**Spartina**

*Spartina alterniflora*, known as cordgrass, is a deciduous, perennial flowering plant native to the Atlantic coast and the Gulf Coast of the United States. It is the dominant native species of the lower salt marshes along these coasts, where it grows in the intertidal zone (the area covered by water some parts of the day and exposed others).

These natural salt marshes are among the most productive habitats in the marine environment. Nutrient-rich water is brought to the wetlands during each high tide, making a high rate of food production possible. As the seaweed and marsh grass leaves die, bacteria break down the plant material, and insects, small shrimplike organisms, fiddler crabs, and marsh snails eat the decaying plant tissue, digest it, and excrete wastes high in nutrients. Numerous insects occupy the marsh, feeding on living or dead cordgrass tissue, and redwing blackbirds, sparrows, rodents, rabbits, and deer feed directly on the cordgrass. Each tidal cycle carries plant material into the offshore water to be used by the subtidal organisms.

*Spartina* is an exceedingly competitive plant. It spreads primarily by underground stems; colonies form when pieces of the root system or whole plants float into an area and take root or when seeds float into a suitable area and germinate. *Spartina* establishes itself on substrates ranging from sand and silt to gravel and cobble and is tolerant of salinities ranging from that of near freshwater (0.05 percent) to that of salt water (3.5 percent). Because they lack oxygen, marsh sediments are high in sulfides that are toxic to most plants. *Spartina* has the ability to take up sulfides and convert them to sulfate, a form of sulfur that the plant can use; this ability makes it easier for the grass to colonize marsh environments. Another adaptive advantage is *Spartina's* ability to use carbon dioxide more efficiently than most other plants.

These characteristics make *Spartina* a valuable component of the estuaries where it occurs naturally. The plant functions as a stabilizer and a sediment trap and as a nursery area for estuarine fish and shellfish. Once established, a stand of *Spartina* begins to trap sediment, changing the substrate elevation, and eventually the stand evolves into a high marsh system where *Spartina* is gradually displaced by higher-elevation, brackish-water species. As elevation increases, narrow, deep channels of water form throughout the marsh. Along the east coast *Spartina* is considered valuable for its ability to prevent erosion and marshland deterioration; it is also used for coastal restoration projects and the creation of new wetland sites.

*Spartina* was transported to Washington State in packing materials for oysters transplanted from the east coast in 1894. Leaving its insect predators behind, the cordgrass has been spreading slowly and steadily along Washington's tidal estuaries on the west coast, crowding out the native plants and drastically altering the landscape by trapping sediment. *Spartina* modifies tidal mudflats, turning them into high marshes inhospitable to the many fish and waterfowl that depend on the mudflats. It is already hampering the oyster harvest and the Dungeness crab fishery, and it interferes with the recreational use of beaches and waterfronts. *Spartina* has been transplanted to England and to New Zealand for land reclamation and shoreline stabilization. In New Zealand the plant has spread rapidly, changing mudflats with marshy fringes to extensive salt meadows and reducing the number and kinds of birds and animals that use the marsh.

Efforts to control *Spartina* outside its natural environment have included burning, flooding, shading plants with black canvas or plastic, smothering the plants with dredged materials or clay, applying herbicide, and mowing repeatedly. Little success has been reported in New Zealand and England; Washington State's management program has tried many of these methods and is presently using the herbicide glyphosphate to control its spread. Work has begun to determine the feasibility of using insects as biological controls, but effective biological controls are considered years away. Even with a massive effort, it is doubtful that complete eradication of *Spartina* from nonnative habitats is possible, for it has become an integral part of these shorelines and estuaries during the last 100 to 200 years.

According to paragraph 1, each of the following is true of ***Spartina alrerniflora*** EXCEPT:

|  |  |
| --- | --- |
| A | It rarely flowers in salt marshes. |
| B | It grows well in intertidal zones. |
| C | It is commonly referred to as cordgrass. |
| D | It occurs naturally along the Gulf Coast and the Atlantic coast of the United States. |

According to paragraph 2, a major reason why natural salt marshes are so productive is that they are

|  |  |
| --- | --- |
| A | inhabited by long-lived seaweed and marsh grasses that reproduce gradually |
| B | kept clear of excess plant material by the tides |
| C | regularly supplied with high levels of nutrients |
| D | home to a wide variety of different species of grasses |

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

|  |  |
| --- | --- |
| A | Insects feed only on dead cordgrass, while most other marsh inhabitants feed on live cordgrass. |
| B | The marsh is a good habitat for insects, but a relatively poor one for birds and animals. |
| C | Although cordgrass provides food for birds and animals, it gives insects both food and a place to live. |
| D | Cordgrass provides food for numerous insects, birds, and other animals. |

What is the organizational structure of paragraph 3?

|  |  |
| --- | --- |
| A | It makes a general claim about Spartina and then provides specific evidence to defend that claim against objections to the claim. |
| B | It presents a general characterization of Spartina and then describes particular features on which this characterization is based. |
| C | It reports a widely held view about Spartina and then considers evidence both for and against that view. |
| D | It presents a general hypothesis about Spartina and then lists specific evidence that disputes that hypothesis. |

The word "exceedingly" in the passage is closest in meaning to

|  |  |
| --- | --- |
| A | unusually |
| B | dangerously |
| C | surprisingly |
| D | highly |

According to paragraph 3, one reason that ***Spartina*** is able to compete in marsh environments so successfully is its ability to

|  |  |
| --- | --- |
| A | alter the substrate in which it grows |
| B | convert sulfides into a usable form of sulfur |
| C | grow and produce seeds while floating on the surface of the water |
| D | produce carbon dioxide with great efficiency |

Paragraph 4 suggests that where ***Spartina*** occurs naturally, an established stand of it will eventually

|  |  |
| --- | --- |
| A | create conditions in which it can no longer survive |
| B | get washed away by water flowing through the deep channels that form around it |
| C | become adapted to brackish water |
| D | take over other grass species growing in the area |

According to paragraph 4, in its natural habitats, ***Spartina*** helps estuaries by

|  |  |
| --- | --- |
| A | controlling marshland decline |
| B | decreasing the substrate elevation |
| C | reducing the brackishness of the water |
| D | increasing the flow of water into the estuary |

The word "modifies" in the passage is closest in meaning to

|  |  |
| --- | --- |
| A | creates |
| B | changes |
| C | grows on |
| D | breaks down |

The word "Efforts" in the passage is closest in meaning to

|  |  |
| --- | --- |
| A | Laws |
| B | Suggestions |
| C | Attempts |
| D | Failures |

According to paragraph 5, ***Spartina*** negatively affects wildlife in estuaries by

|  |  |
| --- | --- |
| A | trapping fish and waterfowl in sediment |
| B | preventing oysters from transplanting successfully |
| C | turning mudflats into high marshes and salt meadows |
| D | expanding the marshy fringes of salt meadows |

According to paragraph 6, each of the following methods has been used in attempts to control ***Spartina*** EXCEPT

|  |  |
| --- | --- |
| A | flooding plants |
| B | cutting plants down repeatedly |
| C | applying herbicides |
| D | introducing predatory insects |

*Spartina* is particularly able to tolerate high salinities because salt glands on the surface of the leaves remove the salt from the plant sap.

|  |  |
| --- | --- |
| A | 1 |
| B | 2 |
| C | 3 |
| D | 4 |

**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.**

Spanina alrerniflora, or cordgrass, is the dominant native species in salt marshes along the Atlantic coast and the Gulf Coast of the United States.

**1**Spartina is very well adapted to conditions in salt marshes, where it plays a valuable role in stabilizing them and making them highly productive marine habitats.

**2**Spartina expands by growing root systems that float on the water's surface and descend underground, where it finds the nutrients that it needs to germinate.

**3**As a result of its spread in Washington State over the past hundred years. Spartina has now become a threat to native oysters by releasing sediments that contain sulfides into the waters.

**4**The dead leaves of Spartina become food for a wide variety of marine organisms.

**5**Outside its native regions, Spartina can pose serious problems by turning mudflats into high marshes that are inhospitable to many native fish and birds.

**6**Spartina has physiological adaptations that allow it to grow in environments where other plants cannot, making it a very strong competitor that is difficult to control once it is established.

**The Birth of Photography**

Perceptions of the visible world were greatly altered by the invention of photography in the middle of the nineteenth century. In particular, and quite logically, the art of painting was forever changed, though not always in the ways one might have expected. The realistic and naturalistic painters of the mid- and late-nineteenth century were all intently aware of photography—as a thing to use, to learn from, and react to.

Unlike most major inventions, photography had been long and impatiently awaited. The images produced by the camera obscura, a boxlike device that used a pinhole or lens to throw an image onto a ground-glass screen or a piece of white paper, were already familiar—the device had been much employed by topographical artists like the Italian painter Canaletto in his detailed views of the city of Venice. What was lacking was a way of giving such images permanent form. This was finally achieved by Louis Daguerre (1787-1851), who perfected a way of fixing them on a silvered copper plate. His discovery, the "daguerreotype," was announced in 1839.

A second and very different process was patented by the British inventor William Henry Talbot (1800-1877) in 1841. Talbot's "calotype" was the first negative-to-positive process and the direct ancestor of the modern photograph. The calotype was revolutionary in its use of chemically treated paper in which areas hit by light became dark in tone, producing a negative image. This "negative," as Talbot called it, could then be used to print multiple positive images on another piece of treated paper.

The two processes produced very different results. The daguerreotype was a unique image that reproduced what was in front of the camera lens in minute, unselective detail and could not be duplicated. The calotype could be made in series, and was thus the equivalent of an etching or an engraving. Its general effect was soft edged and tonal.

One of the things that most impressed the original audience for photography was the idea of authenticity. Nature now seemed able to speak for itself, with a minimum of interference. The title Talbot chose for his book, *The Pencil of Nature*(the first part of which was published in 1844), reflected this feeling. Artists were fascinated by photography because it offered a way of examining the world in much greater detail. They were also afraid of it, because it seemed likely to make their own efforts unnecessary.

Photography did indeed make certain kinds of painting obsolete—the daguerreotype virtually did away with the portrait miniature. It also made the whole business of making and owning images democratic. Portraiture, once a luxury for the privileged few, was suddenly well within the reach of many more people.

In the long term, photography's impact on the visual arts was far from simple. Because the medium was so prolific, in the sense that it was possible to produce a multitude of images very cheaply, it was soon treated as the poor relation of fine art, rather than its destined successor. Even those artists who were most dependent on photography became reluctant to admit that they made use of it, in case this compromised their professional standing.

The rapid technical development of photography—the introduction of lighter and simpler equipment, and of new emulsions that coated photographic plates, film, and paper and enabled images to be made at much faster speeds—had some unanticipated consequences. Scientific experiments made by photographers such as Eadweard Muybridge (1830-1904) and Etienne-Jules Marey (1830-1904) demonstrated that the movements of both humans and animals differed widely from the way they had been traditionally represented in art. Artists, often reluctantly, were forced to accept the evidence provided by the camera. The new candid photography—unposed pictures that were made when the subjects were unaware that their pictures were being taken—confirmed these scientific results, and at the same time, thanks to the radical cropping (trimming) of images that the camera often imposed, suggested new compositional formats. The accidental effects obtained by candid photographers were soon being copied by artists such as the French painter Degas.

What can be inferred from paragraphs 1 and 2 about the effect of photography on nineteenth-century painting?

|  |  |
| --- | --- |
| A | Photography did not significantly change the way people looked at reality. |
| B | Most painters used the images of the camera obscura in preference to those of the daguerreotype. |
| C | Painters who were concerned with realistic or naturalistic representation were particularly influenced by photography. |
| D | Artists used the long-awaited invention of photography in just the ways they had expected to. |

The word "duplicated" in the passage is closest in meaning to

|  |  |
| --- | --- |
| A | copied |
| B | replaced |
| C | handled |
| D | clarified |

The phrase "Its general effect" in the passage refers to

|  |  |
| --- | --- |
| A | the camera lens |
| B | the calotype |
| C | the etching |
| D | the engraving |

According to paragraphs 2 and 3 which of the following did the daguerreotype and the calotype have in common?

|  |  |
| --- | --- |
| A | They were equally useful for artists. |
| B | They could be reproduced. |
| C | They produced a permanent image. |
| D | They were produced on treated paper. |

The word "authenticity" in the passage is closest in meaning to

|  |  |
| --- | --- |
| A | improvement |
| B | practicality |
| C | genuineness |
| D | repetition |

What point does the author make in paragraph 6?

|  |  |
| --- | --- |
| A | Paintings became less expensive because of competition with photography. |
| B | Photography, unlike painting, was a type of portraiture that even ordinary people could afford. |
| C | Every style of painting was influenced by the invention of photography. |
| D | The daguerreotype was more popular than the calotype. |

The word "reluctant" in the passage is closest in meaning to

|  |  |
| --- | --- |
| A | unable |
| B | embarrassed |
| C | unlikely |
| D | unwilling |

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 | Photography did not replace other fine arts because people felt the image looked cheap in relation to the other arts. |
| B | Photography was not considered a true art because people could use it to create many images cheaply. |
| C | Photography was so cheap and readily available that it could be purchased by people who were too poor to purchase fine art. |
| D | Photography not only spread quickly but  also was a cheap art form and so became true successor of fine arts rather than its poor relation. |

The word "unanticipated" in the passage is closest in meaning to

|  |  |
| --- | --- |
| A | indirect |
| B | not expected |
| C | unquestionable |
| D | beneficial |

The word "accidental" in the passage is closest in meaning to

|  |  |
| --- | --- |
| A | surprising |
| B | unintentional |
| C | realistic |
| D | unusual |

Which of the following is mentioned in paragraph 8 as a benefit that artists derived from photography?

|  |  |
| --- | --- |
| A | It inspired artists to use technological themes in their painting. |
| B | It lent prestige to those artists who used photographs as models for paintings. |
| C | It provided artists with new types of equipment to speed up the painting process. |
| D | It motivated artists to think about new ways to compose images in their paintings. |

It can be inferred from paragraph 8 that one effect that photography had on painting was that it

|  |  |
| --- | --- |
| A | provided painters with new insights into how humans and animals actually move |
| B | showed that representing movement could be as interesting as portrait art |
| C | increased the appeal of painted portraiture among the wealthy |
| D | influenced artists to improve techniques for painting faster |

Although his process produced permanent images, each was unique and no reproduction of the picture was possible.

|  |  |
| --- | --- |
| A | 1 |
| B | 2 |
| C | 3 |
| D | 4 |

**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.**

The invention of photography had a significant impact on the art of painting in the nineteenth century.

**1**For a brief time, artists preferred not to paint natural or realistic images that would have to compete with photographs.

**2**Before photography, Canaletto had used the camera obscura to project scenes onto a paper or glass plate.

**3**The photographic processes of Louis Daguerre and William Henry Talbot both made permanent images, but only Talbot's process allowed making multiple copies.

**4**The work of Eadweard Muybridge and Etienne-Jules Marey established photography both as a science and as an art.

**5**Photography made accurate images widely and inexpensively available, but this popular success also had the effect of lowering its perceived value in relation to the fine arts.

**6**Photography eliminated the painted portrait miniature, led artists to accurately represent movement, and affected pictorial composition, but did not replace traditional visual arts.

**The Allende Meteorite**

Sometime after midnight on February 8,1969, a large, bright meteor entered Earth's atmosphere and broke into thousands of pieces, plummeted to the ground, and scattered over an area 50 miles long and 10 miles wide in the state of Chihuahua in Mexico. The first meteorite from this fall was found in the village of Pueblito de Allende. Altogether, roughly two tons of meteorite fragments were recovered, all of which bear the name Allende for the location of the first discovery.

Individual specimens of Allende are covered with a black, glassy crust that formed when their exteriors melted as they were slowed by Earth's atmosphere. When broken open, Allende stones are revealed to contain an assortment of small, distinctive objects, spherical or irregular in shape and embedded in a dark gray matrix (binding material), which were once constituents of the solar nebula—the interstellar cloud of gas and dust out of which our solar system was formed.

The Allende meteorite is classified as a chondrite. Chondrites take their name from the Greek word *chondros*—meaning "seed"—an allusion to their appearance as rocks containing tiny seeds. These seeds are actually chondrules: millimeter-sized melted droplets of silicate material that were cooled into spheres of glass and crystal. A few chondrules contain grains that survived the melting event, so these enigmatic chondrules must have formed when compact masses of nebular dust were fused at high temperatures—approaching 1,700 degrees Celsius—and then cooled before these surviving grains could melt. Study of the textures of chondrules confirms that they cooled rather quickly, in times measured in minutes or hours, so the heating events that formed them must have been localized. It seems very unlikely that large portions of the nebula were heated to such extreme temperatures, and huge nebula areas could not possibly have lost heat so fast. Chondrules must have been melted in small pockets of the nebula that were able to lose heat rapidly. The origin of these peculiar glassy spheres remains an enigma.

Equally perplexing constituents of Allende are the refractory inclusions: irregular white masses that tend to be larger than chondrules. They are composed of minerals uncommon on Earth, all rich in calcium, aluminum, and titanium, the most refractory (resistant to melting) of the major elements in the nebula. The same minerals that occur in refractory inclusions are believed to be the earliest-formed substances to have condensed out of the solar nebula. However, studies of the textures of inclusions reveal that the order in which the minerals appeared in the inclusions varies from inclusion to inclusion, and often does not match the theoretical condensation sequence for those metals.

Chondrules and inclusions in Allende are held together by the chondrite matrix, a mixture of fine-grained, mostly silicate minerals that also includes grains of iron metal and iron sulfide. At one time it was thought that these matrix grains might be pristine nebular dust, the sort of stuff from which chondrules and inclusions were made. However, detailed studies of the chondrite matrix suggest that much of it, too, has been formed by condensation or melting in the nebula, although minute amounts of surviving interstellar dust are mixed with the processed materials.

All these diverse constituents are aggregated together to form chondritic meteorites, like Allende, that have chemical compositions much like that of the Sun. To compare the compositions of a meteorite and the Sun, it is necessary that we use ratios of elements rather than simply the abundances of atoms. After all, the Sun has many more atoms of any element, say iron, than does a meteorite specimen, but the ratios of iron to silicon in the two kinds of matter might be comparable. The compositional similarity is striking. The major difference is that Allende is depleted in the most volatile elements, like hydrogen, carbon, oxygen, nitrogen, and the noble gases, relative to the Sun. These are the elements that tend to form gases even at very low temperatures. We might think of chondrites as samples of distilled Sun, a sort of solar sludge from which only gases have been removed. Since practically all the solar system's mass resides in the Sun, this similarity in chemistry means that chondrites have average solar system composition, except for the most volatile elements; they are truly lumps of nebular matter, probably similar in composition to the matter from which planets were assembled.

The word "location" in the passage is closest in meaning to

|  |  |
| --- | --- |
| A | sight |
| B | sake |
| C | success |
| D | place |

Which of the following can be inferred from paragraph 1 about the large meteor that entered Earths atmosphere on February 8, 1969?

|  |  |
| --- | --- |
| A | It was almost ten miles wide. |
| B | It was the biggest meteor ever to hit Mexico. |
| C | It weighed more than two tons. |
| D | It broke into more pieces than most meteors do. |

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 | Allende meteorites were formed when constituents of the interstellar cloud of gas and dust got trapped inside small, roughly spherical objects and these objects became bound together in a dark gray matrix. |
| B | Inside Allende meteorites is a dark gray matrix that binds together small spherical or irregular objects formed from the interstellar cloud of gas and dust out of which the solar system was made. |
| C | By breaking open Allende meteorites, scientists were able to find out what the solar nebula was made of. |
| D | Allende meteorites were filled with material formed almost entirelyfrom interstellar gas and dust. |

The word "allusion" in the passage is closest in meaning to

|  |  |
| --- | --- |
| A | addition |
| B | modification |
| C | resemblance |
| D | reference |

The word "enigmatic" in the passage is closest in meaning to

|  |  |
| --- | --- |
| A | dangerous |
| B | mysterious |
| C | interesting |
| D | surprising |

According to paragraph 3, what does the presence of grains inside some of the chondrules indicate?

|  |  |
| --- | --- |
| A | The chondrules were formed of silicate material. |
| B | The chondrules were formed at high temperatures and then cooled rapidly. |
| C | The grains were formed in huge areas of the solar nebula. |
| D | The grains were formed after the chondrules were fused together into chondrites. |

According to paragraph 4, all of the following are true about the minerals found in the refractory inclusions EXCEPT:

|  |  |
| --- | --- |
| A | These minerals are among the most resistant to melting of all the major elements in the solar nebula. |
| B | These minerals are believed to be some of the first elements to have condensed out of the solar nebula. |
| C | These minerals are among the least commonly found elements on Earth. |
| D | These elements occur in the order that scientists would have predicted. |

The word "pristine" in the passage is closest in meaning to

|  |  |
| --- | --- |
| A | pure |
| B | solid |
| C | ordinary |
| D | trapped |

According to paragraph 5, which of the following is indicated by studies of the mixture holding the inclusions together?

|  |  |
| --- | --- |
| A | Large amounts of this material were formed by condensation or melting in the nebula. |
| B | This material contains more iron and iron sulfide than had previously been thought. |
| C | This material is very similarto the material from which the refractory inclusions are made. |
| D | The grains in this material are made from the same elements as chondrules are. |

In paragraph 6, why does the author mention that "the Sun has many more atoms of any element, say iron, than does a meteorite specimen"?

|  |  |
| --- | --- |
| A | To show how difficult it is to compare the composition of a meteorite with that of the Sun |
| B | To explain why a comparison of the compositions of a meteorite and of the Sun has to be done in terms of ratios of elements |
| C | To identify the most common element in both the Sun and meteorite specimens |
| D | To emphasize how much largerthe Sun is than any meteorite specimen is |

According to paragraph 6, the composition of chondritic meteorites differs from the composition of the Sun primarily in

|  |  |
| --- | --- |
| A | containing nebular matter |
| B | containing many fewer atoms of iron |
| C | the relative amount of volatile elements |
| D | the ratio of iron to silicon |

According to paragraph 6, what is the significance of the similarity in composition between chondrites and the Sun?

|  |  |
| --- | --- |
| A | It indicates what the matter from which planets were formed was probably like. |
| B | It may explain howthe Sun originally developed. |
| C | It helps scientists estimate the variations in the chemical composition of different meteors. |
| D | It suggests that most meteorites may contain large quantities of volatile elements. |

It is therefore still unclear if all inclusions were formed in the same way.

|  |  |
| --- | --- |
| A | 1 |
| B | 2 |
| C | 3 |
| D | 4 |

**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.**

Studies of the Allende meteorite provided information about the composition of chondritic meteorites and their possible origin.

**1**When Allende entered Earth's atmosphere, it broke into thousands of pieces called chondrites because they look like glassy, black seeds.

**2**The mineral content of chondrules suggests that they were probably formed in isolated regions of the nebula that remained much hotter than the rest.

**3**Chondrules are tiny, millimeter-sized drops of silicate materials that probably formed when lumps of nebular dust were fused at extremely high temperatures and then quickly cooled.

**4**Irregularly shaped inclusions in Allende are composed of minerals that are resistant to melting and are believed to be the earlest minerals to have condensed out of the nebula.

**5**The matrix that holds the chondrules and inclusions together in Allende consists mainly of grains of nebular dust that were trapped inside the meteor before they could be melted.

**6**Except for being depleted in volatile elements, chondritic meteorites are probably very similar in composition to the matter from which planets were assembled.