2024 MCAS Sample Student Work and Scoring Guide

High School Biology
Question 42: Constructed-Response

Reporting Category: Evolution
Practice Category: Investigations and Questioning
Standard: HS.LS.4.5 - Evaluate models that demonstrate how changes in an environment may result in the evolution of a population of a given species, the emergence of new species over generations, or the extinction of other species due to the processes of genetic drift, gene flow, mutation, and natural selection.
Item Description: Write a testable question that, when answered, could determine whether a trait is the result of natural selection, explain how a piece of evidence could support two organisms being different species, and explain how geographic isolation can lead to speciation.

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Scoring Guide

Select a score point in the table below to view the sample student response.

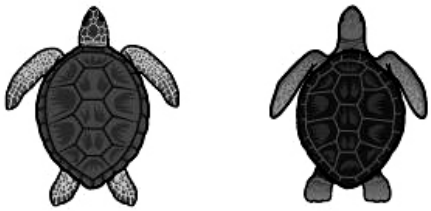
Score*	Description
4A	The response demonstrates a thorough understanding of the evolution of a species through natural selection. The response includes a clearly written testable question that could be answered by scientists to determine whether natural selection plays a role in the black sea turtle's color. The response correctly identifies and clearly explains one piece of evidence that scientists can use to determine whether green and black sea turtles are separate species. The response also clearly explains how geographically isolating a small group of turtles from a larger population of turtles can lead to the two populations becoming separate species.
4B	
3	The response demonstrates a general understanding of the evolution of a species through natural selection.
2	The response demonstrates a limited understanding of the evolution of a species through natural selection.
1	The response demonstrates a minimal understanding of the evolution of a species through natural selection.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

*Letters are used to distinguish between sample student responses that earned the same score (e.g., 4A and 4B).

Score Point 4A

This question has four parts.

While most green sea turtles have tan skin and shells, a small population of green sea turtles in the eastern Pacific Ocean have evolved to have black skin and shells. These turtles are commonly known as black sea turtles. The diagram shows a green sea turtle and a black sea turtle.



Green sea turtle Black sea turtle

Part A

A scientist wonders whether the black color in this sea turtle population is a result of natural selection.

Write a testable question that scientists could answer to determine whether natural selection plays a role in the black sea turtle's color.

Do the black turtles have a higher chance of surviving and reproducing/finding mates than the green turtles?

Part B

Some scientists think that green sea turtles and black sea turtles are separate species.

Besides physical characteristics, identify **one** piece of evidence that scientists can use to determine whether green sea turtles and black sea turtles are separate species.

They can mate the two turtles and record if they produce fertile offspring or not.

Part C

Explain how the type of evidence you identified in Part B can be used by scientists to determine whether the green sea turtles and black sea turtles are separate species.

If one black sea turtle and one green sea turtle successfully produce fertile offspring, this means they are the same species. If they can't produce fertile offspring, this means that the organisms are of different species.

Part D

Other scientists think that green sea turtles and black sea turtles may become separate species because they are geographically isolated from each other.

Explain how geographically isolating a small group of turtles from a larger population of turtles can lead to the two populations becoming separate species.

Over time, each group of turtles will only be able to mate and reproduce with turtles from their own group. In each group, mutations will happen and natural selection will occur. After years of this evolution, each group will be so different physically and genetically that they will no longer be the same species.

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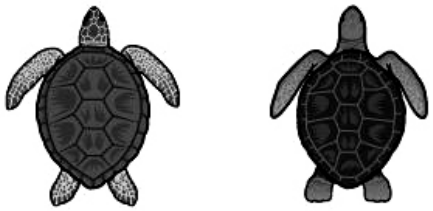
Score Point 4B

This question has four parts.

While most green sea turtles have tan skin and shells, a small population of green sea turtles in the eastern Pacific Ocean have evolved to have black skin and shells. These turtles are commonly known as black sea turtles. The diagram shows a green sea turtle and a black sea turtle.



Green sea turtle Black sea turtle

Part A

A scientist wonders whether the black color in this sea turtle population is a result of natural selection.

Write a testable question that scientists could answer to determine whether natural selection plays a role in the black sea turtle's color.

Are black turtles more likely to survive and reproduce than green turtles?

Part B

Some scientists think that green sea turtles and black sea turtles are separate species.

Besides physical characteristics, identify **one** piece of evidence that scientists can use to determine whether green sea turtles and black sea turtles are separate species.

A piece of evidence that would determine whether or not the green and black sea turtles are the same or seperate species is whether a black sea turtle and a green sea turtle can mate to produce fertile offspring. If they can, they are the same species. If they cannot, they are two different species.

Part C

Explain how the type of evidence you identified in Part B can be used by scientists to determine whether the green sea turtles and black sea turtles are separate species.

Species are determined by whether or not similar individuals can mate and produce fertile offspring that can also reproduce. This is in the definition of species. If a green turtle and a black turtle can mate and produce fertile offspring, they are the same species. If they cannot produce fertile offspring, they are not the same species.

Part D

Other scientists think that green sea turtles and black sea turtles may become separate species because they are geographically isolated from each other.

Explain how geographically isolating a small group of turtles from a larger population of turtles can lead to the two populations becoming separate species.

Geographically isolating a group of turtles from a larger population of turtles can lead to speciation of the two groups. When small group is seperated from the main group, there are fewer genes and genotypes to mix as the population breeds. Over time, the small population may develop mutations and/or adaptations that differ from the original population. The lack of breeding between individuals from the original population with the new population prevents the mutation from dispersing among the whole population, instead only being shared in the new population. If the changes become so extreme that individuals from the original group and the new group can no longer breed to produce fertile offspring, then two different species have been formed.

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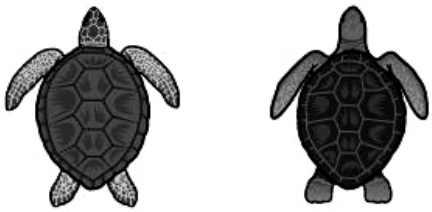
Score Point 3

This question has four parts.

While most green sea turtles have tan skin and shells, a small population of green sea turtles in the eastern Pacific Ocean have evolved to have black skin and shells. These turtles are commonly known as black sea turtles. The diagram shows a green sea turtle and a black sea turtle.



Green sea turtle Black sea turtle

Part A

A scientist wonders whether the black color in this sea turtle population is a result of natural selection.

Write a testable question that scientists could answer to determine whether natural selection plays a role in the black sea turtle's color.

Do black sea turtles get eaten by predators less often then green sea turtles because they can blend in?

Part B

Some scientists think that green sea turtles and black sea turtles are separate species.

Besides physical characteristics, identify **one** piece of evidence that scientists can use to determine whether green sea turtles and black sea turtles are separate species.

One piece of evidence that scientists can use to determine whether green sea turtles and black sea turtles are separate species is wether or not they mate and produce fertile offspring with each other.

Part C

Explain how the type of evidence you identified in Part B can be used by scientists to determine whether the green sea turtles and black sea turtles are separate species.

The evidence of wether or not black and green sea turtles mate can be used by scientisits to determine whether they are different species because we know that in order for organisms to be a part of the same species they need to mate and produce fertile offspring. We will know that if the black and green sea turtles mate and produce fertile offspring then they are the same species but, if they dont we will know that they are different species.

Part D

Other scientists think that green sea turtles and black sea turtles may become separate species because they are geographically isolated from each other.

Explain how geographically isolating a small group of turtles from a larger population of turtles can lead to the two populations becoming separate species.

Geographical isolation can form two different species from one because they will not be able to mate with each other and they will evolve in different ways.

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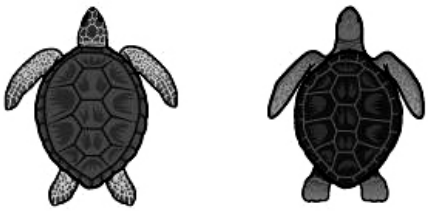
Score Point 2

This question has four parts.

While most green sea turtles have tan skin and shells, a small population of green sea turtles in the eastern Pacific Ocean have evolved to have black skin and shells. These turtles are commonly known as black sea turtles. The diagram shows a green sea turtle and a black sea turtle.



Green sea turtle Black sea turtle

Part A

A scientist wonders whether the black color in this sea turtle population is a result of natural selection.

Write a testable question that scientists could answer to determine whether natural selection plays a role in the black sea turtle's color.

Are there any green sea turtles in the area of which the black sea turtles live?

Part B

Some scientists think that green sea turtles and black sea turtles are separate species.

Besides physical characteristics, identify **one** piece of evidence that scientists can use to determine whether green sea turtles and black sea turtles are separate species.

Looking at DNA they might find something completely different within the two sea turtles populations.

Part C

Explain how the type of evidence you identified in Part B can be used by scientists to determine whether the green sea turtles and black sea turtles are separate species.

If there is a major difference in the sea turtles DNA, then they could be determined as separate species.

Part D

Other scientists think that green sea turtles and black sea turtles may become separate species because they are geographically isolated from each other.

Explain how geographically isolating a small group of turtles from a larger population of turtles can lead to the two populations becoming separate species.

Evolution can play a major factor in population size. If geographically the two groups of turtles are isolated, then the turtles can evolve into bigger populations. There is also less competition between the two sea turtle populations.

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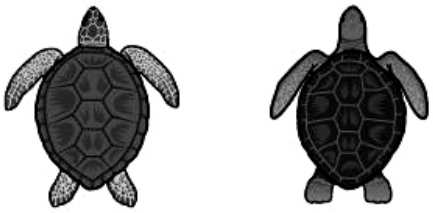
Score Point 1

This question has four parts.

While most green sea turtles have tan skin and shells, a small population of green sea turtles in the eastern Pacific Ocean have evolved to have black skin and shells. These turtles are commonly known as black sea turtles. The diagram shows a green sea turtle and a black sea turtle.



Green sea turtle Black sea turtle

Part A

A scientist wonders whether the black color in this sea turtle population is a result of natural selection.

Write a testable question that scientists could answer to determine whether natural selection plays a role in the black sea turtle's color.

Does the black shell help hide the turtles from predators better than the green shell?

Part B

Some scientists think that green sea turtles and black sea turtles are separate species.

Besides physical characteristics, identify **one** piece of evidence that scientists can use to determine whether green sea turtles and black sea turtles are separate species.

What the turtles eat.

Part C

Explain how the type of evidence you identified in Part B can be used by scientists to determine whether the green sea turtles and black sea turtles are separate species.

It can show that they may have different forms of digestion/different predators/prey making them different from one another.

Part D

Other scientists think that green sea turtles and black sea turtles may become separate species because they are geographically isolated from each other.

Explain how geographically isolating a small group of turtles from a larger population of turtles can lead to the two populations becoming separate species.

Because of species isolationism they cant reproduce because their behaviors are way too different.

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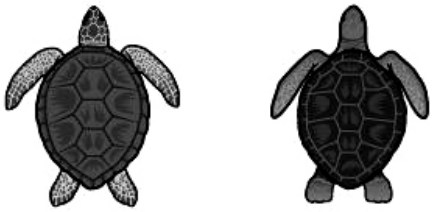
Score Point 0

This question has four parts.

While most green sea turtles have tan skin and shells, a small population of green sea turtles in the eastern Pacific Ocean have evolved to have black skin and shells. These turtles are commonly known as black sea turtles. The diagram shows a green sea turtle and a black sea turtle.



Green sea turtle Black sea turtle

Part A

A scientist wonders whether the black color in this sea turtle population is a result of natural selection.

Write a testable question that scientists could answer to determine whether natural selection plays a role in the black sea turtle's color.

Do black sea turtles tend to inhabit darker areas of the ocean?

Part B

Some scientists think that green sea turtles and black sea turtles are separate species.

Besides physical characteristics, identify **one** piece of evidence that scientists can use to determine whether green sea turtles and black sea turtles are separate species.

Scientists could identify some of their habits, like eating for example. What food do they eat and how does it affect them differently?

Part C

Explain how the type of evidence you identified in Part B can be used by scientists to determine whether the green sea turtles and black sea turtles are separate species.

For example, if a green sea turtle is mostly herbivouris it would live in diffferent parts of the ocean filled with ocean plants than a black sea turtle if it were to eat small crustations at the bottom of the sea bed.

Part D

Other scientists think that green sea turtles and black sea turtles may become separate species because they are geographically isolated from each other.

Explain how geographically isolating a small group of turtles from a larger population of turtles can lead to the two populations becoming separate species.

If separated, some turtles could end up picking up different habits, like what food they eat, and they could even have different predators depending on where they are located from the others.

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