2024 MCAS Sample Student Work and Scoring Guide

High School Biology
Question 20: Constructed-Response

Reporting Category: Ecology
Practice Category: None
Standard: HS.LS.2.1 - Analyze data sets to support explanations that biotic and abiotic factors affect ecosystem carrying capacity.
Item Description: Compare birth and death rates in a population that is increasing and explain how environmental factors could affect the death rate and birth rate in a population.

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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 how environmental factors affect organisms in an ecosystem. The response clearly describes how the birth rate must compare to the death rate for the size of a sandpiper population to increase. The response correctly identifies two environmental factors that could affect the death rate in the sandpiper population, clearly describes how each factor affects the death rate, and clearly explains the reasoning. The response also correctly identifies one environmental factor that could affect the birth rate in the sandpiper population, clearly describes how the factor affects the birth rate, and clearly explains the reasoning.
4B	
3	The response demonstrates a general understanding of how environmental factors affect organisms in an ecosystem.
2	The response demonstrates a limited understanding of how environmental factors affect organisms in an ecosystem.
1	The response demonstrates a minimal understanding of how environmental factors affect organisms in an ecosystem.
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.

The upland sandpiper is a type of bird that is endangered in Massachusetts. Scientists are studying factors affecting death rates and birth rates in upland sandpiper populations.

Part A

Assume immigration and emigration rates are equal in an upland sandpiper population.

Describe how the birth rate must compare with the death rate for the size of this population to increase.

For the population size to increase, birth rates would have to be higher than death rates.

Part B

Identify **two** environmental factors that could affect the death rate in an upland sandpiper population.

Increased predation can be a factor for the high death rates, as well as a potential disease that is being spread among the sandpipers.

Part C

Determine whether **each** factor you identified in Part B would increase or decrease the death rate in the upland sandpiper population. Explain your reasoning for **each** factor.

Increased predation and disease are both factors that would increase death rates. If a species gained more predators, or if their predator population incresed, then they would be hunted more, and therefore more would die. If there was a potential disease spreading, that would also decrease the sandpiper population, as more would die from the illness.

Part D

Identify **one** environmental factor, other than the factors you identified in Part B, that could affect the birth rate in the upland sandpiper population. Describe how this factor affects the birth rate **and** explain your reasoning.

If there were an increase of resources for the sandpipers, like food or shelter, then birth rates would also increase. Ample resources means that more sandpipers will live to produce more offspring, so there would be an increase in birth rates, as well as an overall increase in their population.

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Score Point 4B

This question has four parts.

The upland sandpiper is a type of bird that is endangered in Massachusetts. Scientists are studying factors affecting death rates and birth rates in upland sandpiper populations.

Part A

Assume immigration and emigration rates are equal in an upland sandpiper population.

Describe how the birth rate must compare with the death rate for the size of this population to increase.

Assuming immigration and emigration rates are equal in an upland sandpiper population, the birth rate would have to be higher than the death rate for the size of this population to increase.

Part B

Identify **two** environmental factors that could affect the death rate in an upland sandpiper population.

Two enviromental factos that could affect the death rate in an upland sandpiper population are food supply, and predation

Part C

Determine whether **each** factor you identified in Part B would increase or decrease the death rate in the upland sandpiper population. Explain your reasoning for **each** factor.

The factors I identified in Part B would increase the death rate if there was a decrease in the food supply, and would increase the death rate if there was a increase in predation. If the there was a lower food supply, many birds would die hungry and not able to survive due to the lack of nutrients. If there was a high predation, the birds would be hunted and killed by predators, whether they be human or not.

Part D

Identify **one** environmental factor, other than the factors you identified in Part B, that could affect the birth rate in the upland sandpiper population. Describe how this factor affects the birth rate **and** explain your reasoning.

One enviromental factor, other than the factors I indentified in Part B, that could affect the birth rate in the upland sandpiper population is temperature. This enviromental factor would decrease the birth rate as if the temperature got too hot or too cold, the birds wouldn't be able to reproduce as they newly borth offspring would die off due to the extreme temperature.

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Score Point 3

This question has four parts.

The upland sandpiper is a type of bird that is endangered in Massachusetts. Scientists are studying factors affecting death rates and birth rates in upland sandpiper populations.

Part A

Assume immigration and emigration rates are equal in an upland sandpiper population.

Describe how the birth rate must compare with the death rate for the size of this population to increase.

For this population to increase the death rate must be lower than the brth rate.

Part B

Identify **two** environmental factors that could affect the death rate in an upland sandpiper population.

Two environmental factors that could affect the upland sandpiper population are habitat destruction, and their competitors dying.

Part C

Determine whether **each** factor you identified in Part B would increase or decrease the death rate in the upland sandpiper population. Explain your reasoning for **each** factor.

The first factor I mentioned, habitat destruction, would increase the death rates of the population This factor would increase the death rates because if the habitat got destroyed then the upland sandpipers would lose the resources that they need to survive, and more would die. The competitors of the sandpipers dying, would decrease the death rates in the population because there would be less competition for food sources. This would make it easier for the sandpipers to get food, shelter and their other resources that they need to survive so less would die.

Part D

Identify **one** environmental factor, other than the factors you identified in Part B, that could affect the birth rate in the upland sandpiper population. Describe how this factor affects the birth rate **and** explain your reasoning.

The birth rate could be affected by a behavioral change in when the sandpipers reproduce. If the sandpipers evolve to reproduce for a longer period of time each year then more of the birds would be born.

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Score Point 2

This question has four parts.

The upland sandpiper is a type of bird that is endangered in Massachusetts. Scientists are studying factors affecting death rates and birth rates in upland sandpiper populations.

Part A

Assume immigration and emigration rates are equal in an upland sandpiper population.

Describe how the birth rate must compare with the death rate for the size of this population to increase.

> The birth rate must compare with the death rate for the size of this population to increase because of not it can result in over population fast.

Part B

Identify **two** environmental factors that could affect the death rate in an upland sandpiper population.

> two environmental factors that could affect the death rate in a upland sandpiper population is a decrease in there food and an increase on there predators.

Part C

Determine whether **each** factor you identified in Part B would increase or decrease the death rate in the upland sandpiper population. Explain your reasoning for **each** factor.

> Each factor i identified in Part B would increase the death rate in the upland sandpiper population because of the upland sandpipers food decreases then they will have nothing to eat and starve and if there predator population increases they will get eaten and that will decrease the upland sandpiper population.

Part D

Identify **one** environmental factor, other than the factors you identified in Part B, that could affect the birth rate in the upland sandpiper population. Describe how this factor affects the birth rate **and** explain your reasoning.

> one environmental factor that could affect the birthrate in the upland sandpiper population is if the food increases and if the upland sandpipers find a species of birds to mate with.

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Score Point 1

This question has four parts.

The upland sandpiper is a type of bird that is endangered in Massachusetts. Scientists are studying factors affecting death rates and birth rates in upland sandpiper populations.

Part A

Assume immigration and emigration rates are equal in an upland sandpiper population.

Describe how the birth rate must compare with the death rate for the size of this population to increase.

The birth rate must be higher than the death rate for the population to increase.

Part B

Identify **two** environmental factors that could affect the death rate in an upland sandpiper population.

One factor that could affect the death rate in an upland sandpiper population would be natrual selection, a second factor could be enviromental changes.

Part C

Determine whether **each** factor you identified in Part B would increase or decrease the death rate in the upland sandpiper population. Explain your reasoning for **each** factor.

Both factors would decrease the population because of the outcome they both will produce.

Part D

Identify **one** environmental factor, other than the factors you identified in Part B, that could affect the birth rate in the upland sandpiper population. Describe how this factor affects the birth rate **and** explain your reasoning.

One factor that could affect birth rate would be the amount of time in breeding season, and this would affect the birth rate by giving them more or less time to breed.

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Score Point 0

This question has four parts.

The upland sandpiper is a type of bird that is endangered in Massachusetts. Scientists are studying factors affecting death rates and birth rates in upland sandpiper populations.

Part A

Assume immigration and emigration rates are equal in an upland sandpiper population.

Describe how the birth rate must compare with the death rate for the size of this population to increase.

birth rate would be lower then the death rate because if the upland sandpiper bird is endangered and they all die then there won't be any new birds.

Part B

Identify **two** environmental factors that could affect the death rate in an upland sandpiper population.

1. endangerment
2. extinction

Part C

Determine whether **each** factor you identified in Part B would increase or decrease the death rate in the upland sandpiper population. Explain your reasoning for **each** factor.

both factors would increase the death rate because if the birds go extinct then there will be no more birds.

Part D

Identify **one** environmental factor, other than the factors you identified in Part B, that could affect the birth rate in the upland sandpiper population. Describe how this factor affects the birth rate **and** explain your reasoning.

another enviormental factor is no more of the birds.

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