Lake Baikal

Paragraph

Crescent-shaped Lake Baikal, in Siberia, is only the ninth largest lake in area at 395 miles (635 kilometers) in length and 49 miles (74 kilometers) in width, yet it is easily the largest body of fresh water in the world. It holds one-fifth of the world's fresh water, which is more than the total of all the water in the five Great Lakes, a group of lakes located on the border between Canada and the United States. It holds so much fresh water despite its less-than-impressive area because it is by far the world's deepest lake. The average depth of the lake is 1,312 feet (400 meters) below sea level, and the Olkhon Crevice, the lake's deepest point, is almost a mile (1,637 meters) below sea level.

Lake Baikal, which today is located near the center of the Asian peninsula, is most likely the world's oldest lake. It began forming 25 million years ago as Asia started splitting apart in a series of great faults. The Baikal Valley dropped away, eventually filling with water and creating the deepest of the world's lakes. Underneath the lake, below a layer of silt, lies a layer of sediment 3 miles (5 kilometers) thick. Tectonic activity in the area is about 2 centimeters per year. The fault zone also has continual seismic activity with the regular recording of earthquakes every 3 to 4 years. The lake is singular among large high-latitude lakes due to the fact that its sediments have not been scoured clean by any continental ice sheets that flowed over the area, giving researchers a very specific record of climactic changes over the previous 250,000 years.

Surrounded by mountains, this large body of freshwater is located in a region where average temperatures are below freezing for nearly six months of the year, with a low of minus 57 degrees Fahrenheit) in the summer months. Before convenient modes of transportation around and across the lake became common, those who were daring could cross the lake on foot during the deep winter freezes. However, these adventurous travelers put themselves at great risk for frostbite and hypothermia, since the large, flat open expanse of the lake offers no protection from the bone-chilling winds that blow.

At the turn of the twentieth century, the Trans-Siberian Railroad was completed, which opened up travel to and around the lake. As more people came into contact with the lake, its potential as a commercially profitable resource was explored. This led a variety of investors, ranging from those interested in tourism and environmental preservation to those looking to develop new energy resources, to survey the area and introduce a wide range of commercial opportunities into the region. As a result, today the area has been developed with a variety of industries, and the lake is being polluted by pollutants. To exploit the region for fossil fuel and nuclear energy sources have been largely restricted to preserve the natural beauty of the area, many predict that it is only a matter of time before large corporations will be permitted to fully utilize the abundant natural resources of the lake valley.

A number of environmental concerns have been raised as development of the Lake Baikal area progresses. One such concern involved the Baykal Pulp and Paper Mill, constructed in 1966 on the southern shore of the lake. The mill dumped its industrial waste directly into the lake. Decades of protest from area residents had little effect in changing the conditions of the plant. Though it closed in 2008 due to lack of revenue, and with a promise from the owner that the plant would never reopen, it in fact resumed production in 2010, with support from the federal government, which created legislation permitting the mill operation to continue for 25 more years.

Residents and environmental protesters/activists had more luck with the proposed oil pipeline that a major Russian corporation planned to route through the Lake Baikal Valley. Environmental activists and concerned local citizens worked together to keep the pipeline out of the valley. These groups pointed out that the consistent seismic activity in the area could cause a catastrophic oil spill that would be capable of destroying the ecological balance of the region. However, in spite of the numerous public protests, it was not until the government intervened that the company changed its proposed remake the pipeline that the corporation agreed to honor the wishes of the protestors. Ultimately, the pipeline was diverted completely away from the federal and public
natural reserves that surround Lake Baikal.

1. What is stated in paragraph 1 about the shape of Lake Baikal?
   - ① It is wider than it is long.
   - ② It is circular in shape.
   - ③ Its width is one-half of its length.
   - ④ It is shaped like a new moon.

2. According to paragraph 1, Lake Baikal
   - ① holds one-fifth of the world's water
   - ② holds five times the water of the Great Lakes
   - ③ holds one-ninth of the world's water
   - ④ holds 20 percent of the world's fresh water

3. According to paragraph 1, the Olkhon Crevice is
   - ① outside of Lake Baikal
   - ② 400 meters below sea level
   - ③ the deepest part of Lake Baikal
   - ④ 5,000 meters deep

4. It is mentioned in paragraph 2 that Lake Baikal
   - ① is not as old as some other lakes
   - ② formed when sections of the Earth were moving away from each other
   - ③ was fully formed 25 million years ago
   - ④ is today located on the edge of the Asian peninsula

5. Paragraph 3 states that Lake Baikal
   - ① is protected from the weather by mountains
   - ② never gets colder than 14 degrees Celsius
   - ③ is frozen enough to walk on in the summer
   - ④ was dangerous to cross in the winter

6. According to paragraph 4, the lake region
   - ① has provided economic opportunity for tourists
   - ② has had its abundant natural resources fully exploited
   - ③ has been commercially developed by investors
   - ④ has had its natural beauty destroyed

7. Paragraph 5 mentions the Baykal Pulp and Paper Mill as an example
   - ① of a progressive and productive company
   - ② of a company that is an environmental hazard
   - ③ of an unsuccessful lake area investment
   - ④ of a company that responds to citizen concerns

8. According to paragraph 6, activists and citizens
   - ① protested government involvement in building the oil pipeline near Lake Baikal
   - ② wanted the new oil pipeline near Lake Baikal to be made safer
   - ③ experienced earthquakes during their protests
   - ④ cooperated to prevent the construction of the oil pipeline near Lake Baikal

The Postage Stamp

Paragraph

The postage stamp has been around for only a relatively short period of time. The use of stamps for postage was first proposed in England in 1837, when Sir Rowland Hill published a pamphlet entitled "Post Office Reform: Its Importance and Practicability" to argue for a low, uniform postage rate. Prior to Hill's proposal, the cost of postage was based on the distance that a letter or package travels but should instead be based on the weight of the parcel and that fees for postal services should be collected in advance of the delivery, rather than after, through the use of postage stamps.

Prior to Hill's revolutionary suggestion, postal fees were usually charged to the recipient of the mail, as opposed to the sender, which created severe problems for the postal service. One of the most critical was that the British postal service had no effective means of tracking the recipient of a letter or package who was not home when it arrived. Another issue was that of limiting the size and number of packages sent from one location to the other; there was no incentive for people sending mail to put restrictions on the size or amount of parcels, since they were not the ones that were charged for the delivery.

This created cumbersome loads of mail for postal workers to deliver, and the issue was compounded if the recipient refused to pay, which rendered the mail undeliverable.

Fortunately, the ideas proposed by Hill went into effect in England almost immediately after the publication of his pamphlet. The first English stamp, which featured a portrait of then Queen Victoria, was printed in 1840. This stamp, the "penny black," came in sheets of 240 individual stamps. The penny black was intended to be used to prepay the cost of postage for a letter weighing 14 grams or less to any destination. Another more expensive stamp, the "two pence blue" was put on sale within days of the first stamp's introduction to provide for the delivery of heavier pieces of mail.

Other countries noted the success of the new system of postal delivery and followed England's lead in the production of postage stamps. In 1843, Brazil was the first next nation to produce national postage stamps, and various areas in what is today Switzerland also produced postage stamps later in the same year. Postage stamps in five- and ten-cent denominations were first approved by the U.S. Congress in 1847, and by 1860 postage stamps were being issued in more than ninety governmental jurisdictions worldwide. Most original postage stamps followed a pattern similar in design and structure to England's "penny black"; the stamps were rectangular in shape and typically depicted the ruler of the country in which the stamp was issued, in honor of the postal reform. One primary exception was the Brazilian stamp; the government of Brazil opted to put an abstract image on the postage in order to prevent their leader's image being marred by a postmark, a necessary mark indicating the stamp had been paid for.

As postage stamps became more widespread in their use, innovations occurred in the production of stamps to make them more efficient. In order to save space on the stamp's initial appearance, perforations between the individual stamps were instituted on the sheets of multiple stamps. These small holes dividing the postage greatly increased the ease and speed of separating individual stamps. Instead of needing scissors to carefully cut between the stamps, the postage could now be separated by tearing along the perforated lines. Another innovation involved the images on the stamps. As time progressed, countries moved away from solely depicting national leaders on the small rectangles of paper, and began to include other images on stamps, including flowers, plants and wildlife, celebrities, and even icons symbolizing the nation. In the United States, for example, stamps have been issued with famous cartoon characters, such as Mickey Mouse and Bart Simpson.

It is these diverse images that have caused stamps to become popular as collectibles. Serious collectors track down stamps with diverse images, especially stamps that have not been separated from their sheets, or stamps that have a clean postmark. Stamps that are in mint condition, or those with low circulation, are particularly sought after, and can be worth much more than their face value.

9. According to paragraph 1, postage stamps were first suggested
   - ① in the first half of the eighteenth century
   - ② in the second half of the eighteenth century
   - ③ in the first half of the nineteenth century
   - ④ in the second half of the nineteenth century

10. It is indicated in paragraph 1 that Sir Rowland Hill believed that postage fees
    - ① should be paid before delivery
    - ② should be related to distance
    - ③ should have nothing to do with how heavy a package is
    - ④ should be collected after the package is delivered

11. According to paragraph 2, prior to the use of postage stamps
    - ① mail carriers refused to deliver heavy pieces of mail
    - ② the receiver often paid to have mail returned to the sender
    - ③ the sender would limit the amount and number of packages sent
    - ④ the size and volume of packages sent were problems for the postal service

12. What is stated in paragraph 3 about the first English postage stamp?
    - ① It was designed by Queen Victoria.
    - ② It contained a drawing of a black penny.
    - ③ It was produced in sheets of fourteen stamps.
    - ④ It could be used to send a lightweight letter.

13. According to paragraph 4, Brazil introduced postage stamps
    - ① before England
    - ② before Switzerland
    - ③ after the United States
    - ④ after Switzerland

14. It is mentioned in paragraph 4 that in 1847
    - ① postage stamps were in use in ninety different countries
    - ② five-cent coins to mail a letter in the United States
    - ③ two different denominations of postage stamps were introduced in the United States
    - ④ the U.S. Congress introduced the "penny black" stamp

15. Which of the following is an innovation in the production of stamps mentioned in paragraph 5?
    - ① Scissors were no longer included with each sheet of stamps, making it easier to separating them
    - ② Stamp images of national leaders and heroes were introduced.
    - ③ Small holes were punched into the sheets of stamps to make the stamps easier to separate.
    - ④ A single sheet of stamps included stamps with various images.

16. It is mentioned in paragraph 6 that some stamps
    - ① preserved in complete sheets are considered more valuable to collectors
    - ② are worth more than face value
    - ③ duplicate images to appeal to collectors
    - ④ have unlimited circulation

The Clovis Culture

Paragraph

From its first discovery in the early part of the twentieth century, an ancient indigenous people referred to as the Clovis culture was considered to be the earliest native culture in the Americas. While this claim has been discredited due to more recent discoveries of earlier groups of people, the fact remains that the Clovis people were influential in the development of tribes, or groups of people that lived, socialized, and created family units, across the North American continent. Several later tribes are thought to have derived from the Clovis people, and their influence is felt even today. While the exact timeline and dating of the origin of this New World culture cannot be determined, but many experts estimate that the Clovis people lived between 13,000–13,500 years ago.

The Clovis people were initially identified and grouped together by the tools that archeologists found at various sites. They were named the Clovis people after the site near Clovis, New Mexico, where the first tools were found and identified in 1932. The tools are quite sophisticated and are unlike any tools that have been found in the Old World. Their development indicates a relatively superior knowledge and use of the technology available to people at that time. One distinct and commonly found indicator of the Clovis culture is the spear point used in their weapons; the point is fluted, thinned down by chipping away small flakes, on both sides, an advantage for hunting, and presumably, for protection from invaders.

The Clovis tools and the first tools of this sort were discovered in New Mexico, archeologists have discovered Clovis tools in areas ranging from Mexico to Montana in the United States and Nova Scotia in Canada. All of the Clovis finds date from approximately the same period, a fact that suggests that the Clovis spread rapidly throughout the North American continent. From the evidence that has been discovered, some archeologists have concluded that the Clovis were a mobile culture. They traveled in groups of 40 to 50 individuals, migrating seasonally and returning to the same hunting camps each year. The rapid dissemination of the Clovis tools and the fact that they were found in areas that are quite possibly inaccessible to develop their sophisticated hunting tools to feed their rapidly expanding populace.

However, another theory has been proposed to explain the wide proliferation of the tools that were used in the Clovis culture. Rather than a single group of indigenous people that moved and spread the Clovis culture and its distinctive tools, some researchers suggest that the tools created by the original tribe were rapidly adopted by neighboring tribes. Thus, instead of the Clovis people dominating the region, perhaps the initial tribe remained relatively small and stationary, while their tools were passed and replicated from tribe to tribe. This replication could have been accomplished through several methods: trade with neighboring tribes, invasions and conflicts, or less likely, through intermarriage between the Clovis and other tribes.

The reason for the extinction of the Clovis people and their culture spread is uncertain, so the reason in which the Clovis people disappeared remains a mystery. One prevalent theory hypothesizes that the decline in availability of both the vegetation and animals that the Clovis consumed resulted in their eventual extinction. Another hypothesis is that a period of climactic cooling, lasting approximately 1,500 years, created inhabitable conditions which made it impossible for the Clovis to survive. A third, less supported idea, is that a comet struck the earth in the area where the Clovis dwelled and destroyed their culture.

While there is a great deal of uncertainty surrounding the origin and the eventual disappearance of the Clovis culture, archeologists have agreed on a few significant points. The first point is that the tools used by the people allowed for mobility and superior methods of obtaining food. The second is that many tribes using the Clovis tools traveled in relatively small groups and returned annually to the same sites. Yet another point of agreement is that the Clovis culture spread rapidly and became the dominant culture quite rapidly throughout North, Central, and parts of South America. These points of concession bolster the reputation of the Clovis as a dominant force in their era, and provide essential information about the evolution of native tribes in the Western hemisphere.

17. Paragraph 1 states that the Clovis people
    - ① were the first people to live on the American continents
    - ② originated less than 13,000 years ago in North America
    - ③ evolved from several other New World tribes
    - ④ were preceded by other tribes in the Americas

18. What is stated in paragraph 2 about Clovis tools?
    - ① They date from around 10,000 B.C.
    - ② They were used to help identify the Clovis people.
    - ③ They have been found at only one location.
    - ④ They were discovered by archeologists hundreds of years ago.

19. It is indicated in paragraph 2 that the tools found near Clovis, New Mexico, were
    - ① very rudimentary
    - ② similar to others found prior to 1932
    - ③ rather advanced
    - ④ similar to some found in Africa and Europe

20. It is mentioned in paragraph 3 that it is believed that the Clovis people
    - ① lived in familial groups of four or five people
    - ② had a relatively stable population
    - ③ lived only in New Mexico
    - ④ spent summers and winters in different places

21. According to paragraph 4, an alternative theory states that
    - ① the Clovis tribes may have not have moved around very much
    - ② isolated themselves from other tribes
    - ③ were dominated by another, more powerful tribe
    - ④ did not engage in trade

22. The theory mentioned in paragraph 4 also states that
    - ① the Clovis tools spread after the extinction of the Clovis people
    - ② there was not a rapid spread of the Clovis tools
    - ③ the tools made by the Clovis people were used by other tribes
    - ④ the Clovis offered their tools to their neighbors

23. According to paragraph 5
    - ① the reason for the extinction of the Clovis people is that they were unable to grow enough food
    - ② how and why the Clovis people disappeared remain unsolved
    - ③ the culture of the Clovis people was limited by the impact of a comet
    - ④ the cooling period that destroyed the Clovis culture has not been determined

24. What does paragraph 6 state is TRUE about the Clovis culture?
    - ① The Clovis people moved more rapidly than other tribes.
    - ② The Clovis people had a strong influence on their era.
    - ③ The Clovis people quickly adapted to other tribes' superior technology.
    - ④ The Clovis people significantly changed the evolution of native tribes.

Brown Dwarfs

Paragraph

A brown dwarf is a celestial body that has never quite become a star. A typical brown dwarf has a mass that is 8 percent or less than that of the Sun. The mass of a brown dwarf is too small to generate the internal temperatures capable of igniting the nuclear burning of hydrogen that powers a typical star.

A brown dwarf contracts at a steady rate, and after it has contracted as much as possible, a process that takes about 1 million years, it begins to cool off. Its emission of light diminishes with the decrease in its internal temperature, and after a period of 2 to 3 billion years, its emission of light is so weak that it can be difficult to observe from Earth.

Because of these characteristics of a brown dwarf, it can be easily distinguished from stars in different stages of formation. A brown dwarf is quite distinctive because its composition—a composition that is similar to that of a typical star, approximately 75 percent hydrogen—has remained essentially the same as it was when first formed. A white dwarf, in contrast, has gone through a long period when it burns hydrogen, followed by another long period in which it burns the helium created by the burning of hydrogen and ends up with a core that consists mostly of oxygen and carbon with a thin layer of hydrogen surrounding the core.

Another factor that is used to distinguish brown dwarf stars from other stars, particularly those that are in the process of forming, is the presence or absence of lithium in the atmosphere surrounding the star. Typically, most stars burn off lithium as they heat up, so the chemical element is depleted as the stars age. However, brown dwarfs almost never reach an internal temperature high enough to burn off the majority of the lithium so its presence in more than trace amounts signals to scientists that they are looking at a brown dwarf rather than a star. The fact that lithium is present in many young stars, that are not brown dwarfs, may still have significant amounts of lithium in their atmosphere. Likewise, a few brown dwarfs may reach a temperature intense enough to burn off lithium without being hot enough to ignite hydrogen. Therefore, other tests are used in conjunction with the lithium assessment to verify whether a star is actually a brown dwarf.

It is even more difficult to discriminate between brown dwarfs and large planets. Though a brown dwarf is not a planet, some of the planets that are found in our solar system at current state have some of the same characteristics as a brown dwarf. The planet Jupiter, for example, is the largest planet in our solar system with a mass 317 times that of our planet and resembles a brown dwarf in that it radiates energy based on its internal energy. In addition, Jupiter has more or less the same radius as most brown dwarfs. It is the mechanism by which it was formed that distinguishes a planet such as Jupiter from a brown dwarf.

Since there is no exact standard to determine the difference between a brown dwarf and a planet based on mass, the International Astronomical Union (IAU) has established loose guidelines to define the difference. In general, if a body in space is more than ten times the mass of Jupiter, experts estimate its likelihood of being a planet to be very small. The likelihood decreases even further if the body reaches more than 13 times the mass of Jupiter, which is the cutoff point the IAU recommends for defining an outer space body as a brown dwarf.

As the mass of a brown dwarf climbs, the method through which its volume is governed changes. Those that are above a mass 65 times that of Jupiter have their volume controlled by the same process that controls the volume of stars. Those at the low end of brown dwarf mass, closer to only ten times the mass of Jupiter, have their volume controlled much in the same way that planets do. Those that fall within the range have a mixed method of volume control. Regardless of the mass, the same three methods used to control the volume of both planets and stars. The consequence of these various control methods is that the volume of all brown dwarfs remains relatively constant, rarely varying more than 10 to 15 percent in the radius of each of these celestial objects.

25. It is stated in the passage that the mass of an average brown dwarf
    - ① is smaller than the mass of the Sun
    - ② generates an extremely high internal temperature
    - ③ is capable of igniting nuclear burning
    - ④ causes the release of considerable energy and light

26. According to paragraph 2, a brown dwarf cools off
    - ① within the first million years of its existence
    - ② after its contraction is complete
    - ③ when its mass decreases
    - ④ in order to begin contracting

27. What is stated in paragraph 2 about a brown dwarf that has cooled off for 2 to 3 billion years?
    - ① Its weak light makes it difficult to see from Earth.
    - ② It no longer emits light.
    - ③ It has begun to undergo the process of weakening/fading.
    - ④ Scientists are unable to study it.

28. It is indicated in paragraph 3 that
    - ① the mass of a typical brown dwarf has increased dramatically
    - ② a brown dwarf had far more hydrogen when it first formed
    - ③ about three-quarters of the core of a brown dwarf is hydrogen
    - ④ the internal composition of a brown dwarf is always changing

29. What is stated in paragraph 4 about lithium's relationship to brown dwarfs?
    - ① It indicates a lower mass than other stars.
    - ② It is easily burned off by the heat of the brown dwarf.
    - ③ It takes more heat to burn off than to ignite hydrogen.
    - ④ It tends to be present in higher amounts in the atmosphere around brown dwarfs than other stars.

30. It is indicated in paragraph 5 that both large planets and brown dwarfs
    - ① share the same mass
    - ② are formed in the same way
    - ③ have some of the same features
    - ④ produce a large amount of internal energy

31. According to paragraph 6, the IAU
    - ① has been in existence for over ten years
    - ② is the only astronomy group dedicated to the study of brown dwarfs
    - ③ has developed guidelines to distinguish brown dwarfs from large planets
    - ④ has established an exact definition of brown dwarfs and large planets

32. What is mentioned in paragraph 7 about the volume of brown dwarfs?
    - ① It is controlled by the same process in all brown dwarfs.
    - ② It remains fairly consistent, regardless of mass.
    - ③ It has never been accurately measured.
    - ④ It has no relationship to the radius.

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