tpo_25_passage_3

The surface of Mars shows a wide range of geologic features, including huge volcanoes-the largest known in the solar system-and extensive impact cratering. Three very large volcanoes are found on the Tharsis bulge, an enormous geologic area near Mars`s equator. Northwest of Tharsis is the largest volcano of all: Olympus Mons, with a height of 25 kilometers and measuring some 700 kilometers in diameter at its base. The three large volcanoes on the Tharsis bulge are a little smaller-a "mere" 18 kilometers high. None of these volcanoes was formed as a result of collisions between plates of the Martian crust-there is no plate motion on Mars. Instead, they are shield volcanoes - volcanoes with broad, sloping slides formed by molten rock. All four show distinctive lava channels and other flow features similar to those found on shield volcanoes on Earth. Images of the Martian surface reveal many hundreds of volcanoes. Most of the largest volcanoes are associated with the Tharsis bulge, but many smaller ones are found in the northern plains. The great height of Martian volcanoes is a direct consequence of the planet`s low surface gravity. As lava flows and spreads to form a shield volcano, the volcano`s eventual height depends on the new mountain`s ability to support its own weight. The lower the gravity, the lesser the weight and the greater the height of the mountain. It is no accident that Maxwell Mons on Venus and the Hawaiian shield volcanoes on Earth rise to about the same height (about 10 kilometers) above their respective bases-Earth and Venus have similar surface gravity. Mars`s surface gravity is only 40 percent that of Earth, so volcanoes rise roughly 2.5 times as high. Are the Martian shield volcanoes still active? Scientists have no direct evidence for recent or ongoing eruptions, but if these volcanoes were active as recently as 100 million years ago (an estimate of the time of last eruption based on the extent of impact cratering on their slopes), some of them may still be at least intermittently active. Millions of years, though, may pass between eruptions. Another prominent feature of Mars`s surface is cratering. The Mariner spacecraft found that the surface of Mars, as well as that of its two moons, is pitted with impact craters formed by meteoroids falling in from space. As on our Moon, the smaller craters are often filled with surface matter-mostly dust-confirming that Mars is a dry desert world. However, Martian craters get filled in considerably faster than their lunar counterparts. On the Moon, ancient craters less than 100 meters across (corresponding to depths of about 20 meters) have been obliterated, primarily by meteoritic erosion. On Mars, there are relatively few craters less than 5 kilometers in diameter. The Martian atmosphere is an efficient erosive agent, with Martian winds transporting dust from place to place and erasing surface features much faster than meteoritic impacts alone can obliterate them. As on the Moon, the extent of large impact cratering (i.e. craters too big to have been filled in by erosion since they were formed) serves as an age indicator for the Martian surface. Age estimates ranging from four billion years for Mars`s southern highlands to a few hundred million years in the youngest volcanic areas were obtained in this way. The detailed appearance of Martian impact craters provides an important piece of information about conditions just below the planet`s surface. Martian craters are surrounded by ejecta (debris formed as a result of an impact) that looks quite different from its lunar counterparts. A comparison of the Copernicus crater on the Moon with the (fairly typical) crater Yuty on Mars demonstrates the differences. The ejecta surrounding the lunar crater is just what one would expect from an explosion ejecting a large volume of dust, soil, and boulders. However, the ejecta on Mars gives the distinct impression of a liquid that has splashed or flowed out of crater.Geologists think that this fluidized ejecta crater indicates that a layer of permafrost, or water ice, lies just a few meters under the surface. Explosive impacts heated and liquefied the ice, resulting in the fluid appearance of the ejecta.

question 1

According to paragraph 1, Olympus Mons differs from volcanoes on the Tharsis bulge in that Olympus Mons

A Has more complex geologic features

B Shows less impact cratering

C Is taller

D Was formed at a later time

question 2

According to paragraphs 1 and 2, which of the following is NOT true of the shield volcanoes on the Tharsis bulge?

A They have broad, sloping sides.

B They are smaller than the largest volcano on Mars.

C They have channels that resemble the lava channels of volcanoes on Earth.

D They are over 25 kilometers tall.

question 3

In paragraph 3, why does the author compare Maxwell Mons on Venus to the Hawaiian shield volcanoes on Earth?

A To help explain the relationship between surface gravity and volcano height

B To explain why Mars’ s surface gravity is only 40 percent of Earth’ s

C To point out differences between the surface gravity of Earth and the surface gravity of Venus

D To argue that there are more similarities than differences between volcanoes on different planets question 4

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 Although direct evidence of recent eruptions is lacking, scientists believe that these volcanoes were active as recently as 100 million years ago.

B Scientists estimate that volcanoes active more recently than 100 years ago will still have extensive impact cratering on their slopes.

C If, as some evidence suggests, these volcanoes erupted as recently as 100 million years ago, they may continue to be intermittently active.

D Although these volcanoes were active as recently as 100 million years ago, there is no direct evidence of recent or ongoing eruptions.

question 5

According to paragraph 4, what is demonstrated by the fact that craters fill in much faster on Mars than on the Moon?

A Erosion from meteoritic impacts takes place more quickly on Mars than on the Moon.

B There is more dust on Mars than on the Moon.

C The surface of Mars is a dry desert.

D Wind is a powerful eroding force on Mars.

question 6

In paragraph 4, why does the author point out that Mars has few ancient craters that are less than 5 kilometers in diameter?

A To explain why scientists believe that the surface matter filling Martian craters is mostly dust

B To explain why scientists believe that the impact craters on Mars were created by meteoroids

C To support the claim that the Martian atmosphere is an efficient erosive agent

D To argue that Mars experienced fewer ancient impacts than the Moon did

question 7

According to paragraph 5, what have scientists been able to determine from studies of large impact cratering on Mars?

A Some Martian volcanoes are much older than was once thought.

B The age of Mars’ s surface can vary from area to area.

C Large impact craters are not reliable indicators of age in areas with high volcanic activity.

D Some areas of the Martian surface appear to be older than they actually are.

question 8

According to paragraph 6, the ejecta of Mars’ s crater Yuty differs from the ejecta of the Moon’ s Copernicus crater in that the ejecta of the Yuty crater

A Has now become part of a permafrost layer

B Contains a large volume of dust, soil and boulders

C Suggests that liquid once came out of the surface at the crater site

D Was thrown a comparatively long distance from the center of the crater

question 9

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

The surface of Mars shows a wide range of geologic features, including huge volcanoes-the largest known in the solar system-and extensive impact cratering.

Three very large volcanoes are found on the Tharsis bulge, an enormous geologic area near Mars`s equator. Northwest of Tharsis is the largest volcano of all: Olympus Mons, with a height of 25 kilometers and measuring some 700 kilometers in diameter at its base. The three large volcanoes on the Tharsis bulge are a little smaller-a "mere" 18 kilometers high. None of these volcanoes was formed as a result of collisions between plates of the Martian crust-there is no plate motion on Mars. Instead, they are shield volcanoes - volcanoes with broad, sloping slides formed by molten rock. All four show distinctive lava channels and other flow features similar to those found on shield volcanoes on Earth. Images of the Martian surface reveal many hundreds of volcanoes. Most of the largest volcanoes are associated with the Tharsis bulge, but many smaller ones are found in the northern plains. The great height of Martian volcanoes is a direct consequence of the planet`s low surface gravity.  As lava flows and spreads to form a shield volcano, the volcano`s eventual height depends on the new mountain`s ability to support its own weight. The lower the gravity, the lesser the weight and the greater the height of the mountain. It is no accident that Maxwell Mons on Venus and the Hawaiian shield volcanoes on Earth rise to about the same height (about 10 kilometers) above their respective bases-Earth and Venus have similar surface gravity. Mars`s surface gravity is only 40 percent that of Earth, so volcanoes rise roughly 2.5 times as high. Are the Martian shield volcanoes still active? Scientists have no direct evidence for recent or ongoing eruptions, but if these volcanoes were active as recently as 100 million years ago (an estimate of the time of last eruption based on the extent of impact cratering on their slopes), some of them may still be at least intermittently active. Millions of years, though, may pass between eruptions. Another prominent feature of Mars`s surface is cratering. The Mariner spacecraft found that the surface of Mars, as well as that of its two moons, is pitted with impact craters formed by meteoroids falling in from space. As on our Moon, the smaller craters are often filled with surface matter-mostly dust-confirming that Mars is a dry desert world. However, Martian craters get filled in considerably faster than their lunar counterparts. On the Moon, ancient craters less than 100 meters across (corresponding to depths of about 20 meters) have been obliterated, primarily by meteoritic erosion. On Mars, there are relatively few craters less than 5 kilometers in diameter. The Martian atmosphere is an efficient erosive agent, with Martian winds transporting dust from place to place and erasing surface features much faster than meteoritic impacts alone can obliterate them. As on the Moon, the extent of large impact cratering (i.e. craters too big to have been filled in by erosion since they were formed) serves as an age indicator for the Martian surface. Age estimates ranging from four billion years for Mars`s southern highlands to a few hundred million years in the youngest volcanic areas were obtained in this way. The detailed appearance of Martian impact craters provides an important piece of information about conditions just below the planet`s surface. Martian craters are surrounded by ejecta (debris formed as a result of an impact) that looks quite different from its lunar counterparts. A comparison of the Copernicus crater on the Moon with the (fairly typical) crater Yuty on Mars demonstrates the differences. The ejecta surrounding the lunar crater is just what one would expect from an explosion ejecting a large volume of dust, soil, and boulders. [] However, the ejecta on Mars gives the distinct impression of a liquid that has splashed or flowed out of crater. [] Geologists think that this fluidized ejecta crater indicates that a layer of permafrost, or water ice, lies just a few meters under the surface. [] Explosive impacts heated and liquefied the ice, resulting in the fluid appearance of the ejecta. []

question 10

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.

A. Plate motion on Mars, once considered to have played no role in shaping the planet’s surface, is now seen as being directly associated with the planet’s earliest volcanoes.

B. Mars has shield volcanoes, some of which are extremely tall because of the planet’s low surface gravity.

C. Although the erosive power of the Martian atmosphere ensures that Mars has fewer craters than the Moon does, impact craters are prominent on Mars’s surface.

D. Scientists cannot yet reliably estimate the age of the Martian surface because there has been too much erosion of it.

E. Scientists have been surprised to discover that conditions just below the surface of Mars are very similar to conditions just below the surface of the Moon

F. Studies of crater ejecta have revealed the possibility of a layer of permafrost below the surface of Mars.