Changes in the characteristics of seismic waves at the Gutenberg discontinuity support the conclusion that the outer part of Earth's core is liquid.
- D. Silicate rocks, which are found in Earth's mantle and crust, are not good conductors of electricity.
- E. Scientists believe that most of the iron and nickel found in Earth's core came from iron meteorites scattered into space when the interior of an ancient planet broke apart.
- F. A variety of evidence leads to the conclusion that Earth's inner core is solid and composed primarily of metals,

which fits well with the fact that Earth has a magnetic field.