

2022 MCAS Sample Student Work and Scoring Guide

High School Biology

Question 37: Constructed-Response

Reporting Category: Evolution

Practice Category: None

Standard: [HS.LS.4.2](#) - Construct an explanation based on evidence that Darwin’s theory of evolution by natural selection occurs in a population when the following conditions are met: (a) more offspring are produced than can be supported by the environment, (b) there is heritable variation among individuals, and (c) some of these variations lead to differential fitness among individuals as some individuals are better able to compete for limited resources than others.

Item Description: Describe how genetic diversity of a population changed as the population decreased and explain how a trait can become more common in a population over time.

[View item in MCAS Digital Item Library](#)

Scoring Guide

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

Score*	Description
3A	The response demonstrates a thorough understanding of Darwin’s theory of evolution by natural selection. The response clearly describes how the genetic diversity of North American bats has most likely changed since 2006 and clearly explains the reasoning. The response also correctly identifies how the trait for resistance to WNS in the population changes over time and clearly explains the reasoning.
3B	
2	The response demonstrates a partial understanding of Darwin’s theory of evolution by natural selection.
1	The response demonstrates a minimal understanding of Darwin’s theory of evolution by 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., 3A and 3B).

Score Point 3A

In North America, the populations of six species of bats have decreased by up to 99% since 2006. These decreases in population sizes are largely due to white-nose syndrome (WNS). WNS is caused by a fungus that infects the skin on bats' wings, ears, and noses. The infected skin, which often appears white, loses more water than healthy, normal skin.

One species of bat affected by WNS is the little brown bat. This bat has a very small mass (about 14 g) and hunts for flying insects at night. Females typically give birth to one offspring per year.

In preparation for winter, little brown bats eat more insects to build up fat reserves in their bodies. In winter, they hibernate, which decreases body temperature, breathing rate, and metabolic rate. The bats do not eat while they are hibernating.

Little brown bats typically wake up only for brief periods of time during hibernation. When a bat does wake up,

This question has two parts.

The death rates of bats in North America are very high due to WNS.

Part A

Describe how the genetic diversity of North American bats has most likely changed (increased, decreased, or stayed the same) since 2006. Explain your reasoning.

The genetic diversity of North American bats has likely decreased since 2006 and the emerging prevalence of WNS because as more bats die, since they are dead, they are unable to pass on their genes leading to a population that as a whole is lacking in the genes of the infected bats. This has the result of a population that is less genetically diverse than one where 99% of its organisms are still living.

Part B

In a population of little brown bats infected with WNS, scientists found some bats that are resistant to WNS. Resistance to WNS may be inherited.

If resistance to WNS is an inherited trait, will the trait increase, decrease, or stay the same in the population over time? Explain your reasoning using your knowledge of natural selection.

The trait will increase because it is preferable to the bats' genetic fitness; the bats with the trait will survive and pass it on whereas the bats without the trait will be less biologically fit because they run the risk of dying of WNS.

[Back to Scoring Guide](#)

Score Point 3B

In North America, the populations of six species of bats have decreased by up to 99% since 2006. These decreases in population sizes are largely due to white-nose syndrome (WNS). WNS is caused by a fungus that infects the skin on bats' wings, ears, and noses. The infected skin, which often appears white, loses more water than healthy, normal skin.

One species of bat affected by WNS is the little brown bat. This bat has a very small mass (about 14 g) and hunts for flying insects at night. Females typically give birth to one offspring per year.

In preparation for winter, little brown bats eat more insects to build up fat reserves in their bodies. In winter, they hibernate, which decreases body temperature, breathing rate, and metabolic rate. The bats do not eat while they are hibernating.

Little brown bats typically wake up only for brief periods of time during hibernation. When a bat does wake up,

This question has two parts.

The death rates of bats in North America are very high due to WNS.

Part A

Describe how the genetic diversity of North American bats has most likely changed (increased, decreased, or stayed the same) since 2006. Explain your reasoning.

The genetic diversity of North American bats has decreased since 2006 because the population sizes have also decreased significantly since 2006.

Part B

In a population of little brown bats infected with WNS, scientists found some bats that are resistant to WNS. Resistance to WNS may be inherited.

If resistance to WNS is an inherited trait, will the trait increase, decrease, or stay the same in the population over time? Explain your reasoning using your knowledge of natural selection.

The trait will increase because natural selection allows the bats with that trait to survive and reproduce, so the trait will be passed on more frequently than the genes of not having the trait because this trait allows the bats to survive.

[Back to Scoring Guide](#)

Score Point 2

In North America, the populations of six species of bats have decreased by up to 99% since 2006. These decreases in population sizes are largely due to white-nose syndrome (WNS). WNS is caused by a fungus that infects the skin on bats' wings, ears, and noses. The infected skin, which often appears white, loses more water than healthy, normal skin.

One species of bat affected by WNS is the little brown bat. This bat has a very small mass (about 14 g) and hunts for flying insects at night. Females typically give birth to one offspring per year.

In preparation for winter, little brown bats eat more insects to build up fat reserves in their bodies. In winter, they hibernate, which decreases body temperature, breathing rate, and metabolic rate. The bats do not eat while they are hibernating.

Little brown bats typically wake up only for brief periods of time during hibernation. When a bat does wake up,

This question has two parts.

The death rates of bats in North America are very high due to WNS.

Part A

Describe how the genetic diversity of North American bats has most likely changed (increased, decreased, or stayed the same) since 2006. Explain your reasoning.

The genetic diversity of these bats most likely has increased since 2006. They had to adapt to their population change and adapt around WNS. With genetic diversity they are able to survive more.

Part B

In a population of little brown bats infected with WNS, scientists found some bats that are resistant to WNS. Resistance to WNS may be inherited.

If resistance to WNS is an inherited trait, will the trait increase, decrease, or stay the same in the population over time? Explain your reasoning using your knowledge of natural selection.

This resistance trait will increase. Due to natural selection, overtime most of the bats surviving will be the ones with this trait. As they survive, because they are more fitting to their environment, they will reproduce and their offspring will most likely inherit this trait. Then as time goes on, more and more bats will have this trait as they are the ones able to survive (natural selection).

[Back to Scoring Guide](#)

Score Point 1

In North America, the populations of six species of bats have decreased by up to 99% since 2006. These decreases in population sizes are largely due to white-nose syndrome (WNS). WNS is caused by a fungus that infects the skin on bats' wings, ears, and noses. The infected skin, which often appears white, loses more water than healthy, normal skin.

One species of bat affected by WNS is the little brown bat. This bat has a very small mass (about 14 g) and hunts for flying insects at night. Females typically give birth to one offspring per year.

In preparation for winter, little brown bats eat more insects to build up fat reserves in their bodies. In winter, they hibernate, which decreases body temperature, breathing rate, and metabolic rate. The bats do not eat while they are hibernating.

Little brown bats typically wake up only for brief periods of time during hibernation. When a bat does wake up,

This question has two parts.

The death rates of bats in North America are very high due to WNS.

Part A

Describe how the genetic diversity of North American bats has most likely changed (increased, decreased, or stayed the same) since 2006. Explain your reasoning.

It has decreased because the population has decreased 99% since 2006.

Part B

In a population of little brown bats infected with WNS, scientists found some bats that are resistant to WNS. Resistance to WNS may be inherited.

If resistance to WNS is an inherited trait, will the trait increase, decrease, or stay the same in the population over time? Explain your reasoning using your knowledge of natural selection.

Stay the same because they will just stay immune to WNS.

[Back to Scoring Guide](#)

Score Point 0

In North America, the populations of six species of bats have decreased by up to 99% since 2006. These decreases in population sizes are largely due to white-nose syndrome (WNS). WNS is caused by a fungus that infects the skin on bats' wings, ears, and noses. The infected skin, which often appears white, loses more water than healthy, normal skin.

One species of bat affected by WNS is the little brown bat. This bat has a very small mass (about 14 g) and hunts for flying insects at night. Females typically give birth to one offspring per year.

In preparation for winter, little brown bats eat more insects to build up fat reserves in their bodies. In winter, they hibernate, which decreases body temperature, breathing rate, and metabolic rate. The bats do not eat while they are hibernating.

Little brown bats typically wake up only for brief periods of time during hibernation. When a bat does wake up,

This question has two parts.

The death rates of bats in North America are very high due to WNS.

Part A

Describe how the genetic diversity of North American bats has most likely changed (increased, decreased, or stayed the same) since 2006. Explain your reasoning.

The genetic diversity of North American bats has most likely increased because of these genetic syndromes that cause these bats to become genetically different and diverse.

Part B

In a population of little brown bats infected with WNS, scientists found some bats that are resistant to WNS. Resistance to WNS may be inherited.

If resistance to WNS is an inherited trait, will the trait increase, decrease, or stay the same in the population over time? Explain your reasoning using your knowledge of natural selection.

If resistance was an inherited trait, the trait would probably stay the same because they are so outnumbered by the bats with WNS, they couldn't overtake them. They also probably wouldn't breed with them because they are so different and that's because of natural selection.

[Back to Scoring Guide](#)